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Nutrition support in adults: oral supplements, enteral tube feeding and parenteral nutrition

Appendices

Contents

Appendix One: scope

National Institute for Clinical Excellence

Scope

Guideline title

Nutrition support in adults: oral supplements, enteral and parenteral nutrition.

Short title

Nutrition support

Background

The National Institute for Clinical Excellence ('NICE' or 'the Institute') has commissioned the National Collaborating Centre for Acute Care to develop a clinical guideline on nutrition support in adults: oral supplements, enteral and parenteral nutrition, for use in the NHS in England and Wales. This follows referral of the topic by the Department of Health and Welsh Assembly Government (Appendix). The guideline will provide recommendations for good practice that are based on the best available evidence of clinical and cost effectiveness.

The Institute's clinical guidelines will support the implementation of National Service Frameworks (NSFs) in those aspects of care where a Framework has been published. The statements in each NSF reflect the evidence that was used at the time the Framework was prepared. The clinical guidelines and technology appraisals published by the Institute after an NSF has been issued will have the effect of updating the Framework.

Clinical need for the guideline

People who are ill in hospital or the community may have lack of appetite and/or difficulties accessing or absorbing sufficient food and fluid to maintain an adequate nutritional status. The consequence is malnutrition. There is no widely accepted definition for malnutrition,

because of varying assessment criteria, but the approximate prevalence is estimated at 10–40% of patients in the community (at home and in care homes) and in hospital. Significant deterioration of nutritional status during hospitalisation is common. Investigators identified that 60–100% of patients assessed at admission and then at discharge showed significant deterioration in nutritional status. The reported consequences of malnutrition include delayed wound healing, impaired respiratory and immune function, muscle weakness, depression, increased frequency and duration of hospitalisation, and premature death.

The causes of malnutrition are multifactorial: poor appetite, physical disabilities, including swallowing impairments; increased metabolic demands for nutrients; and nutrient losses due to vomiting and diarrhoea, are some of the reasons. Inadequate nutritional knowledge among nursing and medical staff, partly because of the low emphasis given to nutrition education in undergraduate training, have led to a lack of awareness and recognition of malnutrition. This has diminished the importance of providing adequate and appropriate food and fluid to patients. Consequently, low referral rates to dietetic and specialist staff are not uncommon. One study reported that more than 80% of patients identified as malnourished on admission to hospital did not receive any nutrition intervention during their hospital stay.

The type and severity of the patient's disease, disorder or medical condition, and his or her nutritional status, will determine the choice of nutrition support (such as specially formulated nutritional fluids). Nutrition support can be administered via the enteral route (orally or via a tube), which utilises the gastrointestinal tract, and/or the parenteral route – administered intravenously to bypass the gastrointestinal tract. The options for enteral and parenteral nutrition are numerous and the criteria for choosing either option may be complex and will vary depending on the individual patient and the clinical expertise available.

Variable levels of nutritional knowledge among clinicians, the numerous options for nutrition support, and the lack of agreed national clinical guidelines (despite some agreed national standards) have led to a wide variation in practice. In 1992 it was estimated that if better systems were in place to recognise and treat patients with malnutrition, in addition to the obvious benefits for patients, the potential saving to the NHS would exceed £260 million per year.

The objective is to provide a clinical guideline that will help clinicians to correctly identify patients in the community and hospital who require nutritional intervention, and help them to deliver the most appropriate form of nutrition support at the most appropriate time.

The guideline

The guideline development process is described in detail in three booklets that are available from the NICE website (see 'Further information'). *The Guideline Development Process – Information for Stakeholders* describes how organisations can become involved in the development of a guideline.

This document is the scope. It defines exactly what this guideline will (and will not) examine, and what the guideline developers will consider. The scope is based on the referral from the Department of Health and Welsh Assembly Government (see Appendix).

The areas that will be addressed by the guideline are described in the following sections.

Population

Groups that will be covered

Adults (aged 18 years or older) in hospital and the community, with a disease, disorder or other condition, who are at risk of malnutrition or who have become malnourished.

As far as is possible, recommendations for the general adult population will be made and specific recommendations may be made for certain clinical situations, conditions or groups (such as older people), although it will not be possible to do this for a large number of situations, conditions or groups.

Patients receiving home parenteral nutrition.

Groups that will not be covered

Patients requiring specific long-term therapeutic regimens for the treatment of diseases such as inborn errors of metabolism and chronic renal, liver, or cardiac disease.

Pregnant women, since the nutritional demands on the mother and baby require specialist considerations.

Patients with eating disorders, because the aims of intervention will differ significantly from those with malnutrition related to disease or social circumstances.

Healthcare setting

This guideline will be relevant to patients and their carers in the community (home and care homes) and hospital (all departments).

The guideline will be relevant to a range of disciplines involved in the care of adult patients in the hospital and community, including doctors, nurses, dietitians, pharmacists, speech therapists, occupational therapists and clinical psychologists.

Clinical management

The guideline will include evidence on the prevalence of malnutrition in the community and in hospital settings, the causes contributing to the problem and the physiological and functional consequences of malnutrition and its effects on the cost to the NHS.

The guideline will include recommendations on the following:

Nutritional screening and assessment of nutritional status – choosing the most appropriate assessment tool to determine those patients who are nutritionally at risk and highlight those who require nutritional intervention. The timing and frequency of the assessment and the most appropriate methods of documenting the outcomes of the screening process will be included.

Assessment of nutritional status; what are the optimum measures for determining a patient's nutritional status in the hospital and community setting.

The types of support that can be provided to those who need support with, and can benefit from, conventional feeding, in order to prevent or delay the need to start enteral tube feeding or parenteral nutrition where possible.

Indications for nutrition support – indications for initiating and stopping enteral and parenteral nutrition. Criteria for determining this will include severity of nutritional status, disease status, and duration of inadequate and adequate intake.

Administration of nutrition support.

Indications for type of access for delivering nutrition support to the patient, including indications for the most appropriate types of access for enteral nutrition (such as nasogastric, nasoduodenal, nasojejunal tubes, gastrostomy and jejunostomy) and parenteral nutrition (peripheral, central line access).

Indications for type of nutrition support, including what type (but not specific brand) of nutritional supplement to provide, such as indications for a polymeric feed, polymeric feed with fibre, hydrolysed preparations or parenteral nutrition solutions.

Mode of administration – including optimum modes of delivering the nutritional supplement such as oral, bolus, continuous, or intermittent continuous administration.

Prescription or recommendation of nutrition support – where and how to derive the correct prescription of nutritional requirements.

Individual tolerances to difference types and modes of administering nutrition support.

Monitoring. Optimum parameters and frequency of monitoring for patients receiving nutritional interventions (either enteral or parenteral). This will include: type and frequency of appropriate biochemical tests (such as anaemia, vitamin status, metabolic status), physiological tests (including nutritional status; weight, body mass index), frequency of observing access sites used for enteral and parenteral administration, acceptability of nutrition support and support structures required for the prevention of infections or complications.

The need to consider patient preference, cultural and lifestyle issues when assessing for and providing nutritional supplements.

The need for education for patients and/or carers, for example, to inform patient choice and promote self-care.

The need for consideration of ethical issues in:

- the provision or withdrawal of nutrition support
- the preservation of dignity and maximising independence.

The guideline will not include recommendations on the following:

a) The suitability of individually named oral, enteral (including oral supplements) and parenteral solutions.

The use of novel substrates such as glutamine or arginine.

Appropriate types of tubing or receptacles for enteral and parenteral administration.

Management of infection, including infection control for feeding solutions and receptacles, however the existing NICE guidance on Infection Control will be referred to where appropriate.

Primary prevention of malnutrition in healthy individuals in the general population.

Audit support within guideline

The guideline will include key review criteria for audit, which will enable objective measurements to be made of the extent and nature of local implementation of this guidance, particularly its impact upon practice and outcomes for patients.

Status

Scope

This is the scope, which has been through a 4-week period of consultation with stakeholders and reviewed by the Guidelines Review Panel and the Institute's Guidance Executive.

Guideline

The development of the guideline recommendations will begin in September 2003.

Further information

Information on the guideline development process is provided in:

The Guideline Development Process – Information for the Public and the NHS

The Guideline Development Process – Information for Stakeholders

The Guideline Development Process – Information for National Collaborating Centres and Guideline Development Groups

These booklets are available as PDF files from the NICE website (www.nice.org.uk). Information on the progress of the guideline will also be available from the website.

Referral from the Department of Health and Welsh Assembly Government

The Department of Health and Welsh Assembly Government asked the Institute:

"to develop a guideline on appropriate methods of feeding for patients who

A) are still capable of deriving at least some of their nutritional requirements by conventional feeding and/or

B) have difficulty in swallowing

including the use of nutritional supplements and enteral and parenteral nutrition methods."

Appendix Two: The Clinical Questions

These are the clinical questions which were considered priority to review because there was either known variation in practice and or there was concern about patient benefits and cost implications.

Section	Question
Oral	**Oral v nil e.g. sip feed, food fortification, menu modification**
	Oral (+/- dietary counselling) vs. standard care/no intervention
	sip feed v standard care/no intervention
	multivitamin/mineral v standard care/no intervention
	menu modification v standard care/no intervention
	dietary counselling v standard care/no intervention
	Oral vs. Oral
	sip feed v multivitamin/mineral supp
	menu modification v sip feed
	menu modification v multivitamin/mineral supplement
	Preoperative oral nutrition versus no preoperative nutritional support
	Pre and post operative oral nutrition support versus no nutrition support
	Preoperative oral nutritional support versus postoperative oral nutrition support
	Post operative oral nutrition support versus standard care
Dysphagic patients	altered consistency v standard normal diet
	altered consistency v enteral intervention
Enteral	Enteral vs. nil by mouth (including early v late)
	enteral v standard care/no intervention
	enteral route of entry
	enteral mode of delivery
	timing enteral feeding post gastrostomy surgery
	enteral motility
	Specialist enteral feeding education v no specialist advice
	Pre-discharge education vs. post discharge education
	Preoperative enteral support versus no preoperative nutrition support
	Pre and post operative enteral support versus no nutrition support
Parenteral	**PN v no PN,** standard care (e.g. continued oral diet)?
	PN with additives v nil orally/enterally?
	PN (exclusively) v ETF (any mode) including early En v PN
	PN and minimal ETF concurrently v PN but no minimal ETF?
	<u>Route of access</u>
	1) CVC v PICC
	2) CVC v peripheral
	3) tunnelled v non tunnelled
	PN cyclically v PN continuously
	PN with additives (containing vitamins, minerals, trace elements) v PN without additives?
	PN with additives v delayed provision (3-7 days) PN with additives?
	in line filter (1.2 micron filter) v no filter
	standard preparations of PN v tailored PN preparations
	Preoperative versus no preoperative PN support
	Preoperative and post operative versus no PN support

Section	These are the clinical questions which were considered priority to review because there was either known variation in practice and or there was concern about patient benefits and cost implications. Question
Monitoring	Monitoring v no monitoring
Nutrition support teams	Nutrition support teams v no nutrition support teams
Nutritional screening	Is a nutritional screening programme effective in reducing mortality and morbidity, and in increasing quality of life (through early diagnosis of malnutrition)? Is a nutritional screening programme effective in reducing level of malnutrition? Is a nutritional screening programme effective in improving quality of care provided (e.g. change in health professionals' behaviour) to malnourished patients?

Appendix Three: Literature Search Strategies

Research Methodological Search Strategies

The following search filters were applied to each search to identify specific study types for the sections listed below except screening and patient views. The Cochrane Library and the Health Economic Evaluation Database (HEED) did not need search filters as these databases are comprised of specific study types.

Medline (Dialog Datastar)

Systematic Review Filter

1 Meta-Analysis.DE. OR META (ANALYSIS OR ANALYSE$ OR ANALYTIC$) OR METAANALY$ OR META-ANALYSIS.PT. OR (systematic (review$1 OR overview$1)) OR Review-Literature#.DE.
2 cochrane.AB. OR embase.AB. OR (psychlit OR psyclit).AB. OR (psychinfo OR psycinfo).AB. OR (cinahl OR cinhal).AB. OR (science citation index).AB. OR bids.AB. OR cancerlit.AB.
3 (reference ('LIST' OR lists)).AB. OR bibliograph$.AB. OR hand-search$.AB. OR (relevant journals).AB. OR (manual search$).AB.
4 ((selection criteria).AB. OR (data extraction).AB.) AND review.PT.
5 comment.PT. OR letter.PT. OR editorial.PT. OR animal=yes NOT (animal=yes AND human=yes)
6 1 OR 2 OR 3 OR 4
7 6 NOT 5

Randomised Controlled Trial Filter

1 Randomized-Controlled-Trials.DE. OR PT=RANDOMIZED-CONTROLLED-TRIAL OR Random-Allocation.DE. OR Double-Blind-Method.DE. OR Single-Blind-Method.DE. OR PT=CLINICAL-TRIAL$ OR Clinical-Trials#.DE. OR clinical (trial OR trials) OR (single OR double OR treble OR triple) (blind$3 OR mask$3) OR Placebos.W..DE. OR Placebo$ OR Randomly allocated OR allocated random
2 Case report OR PT=LETTER OR PT=HISTORICAL-ARTICLE OR PT=REVIEW-OF-REPORTED-CASES
3 1 NOT 2

Economics Filter

1 Economics.W..DE. OR Costs-and-Cost-Analysis.DE. OR Cost-Allocation.DE. OR Cost-Benefit-Analysis.DE. OR Cost-Control.DE. OR Cost-Savings.DE. OR Cost-Of-Illness.DE. OR Cost-Sharing.DE. OR Deductibles-and-Coinsurance.DE. OR Medical-Savings-Accounts.DE. OR Health-Care-Cert.Ed. OR Direct-Service-Costs.DE. OR Drug-Costs.DE. OR Employer-Health-Costs.DE. OR Hospital costs OR Health-Expenditures.DE. OR Capital-Expenditures.DE. OR Value-Of-Life.DE.
2 Economics-Hospital#.DE. OR Economics-Medical#.DE. OR Economics-Nursing.DE. OR Economics-Pharmaceutical.DE. OR Fees-and-Charges#.DE. OR Budgets#.W..DE. OR (low cost).TI,AB. OR (high cost).TI,AB. OR ((healthcare OR health care OR health-care) (cost OR costs OR costing OR costings)).TI,AB. OR fiscal OR funding OR financial OR finance
3 (cost estimate$).TI,AB. OR (cost variable).TI,AB. OR (unit (cost OR costs OR costing OR costings)).TI,AB. OR economic$ OR pharmacoeconomic$ OR price OR prices OR pricing
4 1 OR 2 OR 3

Embase (Dialog Datastar)

Systematic Review Filter

1 Meta-Analysis#.DE. OR (Meta (analysis OR analyse OR analyses OR analysed OR analytic$)) OR Metaanaly$ OR (systematic (review$1 OR overview$1))
2 cancerlit.AB. OR cochrane.AB. OR embase.AB. OR (psychlit OR psyclit).AB. OR (psychinfo OR psycinfo).AB. OR (cinahl OR cinhal).AB. OR (science citation index).AB. OR bids.AB.
3 (reference lists).AB. OR bibliograph$.AB. OR hand-search$.AB. OR (manual search$).AB. OR (relevant journals).AB.
4 ((data extraction).AB. OR (selection criteria).AB.) AND AT=REVIEW
5 ANIMAL=YES NOT (HUMAN=YES AND ANIMAL=YES) OR AT=LETTER OR AT=EDITORIAL
6 1 OR 2 OR 3 OR 4
7 6 NOT 5

Randomised Controlled Trials Filter

1 Clinical-Trial.DE. OR Randomized-Controlled-Trial.DE. OR Randomization.W..DE. OR Single-Blind-Procedure.DE. OR Double-Blind-Procedure.DE. OR Crossover-Procedure.DE. OR Placebo.W..DE. OR (Randomised OR Randomized) controlled trial$ OR Rct OR Random allocation OR Randomly allocated OR Allocated randomly OR allocated NEXT random OR Single blind$ OR Double blind$ OR (treble OR triple) blind$ OR Placebo$ OR Prospective-Study.DE.
2 Case-Study.DE. OR Case report OR Abstract-Report.DE. OR Letter.W..DE.
3 1 NOT 2

Economics Filter

1 Socioeconomics.W..DE. OR Cost-Benefit-Analysis.DE. OR Cost-Effectiveness-Analysis.DE. OR Cost-Of-Illness.DE. OR Cost-Control.DE. OR Economic-Aspect.DE. OR Financial-Management.DE. OR Health-Care-Cost.DE. OR Health-Care-Financing.DE. OR Health-Economics.DE.
2 Hospital-Cost.DE. OR fiscal OR financial OR finance OR funding OR Cost-Minimization-Analysis.DE. OR (cost estimate$).TI,AB. OR (cost variable$).TI,AB. OR (unit (cost OR costs OR costing OR costings)).TI,AB.
3 1 OR 2

Cinahl (Dialog Datastar)

Systematic Review Filter

1 Meta-Analysis.DE. OR (Meta (analysis OR analyse$ OR analytic$)) OR Metaanaly$ OR Literature-Review#.DE. OR (systematic (review OR overview))
2 Commentary.PT. OR Letter.PT. OR Editorial.PT. OR Animals.W..DE.
3 1 NOT 2

Randomised Controlled Trials Filter

1 Clinical-Trials#.DE. OR PT=CLINICAL-TRIAL OR clinical (trial OR trials) OR (singl$ OR doubl$ OR trebl$ OR tripl$) (blind$3 OR mask$3) OR (Randomised OR Randomized) control$ trial$ OR Random-Assignment.DE. OR Random$ allocat$ OR Placebo$ OR Placebos.W..DE. OR Quantitative-Studies.DE. OR Allocat$ random$

Economics Filter

1 (((Health-Resource-Allocation.DE. OR Health-Resource-Utilization.DE. OR Economics#.W..DE. NOT (Financial-Management#.DE. OR Financial-Support#.DE. OR Financing-Organized#.DE. OR Business#.W..DE.) OR cost OR costs OR economic$ OR pharmacoeconomic$ OR price$ OR pricing$) NOT (PT=EDITORIAL OR PT=LETTER)) NOT Animal-Studies.DE.) NOT (Cochrane library).SO.

AMED (Dialog Datastar)

Systematic Review Filter

1 ((metaanalys$ OR meta) analys$) OR (systematic (review OR overview))

Randomised Controlled Trials Filter

1 (clinic$ trial$) OR ((singl$ OR doubl$ OR trebl$ OR tripl$) WITH (blind$ OR mask$)) OR ((randomised OR randomized) WITH (control$ trial$)) OR ((random$ WITH allocat$) OR placebo$)

AMED was not searched for the economic studies

British Nursing Index (Dialog Datastar)

Systematic Review Filter

1 ((metaanalys$ OR meta) analys$) OR (systematic (review OR overview))

Randomised Controlled Trials Filter

1 (clinic$ trial$) OR ((singl$ OR doubl$ OR trebl$ OR tripl$) WITH (blind$ OR mask$)) OR ((randomised OR randomized) WITH (control$ trial$)) OR ((random$ WITH allocat$) OR placebo$)

The British Nursing Index was not searched for the economic studies

Screening Search Strategies

No search filters for study design were used for the screening search. All study types were sort.

The Cochrane Library

1. (screen* near nutrition*) or (screen* near malnutrition) or (screen* near malnourish*) or (screen* near undernutrition) or (screen* near under-nutrition) or (screen* near undernourish*) or (screen* near under-nourish*) or (case finding near nutrition*) or (case finding near malnutrition) or (case finding near malnourish*) or (case finding near undernutrition) or (case finding near under-nutrition) or (case finding near undernourish*) or (case finding near under-nourish*) or (casefinding near nutrition*) or (casefinding near malnutrition) or (casefinding near malnourish*) or (casefinding near undernutrition) or (casefinding near under-nutrition) or (casefinding near undernourish*) or (casefinding near under-nourish*) or (case-finding near nutrition*) or (case-finding near malnutrition) or (case-finding near malnourish*) or (case-finding near undernutrition) or (case-finding near under-nutrition) or (case-finding near undernourish*) or (case-finding near under-nourish*)

Medline (Dialog Datastar)

1 nutrition-disorders.de.
2 deficiency-diseases.de.
3 nutrition#.w..de.
4 nutrition-assessment.de.
5 (nutrition$ status).ti,ab.
6 1 or 2 or 3 or 4 or 5
7 mass-screening#.de.
8 multiphasic-screening.de.
9 7 or 8
10 6 and 9
11 ((screen$ or case finding or casefinding or case-finding) with (nutrition$ or malnutrition or malnourish$ or undernutrition or under-nutrition or undernourish$ or under nourish$ or under-nourish$)).ti,ab.
12 10 or 11

Embase (Dialog Datastar)

1 nutritional-disorder#.de.
2 nutrition.w..de.
3 nutritional-status.de.
4 (nutrition$ status).ti,ab.
5 1 or 2 or 3 or 4
6 screening.w..de. or mass-screening.de. or screening-test.de.
7 5 and 6
8 ((screen$ or case finding or casefinding or case-finding) with (nutrition$ or malnutrition or malnourish$ or undernutrition or under-nutrition or undernourish$ or under nourish$ or under-nourish$)).ti,ab.
9 7 or 8

CINAHL (Dialog Datastar)

1 nutrition-disorders.de.
2 deficiency-diseases.de.
3 nutrition#.w..de.
4 nutritional-assessment.de.
5 (nutrition$ status).ti,ab.
6 1 or 2 or 3 or 4 or 5
7 health-screening.de.
8 6 and 7
9 ((screen$ or case finding or casefinding or case-finding) with (nutrition$ or malnutrition or malnourish$ or undernutrition or under-nutrition or undernourish$ or under nourish$ or under-nourish$)).ti,ab.
10 8 or 9

AMED (Dialog Datastar)

1 ((screen$ or case finding or casefinding or case-finding) with (nutrition$ or malnutrition or malnourish$ or undernutrition or under-nutrition or undernourish$ or under nourish$ or under-nourish$)).ti,ab.

British Nursing Index (Dialog Datastar)

1 ((screen$ or case finding or casefinding or case-finding) with (nutrition$ or malnutrition or malnourish$ or undernutrition or under-nutrition or undernourish$ or under nourish$ or under-nourish$)).ti,ab.

HEED

1 screen* or case finding or casefinding or case-finding
2 nutrition* or malnutrition or malnourish* or undernutrition or under-nutrition or undernourish* or under-nourish*
3 CS=(1 and 2)

Oral Interventions Search Strategies

The Cochrane Library

1 *MeSH descriptor* Nutritional Support
2 *MeSH descriptor* Energy Intake
3 *MeSH descriptor* Food
4 *MeSH descriptor* Diet Therapy
5 *MeSH descriptor* Nutrition Therapy
6 *MeSH descriptor* Eating
7 *MeSH descriptor* Appetite
8 *MeSH descriptor* Dietary Fats explode
9 *MeSH descriptor* Dietary Fiber
10 *MeSH descriptor* Dietary Proteins
11 *MeSH descriptor* Dietary Carbohydrates explode
12 *MeSH descriptor* Dietary Supplements
13 *MeSH descriptor* Vitamins
14 *MeSH descriptor* Minerals
15 *MeSH descriptor* Foods, Specialized
16 *MeSH descriptor* Food, Formulated
17 *MeSH descriptor* Food, Fortified
18 (nutrition* next support) or ((counsel* or advice*) near (diet or diets or dietary))
19 ((calori* or energy) next (intake or supplement*)) or ((intake or supplement*) next (calori* or energy))
20 ((oral or orally) next (feed* or intake* or nutrition* or supplement* or diet or diets or dietary) or (feed* or intake* or nutrition* or supplement* or diet or diets or dietary) next (oral or orally))
21 (supplement* next (food or foods or diet or diets or dietary or nutrition* or intake*) or (food or foods or diet or diets or dietary or nutrition* or intake*) next supplement*)
22 (nutrient next intake)
23 (food next intake)
24 (sip next feed*)
25 (nutrient next drink)
26 (modified next (diet or diets or dietary))
27 (formula* next (food or foods or diet or diets or dietary or nutrition*) or (food or foods or diet or diets or dietary or nutrition*) next formula*)
28 (enrich* next (food or foods or diet or diets or dietary) or (food or foods or diet or diets or dietary) next enrich*)
29 (fortif* next (food or foods or diet or diets or dietary or nutrition*) or (food or foods or diet or diets or dietary or nutrition*) next fortif*)
30 (food next consistenc*)
31 ((diet or diets or dietary) next consistenc* or consistenc* next (diet or diets or dietary))
32 (thick* next (food or foods or consistenc* or agent or agents) or (food or foods or consistenc* or agent or agents) next thick*)
33 (puree* next (food or foods or diet or diets or dietary or consistenc*) or (food or foods or diet or diets or dietary or consistenc*) next puree*)
34 ((diet or diets or dietary) next intake)
35 macronutrient*
36 ((vitamin or vitamins) next supplement*)
37 ((mineral or minerals) next supplement*)
38 (multivitamin* next supplement* or multi-vitamin* next supplement*)
39 ((protein or proteins) next supplement* or supplement* next (protein or proteins))
40 (multi next nutrient* or multinutrient*)
41 (nutrient next (fortif* or supplement*) or (fortif* or supplement*) next nutrient)
42 snack*
43 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42

Medline (Dialog Datastar)

1 nutritional-support.de. or (nutrition$ support).ti,ab. or ((counsel$ or advice$) near (diet or diets or dietary)).ti,ab.
2 energy-intake.de.

2 food.w..de.
4 diet-therapy.de. or nutrition-therapy.de.
5 eating.w..de. or appetite.w..de.
6 dietary-fats#.de.
7 dietary-fiber.de.
8 dietary-proteins.de.
9 dietary-carbohydrates#.de.
10 dietary-supplements.de.
11 vitamins.w..de.
12 minerals.w..de.
13 foods-specialized.de.
14 food-formulated.de.
15 food-fortified.de.
16 ((calori$ or energy) (intake or supplement$)) or ((intake or supplement$) (calori$ or energy)).ti,ab.
17 ((oral or orally) (feed$ or intake$ or nutrition$ or supplement$ or diet or diets or dietary) or (feed$ or intake$ or nutrition$ or supplement$ or diet or diets or dietary) (oral or orally)).ti,ab.
18 (supplement$ (food or foods or diet or diets or dietary or nutrition$ or intake$) or (food or foods or diet or diets or dietary or nutrition$ or intake$) supplement$).ti,ab.
19 (nutrient intake).ti,ab.
20 (food intake).ti,ab.
21 (sip feed$).ti,ab.
22 (nutrient drink).ti,ab.
23 (modified (diet or diets or dietary)).ti,ab.
24 (formula$ (food or foods or diet or diets or dietary or nutrition$) or (food or foods or diet or diets or dietary or nutrition$) formula$).ti,ab.
25 (enrich$ (food or foods or diet or diets or dietary) or (food or foods or diet or diets or dietary) enrich$).ti,ab.
26 (fortif$ (food or foods or diet or diets or dietary or nutrition$) or (food or foods or diet or diets or dietary or nutrition$) fortif$).ti,ab.
27 (food consistenc$).ti,ab.
28 ((diet or diets or dietary) consistenc$ or consistenc$ (diet or diets or dietary)).ti,ab.
29 (thick$ (food or foods or consistenc$ or agent or agents) or (food or foods or consistenc$ or agent or agents) thick$).ti,ab.
30 (puree$ (food or foods or diet or diets or dietary or consistenc$) or (food or foods or diet or diets or dietary or consistenc$) puree$).ti,ab.
31 ((diet or diets or dietary) intake).ti,ab.
32 macronutrient$.ti,ab.
33 ((vitamin or vitamins) supplement$).ti,ab.
34 ((mineral or minerals) supplement$).ti,ab.
35 (multivitamin$ supplement$ or multi-vitamin$ supplement$).ti,ab.
36 ((protein or proteins) supplement$ or supplement$ (protein or proteins)).ti,ab.
37 (multi nutrient$ or multinutrient$).ti,ab.
38 (nutrient (fortif$ or supplement$) or (fortif$ or supplement$) nutrient).ti,ab.
39 snack$.ti,ab.
40 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38

Embase (Dialog Datastar)

1 nutritional-support.de. or (nutrition$ support).ti,ab. or ((counsel$ or advice$) near (diet or diets or dietary)).ti,ab.
2 dietary-intake.de.
3 caloric-intake.de.
4 fluid-intake.de.
5 food-intake.de.
6 protein-intake.de. or protein-diet.de.
7 carbohydrate-intake#.de. or carbohydrate-diet.de.
8 fat-intake.de.
9 vitamin-intake.de.
10 mineral-intake.de.

11 dietary-fiber.de.
12 food.w..de.
13 drinking.de. or eating.de. or feeding.de. or appetite.de.
14 diet.de.
15 supplementation.de. or diet-supplementation.de. or vitamin-supplementation.de.
16 diet-therapy.de.
17 food-composition.de.
18 ((calori$ or energy) (intake or supplement$) or (intake or supplement$) (calori$ or energy)).ti,ab.
19 ((oral or orally) (feed$ or intake$ or nutrition$ or supplement$ or diet or diets or dietary) or (feed$ or intake$ or nutrition$ or supplement$ or diet or diets or dietary) (oral or orally)).ti,ab.
20 (supplement$ (food or foods or diet or diets or dietary or nutrition$ or intake$) or (food or foods or diet or diets or dietary or nutrition$ or intake$) supplement$).ti,ab.
21 (nutrient intake).ti,ab.
22 (food intake).ti,ab.
23 (sip feed$).ti,ab.
24 (nutrient drink).ti,ab.
25 (modified (diet or diets or dietary)).ti,ab.
26 (formula$ (food or foods or diet or diets or dietary or nutrition$) or (food or foods or diet or diets or dietary or nutrition$) formula$).ti,ab.
27 (enrich$ (food or foods or diet or diets or dietary) or (food or foods or diet or diets or dietary) enrich$).ti,ab.
28 (fortif$ (food or foods or diet or diets or dietary or nutrition$) or (food or foods or diet or diets or dietary or nutrition$) fortif$).ti,ab.
29 (food consistenc$).ti,ab.
30 ((diet or diets or dietary) consistenc$ or consistenc$ (diet or diets or dietary)).ti,ab.
31 (thick$ (food or foods or consistenc$ or agent or agents) or (food or foods or consistenc$ or agent or agents) thick$).ti,ab.
32 (puree$ (food or foods or diet or diets or dietary or consistenc$) or (food or foods or diet or diets or dietary or consistenc$) puree$).ti,ab.
33 ((diet or diets or dietary) intake).ti,ab.
34 macronutrient$.ti,ab.
35 ((vitamin or vitamins) supplement$).ti,ab.
36 ((mineral or minerals) supplement$).ti,ab.
37 (multivitamin$ supplement$ or multi-vitamin$ supplement$).ti,ab.
38 ((protein or proteins) supplement$ or supplement$ (protein or proteins)).ti,ab.
39 (multi nutrient$ or multinutrient$).ti,ab.
40 (nutrient (fortif$ or supplement$) or (fortif$ or supplement$) nutrient).ti,ab.
41 snack$.ti,ab.
42 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40

CINAHL (Dialog Datastar)

1 nutritional-support.de. or (nutrition$ support).ti,ab. or ((counsel$ or advice$) near (diet or diets or dietary)).ti,ab.
2 energy-intake.de.
3 food.w..de. or dietary-carbohydrates.de. or dietary-fats.de. or dietary-fiber.de. or dietary-proteins.de. or food-formulated.de. or food-fortified.de. or snack-foods.de.
4 dietary-supplementation.de.
5 diet-therapy.de.
6 vitamins.w..de. or minerals.w..de.
7 eating.w..de. or appetite.w..de.
8 ((calori$ or energy) with (intake or supplement$)).ti,ab.
9 (oral$ with (feed$ or intake$ or nutrition$ or supplement$ or diet or diets or dietary)).ti,ab.
10 (supplement$ with (food or foods or diet or diets or dietary or nutrition$ or intake$)).ti,ab.
11 (nutrient$ intake).ti,ab.
12 (food intake).ti,ab.
13 sip feed$.ti,ab.
14 modified (diet or diets or dietary).ti,ab.
15 (formula$ with (food or foods or diet or diets or dietary or nutrition$)).ti,ab.

16 (enrich$ with (food or foods or diet or diets or dietary)).ti,ab.
17 (fortif$ with (food or foods or diet or diets or dietary or nutrition$)).ti,ab.
18 food consistenc$.ti,ab.
19 diet consistenc$.ti,ab.
20 thick$ with (food or foods or consistenc$ or agent$).ti,ab.
21 puree$ with (food or foods or diet or diets or dietary or consistenc$).ti,ab.
22 macronutrient$.ti,ab.
23 ((diet or diets or dietary) intake).ti,ab.
24 (vitamin$ supplement$).ti,ab.
25 (mineral$ supplement$).ti,ab.
26 multivitamin$ supplement$ or multi-vitamin$ supplement$.ti,ab.
27 protein supplement$.ti,ab.
28 multi nutritent$ or multinutrient$.ti,ab.
29 (nutrient$ with (fortif$ or supplement$)).ti,ab.
30 snack$.ti,ab.
31 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29

AMED (Dialog Datastar)

1 (calori$ or energy) with (intake or supplement$)
2 oral$ with (feed$ or intake$ or nutrition$ or supplement$ or diet$)
3 supplement$ with (food$ or diet$ or nutrition$ or intake$)
4 nutrient$ intake
5 food intake
6 sip feed$
7 modified diet$
8 formula$ with (food$ or diet$ or nutrition$)
9 enrich$ with (food$ or diet$)
10 fortif$ with (food$ or diet$ or nutrition$)
11 food consistenc$
12 thick$ with (food$ or consistenc$ or agent$)
13 puree$ with (food$ or diet$ or consistenc$)
14 macronutrient$
15 diet$ intake
16 vitamin$ supplement$
17 mineral$ supplement$
18 multivitamin$ supplement$ or multi-vitamin$ supplement$
19 protein supplement$
20 nutrient$ with (fortif$ or supplement$)
21 snack$
22 diet-therapy.de.
23 vitamins.w..de. or minerals.w..de.
24 eating.w..de. or appetite.w..de.
25 food.w..de.
26 dietary-carbohydrates.de.
27 dietary-fats.de.
28 dietary-fiber.de.
29 dietary-proteins.de.
30 food-formulated.de.
31 food-fortified.de.
32 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31

British Nursing Index (Dialog Datastar)

1 (nutrition$ support).ti,ab. or ((counsel$ or advice$) near (diet or diets or dietary)).ti,ab.
2 nutrition-and-diet.de. or elderly-nutrition.de. or nutrition.w..de.
3 diets.w..de.
4 (calori$ or energy) with (intake or supplement$)
5 oral$ with (feed$ or intake$ or nutrition$ or supplement$ or diet$)
6 supplement$ with (food$ or diet$ or nutrition$ or intake$)

7 nutrient$ intake
8 food intake
9 sip feed$
10 modified diet$
11 formula$ with (food$ or diet$ or nutrition$)
12 enrich$ with (food$ or diet$)
13 fortif$ with (food$ or diet$ or nutrition$)
14 macronutrient$
15 diet$ intake
16 vitamin$ supplement$
17 mineral$ supplement$
18 multivitamin$ supplement$ or multi-vitamin$ supplement$
19 nutrient$ with (fortif$ or supplement$)
20 snack$
21 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20

HEED

1 AX=calori* or AX=energy or AX=formula* or AX=enrich* or AX=fortif* or AX=protein or AX=nutrient* or AX=sip or AX=counsel* or AX=advice or AX=support
2 AX=diet* or AX=food* or AX=feed* or AX=nutrition* or AX=intake* or AX=supplement* or AX=drink
3 CS=(1 and 2)
4 AX=supplement*
5 AX=food* or AX=diet or AX=nutrition* or AX=intake* or AX=vitamin* or AX=mineral*
6 CS=(4 and 5)
7 AX=food* or diet* or AX=thick* or AX=puree*
8 AX=consistenc* or AX=intake* or AX=diet* or AX=agent*
9 CS=(7 and 8)
10 AX=multivitamin* or AX=multi-vitamin*
11 CS=(3 or 6 or 9 or 10)

Enteral tube feeding Search Strategies

The Cochrane Library

1 *MeSH descriptor* Enteral Nutrition
2 (enteral or enteric) next (nutrition* or feed*) or (nutrition* or feed*) next (enteral or enteric)
3 *MeSH descriptor* Gastrostomy
4 gastrostom*
5 *MeSH descriptor* Jejunostomy
6 jejunostom*
7 gastrojejunostom*
8 (gastrojej* or gastroduoden* or gastric) next (nutrition* or feed*) or (nutrition* or feed*) next (gastrojej* or gastroduoden* or gastric)
9 (tube or tubes) next (nutrition* or feed*) or (nutrition* or feed*) next (tube or tubes)
10 nasojejun* or naso-jejun* or nasal-jejun*
11 nasogastr* or naso-gastr* or nasal next gastric or nasal-gastric
12 naso-duoden* or nasoduoden* or nasal-duoden*
13 (jejunal* or jejunum) next (nutrition* or feed*) or (nutrition* or feed*) next (jejunal* or jejunum)
14 (duodenal or duodenum or duodeno*) next (nutrition* or feed*) or (nutrition* or feed*) next (duodenal or duodenum or duodeno*)
15 PEJ
16 (#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15)

Medline (Dialog Datastar)

1 enteral-nutrition.de.
2 ((enteral or enteric) (nutrition$ or feed$) or (nutrition$ or feed$) (enteral or enteric)).ti,ab.
3 gastrostomy.w..de. or gastrostom$.ti,ab.
4 jejunostomy.w..de. or jejunostom$.ti,ab.

5 gastrojejunostom$.ti,ab.
6 ((gastrojej$ or gastroduoden$ or gastric) (nutrition$ or feed$) or (nutrition$ or feed$) (gastrojej$ or gastroduoden$ or gastric)).ti,ab.
7 ((tube or tubes) (nutrition$ or feed$) or (nutrition$ or feed$) (tube or tubes)).ti,ab.
8 (nasojejun$ or naso-jejun$ or nasal-jejun$).ti,ab.
9 (nasogastr$ or naso-gastr$ or nasal gastric or nasal-gastric).ti,ab.
10 (naso-duoden$ or nasoduoden$ or nasal-duoden$).ti,ab.
11 ((jejunal$ or jejunum) (nutrition$ or feed$) or (nutrition$ or feed$) (jejunal$ or jejunum)).ti,ab.
12 ((duodenal or duodenum or duodeno$) (nutrition$ or feed$) or (nutrition$ or feed$) (duodenal or duodenum or duodeno$)).ti,ab.
13 PEJ.ti,ab.
14 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13

Embase (Dialog Datastar)

1 enteric-feeding.de. or nose-feeding.de. or tube-feeding.de.
2 ((enteral or enteric) (nutrition$ or feed$) or (nutrition$ or feed$) (enteral or enteric)).ti,ab.
3 gastrostomy.w..de. or gastrostom$.ti,ab. or percutaneous-endoscopic-gastrostomy.de.
4 jejunostomy.w..de. or jejunostom$.ti,ab.
5 gastroduodenostomy.w..de. or gastrojejunostomy.w..de. or gastrojejunostom$.ti,ab.
6 ((gastrojej$ or gastroduoden$ or gastric) (nutrition$ or feed$) or (nutrition$ or feed$) (gastrojej$ or gastroduoden$ or gastric)).ti,ab.
7 ((tube or tubes) (nutrition$ or feed$) or (nutrition$ or feed$) (tube or tubes)).ti,ab.
8 (nasojejun$ or naso-jejun$ or nasal-jejun$).ti,ab.
9 (nasogastr$ or naso-gastr$ or nasal gastric or nasal-gastric).ti,ab.
10 (naso-duoden$ or nasoduoden$ or nasal-duoden$).ti,ab.
11 ((jejunal$ or jejunum) (nutrition$ or feed$) or (nutrition$ or feed$) (jejunal$ or jejunum)).ti,ab.
12 ((duodenal or duodenum or duodeno$) (nutrition$ or feed$) or (nutrition$ or feed$) (duodenal or duodenum or duodeno$)).ti,ab.
13 PEJ.ti,ab.
14 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13

CINAHL (Dialog Datastar)

1 enteral-nutrition.de.
2 ((enteral or enteric) with (nutrition$ or feed$ or formula$)).ti,ab.
3 gastrostomy.de. or gastrostom$.ti,ab.
4 jejunostomy.de. or jejunostom$.ti,ab.
5 ((gastrojej$ or gastroduoden$ or gastric or tube$ or duoden$ or jejun$) with (nutrition$ or feed$)).ti,ab.
6 ((nasal or naso) with (jejun$ or duoden$ or gastrojej$ or gastroduoden$ or gastric)).ti,ab.
7 (nasojejun$ or nasaljejun$ or nasoduoden$ or nasalduoden$ or nasogastr$ or nasalgastr$).ti,ab.
8 PEJ.ti,ab.
9 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8

AMED (Dialog Datastar)

1 enteral-nutrition.de.
2 (enteral or enteric) with (nutrition$ or feed$ or formula$)
3 gastrostom$ or jejunostom$
4 (gastr$ or tube$ or duoden$ or jejun$) with (nutrition$ or feed$)
5 (nasal or naso) with (jejun or duoden$ or gastr$)
6 nasojejun$ or nasaljejun$ or nasoduoden$ or nasalduoden$ or nasogastr$ or nasalgastr$
7 PEJ.ti,ab.
8 1 or 3 or 4 or 5 or 6 or 7 or 8

British Nursing Index (Dialog Datastar)

1 enteral-and-parenteral-nutrition.de.
2 (enteral or enteric) with (nutrition$ or feed$ or formula$)
3 gastrostom$ or jejunostom$
4 (gastr$ or tube$ or duoden$ or jejun$) with (nutrition$ or feed$)
5 (nasal or naso) with (jejun or duoden$ or gastr$)
6 nasojejun$ or nasaljejun$ or nasoduoden$ or nasalduoden$ or nasogastr$ or nasalgastr$

7 PEJ
8 1 or 2 or 3 or 4 or 5 or 6 or 7

HEED

1 AX=enteral or AX=enteric or AX=naso or AX=nasal or AX=nose or AX=tube or AX=duodenal or AX=gastric or AX=jejunal
2 AX=feeding or AX=nutrition
3 CS=(1 and 2)
4 AX=gastrostomy or AX=jejunostomy or AX=gastrojejunostomy or AX=PEJ or AX=PEG
5 CS=(3 or 4)

Parenteral Nutrition Search Strategies

The Cochrane Library

#1 *MeSH descriptor* Parenteral Nutrition *explode all trees*
#2 (((parenteral* or intravenous*) and (feed* or nutrition*)) and central)
#3 (((parenteral* or intravenous*) and (feed* or nutrition*)) and peripheral)
#4 (PICC or HPN or TPN)
#5 *MeSH descriptor* Catheterization Central Venous *single term*
#6 *MeSH descriptor* Catheterization Peripheral *explode all trees*
#7 (#1 or #2 or #3 or #4 or #5 or #6)

Medline (Dialog Datastar)

1 parenteral-nutrition#.de.
2 ((parenteral$ or intravenous$) (feed$ or nutrition$)).ti,ab. and central.ti,ab. or ((feed$ or nutrition$) (parenteral$ or intravenous$)).ti,ab. and central.ti,ab.
3 catheterization-central-venous.de. and (nutrition$ or feed$).ti,ab.
4 ((parenteral$ or intravenous$) (feed$ or nutrition$)).ti,ab. and peripheral.ti,ab. or ((feed$ or nutrition$) (parenteral$ or intravenous$)).ti,ab. and peripheral.ti,ab.
5 catheterization-peripheral.de. and (nutrition$ or feed$).ti,ab.
6 PICC.ti,ab.
7 (TPN or HPN).ti,ab.
8 1 or 2 or 3 or 4 or 5 or 6 or 7

Embase (Dialog Datastar)

1 parenteral-nutrition#.de.
2 ((parenteral$ or intravenous$) (feed$ or nutrition$)).ti,ab. and central.ti,ab. or ((feed$ or nutrition$) (parenteral$ or intravenous$)).ti,ab. and central.ti,ab.
3 central-venous-catheterization.de. and (nutrition$ or feed$).ti,ab.
4 ((parenteral$ or intravenous$) (feed$ or nutrition$)).ti,ab. and peripheral.ti,ab. or ((feed$ or nutrition$) (parenteral$ or intravenous$)).ti,ab. and peripheral.ti,ab.
5 catheterization.w..de. and (nutrition$ or feed$).ti,ab.
6 PICC.ti,ab.
7 (TPN or HPN).ti,ab.
8 1 or 2 or 3 or 4 or 5 or 6 or 7

CINAHL (Dialog Datastar)

1 parenteral-nutrition#.de.
2 ((parenteral$ or intravenous$) with (feed$ or nutrition$)).ti,ab.
3 catheterization-central-venous#.de. and (feed$ or nutrition$).ti,ab.
4 catheterization-peripheral#.de. and (feed$ or nutrition$).ti,ab.
5 (picc$ or tpn or hpn).ti,ab.
6 1 or 2 or 3 or 4 or 5

AMED (Dialog Datastar)

1 (parenteral$ or intravenous$ or central$ or peripheral$) with (feed$ or nutrition$)
2 PICC$ or TPN or HPN
3 1 or 2 or 3 or 4

British Nursing Index (Dialog Datastar)

1 enteral-and-parenteral-nutrition.de.
2 (parenteral$ or intravenous$ or central$ or peripheral$) with (feed$ or nutrition$)
3 PICC$ or TPN or HPN
4 1 or 2 or 3

HEED

1 AX=Parenteral or AX=Intravenous
2 AX=Central or AX=Peripheral
3 AX=Feed* or AX=Nutrition*
4 CS=(1 and 2)
5 CS=(1 and 3)
6 CS=(2 and 3)
7 AX=PICC or AX=TPN or AX=HPN
8 CS=(4 or 5 or 6 or 7)

Dysphagia Search Strategies

The Cochrane Library

#1 *MeSH descriptor* Deglutition *explode all trees*
#2 *MeSH descriptor* Deglutition Disorders
#3 dysphag* or swallow* or deglutition
#4 (#1 or #2 or #3 or #4)
#5 puree* or (bolus near (feed or feeds or feeding or consistenc$ or volume or volumes or viscosity))
#6 thick* near/2 (fluid* or liquid* or food or foods or consistenc* or agent*)
#7 (diet or diets or dietary or modified or modify or modification or altered or alter or alteration) near/2 (consistenc$ or texture or textural)
#8 #5 or #6 or #7
#9 #4 and #8
#10 *MeSH descriptor N*utritional Support *explode all*
#11 (nutrition* near/1 support*) or (metabolic near/1 support*)
#12 (enteral or enteric) near/1 (nutrition* or feed*)
#13 *MeSH descriptor* Gastrostomy *explode all trees*
#14 *MeSH descriptor* Jejunostomy *explode all trees*
#15 gastrostom* or jejunostom* or gastrojejunostom* or nasojejun* or naso-jejun* or nasal-jejun* or nasogastr$ or naso-gastr* or nasal gastric or nasal-gastric or naso-duoden* or nasoduoden* or nasal-duoden*
#16 ((gastrojej* or gastroduoden* or gastric) near/1 (nutrition* or feed*)) or ((jejunal* or jejunum) near/1 (nutrition* or feed*)) or ((duodenal or duodenum or duodeno*) near/1 (nutrition* or feed*))
#17 PEG or PEJ
#18 #10 or #11 or #12 or 13 or #14 or #15 or #16 or #17
#19 #4 and #18
#20 #9 or #19

Medline (Dialog Datastar)

1 deglutition-disorders.de. or deglutition.w..de. or dysphag$ or swallow$ or deglutition
2 puree$
3 ((diet or diets or dietary or modified or modify or modification or altered or alter or alteration) (consistenc$ or texture or textural) or (consistenc$ or texture or textural) (diet or diets or dietary or modified or modify or modification or altered or alter or alteration)).ti,ab.
4 (thick$ (fluid$ or liquid$ or food or foods or consistenc$ or agent$) or (fluid$ or liquid$ or food or consistenc$ or agent$) thick$).ti,ab.
5 2 or 3 or 4
6 nutritional-support#.de.
7 (nutrition$ support$ or metabolic support$).ti,ab.
8 enteral-nutrition.de.
9 ((enteral or enteric) (nutrition$ or feed$) or (nutrition$ or feed$) (enteral or enteric)).ti,ab.
10 gastrostomy.de. or gastrostom$.ti,ab.

11 jejunostomy.de. or jejunostom$.ti,ab.
12 gastrojejunostom$.ti,ab.
13 ((gastrojej$ or gastroduoden$ or gastric) (nutrition$ or feed$) or (nutrition$ or feed$) (gastrojej$ or gastroduoden$ or gastric)).ti,ab.
14 (nasojejun$ or naso-jejun$ or nasal-jejun$).ti,ab.
15 (nasogastr$ or naso-gastr$ or nasal gastric or nasal-gastric).ti,ab.
16 (naso-duoden$ or nasoduoden$ or nasal-duoden$).ti,ab.
17 ((jejunal$ or jejunum) (nutrition$ or feed$) or (nutrition$ or feed$) (jejunal$ or jejunum)).ti,ab.
18 ((duodenal or duodenum or duodeno$) (nutrition$ or feed$) or (nutrition$ or feed$) (duodenal or duodenum or duodeno$)).ti,ab.
19 (PEG or PEJ).ti,ab.
20 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22
21 1 and (5 or 20)

Embase (Dialog Datastar)

1 dysphagia.w..de. or swallowing.w..de. or swallow$ or dysphag$ or deglutition
2 puree$
3 ((diet or diets or dietary or modified or modify or modification or altered or alter or alteration) (consistenc$ or texture or textural) or (consistenc$ or texture or textural) (diet or diets or dietary or modified or modify or modification or altered or alter or alteration)).ti,ab.
4 (thick$ (fluid$ or liquid$ or food or foods or consistenc$ or agent$) or (fluid$ or liquid$ or food or consistenc$ or agent$) thick$).ti,ab.
5 2 or 3 or 4
6 nutritional-support#.de.
8 (nutrition$ support$ or metabolic support$).ti,ab.
9 enteric-feeding.de. or nose-feeding.de. or tube-feeding.de.
10 ((enteral or enteric) (nutrition$ or feed$) or (nutrition$ or feed$) (enteral or enteric)).ti,ab.
11 gastrostomy.de. or gastrostom$.ti,ab.
12 jejunostomy.de. or jejunostom$.ti,ab.
13 gastrojejunostom$.ti,ab.
14 ((gastrojej$ or gastroduoden$ or gastric) (nutrition$ or feed$) or (nutrition$ or feed$) (gastrojej$ or gastroduoden$ or gastric)).ti,ab.
15 (nasojejun$ or naso-jejun$ or nasal-jejun$).ti,ab.
16 (nasogastr$ or naso-gastr$ or nasal gastric or nasal-gastric).ti,ab.
17 (naso-duoden$ or nasoduoden$ or nasal-duoden$).ti,ab.
18 ((jejunal$ or jejunum) (nutrition$ or feed$) or (nutrition$ or feed$) (jejunal$ or jejunum)).ti,ab.
19 ((duodenal or duodenum or duodeno$) (nutrition$ or feed$) or (nutrition$ or feed$) (duodenal or duodenum or duodeno$)).ti,ab.
20 (PEG or PEJ).ti,ab.
21 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20
22 1 and (5 or 21)

CINAHL (Dialog Datastar)

1 deglutition-disorders.de. or deglutition.w..de. or dysphag$ or swallow$ or deglutition
2 puree$
3 ((diet or diets or dietary or modified or modify or modification or altered or alter or alteration) (consistenc$ or texture or textural) or (consistenc$ or texture or textural) (diet or diets or dietary or modified or modify or modification or altered or alter or alteration)).ti,ab.
4 (thick$ (fluid$ or liquid$ or food or foods or consistenc$ or agent$) or (fluid$ or liquid$ or food or consistenc$ or agent$) thick$).ti,ab.
5 2 or 3 or 4
6 nutritional-support#.de.
7 (nutrition$ support$ or metabolic support$).ti,ab.
8 6 or 7
9 enteral-nutrition.de.
10 ((enteral or enteric) (nutrition$ or feed$) or (nutrition$ or feed$) (enteral or enteric)).ti,ab.
11 gastrostomy.de. or gastrostom$.ti,ab.
12 jejunostomy.de. or jejunostom$.ti,ab.
13 gastrojejunostom$.ti,ab.

14 ((gastrojej$ or gastroduoden$ or gastric) (nutrition$ or feed$) or (nutrition$ or feed$) (gastrojej$ or gastroduoden$ or gastric)).ti,ab.
15 (nasojejun$ or naso-jejun$ or nasal-jejun$).ti,ab.
16 (nasogastr$ or naso-gastr$ or nasal gastric or nasal-gastric).ti,ab.
17 (naso-duoden$ or nasoduoden$ or nasal-duoden$).ti,ab.
18 ((jejunal$ or jejunum) (nutrition$ or feed$) or (nutrition$ or feed$) (jejunal$ or jejunum)).ti,ab.
19 ((duodenal or duodenum or duodeno$) (nutrition$ or feed$) or (nutrition$ or feed$) (duodenal or duodenum or duodeno$)).ti,ab.
20 (PEG or PEJ).ti,ab.
21 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20
22 1 and (5 or 8 or 21)

AMED (Dialog Datastar)

1 dysphag$ or swallow$ or deglutition
2 puree$
3 ((diet or diets or dietary or modified or modify or modification or altered or alter or alteration) (consistenc$ or texture or textural) or (consistenc$ or texture or textural) (diet or diets or dietary or modified or modify or modification or altered or alter or alteration))
4 (thick$ (fluid$ or liquid$ or food or foods or consistenc$ or agent$) or (fluid$ or liquid$ or food or consistenc$ or agent$) thick$)
5 2 or 3 or 4
6 1 and 5
7 nutrition$ support$ or metabolic support$
8 enteral-nutrition.de.
9 (enteral or enteric) with (nutrition$ or feed$ or formula$)
10 gastrostom$ or jejunostom$
11 (gastr$ or tube$ or duoden$ or jejun$) with (nutrition$ or feed$)
12 (nasal or naso) with (jejun or duoden$ or gastr$)
13 nasojejun$ or nasaljejun$ or nasoduoden$ or nasalduoden$ or nasogastr$ or nasalgastr$
14 PEG or PEJ
15 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14
16 1 and (5 or 15)

British Nursing Index (Dialog Datastar)

1 dysphag$ or swallow$ or deglutition
2 puree$
3 (diet or diets or dietary or modified or modify or modification or altered or alter or alteration) (consistenc$ or texture or textural) or (consistenc$ or texture or textural) (diet or diets or dietary or modified or modify or modification or altered or alter or alteration)
4 (thick$ (fluid$ or liquid$ or food or foods or consistenc$ or agent$) or (fluid$ or liquid$ or food or consistenc$ or agent$) thick$)
5 2 or 3 or 4
6 1 and 5
7 nutrition$ support$ or metabolic support$
8 enteral-and-parenteral-nutrition.de.
9 (enteral or enteric) with (nutrition$ or feed$ or formula$)
10 gastrostom$ or jejunostom$
11 (gastr$ or tube$ or duoden$ or jejun$) with (nutrition$ or feed$)
12 (nasal or naso) with (jejun or duoden$ or gastr$)
13 nasojejun$ or nasaljejun$ or nasoduoden$ or nasalduoden$ or nasogastr$ or nasalgastr$
14 PEG or PEJ
15 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14
16 1 and (5 or 15)

Nutrition Support Teams and Monitoring Search Strategies

The Cochrane Library

1 patient care team (mesh)

2 ((patient:ti next care:ti next team*:ti) or (patient:ti next care:ti next service*:ti) or (patient:ab next care:ab next team*:ab) or (patient:ab next care:ab next service*:ab))
3 ((interdisciplinary:ti next team*:ti) or (inter-disciplinary:ti next team*:ti) or (interdisciplinary:ti next service*:ti) or (inter-disciplinary:ti next service*:ti) or (multidisciplinary:ti next team*:ti) or (multi-disciplinary:ti next team*:ti) or (multidisciplinary:ti next service*:ti) or (multi-disciplinary:ti next service*:ti) or (interdisciplinary:ab next team*:ab) or (inter-disciplinary:ab next team*:ab) or (interdisciplinary:ab next service*:ab) or (inter-disciplinary:ab next service*:ab) or (multidisciplinary:ab next team*:ab) or (multi-disciplinary:ab next team*:ab) or (multidisciplinary:ab next service*:ab) or (multi-disciplinary:ab next service*:ab))
4 monitoring physiologic (mesh)
5 (monitoring:ti or monitoring:ab or surveillance:ti or surveillance:ab)
6 (#1 or #2 or #3 or #4 or #5)
7 nutritional support (mesh) (exploded in all trees)
8 nutritional status (mesh)
9 nutrition assessment (mesh)
10 ((parenteral:ti next nutrition*:ti) or (parenteral:ti next feed*:ti) or (intravenous:ti next nutrition:ti) or (intravenous:ti next feed*:ti) or (enteral:ti next nutrition*:ti) or (enteral:ti next feed*:ti) or (enteric:ti next feed*:ti) or (nutrition*:ti next support*:ti) or (metabolic:ti next support*:ti) or hyperaliment*:ti or hyper-aliment*:ti or (tube:ti next feed*:ti) or (oral:ti next feed*:ti) or (oral:ti next nutrition*:ti) or (oral:ti next supplement*:ti) or (parenteral:ab next nutrition*:ab) or (parenteral:ab next feed*:ab) or (intravenous:ab next nutrition:ab) or (intravenous:ab next feed*:ab) or (enteral:ab next nutrition*:ab) or (enteral:ab next feed*:ab) or (enteric:ab next feed*:ab) or (nutrition*:ab next support*:ab) or (metabolic:ab next support*:ab) or hyperaliment*:ab or hyper-aliment*:ab or (tube:ab next feed*:ab) or (oral:ab next feed*:ab) or (oral:ab next nutrition*:ab) or (oral:ab next supplement*:ab))
11 (#7 or #8 or #9 or #10)
12 ((nutrition:ti next team*:ti) or (parenteral:ti next team*:ti) or (enteral:ti next team*:ti) or (parenteral:ti next nutrition:ti next service*:ti) or (enteral:ti next nutrition:ti next service*:ti) or (nutrition:ti next support:ti next team*:ti) or (metabolic:ti next support:ti next team*:ti) or (nutrition:ti next support:ti next service*:ti) or (metabolic:ti next support:ti next service*:ti) or (nutrition:ti next care:ti next team*:ti) or (metabolic:ti next care:ti next team*:ti) or (nutrition:ti next care:ti next service*:ti) or (metabolic:ti next care:ti next service*:ti) or (hyperalimentation:ti next team*:ti) or (hyper-alimentation:ti next tearm*:ti) or (hyperalimentation:ti next service*:ti) or (hyper-alimentation:ti next service*:ti) or (nutrition:ab next team*:ab) or (parenteral:ab next team*:ab) or (enteral:ab next team*:ab) or (parenteral:ab next nutrition:ab next service*:ab) or (enteral:ab next nutrition:ab next service*:ab) or (nutrition:ab next support:ab next team*:ab) or (metabolic:ab next support:ab next team*:ab) or (nutrition:ab next support:ab next service*:ab) or (metabolic:ab next support:ab next service*:ab) or (nutrition:ab next care:ab next team*:ab) or (metabolic:ab next care:ab next team*:ab) or (nutrition:ab next care:ab next service*:ab) or (metabolic:ab next care:ab next service*:ab) or (hyperalimentation:ab next team*:ab) or (hyper-alimentation:ab next tearm*:ab) or (hyperalimentation:ab next service*:ab) or (hyper-alimentation:ab next service*:ab))
13 ((#6 and #11) or #12)
14 critical pathways (mesh)
15 clinical protocols (mesh)
16 ((critical:ti next pathway*:ti) or (critical:ab next pathway*:ab) or (clinical:ti next pathway*:ti) or (clinical:ab next pathway*:ab))
17 (protocol*:ti or protocol*:ab)
18 (#14 or #15 or #16 or #17)
19 (((#6 or #18) and #11) or #12)

Medline (Dialog Datastar)

1 patient-care-team#.de.
2 (patient care team$ or patient care service$).ti,ab.
3 (interdisciplinary near team$ or inter-disciplinary near team$ or interdisciplinary near service$ or inter-disciplinary near service$ or multidisciplinary near team$ or multi-disciplinary near team$ or multidisciplinary near service$ or multi-disciplinary near service$).ti,ab.
4 1 or 2 or 3
5 monitoring-physiologic.de.
6 (monitoring or monitored or surveillance).ti,ab.
7 5 or 6
8 clinical-protocols.de. or critical-pathways.de.

9 (critical pathway$ or clinical pathway$ or protocol$).ti,ab.
10 8 or 9
11 nutritional-support#.de.
12 nutritional-status.de.
13 nutrition-assessment.de.
14 (parenteral nutrition$ or parenteral feed$ or intravenous nutrition or intravenous feed$ or enteral nutrition$ or enteral feed$ or enteric feed$ or nutrition$ support$ or metabolic support$ or hyperaliment$ or hyper-aliment$ or tube feed$ or oral feed$ or oral nutrition$ or oral supplement$).ti,ab.
15 11 or 12 or 13 or 14
16 (4 or 7 or 10) and 15
17 (nutrition$ team$ or parenteral team$ or enteral team$).ti,ab.
18 (parenteral nutrition service$ or enteral nutrition service$).ti,ab.
19 (nutrition$ support team$ or nutrition$ support service$).ti,ab.
20 (metabolic support team$ or metabolic support service$).ti,ab.
21 (hyperalimentation team$ or hyper-alimentation team$ or hyperalimentation service$ or hyper-alimentation service$).ti,ab.
22 17 or 18 or 19 or 20 or 21
23 16 or 22

Embase (Dialog Datastar)

1 (patient care team$ or patient care service$).ti,ab.
2 (interdisciplinary near team$ or inter-disciplinary near team$ or interdisciplinary near service$ or inter-disciplinary near service$ or multidisciplinary near team$ or multi-disciplinary near team$ or multidisciplinary near service$ or multi-disciplinary near service$).ti,ab.
3 1 or 2
4 monitoring.de. or patient-monitoring.de.
5 (monitoring or monitored or surveillance).ti,ab.
6 4 or 5
7 clinical-protocol.de. or clinical-pathway.de.
8 (critical pathway$ or clinical pathway$ or protocol$).ti,ab.
9 7 or 8
10 nutritional-support#.de. or artificial-feeding.de.
11 nutritional-status.de.
12 (parenteral nutrition$ or parenteral feed$ or intravenous nutrition or intravenous feed$ or enteral nutrition$ or enteral feed$ or enteric feed$ or nutrition$ support$ or metabolic support$ or hyperaliment$ or hyper-aliment$ or tube feed$ or oral feed$ or oral nutrition$ or oral supplement$).ti,ab.
13 10 or 11 or 12
14 (3 or 6 or 9) and 13
15 (nutrition$ team$ or parenteral team$ or enteral team$).ti,ab.
16 (parenteral nutrition service$ or enteral nutrition service$).ti,ab.
17 (nutrition$ support team$ or nutrition$ support service$).ti,ab.
18 (metabolic support team$ or metabolic support service$).ti,ab.
19 (hyperalimentation team$ or hyper-alimentation team$ or hyperalimentation service$ or hyper-alimentation service$).ti,ab.
20 15 or 16 or 17 or 18 or 19
21 14 or 20

CINAHL (Dialog Datastar)

1 multidisciplinary-care-team.de.
2 (patient care team$ or patient care service$).ti,ab.
3 (interdisciplinary near team$ or inter-disciplinary near team$ or interdisciplinary near service$ or inter-disciplinary near service$ or multidisciplinary near team$ or multi-disciplinary near team$ or multidisciplinary near service$ or multi-disciplinary near service$).ti,ab.
4 1 or 2 or 3
5 monitoring-physiologic.de.
6 (monitoring or monitored or surveillance).ti,ab.
7 5 or 6
8 protocols.w..de. or critical-path.de.

9 (critical pathway$ or clinical pathway$ or protocol$).ti,ab.
10 8 or 9
11 nutritional-support#.de.
12 nutritional-status.de.
13 nutritional-assessment.de.
14 (parenteral nutrition$ or parenteral feed$ or intravenous nutrition or intravenous feed$ or enteral nutrition$ or enteral feed$ or enteric feed$ or nutrition$ support$ or metabolic support$ or hyperaliment$ or hyper-aliment$ or tube feed$ or oral feed$ or oral nutrition$ or oral supplement$).ti,ab.
15 11 or 12 or 13 or 14
16 (nutrition$ team$ or parenteral team$ or enteral team$).ti,ab.
17 (parenteral nutrition service$ or enteral nutrition service$).ti,ab.
18 (nutrition$ support team$ or nutrition$ support service$).ti,ab.
19 (metabolic support team$ or metabolic support service$).ti,ab.
20 (hyperalimentation team$ or hyper-alimentation team$ or hyperalimentation service$ or hyper-alimentation service$).ti,ab.
21 16 or 17 or 18 or 19 or 20
22 15 or 21

AMED (Dialog Datastar)

1 patient-care-team#.de.
2 (patient care team$ or patient care service$).ti,ab.
3 (interdisciplinary near team$ or inter-disciplinary near team$ or interdisciplinary near service$ or inter-disciplinary near service$ or multidisciplinary near team$ or multi-disciplinary near team$ or multidisciplinary near service$ or multi-disciplinary near service$).ti,ab.
4 1 or 2 or 3
5 (monitoring or monitored or surveillance).ti,ab.
6 clinical-protocols.de.
7 (critical pathway$ or clinical pathway$ or protocol$).ti,ab.
8 6 or 7
9 nutritional-status.de.
10 feeding-methods#.de.
11 (parenteral nutrition$ or parenteral feed$ or intravenous nutrition or intravenous feed$ or enteral nutrition$ or enteral feed$ or enteric feed$ or nutrition$ support$ or metabolic support$ or hyperaliment$ or hyper-aliment$ or tube feed$ or oral feed$ or oral nutrition$ or oral supplement$).ti,ab.
12 9 or 10 or 11
13 (nutrition$ team$ or parenteral team$ or enteral team$).ti,ab.
14 (parenteral nutrition service$ or enteral nutrition service$).ti,ab.
15 (nutrition$ support team$ or nutrition$ support service$).ti,ab.
16 (metabolic support team$ or metabolic support service$).ti,ab.
17 (hyperalimentation team$ or hyper-alimentation team$ or hyperalimentation service$ or hyper-alimentation service$).ti,ab.
18 13 or 14 or 15 or 16 or 17
19 ((4 or 5 or 8) and 12) or 19

British Nursing Index (Dialog Datastar)

1 multidisciplinary-teams.de.
2 (patient care team$ or patient care service$).ti,ab.
3 (interdisciplinary near team$ or inter-disciplinary near team$ or interdisciplinary near service$ or inter-disciplinary near service$ or multidisciplinary near team$ or multi-disciplinary near team$ or multidisciplinary near service$ or multi-disciplinary near service$).ti,ab.
4 1 or 2 or 3
5 care-plans-and-planning.de.
6 standards-and-guidelines.de.
7 (critical pathway$ or clinical pathway$ or protocol$).ti,ab.
8 5 or 6 or 7
9 (monitoring or monitored or surveillance).ti,ab.
10 elderly-nutrition.de. or enteral-and-parenteral-nutrition.de.

11 (parenteral nutrition$ or parenteral feed$ or intravenous nutrition or intravenous feed$ or enteral nutrition$ or enteral feed$ or enteric feed$ or nutrition$ support$ or metabolic support$ or hyperaliment$ or hyper-aliment$ or tube feed$ or oral feed$ or oral nutrition$ or oral supplement$).ti,ab.
12 10 or 11
13 (nutrition$ team$ or parenteral team$ or enteral team$).ti,ab.
14 (parenteral nutrition service$ or enteral nutrition service$).ti,ab.
15 (nutrition$ support team$ or nutrition$ support service$).ti,ab.
16 (metabolic support team$ or metabolic support service$).ti,ab.
17 (hyperalimentation team$ or hyper-alimentation team$ or hyperalimentation service$ or hyper-alimentation service$).ti,ab.
19 13 or 14 or 15 or 16 or 17
20 ((4 or 8 or 9) and 12) or 19

HEED

1 'patient care team*' or 'patient care service*' or 'interdisciplinary team*' or 'inter-disciplinary team*' or 'interdisciplinary service*' or 'inter-disciplinary service*' or 'multidisciplinary team*' or 'multi-disciplinary team*' or 'multidisciplinary service*' or 'multi-disciplinary service*'
2 'critical pathway*' or 'clinical pathway*' or protocol*
3 monitoring or monitored or surveillance
4 parenteral or enteral or 'intravenous nutrition' or 'intravenous feed*' or 'nutrition* support*' or 'metabolic support*' or hyperaliment* or hyper-aliment* or 'tube feed*' or 'oral feed*' or 'oral nutrition*' or 'oral supplement*'
5 (1 or 2 or 3) and 4
6 'nutrition* team*' or 'parenteral team*' or 'enteral team*'
7 'parenteral nutrition service*' or 'enteral nutrition service*'
8 'nutrition* support team*' or 'nutrition* support service*'
9 'metabolic support team*' or 'metabolic support service*'
10 'hyperalimentation team*' or 'hyper-alimentation team*' or 'hyperalimentation service*' or 'hyper-alimentation service*'
11 6 or 7 or 8 or 9 or 10
12 5 or 11

Patient Views Search Strategies

No search filters for study design were used for the patient views search.

Medline (Dialog Datastar)

1 patient-acceptance-of-health-care.de. or patient-satisfaction.de. or patient-participation.de. or ((patient or patients) with (view$ or satisf$ or accept$ or perspective$ or perception$ or attitude$)).ti,ab.
2 nutritional-support#.de.
3 (nutrition$ support$ or metabolic support$ or hyperaliment$ or hyper-aliment$).ti,ab.
4 2 or 3
5 ((oral or orally) (feed$ or intake$ or nutrition$ or supplement$ or diet or diets or dietary) or (feed$ or intake$ or nutrition$ or supplement$ or diet or diets or dietary) (oral or orally)).ti,ab.
6 (supplement$ (food or foods or diet or diets or dietary or nutrition$ or intake$) or (food or foods or diet or diets or dietary or nutrition$ or intake$) supplement$).ti,ab.
7 (sip feed$).ti,ab.
8 5 or 6 or 7
9 ((enteral or enteric) (nutrition$ or feed$) or (nutrition$ or feed$) (enteral or enteric)).ti,ab.
10 gastrostomy.w..de. or gastrostom$.ti,ab.
11 jejunostomy.w..de. or jejunostom$.ti,ab.
12 gastrojejunostom$.ti,ab.
13 ((gastrojej$ or gastroduoden$ or gastric) (nutrition$ or feed$) or (nutrition$ or feed$) (gastrojej$ or gastroduoden$ or gastric)).ti,ab.
14 ((tube or tubes) (nutrition$ or feed$) or (nutrition$ or feed$) (tube or tubes)).ti,ab.
15 (nasojejun$ or naso-jejun$ or nasal-jejun$).ti,ab.
16 (nasogastr$ or naso-gastr$ or nasal gastric or nasal-gastric).ti,ab.
17 (naso-duoden$ or nasoduoden$ or nasal-duoden$).ti,ab.

18 ((jejunal$ or jejunum) (nutrition$ or feed$) or (nutrition$ or feed$) (jejunal$ or jejunum)).ti,ab.
19 ((duodenal or duodenum or duodeno$) (nutrition$ or feed$) or (nutrition$ or feed$) (duodenal or duodenum or duodeno$)).ti,ab.
20 (peg or pej).ti,ab.
21 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20
22 ((parenteral$ or intravenous$) (feed$ or nutrition$)).ti,ab. or ((feed$ or nutrition$) (parenteral$ or intravenous$)).ti,ab.
23 (picc with (feed$ or nutrition$)).ti,ab.
24 (tpn or hpn).ti,ab.
25 22 or 23 or 24
26 year=2004 or year=2003 or year=2002 or year=2001 or year=2000 or year=1999 or year=1998 or year=1997 or year=1996 or year=1995 or year=1994 or year=1993 or year=1992 or year=1991 or year=1990 or year=1989 or year=1988 or year=1987 or year=1986 or year=1985
27 1 and 26 and (4 or 8 or 21 or 25)

Embase (Dialog Datastar)

1 patient-attitude.de. or patient-satisfaction.de. or ((patient or patients) with (view$ or satisf$ or accept$ or perspective$ or perception$ or attitude$)).ti,ab.
2 nutritional-support.de. or artificial-feeding#.de.
3 (nutrition$ support$ or metabolic support$ or hyperaliment$ or hyper-aliment$).ti,ab.
4 2 or 3
5 ((oral or orally) (feed$ or intake$ or nutrition$ or supplement$ or diet or diets or dietary) or (feed$ or intake$ or nutrition$ or supplement$ or diet or diets or dietary) (oral or orally)).ti,ab.
6 (supplement$ (food or foods or diet or diets or dietary or nutrition$ or intake$)) or ((food or foods or diet or diets or dietary or nutrition$ or intake$) supplement$).ti,ab.
7 (sip feed$).ti,ab.
8 5 or 6 or 7
9 ((enteral or enteric) (nutrition$ or feed$) or (nutrition$ or feed$) (enteral or enteric)).ti,ab.
10 gastrostomy.w..de. or gastrostom$.ti,ab.
11 jejunostomy.w..de. or jejunostom$.ti,ab.
12 gastrojejunostom$.ti,ab.
13 ((gastrojej$ or gastroduoden$ or gastric) (nutrition$ or feed$) or (nutrition$ or feed$) (gastrojej$ or gastroduoden$ or gastric)).ti,ab.
14 ((tube or tubes) (nutrition$ or feed$) or (nutrition$ or feed$) (tube or tubes)).ti,ab.
15 (nasojejun$ or naso-jejun$ or nasal-jejun$).ti,ab.
16 (nasogastr$ or naso-gastr$ or nasal gastric or nasal-gastric).ti,ab.
17 (naso-duoden$ or nasoduoden$ or nasal-duoden$).ti,ab.
18 ((jejunal$ or jejunum) (nutrition$ or feed$) or (nutrition$ or feed$) (jejunal$ or jejunum)).ti,ab.
19 ((duodenal or duodenum or duodeno$) (nutrition$ or feed$) or (nutrition$ or feed$) (duodenal or duodenum or duodeno$)).ti,ab.
20 (peg or pej).ti,ab.
21 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20
22 ((parenteral$ or intravenous$) (feed$ or nutrition$)).ti,ab. or ((feed$ or nutrition$) (parenteral$ or intravenous$)).ti,ab.
23 (picc with (feed$ or nutrition$)).ti,ab.
24 (tpn or hpn).ti,ab.
25 22 or 23 or 24
26 year=2004 or year=2003 or year=2002 or year=2001 or year=2000 or year=1999 or year=1998 or year=1997 or year=1996 or year=1995 or year=1994 or year=1993 or year=1992 or year=1991 or year=1990 or year=1989 or year=1988 or year=1987 or year=1986 or year=1985
27 1 and 26 and (4 or 8 or 21 or 25)

CINAHL (Dialog Datastar)

1 patient-attitudes.de. or attitude-to-health.de. or patient-satisfaction.de. or ((patient or patients) with (view$ or satisf$ or accept$ or perspective$ or perception$ or attitude$)).ti,ab.
2 nutritional-support#.de.
3 (nutrition$ support$ or metabolic support$ or hyperaliment$ or hyper-aliment$).ti,ab.
4 2 or 3
5 ((oral or orally) (feed$ or intake$ or nutrition$ or supplement$ or diet or diets or dietary) or (feed$ or intake$ or nutrition$ or supplement$ or diet or diets or dietary) (oral or orally)).ti,ab.

6 (supplement$ (food or foods or diet or diets or dietary or nutrition$ or intake$) or (food or foods or diet or diets or dietary or nutrition$ or intake$) supplement$).ti,ab.
7 (sip feed$).ti,ab.
8 5 or 6 or 7
9 ((enteral or enteric) (nutrition$ or feed$) or (nutrition$ or feed$) (enteral or enteric)).ti,ab.
10 gastrostomy.w..de. or gastrostom$.ti,ab.
11 jejunostomy.w..de. or jejunostom$.ti,ab.
12 gastrojejunostom$.ti,ab.
13 ((gastrojej$ or gastroduoden$ or gastric) (nutrition$ or feed$) or (nutrition$ or feed$) (gastrojej$ or gastroduoden$ or gastric)).ti,ab.
14 ((tube or tubes) (nutrition$ or feed$) or (nutrition$ or feed$) (tube or tubes)).ti,ab.
15 (nasojejun$ or naso-jejun$ or nasal-jejun$).ti,ab.
16 (nasogastr$ or naso-gastr$ or nasal gastric or nasal-gastric).ti,ab.
17 (naso-duoden$ or nasoduoden$ or nasal-duoden$).ti,ab.
18 ((jejunal$ or jejunum) (nutrition$ or feed$) or (nutrition$ or feed$) (jejunal$ or jejunum)).ti,ab.
19 ((duodenal or duodenum or duodeno$) (nutrition$ or feed$) or (nutrition$ or feed$) (duodenal or duodenum or duodeno$)).ti,ab.
20 (peg or pej).ti,ab.
21 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20
22 ((parenteral$ or intravenous$) (feed$ or nutrition$)).ti,ab. or ((feed$ or nutrition$) (parenteral$ or intravenous$)).ti,ab.
23 (picc with (feed$ or nutrition$)).ti,ab.
24 (tpn or hpn).ti,ab.
25 22 or 23 or 24
26 year=2004 or year=2003 or year=2002 or year=2001 or year=2000 or year=1999 or year=1998 or year=1997 or year=1996 or year=1995 or year=1994 or year=1993 or year=1992 or year=1991 or year=1990 or year=1989 or year=1988 or year=1987 or year=1986 or year=1985
27 1 and 26 and (4 or 8 or 21 or 25)

Appendix Four: Evidence Tables

Nutritional Screening

Table 24: Nutrition screening

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Jordan et al 2003[177]	Non-random-ised controlled before-after study		2 + 2 wards; 175 out of possible 628; recruited over two separate one month periods	Mean age 67 Hospitalised for 1-56 days	Screening tool: Nursing Nutritional Screening Tool	Usual care	Until discharge	Nursing documentation; patient care at mealtime; dietitian referral	Weight recording: Intervention ward: 26.1% before; 71.9% after Of 12 stayed for ten days, 2 were recorded weekly. Control ward: 29.6% before; 7.9% after. Screening tool was not recorded for 7 out of 64 post-intervention. Care at mealtimes: No observed change due to intervention Referral to dietitian (no change): Intervention ward: 15.2% before; 9.4% after Control: 18.5% before; 10.5% after	Funding: Dyfed NHS Research and Development Consortium
Moore et al 1997[237]	Clustered random-ised trial		26 practices / 261 patients Intervention:	Age >=70; visiting practices; not acutely or terminally ill, English speaking, able to	Intervention group: patients administered with screening at a new	Weight (<100 lb) or losing 10 lb within the past 6 months to specify as at nutrition	1 month for condition specific intervention	Nutritional intervention / patient health outcome (MOS SF36)	70% of the doctors reported screening for nutrition) among the highest in 8 diseases):	Study of 8 screening at the same time. This makes it more an effectiveness study,

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			n=112 Control: n=149	answer questions Sample probably healthier than general population, but no difference between control and intervention groups.	visit for 8 common elderly ailments; short tool. Their physicians given pertinent clinical summaries. Education was given to the doctors and they were contacted regularly	risk Comparison: usual care	6 months for patient outcome		suggests acceptability of tool. Detection of nutritional problem: 0 (-1 to 1) ; 5% in intervention and 5% control. Nutritional intervention: 0 (-4 to 4); 4% in intervention and 4% in control. General health: no significant difference between the groups (multiple items)	than if it was only nutrition screening. Because this is more similar to what happens in reality within general practice. Seems to be of good quality. Patient level analysis could have been improved by multi-levelling. Though it would have made it even less likely to detect a significant difference Funding: Robert Wood Johnson Clinical Scholars Program; the National Institute on Aging Geriatric Academic Program
Rypkema et al 2004[299]	Prospective cohort analysis in two hospitals		298 subjects Intervention: n=140 Control: n=158	Patients aged over 60 admitted to hospital geriatric units for >2 days and <150 days	Protocol, which includes screening for malnutrition (MNA-sf), dysphagia and dehydration on admission followed by immediate interventions (including menu modification or supplements)	Standard care	Not reported	Average weight change (kg) (mean ± SEM): No. of patients with >3% weight loss during admission: LOS (days) (mean ± SEM): Analysis was repeated excluding	Control (n=140): -0.76 ± 0.28 (decreased) Intervention (n=105): 0.92 ± 0.27 (gained) **[p<0.001]** Intervention: 11/105 Control: 42/140 **[p<0.001]** Difference: 65% reduction Control (n=158): 32.7 ± 1.8 Intervention (n=140): 31.1 ± 1.9 [p<0.51]	Funding: Research grant from the Dutch Universities (VAZ) & partly by Nutricia, Inc.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								patients with oedema or heart failure –		
								Average weight change (kg) (mean ± SEM):	Control (n=140): 0.00 ± 0.3 (decreased) Intervention (n=105): 1.0 ± 0.3 (gained) **[p<0.017]**	
								No. of patients with >3% weight loss during admission:	Intervention: 5/71 Control: 14/72 **[p=0.025]**	
								No. of nosocomial infections:	Intervention: 33/140 Control: 58/158 **[p=0.01]** Difference: 36%	
								No. of pressure sores:	Intervention: 23/140 Control: 33/158 [p=0.37]	
								LOS (days):	Control (n=158): 32.7 ± 1.8 Intervention (n=140): 31.1 ± 1.9 [p<0.51]	
								Analysis of covariance was carried out with weight on admission as covariate –		
								Weight change (kg) (mean ± SEM):	Patients with the lower BMI: Control: 0.25 ± 0.61 Intervention: 1.94 ± 0.56 **[p<0.039]**	
								No. of patients with >3% weight loss:	Intervention: 3/31 Control: 11/37 **[p=0.011]**	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Weight change (kg) (mean ± SEM): No. of patients with >3% weight loss:	Patients with the higher BMI: Control: -0.64 ± 0.28 Intervention: 1.15 ± 0.29 **[p<0.001]** Intervention: 7/87 Control: 37/131 **[p=0.001]**	

Table 25:Nutrition screening -- Economic evaluations: characteristics of studies

Study	Comparison	Patient group	Incremental analysis	Measure of effectiveness	Cost components included	Method
Rypkema et al 2004, Netherlands[299]	1) Protocol, which includes screening for malnutrition (MNA-sf), dysphagia and dehydration on admission followed by immediate interventions (including menu modification or supplements) 2) Standard care	Patients aged over 60 admitted to hospital geriatric units for >2 days and <150 days. (n_1=140, n_2=158)	Cost-effectiveness analysis	Weight change	Nutrition-related interventions, training, lab tests, staff costs (nurse, dietitian, speech and language specialist), team meetings, antibiotics, pressure sore treatment	Prospective cohort analysis in two hospitals

Table 26: Nutrition screening -- Economic evaluations: results

Study	Comparison	Effectiveness (per patient)	Cost (per patient)	Incremental cost-effectiveness ratio (ICER)
Rypkema et al 2004, Netherlands[299]	1) Protocol, which includes screening for malnutrition (MNA-sf), dysphagia and dehydration on admission followed by immediate interventions (incl menu modification or supplements) 2) Standard care	Weight change (all patients): 1) 0.92kg vs. 2) -0.76kg **[p<0.001]** Weight change (excluding oedema or heart failure): 1) 1.0kg vs. 2) 0.0kg **[p=0.017]**	Including hospitalisation cost 1) 7516 euro vs. 2) 7908 Excluding hospitalisation cost 1) vs. 2) +94 euros (sensitivity range*: 80 to-+110 euros) 'Worst case scenario'** 1) vs. 2) +835 euros	Including hospitalisation cost 1) dominates 2) Excluding hospitalisation cost 1) vs. 2) 56 euros per Kg gained (CI: 38-105) 'Worst case scenario'** 1) vs. 2) 530 euro per kg gained

* Excluding hospitalisation costs and using the CI for difference in antibiotics cost
** Using upper CI for difference hospitalisation costs

Oral nutrition support

Table 27: Oral nutritional supplementation vs. standard care

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Arnold and Richter, 1999[10]	RCT	1+	50 Intervention: 23 Cont:rol: 27	Ambulatory head and neck cancer patients stratified by stage of disease and tumour site. Gender (m/f) Int: 9/14 Cont: 20/7 Median (range) age Int: 64.1 (34-88) Cont: 68.3 (43-80) Mean (±SD) "usual" weight Int: 153 (±35.9) lbs Cont: 152.7 (±35) lbs Mean (±SD) pretreatment weight Int: 150.9 (±36.6) lbs Cont: 151.9 (±36) lbs	Supplement plus normal diet for 10 weeks starting on the first day of treatment Supplement: 960 or 1080 kcal/day of Sustacal (tm) liquid (content not given) Intensive nutritional counselling including recommendations of full liquid, pureed or soft diets when appropriate using common household foods. Participants also encouraged to eat normal diet ad libitum.	Intensive nutritional counselling including recommendations of full liquid, pureed or soft diets when appropriate using common household foods. Participants also encouraged to eat normal diet ad libitum.	10 week study, 6 month follow-up	Mortality at 3 months post treatment Mean (±SD or SEM not stated which) energy intake over 10 week study.	Intervention: 3 (n=23) Control: 0 (n=27) p value not reported Intervention: 1929.8 (±605.3) kcal Control: 1624.3 (±528.7)	Weight loss measured during study but data not reported
Banerjee et al, 1978[19]	RCT	1+	63 Intervention: 31 Control: 32	Long stay geriatric ward patients. All patients who consented to take part were included. Median length of stay of included patients 23 months. No baseline data for	Observed for 14 weeks then given Complan for 14 weeks in addition to normal food intake Content: 60g containing 265 kcal, 18.6g protein, 26.4g carbohydrate, 9.6g fat, minerals	Observed for 28 weeks with normal food intake	28 weeks	Mortality Mean (SD) change in skinfold thickness	Intervention: 4 (n=31) Control: 6 (n=32) p value not reported Intervention: 1.7 (1.3) n=24 Control: -0.2 (1.8) n=26 p<0.001	10 patients died but no indication whether they died before or after supplement was started.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				nutritional status. Gender (m/f): 21/42 Mean (range) age: 81 (60-98) years	and vitamins)			Energy intake in calories Protein intake in grams	Intervention: 6.8 calories n=24 Control: 1.9 calories n=26 p>0.1 Intervention: 12.8g n=24 Control: 0.9g n=26 p<0.001	**Funding**: Glaxo Laboratories Ltd
Beattie et al 2000[23]	RCT	1+	109 patients randomised: Intervention: 55 Control: 54 8 patients withdrawn: Int:ervention 3 Control: 5 Total: 101 Intervention: 52 Control: 49	Patients between 18-80 years admitted for elective GI or vascular surgery. Inclusion criteria: Presence of malnutrition on admission or on resumption of oral diet by the 8th post op. day and/or weight loss of 5% or more from admission until oral intake was resumed by the 8th postop. Day. Malnutrition was defined as BMI <= 20 kg/m2 and TSF or MAMC <= 15th percentile and/or weight loss >=5% from admission to hospital to the initiation of oral diet. Mean (SD) age: Int: 54.4 (19.4) Cont: 62.4 (10.9) p<0.05	On initiation of oral diet, patients were provided with an oral diet supplement (Ensure Plus, Ross Laboratories, UK) which provided 1.5 kcal and 0.06 g/ml protein. Patients were encouraged to aim to consume 400 ml of the supplements in small, frequent amounts in between meals to increase nutrient intake. Compliance was monitored by asking patients how much of the nutritional supplements were consumed; in practice the majority of patients took 200-400 ml daily.	On initiation of oral diet, patients continued with routine nutritional management.	10 weeks	Mean (SD) weight loss (kg)	Int: n= 52 Cont: n= 49 Inclusion: Int: 2.31 (1.36) Cont: 2.28 (1.28) 2 weeks: Int: 3.40 (2.94) Cont: 4.21 (2.44) 4 weeks: Int: 3.40 (3.26) Cont: 5.13 (3.23) 6 weeks: Int: 2.48 (3.58) Cont: 5.68 (3.90) 8 weeks: Int: 1.89 (4.27) Cont: 5.96 (4.21) 10 weeks: Int: 1.53 (4.23) Cont: 5.86 (4.33) **[p<0.001]**	The mean age of patients in the treatment group was younger by less than 10 years **[p<0.05]**. All patients were assessed by means of a home visit every two weeks postoperatively for 10 weeks. The assessments in this trial were not made blind to treatment. Funding: Abbott Laboratories **Data not extracted:** Mean (SD) weight loss in patients with benign and malignant disease at each assessment point from time of admission Mean (SD) decrease

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Gender (M/F): Int: 27/25 Cont: 33/16 BMI (kg/m2) of patients on inclusion into the study (n): Any malnutrition (<=20): Int: 35 Cont: 30 - Severe (<=16): Int: 1 Cont: 2 - Moderate (<=18): Int: 5 Cont: 9 - Mild (<= 20): Int: 29 Cont: 19 Normal (20-25): Int: 13 Cont: 16 Overweight (>=25): Int: 4 Cont: 3 (Normal and overweight patients were recruited due to >=5% weight loss in the period between admission and inclusion into the study) BMI (kg/m2) of patients on admission reported: Data not extracted. Mean (SD) length of time (days) from surgery to inclusion in the study: Int: 6.5 (1.6)				<u>Complications</u>: Total: Int: 13 Cont: 28 Incidence of chest infections (n): Incidence of wound infections (n): Prescription for antibiotics (n): Mean (SD) LOS (days) Mortality Quality of life measurement for physical score (Mean, SD) Quality of life measurement for mental score (Mean, SD)	 Int:ervention: 2 Control: 6 RR: 0.31 95% CI: 0.07-1.48 Int:ervention : 4 Control: 7 RR: 0.53 95% CI: 0.17-1.73 Int:ervention : 7 Control: 15 RR: 0.43 95% CI: 0.19-0.97 **[p<0.05]** Int: 18.4 (9.9) Cont: 20.6 (15.0) [NS] No deaths Initial assessment (A): Int: -13.8 (43.4) Cont: -18.0 (33.5) Final assessment (B): Int: 7.3 (47.3) Cont: -13.9 (38.6) Change (B-A): Int: 21.1 (18.6) Cont: 4.1 (17.3) **[p<0.001]** Initial assessment (A): Int: 4.8 (43.6) Cont: 6.3 (35.8)	in TSF, MAMC, grip strength: TSF and MAMC showed similar significant difference as weight change in both groups, indicating relative body protein and body fat depletion **[p<0.001]** - RR adjusted for age (continuous) and age and sex for each of the above three incidence of complications Exclusion criteria: Patients who required PN, pregnant or lactating, patients with terminal diseases and those with decompensated liver or renal disease.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Cont: 6.5 (1.4) Benign and malignant disease: Int: Benign: 32 Malignant: 20 Cont: Benign: 28 Malignant: 21					Final assessment (B): Int: 20.8 (46.1) Cont: 7.2 (39.1) Change (B-A): Int: 21.1 (18.6) Cont: 4.1 (17.3) **[p<0.001]**	
Beck et al 2002[25]	RCT	1+	16 patients Intervention: n=8 Control: n=8 (Please see comments)	Residents of a nursing home >= 65 years who scored 17-23.5 MNA points and BMI < 24 kg/m2. Gender (% males) Intervention: 25% Control: 50% Median (95%CI) age: Intervention: 84 (65-96) Control: 87 (77-91) Median (95%CI) BMI (kg/m2): Intervention: 20.1 (15.1-22.4) Control: 20.8 (14.0-23.9) Median (95%CI) energy intake (MJ/d): Intervention: 7.5 (6.2-9.6) Control: 7.8 (6.1-9.4) Exclusion criteria: patients in terminal conditions.	Participants received a home-made oral supplement every evening for two consecutive months. Energy content in one serving (2 dL) was around 1.6 MJ (1MJ=240 Kcal); 73% of the energy came from fat and 5% from protein.	Standard diet	2 months	Median (95% CI) baseline body weight (kg) Median (95% CI) change in body weight after 2 months (kg) Median (95%CI) baseline energy intake (MJ/d) Median (95%CI) change in energy intake (MJ/d)	Intervention: n=8 Control: n=8 Intervention: 51.1 (44.1-55.5) kg Control: 51.7 (33.5-58.7) p>0.1 Intervention: 1.3 (-1.0-3.0) kg Control: 1.5 (-2.3-9.0) Intervention: 7.5 (6.2-9.6) MJ/day Control: 7.8 (6.1-9.4) p>0.1 Intervention: -0.1 (-1.9-3.6) Control: 0.1 (-0.7-2.0)	It is not clear the initial number of patients that were randomised to groups B and C. Data on tables indicate that there were only 16 patients: 8 in control and 8 in intervention. The evening health care personnel monitored the consumption of the supplement (recorded as 1, ¾, ½, or ¼ portion consumed). Funding: part of the study was supported by a grant from the Health Insurance Foundation.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Berneis et al 2000[31]	RCT	1+	18 patients, 3 withdrawn. Total: 15 patients Intervention: n=8 Control: n= 7	HIV-infected patients with a weight loss of 5% or more of their body weight during the past 6 months or a body mass index of less than 21 kg/m2 or a CD4 T-cell count of less than 500/mm3. In stable condition without acute infectious complications. Antiretroviral therapy (n): Intervention: 2 Control: 6 Mean SEM Weight (kg): Intervention: 64.9 +/- 2.6 Control: 73.3 +/- 8.8 kg Mean SEM energy intake (MJ/d) Mean SEM protein intake (g/d)	Oral nutritional supplements and dietary counselling. The supplements were liquid and palatably flavoured and contained 2510 kJ per day consisting of 26 g whey protein, 88 g carbohydrates, 17 g fat as corn oil, electrolytes and daily requirements of trace elements and vitamins Meritene Y (Novartis Nutrition, Berne, Switzerland). Nutrition counselling consisted of teaching the principles of a balanced nutrition, and discussion of individual problems related to nutrition (diarrhoea, nausea, weight loss) and the aspects of hygiene. Intervention: 12.9 +/- 1.2 Cont: 11.4 +/- 1.3 Intervention: 92 +/- 10 Cont: 77 +/- 12	No nutritional therapy	12 weeks	Mean +/- SEM Weight (kg): Mean +/- SEM plasma concentrations of CD4 (mm3) Mean +/- SEM plasma concentrations of CD8 (mm3) - Physical function	Intervention: n= 8 Control: n= 7 Intervention: Baseline: 64.9 +/- 2.6 After 12 weeks: 66.2 +/- 3.2 Control: Baseline: 73.8 +/- 8.8 After 12 weeks: 73.3 +/- 3.4 [Not significant] Intervention: Baseline: 161 +/- 53 Week 12: 159 +/-57 Control: Baseline: 244 +/- 86 Week 12: 311 +/- 107 [Not significant] Intervention: Baseline: 528 +/- 44 Week 12: 583 +/- 71 Control: Baseline: 588 +/- 100 Week 12: 734 +/- 139 [Not significant] Intervention: Baseline: 4.3 +/- 0.3 Week 12: 4.3 +/- 0.5 Control: Baseline: 4.6 +/- 0.2 Week12: 4.8 +/- 0.3 [Not significant]	Baseline characteristics on age, gender for each group not provided. At baseline 2/8 patients in the Int. group and 6/7 in the control group received antiretroviral therapy. Patients were monitored by a dietitian weekly during the first 4 weeks, and thereafter every 2 weeks during the 12 weeks study period. **Data not extracted** -Leucocine oxidation -Lean mass (% body weight) and Fat mass (% body weight -Plasma concentrations of TNFR 55, TNFR 75, ILR2, albumin, globulin, insulin, glucagon, nonesterified fatty acids at baseline and week 12 -Health related QOL (scores ranged between one and six, with six as the optimal score) -Mean SEM fat,

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								- Social role	Intervention: Baseline: 4.9 +/- 0.4 Week12: 4.8 +/- 0.4 Control: I Intervention: 5.1 +/- 0.4 Week12: 5.3 +/- 0.4 [Not significant]	carbohydrates at baseline and week 12
								- Mental health	Intervention: Baseline: 4.1 +/- 0.4 Week12: 4.2 +/- 0.3 [Not significant] Control: Baseline: 4.5 +/- 0.2 Week12: 4.4 +/- 0.1 [Not significant]	
								- Pain	Intervention: Baseline: 4.9 +/- 0.6 Week12: 4.8 +/- 0.5 [Not significant] Control: Baseline: 5.4 +/- 0.3 Week12: 5.4 +/- 0.3 [Not significant]	
								Mean SEM total energy intake (MJ/d) (Daily food intake assessed by 24-h records, including nutritional supplements. Data are averages of 3 consecutives days).	Intervention: Baseline: 12.9 +/- 1.2 Week12: 13.1 +/- 1.1 Control: Baseline: 11.4 +/- 1.3 Week12: 10.1 +/- 1.2	
								Mean SEM protein intake (g/d)	Intervention: Baseline: 92 +/- 10 Week12: 113 +/- 35	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Control: Baseline: 77 +/- 12 Week12: 79 +/- 9	
Bourdel-Marchasson et al 2000[36]	RCT (multi centre trial)		672 patients Nutritional group: n=295 Age:83.6±7.3 M/F:96/199 Weight(kg): 60.2±17. Control group: n=377 Age:83.0±7.1 M/F:139/238 Weight(kg):55.2 ±15.0	Critically ill elderly patients	Consisted of standard diet of 1800kcal/d in 3 meals plus two oral supplements with each supplement containing 200kcals (one with breakfast and the other in mid-afternoon) 200mL of supplements provided 200kcal with 30% protein, 20% fat & 50% CHO in addition to minerals & vitamins.	Standard diet of 1800kcal/d in 3 meals	15 days	Mortality Complications Total energy & protein intake Pressure ulcers	Intervention 25 Control 22 Intervention: 118 Control: 181 Total energy intake(kcal) Day 5 Nutritional gp:1181±598 Control group:1022±503 **[p<0.001]** Day15 Nutritional gp:1188±613 Control group:1102±503 [No sig. diff] Total protein intake(g) Day 5 Nutritional gp:49.5±26.7 Control group: 41.8±23.6 **[p<0.001]** Day 15 Nutritional gp:51.0±28.1 Control group:44.0±23.6 [No sig. diff] Pressure ulcer	High protein content was chosen because poor dietary protein intake has been described as being associated with increased risk of pressure ulcers Only 60% of patients in the nutritional group ingested the oral supplements in the first week but this increased to 99% at the end of the 2nd week Multi variate analysis indicated that the relative risk of developing a pressure ulcer during this period was significant only for hypoalbuninaemia, functional dependence, low norton score, lower limb fracture & belonging to the control group

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									cumulative incidence Day5 Nutritional group:16% Control group:25% Day10 Nutritional group:27% Control group:37% End of follow-up Nutritional group:40% Control group:48% Potential baseline risk factors for developing ulcers Relative risk(95% CI): Control v nutritional: 1.57(1.03 to 2.38) **[p=0.04]**	
Charlin et al 2002[62]	RCT (cross-over study)	1+	46 patients randomised: Group 1: intervention):21 Mean age (SD): 38.2 ± 11.5 M/F:19/2 BMI: 18.5 ± 1.4 Group 2: (control):25 Mean age (SD): 37.7 ±12.5 M/F:23/2 BMI: 18.6± 1.2 11 died during study.	HIV-infected adults: outpatients from the AIDS wards in two hospitals. All patients had calorie-protein malnutrition according to the BMI (BMI) (low to 20 kg/m2) Mean +/- SD CD4 (x106/L): Group 1: 134 +/- 126 Group 2: 211 +/- 244 Mean +/- SD CD8 (x 106/L): Group 1: 463 +/-357 Group 2: 747 +/- 546 Mean +/- SD Energy	This is a cross-over study. Patients were given two types of dietary supplements in random order, consisting of regular foods or a polymeric diet over two consecutive periods of 45 days. Group1: patients received polymeric diet during the first period and then regular food. Group2: regular food during the first period and then polymeric food.	Regular foods: cereals, dairy products, eggs, albumin; ~15% of protein contribution to total energy.	90 days (for this table only data for the first 45 days have been extracted. See comments).	Mortality at day 45 Mean (SD) weight (kg) at baseline and first 45 days Mean (SD) BMI (kg/m2) at baseline and first 45 days	Intervention: 3 (n=21) Control: 8 (n=25) Data Mean ± SD Intervention: n= 18 Control: n=17 Weight (kg) Intervention: Baseline: 52.7 +/- 5.5 45-Day: 57.5 +/- 6.3 **[p<0.05]** Control: Baseline: 56.2 +/- 5.5 45-Day: 57.7 +/- 6.9 Intervention: Baseline: 18.6 +/- 1.4 45-Day: 20.2 +/- 1.8	This is a cross-over study. Only data before cross-over (first 45 days) have been extracted here. After cross-over data does not address the question oral vs. standard care. Data after cross-over is for oral v oral. The Intervention had significantly higher energy intake at baseline than the control Nutritional intake was recorded by 24 hour recall taken on three

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Total: 35 patients: Intervention: n=18 Control: n=17	intake (kcal/kg/d): Intervention: 34.2 +/- 8.8 Control: 27.2 +/- 7.5 **[p<0.05]** Zidovudine therapy (yes/no): Intervention: 11/10 Control: 12/9	Polymeric diet: Powdered polymeric diet at 22% water dilution (And Davis SA Laboratories, Braun Co.). Composition per 10 dl: 103 kcal, 3.6 g of protein (sodium and calcium caseinate; 14% of contribution to total energy), 13.0 g of carbohydrates (maltodextrines) and 4.0 g of lipids (sunflower seed oil and coconut oil). This formula covers vitamin and micronutrient US-RDA requirements for an adult with 200 dl per day. Energy and protein needs for supplementation were calculated as follow: - Energy supplementation (kcal/d)= (REE x 1.5*) – EI *….			Mean +/- SD energy intake (kcal/kg) at baseline and first 45 days	**[p<0.05]** Control: Baseline: 18.8 +/-1.1 45-Day: 19.3 +/- 1.4 Mean +/- SD energy intake ntervention: Baseline: 33.0 +/- 8.6 45-Day: 34.9 +/- 6.9 Control: Baseline: 26.3 +/- 6.3 45-Day: 27.3 +/- 5.9	alternate days before the beginning of the study and during all the supplementation period. Energy and proteins intakes were calculated by using the chemical composition tables of Chilean foods. Funding: Supported by a grant from the research Project FONDECYT 1940570 (Santiago, Chile), and the collaboration from Davis Laboratories, Braun Co, Chile. **Data not extracted:** -Fat mass, fat free mass, plasma albumin, at baseline and first 45 days -Resting energy expenditure, energy balance, urinary ureic nitrogen excretion, nitrogen intake, nitrogen balance at baseline and first 45 days.
Delmi et al, 1990[79]	RCT	1+	59 Intervention: 27 M/F:3/24 Mean age: 80.4 years, range	Femoral neck fracture after a fall. Mean (SD) upper arm	Nutritional supplement in addition to standard hospital diet Content:	Normal hospital diet	6 months	Median (range) length of stay (days)	Intervention: 24 (13-157) n=21 Control: 40 (10-259) n=28 p<0.02	Complications include: bedsores, severe anaemia, cardiac failure, infection, gastrointestinal ulcer

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			61-93 Control: 32 M/F:3/29 82.9 years, range 66-96	circumference in women Int: 251(30) mm Control: 261(41) mm Upper arm circumference in men Int: 255, 260, & 260mm Control: 230, 270, & 290mm Mean (SD) tricep skinfold in women Int: 12.1(4.6)mm Control: 11.4(5.7)mm Tricep skinfold in men Int: 5, 7 & 10mm Control: 4, 7 & 13mm	250ml providing 254kcal, 20.4g protein, 29.5g carbohydrate, minerals and vitamins.			Mortality at 6 months No. of complications while in first (orthopaedic) hospital No. of complications while in second (recovery) hospital. (Not everyone went into recovery hospital) Total no. of complications after discharge at 6 month follow up	Intervention: 6 Control: 10 p value not reported Intervention: 4 (n=27) Control: 14 (n=32) p value not reported Intervention: 2 (n=9) Control: 12 (n=15) p value not reported Intervention: 4 (n=25) Control: 10 (n=27) p value not reported	
Douglass et al, 1987[86]	RCT		Total: n=30 Intervention: n=13 Age & Sex distribution not reported Control: n=17 Age & Sex distribution not reported	Patients with locally advanced, nonreserctable or recurrent carcinoma in whom radiation therapy was planned	Standard diet supplemented with a 900calories (vivonex- elemental diet)	Standard diet		% weight loss based on site of cancer during therapy Mortality	Pancreas Intervention: 3.5 (n=6) Control: 6.4 (n=9) Stomach Intervention: 10.2 (n=2) Control: 4.1 (n=3) Colorectum Intervention: 6.4 (n=5) Control: 4.9 (n=5) Intervention: 8 (n=13) Control: 13 (n=17) (NS)	Change in serum albumin levels also recorded, data not extracted

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Edington et al 2004[87]	RCT	1+	100 patients Men/Women: 45/55 Mean age: 78 Only 58 completed the whole 24 weeks	Elderly malnourished subjects were randomised to 8 weeks of supplementation or no supplementation post discharge Energy & (Protein) Intake: Week 1 Intervention: 1936.1 kcal (78.5g) Control: 1797 kcal (68.6g) Week 2 Intervention: 2025.2kcal (75.1g) Control: 1679 kcal (64.7g) Intake from supplement Intervention: 342.3kcal (15.8g)	Subjects were given a choice of one or more supplements (ensure plus, tetrapak, enlive tetrapack, formance, pudding or ensure bar) n=51 Age: 76.8±5.3 M/F: 22/29	Standard care n=49 Age: 79.3±8.0 M/F: 23/26	24 weeks	Mortality Nutritional status Mean no. of admissions to hospital Mean (SD) length of stay of those admitted (days Mean (SD) weight: change BMI: Baseline Intervention: 18.43±1.87 Control: 18.44±2.10 TST: Baseline Intervention: 10.28±3.98 Control: 10.25±4.24	Intervention: 17 n=51 Control: 15 n=49 Intervention: n=32 Cont: n=26 Intervention: 1.04 (1.35) (n=48) Control: 1.04 (1.38) (n=46) p value not reported Intervention: 16.86 (26.67) (n=48) Control: 10.30 (15.81) (n=46) p value not reported Intervention: 1.85 (±3.66) Control: 1.33 (±4.41) p value not reported BMI: 24weeks Intervention: 19.23±2.16 (change form baseline: **[p=0.0058]**) Control:19.19±3.01 Nutritional status improved significantly from baseline to week 24 in the intervention group (**[p<0.05]**) but not in the control. There was NS btw the groups at week 24 TST: 24weeks Intervention: 11.93±4.41 (change form baseline:	7 patients in the intervention group and 6 in the control group died during the study, while a further 9 in the control group died during the 6month follow-up period The changes in anthropometric indices for the intervention throughout the course of the study evened out and became comparable at the end of the study indicating that simply providing a dietitian for the control group may have had a placebo effect causing an increase in their dietary intake and thus improving their body weight. Even though the dietitian gave no dietary advise The intervention group. Had a longer length of stay. There was no explanation for this. TST: triceps skin thickness

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									[p=0.0027]) Control: 11.00±5.21 MAMC: 24weeks Intervention: 20.61±2.10 Control: 20.84±2.53 (no sig. diff.) Hand grip strength Intervention group: Improved significantly during supplementation Quality of Life No significant difference btw the groups	
Efthimiou et al 1988[88]	RCT	1+	14 Intervention : n=7 Age;59.9±3.4 M/F:4/3 Control : n=7 Age;64.1±2.5 M/F:4/3 Group 3 : n=7 Age;63.1±4.0 M/F: 4/3	Poorly nourished patients with COPD	Intervention: poorly nourished patients received Normal diet :1-3 months Supplemented diet: 4-6 months Normal diet :7-9 months Patients received high protein high calorie diet(carnation build-up supplemented diet)	Control: poorly nourished patients received normal diet for entire 9 months Group 3: well nourished patients received normal diet for entire 9 months	9 months	Weight (kg) TSF (cm)	Weight (kg) Intervention Months 1-3 :44.6 Months 4 - 6 :48.8 Months 7 – 9 :47.4 Control Months 1- 3 :48.0 Months 4 - 6 :48.1 Months 7 – 9 :48.3 Diff btw months 1 – 3 versus 4 to 6 in Group 1 = **[p<0.05]** TSF (cm) Intervention Months 1- 3 :0.79 Months 4 - 6 :0.97 Months 7 – 9 :0.94 Control Months 1- 3 :0.84 Months 4 - 6 :0.83	Most patients were on some form of chest medication. During the 3 months of supplementation, there was a significant increase in the mean daily calorie and protein intake as planned. All group 1 patients reduced their intakes during the 3 months after the supplemented diet to levels similar to those of the initial 3 months of the study Group 3 not randomised …..were healthy patients marched for age and sex to malnourished group.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Months 7 – 9 :0.86 Diff btw months 1 – 3 versus 4 to 6 in Group 1 = **[p<0.05]**	In the 3 months of supplementation there was significant improvement in the nutritional status of Group 1 patients as evidenced by body weight, TSF, MAMC. As nutritional status improved, the contractile abnormalities and increased fatigability of the sternomastoid muscle also improved. General well- being, breathlessness scores and 6min walking distances also significantly improved after the 3 months of dietary supplementation.
								MAMC (cm)	MAMC (cm) Intervention Months 1- 3 :18.6 Months 4 - 6 :19.3 Months 7 – 9 :18.9 Control Months 1- 3 :18.7 Months 4 - 6 :18.8 Months 7 – 9 :18.8 Diff btw months 1 – 3 versus 4 to 6 in Group 1 = **[p<0.05]**	
Food Trial Collaboration 2005[344]	Multi-centre RCT	1+	4023 patients from 125 hospitals in 15 countries Intervention group: n=2016 Age: 71±12 Male%: 53 Control group: n=2007 Age: 71±13 Male %: 54 Mean hospital stay in intervention arm: 34 days therefore each	Stroke patients from a multi-centre study who could not swallow. Only 314 (8%) were judged to be malnourished at baseline. The four most commonly represented countries were UK, India, Italy & New Zealand	Normal diet + oral protein energy supplements equivalent to 360mL at 6.27kJ/Ml and 62.5g/L in protein everyday until discharge. Most centres used commercially available supplements of suitable consistency (e.g. liquid, yogurt, pudding)	Normal diet		Length of stay for all patients, nourished and malnourished Death	Median length of stay Intervention group: 16 days (IQR 7-44, mean 34, SD 48) Control group: 16 days (IQR 7-41, mean 32, SD 45) Difference in mean length of stay -2.1(95% CI -5.0 to 0.8) No sig btw both groups Death Intervention group: OR :0.94 (95% CI 0.78 to 1.13) [Not significant]	79(4%) of the intervention group did not receive oral supplements The study did not find a benefit for death or poor outcome from routine ONS for mainly well nourished stroke patients in

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			patient received an average of 14L of oral supplements					MRS grade Pressure sores Quality of life No significant difference was recorded btw the groups for Quality of life as well as any other complications	MRS grade for survivors Death/ poor outcome Intervention group: OR :1.03 (0.91 to 1.17) [Not significant] Absolute difference in risk of death: 0.7% (-1.4 to 2.7) in favour of supplemented diet Absolute difference in death or poor outcome: 0.7% (-2.3 to 3.8) In favour of normal diet Pressure sores Intervention group: 15(1%) Cont group: (1%) **[p=0.05]** (data to be interpreted with caution as local source data could not be verified) Quality of life (EUROQoL) Median utility (ranging from 0, death, to 1, perfect health) for all patients, including those who died was 0.52 (IQR 0.3-0.74, p+0.96 for diff btw groups)	hospital. Their results are more compatible with a 2% absolute benefit or harm from oral supplements Results do not therefore support the policy of routine ONS after stroke.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Fuenzalida et al, 1990[118]	RCT	1+	9 Interrvention: 5 Control::4	Men with advanced Chronic Pulmonary Obstructive Disease with >5% weight loss over last year and FEV response between 30 and 50% of predicted. Mean (±SD) age = 62.4 (±5.6) years Mean (±SD) percent of ideal weight corrected for height and age = 78.5% (±9.6%) Mean (±SD) percent of usual weight loss in previous year to admission 8.3% (±1.54%)	Supplement for 42 days plus individually planned diet by dietitian to achieve 100% of recommended dietary allowance. 3 cans of Sustacal per day each containing 360kcal (1.5kcal/ml, 16% protein, 50% carbohydrate and 29% fat)	Individually planned diet by dietitian to achieve 100% of recommended dietary allowance	42 days	Mortality Mean (±SD) weight change (kg) Mean (±SD) tricep skinfold change (mm) Mean (±SD) mid-arm muscle circumference change (cm)	Intervention: 0 (n=5) Control: 0 (n=4) Intervention: 4.48 (±1.38) Control: 3.20 (±1.84) p value not reported Intervention: 2.66 (±1.82) Control 0.20 (±1.31) p value not reported Intervention: -0.62 (±9.49) Control 4.08 (±2.50) p value not reported	Pulmonary function, immune function and skin test reactions also reported. Data not extracted
Gariballa et al 1998[121]	RCT	1+	42 patients Intervention: n=21 Age: 78±10 M/F:10/11 Body weight: 57.3±9.1 Control: n=21 Age: 80.±7 M/F:11/10 Body weight; 57±8.85	Acute ischaemic stroke in-patients with impaired nutritional status	Twice daily oral food supplement (≥400ml of Fortisip containing 600kcal &20g protein) in addition to regular hospital diet	Standard hospital diet	12 weeks	Intervention: n=20 Control: n=20 Energy & protein intakes Median (interquartile range) length of stay (days)	Energy Intervention: 1807±318kcal/day Control: 1084±343kcal/day **[p<0.0001]** Protein Intervention: 65.1±13.8g/d Control: 44.1±12.8g/d **[p<0.001]** Intervention 24(3-22) Control: 42 (3-77)	2 patients, one from each group were lost to follow-up Single blinded study so that only patients and nurses were aware of the group to which they belonged

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Nos. discharged Intervention: 12 Control: 8 [no sig. diff.]	
								Change in weight	Mean weight change(kg) Intervention: 0.2 Control: -0.7 [no sig. diff.]	
								Change in TSF	Change in TSF(mm) Intervention: -0.9 Control: -0.6 [no sig. diff.]	
								Change in MAC	Change in MAC(cm) Intervention: -0.3 Control: -0.3 [no sig. diff.]	
								Mortality at 3 months	Mortality Intervention: 2 Control: 7 [no sig. diff.]	
Hirsch et al, 1993[157]	RCT	1+	65 Intervention: 26 M/F21/5 Age±SEM: 49.9 ±8.68 Control: 25 M/F:21/4 Age±SEM: 46.0 ±8.01	Alcoholic liver disease patients attending a clinic Mean (SEM) mid arm circumference (cm) Intervention: 25.6 (±3.4) Control: 26.3(±5.2) Mean (SEM) tricep skinfold (mm) Intervention: 14.6(±7.1) Control: 11.8(±7.1)	Oral supplement plus regular diet 1 litre of a 20% solution of commercial casein-based formula (ADN, Laboratories Davis, Santiago) providing 34g protein/day, 1000kcal/day and 600mg of sodium per kcal.	Regular diet plus a "placebo capsule daily to promote compliance with the protocol"	1 year	Mortality Hospitalisation of patients Mean (SEM) baseline weight (kg) Mean (SEM) weight	Intervention: 3 (n=26) Control: 6 (n=25) Intervention: 23 times (n=26) Control: 35 times (n=25) p<0.001 Intervention: 66.8 (11.6) (n=26) Control: 67.9 (15.6) (n=25) p value not reported Intervention:	Funding: grant from Fondecyt 14 patients withdrawn from study (6 intervention patients, 5 for lack of compliance, 1 because of intractable diarrhoea and 8 control for lack of compliance).

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								at end of study(kg)	71.0 (11.7) (n=26) Control: 74.0 (20.5) (n=25) p value not reported	
								Mean length of stay of hospitalised patients	Intervention: 14 (±12) days (23 occasions of hospitalisation) Control: 13 (±9) days (35 occasions of hospitalisation) p value not reported	
								Frequency of hospitalisation	Intervention: 0.85 (±0.88) (n=26) Control: 1.60 (±1.18) (n=25) p<0.005	
								Mean (SEM) mid arm circumference at end of study	Intervention: 28.8 (±3.4) cm Control: 28.8(±3.8) cm p value not reported	
								Mean (SEM) tricep skinfold	Intervention: 15.4 (±6.7) mm Control: 15.5(±6.7) mm p value not reported	
								Calorie intake per day	Intervention: 2469 (±532) kcal Control: 1580 (±520) kcal p<0.0001	
								Protein intake per day	Intervention: 74 (±10.2) g Control: 45.3 (±13.6) g p<0.0001	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Keele et al 1997[181]	RCT	1+	100 patients Phase 1 Intervention(Treatment): n= 47 Age:64.7±4.9 M/F: 25/18 Control: n= 53 Age;60.0±5.1 M/F:23/20	Patients admitted for elective moderate to major gastro-intestinal surgery	Phase 1 Received a normal ward diet post-op supplemented with an oral dietary supplement Phase 2 After being discharged patients received home diet plus an oral dietary supplement for 4 months	Phase 1 Received a normal ward diet post-op Phase 2 After being discharged patients received home diet only for 4 months		Phase 1 Intervention /Control Pre-op: n=43 Day 3: n=42 Discharge: n=38(39 for control) Weight BMI TSF	Phase 1 Weight(kg) Intervention Pre-op:66.0±3.7 Day 3:65.0±3.7 Discharge:64.0±3.7 **[p<0.001]** each of both values v pre-op values Control Pre-op:69.6±4.3 Day 3:67.4±4.3 Discharge:66.1±4.1 **[p<0.001]** each of both values v pre-op values Weight change Intervention Day 3: -1.5±0.8 Discharge: - 2.2±1.0 Control: Day 3: -3.0±0.6 Discharge: -4.2±0.8 **[p<0.001]** v control BMI(kg/mm²) Intervention Pre-op:23.5±1.2 Day 3:23.2±1.2 Discharge:22.8±1.2 **[p<0.001]** each of both values v pre-op values Control Pre-op:25.1±1.4 Day 3:24.2±1.4 Discharge:23.6±1.4 **[p<0.001]** each of both values v pre-op values TSF(mm) Intervention Pre-	Supplementation during the outpatient phase had no significant effect on weight, weight change, MAC and TSF

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									op:14.1±2.2 Day 3: 13.5±2.2 Discharge: 13.3±2.4 **[p<0.001]** each of both values v pre-op values Control Pre-op:16.1±2.6 Day 3:14.9±2.6 Discharge:14.9±2.6 **[p<0.001]** each of both values v pre-op values	
								MAC	MAC(cm) Intervention Pre-op:28.0±1.0 Day 3:27.3±1.0 Discharge:27.0±1.0 **[p<0.001]** each of both values v pre-op values Control Pre-op:29.2±1.2 Day 3:28.2±1.2 Discharge:28.0±1.2 **[p<0.001]** each of both values v pre-op values	
								Hand-grip strength	Hand-grip strength(KPa) Intervention Pre-op:65.7±6.5 Day 3:63.3±5.3 Discharge:65.7±6.5 **[p<0.05]** day 3 v pre-op values Control Pre-op:68.5±4.1 Day 3:63.9±4.9 Discharge:62.8±4.9 **[p<0.01]** each of both values v pre-op values	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Fatigue score Complications	Fatigue score Intervention Pre-op:4.4±1.2 Day 3:5.5±1.2 Discharge:5.1±1.2 Control Pre-op:3.9±1.2 Day 3:6.5±1.0 Discharge:6.1±1.2 **[p<0.01]** each of both values v pre-op values Complications Intervention: 4 Control:12 **[p<0.05]**	
Knowles et al 1988[187]	Cross-over RCT		25 patients Group A : n=13 Number Malnourished=8 Group B : n=12 Number Malnourished=5 There was a wide variability in weight as percentage IBW (ideal body weight) – range=61 to 108 percent. 13 out of 25 patients were malnourished(< 85% of IBW)	Ambulatory patients with severe COPD. All patients were in stable phase of their disease Mean (SD) age Intervention: 68 (11) years Control: 70 (7) years	Normal diet supplemented with 24% protein, 22% fat, 54% carbohydrate(sustacal) was given for 8 weeks after which supplement was withheld for 8weeks in Group A while Group B started off as being controls i.e. 8 weeks without supplementation followed by another 8 weeks of oral nutritional supplementation	No additional supplement	8 weeks	Calorie intake Weight change	Calorie intake: Baseline calorie intake was similar in both groups but mean body weight of Group A was less than that of Group B. daily calorie intake & calorie intake in kcals/kg body wt/day increased in fed group [both=**p<0.05**] and were both greater than in control Body weight and weight as a percentage of IBW did not change in either group at 4weeks but there was small increase in both measures in the fed group at 8weeks of the study (weight, 55.8±9.8kg at baseline and 56.9±9.7kg at 8 weeks; **[p<0.05]**) and	Paper looked at the effect of oral nutritional supplementation on respiratory muscle performance Study was a cross-over trial. Sequence of events Group A: BSSCC Group B: BCCSS B=Baseline C=Control S=Supplement Data not extracted for the following FEV FVC RV PaO2 PaCO2

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									no change in controls Anthropometrics TSF, MAMC were not different in the 2 groups and did not change in either group throughout the study Compared to NN patient's malnourished patients had lower body weight lower measurement of upper arm anthropometrics. Respiratory muscle strength and endurance were not different in both NN and MN groups. Though both groups increased their caloric intake during supplementation **[p<0.05]**, increase in body weigh and PImax were only observed in the normally nourished patients	
Kwok et al 2001[195]	RCT		47 Intervention group: n=28 Age : 81.2±9.5 M/F :9/16 BMI :19.1±3.1 Control group: n=24 Age :79.7±10.5 M/F :10/12 BMI :20.1±3.1	Elderly malnourished people living in nursing homes	Milk powder(low lactose) 2ce daily	No supplement	7 weeks	Mortality Weight BMI	Intervention: 1 Control: 0 Mean (SD) weight change (kg) Intervention group: 1.45 Control group: -0.34 [Not significant] Mean BMI change (kg/m2) Intervention group: 0.67	Overall compliance of product was good There was a trend of weight gain in supplemented subjects but did not reach statistical significance

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Control group: - 0.13 [Not significant]	
								TSF	Mean TSF change (mm) Intervention group: - 0.08 Control group: 1 [Not significant]	
								MAC	MAC(cm) Intervention group: - 0.09 Control group: 0 [Not significant]	
								Grip strength	Grip strength(kg) Intervention group: -0.3 Control group: - 0.5 [Not significant]	
Larsson et al, 1990[197] (same study as Unosson et al 1992[359])	RCT		501 randomised 71 withdrawn Total: n=430 Intervention: n=197 M/F:78/119 Age: Males: 78.5 ±9.7 Females: 81.7 ± 7.6 Control: n=233 M/F:89/144 Age: Males: 77.8 ±	Elderly patients with an expected hospital stay of more than 3 weeks, admitted consecutively to a long-term medical care clinic. Mean (+/- SD) weight index: Intervention: Males: 84.46 +/- 12.8 Females: 87.4 +/- 17.9 Control: Males: 89.6 +/-15.3 **[p<0.05]** compared with males in the Intervention group) Females: 90.8 +/- 16.5 Malnourished (%):	Nutritional supplementation in addition to a normal hospital diet. 400 ml of dietary supplement daily containing 4 g of protein, 4 g of fat and 11.8 g of carbohydrate per 100 ml (1000 kcal), vitamins and minerals (Biosorb drink, Kabi Nutrition, Sweden). This was served in the morning and in the afternoon between meals, when all the patients on the wards were routinely supplied with drinks.	Normal hospital diet only. The standard hospital diet contained 2200kcal/day	26 weeks	Statistical comparisons between admission scores and scores after 4, 8, 16 and 26 weeks	After 4 weeks: Intervention: Activity score: sig. Improvement **[p<0.01]** Food and fluid intake: sig. Improvement **[p<0.05]** General physical condition: sig. Improvement **[p<0.01]** Control: General physical condition: sig. Improvement **[p<0.02]** After 8 weeks:	TSF and weight index in the males **[p<0.05]** and AMC in the females **[p<0.001]** was lower in the Intervention group than in the control group. Mental score was lower in Intervention group **[p<0.05]** on admission

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			8.5 Females: 81.1 ± 7.9	Intervention: Males: 25.6 Females: 32.7 Control: Males: 19.1 Females: 25.0	The standard hospital diet contained 2200kcal/day				Intervention: Activity score: sig. Improvement **[p<0.01]** General physical condition: sig. Improvement **[p<0.02]** Control: General physical condition: sig. Improvement **[p<0.01]** Motility: Sig. Improvement **[p<0.02]** Among patients malnourished at admission: Intervention group Motility score: sig. Improved **[p<0.01]** Control: Motility score sig. Improved **[p<0.05]** The only significant difference between the Intervention and control groups **[p<0.05]** was in activity at 8 weeks. The difference was almost entirely due to changes in the initially well nourished patients **[p<0.01]**, since no statistically significant difference was seen between Intervention and control groups of initially malnourished	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Larsson et al, 1990[197] (same study as Unosson et al 1991[359])									patients Mortality: Intervention: 14% Control: 22 % **[p<0.05]** Among those patients with a reduced food or fluid intake on admission (score <=3) Intervention: 21.6 % Control: 53.4 % **[p<0.01]** LOS Data on figure Intervention: 9.9% Control: 12% [Not significant] Intervention: 11.1 % Control: 24.6% [Not significant] Intervention: 67 Control: 83 [Not significant] Improved Intervention: 51.3% Control: 43.9% Intervention: 41.8% Control: 30.3% After 8 weeks: The Intervention group	The presence of pressure sores was evaluated weekly in terms of persistent discoloration (dark red, reddish-blue colour) or epithelial damage or damage to the full thickness of the skin with or without cavity and size, status and treatment Immunological competence was measured by an
								Mortality during study period		
								LOS		
								Percentage of patients without pressure sores on admission that developed pressure sores		
								Frequency of development of second or third pressure sore		
								Total number of sores		
								Percentage of patients that improved		
								Percentage of patients that healed		
								Delay hypersensitivity test		

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									showed significant increase in the number or patient with reactivity **[p<0.02]** Control: Did not alter reactivity After 26 weeks: The Intervention group showed significant increase in the number or patient with reactivity **[p<0.01]** Control: Did not alter reactivity	intracutaneous injection on three recall antigens (purified protein derivate PPD, candida and mumps). The testing was performed by a trained nurse on admission to the study and after 8 and 26 weeks. The area of induration was measured after 48 h and was considered normal (reactive) if the sum of the right angle diameter was 10mm or greater. Funding: Grants from the Swedish Medical Research Council and the Research Found of the County of Ostergotland. The supply of Bisorb drink from Kabi Nutrition, Sweden is acknowledged
								% of malnourished patients who no longer fulfilled the criteria for malnutrition % of well nourished patients who fulfilled the criteria for malnutrition Mortality	At 8 weeks : Intervention : 41% Control : 18% **[p<0.01]** After 26 weeks : Intervention : 8.3% Control : 26.1% **[p<0.05]** There was a higher mortality rate among the initially malnourished compared with the well nourished patients **[p<0.01]** In the initially well nourished group of 321 patients : Intervention : 8.6% died Control : 18.6% **[p<0.02]**	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Anthropometry Serum proteins	Among those initially malnourished there was a pattern of decrease in anthropometric values up to 26 weeks in both groups. The only exception was weight index which was unchanged Among those with normal initial nutrition the Intervention group, compared to the control group showed significantly less loss in weight index after 8 weeks **[p<0.05]** and after 26 weeks **[p<0.01]**, less decrease in arm muscle circumference after 26 weeks **[p<0.05]**. Triceps skin fold thickness decreased most in the control group Serum proteins Data not extracted	
Le Cornu et al, 2000[199]	RCT	1+	82 Intervention: 41 M/F:29/13 Control: 39 M/F:31/9 1 from each group lost to follow up	Patients with end-stage liver disease accepted for orthotopic liver transplantation with a mid-arm muscle circumference $\leq 25^{th}$ percentile. ($10\text{-}25^{th}$ percentile Int: 11 Control: 17 $5\text{-}10^{th}$ percentile Int: 7 Control: 4	Supplement and advised to follow usual dietary advice appropriate to their underlying medical condition. 500ml providing 750 kcal, 20g protein, 33.5g fat, 9.75mmol sodium, 25mmol potassium daily from	Usual dietary advice appropriate to their underlying medical condition.	Intervention until transplant, follow up 6 months	Mortality from time of entry to trial to 6 months posttransplant Post-transplant mortality	Intervention: 5 (n=41) Control: 9 (n=39) p=0.075 Intervention: 3 (n=41) Control: 2 (n=39) p=0.595	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				<5th percentile Int: 24 Control: 19 Median (range) age Int: 52 (27-67) years Control: 50 (24-68) years Median (range) mid arm circumference Int: 26 (19-31) cm Control: 26(19-32) cm p=0.092 Median (range) mid arm muscle circumference Int: 22.15 (17.6-26.2) cm Control: 23.2 (17.2-26.8) cm p=0.072 Median (range) tricep skinfold Int: 8.8 (3.6-19.6) Control: 9.15 (4.2-20.0) p=0.948	acceptance into trial until transplant			Pretransplant mortality Median (range) Mid Arm Muscle Circumference at meeting before transplantation or death Median (range) tricep skinfold at meeting before transplantation or death	Intervention: 2 (n=41) Control: 7 (n=39) p=0.595 Intervention: 22.5 (17.6-28.4) cm (n=41) Control 23.6 (17.3-31) cm (n=39) p=0.138 Intervention: 9.3 (3.6-18.4) cm (n=41) Control 8.8 (5-20) cm (n=39) p=0.686	
Lewis et al 1987[205]	RCT	1+	21 patients Intervention: n=10 M/F:8/2 Age:65.1± 9.2 Control: n=11	Patients with severe COPD (FEV<1,21) who were judged to be receiving optimal medical therapy. Inclusion criteria: Patients should fulfilled two of the following criteria: weight for height and frame size > 10% below ideal body	Patients were given in addition to their diet a high calorie, high protein formula: 2 Kcal/ml, 15% (7.5 g/dl) protein; 40% (20.0 g/dl) carbohydrate; 45% (10.2 g/dl) fat (Isocal HCN;Mead Johnson, Evansville, IN).	Standard diet	8 weeks	Mean daily caloric intake (kcal/d) Mean daily protein intake (Data on figures)	Intervention: n= 10 Cont: n=11 Intervention: 2091+/- 160 Cont: 1883 +/- 397 **[p<0.05]** There was a significant increase in the mean protein **[p<0.05]**	During the study period patients returned to follow-up on a weekly basis to monitor intake and weight and assure compliance with the study protocol. Data not extracted

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			M/F:7/4 Age: 59.3±19.3	weight (IBW) (the percent below IBW was determined using the midpoint of the desirable weight range for height and frame size) and MAMC< 10th percentile, TSF < 10th percentile. Mean +/- SD baseline caloric intake: Intervention: 1,816 +/- 373 Cont: 1,938 +/- 525 % IBW: Intervention: 86.3 +/- 4.6 Control: 84.6 +/- 9.6 Exclusion criteria: Patients who demonstrated an increase in FEV of > 15% after using a bronchodilator, or who had an unstable COPD (defined as exacerbation of their disease within 3 months prior to the study). Also, congestive heart failure, peptic ulcer disease, diabetes mellitus, thyroid disease, malignant disease, or patients who had GI resectional surgery.	Patients were encouraged to take a minimum of 8 fluid ounces (240ml) of the supplemental formula per day and to increase this to 16 fluid ounces per day if possible, thus providing approx. 500 to 1,000 additional calories per day (assuming that the caloric intake from their usual diet remained the same). The supplement was to be taken as each patient desired: all at once or in portions throughout the day. Patients were told that they could mix the formula with flavouring agents such as chocolate syrup, coffee crystals, and extracts, or mix with ice cream, milk or juices. They were warned not to heat nor boil the formula, as this could possibly change the protein content.			Body weight (Data on figures)	Body weight showed a trend towards weight gain in the Int. group but was not significant. No change in body weight was noted in the control group.	MACM, TSF, HGC at week 1, 4 and 8 Energy expenditure prior to and during study period Blood test profile: Hb, Hematocrit, blood urea nitrogen, creatinine, total protein, Albumin, retinol binding protein at week 1 and 8
McEvoy and	RCT		51 patients	Hospitalised elderly	Nutritional	Normal hospital diet	Not clear	Mean (SD) weight	Weight gain (kg)	Age and sex of

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
James 1982[226]			Intervention group: n=26 Control group: n=25	malnourished patients	supplement – 'build-up' in addition to hospital diet			gain TSF MUAC AMC	Intervention group: 2.6±2.4 Control group: -0.2±1.5 **[p<0.001]** TSF gain (mm) Intervention group: 0.5±0.7 Control group: 0±0.1 **[p<0.001]** MUAC gain (cm) Intervention group: 0.4±0.9 Control group: 0±0.1 **[p<0.05]** AMC gain (cm) Intervention group: 0.2±0.7 Control group: 0±0.2 [Not significant]	patients not stated
McWhirter and Pennington 1996[228]	RCT	1+	86 patients Intervention: n= 35 Control: n=26 (also 3rd arm to study: Nasogastric: n=25)	Patients admitted to hospital and identified as malnourished (BMI 20 or less, or triceps skinfold thickness below 15th percentile, or midarm circumference below 15th percentile). Diagnoses were malignant disease (n=13), investigation of weight loss (n=10), neurological (n=2), respiratory disease (n=29), pneumonia (n=10) and others (n=22). Gender not provided.	All patients had access to hospital diet. Oral supplement group received Tonexis (Clinical Nutrition Ltd) in oral supplement form. Nasogastric, enteral group received Clinifeed Favour (Clintec Nutrition Ltd) via a fine bore nasogastric tube. In both intervention groups energy requirements were	No intervention (i.e. normal hospital diet)	All patients had their nutritional status re-assessed on discharge or at the end of the feeding period. All patients fed for a minimum of 7 days. Mean length of feeding time was 8.9 days in controls, 9.7 days in oral supplement	Achievement of more than 80% of estimated energy and protein requirements. Weight change.	Energy req: Control: 1/26 (4%) Oral: 25/35 (71 Nasogastric: 22/25 (88%) [No p-values provided] Protein req: Control: 4/26 (15%) of Oral: 32/35 (91%) Nasogastric: 23/25 (92%) No p-values provided. Weight gain: Control: 4/26 (15%) of controls	Paper states an intention to treat analysis, and that 7 patients refused nasogastric tube, 2 refused oral supplements and 3 were withdrawn. It is not clear whether patients crossed into different arms (i.e. 7 nasogastric to oral/control and 2 oral to nasogastric/control), or were excluded from the analyses. Imbalances in the numbers in each arm suggest that some patients were

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Mean age: Control: 74 (range 57-89) Oral: 69 (range 24-88) Nasogastric: 71 (range 40-94) Severe malnutrition was present in 8/26 controls, 11/35 oral group, 8/25 nasogastric group.	defined for each patient using the Schofield equation corrected for stress and activity. Intervention feeding continued until oral intake or nutritional status had improved sufficiently or when agreement between patient and medical staff deemed it appropriate, or on discharge.		group and 11.8 in tube-fed group.		Oral group: 22/35 (63%) Nasogastric group: 17/25 (68%) **p-value of <0.001** is quoted but not test statistic provided - presumably chi-square). Mean % weight change Controls:-2.5% Oral gropu+2.9% Nasogastric group:+3.3% **p<0.001** is quoted, presumably ANOVA, but no sub-group comparisons provided. Mean % MAMC change Controls: -2.8% Oral: +1.7% Nasogastric: +2.1%. **p<0.001** is quoted, presumably ANOVA, but no sub-group comparisons provided. Control: Energy: 1250kcal per day Protein:39.5 g/day. Oral group: 1680kcal per day and 77.9 g/day Nasogastric group:1863kcal per day and 88.1 g/day No differences in contribution to total	excluded. No attempt to control for information bias among those evaluating outcomes, or the effect of information bias on patient feeding behaviour. Biggest risk to study may come from longer treatment duration in tube-fed patients. Likely that the large effect sizes not entirely due to bias. No power calculations mentioned, and the tracking of patients through the trial is unclear. Funding: Clintec Nutrition Ltd
								Mid-arm circumference (MAMC) change		
								Energy and protein intake		

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									intake from normal diet were observed -- differences came from supplementation.	
Otte et al 1989[260]	RCT		28 patients Intervention group: n=13 Control group: n=15	Malnourished ambulant patients with pulmonary emphysema	Nutritional formula providing	Placebo	13 weeks	Mean (SEM) weight gain Sum of Four skin folds(SFS) MAMC Subjective wellbeing(dyspnoeic score) S- albumin Pulmonary function test	Weight gain (kg) Intervention group: 1.52±0.39 Control group: 0.16±0.24 **[p<0.01]** Mean SFS (mm) Intervention group: 2.73 ± 0.87 Control group: -0.93±0.81 **[p<0.01]** MAMC(cm) Intervention group: 2.73 ± 0.87 Control group: -0.93±0.81 [Not significant]	Age and sex of patients not stated No difference were observed regarding pulmonary function or immunological status
Paton et al, 2004[269]	RCT	1+	Total: n=36 Intervention group: n=19 Age: 39.5±14.3 M/F=8/11 Control group: n=17 38.4±19.3[2]	Patients with newly diagnosed tuberculosis and wasting Mean (SD) BMI Intervention 17.9 (1.9) Control: 16.7 (1.5)	High Energy supplements (Ensure Plus) in addition to daily diet and planned dietary advice	Normal diet and general advice	24 weeks After 6 weeks people who had reached a BMI of 20 or their usual body weight were	Mean (SD) change in weight at week 6 (kg) Mean (SD) change in weight at week 12 (kg) Mean (SD) change in weight at week 24	Intervention:2.57 (1.78) Control:0.84 (0.89) P=0.001 Intervention:4.14 (2.67) Control:1.92 (1.42) P=0.008 Intervention:2.66 (2.51) Control:4.44 (2.73)	AI patients received combination antituberculous drug treatment and follow-up for TB care Grip strength increased more in the control group in week 6 so that by week 24

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			M/F=8/9				encouraged to discontinue supplements and continue and ad libitium diet	(kg) Total lean Mass Grip strength	P=0.073 Total lean Mass(kg) Intervention: 1.17±0.93 Control:0.04±1.26 P=0.006 Grip strength (kg)Intervention: 2.79±3.11 Control: -0.65±4.48 (P=0.016)	the magnitude of the change from baseline did not differ between the 2 groups
Payette et al 2002[270]	RCT	1+	83 Intervention: n=41 Age:81.6±7.5 M/F:12/29 Control: n=42 Age:78.6±6.1 M/F:12/30	Subjects receiving long-term home help services and at high risk for under-nutrition	Two (2) cans of 235mL per day of patients choice of a commercial liquid formula (ensure or ensure plus) along with their regular meals and were contacted every 2 weeks between visits and counselled	Normal diet but also visited every month and given small gifts to control for effect of greater attention	16 weeks	Total energy intake Mean (SD) weight gain (kg) TSF MAC	Total energy intake(kcal) Intervention:1772 Control:1440 **[p <0.001]** Intervention:1.62 (1.77) Control:0.04 (1.47) **[p<0.001]** Intervention: Week 0:13.5±5.3 Week 16:14.4±5.6 [no sig diff.] Control: Week 0: 13.3±6.5 Week 16: 13.6±6.6 [no sig diff.] MAC(cm) Intervention: Week 0: 21.0±2.0 Week 16: 21.0±2.0 Control: Week 0: 21.3±2.4 Week16: 21.1±2.5 [no sig diff.]	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Physical role and emotional role functioning were measured by the SF-36 questionnaire	Physical role functioning Intervention: Week 0: 46.2±39.6 Week 16: 63.1±35.00 **[p<0.01]** Control: n=39 Week 0: 54.3±36.2 Week16: 69.5±37.7 **[p<0.01]** Significant differences were observed for physical role functioning in both groups And in emotional role functioning for the intervention group but there was no significant difference between both groups	
Potter et al 2001a[279]	RCT	1+	381 patients Intervention: n=186 Control: n=195	Hospitalised patients over 60 years. Inclusion criteria: emergency admission from home; ability to gain consent from patients or relatives; no non malignancy; ability to swallow; non-obesity, BMI < 75th percentile. Intervention: Severely malnourished- BMI < 5th percentile: Intervention: 34 Control: 40 Control: Moderately	Oral supplement commenced 48 hours of admission throughout hospitalisation. Supplement: Oral commercially available protein energy sip feed which contained 1.5 kcal/mL energy (Entera Frusenius; Frusenius UK Ltd, Newcastle, UK) intended to provide 22.5 g protein and 540 kcal energy per day. Three times daily 120mL was	Standard diet	Until discharge, death or referral to a nursing or residential home.	Mean (SD) total energy intake (weighed dietary intakes of voluntary food were undertaken on a random sample of subjects (1 in 3) on 3 separate days: 3, 10 and 17) in each nutritional group of both control and intervention arms)	Measured in a sample of 94 patients: Intervention: n=46, Control: n=48 Severely malnourished: Intervention: n=8 1278 (541) Control: n=10 998 (428) [Not significant] Moderately malnourished: Intervention: n= 24 1367 (475) Control: n=19 1023 (397) [Not significant]	Group 3 ‘Adequately Nourished’. Since the majority of admissions were adequately nourished, only 1 in 2 recruits to this group were sequentially randomised. Anthropometric measures were undertaken weekly. Compliance: 50% of patients consumed a mean additional intake of 430 to 540 kcal/d, and a further 25% of patients consumed a

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				malnourished- BMI> 5th percentile and <25th percentile: Intervention: 90 Control: 87 Group 3: Adequately Nourished - BMI > 25th percentile and < 75th percentile Intervention: 62 Control: 68 There was no significant difference in baseline data (average age, weight, or Barthel score) between the treatment and control arms within the 3 nutritional groups. (Data not reported). Median age (total number of patients) = 83 range (61-99) years.	prescribed (8:00 AM, 2:00 PM, and 6:00 PM) in the medicine prescription chart.			Mean (SD) weighted dietary intake at day 3 Mean (SD) baseline weight and change of weight (kg)	Adequately nourished: Intervention: n=14 1580 (448) Control: n= 19 1205 (426) [Not significant] Total: Intervention: n=46 1409 (482) Control: n=48 1090 (417) **[p=0.001]** Measured in a sample of 94 patients: Intervention: n=46, Control: n=48 Data not extracted Data includes only those patients who were able to be weighed Group 1: Intervention: Baseline n=34: 39.8 (6.4) Change in weight n=22: + 1.3 (2.3) Control: Baseline n=39: 39.7 (5.2) Change in weight n=27: -0.5 (2.7) Group 2: Intervention:	mean additional intake of at least 270 kcal/d. In no cases did the physician responsible withdraw treatment due to adverse effects. Funding: Chief Scientist's Office of Scottish Office. Frusenious UK Ltd provided the sip feed supplements free of charge.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Baseline n=90: 45.9 (6.0) Change in weight n=78 + 0.2 (2.7) Control: Baseline n=86: 46.3 (6.5) Change in weight n= 67 -0.4 (2.8) Group 3: Intervention: Baseline n= 61 57.6 (6.6) Change in weight: n=42 + 0.5 (2.6) Control: Baseline n=67: 57.9 (7.9) Change in weight n=7: -0.7 (3.0) Total Intervention: Baseline n=185: 48.6 (9.1) Change in weight n=142: + 0.4 (2.6) Total Control: Baseline n=192: 49.0 (9.1) Change in weight n=151: -0.5 (2.9) Data excluding those patients with any potential confounding condition (cardiac failure given diuretic	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									treatment, dehydration given IV fluids, blood transfusion)	
								Mean (SD) % weight change	Intervention group had significant improvement in weight change.	
								Mean (SD) arm muscle circumference baseline, change and % change	Mean (SD) % weight change Data not extracted	
									Mean (SD) arm muscle Data not extracted	
								Mortality	Deaths n (%) Group 1: Intervention n=34: 5 (14.7) Control n= 40: 14 (35.0) **[p<0.05]**	
									Group 2: Intervention n=90: 8 (8.9) Control n=87: 13 (14.9) [p=0.38]	
									Group 3: Intervention n= 62: 8 (12.9) Control n=68: 6 (8.8) [Not significant]	
									Total Intervention n=186: 21 (11.3) Total control n= 195: 33 (16.9) [p=0.117]	
								Median (range) LOS		

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								(among survivors only, until discharge from hospital or until discharged from ongoing rehabilitation and awaiting placement) Functional Recovery Barthel (Num. of patients who survived with improved Barthel scores expressed as a % of those who had more than 1 Barthel score. An improvement in function was defined as final Barthel score higher than admission score)	Median (range) LOS Group 1: Intervention n=29: 17 (4,100) Control n=40: 17.5 (2,76) [Not significant] Group 2: Intervention n=82: 18.5 (3, 141) Control n=74: 16.5 (3, 62) [Not significant] Group 3: Intervention n= 54: 13.5 (3, 62) Control n=62: 21.0 (2, 69) **[p<0.05]** Total Intervention n=165: 16.0 (3, 141) Total Control n=162: 18.0 (2, 76) [Not significant] Functional Recovery improved/total (%) Group 1: Intervention: 17/25 (68) Control: 11/28 (39) **[p=0.04]** Group 2: Intervention: 57/81 (70) Control: 51/71 (72) Group 3: Intervention: 28/43 (65) Control: 38/58 (66)	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Discharge placement (home or institutional care) n (%)	Total Intervention: 102/49 (68) Total Control: 100/157 (64) [p=0.38] Data not extracted	
Rabeneck et al, 1998[282]	RCT	1+	118 Interrvention: 59 Age: 39.3 ± 8.8 yrs Control: 59 Age: 41.1±9.7 99 completed at least 4 out of the 6 week study Intervention: 49 Control: 50 90 completed the whole 6 weeks of the study Intervention: 43 Control: 47	Malnourished HIV men at <90% of usual body weight for height or who had an involuntary weight loss of >10% in previous 6 months. Mean (±SD) BMI Int: 20.6 (± 3.0) kg/m^2 Cont: 21.0 (± 2.6) kg/m^2	Specialised, medium chain triglyceride formula suitable for HIV patients with fat malabsorption (Lipisorth, Mead Johnson) PLUS individualised nutritional counselling by the same dietitian to achieve a specific energy target which was >960 kcal/day of estimated total energy expenditure.	Individualised nutritional counselling by the same dietitian to achieve a specific energy target which was >960 kcal/day of estimated total energy expenditure.	6 weeks	Proportion of patients averaging 80% or more of energy target Mean (±SEM) weight change Mean (±SEM) mid-arm circumference change Mean (±SEM) tricep skinfold Mean (±SEM) quality of life score based on a 30-item instrument developed for this study	Intervention: 56% Control: 80% p=0.56 (numbers of patients this applies to not given) Intervention: -0.1 (±0.4) kg (n=50) Control: -0.1 (±0.3) kg (n=52) p=0.97 Intervention: 0.2 (±1.4) mm (n=50) Control: -2.2 (±1.1) mm (n=52) p=0.26 Intervention: -0.5 (±0.3) mm (n=50) Control: -0.1 (±0.1) mm (n=52) p=0.37 Intervention: 3.6 (±2.4) (n=50) Control: -0.3 (±2.1) (n=52) p=0.49	Unclear as to when the measurements were taken for the outcomes. They do not appear to relate to the numbers still in the study at 4 weeks as there are more in each arm. Funding: research "supported" by Mead Johnson.
Rana et al 1992[283]	RCT	1+	54 patients randomised	Patients undergoing elective GI surgery.	Standard hospital diet supplemented	Standard hospital diet	Until discharge	Daily nutritional intake:	Mean (SEM) Energy intake (Kcal/day) (for	Nutritional status was assessed on

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			14 withdrawn Total 40 patients: Intervention: 20 Control: 20	Data Mean (SEM) Age: Intervention: 57.8 (3.5) Control: 64.5 (2.4) Gender (F/M): Intervention: 12/8 Control: 7/13 Usual body weight (kg): Intervention: 67.9 (2.7) Control: 70.6 (2.6) Pre-op. weight (kg): Intervention: 62.9 (2.8) Control: 66.1 (3.0) Weight change: Intervention: -5.0 (0.7) Cont: -4.7 (1.01) % Weight loss at randomisation: Intervention: 7.6 (1.3) Control: 7.1 (1.7) Grip strength (Kpa): Intervention: 68.7 (4.9) Control: 63.8 (4.19) Exclusion criteria: dementia, receiving any form of pre-operative nutritional support, requiring ETF or PN. Patients were also withdrawn if they were unable or refused to comply with study protocol.	ad libitum with commercially available liquid sip feed (Fortisip, Nutricia, Holland). Fortisip has an energy density of 1.5 Kcal/ml. Nitrogen source 7.8 g/L is provided as unhydrolysed protein. 1.4 L provide at least 100% of the UK Department of Health and Social Security RDAs for all vitamins and minerals.		(Intervention period: from beginning of feeding with free fluids and or 'light diet' post op until discharge)	Mean daily nutritional intakes calculated from food diaries of patients completing day 1-3 and 1-7 of study period	Int. group, energy intake is the total energy consumed from hosp. diet and supplement): Study day 3: Intervention (n=20): 1968 (164) Control (n=20): 1056 (101) [No p value reported] Study day 7: Intervention (n=8): 2156 (242) Control (n=9): 1292 (126) [No p value reported] Mean (SEM) protein intake (g/day (for Int. group protein intake is the total protein consumed from hosp. diet and supplement): Study day 3: Intervention (n=20): 70.8 (5.6) Control (n=20): 47.3 (4.9) [No p value reported]. Study day 7: Intervention (n=8): 80.1 (6.0) Control (n=9): 63.7 (6.3) [No p value reported] Data in Mean (SEM) Energy intake (Kcal/day):	admission following randomisation, on day 3 of the 'Study period' and on discharge. Dietary intake was assessed prospectively throughout the Study by a trained dietitian, from daily food records which documented all oral intake including drinks and snacks. All patients were seen daily and food records reviewed and discussed to clarify actual intake; details of plate waste were recorded. Energy and nutrient intakes were calculated using the food composition tables and manufacturers information. As over half of the patients in each treatment group had been discharged by study day 7, the average daily intake of energy and protein were assessed from 3 and 7 day food diaries according to the technique validated by Hessov.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Study period 1-3 days (Intervention n=20 Cont n=20): a) Intervention (Energy from hosp. food only): 1132 (81) b) Intervention (Energy from hosp. food and supplement): 1607 (96) Cont: 864 (56) a) v Control **[p<0.01]** b) v Control **[p<0.0001]** Study period 1-7 days (Intervention n=8 Control n=9): a) Intervention (Energy from hosp. food only): 1353 (92) b) Intervention (Energy from hosp. food and supplement): 1833 (99) Cont: 1108 (56) a) v Control **[p<0.02]** b) v Control **[p<0.0001]** Protein intake (g/day): Study period 1-3 days (Intervention n=20 Cont n=20): a) Intervention (Protein intake from hosp. food only): 42.6 (3.2) b) Intervention (Protein intake from hosp. food and supplement): 58.5 (3.6) Control: 40.5 (3.0) a) v Control **[p<0.01]** b) v Control **[p< 0.001]** Study period 1-7 days	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Nutritional status Mean +/- (SEM) Hand grip strength (kpa) Study reports other parameters: Mid arm	(Intervention n=8 Cont n=9): a) Intervention (Protein intake from hosp. food only): 50.1 (3.2) b) Intervention (Protein intake from hosp. food and supplement):66.0 (3.4) Cont: 52.9 (29) a) v Control no p value b) v Control **[p<0.0001]** Data Mean (SEM) Weight (Kg) (Intervention n= 20 Control n=20): Intervention: Pre-op: 62.9 (2.8) Study day 3: 61.8 (2.6) Discharge: 61.6 (2.6) NS weight loss either at study day 3 or at discharge Cont: 1) Pre-op: 66.1 (3.0) 2) Study day 3: 61.6 (2.6) 3) Discharge: 61.4 (2.8) 2) v 1) **[p<0.0001]** 3) v 1) **[p<0.03]** Pre-operative: Intervention: 68.7 (4.9) Control: 63.8 (4.9) [No p value reported] Study day 3: Intervention: 65.9 (5.4) Control: 49.2 (4.7) **[p<0.03]**	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								circumference, triceps skinfolds thickness, Mid arm muscle circumference, albumin, retinol binding albumin, retinol binding protein and prealbumin	Discharge: Intervention: 53.2 (4.9) Control: 68.8 (4.9) **[p<0.03]** Data not extracted Data Mean (SEM)	
								Post-operative 'nil by mouth' period (days)	Intervention: (5.8 +/- 0.4) Cont: (6.3 +/- 0.7) [Not significant]	
								Study period (days)	Intervention: 6.8 (0.9) Cont: 9.6 (1.9) [Not significant]	
								Mean (SEM) length of stay (days)	Intervention: 12.6 (1.1) Cont: 15.9 (1.9) [Not significant]	
								Total post-op. complications (pneumonia and wound infections)	Data (n) Intervention: 3 Cont: 10 **[p<0.02]**	
								- Pneumonia	Intervention: 0 Cont: 2	
								- Wound infection	Intervention: 3 Cont: 8	
								Mortality	Intervention: 0 Cont: 0	
Ravasco et al, 2005[285]	RCT	1+	111 stratified by staging & randomised into 3 groups: Baseline data not	Colorectal cancer patients undergoing radiotherapy	Ready to use high protein, energy dense polymeric oral supplement (2 x 200ml cans per day	Individualised dietary counselling	3 months after end of radiotherapy. Intervnetions provided to	Median (range) change in energy intake at end of radiotherapy	Intervention: 296 (286-401) kcal Control: -285 (-201 to -398) kcal p value not reported	**Funding**: grant from Nucleo Regional do Sul da Liga Portuguesa contra of Cancro-Terry Fox

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Intervention1: High protein oral supplement n=37 Intervention 2: Ad libitum intake n=37 Intervention 3: Dietary counselling (regular foods) n=37	provided	containing 200kcal and 20g protein) plus normal diet		end of radiotherapy	Median (range) change in protein intake at end of radiotherapy Nos. of people with maintained or improved BMI No. of people with maintained or improved PG-SGA score (Patient Generated Subjective Global Assessment) Quality of life Quality of life function scores at radiotherapy completion	Intervention: 30 (20 – 40) g/day Control: -10 (-7 to -15) g/day At end of radiotherapy Intervention: 34 (n=37) Control: 32 (n=37) 3 months after end of radiotherapy Intervention: 31 (n=37) Control: 29 (n=37) NS (p value not reported) At end of radiotherapy Intervention: 18 (n=37) Control: 3 (n=37) p<0.001 3 months after end of radiotherapy Intervention: 13 (n=37) Control: 1 (n=37) p<0.001 Counselling and supplement groups improvement/deteriorati on of QoL correlated with better/poorer Counselling – all QoL scores improved proportionally to adequate intake or	Foundation

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									nutritional status p<0.05 Supplements – 3 of 6 improved proportionally to protein intake p=0.04 Ad libitum – all QoL scores worsened p<0.05 Counselling – maintained/improved function, symptoms and single-item scores p<0.02 Supplements – few function and symptom scales improved p<0.05 Ad libitum –QoL remained as poor after radiotherapy p	
Saluja et al 2002[302]	RCT	1+	60 patients Intervention: n=30 Control: n=30 Patients were divided into three categories according to the Nutritional Risk Index. There were 10 patients in the Intervention group and 10 patients in the control group for each category.	Patients undergoing major abdominal surgery. Emergency and elective abdominal procedures were included. Patients were divided into three categories according to the Nutritional Risk Index (NRI). Patients were considered malnourished if they met any of the following criteria of nutritional assessment: a) NRI<100 [NRI= 1.519 x serum albumin	Standard ward diet and hospital kitchen-prepared liquid sip feed of 500 ml providing 500 kcal comprised of 16.6g protein, 43.5 g carbohydrate, and 30 g fat. The 500 ml sip feed contained 375 ml milk, 12.5 g butter, 12.5 g colustarch, 125 ml rice water, and half an egg. All patients were assessed on the day of admission, day 3 and on the day of discharge.	Standard ward diet All patients were assessed on the day of admission, day 3 and on the day of discharge.	Until discharge (Intervention period from beginning of oral fluids or a light diet post op. until discharge).	Nutritional intake	Unit details i.e, median, mean and p values not provided for Min. max caloric and protein intake. Min - Max caloric intake (kcal) (n=10 in each category for Intervention and Control): Borderline malnourished: Intervention: 1336-2178 Control: 951-1372 Moderately malnourished: Intervention: 1210-	All patients were seen daily, and food records were reviewed and discussed to clarify the actual intake. Details of the plate waste were recorded. Fluid intake was recorded by volume. Energy and nutrient intakes were calculated according to tables supplied by the dietary department. Supplemented feeds were well tolerated and the total caloric and protein intake in

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				(g/l) + 0.417 (current weight/usual weight) x 100 or b) current weight > 95% of the ideal weight and serum albumin < 39.2 g/l. (For data below, unit details i.e. median, mean, not provided) Borderline malnourished: NRI<100->97.5 Intervention: n=10 Control: n=10 Age (y): Intervention: 33 Control: 36 Gender (M/F): Intervention: 6/4 Control: 6/4 Weight (Kg): Intervention: 55.3 Control: 49.45 Moderate malnutrition: NRI<97.5->83.5 Intervention: n=10 Control: n=10 Age (y): Intervention: 35.6 Control: 35 Gender (M/F): Intervention: 5/5 Cont: 7/3 Weight (Kg): Intervention: 49.2 Control: 47.4 Severe malnutrition:					2088 Control: 852-1361 Severely malnourished: Intervention: 1119-2025 Control: 871-1287 Min-Max protein intake (g): Borderline malnourished: Intervention: 41.80-67.20 Cont: 32.40-50.57 Moderately malnourished: Intervention: 38.08-64.50 Control: 24.84-47.01 Severely malnourished: Intervention: 34.80-62.57 Control: 18.01-46.71 Total caloric and protein intake: Calories (kcal): Intervention (n=30): 1798+/- 385 Control (n=30): 1182 +/- 178 **[p<0.01]** Proteins (g): Intervention (n=30): 55.71 +/- 11.63 Control (n=30): 39.48 +/- 11.14 **[p<0.01]**	the intervention group.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				NRI <83.5 Intervention: n=10 Control: n=10 Age (y): Intervention: 34.9 Control: 34 Gender (M/F): Intervention: 5/5 Control: 6/4 Weight (Kg): Intervention: 38.8 Control: 46.6 Exclusion criteria: patients with dementia, diabetes, renal failure, or hepatic failure and those who refused to give consent. Patients were withdrawn from the study if they required PN.				- Average voluntary and total protein and caloric intake in the different categories reported Mean weight change (kg): Change in albumin, MAC, handgrip strength, lymphocyte count Complications:	Average voluntary and total protein Data not extracted Mean weight change (kg): Borderline malnourished: Intervention: 2.6 +/- 0.5 Control: 2.5 +/- 0.74 [Not significant] Moderately malnourished: Intervention: 3.35 +/- 0.91 Control: 2.35 +/- 2.14 [Not significant] Severely malnourished: Intervention: 2.15 +/- 1.0 Control: 4.6 +/- 2.4 **[p<0.01]** Weight loss in severely malnourished patients was significantly less in the intervention group Data not extracted Complications: Intervention: (n=30) Control: (n=30) Intervention: 7 Control: 10 [Not significant] Borderline malnourished	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Intervention: 1 Control: 1 Moderately malnourished: Intervention: 2 Control: 2 Severely malnourished: Intervention: 4 Control: 7 **[p<0.05]**	
								Length of stay	LOS Borderline malnourished: Intervention: 10.3 +/- 0.4 Control: 10.1 +/- 0.1 Moderately malnourished: Intervention: 10.2 +/- 0.4 Control: 10.2 +/- 0.4 Severely malnourished: Intervention: 10.1 +/- 0.3 Control: 10.6 +/- 0.5 No p value reported	
								Mean weight (kg) at discharge:	Mean weight (kg) at discharge: Borderline malnourished: Intervention: 52.7 Control: 46.95 Moderately malnourished: Intervention: 45.85 Control: 45.05 Severely malnourished:	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Intervention: 36.35 Control: 42.00	
Saudny-Unterberber et al, 1997[306]	RCT	1+	Total: n=33 Intervention: n=17 M/F:8/6 Age:69.21±2.21 Control:=16 M/F:7/3 Age:69.40±3.91	Patients hospitalized for an acute exacerbation of COPD	Extra nutritional support – (Ensure, ensure plus or a variety of puddings) **or extra snacks to assure a calorie intake of at least 1.7 x REE if their BMI was below 20**	Traditional hospital care	Study was carried out over a 14day period	Mortality Outcomes measured at 2wks as change scores. Mean (SEM) weight change FVC(% predicted) Change in FEV_1 Handgrip strength General wellbeing score	Intervention: 1 (n=17) Control: 1 (n=16) Result based on n=14 in the treatment and n=10 in the control groups respectively Weight change(kg) Intervention:0.209±0.68 Control: -0.078±0.20 (NS) FVC(% predicted) Intervention: +89.7% Control:-3.5% (p=0.015) Change in FEV_1 Improved in the treatment group but was not significant Handgrip strength Intervention:-0.869±0.99 Control: -0.375±0.86 (NS) Intervention: +11.96 Control:-10.25 (p<0.066)	Almost all subjects were in negative nitrogen balance, indicating muscle wasting. Degree of musle wasting was strongly correlated with the dose of corticosteroids. Due to a series of reasons such as illness and death(1each in both the intervention groups) only 24 of the initial subjects were available for analysis
Smedley et al 2004[326]	RCT	1+	152 patients analysed. Split into 4 groups: Group 1- No	Patients undergoing elective moderate to major lower GI surgery. Diagnosis- Colonic or rectal cancer:	Nutrition support consisted of Fortisip (Nutricia, Wageningen, The Netherlands), a drink containing 1.5kcal & 0.05g protein per ml	No nutrition support given	Phase I commenced before operation, when the decision to operate	Post-op. hospital stay /days (mean (SD)): Post-op. minor complications:	Group 1: 14.1 (6.6) Group 2: 11.7 (5.1) Group 3: 13.4 (7.5) Group 4: 12.8 (4.5) Group 1: 30 Group 2: 10 **[p<0.05**	179 Patients were recruited between Oct 1987 and Mar 2001. 27 patients were withdrawn leaving 152 patients for analysis.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			nutritional supplements (nutrition support): n=44 Group 2 - Nutrition support before & after surgery: n=32 Group 3 – Post-op nutrition support only: n=35 Group 4 – Nutrition support only before surgery: n=41	Group 1: 35 Group 2: 21 Group 3: 25 Group 4: 31 Colitis: Group 1: 6 Group 2: 12 Group 3: 7 Group 4: 7 Diverticulosis: Group 1: 3 Group 2: 6 Group 3: 3 Group 4: 5 Other: Group 1: 6 Group 2: 3 Group 3: 4 Group 4: 5 Age (yrs): Group 1: 63 Group 2: 55 Group 3: 62 Group 4: 61 Sex ratio (M:F): Group 1: 28:22 Group 2: 19:23 Group 3: 20:19 Group 4: 33:15 BMI (kg/m2): Group 1: 27.8 (5.6) Group 2: 24.9 (4.5) Group 3: 25.5 (4.5) Group 4: 26.9 (4.9) Stratification- At risk: Group 1: 17	was used for oral NS. Patients were encouraged to drink this ad libitum in small, frequent quantities between meals. Pre-op. Nutrition was given from the time it was decided to operate to 1 day before surgery. Post-op. Nutrition support was started when the patient was able to take free fluids & continued for 4 wks after discharge from hospital.		electively was made in the outpatient setting and ended 24hrs before surgery. Phase II commenced on the 1st day that the patients was able to take free fluids or a light diet after operation & ended 4 wks after discharge from hospital.	Post-op. major complications: Total complications: Mean intake of oral nutrition support at the inpatient phase & at 2 & 4 wks after discharge from hospital between group 2 & 3: Dietary intake in terms of energy consumed between groups at any time point: Body weight change (%) (data in graph format): Fatigue & QOL scores:	**vs. group 1]** Group 3: 13 **[p<0.05 vs. group 1]** Group 4: 17 Group 1: 4 Group 2: 5 Group 3: 2 Group 4: 3 Group 1: 34 Group 2: 15 Group 3: 15 Group 4: 20 No sig. differences. No sig. differences. Group 2 gained weight before surgery; these patients also lost sig. less weight **[p<0.05]** over the course of the study than those in Group 1 & Group 3. No differences.	Rate of major complications was similar in the 4 groups but there were sig. fewer minor complications in Group 2 & 3 than in Group 1 **[p<0.05]**. Use of post-op. Oral nutrition support resulted in a sig. reduction in post-op. morbidity & weight loss. Patients receiving oral nutrition support over an extended perioperative period lost sig. less weight than those who received no nutrition support or post-op nutrition support only. Incidence of minor complications was sig. lower in patients receiving oral nutrition support throughout or after surgery than in those receiving no nutrition support or pre-op. nutrition support only. Funding: Numico Research, Wageningen, The Netherlands.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Group 2: 14 Group 3: 14 Group 4: 16 Stratification- Not at risk: Group 1: 33 Group 2: 28 Group 3: 25 Group 4: 32						Excl: Under 18yrs, pregnant, overt dementia, emergency or laproscopic surgery, receipt of other forms of preoperative nutritional support & inability to take ONS for a min. 7 days before operation.
Tidermark et al 2004[349]	RCT	1+	40 Patients Intervention: n=20 Age:83.5±6.1 Control: n=20 Age :84.1±4.3	Female patients, mean age 83 ± 5yrs (range 70-92), with acute femoral neck fracture treated with internal fixation	Patients receiving a protein-rich formula (Fortimel, 200ml/day, 20g protein/day). All patients received additional calcium (1g) & vitamin D (400IE) (Calcichew-D3) daily.	Patients received the standard treatment. All patients received additional calcium (1g) & vitamin D (400IE) (Calcichew-D3) daily.	6 months. Patients were re-examined after 6 & 12 months.	No fracture healing complication: Fracture healing complication: Mean (SD) weight change Int group: n=18 Cont group: n=17 Median (range) length of stay (days) Hand grip strength Lean body Mass(LBM) Activities of daily living	Intervention: 14/20 Control: 10/20 Intervention: 4/20 Control: 7/20 Weigh(kg) At 6 months Intervention: -1.26±4.4 Control: - 2.39±2.8 Intervention: 20 (5-356) Control: 27 (5-197) Hand grip strength At 6 months Intervention: +0.73±3.0 Control: -0.37±2.4 Lean body Mass(kg) At 6 months Intervention: -1.25±1.3 Control: -1.16±2.1 LBM decreased in both control and PR groups Activities of daily living Intervention: Remained	Study was carried out to evaluate the effects of a protein-rich supplementation alone or in combination with anabolic steroids No direct comparison available for both groups Funding: Trygg Hansa Insurance Company, the Swedish Orthopaedic Association, the Swedish Research Council (MFR no. 04224) & VR K2002-72VX-14308-01A, the Novo Nordic Fund, Nutricia Nordica AB & Nycomed AB.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									at a high level Control: Declined significantly	
								Quality of Life	QoL(EQ-5D) At 6 months Intervention: 0.6 Control: 0.5 There were no sig. differences in health related QoL between the groups at the start, But there were trends towards improvement in the intervention group, showing differences at the 6 & 12 month follow-ups.	
Vermeeren et al 2004[363]	RCT	1+	47 Patients Intervention: n=23 Control: n=24	Patients who were acutely admitted to hospital for an exacerbation of COPD. Patients had weight loss>5% weight loss in 1mo or >10% weight loss in 6mo prior admission to the hospital. Excl: patients with diabetes mellitus type 1, patients with thyroid or intestinal diseases & patients with carcinoma. Mean (SD) age Intervention: 66 (8) Control: 65 (10)	Intervention consisted of 3 x 125ml Respifor/day (Nutricia, the Netherlands); 2.38MJ/day, 20 energy% protein, 20 energy% fat & 60 energy% carb. Supplementation given 3 times daily during daytime between main meals. All patients could also select their own menus from a standardised hospital form.	Control patients received placebo, 3 x 125ml vanilla flavoured water with 0MJ/day. Supplementation given 3 times daily during daytime between main meals. All patients could also select their own menus from a standardised hospital form.	9 days	Mean energy intake (MJ/day): Cumulative energy intake during hospitalisation (MJ/day): Mean protein intake (g/kg body weight): Mean carb intake during hospitalisation (energy%): Mean fat intake during hospitalisation (energy%):	Intervention: 9.40 ± 2.54 Control: 10.89 ± 2.01 **[p<0.05]** Intervention: 89.9 ± 17.9 Control: 77.1 ± 18.3 **[p<0.05]** Intervention: 1.8 ± 0.4 Control: 1.3 ± 0.3 **[p<0.01]** Intervention group 38% higher than control group Intervention: 54 ± 4 Control: 47 ± 5 **[p<0.01]** Intervention: 27 ± 3 Control: 33 ± 4 **[p<0.01]**	Funding: supported by Numico Research BV, The Netherlands

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Mean (SD) weight change during hospitalisation (kg) Muscle strength:	Intervention: 1.37 ± 1.3 Control: 1.12 ± 1.2 [Not significant] No difference between the 2 groups.	
Vlaming et al 2001a[364] Sip feed study	RCT	1+	549 Sip Feed ± mulitvit n=275 Placebo sip feed ± multivit n=274	Secondary randomisation of identified acute "thin" patients (BMI 18-22 kg/m2, or unintentional weight loss ≥5%) on medical, surgical or orthopaedic wards. Age (median, interquartile range) Sip Feed +/-mulitvit 67 (47-76) yrs Placebo feed +/-mulitvit 66 (45-75) yrs Gender (m/f) Sip feed +/-multivit: (165/110) Placebo sip feed +/-multivit: (149/125) BMI (median, interquartile range) Sip feed +/- multivit:: 20.5 (18.9-21.5) kg/m2 (n=97) Placebo sip feed +/-multivit: 20.7 (19.4-21.8) kg/m2 (n=101) Mean (SD) % weight loss	Sip feed +/-mulitvits (2 x 200ml) Sip feed & multivits (n=130) Sip feed & placebo multivit (n=145) Sip feed contains 600kcal energy, 80.8g carbohydrate vitamins and minerals	Placebo sip feed +/-mulitvits (500ml) Placebo sip feed & multivits (n=151) Placebo sip feed & placebo multivit (n=123) Placebo contains 100kcal energy, 25g carbohydrate	Studied for duration of admission in hospital	Mean (SD) length of stay all patients Mean (SD) length of stay truncated at 100 days for patients receiving multivitamin tablet (11 patients had a length of stay > 100 days) Mean (SD) length of stay truncated at 100 days for patients receiving multivitamin tablet (11 patients had a length of stay > 100 days) Mean (SD) length of stay truncated at 100 days for patients receiving multivitamin tablet (11 patients had a length of stay > 100 days)	Sip feed +/- multivit: 14.2 (24.9) days (n=275) Placebo sip feed +/-multivit: 11.4 (16.4) days (n=274) (p value not reported) Sip feed + multivit 11.4 (14.1) days (n=130) Placebo sip feed + multivit 11.9 (15.3) days (n=151) [p value not reported] Multivit: + sip feed 11.4 (14.1) days (n=130) Placebo multivit + sip feed 14.2 (19.1) days (n=144) [p value not reported] Sip feed + placebo multivit: 14.2 (19.1) days (n=144) Placebo sip feed + placebo multivit 10.2 (13.9) days (n=123) [p value not reported]	Seriously malnourished excluded as authors regarded it as unethical to withhold nutritional supplementation from them. Patients also participating in a multivitamin trial. Compliance (not split in to intervention and control groups): 139 / 222 (63%) received at least 50% of prescribed feed (sip feed or sip feed placebo) 560 / 846 (66%) received at least 50% of prescribed tablet (multivit or placebo) Sip feed and the placebo looked and tasted different and the actual sip feed (Ensure plus) was familiar to the ward nurses. The trial was described to nurses as an alternative trial

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Sip feed +/- multivit:: 4.9 (+/-5.5) % (n=99) Placebo sip feed +/- multivit: 4.5 (+/-4.7) % (n=76)				Mortality during admission Biochemical measurements or pyridoxal phosphate, pyridoxic acid and total B1 recorded	Sip feed +/-multivit: 12 (n=275) Placebo sip feed +/- multivit: 14 (n=274) [p value not reported]	feed; they were not told which drink was under test. Funding: North Thames Regional Health Authority. Abbott Laboratories provided sip feed and placebo drink Seton Health Care provided vitamins and placebo tablets
Volkert et al 1996[365]	RCT	1+	72 Intervention: 35 Control: 37 Only 46 patients completed the study Intervention:: 20 Control (CG): n=26 Patients in the intervention group was also analysed 2 sub-groups on the basis of their acceptance of the supplement Good acceptance (consumed one or nearly one suppl per day)	Malnourished geriatric patients Inclusion criteria: Females aged 75 or more	Liquid supplementation (200ml soup in the mid-afternoon, 200ml sweet drink in the afternoon) daily plus standard hospital diet. Patients received 400ml during stay and 200ml for 6months at home	Usual care	During hospital stay and for 6months after discharge	Mortality Body weight Iincomplete data as not able to measure for some patients SG+: n=7 SG-: n=6 CG: n=19	Intervention: 4 (n=35) Control: 8 (n=37) p value not reported Mean body weight difference(kg) SG+ At discharge SG+= 0.4 [Not significant] Discharge to 6 months SG+=3.4 **[p<0.01]** – discharge compared to 6 months **[p<0.01]** – admission compared to 6 months SG- At discharge SG-= -1.4 **[p<0.05]** Discharge to 6 months SG-=3.0 **[p<0.05]** - discharge compared to 6 months CG At discharge SG-= -0.1	Due to the great differences in supplement acceptance, patients in the supplemented group were divided into 2 subgroups according to the accepted amount of the supplement after hospitalisation

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			(SG+) : n=11 Age :84.5±6.7 Poor acceptance (consumed on suppl every 2 days or less (SG-) : n=9 Age :88.7±6.6					Barthel activities of daily living (ADL) – Higher scores indicate greater independence and a maximum score of 100 points	[Not significant] Discharge to 6months SG-=2.9 **[p<0.05]** - discharge compared to 6months **[p<0.05]** - admission compared to 6months Median ADL changes (minimum to maximum) SG+ Adm to Discharge 20 (0 to +30) Discharge to 6 months 5 (-5 to =30) Adm to 6 months 20 (0 to +50) SG- Adm to Discharge 0 (-35 to +60) Discharge to 6 months -10 (-70 to +30) Adm to 6 months 0 (-80 to +55) CG Adm to Discharge 5 (-45 to +50) Discharge to 6 months 2.5 (-35 to +45) Adm to 6 months 12.5 (-45 to +60) Differences in the proportion of independent patients (>65points) were significant between SG+ and CG and between SG- and CG at discharge, and btw SG+ and CG after 6months **[p<0.05]**	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									The proportion of patients who improved was smaller in SG- (44% at hospital, 22% at home) as well as in CG (23% at hospital, 35% at home) compared to SG+. None of SG+ deteriorated in hospital or at home in contrast to SG- and CG	
Wilson et al, 2001[373]	RCT		10 outpatients' hemodialysis centers. N=46 Intervention: 18 Age: 58±8.6 Control: 14 Control: 64±10	Malnourished patients with mild hemodialysis in outpatients centers in southeast Michigan	Experimental group received dietary counseling and oral supplements	Control gp: patients with mild hypoalbuminemia-serum albumin(SA)=3.5 to 3.7g/dL – received dietary counseling alone Comparison gp: with moderate top severe HA (SA=2.5 to3.4g/dL) – received physician prescribed ONS and dietary counseling		Nutritional repletion Percentage reaching nutritional repletion at end of study Length of hospital study	Overall repletion occurred more quickly in the experimental group Intervention: 50% Control: 57% Intervention: 71days Control: 107days	Sample size really small for results to be conclusive
Woo et al, 1994[375]	RCT		Total: n=81 Intervention: n=40 Age:72±5 M/F:22/18 Control: n=41 Age: 74±6 M/F:29/12	Elderly patients recovering from chest infection	Oral nutritional supplements 500ml of Ensure liquid daily for one month after being discharged	No supplement after discharged form hospital	3 months	Mean (SD) length of hospital stay Death BMI	Length of hospital stay Intervention:10.1±6.2 Control:9.5±5.9 Deaths A total of 5 deaths were recorded but paper did not state what groups they belonged. BMI Men(intervention) At baseline	Arthropometric indices were analysed separately in men and women

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									19.33±3.24 At 3rd visit 20.76±2.86 (p<0.001) Men(Control) At baseline 19.44±4.03 at 3rd visit 19.74±4.17 Women(intervention) At baseline 19.99±4.63 At 3rd visit 20.40±4.23 Women(Control) At baseline 19.86±4.89 At 3rd visit 20.63±5.15	
								AMC	AMC Men(intervention) At baseline 20.64±2.23 At 3rd visit 21.40±2.01 (p<0.001) Men(Control) At baseline 20.05±2.30 At 3rd visit 20.29±2.46 Women(intervention) At baseline 18.29±2.47 At 3rd visit 18.00±2.12	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Women(Control) At baseline 18.14±2.23 At 3rd visit 18.16±2.45	
Wouters-Wessleing et al 2002a[379]	RCT	1+	42 patients Intervention: 21 Control: 21 35 completed study 7 dropped out e.g. death, distaste of product	Inclusion criteria: ≥60yrs diagnosed with dementia, admitted to nursing home for at least 2 months and BMI <23. Exclusion criteria: Patients with cancer, terminal care, GI disorders, needing ETF or PN, requiring a therapeutic diet not compatible with the intervention/placebo. Patient characteristics: Age (mean, SD) Intervention: 85.3 (8.4) Control:78.7 (8.8) BMI (mean, SD) Intervention: 20.7 (2.7) Control: 20.7 (3.2) Barthel index: (median, range) Intervention: 5.5 (1-14) Control: 4 (0-20) Daily energy intake before study (Kcals, mean, SD) Intervention: 1490 (264) Control: 1496 (416)	2 x 125ml tetra packs of liquid nutrition supplement with energy – 273kcals, protein 8.5g, and multivit/mineral, per tetra pack and regular dietary intake for 3 months.	2 x 125ml Placebo: drink in tetra pack, water, cloudifier, flavourant and non calorific sweetener and regular dietary intake for 3 months.	3 months	Mortality Consumption of intervention product, mean (SD) Mean (SD) change in weight (kg) Change in BMI at baseline, 6 and 12 weeks Barthel Index: at baseline, 6 and 12 weeks, median and range	Intervention: 1(n=21) Control: 2 (n=21) Intervention: 228 +/-20.5ml (91% of prescribed volume) Control: 228 +/-20.5ml (91% of prescribed volume) Intervention: 1.4 (2.4) n=19 Control: -0.8 (3.0) n=16 p=0.03 Intervention: (n=19) BMI at base:20.7+/-3.2 BMI at 6 wk:21.1 +/-3.0 BMI at 12 wk:21.2 +/-2.9 sig change in BMI from baseline **[p<0.05]** Control: (n=16) BMI at base:20.6 +/-2.7 BMI at 6 wk:20.6 +/-2.9 BMI at 12 wk:20.4 +/-3.0 No sig change in BMI from baseline,no p value Intervention: (n=19) Barthel at base: 4 (0-20) Barthel at 6 wk: 4 (0-	35/42 completed the 12 week trial. Patients and clinicians were blinded. Method of randomisation unclear

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									20) Barthel at 6 wk: 4 (0-20) no sign change, no p value Cont: :(n=16) Barthel base: 5.5(1-14) Barthel 6 wk: 5.5 (1-15) Barthel 12 wk: 5 (1-15) no sign change, no p value	
								Bowel function, nos of days patients experienced diarrhoea, median and range. Other outcomes change in biochemical e.g. vitamin, albumin status. Data not reported here.	Intervention I: (n=19) 1 (0-21) Control:: (n=16) 2 (0-18)	

Table 28: Dietary counselling vs. standard care

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Baldwin et al 2001[17]	System-atic Review (RCTs & quasi RCTs)	1+	888 patients 3 out of 5 trials with useable data (n=760)	5 trials Patient groups: 3 cancer patients 1 elderly 1 Crohn's disease	Dietary counselling	No dietary counselling	16 days to 6 months	Mortality at 6 months for 3 studies. Hospital admission/re-admission & length of stay Measures of nutritional status (WMD = weighted mean difference) (data available for 46% of patients of one study only) Measures of clinical function. (data available for 46% of patients of one study only)	Mortality at 6 months (3 trials, n=760) RR 0.95, 95% CI 0.75 to 1.21 [not significant] Hospital admission (1 trial, n=137) RR 0.91, 95% CI 0.48 to 1.72 [not significant] Weight change at 16 days (1 trial, n=592) WMD -0.03kg, 95% CI -0.69 to 0.63 not significant BMI (1 trial, n=592) at 16 days (1 trial) WMD -0.13 kg/m2, 95% CI -0.41 to 0.15 [not significant] Grip strength (1 trial, n=592) WMD 0.26kg/m2, 95% CI -0.57 to 1.09 [not significant] Mid-arm muscle circumference (1 trial, n=592) WMD -0.01cm, 95% CI -0.25 to 0.23 [not significant] Tricep skinfold (1 trial, n=592) WMD -0.07mm 95% CI -0.48 to 0.34 [not significant]	2 of the 5 studies included in the systematic review had no useable data No data reported: Nutritional intake before and after intervention

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Baldwin et al 2001[17]	System-atic Review (RCTs & quasi RCTs)	1+	665 patients 2 out of 7 trials with useable data (n=91)	7 trials Patient groups: 4 cancer patients 1 surgical patients 2 chronic obstructive pulmonary disorder	Dietary counselling plus oral supplements if required	No dietary counselling and no oral supplements	6 weeks to 2 years	Mortality at 3 months and 1 year Hospital admission/re-admission & length of stay Measures of nutritional status (WMD = weighted mean difference) (data available for 46% of patients of one study only) Nutritional intake before and after intervention Measures of clinical function	Mortality at 3 months (1 trial, n=61) RR 6.50, 95% CI 0.35 to 118.88 not significant Mortality at 1 year (1 trial, n=30) RR 1.50, 95% CI 0.29 to 7.73 not significant No data reported Weight change at 3 months (1 trial, n=61) WMD 1.10kg, 95% CI -0.96 to 3.16 not significant No data reported No data reported	5 of the 7 studies included in the systematic review had no useable data
Forli et al 2001A[114]	RCT	1+	71 patients Intervention: n=21 M/F:10/11 Age:47(28-59) Mean BMI 17.9kg/m^2	Underweight patients with end stage pulmonary disease who had been referred for lung transplantation	Intensified dietary support, energy rich diet + supplements if patients desired them & outpatient dietary counselling.	Normal diet & occasionally given support as per normal practice	21 weeks	Mortality Median weight change Mean (SD) BMI at	Intervention 0 (n=21) Control 1 (n=21) Intervention: 1.2 kg (n=18) Control: 0 (n=18) **[(p≤0.001]** Intervention: :	Normal weight patients were included as the control group There were no significant differences in energy intake in weight gain between groups A & B 8 people from the

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Control: n=21 M/F:10/11 Age:46(25-60) Mean BMI 17.0kg/m^2 Comparison to a group of normal weight individuals n=29 M/F:12/17 Age52(26-60)					end of study No. of patients using supplements Median total energy intake (kJ/kg)	18.3 (1.7) (n=18) Control: 17.0 (2.2) (n=18) p value not reported Intervention: 11 Control: 1 Energy intake Intervenion::215 Control:168 p value not reported	intervention group and 2 from the control group died and another 14 from the intervention group and 7 from the control group developed infections. However there was no significant difference between both groups.

Table 29: Oral vs. oral -- menu modification/counselling vs. oral supplements

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Baldwin et al 2001[17]	Systematic Review (RCTs & quasi RCTs)	1+	173 patients	4 trials Patient groups: 1 elderly at home 1 elderly in long-term care 1 HIV 1 cystic fibrosis	Dietary counselling	Oral Supplement	3 months for all studies 6 months for one study	Mortality (at 3 months for all studies and 6 months for one study. No deaths in the 6 month study) Hospital admission/re-admission & length of stay Measures of nutritional status (WMD = weighted mean difference) Nutritional intake before and after intervention	Mortality at 3 months (4 trials, n=173) RR 0.33, 95% CI 0.04 to 2.99 [Not significant] Hospital admission (1 trial, n=50) RR 0.36, 95% CI 0.04 to 3.24 [Not significant] Weight change at 3 months (4 trials, 173) WMD -1.15kg, 95% CI -1.93 to -0.36 Oral supplement group significantly greater weight gain than dietary counselling group Weight change at 6 months (1 trial, only 5 people) WMD -0.32kg 95% CI -3.87 to 3.23 [Not significant] BMI (1 trial, n=68) WMD 0.0 kg/m2, 95% CI -0.56 to 0.56 [Not significant] Change in energy intake (4 trials, n=173) WMD 91 kcals, 95% CI 1.59 to 23 Oral supplement group significantly greater energy intake than	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									dietary counselling group Grip strength (1 trial, n=50) WMD 0.16kg/m2, 95% CI -1.54 to 1.86 [Not significant] Mid-arm muscle circumference (1 trial, n=50) WMD -0.80cm, 95% CI -5.29 to 3.69 [Not significant] Tricep skinfold (1 trial, n=50) WMD -0.30mm 95% CI -1.69 to 1.09 [Not significant]	
Ravasco et al 2005[285]	RCT		111 stratified by staging Malnourished: 42 determined by PG-SGA 12 as determined by BMI <20Kg/m2 Dietary counselling (regular foods) n=37 Malnourished: 15 – PG-SGA 5 – BMI <20Kg/m2 High protein oral supplement	Colorectal cancer patients undergoing radiotherapy	Dietary counselling	Oral supplement 2 cans per day of 200ml high protein (20g per can), energy dense liquid polymeric formulations (200 Kcal per can)	3 months after end of radiotherapy	Weight change in malnourished patients at 3 month follow-up (malnourished determined by Patient Generated Subjective Global Assessment (PG-SGA)) "Additional nutritional deterioration" at end of radiotherapy and at 3 month follow-up (malnourished determined in 2	Counselling 4 (2 to 7) kg (9 out of 15) Supplement weight gain (0 out of 14) (weight change value not reported) Ad libitum weight gain (0 out of 13) (weight change value not reported) ([p value not reported] Supplement and standard care group more nutritional deterioration than in counselling group. **[p<0.001]**	See Oral v Standard Care for supplements vs. ad libitum intake see dietary counselling v standard care for counselling vs. ad libitum intake Patient Generated Subjective Global Assessment (PG-SGA)

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			n=37 Malnourished: 14 – PG-SGA 4 – BMI <20Kg/m2 Ad libitum intake n=37 Malnourished: 13 – PG-SGA 3 – BMI <20Kg/m2					ways by Patient Generated Subjective Global Assessment (PG-SGA) and by BMI) Mortality	Nutritional deterioration significantly more severe in ad libitum diet compared to supplement and counselling groups **[p<0.008]** All patients appear to be alive 3 months after the end of radiotherapy	

Table 30: Oral multivit and mineral vs. standard care

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Allsup et al 2004[8]	RCT	1+	164 patients randomised 46 withdrew Total number of patients analysed: n=118 Multivit/min: n=81 (20 withdrew) Placebo: n= 83 (26 withdrew)	People living in nursing and residential homes (31 homes) in the city of Liverpool. Inclusion/exclusion criteria: Eligibility depended on participants being able to give informed consent (abbreviated mental score>7), not having neoplastic disease, and not prescribed immunosuppressant medication at the time of recruitment.	Multivit/min supplement. One tablet twice a day for 8 weeks (starting on week -4). Content: Vit A 2,666 IU, Vit D3 400 IU, Vit E 60 mg, Vit B1 1.2 mg, Vit B2 1.4 mg, Vit B6 3.0 mg, nicotinamide 14 mg, folic acid 0.6 mg, vit B12 200 µg, biotin 30µg, calcium 240 µg, and magnesium 100 mg.	Placebo tablet One tablet twice a day for 8 weeks (starting on week -4). All participants were administered split-virus inactivated influenza vaccine in week 0. The vaccine contained three antigens: H1N1, H3N2 and B. Blood samples were taken from participants on three	8 weeks	Multivit/min: n=61 Control: n=57 Antibody response assessed separately for each of the three antigens. MFI (mean fold increase): H1N1: Multivit/min: 4.3 Control: 2.7 MFI ratio multivit/min/control (95% CI):		There was a high drop out rate (27%). Short length of follow up.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Individuals taking multivit supplements, vitamin C, or vitamin B and those with a previous adverse reaction to influenza vaccine were also excluded. Median (IQR) age: Multivit/min: 83.1 (6.6) Control: 82.6 (8.8) Gender-Male, n(%) Multivit/min: 25 (41.0) Placebo: 18 (31.6) Barthel score, median (IQR): Multivit/min: 75 (55) Placebo: 60 (50) BMI (Kg/m2), median (IQR): Multivit/min: 25.8 (8.3) Placebo: 25.6 (7.6) Albumin (g/L), mean +/- SD Multivit/min: 36.4 +/- 3.3 Placebo: 35.4 +/- 3.6 Prescribed vit B12 replacement therapy, n (%): Multivit/min: 0 Placebo: 2 (3.5) Prescribed Iron therapy, n (%) Multivit/min: 6 (9.8) Placebo: 4 (7.0)	All participants were administered split-virus inactivated influenza vaccine in week 0. The vaccine contained three antigens: H1N1, H3N2 and B. Blood samples were taken from participants on three occasions: at the start of the study (week -4), immediately before vaccination (week 0), and 4 weeks after vaccination (week +4).	occasions: at the start of the study (week -4), immediately before vaccination (week 0), and 4 weeks after vaccination (week +4).		1.6 (1.1-2.4) H3N2: Multivit/min: 4.8 Control: 3.8 MFI ratio multivit/min/control (95% CI): 1.3 (0.8-2.1) B: Multivit/min: 3.0 Control: 3.4 MFI ratio multivit/min/control (95% CI): 0.9 (0.6-1.4) Responders-n (%) (proportion of subjects having a fourfold or greater rise between week 0 and week +4, with a rise in titre from less than 1:10 to 1:20 or greater, also considered a fourfold or greater increase) H1N1: Multivit/min: 28 (49) Control: 25 (41) Difference in percentage response (Control – Multivit/min) (95% CI): -8 (-25 to 10) [p=0.374]		

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Prescribed vit D supplements, n (%) Multivit/min: 4 (6.6) Placebo: 5 (8.8) Influenza Immunization in 1999/2000, n (%) Multivit/min: 51 (83.6) Placebo: 50 (87.7)				H3N2: Multivit/min: 33 (58) Control: 30 (49) Difference in percentage response (Control – Multivit/min) (95% CI): -9 (-26 to 9) [p=0.343] B: Multivit/min: 23 (40) Control: 25 (41) Difference in percentage response (Control – Multivit/min) (95% CI): 1 (-17 to 18) [p=0.944] Plasma levels of vitamins and minerals at week -4, 0 and week +4		
Girodon et al 1997[126] and Girodon et al 1997a[124] (Two papers, same study. Different outcomes reported. Presented together)	RCT	1+	81 patients Four arms: Placebo group n=20 Mineral group n=20 Vitamin group n=20 Mineral and vitamin group n=21 9 died after 1 year	Long-term institutionalised subjects. They had only age-related diseases. Age (y) (mean +/- SD) Placebo group= 84 +/-8 Mineral group= 84 +/- 8 Vitamin group= 84 +/-8 Mineral and vitamin group= 83 +/- 8 NS Gender (W/M) Placebo= 14/6	Four arms. Patients received one capsule per day. Mineral group: Zinc sulfate and selenite (20 mg zinc and 100 µgrams selenium) Vitamin group: ascorbic acid (120 mg), betacarotene (6 mg= 1000 retinol equivalent), and alfa-tocopherol (15 mg) Mineral and vitamin	Mineral effect Mineral + (Mineral and vitamin) v Placebo + Vitamin Vitamin effect Vitamin+ (Mineral and Vitamin) v Placebo+ Mineral	Two years	Outcome measures reported in Girodon 1997a Biochemical assessment of plasma vitamin and mineral levels at baseline, after 6 months, 1 year and 2 years of supplementation.	Mean plasma levels of alfa-tocopherol/cholesterol, beta carotene and vit C increased significantly after 6 months of supplementation in the vitamin and (mineral and vitamin) groups. Mean plasma levels of alfa-tocopherol/cholesterol	This study appears to be a subsample of a larger scale study (see below Girodon 1999). The population of this institution had previously participated in nutritional surveys. Blood samples of apparently healthy volunteers were utilised as the reference young controls for the free

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			16 died during the second year	Mineral= 15/5 Vitamin= 17/3 Mineral and vitamin= 15/6 BMI (kg/m2) Placebo= 25.64 +/- 10.21 Mineral= 21.07 +/- 4.20 Vitamin= 22.83 +/- 4.02 Mineral and vitamin= 21.35 +/- 3.51 NS Exclusion criteria: history of cancer, GI, liver and kidney disease, medication that might interfere with nutritional status and immunocompetence, or vit. And/or mineral supplements	group: both of the above mineral and vitamin supplements Placebo group: (calcium phosphate and cellulose)			Indicators of oxidative stress and antioxidant enzymes Free radical-initiated haemolysis test (blood samples of apparently healthy normal volunteers were utilised as the reference young controls 11 men and 7 women) Outcome measures reported in Girodon 1997 Infections (only respiratory and symptomatic urogenital infections were reported)	and betacarotene decreased between day 365 and day 730 in the vitamin and (mineral and vitamin) groups. There was a significant increase in GPx (selenium-dependent gluthathione peroxidase) (antioxidant) in groups receiving minerals (alone or with vitamins) at 6 months Placebo group (n=20): 1st year= 16 2nd year= 19 Total= 35 Mean= 1.75 SD= 1.48 Mineral group (n=20): 1st year= 7 2nd year=5 Total= 12 Mean=0.60 SD= 0.99 Vitamin group (n=20): 1st year= 10	radical-initiated haemolysis test. Funding: Societe des Produits Roche (France) and Laboratories Labcatal (France). Partly supported by the Institut National de la Sante et de la Recherche Medicale (INSERM), the Conseil Rgional de Bourgogne and the Universite de Bourgogne.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									2nd year=14 Total= 24 Mean= 1.20 SD= 1.43 Vitamin and mineral group (n=21): 1st year=14 2nd year= 9 Total= 23 Mean = 1.09 SD= 1.09 Subjects who received minerals alone or with vitamins had significantly fewer respiratory and urogenital infections **[p<0.01]** than those who had no trace elements supplementation. Number of deaths after two years: Placebo group= 7 (2 died because of infection) Mineral group=6 Vitamin group= 5 Vitamin and mineral group= 7 (1 died because of infection) No beneficial effect of supplementation upon survival was noted.	
Girodon et al	RCT	1+?	725 patients	Long-term	Four arms: Patients	Vitamin effect	Two years	Mortality Serum levels of alfa-		Patients were not

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
1999[125]			from 25 nursing homes. There are four arms in this study: Trace element group (T) n= 182 (withdrawn: 4) Vitamin group (V) n= 180 (Withdrawn 3) Trace element and Vitamin group (TV) n= 181 (withdrawn 3) Placebo n= 182 (withdrawn 4) Total withdrawn 14	institutionalised elderly patients with no acute illness >= 65 years old. Age (mean +/- SD) Placebo = 83.7 +/- 7.4 Trace element group = 83.6 +/- 7.6 Vitamin group = 83.8 +/- 7.9 Vitamin and trace element group = 83.4 +/- 7.5 Gender (M/W) Placebo= 46/136 Trace element group= 49/133 Vitamin group= 46/134 Vitamin and trace element group= 44/137 BMI (Kg/m2) Placebo= 24.5 +/- 5.8 Trace element group= 23 +/- 5.7 Vitamin group= 24.5 +/- 6.7 Vitamin and trace element group= 24 +/- 5.7	received 1 capsule daily, with their breakfast: Trace element- Zinc sulfate and selenium (providing 20 mg of zinc and 100 µgr of selenium) Vitamin- Ascorbic acid (120 mg), beta carotene (6 mg= 1000 retinol equivalents), alfa-tocopherol (15 mg) Vitamin and trace element- Trace elements and vitamin supplements Placebo: calcium phosphate and microcrystalline cellulose	Vitamin + (Vitamin and trace element) v Placebo + Trace element Trace elements effect Trace element+ (Vitamin and trace element) v Placebo + Vitamin		tocopherol, beta-carotene, vitamin C, Zinc and Selenium. Base levels and after 6, 12 and 24 months of supplementation Delayed-type hypersensitivity skin test responses to 7 antigens Humoral response to influenza vaccine.	Assessed in a subsample n=173 at baseline and after 6 and 12 months of supplementation Tested in a subsample n=140 patients. Vaccine was injected after 15 to 17 months of supplementation. Seroprotected patients after influenza vaccine %: Day 28 Placebo: 27.7 Trace element: 44.1 Vitamin: 12.1 Vitamin and trace element: 30.0 Trace element effect: T + TV **[p<0.05]** Day 90: Placebo: 31.4 Trace element: 43.2 Vitamin: 11.7 Vitamin and trace element: 33.3 Trace element effect: T + TV **[p<0.05]** Day 180: Placebo: 25.7 Trace element: 36.1 Vitamin: 8.8	treated equally during the study. A subsample of patients (n=173) had an hypersensitivity test and another subsample (n=140) underwent humoral response to influenza vaccine test. Fourteen patients were withdrawn from the study after transfer to other hospital. There are some limitations in this study. A subsample of 140 patients received influenza vaccine. Infections are reported in total and not extracted for this group of patients. Funding: Produits Roche SA (Paris, France) and Labcatal (Montrougue, France)

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Exclusion criteria: patients with a history of cancer or those taking medication that might interfere with nutritional status, immunocompetence, or vitamin or mineral supplements.					Vitamin and trace element: 16.1 [NS] Day 270: Placebo: 21.8 Trace element: 29.4 Vitamin: 6.0 Vitamin and trace element: 6.4 [NS] The overall proportion of patients who remained free from respiratory infections was higher in those with mineral supplementation than in those without [p=.06]. When classifying into numbers of infectious events, there was NS difference between groups. Placebo group= 51 Trace element group= 55 Vitamin group= 45 Vitamin and trace element group= 55 [p>.10] Survival analysis of the 2 years did not show any difference between the groups.	
Jiamton et al 2003[169]	RCT		481 patients randomised Multivit/min:	HIV- infected patients. Patients were eligible for the trial if they were	One tablet twice daily after food. Tablet content: vit A	Placebo tablet. One tablet twice a day after food.	48 weeks	Minor adverse effects (n) Patients reporting	Multivit/min: 64 Placebo: 73 Multivit/min: 23	Funding: Supported by Nestle Foundation. S. J. is supported by a strategic grant in

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			n=242 (8 died, 41 lost follow up) Placebo: n=239 (3 died, 12 lost to follow-up)	over 18 years old, had not been taking micronutrients or antiretrovirals in the last 30 days and had a CD4 cell count between 50 x 106 and 550 x 106/l. A few patients attending hospital for routine testing for sexually transmitted infections also volunteered. Age (mean-range) Multivit/min: 32 (18,63) Placebo: 32 (20,60) Gender (men-%): Multivit/min: 95 (39) Placebo: 94 (39) Body mass index (kg/m2) (mean- SD): Multivit/min: 21.2 (2.7) Placebo: 21.6 (3.3)	3000 µg, betacarotene 6 mg, vitamin D3 20 µg, vit E 80 mg, vit K 180 µg, vit C 400 mg, vit B1 24 mg, vit B2 15 mg, vit B6 40 mg, vit B12 30 µg, folacin 100 µg, panthothenic acid 40 mg, iron 10 mg, magnesium 200 mg, manganese 8 mg, zinc 30 mg, iodine 300 µg, copper 3 mg, selenium 400 µg, chromium 150 µg anc cystine 66 mg.			discoloration of urine Plasma levels of vitamin E and selenium Deaths [n/n (%)] - Death in patients with CD4 cell counts <200 (x 106/l) - Death in patients with CD4 cell count <100 (x 106/l) Admissions to hospital Median CD4 cell count at the final follow-up and mean fall in CD4 cell count from baseline	Placebo: 0 **[p<0.0001]** Data not extracted Multivit/min: 8/242 Placebo: 15/239 Mortality hazard ratio (95% CI) 0.53 (0.22-1.25) [p= 0.1] Multivit/min: 5/96 Placebo: 12/92 Mortality hazard ratio (95% CI) 0.37 (0.13-1.06) [p= 0.052] Multivit: 3/40 Placebo: 10/41 Mortality hazard ratio (95% CI) 0.26 (0.07-0.97) **[p= 0.03]** The rate of first admissions did not differ significantly between the two groups either overall or when stratified by baseline CD4 cell count There were no significant differences between the groups overall and among those with baseline	Epidemiology from the Medical Research council, UK. The micronutrients were supplied by Vitabiotics Ltd, London. The sponsors of the trial had no role in the study design, data collection, data analysis, data interpretation or the writing of the report

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Plasma viral load	CD4 cell < 200 x 106/l or >= 200 x 106/l ([p>0.3] in each case) Did not differ significantly between the groups	

Table 31: Oral multivit vs. standard care

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Hogarth et al 1996[159] Part 1 vit vs placebo	RCT	1+	106 patients 13 died, 6 withdrew Total: 87 patients Vitamin group: 44 Placebo group: 43 Some of the patients in each group received energy drink	Elderly medical patients. Age year (SD): Vitamin group: no energy 84.3 (7.6) energy 81.8 (6.9) Cont: No energy 81.3 (7.3) Energy 83.2 (6.3) Gender (% men) Int: No energy: 34.8 Energy: 61.3 Cont: No energy 21.4 Energy 45.8 BMI: Int:	Vitamins: capsules Vit A, B1, B2, B3, B6 and C Some of the patients received energy drink: 750 ml glucose drink (Lucozade)	Placebo: capsules of maize, starch and lactose Some of the patients received energy drink: 750 ml glucose drink (Lucozade)	1 month	Weight increase kg (SD) Mental test score increase; score (SD) Increase Barthel score; score (SD)	From the total number of patients n=106; Vit: 7 (13) Placebo: 6 (11) 95% CI –10, +15 Information below is from the total number of patients that completed the trial n=87 Vit: -0.5 (3.8) Placebo: + 0.1 (2.8) 95% CI –2.1, + 0.8 Vit: = + 0.5 (1.3) Placebo: + 0.6 (2.2) 95% CI –0.5, +1.0 Vit: =2.3 (3.6) Placebo: + 1.4 (3.7) 95% CI –0.6, + 2.5	Outcomes are reported for vitamin v placebo and energy v placebo separately. Only data for vitamin v placebo are included in this table. Mental test score was significantly higher in the vitamin group at baseline. Vitamin compliance was monitored by tablet count at the end of the 1-month period at the final assessment. Vitamin capsule compliance was higher than liquid energy compliance. Approx 90% of the

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				No energy: 20.0 (2.2) Energy: 19.9 (2.9) Cont: No energy: 20.0 (2.4) Energy: 20.3 (3.5) Exclusion criteria: Already taking nutritional supplements, had diabetes mellitus, dysphagia, BMI (weight/height 2) >25 or <15 kg/m2				LOS The study also reports increase in blood sugar and serum albumin	Days (SD) Vit: 10.5 (5.9) Placebo: 11.3 (5.8) 95% CI –3.4, +1.8 There was no significant difference in any of the outcome measures tested with active vitamins.	patients took more than 50% of the capsules provided (48/52 active group; 49/54 placebo group)
Penn et al 1991[275]	RCT	1+	30 patients Int: 15 Cont: 15 One patient Int. died, one patient cont was discharged Total= 28 Vitt: 14 Placebo:14	Patients who had been in hospital for more than 3 months. All required nursing care as a consequence of stroke disease but none had an active medical problem. Mean age (y): Int: 83.5 Cont: 83.9 Gender (F/M): Int: 11/4 Cont: 13/2 Exclusion criteria: Patients who were	Vitamin cocktail comprising vit C 100 mg, vit A 8000 iu and vit E 50mg	Placebo	28 days	Weight (kg) +/- 1SD MAC (cm) +/- 1SD Absolute number	Vit: Before: 56.1 +/- 15.6 After: 55.8 +/- 15.4 **[p<0.05]** Placebo: Before: 56.0 +/- 16.8 After: 65.0 +/- 16.0 [NS] Vit: Before: 23.3 +/- 3.0 After: 23.1 +/- 2.9 **[p<0.02]** Placebo: Before: 22.5 +/- 1.9 After: 22.4 +/- 1.6 [NS] Vit:	Outcomes were reported comparing before v after supplementation for vitamin and placebo groups individually. The study does not compare the changes between vitamin and placebo groups. **Data not extracted:** Other outcomes reported biochemical assessment including haemoglobin, serum albumin, leucocyte vit C, plama vit A and E and vitamin E to lipid

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				catheterized, or who had pressure sores or who were receiving medication known to affect immune system.				Lymphocytes x 106/ml (Mean +/- SD) T cells x 106/ml (Mean +/- SD) T4 cells x 106/ml (Mean +/- SD) T8 cells x 106/ml (Mean +/- SD) Percentage T cells +/- 1SD	Before: 11.62 +/- 5.33 After: 14.22 +/- 4.37 [NS] Placebo: Before: 15.21 +/- 1.52 After: 16.18 +/- 1.59 [NS] Vit: Before: 7.65 +/- 4.38 After: 10.0 +/- 3.52 **[p<0.05]** Placebo: Before: 10.25 +/- 7.9 After: 11.86 +/- 9.18 [NS] Vit: Before: 5.45 +/- 3.02 After: 7.72 +/- 3.10 **[p<0.05]** Placebo: Before: 6.27 +/- 5.74 After: 6.78 +/- 7.79 [NS] Vit: Before: 2.80 +/- 1.05 After: 2.68 +/- 1.35 **[p<0.05]** Placebo: Before: 2.97 +/- 2.47 After: 2.66 +/- 1.26 [NS] Vit: Before: 6.58 +/- 6.3 After: 69.1 +/- 9.7 [NS]	ratio. Proliferative response of lymphocytes to the mitogen phytohaemaglutinin

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Percentage T4 cells +/- 1SD Percentage T8 cells +/- 1SD T4: T8 +/- 1SD T4: T8 +/- 1SD	Vit: Before: 45.2 +/- 4.5 After: 50.3 +/- 8.8 **[p<0.05]** Vit: Before: 24.7 +/- 5.3 After: 19.7 +/- 7.6 **[p<0.05]** Vit: Before: 1.92 +/- 0.49 After: 2.88 +/- 1.2 **[p<0.01]** Placebo: Before: 15.3 +/- 7.2 After: 15.7 +/- 8.2 [NS] Vit: Before: 1.92 +/- 0.49 After: 2.88 +/- 1.2 **[p<0.01]** Placebo: Before: 2.24 +/- 0.89 After: 2.48 +/- 2.53 [NS]	
Vlaming et al 2001a[364] Part 1 of 2 Vitamin vs. Placebo	RCT	1++	1561 Multivit + sip feed: n=780 Placebo + sip feed: n=781 (further randomisation of "thin" patients for second study)	Acute medical, surgical or orthopaedic patients. Age (median, interquartile range) Multivit + sip feed: 61 (42-72) yrs Placebo + sip feed: 63 (45-72) yrs Gender (m/f) Multivit + sip feed: (441/339)	A mutlitvitamin tablet (Orovite Vit b and C), daily unless tablet not allowed. Further randomisation to receive sip feed or a sip feed placebo of "thin" patients who entered the study. The sip feed placebo contained 100kcal of	A placebo tablet given daily unless tablet not allowed. Further randomisation to receive sip feed or a sip feed placebo of "thin" patients who entered the study. The sip feed placebo contained 100kcal of energy and 25g or	Studied for duration of admission in hospital	Mean (SD) length of stay for all patients Mean (SD) length of stay truncated at 100 days for patients receiving multivitamin tablets only	Multivit + sip feed: 10.1 (16.0) days (n=780) Placebo + sip feed 10.5 (16.7) days (n=781) Multivit tablet 8.7 (10.4) days (n=499) Placebo 9.0 (11.3) days (n=512) (p value not reported)	Appears as though some (11) patients were on enteral or PN 560 / 846 (66%) received at least 50% of prescribed tablet

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Placebo + sip feed (452/329) Median (interquartile range) BMI Multivit + sip feed: 24.3 (21.2-28) kg/m2 Placebo + sip feed: 25 (21.7-28.6) kg/m2	energy and 25g or carbohydrate. Vitamin & sip feed (n=130) Vitamin & sip feed placebo (n=151) data for this part of the study presented in oral v oral section	carbohydrate. Placebo & sip feed (n=145) Placebo & sip feed placebo (n=123) data for this part of the study presented in oral v oral section		Mortality during admission Biochemical measurements or pyridoxal phosphate, pyridoxic acid and total B1 recorded	Multivit + sip feed: 23 (n=781) Placebo + sip feed 35 (n=780)	

Table 32: Elective pre-operative / perioperative oral nutrition support in surgical patients

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Smedley et al 2004[326]	RCT	1+	152 patients analysed. Split into 4 groups: Group 1- No nutritional supplements (nutrition support): n=44 Group 2 - Nutrition support before & after surgery: n=32 Group 3 – Post-op nutrition support only: n=35 Group 4 – Nutrition support only before surgery: n=41	Patients undergoing elective moderate to major lower GI surgery. Diagnosis- Colonic or rectal cancer: Group 1: 35 Group 2: 21 Group 3: 25 Group 4: 31 Colitis: Group 1: 6 Group 2: 12 Group 3: 7 Group 4: 7 Diverticulosis: Group 1: 3 Group 2: 6 Group 3: 3 Group 4: 5 Other: Group 1: 6 Group 2: 3 Group 3: 4 Group 4: 5 Age (yrs): Group 1: 63 Group 2: 55 Group 3: 62 Group 4: 61 Sex ratio (M:F): Group 1: 28:22 Group 2: 19:23 Group 3: 20:19 Group 4: 33:15	Nutrition support consisted of Fortisip (Nutricia, Wageningen, The Netherlands), a drink containing 1.5kcal & 0.05g protein per ml was used for oral NS. Patients were encouraged to drink this ad libitum in small, frequent quantities between meals. Pre-op. Nutrition was given from the time it was decided to operate to 1 day before surgery. Post-op. Nutrition support was started when the patient was able to take free fluids & continued for 4 wks after discharge from hospital.	No nutrition support given	Phase I commenced before operation, when the decision to operate electively was made in the outpatient setting and ended 24hrs before surgery. Phase II commenced on the 1st day that the patients was able to take free fluids or a light diet after operation & ended 4 wks after discharge from hospital.	Post-op. hospital stay /days (mean (SD)): Post-op. minor complications: Post-op. major complications: Total complications: Mean intake of oral nutrition support at the inpatient phase & at 2 & 4 wks after discharge from hospital between group 2 & 3: Dietary intake in terms of energy consumed between groups at any time point: Body weight change (%) (data in graph format):	Group 1: 14.1 (6.6) Group 2: 11.7 (5.1) Group 3: 13.4 (7.5) Group 4: 12.8 (4.5) Group 1: 30 Group 2: 10 **[p<0.05 vs. group 1]** Group 3: 13 **[p<0.05 vs. group 1]** Group 4: 17 Group 1: 4 Group 2: 5 Group 3: 2 Group 4: 3 Group 1: 34 Group 2: 15 Group 3: 15 Group 4: 20 No sig. differences. No sig. differences. Group 2 gained weight before surgery; these patients also lost sig. less weight **[p<0.05]** over the course of the study than those in	179 Patients were recruited between Oct 1987 and Mar 2001. 27 patients were withdrawn leaving 152 patients for analysis. Rate of major complications was similar in the 4 groups but there were sig. fewer minor complications in Group 2 & 3 than in Group 1 **[p<0.05]**. Use of post-op. Oral nutrition support resulted in a sig. reduction in post-op. morbidity & weight loss. Patients receiving oral nutrition support over an extended perioperative period lost sig. less weight than those who received no nutrition support or post-op nutrition support only. Incidence of minor complications was sig. lower in patients receiving oral nutrition support throughout or after surgery than in

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				BMI (kg/m2): Group 1: 27.8 (5.6) Group 2: 24.9 (4.5) Group 3: 25.5 (4.5) Group 4: 26.9 (4.9) Stratification- At risk: Group 1: 17 Group 2: 14 Group 3: 14 Group 4: 16 Stratification- Not at risk: Group 1: 33 Group 2: 28 Group 3: 25 Group 4: 32				Fatigue & QOL scores:	Group 1 & Group 3. No differences.	those receiving no nutrition support or pre-op. nutrition support only. Funding: Numico Research, Wageningen, The Netherlands. Excl: Under 18yrs, pregnant, overt dementia, emergency or laproscopic surgery, receipt of other forms of preoperative nutritional support & inability to take ONS for a min. 7 days before operation.
MacFie et al 2000[209]	RCT	1+	100 patients. 4 groups: Group 1: n=24 (received oral diet supplements (ODS) in addition to normal diet both pre & post-op) Group 2: n=24 (given ODS in the pre-op period only) Group 3: n=27 (receive ODS only in the post-	Patients who required elective major GI surgery. Sex (M:F): Group 1: 11:13 Group 2: 15:19 Group 3: 8:19 Group 4: 12:13 Age (range): Group 1: 63 (41-86) Group 2: 68 (23-84) Group 3: 66 (23-86) Group 4: 64 (42-85) Surgical procedures-Colorectal: Group 1: 22 Group 2: 20 Group 3: 27 Group 4: 21	ODS was available in 200mL cartons (Fortisip, Nutricia Ltd., Towbridge, Wiltshire, UK), in a variety of flavours providing 1.5kcal, 0.05g protein & 0.18g carb. per mL. A fruit flavoured supplement (Fortijuice, Nutricia Ltd.) was available as an alternative, providing 1.25kcal, 0.025g protein & 0.285g carb. per mL. Patients were instructed to drink the supplements in addition to & not in place of their normal	Normal diet (or permitted fluids)	The study comprised a pre-op outpatient phase and a post-op inpatient phase	Mean body weight (kg) (range):	Pre-op OPD: Group 1: 63 (43-75) Group 2: 65 (38-87) Group 3: 68 (47-106) Group 4: 70 (55-110) Pre-op: Group 1: 62 (43-75) Group 2: 63 (38-86) Group 3: 67 (44-101) Group 4: 70 (53-113) On discharge: Group 1: 60 (41-70) Group 2: 63 (36-81) Group 3: 64 (43-102) Group 4: 69 (53-107) Post-op OPD: Group 1: 60 (41-72) Group 2: 61 (34-80) Group 3: 63 (42-100)	A min. of 7 days supplements were administered in the postop period, Supplements were commenced in the postop gp when oral fluids were permitted. Mean duration of feeding in the preop periods were 15days (range 5-59days) & in the post-op periods were 8 days (range 0-20 days). 5 patients from group 1 & 3 from group 3 complained of nausea with the supplements in the post-op period.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			op period) Group 4: n=25 (did not receive any supplements)	GI: Group 1: 1 Group 2: 3 Group 3: 0 Group 4: 3 Hepatobiliary: Group 1: 1 Group 2: 1 Group 3: 0 Group 4: 1 Excl: Those with dementia, major concurrent metabolic problems such as uncontrolled diabetes, advanced liver disease, or uremia & those patients requiring emergency surgery.	diet & were encouraged to take a min. of 2 cartons daily.			Group 4: 67 (51-108) In supplemented patients: Groups I & 2: 3.3kg No ODS patients: Groups 3 & 4: 4.1kg Diff: 0.8kg 95% CI: -0.5 - 2.1kg [p>0.2]	No differences observed between the groups in serially recorded mid-arm muscle circumference or handgrip strength. All groups demonstrated a sig. mean weight loss pre-op to outpatient review at 4wk after discharge.
								Mean pre-op weight loss (kg): Mean post-op weight loss (kg): Total no. postop complications: Septic complications: Mortality: Mean postop stay (days):	In supplemented patients: Groups I & 3: 3.4kg No ODS patients: Groups 2 & 4: 3.9kg Diff: 0.5kg 95% CI: -0.8 - 1.8kg [p>0.4] Group 1: 6 Group 2: 7 Group 3: 6 Group 4: 3 Group 1: 5 Group 2: 6 Group 3: 4 Group 4: 2 Group 1: 1 Group 2: 1 Group 3: 2 Group 4: 1 Group 1: 11 Group 2: 12 Group 3: 10 Group 4: 13	Incidences of post-op complications, mortality & LOS were similar in all groups. According to responses on the HAD questionnaire, 13% of patients were anxious & 2% depressed at the initial pre-op outpatient assessment. The proportion at 1mo after discharge were 11% & 6% respectively. No difference between the groups & no association was observed between psychological status & clinical outcome. At 6mo post-op, no difference in levels of activity between the study groups.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Preop anxiety (n): Postop anxiety (n): Preop depression (n): Postop depression (n):	Group 1: 6 Group 2: 1 Group 3: 3 Group 4: 3 Group 1: 3 Group 2: 2 Group 3: 4 Group 4: 2 Group 1: 1 Group 2: 1 Group 3: 0 Group 4: 0 Group 1: 2 Group 2: 2 Group 3: 1 Group 4: 1	A validated self-completion hospital anxiety & depression (HAD) questionnaire was distributed to patients at their final assessment 4wk after discharge. 6mo post-op patients completed a postal questionnaire to assess their activity, level of independence & general QOL.

Table 33: Oral vs. standard care – surgery

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Rana et al 1992[283]	RCT	1+	54 patients randomised 14 withdrawn Total 40 patients: Int: 20 Cont:20	Patients undergoing elective GI surgery. Data Mean (SEM) Age: Int: 57.8 (3.5) Cont: 64.5 (2.4) Gender (F/M): Int: 12/8 Cont: 7/13 Usual body weight (kg): Int: 67.9 (2.7) Cont: 70.6 (2.6) Pre-op. weight (kg): Int: 62.9 (2.8) Cont: 66.1 (3.0) Weight change: Int: -5.0 (0.7) Cont: -4.7 (1.01) % Weight loss at randomisation: Int: 7.6 (1.3) Cont: 7.1 (1.7) Grip strength (Kpa): Int: 68.7 (4.9) Cont: 63.8 (4.19) Exclusion criteria: dementia, receiving any form of pre-operative nutritional support, requiring ETF or PN. Patients were also withdrawn if they were unable or refused to comply with study	Standard hospital diet supplemented ad libitum with commercially available liquid sip feed (Fortisip, Nutricia, Holland). Fortisip has an energy density of 1.5 Kcal/ml. Nitrogen source 7.8 g/L is provided as unhydrolysed protein. 1.4 L provides at least 100% of the UK Department of Health and Social Security RDAs for all vitamins and minerals.	Standard hospital diet.	Until discharge (Intervention period: from beginning of feeding with free fluids and or 'light diet' post op until discharge.)	Daily nutritional intake: Mean daily nutritional intakes calculated from food diaries of patients completing day 1-3 and 1-7 of study period	Mean (SEM) Energy intake (Kcal/day) (for Int. group, energy intake is the total energy consumed from hosp. diet and supplement): Study day 3: Int (n=20): 1968 (164) Cont (n=20): 1056 (101) [No p value reported] Study day 7: Int (n=8): 2156 (242) Cont: (n=9): 1292 (126) [No p value reported] Mean (SEM) protein intake (g/day (for Int. group protein intake is the total protein consumed from hosp. diet and supplement): Study day 3: Int (n=20): 70.8 (5.6) Cont (n=20): 47.3 (4.9) [No p value reported]. Study day 7: Int (n=8): 80.1 (6.0) Cont (n= 9): 63.7 (6.3) [No p value reported]. Data in Mean (SEM) Energy intake (Kcal/day): Study period 1-3 days (Int n=20 Cont n=20): a) Int (Energy from hosp. food only): 1132	Nutritional status was assessed on admission following randomisation, on day 3 of the 'Study period' and on discharge. Dietary intake was assessed prospectively throughout the Study by a trained dietitian, from daily food records which documented all oral intake including drinks and snacks. All patients were seen daily and food records reviewed and discussed to clarify actual intake; details of plate waste were recorded. Energy and nutrient intakes were calculated using the food composition tables and manufacturers information. As over half of the patients in each treatment group had been discharged by study day 7, the average daily intake of energy and protein were assessed from 3 and 7 day food diaries according to the technique validated by

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				protocol.					(81) b) Int (Energy from hosp. food and supplement): 1607 (96) Cont: 864 (56) a) v Cont **[p< 0.01]** b) v Cont **[p< 0.0001]** Study period 1-7 days (Int n=8 Cont n=9): a) Int (Energy from hosp. food only): 1353 (92) b) Int (Energy from hosp. food and supplement): 1833 (99) Cont: 1108 (56) a) v Cont **[p<0.02]** b) v Cont **[p<0.0001]** Protein intake (g/day): Study period 1-3 days (Int n=20 Cont n=20): a) Int (Protein intake from hosp. food only): 42.6 (3.2) b) Int (Protein intake from hosp. food and supplement): 58.5 (3.6) Control: 40.5 (3.0) a) v Cont **[p<0.01]** b) v Cont **[p<0.001]** Study period 1-7 days (Int n= 8 Cont n= 9): a) Int (Protein intake from hosp. food only): 50.1 (3.2) b) Int (Protein intake from hosp. food and supplement):66.0 (3.4) Cont: 52.9 (29)	Hessov.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									a) v Cont no p value b) v Cont **[p<0.0001]**	
								Nutritional status	Data Mean (SEM) Weight (Kg) (Int n= 20 Cont n=20): Int: Pre-op: 62.9 (2.8) Study day 3: 61.8 (2.6) Discharge: 61.6 (2.6) NS weight loss either at study day 3 or at discharge Cont: 1) Pre-op: 66.1 (3.0) 2) Study day 3: 61.6 (2.6) 3) Discharge: 61.4 (2.8) 2) v 1) **[p<0.0001]** 3) v 1) **[p< 0.03]**	
								Mean +/- (SEM) Hand grip strength (kpa)	Pre-operative: Int: 68.7 (4.9) Control: 63.8 (4.9) [No p value reported] Study day 3: Int: 65.9 (5.4) Control: 49.2 (4.7) **[p<0.03]** Discharge: Int: 53.2 (4.9) Control: 68.8 (4.9) **[p<0.03]**	
								Study reports other parameters: Mid arm circumference, triceps skinfolds thickness, Mid arm muscle	Data not extracted	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								circumference, albumin, retinol binding albumin, retinol binding protein and prealbumin Post-operative 'nil by mouth' period (days) Study period (days) LOS (days) Total post-op. complications (pneumonia and wound infections) - Pneumonia - Wound infection Mortality	 Data Mean (SEM) Int: (5.8 +/- 0.4) Cont: (6.3 +/- 0.7) [NS] Int: 6.8 (0.9) Cont: 9.6 (1.9) [NS] Int: 12.6 (1.1) Cont: 15.9 (1.9) [NS] Data (n) Int: 3 Cont: 10 **[p<0.02]** Int: 0 Cont: 2 Int: 3 Cont: 8 Int: 0 Cont: 0	
Saluja et al 2002[302]	RCT	1+	60 patients Int: n=30 Cont: n=30 Patients were divided into three	Patients undergoing major abdominal surgery. Emergency and elective abdominal procedures were included. Patients were divided	Standard ward diet and hospital kitchen-prepared liquid sip feed of 500 ml providing 500 kcal comprised of 16.6g protein, 43.5 g carbohydrate, and	Standard ward diet All patients were assessed on the day of admission, day 3 and on the day of discharge.	Until discharge (Intervention period from beginning of oral fluids or a light diet post op. until	Nutritional intake	Unit details i.e., median, mean and p values not provided for Min. max caloric and protein intake. Min - Max caloric intake (kcal) (n=10 in each	All patients were seen daily, and food records were reviewed and discussed to clarify the actual intake. Details of the plate waste were recorded.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			categories according to the Nutritional Risk Index. There were 10 patients in the Int group and 10 patients in the control group for each category.	into three categories according to the Nutritional Risk Index (NRI). Patients were considered malnourished if they met any of the following criteria of nutritional assessment: a) NRI<100 [NRI= 1.519 x serum albumin (g/l) + 0.417 (current weight/usual weight) x 100 or b) current weight > 95% of the ideal weight and serum albumin < 39.2 g/l. (For data below, unit details i.e, median, mean, not provided) Borderline malnourished: NRI<100->97.5 Int: n=10 Cont: n= 10 Age (y): Int: 33 Cont: 36 Gender (M/F): Int: 6/4 Cont: 6/4 Weight (Kg): Int: 55.3 Cont: 49.45 Moderate malnutrition: NRI<97.5->83.5 Int: n=10	30 g fat. The 500 ml sip feed contained 375 ml milk, 12.5 g butter, 12.5 g colustarch, 125 ml rice water, and half an egg. All patients were assessed on the day of admission, day 3 and on the day of discharge. 0		discharge).		category for Int and Cont): Borderline malnourished: Int: 1336-2178 Cont: 951-1372 Moderately malnourished: Int: 1210-2088 Cont: 852-1361 Severely malnourished: Int: 1119-2025 Cont: 871-1287 Min-Max protein intake (g): Borderline malnourished: Int: 41.80-67.20 Cont: 32.40-50.57 Moderately malnourished: Int: 38.08-64.50 Cont: 24.84-47.01 Severely malnourished: Int: 34.80-62.57 Cont: 18.01-46.71 Total caloric and protein intake: Calories (kcal): Int (n=30): 1798+/- 385 Cont (n=30): 1182 +/- 178 **[p<0.01]** Proteins (g):	Fluid intake was recorded by volume. Energy and nutrient intakes were calculated according to tables supplied by the dietary department. **Data not extracted:** - Average voluntary and total protein and caloric intake in the different categories reported - Change in albumin, MAC, lymphocyte count

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Cont: n=10 Age (y): Int: 35.6 Cont: 35 Gender (M/F): Int: 5/5 Cont: 7/3 Weight (Kg): Int: 49.2 Cont: 47.4 Severe malnutrition: NRI <83.5 Int: n=10 Cont: n=10 Age (y): Int: 34.9 Cont: 34 Gender (M/F): Int: 5/5 Cont: 6/4 Weight (Kg): Int: 38.8 Cont: 46.6 Exclusion criteria: patients with dementia, diabetes, renal failure, or hepatic failure and those who refused to give consent. Patients were withdrawn from the study if they required PN.				Mean weight change (kg): Mean change in handgrip strength (mmHg) Complications:	Int (n=30): 55.71 +/- 11.63 Cont (n=30): 39.48 +/- 11.14 **[p<0.01]** Borderline malnourished: Int: 2.6 +/- 0.5 Cont: 2.5 +/- 0.74 [NS] Moderately malnourished: Int: 3.35 +/- 0.91 Cont: 2.35 +/- 2.14 [NS] Severely malnourished: Int: 2.15 +/- 1.0 Cont: 4.6 +/- 2.4 **[p<0.01]** Borderline malnourished: Int: 0 Cont: 0 Moderately malnourished: Int: 0 Cont: 0 Severely malnourished: Int: 0 Cont: 0 Int (n=30) Cont: (n=30) Int: 7 Cont: 10 [NS] Borderline malnourished Int: 1	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Cont: 1 Moderately malnourished: Int: 2 Cont: 2 Severely malnourished: Int: 4 Cont: 7 **[p<0.05]**	
								LOS (days)	Borderline malnourished: Int: 10.3 +/- 0.4 Cont: 10.1 +/- 0.1 Moderately malnourished: Int: 10.2 +/- 0.4 Control: 10.2 +/- 0.4 Severely malnourished: Int: 10.1 +/- 0.3 Control: 10.6 +/- 0.5 No p value reported	
								Mean weight (kg) at discharge:	Borderline malnourished: Int: 52.7 Cont: 46.95 Moderately malnourished: Int: 45.85 Cont: 45.05 Severely malnourished: Int: 36.35 Cont: 42.00	
								Mean handgrip strength (mmHg) at discharge:	Borderline malnourished: Int: 58	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Cont: 53 Moderately malnourished: Int: 48 Cont: 50.3 Severly malnourished: Int: 48 Cont: 54	
Keele et al 1997[181]	RCT	1+	100 patients Phase 1 Intervention(Treatment): n= 47 Age:64.7±4.9 M/F: 25/18 Control: n= 53 Age;60.0±5.1 M/F:23/20	Patients admitted for elective moderate to major gastro-intestinal surgery	Phase 1 Received a normal ward diet post-op supplemented with an oral dietary supplement Phase 2 After being discharged patients received home diet plus an oral dietary supplement for 4 months	Phase 1 Received a normal ward diet post-op Phase 2 After being discharged patients received home diet only for 4 months		Phase 1 Intervention /Control Pre-op: n=43 Day 3: n=42 Discharge: n=38(39 for control) Weight BMI	Phase 1 Weight(kg) Intervention Pre-op:66.0±3.7 Day 3:65.0±3.7 Discharge:64.0±3.7 **[p<0.001]** each of both values v pre-op values Control Pre-op:69.6±4.3 Day 3:67.4±4.3 Discharge:66.1±4.1 **[p<0.001]** each of both values v pre-op values Weight change Intervention Day 3: -1.5±0.8 Discharge: - 2.2±1.0 Control: Day 3: -3.0±0.6 Discharge: -4.2±0.8 **[p<0.001]** v control BMI(kg/mm²) Intervention Pre-op:23.5±1.2 Day 3:23.2±1.2 Discharge:22.8±1.2 **[p<0.001]** each of both	Supplementation during the outpatient phase had no significant effect on weight, weight change, MAC and TSF

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									values v pre-op values Control Pre-op:25.1±1.4 Day 3:24.2±1.4 Discharge:23.6±1.4 **[p<0.001]** each of both values v pre-op values	
								TSF	TSF(mm) Intervention Pre-op:14.1±2.2 Day 3: 13.5±2.2 Discharge: 13.3±2.4 **[p<0.001]** each of both values v pre-op values Control Pre-op:16.1±2.6 Day 3:14.9±2.6 Discharge:14.9±2.6 **[p<0.001]** each of both values v pre-op values	
								MAC	MAC(cm) Intervention Pre-op:28.0±1.0 Day 3:27.3±1.0 Discharge:27.0±1.0 **[p<0.001]** each of both values v pre-op values Control Pre-op:29.2±1.2 Day 3:28.2±1.2 Discharge:28.0±1.2 **[p<0.001]** each of both values v pre-op values	
								Hand-grip strength	Hand-grip strength(KPa) Intervention Pre-op:65.7±6.5 Day 3:63.3±5.3	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Discharge:65.7±6.5 **[p<0.05]** day 3 v pre-op values Control Pre-op:68.5±4.1 Day 3:63.9±4.9 Discharge:62.8±4.9 **[p<0.01]** each of both values v pre-op values	
								Fatigue score	Fatigue score Intervention Pre-op:4.4±1.2 Day 3:5.5±1.2 Discharge:5.1±1.2 Control Pre-op:3.9±1.2 Day 3:6.5±1.0 Discharge:6.1±1.2 **[p<0.01]** each of both values v pre-op values	
								Complications	Complications Intervention: 4 Control:12 **[p<0.05]**	
Beattie et al 2000[23]	RCT	1+	109 patients randomised: Int: 55 Cont: 54 8 patients withdrawn: Int: 3 Cont: 5 Total: 101 Int: 52 Cont: 49	Patients between 18-80 years admitted for elective GI or vascular surgery. Inclusion criteria: Presence of malnutrition on admission or on resumption of oral diet by the 8th post op. day and/or weight loss of 5% or more from admission until oral intake was resumed by	On initiation of oral diet, patients were provided with an oral diet supplement (Ensure Plus, Ross Laboratories, UK) which provided 1.5 kcal and 0.06 g/ml protein. Patients were encouraged to aim to consume 400 ml of the supplements in small, frequent	On initiation of oral diet, patients continued with routine nutritional management.	10 weeks	Mean (SD) weight loss (kg)	Int: n= 52 Cont: n= 49 Inclusion: Int: 2.31 (1.36) Cont: 2.28 (1.28) 2 weeks: Int: 3.40 (2.94) Cont: 4.21 (2.44) 4 weeks: Int: 3.40 (3.26) Cont: 5.13 (3.23)	The mean age of patients in the treatment group was younger by less than 10 years **[p<0.05]**. All patients were assessed by means of a home visit every two weeks postoperatively for 10 weeks. The assessments in this trial were not made blind to

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				the 8th postop. Day. Malnutrition was defined as BMI <= 20 kg/m2 and TSF or MAMC <= 15th percentile and/or weight loss >=5% from admission to hospital to the initiation of oral diet. Mean (SD) age: Int: 54.4 (19.4) Cont: 62.4 (10.9) p<0.05 Gender (M/F): Int: 27/25 Cont: 33/16 BMI (kg/m2) of patients on inclusion into the study (n): Any malnutrition (<=20): Int: 35 Cont: 30 - Severe (<=16): Int: 1 Cont: 2 - Moderate (<=18): Int: 5 Cont: 9 - Mild (<= 20): Int: 29 Cont: 19 Normal (20-25): Int: 13 Cont: 16 Overweight (>=25): Int: 4 Cont: 3	amounts in between meals to increase nutrient intake. Compliance was monitored by asking patients how much of the nutritional supplements were consumed; in practice the majority of patients took 200-400 ml daily.			Mean (SD) decrease in TSF, MAMC, grip strength Mean (SD) weight loss in patients with benign and malignant disease at each assessment point from time of admission Incidence of chest infections (n): Incidence of wound infections (n): Prescription for antibiotics (n):	6 weeks: Int: 2.48 (3.58) Cont: 5.68 (3.90) 8 weeks: Int: 1.89 (4.27) Cont: 5.96 (4.21) 10 weeks: Int: 1.53 (4.23) Cont: 5.86 (4.33) **[p<0.001]** Data not extracted. TSF and MAMC showed similar significant difference as weight change in both groups, indicating relative body protein and body fat depletion **[p<0.001]** Data not extracted Int: 2 Cont: 6 RR: 0.31 95% CI: 0.07-1.48 Int: 4 Cont: 7 RR: 0.53 95% CI: 0.17-1.73 Int: 7 Cont: 15	treatment. Funding: Abbott Laboratories **Data not extracted:** -Mean (SD) weight loss in patients with benign and malignant disease at each assessment point from time of admission - RR adjusted for age (continuous) and age and sex for each of the above three incidence of complications

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				(Normal and overweight patients were recruited due to >=5% weight loss in the period between admission and inclusion into the study) BMI (kg/m2) of patients on admission reported: Data not extracted. Mean (SD) length of time (days) from surgery to inclusion in the study: Int: 6.5 (1.6) Cont: 6.5 (1.4) Benign and malignant disease: Int: Benign: 32 Malignant: 20 Cont: Benign: 28 Malignant: 21 Exclusion criteria: Patients who required PN, pregnant or lactating, patients with terminal diseases and those with decompensated liver or renal disease.				- RR adjusted for age (continuous) and age and sex for each of the above three incidence of complications Mean (SD) LOS (days) Mortality Quality of life measurement for physical score (Mean, SD) Quality of life measurement for mental score (Mean, SD)	RR: 0.43 95% CI: 0.19-0.97 **[p<0.05]** Data not extracted Int: 18.4 (9.9) Cont: 20.6 (15.0) [NS] No deaths Initial assessment (A): Int: -13.8 (43.4) Cont: -18.0 (33.5) Final assessment (B): Int: 7.3 (47.3) Cont: -13.9 (38.6) Change (B-A): Int: 21.1 (18.6) Cont: 4.1 (17.3) **[p<0.001]** Initial assessment (A): Int: 4.8 (43.6) Cont: 6.3 (35.8) Final assessment (B): Int: 20.8 (46.1) Cont: 7.2 (39.1) Change (B-A): Int: 21.1 (18.6) Cont: 4.1 (17.3) **[p<0.001]**	

Table 34: Oral vs standard care -- hip fracture

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Avenell and Handoll 2003[14]	Syst. Rev.(RCT & Quasi RCT)		8/12 Trials reported oral supplement intervention	Patients recovering from hip fracture Patients aged ≥65yrs. Setting was either at home or in the hospital Years searched:1996 to 2002	Received protein &/ energy supplement	No treatment/placebo	1 year	Mortality Complications	Mortality- protein & energy supplementation(5 trials) RR=0.85, 95%CI 0.42, 1.70) Test for heterogeneity: Chi sq=2.87 df=0.24 Test for overall effect z-0.47 [p=0.6] Mortality – protein supplementation (3 trials) RR=1.38(95%CI 0.82, 2.34) Test for heterogeneity: Chi sq=1.34 df=2 [p=0.51] Test for overall effect z-1.22 [p=0.2] Complications(3 trials) RR=0.50(95%CI 0.25, 1.00 Test for heterogeneity: Chi sq=0.20 df=0.66 Test for overall effect z-1.96 **[p=0.05]**	Limited evidence from trails. Flawed study designs including poor patient compliance & short duration follow-up compromises the quality of the available evidence. Oral protein & energy supplementation appears to reduce the number of patients with complications; however this is based on 3 small studies.
Houwing et al 2003[161]	RCT		103 patients	Hip fracture patients	400ml daily of supplement enriched	Placebo		Incidence of pressure ulcer	Incidence of pressure ulcer	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Treatment: n=51 Age:81.5±0.9 M/F:11/40 Control: n=52 Age:80.5±1.3 M/F:8/44	with protein, arginine zinc & anti-oxidant			Mean intake BMI Haemoglobin Incidence of stage 1 & 11 PU	Treatment:55% Control:59% (no sig. diff.) Mean intake(%/day) Treatment:77±3 Control:77±4 (no sig. diff.) BMI((kg/mm²) Treatment:24.2±0.5 Control:23.7±0.5 (no sig. diff.)	
Bruce et al 2003[49]	Quasi-randomised study		109 patients Int: 50 Cont: 59	Female patients admitted to Royal Perth Hospital with hip fracture. Mean age +/- SD: Int: 84.7 +/- 7.3 Cont: 83.3+/- 8.0 Mean +/- SD BMI (kg/m2): Int: 23.1 +/- 3.0 Cont: 22.6 +/- 2.3 Exclusion criteria: BMI< 20 or > 30 kg/m2, residents of nursing homes, residence that would prevent follow-up, malignancy, severe organ failure, diabetes or fracture due to major trauma.	A daily 235 ml oral liquid nutritional supplement (Sustagen Hospital Plus, Mead Johnson) containing 352 kcal energy, 17.6 g protein, 11.8 fat, 44.2 g carbohydrate, vitamins and minerals was commencing within 2-3 days after surgery to 28 days after surgery. The supplement was available in two flavours (chocolate, vanilla). When compliance was poor, the dietitian offered encouragement and strategies to help	Standard care	6 months	Mean +/- SD weight loss after 4 weeks (kg) Mean +/- SD weight loss after 8 weeks (kg) Mean +/- SD LOS (days) % with fall in Katz score (physical function) at discharge % discharged home % home at 6 months	Int: n=50 Cont: n=59 Int: -1.0 +/- 3.1 Cont: -1.4 +/- 2.5 NS Int: -1.1 +/- 2.3 Cont: -1.3 +/- 3.0 NS Int: 17.7 +/- 9.4 Cont: 16.6 +/- 9.2 NS Int: 41.7 % Cont: 33.9% NS Int: 63.3% Cont: 71.9% NS Int: 63.8% Cont: 63.2%	Patients were not properly randomised. Quasi-randomisation: allocation using patients' year of birth: odd or even. Compliance with consuming the nutritional supplements was quite variable: median 26, mean 20.6, range 0-28 cans. Eight patients took less than 10 cans.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					with compliance, e.g., ways to vary the taste or altered timing of the supplement in relation to meals.			% died or in a nursing home at 6 months Serum albumin after 2 weeks, change in serum albumin	NS Int: 23.4% Cont: 24.6% NS Data not extracted	

Table 35: Oral vs nil -- surgical patients -- general laparotomy

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Binderow et al 1994[32]	RCT	1+	64 patients Group 1 (early): n=32 Mean age: 52yrs Women: 18 Group 2 (late): n=32 Mean age: 52yrs Women: 14 All patients had intra-operative NG tube placement	Patients who underwent laparotomy with either a colonic or ileal resection	Early oral diet Patients received regular diet on the first post-op morning	Late oral diet Group 2: Feeding after resolution of post-op ileus. Were allowed a maximum of 8 oz of ice chips/day until bowel activity returned. They were then begun on a diet of clear liquids which if tolerated for 24hrs were then advanced to a regular diet		Rate of Nasogastric tube re-insertion Vomiting Duration of post-op ileus Length of hospital stay	Nasogastric tube re-insertion Group 1 :18.7% Group 2: 12.5% (No sig. diff.) Vomiting Group 1: 44% Group 2: 25% (No sig. diff.) Duration of post-op ileus Group 1: 3.6 days Group 2: 3.4 days (No sig. diff.) Length of hospital stay Group 1: 6.7 days Group 2: 8.0 days (No sig. diff.)	Study demonstrated tolerance for early oral intake after laparotomy but the differences were not significant
Feo et al 2004[104]	RCT	1+	100 patients Oral: n=50	Patients who underwent elective colorectal resection for	Oral group No NG tube, patients	Nil group Routine use of NG	Until discharge		Oral: n=50 Nil: n=50	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Nil: n=50	cancer. Mean age +/- SD: Oral: 67.6 +/- 10.4 years Nil: 67.6 +/- 10.2 NS Exclusion criteria: All patients with previous abdominal operations, cancer of the lower rectum, requiring low anterior or abdominal-peritoneal resection and metastatic disease.	were allowed to drink the day after the operation, eat a soft diet the following day regardless of the passage of flatus, and were then advanced to solid food as tolerated. The NG tube was inserted if they had at least two postoperative episodes of vomiting	tube (decompression) and NPO until passage of flatus, followed by a liquid diet advanced to a soft and solid one as tolerated. NG tube was reinserted following the second episode of vomiting after it had been removed		Fever (n) Wound bleeding (n) Wound infection Wound dehiscence Nausea (n patients) Vomiting (n patients) Bowel movement-Median (range) (days) Hospital stay (days) Death Patients' well being (SF-36 questionnaire)	Oral: 1 Nil: 4 [NS] Oral: 1 Nil: 0 [NS] Oral: 2 Nil: 2 [NS] Oral: 0 Nil: 1 [NS] Oral: 5 (10%) Nil: 4 (8%) [NS] Oral: 16 (32%) Nil: 7 (14%) **[p<0.05]** Oral: 4 (3-10) Nil: 4 (3-9) [NS] Oral: 7 (5-13) Nil: 7 (5-14) [NS] Oral: 0 Nil: 0 There were no significant differences in: physical activity, physical role, physical pain, general health, vitality, social activity, emotional role and mental health (Data not extracted)	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Hartsell et al 1997[144]	RCT	1+	58 patients Int : n=29 Cont : n=29	Patients undergoing elective colorectal surgery Mean age (yrs) Int: 66 (range, 22-82) Cont: 68 (range, 40-83) NS Gender not specified Exclusion criteria: Patients younger than 16 years or had emergency operations. Patients with obstruction, perforation, or active intra-abdominal infection. No laparoscopic procedures were performed.	Full liquid diet on postoperative day 1. If the patient consumed 1000 mL or more in a 24-hour period, he or she was advanced to regular diet the next day. Patients were then dismissed when they could tolerate more than 2/3 or a regular diet. Orogastric tubes placed intraoperatively for gastric decompression, which were removed immediately on arrival at the postanesthetic care unit. Diets were withdrawn and NG tubes placed for vomiting that was unresponsive to antiemetics.	Liquid diet after evidence or return to normal bowel function with passage of flatus or stool. Patients were advanced to a regular diet when they consumed 1000 mL or more in a 24-hour period. They were dismissed when they could consume more than 2/3 of a regular diet.	Until discharge	Nausea Vomiting Required NG decompression and IV fluids for persistent vomiting Morbidity (number of cases) Aspiration pneumonia (number of cases) Mortality LOS (days) (mean +/- SD)	All patients were followed up Int: n=29 cont: n=29 Int: 55% Cont: 50% [NS] Int: 48% Cont: 33% [NS] Int: 27% Cont: 16% [NS] Int: 1 Cont: 1 [NS] Int: 1 Cont: 0 Int: 0 Cont: 1 (75 year-old patient experienced an anastomic leak that resulted in sepsis and death) Int: 7.2 ± 3.3 Cont: 8.1 ± 2.3 (95% CI for difference, -1.6 to + 1.2 days) [NS]	Method of randomisation not specified Early oral feeding after elective colorectal surgery is safe. There was no significant difference in the duration of hospitalisation.
Ortiz et al 1996[258]	RCT	1+	190 patients Gp1 (early): n=95 Mean	Patients who underwent elective colon or rectal surgery. Both groups had NG tubes inserted intra-	Early oral diet Gp1: allowed clear fluids ab lib after surgery until first day	Late oral diet Gp2: patients treated in a 'traditional manner', NG tube		Tolerance of early oral intake n=93	Tolerance of oral intake Gp1: 79.6% tolerated early oral intake. No diff between both gps after day 4	Patients with nausea or vomiting were allowed to make decisions about modifying their diet.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			age:65.54 Women:38 Gp2 (late): n=95 Mean age:65.07 Women:40	operatively.	post-op when they progressed to regular diet	was removed when post-operative ileus had resolved, and were then started on clear fluids which if tolerated for 24hrs were progressed to a regular diet.		 Vomiting n=93 Post-op naso gastric tube insertion 1st bowel movement Post-op complications	**[p<0.05]** Vomiting Gp1: Higher from the operation to 4th day **[p<0.05]** Naso gastric tube insertion higher in Gp1: 21.5% (up to the 4th day) **[p< 0.05]** 1st bowel movement Gp1 : 4.3days Gp2 : 4.7 days [No significant difference] Post-op complications Wound infection Gp1:5.3% Gp2:6.3% Pneumonia Gp1:2.1% Gp2:2.1% Urinary infection Gp1:0 Gp2:1.1% Total Gp1 : 17.9% Gp2 : 19.3% [No significant difference]	If they vomited twice within 24hrs and this was accompanied by lack of bowel movement or flatus then NG tube was re-inserted Two patients from each group were removed form the study because of several modifications in their diet
Reissman et al 1995[291]	RCT	1+	161 patients Gp1(early):n=80 Mean age 51yrs Females:46 Gp2(late):n=81	Patients who underwent elective laparotomy with either colon or small bowel resection. NG tube removed from all patients in both groups immediately after surgery.	Early oral diet Gp1: All patients received a clear liquid on first post-op day followed by regular diet as tolerated	Late oral diet Gp2: Feeding after resolution of post-op ileus.		Tolerance of early oral intake Tolerance of regular diet	Tolerance of oral intake Gp1: 79% tolerated early diet & were advanced to regular diet within 24-48hrs Tolerance of regular diet Gp1:2.6 ± 0.1days	NG tube was reinserted after 2 episodes of vomiting of more than 100mL over 24hrs in the absence of bowel movements

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Mean age:56yrs Females:38						Gp2: 5.0 ± 0.1 days **[p<0.001]**	
								Vomiting	Vomiting Gp1:21% Gp2:14% [No sig. diff.]	
								Post-op naso gastric tube insertion	Post-op naso gastric tube insertion Gp1:11% Gp2:10% [No sig. diff.]	
								Length of ileus	Length of ileus Gp1: 3.8 ± 0.1days Gp2:4.1 ± 0.1days [No sig. diff.]	
								Length of hospitalization	Length of hospitalization Gp1: 6.2 ± 0.2 days Gp 2: 6.8 ± 0.2 days [No sig. diff.]	
								Complications	Complications Wound infection Gp1:2.5% Gp2:1.2% Urinary tract infection Gp1:2.5% Gp2:1.2% Pneumonia Gp1:0 Gp2:1.2% Overall complications Gp1:7.5% Gp2: 6.1% [No sig. diff.]	
Stewart et al 1998[334]	RCT		88 patients (8 were excluded after randomisation)	Patients undergoing an elective colorectal resection with anastomosis, and	Free fluids allowed from 4 hours after operation and progressed to a solid	Fasting until passage of flatus or bowel motion. Fluids were then	Until discharge		All patients were followed up Int: n=40 Cont: n=40	Uniform criteria for discharge were not utilized.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Total: 80 Int; n= 40 Cont: n= 40	without stoma formation. Age (years) Mean (range) Int: 58 (25-89) Cont: 59 (17-88) Gender (Female/Male) Int: 21/19 Cont: 22/18	diet from the first postoperative day at their own discretion. All NG tubes were removed in recovery, and were not reinserted unless vomiting of > 100mL occurred on two occasions within 24 hours.	commenced and progressed to a solid diet over 24- 48 hours at the surgeon's discretion. All NG tubes were removed in recovery, and were not reinserted unless vomiting of > 100mL occurred on two occasions within 24 hours.		Vomiting > 100 mL (N) NG reinsertion (N) Prolonged distension (N) Nausea score: mean (range) Anti-emetic: mean (range) Commencement solid diet. Median (range) Full diet. Median (range) Passage of flatus. Median (range) First bowel action. Median (range) Discharge. Median (range) Postoperative analgesic requirements	Int: 14 Cont: 14 [No p value reported] Int: 4 Cont: 3 [No p value reported] Int: 5 Cont: 9 [NS] Int: 29 (5-120) Cont: 31 (0-78) [NS] Int: 4.1 (0-18) Control: 3.7 (0-8) [NS] Int: 2 (1-4) Control: 6 (4-8) **[p<0.001]** Int: 5 (2-13) Cont: 8 (5-14) **[p<0.001]** Int: 3 (1-5) Cont: 4 (2-6) **[p=0.01]** Int: 4 (2-9) Cont: 5 (2-8) **[p=0.03]** Int: 9 (5-28) Cont: 11 (6-18) [p=0.10] (0.01) Peto statistic	Hospital discharge was not significantly different on log-rank statistics, but it was significant on the Peto statistic. The study concluded that early feeding after elective open colorectal resections is successfully tolerated by the majority of patients.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								- Epidural analgesia Speed of mobilisation Complications (n of cases): Total Respiratory (no details given) Cardiovascular Anastomotic dehiscence Wound infection Urinary tract infection Deaths	Int: 33 Cont: 35 [No p value reported] Overall narcotic requirements were similar [NS] [No p values reported] Int: 10 patients Cont: 11 patients Int: 4 Cont: 3 Int: 4 Control: 3 Int: 1 Control: 0 Int: 0 Cont: 4 Int: 1 Cont: 2 Int: 0 Cont:1	
Han-Geurts et al 2001[140]	RCT	1+	105 patients Int: 56 (Vascular n= 38 Colonic n= 18) Cont: 49 (Vascular n= 30 Cont= 19)	Patients undergoing elective abdominal surgery including open colonic surgery and transabdominal central vascular reconstruction procedures. Patients were > 18 years old and were not	Patients chose when to start oral diet. Patients were given the opportunity to start a normal diet on the first post. op day.	Fixed postoperative feeding regimen: 25 ml water per h on day of operation 50 ml water per h on day1; liquid diet: water, tea, coffee	Until discharge	Complications (number of cases)	No p value reported in any of these complications; All patients were followed up. Int: n=56, Cont: n=49. No patient had more than one complication.	The study concluded that patient-controlled post operative feeding is safe and is started significantly earlier than the fixed regimen imposed by the physician.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				participating in another study at the time. All were mentally competent and able to speak and understand Dutch. Age (years) mean (s.d) Int: 68 (12) Cont: 65 (12) Gender ratio (M:F) Int: 25:31 Cont: 32:17 Type of surgery Int: Vascular: n=38 Colonic: n=18 Cont: Vascular: n= 30 Colonic: n= 19		and lemonade on day 2; liquid diet on day 3; easily digestible diet on day 4; and normal diet on day 5		Total number Anastomotic leakage (colonic surgery only) (Int n=18 Cont n=19) Post. op haemorrage Other (prolonged ileus, colitis) Pelvic abscess Myocardial infarction Stroke Pneumonia (study does not indicate whether these cases are due to aspiration or not) Urinary tract infection Wound infection Exacerbation of COPD Asthma cardiale Number of deaths	Int: 12 Cont: 13 Int: 2 Cont: 1 Int: 1 Cont; 1 Int: 3 Cont: 1 Int: 0 Cont: 1 Int: 1 Cont: 1 Int: 0 Cont: 1 Int: 1 Cont: 1 Int: 2 Cont: 4 Int: 0 Cont: 2 Int: 1 Cont: 0 Int: 1 Cont: 0 Int: 3 (Died before resuming a solid diet. There were no signs of	There were 3 deaths on the intervention group and nil in the control group **[p<0.05]** Incidence of nausea, vomiting- NS difference between the groups Bowel movement after operation- All patients in both groups had bowel movement on the first day after operation

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									aspiration) Cont; 0 **[p<0.05]**	
								Required reinsertion of NG tube	Int: 9 Cont: 9	
								Time to normal diet (days). Median (range)	Int: 3 (1-12) Cont: 5 (4-13) **[p<0.001]**	
								Time to normal diet by type of surgery. (days). Median (range)	Int: Aortic: 5 (2-12) Colonic: 4 (1-11) [NS] Cont: Aortic: 6 (4-9) Colonic: 6 (4-13) [NS]	
								LOS (days). Median (range)	Int: 11 (3-72) Cont: 11 (6-34) [NS]	
								LOS by type of surgery (days). Median (range)	Int: Aortic: 13 (7-35) Cont: 15 (3-72) [NS] Cont: Aortic: 12 (6-34) Cont: 12 (6-27) [NS]	
Ray and Rainsbury 1993[286]	RCT	1+	60 patients Gp1(early=unrestricted): n=31 Gp2(late=restricted): n=29 Diets was	Patients requiring emergency or elective intraperitoneal surgery. Aim of the study was to assessed hydration and nausea	Early group, patients were allowed oral fluids (water/orange squash) from the post-op morning. IV fluids were used to supplement this until an adequate amt of	Late group, oral fluids were allowed on the first post-op morning in the tradition of 30ml/h for 24hr, 60ml/h for 24h, 90ml/h for 24hr and then 'free fluids'		Day 1 Oral intake IV fluid	 Oral intake Gp1:827ml Gp2:314ml **[p<0.001]** IV fluid	NG tubes used in 20 patients but none were passed after surgery Oral intake in group 1 patients was significantly greater

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			introduced in both groups when the patient was tolerating 'free fluids'		oral fluids was tolerated (100ml/h)	when the intra-venous cannula was removed. Regimen modified for patients undergoing appendicectomy, where increments were made every 12h		Nasogastric aspirate Day 2 Oral intake IV fluid Nasogastric aspirate Biochemistry	Gp1:2078ml Gp2:1883ml Nasogastric aspirate Gp1:249ml (n=14) Gp2:164ml (n=6) Oral intake Gp1:1332ml Gp2:625ml **[p<0.001]** IV fluid Gp1:1256ml Gp2:1714ml Nasogastric aspirate Gp1:803ml (n=10) Gp2:42ml (n=3) **[p<0.01]**	than group 2, but this was not associated with any increase in nausea, vomiting or anti-emetic requirement. Gp1 patients felt less dry on both days with the greatest on day 1 **[p<0.05]** Discontinuation of IV fluids and ingestion of the first meal were achieved 24hr earlier in Gp1

Table 36: Oral vs nil -- surgical patients -- caesarean section

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Burrows et al 1995[51]	RCT	1+	100 patients Intervention: n= 50 Control: n=50	Women undergoing caesarean section. Age (years) Mean +/- SD Intervention: 27.2 +/- 6.8 Control: 25.2 +/- 4.8	Solid food within 8 hours of surgery. Patients were instructed not to eat or drink unless they wished to do so but food would be readily available.	Nothing by mouth for a minimum of 12 hours. Clear liquids prior to advancing to solid foods.	Until discharge	Mean time (h) from surgery to first solid food +/- SD Maximum minus minimum abdominal girth during study (cm)	Intervention: 10.2 +/- 5.2 Control: 41.5 +/- 16.0 **[p<0.001]** Intervention: 3.7 +/- 3.4 Control: 5.2 +/- 4.1 [NS]	Early postoperative feeding after caesarean section is safe **NS-no data available:**

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				[Not significant] Exclusion criteria: Receiving general anaesthesia, requiring insulin, having active bowel disease, need for bowel surgery at caesarean, requiring intensive postoperative care.				Nausea or vomiting: On POD 0 On POD 1 Patient reported bowel movement by completion of the study (Number of cases) Patient-requested injectable narcotic analgesics. Median use. Use of oral medication Postpartum endometritis Ileus LOS (days) (mean) Late complications	 Intervention: 11 (22%) Control: 7 (14%) [NS] Intervention: 1 (2%) Control: 4 (8%) [NS] Intervention: 28 Control: 13 **[p<0.05]** Intervention: 75 mg meperidine Control: 225 mg meperidine **[p<0.05]** Intervention: 66 doses narcotic and 120 doses of nonsteroidals Control: 71 doses oral narcotic 120 doses nonsteroidals [NS] Intervention: 16% Control: 30% [NS] No reported cases Intervention: 3.3 +/- 0.7 Control: 3.7 +/- 1.3 [NS] No complications	- Physician reported return of bowel sounds - Patient reported return of flatus - Patient-reported worst abdominal bloating experience

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								(2weeks- 2 months after discharge)	identified	
Gist et al 2002[127]	RCT	1+	119 patients Intervention: 63 Control: 56	Obese caesarean-section patients Age (Mean +/- SE) Intervention: 24.71 +/- 0.78 Control: 24.09 +/- 0.8 [NS] BMI (Mean +/- SE) Intervention: 32.99 +/- 0.995 Control: 32.64 +/- 1.1 [NS] Exclusion criteria: Patients receiving magnesium sulfate, those who had serious intraoperative complications during the course of their caesarean sections; those who did not wish to participate in the study. Patients were not excluded as a result of the use of general anaesthesia or prior to abdominal surgery.	Oral fluid *ad libitum* immediately post-operatively as tolerated. A standard regular hospital diet without modifications was given 6 hours postoperatively.	Clear liquids after the resumptions of bowel sounds, usually on the first postoperative day. Patients were then advanced to a regular hospital diet when flatus was passed and/or bowel movement.	Until discharge	Data (mean +/- SE) Hours until flatus Hours until bowel movement Hours until ambulatory Number of doses of parenteral narcotics Number of doses of oral narcotics Number of doses of oral NSAIDS % Needing bowel stimulants Days in hospital (hospital policy encourages a stay of at least 72 hours after caesarean	 Intervention: 25.85 +/- 1.9 Control: 33.09 +/- 2.0 **[p=0.011]** Intervention: 40.21 +/- 2.2 Control: 54.41 +/- 2.5 **[p=0.0001]** Intervention: 11.41 +/- 0.1 Control: 21.29 +/- 1.2 **[p=0.0001]** Intervention: 1.95 +/- 0.2 Control: 2.57 +/- 0.2 **[p=0.027]** Intervention: 4.57 +/- 0.9 Control: 3.71 +/- 0.3 [NS] Intervention: 3.03 +/- 0.27 Control: 3.16 +/- 0.5 [NS] Intervention: 67% Control: 55% **[p=0.05]** Intervention: 3.55 +/- 0.3 Control: 3.63 +/- 0.3 [NS]	Bowel stimulants were given to both groups to relieve flatulence. General anaesthesia was used in only 4 % of patients, and those were in the intervention group. Early feeding of the high-risk caesarean-section patient promotes early ambulation that may prevent serious postoperative complications.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								section) Hours until oral fluid intake (control only) Hours until regular diet (control only) Complications (num. of cases) (no p value reported) Ileus Chorioamnionitis Endomyometritis Wound infection Thromboembolic event	 Control: 22.18 +/- 0.3 Control: 40.56 +/- 1.4 Intervention: 0 Control: 0 Intervention: 0 Control: 2 Intervention: 4 Control: 3 Intervention: 1 Control: 0 Intervention: 0 Control: 0	
Gocmen 2002[128]	RCT	1+	182 patients Intervention: n= 95 Control: n= 87	Patients undergoing caesarean section under general anaesthesia. Age (years) (mean +/- SD) Intervention: 26.3 +/- 3.3 Control: 26 +/- 4.5 [NS] Gravidity (mean number of pregnancies) Intervention: 2.2 +/- 1.1	Low residue diet within 6 hours of surgery. No oral or rectal bowel stimulants were given after surgery.	Nothing by mouth until bowel movement began after surgery, and then advanced to clear liquids when normal bowel sounds were detected. Progress to a regular diet after passage of flatus or first bowel movement. No oral or rectal bowel stimulants	Until discharge	Time of first oral intake (h) (mean +/- SD) First bowel sounds (h) (mean +/- SD) Ileus (n, %) Mild	Intervention: 6.0 +/- 0.6 Control: 14.5 +/- 2.6 **[p<0.001]** Intervention: 14.1 +/- 3.2 Control: 21.6 +/- 5.5 **[p<0.001]** Intervention: 5 (5.3) Control: 6 (6.9) [p=0.88] Intervention: 4 (4.2) Control: 5 (5.8) [p=1]	Method of randomisation not specified. Early oral feeding after caesarean delivery is well tolerated and is associated with a more rapid return to a normal diet. Exclusion criteria: History of inflammatory bowel disease or

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Control: 2.5 +/- 1.2 [NS] Parity (mean number of births) Intervention: 1.9 +/- 0.9 Control: 2.2 +/- 1.0 [NS] Gestational age (weeks) Intervention: 38.7 +/- 0.8 Control: 38.6 +/- 0.9 [NS]		were given after surgery.		Severe Febril morbidity (n, %) Wound complication (n, %) LOS (h) (mean +/- SD) (Patients were eligible for hospital discharge if they were able to tolerate solid food without nemesis, pass flatus or had bowel movement and demonstrated no febrile morbidity for at least 24 h).	Intervention: 1 (1.1) Control: 1 (1.2) [p=0.74] Intervention: 9 (9.5) Control: 11 (9.5) [p=0.65] Intervention: 2 (2.1) Control: 1 (1.2) [p=1] Intervention: 26.7 +/- 5.2 Control: 43.9 +/- 8.1 **[p<0.001]**	obstruction; use of magnesium sulphate; previous bowel surgery, bowel injury, GI and/or medical conditions that preclude the early consumption of a low residue food; previous surgery that involved extensive lysis of adhesions of the bowel
Guedj et al 1991[137]	RCT		51 patients Intervention: n= 29 Control: n= 22	Parturients at a gestational age of 38-42 weeks who underwent either elective or emergency caesarean section under epidural anaesthesia. Age (years) (Mean +/- SD) Intervention: 31.52 +/- 5.32 Control: 31.37 +/- 5.52 Weight (kg) (Mean +/- SD)	Immediate unlimited oral intake of water, coffee or tea with sugar in the recovery room.	Fast at least 24 hours after the end of the operation	7 days post op	Nausea (num. of cases) Bowel sounds Emission of the first flatus	Intervention: 2 Control: 3 Both groups: between 12th and 24th hour following the operation Intervention: 1 time on day 2 7 times on day 3 18 times on day 4 2 times on day 5 1 time on day 6 Control: 1 time on day 3 21 times on day 4	Method of randomisation not specified. 15 patients (51%) in the intervention group underwent elective caesarean whereas only 4 patients (18%) in the control group underwent elective caesarean.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Intervention: 70.75 +/- 12.68 Control: 70.24 +/- 13.17 Indications for caesarean section: Elective C.S: Intervention: 15 Control: 4 Non-progressive labour: Intervention: 3 Control: 7 Foetal distress: Intervention: 3 Control: 6 Severe pre-eclampsia Intervention: 1 Control: 2 Malpresentation: Intervention: 5 Control: 1 Placental causes: Intervention: 2 Control: 2				Return of bowel movements Abdominal pain due to abdominal distension	Intervention: 1 time on day 2 1 time on day 3 10 times on day 4 16 times on day 5 1 time on day 6 Control: 4 times on day 4 15 times on day 5 3 times on day 6 Intervention: 12 times (57.1%) Control: 13 times (68.4 %)	
Kramer et al 1996[192]	RCT		241 patients (questionnaires from 41 patients were not completed) Total: 200 patients Intervention: n= 91 Control: n= 109	Women undergoing caesarean delivery. Indications for caesareans [NS] Anaesthetic techniques Spinal: Intervention: 33 Control: 36 [NS]	Regular diet within 6 hours postoperatively	Sips of water and ice chips, clear liquids with the detection of bowel sounds, and regular diet with the passage of flatus or bowel movement	Until discharge	GI symptoms (patients filled a questionnaire before discharge): None Abdominal Pain	N (%) Intervention: 45 (49.5) [NS] Control: 4 (39.4) [NS] Intervention: 37 (40.7) Control: 45 (41.2)	17% of questionnaires were not completed. 13% who underwent caesarean during the period of the study were not approached about participation. Early post-op. feeding of caesarean patient does not appear to

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				General: Intervention: 22 Control: 20 [NS] Epidural Intervention: 51 Control: 38 [NS] Diabetes mellitus (n,%) Intervention: 4 (4.4) Control: 3 (2.8) [NS] Lupus Intervention: 0 (0) Control: 1 (0.9) [NS] Pre-eclampsia/ eclampsia (n,%) Intervention: 17 (18.7) Control: 19 (17.4) [NS]				[NS] Distention Nausea Vomiting Incidence of paralytic ileus Average LOS Complications (n,%): Chorioamnionitis Endomyometritis Incidence on the use of NSAIDs	Intervention: 22 (24.2) Control: 32 (29.4) [NS] Intervention: 13 (14.3) Control: 16 (14.7) [NS] Intervention: 5 (5.5) Control: 6 (5.5) [NS] Intervention: 0 Control: 0 Intervention: 3.5 days Control: 3.2 days No p value reported Intervention: 17 (18.7) Control: 18 (16.5) [NS] Intervention: 5 (5.5) Control: 17 (15.6) **[p=0.025]** Intervention: 75% Control: 61% [NS]	increase the incidence of postoperative paralytic ileus or of GI symptoms. Exclusion criteria: Patients undergoing caesarean hysterectomy or other extensive intra-abdominal surgery.
Patolia et al 2001[268]	RCT		124 patients (2 refused to participate and 2 were excluded) Total= 120 Intervention: n= 60 Control: n= 60	Patients who underwent caesarean delivery under regional anaesthesia. Age (y) (mean +/- SD) Intervention: 26.5 +/- 6.2 Control: 27.0 +/- 5.9 [NS]	Solid food within 8 hours of surgery	Nothing by mouth for 12-24 hours after surgery, and then advanced to a clear liquid diet on post op day 1. On day 2 after passage of flatus or bowel movement, a regular diet was given. If passage of flatus	Until discharge	Use of oral analgesic (mean +/- SD) Started solid food after surgery (hours) (mean +/- SD) Mild ileus symptoms	Intervention: 4.1 +/- 3.8 tablets Control: 4.9 +/- 4.3 tablets [NS] Intervention: 5.0 +/- 1.2 Control: 40.0 +/- 10.6 Intervention: 19	Early initiation of solid food after caesarean delivery appears to be well tolerated and may be associated with a shorter hospital stay. Early-fed women whose operations exceed 40 minutes may be more likely to

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Elective caesarean: Intervention: 24 (40%) Control: 24 (40%) [NS] Indications for caesarean delivery [NS] Exclusion criteria: patients undergoing general anaesthesia, receiving magnesium sulphate, underwent intra-operative bowel surgery or had a bowel injury, or had any GI and/or medical conditions that precluded the early consumption of solid food.		was not reported a full liquid diet was given. On post. op day 3 , if full liquid diet was tolerated a regular diet was prescribed.		(n,%) Within Intervention group: Severe ileus (n,%) LOS (h) (mean +/- SD) (Patients were eligible for discharge if they were able to tolerate solid food, without emesis, passed flatus or had a bowel movement, and demonstrated no febrile morbidity for at least 24 hours). Postoperative time of bowel movement (h) (median (interquartile range)) Postoperative fever (n,%) Hospital readmission (n,%)	(31.7%) Control: 16 (26.7%) [p=0.69] Surgery < 40 min: 40.5% Surgery > 40 min: 13.4 % **[p<0.01]** Intervention: 0 (0%) Control: 1 (1.7%) [p>0.95] Intervention: 49.5 +/- 12.7 Control: 75.0 +/- 12.3 **[p<0.001]** Intervention: 34.5 (25.3-48.8) Control: 51.0 (43.3-62.0) **[p<0.001]** Intervention: 8 (13.3%) Control: 10 (16.7%) [p=0.80] Intervention: 1 (1.7%) Control: 2 (3.3%) [p>0.95]	have mild ileus symptoms.
Weinstein et al 1993[369]	RCT	1+	118 patients Intervention:	Patients undergoing caesarean section under regional	PROEF diet (a type of palatable elemental diet	Administration of sips of water postoperatively, with	Until discharge		Intervention: n= 60 Control: n= 58	Preoperative and postoperative hematocrits were not

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			n=60 Control: n=58	anaesthesia (only one patient in each group received general anaesthesia)	developed by the researches) given orally to patients immediately after caesarean section. A cup containing the slush type material, to be eaten with a spoon or straw immediately after surgery and thereafter every 8 hours. The diet was continued until the surgeon believed the patient should have a regular diet.	advancement from a clear liquid to a regular diet.		Bowel sounds (mean +/- SD, hours) Flatus (mean +/- SD hours) Bowel movement (mean +/- SD hours) Days to regular diet (mean +/- SD hours) Days to discharge (mean +/- SD hours) Abdominal distention (No.) Estimated blood loss	Intervention: 10.2 +/- 5.9 Control: 14.5 +/- 7.7 **[p<0.05]** Intervention: 32.9 +/- 16.6 Control: 33.5 +/- 14.1 Intervention: 71.0 +/- 18.1 Control: 70.9 +/- 14.8 Intervention: 2.0 +/- 0.7 Control: 2.3 +/- 0.7 Intervention: 3.3 +/- 1.1 Control: 3.2 +/- 0.6 Intervention: 3 Control: 4 Intervention: 865 ml Control: 778 ml **[p<0.022]**	compared between the groups, and no patient received a blood transfusion

Table 37: Oral vs nil -- surgical patients -- gynaecological surgery

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Cutillo et al 1999[73]	RCT	1+	122	Patients undergoing elective laparotomy for	Clear-fluid diet on the morning of the	Post op. NG decompression with	Until discharge	Post. op. indices of GI function.	All patients were followed up	Because of sub-occlusive symptoms,

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Intervention: n=61 Control: n=61	gynaecologic malignancies. Patients were stratified by the duration of surgery (less than 120 min and greater than 120 min) and type of tumour. Median age (years) Intervention: 52 Control: 55 [NS] Exclusion criteria: Previous pelvic or abdominal radiotherapy; preoperative partial or complete intestinal obstruction; GI, breast, pancreatic, or biliary duct neoplasia diagnosed intra-operatively; concomitant intestinal resection; and operative time less than 60 min.	first post op. day. Advanced to a semi-liquid fibreless diet within the next 24 hrs. The diet was accelerated as tolerated to a regular diet. Intra-operative orogastric decompression was performed in all cases. The NG tube was inserted or reinserted when two or more episodes of vomiting exceeding 100 mL in volume occurred over 12 hours, in the case of abdominal distention, or in absence of bowel peristaltic activity unresponsive to medical therapy.	oral feeding delayed until the first passage of flatus. Clear-liquid diet on the day of first passage of flatus, advanced to a semi-liquid fibreless diet within the next 24 hrs, and were accelerated as tolerated to a regular diet. Intra-operative orogastric decompression was performed in all cases. The NG tube was inserted or reinserted when two or more episodes of vomiting exceeding 100 mL in volume occurred over 12 hours, in the case of abdominal distention, or in absence of bowel peristaltic activity unresponsive to medical therapy.		Patients with nausea Patients with vomiting- Median (range) Time to passage of flatus (days) Median (range) Time to passage of stool (days) Median (range) Time to tolerance of regular diet (days) Median (range) Insertion NG tube Postoperative complications (some patients had more than one complication) None Fever Wound infection	Intervention: n=61 Control: n=61 Intervention: 17 (28%) Control: 23 (38%) [NS] Intervention: 17 (28%) Control: 16 (26%) [NS] Intervention: 2 (1-4) Control: 3 (1-6) **[p<.01]** Intervention: 3 (1-10) Control: 4 (1-8) **[p<.01]** Intervention: 3 (2-14) Control: 5 (2-8) **[p<.01]** Intervention: 6 (10%) Control: (the control group had a NG tube inserted) Intervention: 51 (83%) Control: 53 (86%) [NS] Intervention: 5 (8%) Control: 5 (8%) [NS] Intervention: 1 (2%) Control: 3 (5%) [NS]	NG tube insertion was necessary in 6 patients in the intervention group (10%). Early oral feeding can be administered safely to patients undergoing major laparotomy for gynaecologic malignancies. Placement of NG tube can be safely omitted in gynaecologic oncology surgery. Gastric decompression delays the return to normal GI function.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Wound deshidence Pneumonia (study does not indicate whether these cases are due to aspiration or not) Ascitis (> 1000 mL) Deep vein thrombosis Ureteral fistula Bowel adhesion Symptomatic lymphocyst LOS (days) Median (range)	Intervention: - Control: 1 (2%) [NS] Intervention:- Control: 1 (2%) [NS] Intervention: 3 (5%) Control: - [NS] Intervention: 2 (3%) Control: - [NS] Intervention: 1 (2%) Control: - [NS] Intervention: 1 (2%) Control: - [NS] Intervention: 3 (5%) Control: 3 (5%) [NS] Intervention: 5 (3-18) Control: 6 (4 –18) **[p<.05]**	
MacMillan et al 2000[214]	RCT	1+	150 women (11 were excluded after randomisation) Total 139 women Intervention: n=67	Women who had major abdominal or vaginal gynecologic surgery for benign indications. There were no significant demographic differences between groups, including age,	Low residue diet within 6 hours of arrival on the ward	Ice chips in the immediate postoperative period with advancement to clear liquids when normal bowel sounds were detected and a regular diet after	Until discharge	Complications (number of cases): Postoperative (some patients had more than one complication; 12 in the Intervention group and 12 in the	All patients were followed up Intervention: n=67 Control: n=72	This study had two purposes: to compare early regular diet to conventional postoperative dietary management to determine GI function

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Control: n=72	gravidity, parity, race, medical history, surgical history, and hormonal status. Only data on ethnicity and indications for surgery reported. Reasons for exclusion: Patients with histories of malignancy, inflammatory bowel disease or obstruction. Patients with current or past surgeries that involved extensive lysis of adhesions of bowel, women who had laparoscopic procedures only.		passage of flatus or bowel movements.		control group had one or more complications): Transfusion Ileus Reoperation Febrile morbidity Bowel function: Post op. bowel sounds (days) (mean +/- SD) Flatus passed (days) (mean =/- SD) First bowel movement reported (mean +/- SD) Mean time IV fluids given (hours) Subjects received similar amounts of pain medications including IV narcotics, oral	 Intervention: 2 Control: 1 [p=0.61] Intervention: 2 (3%) Control: 4 (5.8 %) [p=0.68] Intervention: 2 Control: 0 [p=0.12] Intervention: 7 Control: 3 [p=0.20] Intervention: 0.5 +/- 0.6 Control: 0.5 +/- 0.5 [p=0.65] Intervention: 1.7 +/- 0.7 Control: 1.6 +/- 0.8 [p=0.70] Intervention: 2.8 +/- 0.7 Control: 2.2 +/- 1.2 [p=0.7] Intervention: 23.82 +/- 15.05 Control: 25.42 +/- 15.0 [p=0.53]	after major non-laparoscopic gynaecologic surgery for benign indications To evaluate the incidence and severity of postoperative active ileus after gynaecologic surgery This study reports a low incidence of postoperative ileus in these cases Despite the low incidence of postoperative ileus, the low rate of GI complaints and lack of symptoms in the early feeding group show clinically significant safety and tolerance of a regular diet 6 hours after surgery.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								ibuprofen and indomethacin rectal suppositories		
								Total oral fluid intake at lunch on the first post. op day	Intervention: 233 +/- 217 mL Control: 434 +/- 337 mL **[p=0.001]**	
								Total oral fluid intake during the whole day on the first post. op day	Intervention: 690 +/- 511 mL Control: 979 +/- 594 mL **[p=0.01]**	
								Total calories consumed for the day on the first post. op day	Intervention: 621 +/- 424 kcal Control: 499 +/- 401 [p=0.14]	
								Patient report of bowel function return (patients answered a questionnaire on the day of discharge):		
								Time to flatus (days) (mean +/- SD)	Intervention: 1.23 +/- 0.95 Control: 1.22 +/- 0.87 [p=0.97]	
								Time to bowel movement (days) (mean +/- SD)	Intervention: 1.18 +/- 1.34 Control: 1.25 +/- 1.34 [p=0.82]	
								Crampy pain	Intervention: 23 % Control: 24% [p=0.95]	
								Vomiting (including first postoperative day)	Intervention: 7% Control: 12 % [p=0.28]	
								Abdominal	Intervention: 20%	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								distension Nausea Pain scores from the McGill Pain Scale did not differ between groups on the first post op. day or on the day of discharge. When data were stratified within feeding groups to compare abdominal and vaginal approaches, no significant differences were noted including perioperative complications, pain medicine requirements, fluid and caloric intake, and GI function Length of stay	Control: 27% [p=0.26] Intervention: 13 % Control: 23% **[p=0.04]** Only data by type of surgery i.e. vaginal v abdominal reported. Data for Int. v Cont. not reported	
Pearl et al 1998[273]	RCT	1+	200 patients (5 were non-evaluable after randomisation: 3 in Intervention group, 2 in control group)	Gynaecologic oncology patients undergoing non-laparoscopic intra-abdominal surgery Age (years) (median +/- SD):	Clear liquid diet on the first post-operative day and advance to a regular diet as tolerated. (All patients had an orogastric tube	Nothing by mouth until return of bowel function, then began a clear liquid diet, and advanced to a regular diet as tolerated. (All patients had an	Until discharge	Nausea	All patients were followed up Intervention: n=92 Control: n= 103 Intervention: 43.5 % Control: 24.3 % **[p=0.006]**	No exclusion criteria reported Early post-operative feeding in gynaecologic oncology patients undergoing intra-

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Total 195 patients Intervention: n=92 Control: n=103	Intervention: 56.5 +/- 13.9 Control: 57.7 +/- 13.3 [NS] No exclusion criteria reported	placed intra-operatively and removed at the completion of surgery)	orogastric tube placed intra-operatively and removed at the completion of surgery)		Vomiting Abdominal distension NG tube use Duration NG tube (d) Mean +/- SD Diet tolerance on first attempt: Clear liquid diet If intolerant, time to tolerance (d) Mean +/- SD Regular diet If intolerant, time to tolerance (d) Mean +/- SD Bowel sounds (d) Mean +/- SD Flatus (d) Mean +/- SD Initiation clear liquid diet (d) Mean +/- SD	Intervention: 5.3 % Control: 4.2 % [NS] Intervention: 40.2 % Control: 35.9 % [NS] Intervention: 3.3 % Control: 6.7 % [NS] Intervention: 2.7 +/- 0.6 Control: 3.1 +/- 1.3 [NS] Intervention: 86.8 % Control: 91.3 % [NS] Intervention: 2.6 +/- 1.8 Control: 4.1 +/- 2.1 [NS] Intervention: 89.0 % Control: 95.2 % [NS] Intervention: 3.6 +/- 1.9 Control: 5.0 +/- 2.5 [NS] Intervention: 1.8 +/- 1.2 Control: 2.3 +/- 1.2 **[p=0.007]** Intervention: 3.2 +/- 1.5 Control: 3.6 +/- 1.4 [NS] Intervention: 1.2 +/- 1.1 Control: 3.5 +/- 1.5	abdominal surgery is safe and well tolerated.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									[p<0.0001]	
								Initiation regular diet (d) Mean +/- SD	Intervention: 2.3 +/- 1.4 Control: 4.2 +/- 1.5 **[p<0.0001]**	
								Hospital stay (dietary tolerance was a primary determinate of hospital discharge) (d) (Mean +/- SD)	Intervention: 4.6 +/- 2.1 Control: 5.8 +/- 2.7 **[p=0.001]**	
								Major post-op complications:	Data: N (%) Intervention N= 92 Control: N= 103	
								Febrile morbidity	Intervention: 50 (54.3) Control: 57 (55.3) [NS]	
								Pneumonia (There were no known aspirations in either group)	Intervention: 0 (0) Control: 2 (1.9) [NS]	
								Wound complications	Intervention: 20 (21.7) Control: 22 (21.4) [NS]	
								Atelectasis	Intervention: 8 (8.7) Control: 11 (10.7) [NS]	
Schilder et al 1997[308]	RCT	1+	96 patients Intervention: n=49 Age: Intervention: 49.3 ± 2.13 BMI: 28.9 ± 1.11	Patients scheduled for major abdominal gynaecologic surgery.	Clear liquid diet on the first postoperative day. After 500 cc of liquids was tolerated, a regular diet was given.	Nil by mouth until at least two of the following were present: presence of bowel sounds, passage of stool or flatus or subjective hunger.	Until discharge	Mean +/- SEM LOS (days)	Intervention: 3.12 +/- 0.16 Control: 4.02 +/- 0.30 **[p=0.008]**	One death occurred during the study. The study does not report whether the death occurred in the Intervention or control group.
								Mean +/- SEM tolerated solid (POD)	Intervention: 1.88 +/- 0.14 Control: 2.72 +/- 0.14 **[p<0.0001]**	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Control: n=47 Age: 51.2 ± 2.02 BMI: 30.6 ± 1.38					Episodes of emesis Wound dehiscence Aspiration Deaths	Intervention: 0.39 +/- 0.13 Control: 0.32 +/- 0.10 **[p=0.04]** Intervention: 0 Control: 0 Intervention: 0 Control: 0 One death occurred during the study (It is not specified which group the death occurred)	
Steed et al 2002[331]	RCT	1+	96 patients Group A (late): n=49 Mean age: 52±1.9yrs Group B (early): n=47 Mean age:50±1.9 yrs (Note: All females)	Gynaecologic, oncology & urogynaecology patients who underwent major abdominal gynaecologic surgery	Early oral diet Group B: Began clear fluids began clear fluids on the first post-operative day, and once 500mL was tolerated, they received regular diet.	Late oral diet Group A: received nothing by mouth until documentation of bowel function. They were then advanced slowly to solid diet.		Length of hospital stay Median no. days before solid diet tolerated Mean episodes of ileus Post-operative ileus Major complications	Length of hospital stay Group A: 6 days Group B: 4 days **[p=0.0001]** Median no. days before solid diet tolerated Group A:4 Group B:2 **[p=0.0001]** Mean episodes of ileus Group A: 1 ± 0.1 Group B: 1 ± 0.1 [No sig. diff.] Post-operative ileus Group A: 14% Group B: 9% [No sig. diff.] Major complications: Wound infection Group A: 4% Group B: 2%	Seven women were excluded because of intra-operative injury of the GI tract There were no significant differences in post-operative complications between both groups. Study results strongly suggest that early post-op dietary advancement after major abdominal surgery results in a decreased LOHS.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									[No sig. diff.] Urinary tract infection Group A: 4% Group B: 0 [No sig. diff.] Pneumonia Group A: 2% Group B: 2% [No sig. diff.]	

Table 38: Oral vs nil -- pancreatitis (non-surgical patients)

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Lange and Pedersen 1983[196]	RCT	1+	50 patients Int: n=25 Cont: n=25	Patients admitted to hospital who had clinical features of acute pancreatitis and a serum amylase level of more than 416 units per litre. Gender (F/M): Int: 9/16 Cont: 9/16 Age (Median) Int; 77 Cont: 70	Allocation within 12 hours of admission. Free clear fluid oral intake: tea, water and juice, orally without restrictions.	Allocation within 12 hours of admission. NG tube for suction. IV fluids as required.	Not specified	Duration in days of: Abdominal pain Median (range) Abdominal tenderness-Median (range) LOS Median (range) Complications Int n=25; Cont n=25 (no p value reported) :	All patients were followed up Int n= 25 Cont n=25 Int: 3 (1-9) Cont: 3 (1-15) NS Int: 4 (1-10) Cont: 4 (1-13) NS Int: 13 (4-29) Cont: 16 (3-28) NS Total comp.= 14 patients Int= 7	NG suction and IV fluids provided no advantage compared with oral intake of fluids ad libitum in the treatment of patients with mild to moderately severe pancreatitis of various cautations. The orally administered fluid, in this study contained extremely little protein and fat. It is possible that a protein-rich or fat-rich fluid, if given orally in this study, would have altered

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Cont= 7	the clinical course.
								Deaths	Int: 3 Cont: 2	
								Prolonged hyperamylasemia	Int: 5 Cont: 3	
								Pseudocysts	Int: 1 Cont: 1	
								Pancreatic abscess	Int: 0 Cont: 1	
								Relapsing pancreatitis	Int: 1 Cont: 1	

Table 39: Oral nutrition – economic analyses: characteristics of studies

Study	Comparison	Patient group	Incremental analysis	Measure of effectiveness	Cost components included	Method
Aihara et al 2003[6], Japan[6]	1) Feeding commences day 1 post-op 2) Feeding commences day 4 post-op (nil)	Patients who underwent oncological colorectal surgery (n_1=17, n_2=22)	Cost effectiveness	Complications: (vomiting, small bowel obstruction, wound infection, pneumonia, anastomic leakage)	Post operative medical costs only. Cost of nutrition was not included.	Prospective study
Arnaud-Battandier et al 2004, France[9]	1) Frequent prescription of oral nutrition supplements 2) Rare prescription of oral nutrition supplements	Elderly patients (age>70) in 90 general practices, living at home or in institutions, malnourished or at risk (MNA<23.5) (n_1=185, n_2=193)	Cost-effectiveness	MNA score	Costs to the Health insurance system: drugs, consultations, physio visits, nurse visits, lab tests, hospital admissions	Prospective cohort study (12 month follow-up) – baseline differences between populations were controlled using linear regression analysis
BAPEN 2005 (draft report), UK[91]	1) Oral nutritional supplements 2) Standard care	Mainly surgical inpatients	Cost analysis	NA	A. Cost of supplements plus costs associated with length of stay B. Cost of supplements plus costs associated with treating complications	Combined results for a number of RCTs

Study	Comparison	Patient group	Incremental analysis	Measure of effectiveness	Cost components included	Method
Edington et al 2004, UK[87]	1) Oral supplements[1] 2) Standard care	Elderly malnourished patients (n_1=51, n_2=49)	Cost-effectiveness	Quality of life[2]	Cost of prescriptions, cost of general practitioner consultations (at the surgery and at home), cost of hospital admissions and outpatient appointments	RCT with 24 weeks follow-up
Lawson et al 2003, UK[198]	1) Oral supplements[3] 2) No intervention	Adult orthopaedic patients (n_1=84, n_2=97)	Cost-effectiveness	Complication rate	Costs of hospital stay and costs of additional treatments due to medical and surgical complications	Prospective controlled study
Pang et al 2004 (unpublished submission from Abbott Laboratories), UK[265]	1) Preop Assessment, dietary advice and oral intervention mixture of fortification and/or supplements 2) No preop intervention	GI patients undergoing surgery	Cost analysis	Complications averted	Assessment, dietary advice and oral intervention dietary advice, fortification, supplements, bed days	Probabilistic sensitivity analysis using a decision analysis with data from the opinions of 12 NHS consultants
Smedley et al 2003, UK (unpublished)[325]	1) Pre- and post-operative oral supplements[4] 2) Post-operative oral supplements 3) Pre-operative oral supplements 4) No nutritional supplements	Patients undergoing elective major to moderate lower gastrointestinal surgery (n_1=32, n_2=35 n_3=41, n_4=44)	Cost-effectiveness	Average number of complications	Health services costs	RCT
Stratton 2003, UK[335]	1) Oral supplements (sip feed) 2) Standard care	Elderly (n_1=186, n_2=195)	Cost-analysis	N/A	Hospital costs[5]	RCT (Potter et al 2001a[279])
	1) Oral supplements (sip feed) 2) Standard care	Neurology (n_1=21, n_2=21)				RCT (Gariballa et al 1998[121])
	1) Oral supplements (sip feed) 2) Standard care	Orthopaedic patients (n_1=27, n_2=32)				RCT (Delmi et al 1990[79])
	1) Oral supplements (not specified) 2) Standard care	Orthopaedic patients (n_1=5, n_2=5)				RCT (Brown and Seabrook 1992[47])
	1) Oral supplements (protein, mineral and vitamins)	Hip fractured elderly patients (>60) admitted to an				RCT (Tkatch et al 1992[352])

[1] Sip feed, pudding and nutrition bar

[2] Quality of life was measured using EQ5D questionnaire included five domains (mobility, self-care, usual activities, pain/discomfort and anxiety/depression)

[3] Juice or milk based

[4] The oral nutrition supplement was Fortisip –calorie and protein drink.

[5] Hospital costs included hotel costs (£250 day), treatment costs (£80 per complication) and nutrition support (£3 day)

Study	Comparison	Patient group	Incremental analysis	Measure of effectiveness	Cost components included	Method
	2) Oral supplements (minerals and vitamin)	orthopaedic ward (n_1=33, n_2=29)				
	1) Oral supplements (sip feed) 2) Standard care	Surgical patients (n_1=20, n_2=20)				RCT (Rana et al 1992[283])
	1) Oral supplements (sip feed) 2) Standard care	Surgical patients (n_1=49, n_2=37)				RCT (Keele et al 1997[181])
	1) Oral supplements (sip feed) 2) Standard care	Surgical patients (n_1=52, n_2=49)				RCT (Beattie et al 2000[23])
	1) Oral supplements (sip feed) 2) Standard care	Surgical patients (n=100)				RCT (MacFie et al 2000[209])

Table 40: Oral nutrition – economic analyses: results

Study	Comparison	Effectiveness (per patient)	Cost (per patient)	Incremental cost-effectiveness
Aihara et al 2003[6], Japan[6]	1) Feeding commences day 1 post-op 2) Feeding commences day 4 post-op	Complications[6] 1) 29.4% 2) 18.2% [p=0.409]	Cost (median?) 1) $2028 2) $3177 **[p<0.001]** LOS (median) 1) 11 days 2) 18 days **[p<0.001]**	Since costs were expressed as median, ICER was not calculated
Arnaud-Battandier et al 2004, France[9]	1) Frequent prescription of oral nutrition supplements 2) Rare prescription of oral nutrition supplements	Adjusted MNA score at 12 months 1) 18.5 2) 17.2 **[p<0.01]** Mortality 1) 14% 2) 17%	1) 2499 euro 2) 2694 euro 1) vs 2) -195 (-929, 478)	1) dominates 2)

[6] There were no cases of pneumonia or anastomic leakage.

Study	Comparison	Effectiveness (per patient)	Cost (per patient)	Incremental cost-effectiveness
BAPEN 2005 (draft report), UK[91]	1) Oral nutritional supplements 2) Standard care	NA	Surgery patients & mixed patients 1) v 2) A) -£959 (IQR: -£1116, -£787) B) -£298 (IQR: -£363, -£217)	Supplements both reduced complications and reduced cost
Edington et al 2004, UK[87]	1) Oral supplements 2) Standard care	No significant difference in quality of life (quality of life scores and p value were not reported)	Cost of hospital admissions: 1) £3034 2) £1855, **[p=0.034]**	Intervention 2 was cost-saving (£1179)
Lawson et al 2003, UK[198]	1) Oral supplements 2) No intervention	1) 16.6% 2) 35.1%, **[p= 0.005]**	1) £30.16 2) £46.23	Intervention 1 dominated
Pang et al 2004 (unpublished submission from Abbott Laboratories), UK[265]	1) Preop Assessment, dietary advice and oral intervention mixture of fortification and/or supplements 2) No preop intervention	Not reported	1) vs 2) Between £17.25 and £42.18 depending on assumptions about % of patients on ONS, % receiving assessment	If 3 or more bed-days are averted per complication then preop oral nutritional assessment and intervention will be cost-saving
Smedley et al 2003, UK (unpublished)[325]	1) Pre- and post-operative oral supplements 2) Post-operative oral supplements 3) Pre-operative oral supplements 4) No nutritional supplements	1) 0.31 2) 0.37 3) 0.41 4) 0.68 [p values were not reported]	1) £2289 2) £2324 3) £2286 4) £2618	Interventions 1, 2 and 3 (providing oral nutrition supplements) dominated intervention 4
Stratton 2003, UK[335]	1) Oral supplements 2) Standard care	N/A	1) £48 2) £500	Intervention 1 was cost-saving (£452)
	1) Oral supplements 2) Standard care	N/A	1) £120 2) £4544	Intervention 1 was cost-saving (£4424)
	1) Oral supplements 2) Standard care	N/A	1) £222 2) £4064	Intervention 1 was cost-saving (£3842)
	1) Oral supplements 2) Standard care	N/A	1) £63 2) £6500	Intervention 1 was cost-saving (£6437)
	1) Oral supplements (protein, mineral and vitamins) 2) Oral supplements (minerals and vitamin)	N/A	1) £144 2) £8323	Intervention 1 was cost-saving (£8179)

Study	Comparison	Effectiveness (per patient)	Cost (per patient)	Incremental cost-effectiveness
	1) Oral supplements 2) Standard care	N/A	1) £33 2) £865	Intervention 1 was cost-saving (£832)
	1) Oral supplements 2) Standard care	N/A	1) £21 2) £622	Intervention 1 was cost-saving (£601)
	1) Oral supplements 2) Standard care	N/A	1) £219 2) £571	Intervention 1 was cost-saving (£352)
	1) Oral supplements 2) Standard care	N/A	1) £36 2) £756	Intervention 1 was cost-saving (£720)

Enteral tube feeding

Table 41: Enteral tube feeding vs no nutritional intervention (i.e. normal diet) and/or oral interventions

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Bastow et al 1983[20]	RCT	1++	122 patients Intervention: n=64 Comparison: n=58	'Thin' or 'very thin' elderly women from the Nottingham area admitted to hospital with fractured neck of femur, and operated upon for this injury. Nutritional status classification based on TSF with reference to the mean and standard deviation of the home and hospital patients of the anthropometric study of Vir and Love. Classifications used: Thin patients were one to two sd below the mean, Very thin patients were more than 2 sd below the mean. Patients incapable of understanding the nature of the treatment were excluded, as were those with severe dementia (score below 4 on the Camden scale) or serious comorbidities (e.g. stroke). Mean age of controls was 78 years in the thin	In addition to ward diet an overnight feed of 1 litre Clinifeed Iso (4.2 MJ (1000 Kcal) including 28g protein). Started within 5 days of operation and delivered over 8 hours each night through a fine bore (1.5mm external diameter) soft nasogastric tube using a peristaltic pump. If patient failed to tolerate tube or removed it on three consecutive occasions treatment was stopped, Tube feeding was continued until the patient was discharged from the ward or died.	Normal ward diet during the day and given free access to snacks and drinks.	Until discharge or death.	Mortality Median time (days) after operation to weight bearing with support Median time (days) after operation to independent mobility	Thin patients: Controls:4/35 Tube fed:5/39 [no p value reported] Very thin patients: Controls:5/23 Tube fed: 2/25 [p>0.1] Thin patients Controls: 6 days (range 2 to 22) Tube fed: 6 days (range 2 to 15) patients [not significant]. Very thin patients: Control: 11 days (range 4 to 29) Tube fed: 8 days (range 2 to 23) [not significant] Thin patients Controls: 12 days (range 5 to 26) Tube fed: 10 days (range 4 to 20) **[p=0.04]** Very thin patients: Control: 23 days (10 to 45 days) Tube fed: 16 days (range 5 to 34 days) **[p=0.02]**	Possible selection bias may have occurred depending on how randomisation was performed, but this does not seem to have lead to baseline differences between groups. Otherwise an excellent study. Funding: Lead investigator was supported by a grant from Roussell Labs Ltd.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				group (n = 35; range 69-89) and 82 years in the very thin group (n = 23; range 74-89). Mean age of tube fed group was 80 years in the thin group (n = 39; range 68-92) and 82 years in the very thin group (n = 25; range 70-91).				Weight change	Thin patients: Control: +1.2 kg (3.1SD) Tube fed:+2.8 kg (1.9SD) [not significant]. Very thin patients: Control: +0.7 kg (2.6SD Tube fed: +4.9 kg (2.3SD). **[p< 0.01]**	
								Change in TSF	Thin patients: Control: +1.7 mm (2.9SD) Tube fed: +2.6 mm (3.1SD) [not significant]. Very thin patients Control:+2.4 mm (3.2SD Tube fed: +4.1 mm (1.7SD). **[p<0.01]**	
								Change in MAC	Thin patients: Control: +0.7 mm (1.9SD) Tube fed: +1.0 mm (1.4SD). **[p=0.02]**. Very thin patients Control:+0.3 mm (2.1SD) Tube fed: +1.3 mm (1.1SD) **[p<0.01]**	
								Tube toleration	14/64 (22%) tube-fed patients did not tolerate the tube. Incidence of side effects was "minimal".	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Cabre et al 1990[52]	RCT	1+	35 patients Intervention: n=16 Comparison: n=19	Patients admitted to hospital with advanced liver cirrhosis. Patients with upper GI bleeding and/or hepatocarcinoma were excluded. In 12 cases liver cirrhosis was histologically proven, in rest it was based on clinical judgement. Only patients with severe protein-energy malnutrition were included. Mean age: Intervention: 48 (+/- 3 years SEM) Comparison: 53 (+/- 2 years SEM) Gender (no. males): Intervention: 6/16 Comparison: 9/19 MAMC: Intervention: 93.8% of standard (+/- 5.5SEM) Comparison: 88.4% (+/- 4.4SEM) TSF: Intervention: 31.4% (+/- 2.2SEM) Comparison: 28.8% (+/-2.0SEM).	ETF group received 2115 kcal/day as polymeric enteral, tube feed. Feed supplied 71g protein, 38 g fat, 367g carbohydrates Diet continuously infused with fine-bore nasogastric tube.	Standard low sodium hospital diet which supplied 2200 kcal per day. Patients encouraged to eat all meals served and actual intake was 'semiquantitatively assessed' by observation of food trays by a trained dietitian.	23.3 days (+/- 3 days) in the ETF group and 25.3 days (+/- 3.2 days in the controls)	Nutritional intake. Toleration of tube. TSF at end of study MAMC at end of study Poor response to diuretics Severe infection Death	Control: 1320 kcal per day (+/- 75.4) ETF: 2115 kcal/day **[p<0.0001]** 2 patients had tube withdrawn due to psych. issues. ETF: 34.4% +/- 2.6 SEM Oral:29.3% +/- 2.0 SEM. [p-value not significant] ETF: 94.2% +/- 5.0 SEM Oral: 86.2% +/- 4.5 SEM. [p-value not significant] Diuretics poor response: ETF: 6/13 Oral: 6/16 oral. [p-value not significant] Severe infection: ETF:7/16 Oral:7/19 [p-value not significant] Death: ETF:2/16 Oral:9/19 **[p=0.02]**	Non-blinded study, there may have been bias in recording of outcomes. May be some selection bias because of imbalances in baseline prognosis. Very small study. Funding: Supported by a grant given by UNIASA, Granada, Spain (this is the company that makes the enteral formula)
Hartgrink et al 1998[143]	RCT	1+ (some potential for selection	140 patients randomised Intervention: n=70	Patients with fracture of the hip, a pressure-sore risk score of 8 points or more and if informed consent	All patients received a standard hospital diet. Nasogastric tube given during surgery or within 12	Standard hospital diet	2 weeks was target. In study group	Protein intake	Mean Protein intake at 1 week: Tube fed: 66 g/day (N=54), Control:	Possible selection bias may have occurred when clinicians judged randomised patients

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
		bias and drop out rate from interven-tion arm)	Comparison: n=70 62 patients in treatment group and 67 in control group received correct interventions (8 patients in treatment group and 3 in control group were excluded from study after randomisation because of incorrect application of exclusion criteria.	obtained. Excluded were patients with pressure sores of grade 2 (i.e. with superficial or deep subcutaneous necrosis) or more at admission. Mean age was 84 years in 62 tube-fed patients (SD = 7.1) and 83.3 years in 67 controls patients (SD = 8.1). 10/62 tube-fed patients were male, compared to 6/67 controls.	hours afterwards. Actual feeding started within 24 hours of surgery. If patient removed tube it was replaced a maximum of 3 times. Feed consisted of 1500kcal/L energy, 60 gram/L protein. Feeding intended to be given for 2 weeks, and administered between 9pm and 5am every night.		patients, 62 were evaluable at admission, 54 at 1 week and 48 at 2 weeks. In control group patients, 67 were evaluable at admission, 62 at 1 week and 53 at 2 weeks.	Protein intake Energy intake Energy intake Tube tolerance Death Pressure sore risk score	36.2 g/day (N=62): **[p<0.001]** Mean Protein intake at 2 weeks: Tube fed: 61.7 g/day (N=48), Control: 40.1 g/day (N=53): **[p<0.001]** Mean energy intake at 1 week: Tube fed 1640 kcal/day (N=54), Control: 893 kcal/day (N=62): **[p<0.001]** Mean energy intake at 2nd week: Tube fed: 1532 kcal/day (N=48), Control:1020 kcal/day (N=53): **[p<0.001]** 25 patients accepted their tube for more than 1 week, and 16 patients for 2 weeks. Tube fed: n=7 patients in the tube-fed group died within 2 weeks Control: n=0 although authors state "we could not find evidence that this was due to complications associated with tube feeding". [p value not reported] No difference in pressure sore risk	inappropriate for the trial: 8/70 patients intended for tube feeding were rejected versus 3/70 controls. Possible information bias may have influenced pressure sore risk scores assigned and pressure sore grading. High number of patients that actually received tube feeding dilutes the interpretation of any findings. Funding: Nutricia corp provided tubes and feeds.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									scores observed between the two groups at baseline, 1 week or 2 weeks. [p=1.0] Tube fed:20/54 had clinically relevant pressure sores (grade 2 or more) at 1 week, Control: 30/62 [p=0.26] Tube fed: 25/48 tube-fed group had clinically relevant pressure sores (grade 2 or more) at 2 weeks, Control:30/53 [p=0.69]	
Kearns et al 1992[180]	RCT	1+ (Small RCT with some potential for bias)	31 patients Intervention: n=16 Comparison: n=15	Patients admitted for treatment of alcoholic liver disease, with serum bilirubin level of > 51umol/L and one of the following: albumin < 30g/L, prothrombin time prolonged greater than or equal to 4 seconds over control, or absence of ascites on physical examination. 21 patients excluded because of objection to length of study, refusal of tube placement, continuation of GI bleeding, elevation of serum creatinine level to > 221 umol/L and inability to give informed consent.	Enteral tube feeding delivered via nasoduodenal tube. Feed was Isocal which provided 167kJ/kg and 1.5 g/kg of ideal body weight protein. 2 gram sodium and 1500-ml fluid restrictions were imposed in the presence of peripheral edema or ascites. If appetite permitted, patients drank the feed once they had been transferred from hospital to a research unit. Patients also had regular diet.	Regular diet	28 days	Mortality Length of stay (mean) Diarrhoea	Controls: 13% at 2 weeks and 27% at 5 weeks. Tube fed: 0% in tube-fed patients at 2 weeks and 13% at 5 weeks. After 9 weeks the mortality rates are 'identical' but numbers not provided. Not significant findings but raw numbers not provided. Tube fed: 11 days in treatment group Control: 12 days in controls Tube fed: n= 5 Control: n= 6 Denominators not provided. [No p-value]	Possible information bias, bias arising from incomplete follow-up. Reporting of results somewhat biased. Funding: Supported in part by Mead Johnson Nutritional Division Inc., Evansville Indiana and by the NIH.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Mean age: Intervention: 42 (+/-3 years) Comparison: 46 (+/-3 years). Gender: Intervention: 9/16 patients were males Comparison:12/15 were males. Below the 10th percentile for MAC Intervention: 8/16 patients Comparison: 5/15 patients Below the 80% standard in TSF compared Intervention: 8/16 Comparison: 9/15				Renal insufficiency Weight loss Mean grade of encephalopathy (using 0-4 scale where higher numbers represent greater dysfunction) Nutritional intake Nutritional intake	Tube fed: n= 2 Control: n=2 Denominators not provided. [No p-value] Tube fed: 74.4 +/- 4 to 72 +/- 5 kg). (no significant loss) Control: falling from 78 +/- 3 to 72 +/- 4 kg ($P < 0.05$) [No p-value reported] Improved in tube-fed patients from 1.1 +/- 0.3 to 0.4 +/- 0.2 ($P < 0.02$). Decreased in controls (0.7 +/- 0.2 to 0.9 +/- 0.3) but stated as not significant. [No p-value reported] Tube-fed patients received "200% the calories and protein consumed by those in the control group" **[p<0.01]** Protein intake: received an average of 1.5 g/kg protein daily, compared with 0.7 g/kg in the controls **(p<0.01)** Tube-fed patients consumed 1.7 +/- 0.03 times their REE during first 2 weeks in hospital	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									compared to 0.8 +/- 0.1 times REE in controls. [No p-value reported]	
McWhirter and Pennington 1996[228]	RCT	1++	86 patients Control: n=26 Oral: n= 35 Nasogastric: n=25	Patients admitted to hospital and identified as malnourished (BMI 20 or less, or triceps skinfold thickness below 15th percentile, or midarm circumference below 15th percentile). Diagnoses were malignant disease (n=13), investigation of weight loss (n=10), neurological (n=2), respiratory disease (n=29), pneumonia (n=10) and others (n=22). Gender not provided. Mean age: Control: 74 (range 57-89) Oral: 69 (range 24-88) Nasogastric: 71 (range 40-94) Severe malnutrition was present in 8/26 controls, 11/35 oral group, 8/25 nasogastric group.	All patients had access to hospital diet. Oral supplement group received Tonexis (Clinical Nutrition Ltd) in oral supplement form. Nasogastric, enteral group received Clinifeed Favour (Clintec Nutrition Ltd) via a fine bore nasogastric tube. In both intervention groups energy requirements were defined for each patient using the Schofield equation corrected for stress and activity. Intervention feeding continued until oral intake or nutritional status had improved sufficiently or when agreement between patient and medical staff deemed it appropriate, or on discharge.	No intervention (i.e. normal hospital diet)	All patients had their nutritional status re-assessed on discharge or at the end of the feeding period. All patients fed for a minimum of 7 days. Mean length of feeding time was 8.9 days in controls, 9.7 days in oral supplement group and 11.8 in tube-fed group.	Achievement of more than 80% of estimated energy and protein requirements. Weight and mid-arm circumference (MAMC) change.	Energy req: Control: 1/26 (4%) Oral group: 25/35 (71 Nasogastric group: 22/25 (88%) [No p-values provided] Protein req: Control: 4/26 (15%) of Oral group: 32/35 (91%) Nasogastric group: 23/25 (92%) No p-values provided. Weight gain: Control: 4/26 (15%) of controls Oral group: 22/35 (63%) Nasogastric group: 17/25 (68%) **p-value of <0.001** is quoted but not test statistic provided - presumably chi-square). Mean % weight change Controls:-2.5% Oral gropu+2.9% Nasogastric group:+3.3% **p<0.001** is quoted, presumably ANOVA,	Paper states an intention to treat analysis, and that 7 patients refused nasogastric tube, 2 refused oral supplements and 3 were withdrawn. It is not clear whether patients crossed into different arms (i.e. 7 nasogastric to oral/control and 2 oral to nasogastric/control), or were excluded from the analyses. Imbalances in the numbers in each arm suggest that some patients were excluded. No attempt to control for information bias among those evaluating outcomes, or the effect of information bias on patient feeding behaviour. Biggest risk to study may come from longer treatment duration in tube-fed patients. Likely that the large effect sizes not entirely due to bias.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									but no sub-group comparisons provided. Mean % MAMC change Controls: -2.8% Oral: +1.7% Nasogastric: +2.1%. **p<0.001** is quoted, presumably ANOVA, but no sub-group comparisons provided.	No power calculations mentioned, and the tracking of patients through the trial is unclear. Funding: Clintec Nutrition Ltd
								Energy and protein intake	Control: Energy: 1250kcal per day Protein:39.5 g/day. Oral group: 1680kcal per day and 77.9 g/day Nasogastric group:1863kcal per day and 88.1 g/day No differences in contribution to total intake from normal diet were observed -- differences came from supplementation.	
								Tube toleration	7 patients 'refused to have tube passed'. 1 patient accidentally removed the tube.	
Seven et al 2003[315]	RCT		67 patients Intervention: n=34 Comparison: n=33	Patients after total laryngectomy Mean (SD) age: Intervention: 56.1 +/- 11.3 Comparison: 55.3 +/- 10.8	Fed through a tracheoesophageal puncture catheter After 7 post-operative day fed orally if pharyngocutaneous fistula had not	Clear liquid diet on first post operative day (24 hours after laryngectomy) then advanced to regular diet as tolerated.	6 months	Major post operative complications	Pharyngocutaneous fistula Intervention: 3 (9%) n=33 Comparison: 2 (6.2%) n=32 [not significant] Wound complication	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Gender (no. of males): Intervention: 31 (97%) Comparison: 29 (87%)	occurred				Intervention: 2 (6%) n=33 Comparison: 3 (9.3%) n=32 [not significant] Pneumonia Intervention: 1 (3%) n=33 Comparison: 2 (6.2%) n=32 [not significant] Wound hematoma Intervention: 0 (0%) n=33 Comparison: 1 (3%) n=32 [not significant] Chylous fistula Intervention: 1 (3.1%) n=33 Comparison: 0 (0%) n=32 [not significant] Pulmonary embolism Intervention: 0 (0%) n=33 Comparison: 1 (3%) n=32 [not significant]	
								Length of stay in patients without pharyngocutaneous fistula Length of stay in patients with pharyngocutaneous	Mean ± SD Intervention: 8.2 (±2.8) days n=30 Comparison: 7.4 (±3.2) days n=30 [not significant] Mean (range) Intervention: 29 (19 to 57) days n=3	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								fistula	Comparison: 26 (17 to 35) days n=2 [not significant]	
Shukla et al 1984[318]	RCT	1+	110 patients Int: n=67 Con: n=43	Malnourished surgical patients. These included breast cancer patients & patients with benign diseases. Excl: Patients with cardiorespiratory, neurological, hepatic & renal diseases, above 60yrs, hypertensive & with features of obstruction of the GIT.	Enteral hyperalimentation preparation: protein hydrolysate available as Providal NG has a formula of enzymatic protein hydrolysate 90g (20%); yeast extract 4.5g (1%); & carb. base 336g (75%). One bottled pack provides 1704kcal & 12g N. This solution is hyerosmolar (osmolarity 3200-3500), unpalatable & has pungent smell. Enteral hyperalimentation was given between 8am to 8pm to patients preop for 10days. A nasogastric tube was passed to lie in the stomach & a continuous drip of Providal NG at 10-20 drops/min was started. Starting with an infusion of 100ml on the 1st day the amount of infusion was increased to 450ml per day in 3-4days as enteral adaptation occurred. The nasogastric tube	Normal hospital diet	Not stated	Body weight (kg): Wound infection (%): Mortality (%): Postop hospital stay (days): Complications of enteral hyperalimentation: Nausea & vomiting (%):	At beginning: Int: 37.2 ± 5.425 Con: 40.8 ± 7.97 After 10days hyperalimentation: Int: 37.71 ± 7.686 Con: 39.24 ± 6.86 Level of change: Int: 0.485 ± 1.926* Con: -1.58 ± 1.28 * **[p<0.001]** Int: 10.45% Con: 37.2% Int: 6.0% Con: 11.7% Int: 10 ± 2.8 Con: 13 ± 3.4 There was overall improvement in morbidity & mortality in patients receiving enteral hyperalimentation. Int: 39.7 % Con: 45.7%	There were no fatal complications but in 7 patients (10.5%), enteral hyperalimentation had to be discontinued due to uncontrollable diarrhoea, vomiting & severe aversion to the smell & taste of Providal NG.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					was removed after feeding each day for some patients but in others it was left in situ for 10 days. Patients were encouraged to eat or drink. Patients received 3500 to 4000cal per day.					
Sullivan et al 1998[339]	RCT	1+ (Small RCT with some potential for bias)	18 patients Intervention: n= 8 Comparison: n= 10	Age over 64 years and an acute femoral neck or intertrochanteric fracture which required surgical intervention. Excluded if incapable of consent, sustained a pathological fracture, significant trauma to other organ systems, metastatic cancer, cirrhosis of the liver, contraindication to ETF, organ failure. Mean age: Intervention: 74.5 (+/- 2.1 Comparison:76.5 (+/- 6.1) 17/18 patients in the study were male BMI Intervention:24.1 (+/- 4.8SD Comparison: 24.1 +/- 7.8SD) before trial Weight as % of ideal was	Treatment group received standard care plus post-operative nightly enteral feedings. Nasogastric tube used to deliver protein and energy feed - 1375 cc of formula [85.8g protein, 4314 non-nitrogenous kJ (1031 kcal)] over an 11 hour period beginning at 7pm each night. Standard care involved 3 meals per day. Tube remained until at least 90% of requirements achieved via oral route or discharge.	Standard care was simply meals via oral route (no other details provided). No difference recorded between groups in terms of volitional intake.	6 months	Total nutrient intake Post-operative complications. Rate of discharge to an institution In-hospital and 6-mth mortality Status on discharge mean +/-SD	Intervention: 1845kcal, (+/-504kcal) Control: 1028 kcal, (+/-683kcal) **[p=0.012]** Intervention: 88% had post-op complication, 25% had life-threatening complications Comparison: 80% had post-op complications, and 30% had life-threatening complications. [All not significant] Intervention: 50% Comparison: 57% [Not significant] In hospital: Intervention: 0% Comparison: 30% [Not significant] 6-mth mortality Intervention: 0% Comparison: 50% **[p=0.036]**	Very small study with some potential for bias. Funding: Supported by grants from Ross Laboratories and the Department of Veterans Affairs.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Intervention:102.1% (19.8%SD) Comparison: 104.4% (32.5%SD) Weight as % of usual was Intervention: 93.9% Comparison: 99.4% (7.2%SD) Bicep skinfold: Intervention: 7.4mm (4.4mm SD) Comparison: 9.7mm (8.5mm SD)s				Length of stay mean ±SD	Mini Mental State Exam score on discharge Intervention: 19 (+/- 10) Comparison:13 (+/- 14) [Not significant] Katz Activities of Daily Living score on discharge: Intervention: 4.1 (+/- 3.7) Comparison: 5.9 (+/- 4.3) [Not significant] Total number of medications taken on discharge Intervention: 4.6 (±1.8) Comparison: 5.0 (± 2.8) [Not significant] Average length of stay: Intervention: 38.2 days (+/- 36.9) Comparison: 23.7 (± 20) [Not significant]	
Sullivan et al 2004[340] (Not the same study as Sullivan et al 1998 above)	RCT	1+	57 patients Intervention: n=27 Comparison: n=30	Elderly (over 64 years of age) hip fractured patients requiring surgical intervention Mean (SD) age: Intervention: 75.9 (+/- 7.4) Comparison: 81.7 (+/- 7.7) Gender (number of	Treatment group received standard care plus post-operative nightly enteral feedings. Nasogastric tubes used to deliver a nutritionally complete, lactose free, polymeric enteral formula	Standard care: Orthopaedic surgeons writing all diet orders for the daytime meals with the usual advancement to 3 meals each day	6 months	Total nutrient intake. % intake of calculated requirements Mortality in hospital	Intervention: 1401 (1200, 1752)-Kcal/day Comparison: 947 (709,1114)- Kcal/day **[p<0.001]** Intervention: 86 +/-28% Comparison: 63 +/-25% **[p=0.002]** Intervention: 1 (3.7%) n=27	Funding: National institute on Ageing grant. Nutritional supplements and nasogastric tubes supplied by Ross Laboratories

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				males): Intervention: 20/27 (74.1%) Comparison: 19/30 (63.3%) BMI (mean =+/-SD) Intervention: 21.9 (+/- 3.6) kg/m^2 Comparison: 22.2 (+/- 5.2) kg/m^2	(Promote, Ross Laboratories). Content per litre: 1000Kcal (4187kJ), 62.5g protein (25% of calories), 26g fat (23% calories), 130g carbohydrates (52% calories) Feeding over 11 hour period starting at 7pm				Comparison: 0 (0%) n=30 [not significant]	
								Mortality at 6 months post operatively	Intervention: 4 (14.8%) n=27 Comparison: 6 (20%) n=30 [not significant]	
								Post-operative complications.	Intervention: 18 (66.7%) n=27 Comparison: 18 (60%) n=30 [not significant]	
								Post-operative life threatening complications.	Intervention: 4 (14.8%) n=27 Comparison: 3 (10%) n=30 [not significant]	
								Rate of discharge to an institution	Intervention: 25 (92.6%) n=27 Comparison: 27 (90%) n=30 [not significant]	
								Hospital length of stay (median / IQR)	Intervention: 9 (7,21) days n=27 Comparison: 9 (7,15) days n=30 [not significant]	
								Post operative length of stay (median / IQR)	Intervention 7 (5,13) days n=27 Comparison: 7 (5,10) days n=30 [not significant]	
								No. of inadequately controlled problems on discharge	Median (IQR) Intervention: 1 (0,2) n=26 Comparison:1 (0,2)	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									n=30 [not significant]	
								No. of stable problems on discharge	Mean (+/-SD) Intervention: 6.8 (+/-3.1) n=26 Comparison: 7.7 (+/-3.3) n=30 [not significant]	
								Mini Mental State Exam score on discharge	Median (IQR) Intervention: 19 (10,26) n=26 Comparison:14 (7,21) n=30 [not significant]	
								Katz Activities of Daily Living score on discharge:	Median (IQR) Intervention: 8 (4,11) n=26 Comparison: 9 (7,11) n=30 [not significant]	
								Total number of medications taken on discharge	Mean (+/-SD) Intervention: 5.8 (+/-2.6) n=26 Comparison: 7.5 (+/-3.5) n=30 **[p=0.05]**	
van Bokhorst-De Van Der Schueren et al 2001[361]	RCT	1+	49 Patients Gp 1: n=15 Gp 2: n=17 Gp 3: n=17	Severely malnourished (weight loss >10% of body weight over the previous 6mo) head & neck cancer patients undergoing major surgery. All patients had a histological proven squamous cell carcinoma of the oral cavity, larynx, oropharynx or hypopharynx.	Gp 1: Patients received preop enteral nutrition with a specially formulated product that closely reflected the current standard of practice (standard formula). Gp 2: Patients received preop ETF in which 41% of the	Gp 3: Patients received no preop nutrition support. Patients were stimulated to continue their usual oral diet preoperatively; no additional supplements were prescribed. Postoperatively all	Follow-up time for survival was >16mo.	Baseline Weight (kg): Mean weight change after intervention (kg): Nutrition assessment:	Gp 1: 55.3 ± 8.1 Gp 2: 61.6 ± 8.5 Gp 3: 62.8 ± 8.4 Gp 1: 0.5 Gp 2: 0.7 Gp 3: -0.1 No sig. changes in nutritional status were noted between the 3 gps as a result of nutritional intervention.	Gp 1 had more women therefore the weight at baseline may have been lower because of that. But when men & women were compared there was no sig difference.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Preop weight loss (%): Gp 1: 17.1 ± 7.2 Gp 2: 12.8 ± 5.1 Gp 3: 15.4 ± 5.9 Excl: If patients were well nourished (weight loss< 10% body weight); received other investigational drugs or steroids; had renal insufficiency, hepatic failure or any genetic immune disorder or had a confirmed diagnosis of AIDS.	casein was replaced by arginine. Patients in Gp 1 & 2 were given ETF at home for 7-10days preop through a nasogastric feeding tube unless medical circumstances necessitated admission to a hospital. Gp 1 & 2 received their complete nutritional needs by enteral feeding, but were allowed to eat in addition to tube feeding if they wanted.	patients in Gps 1, 2 & 3, received tube feeding starting in the 1st postop day until an X-ray conducted to assess swallowing ability performed 10day after surgery showed no leakage from anastomoses.		Major postop complications n (%) which included fistula formation, wound & flap complications, arterial bleeding & respiratory insufficiency): Mortality as a result of postop complications: No. of patients that never resumed swallowing: Time to resumption of swallowing: Time until discharge from the hospital (days): Survival:	Gp 1: 7/15 (47%) Gp 2: 10/17 (59%) Gp 3: 9/17 (53%) [p=NS] Gp 1: 0 Gp 2: 3 Gp 3: 1 Gp 1: 5 Gp 2: 3 Gp 3: 5 No difference found, although all patients in gp 1 who did resume swallowing did so within 40days, whereas the scatter in Gps 2 & 3 was greater. Gp 1: 46 ± 30 Gp 2: 31 ± 23 Gp 3: 41 ± 32 [p=NS] No particular differences were noted between the gps, although there was a trend toward better survival for patients in Gp 2 [p=0.15].	

Table 42: Nasogastric vs nasoduodenal feeding

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Boivin and Levy 2001[34]	RCT	1+	80 patients Intervention: n=40 Comparison: n=40	Critically ill patients from a hospital's medical, surgical and neurologic ICUs All aged 18 or over, average age intervention group 48, average age control group 49	Nasogastric or orogastric feed with erythromycin	Transpyloric feed	4 day study period	Mean time to goal rate of feeding achieved and maintained for 4 hours Mean percentage of goal feeding rate achieved over the 4 day study period Mean percentage of goal feeding rate achieved per day during the 4 day study period Mean percentage of goal feeding rate achieved per day during the 4 day study period Mean percentage of goal feeding rate achieved per day during the 4 day study period Mortality	Intervention: 32 hours (n=39) Comparison: 33 hours (n=39) [not significant] No significant difference between intervention and control group. [p values not given] Nasogastric higher than nasoduodenal **[p<0.05]** for Day 1. No significant difference for days 2, 3 and 4 [p values not given] Nasogastric (n=39) vs Successful initial transpyloric tub placement (n=28) (no significant difference) for any days [p values not given] Successful (n=28) vs failed (n=11) initial transpyloric tube placement Day 1 **[p<0.01]** Day 2 **[p<0.05]** No significant difference for days 3 and 4 [p values not given] Intervention: 7 (18%) (n=39)	Study concludes that gastric feeding with erythromycin is equivalent to transpyloric feeding in meeting the nutritional goals of the critically ill

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Other outcomes: time to goal rate, change in albumin and prealbumin	Comparison: 7 (18%) (n=39) [not significant]	
Day et al 2001[77]	RCT	1+	25 patients Intervention: n=11 Comparison: n=14	Neurological disease or injury ICU patients Mean age 56.7 ± 15.3	Nasogastric feeding	Nasoduodenal feeding	10 day study period	No. of participants having aspiration pneumonia No. of participants having diarrhoea Vomiting Mean percentage of recommended daily calories intake achieved Mortality Mean daily residual volumes	Intervention: 2 (n=11) Comparison: 0 (n=14) Intervention: 5 (n=11) Comparison: 7 (n=14) [not significant] None recorded in either group Day 2: **[p=0.036]** Intervention: 48% (n=11) Comparison: 22% (n=14) Day 3 **[p=0.003]** Intervention: 79% (n=11) Comparison: 35% (n=14) No significant difference on any of the other days (i.e. days 1, 4 to 10) 3 out of 25 during study period but not stated from which arms Intervention: 0-40ml Comparison: 0-5ml [not significant]	Study concludes that neurologically injured patients fed by nasogastric and nasoduodenal routes did not differ in nutritional outcomes or complications. However, the lack of statistical difference maybe due to the small sample size. Funding: Collaborative Clinical Research Initiative sponsored by the University of California San Francisco Medical Center and the School of Nursing

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Esparza et al 2001[96]	RCT	1+	54 patients Intervention: n=27 Comparison: n=27	Medical ICU patients. Average age: Intervention group 50 ± 17 comparison group 45 ± 14	Nasogastric feed	Nasoduodenal feed (3 out of 27 patients failed to receive transpyloric tube placement, they died within 3 days)	8 day study period	No. of patients who had isotopic aspiration No. of days of aspiration out of fed-patient days Average daily percentage of goal fed Average days of feeding per patient Mortality	Intervention: 2 (7%) (n=27) Comparison: 3 (13%) (n=24) None of the patients receiving prokinetics in either group aspirated Patients receiving motility agents in gastric or duodenal group 0 out of 52 fed-patient days (0%) Patients not receiving motility agents in gastric or duodenal group 4 out of 145 fed-patient days (3%) [not significant] Intervention: 64% (n=27) Comparison: 66% (n=24) [not significant] Intervention: 4.1 days (n=27) Comparison: 3.6 days (n=24) [not significant] Intervention: 11 (41%) (n=27) Comparison: 10 (37%) (n=27) [not significant]	Study concludes that there is no difference in aspiration rates between gastrically and transpylorically fed critically ill patients Funding: Ross Products Division, Abbott Laboratories
Heyland et al 1992[149]	RCT	1+ /1-	31 Patients Nasogastric: Regular	Mainly critically ill trauma and neurosurgical patients in ICU.	Nasogastric. (Enteral Formula (peptamen) with pH 6.5 = Control)	Nasoduodenal (Enteral Formula (peptamen) with pH 6.5 = Control)	5 days	Sterility rate (no microbial growth)	Sterility Rate Nasogastric: 37.5% (n=8) Nasoduodenal: 28.6%	Study demonstrated both elimination and prevention of gastric microbial colonisation

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Feeding into the stomach (n=10) Nasoduodenal: Regular Feeding into the Duodenum (n=7) Nasogastric + acid: Acidified Feeding into stomach (n=12)	Mean Age: 40 25mL/hr increased over 24 to 48 hrs	Also: nasogastric with acidified formula (Peptamen acidified (by the addition of HCl) to a concentration of pH 3.5 in the experimental group)			Patients who were Initially colonized by micro-organisms and became sterile Gastric pH	(n=7) Nasogastric + acid: 87.5% (n=8) % Initially colonized who became sterile Nasogastric: 20% (n=5) Nasoduodenal: 20% (n=5) Nasogastric + acid: 100% (n=4) Acid vs Stom. vs Duod. **[p=0.05]** Acid vs Non-acid **[p=0.02]** Acid vs Stom. vs Duod. **[p=0.02]** Patients with pH < 3.5 Nasogastric: 12.5% (n=8) Nasoduodenal: 71.4% (n=7) Nasogastric + acid: 62.5% (n=8)	in Experimental group. A total of 8 patients were dropped from the study. Two each from the Nasogastric and Nasoduodenal group and 4 from the Experimental group. This left 23 out of the original 31 in the analysis Generally on outcomes measured the acidified feeding group did better than those on Regular feed
Heyland et al 2001[153]	RCT	1+ /1-	39 patients Intervention: n=21 Comparison: n=18 BUT High dropout rate ending with 31 patients Intervention:	Surgical ICU patients. Mean age 59.2 years, standard deviation 16.8 years	Naso- or Orogastric	Duodenal	3 day study period	No. of patients experiencing at least 1 episode of pulmonary microaspiration No. of patients experiencing gastroesophageal regurgitation	Intervention: 11 (52.4%) (n=21) Comparison: 4 (33%) (n=12) [not significant] [not significant when based on logistic regression model either] Intervention: 17 (81%) (n=21) Comparison: 12 (100%) (n=12) [not significant]	Study concludes: that feeding beyond the pylorus is associated with a significant reduction in gastroesophageal regurgitation and a trend towards less microaspiration. High dropout rate in duodenal group (6 out of the 18 randomised to that group) compared to 1 out of

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			n=21 Comparison: n=12					Episodes of gastroesophageal regurgitation based on logistic regression model No. of patients experiencing duodenogastric reflux Gastric pH also recorded as significantly higher in gastric group	Intervention: 39.8% Comparison: 24.9% adjusted odds ratio = 2.13 **[p=0.04]** Intervention: 11 (92%) (n=12)	21 randomised to the gastric group. Used a logistic regression model to compensate for the resultant uneven sample size for each group. Funding: Physicians Inc, Ontrario
Kearns et al 2000[179]	RCT	1+	44 patients Intervention: n=23 Comparison: n=21	Endotracheally intubated, mechanically ventilated patients requiring nutrition in and ICU. Average age of nasogastric 49 years, average age of small intestine group 54 years	Nasogastric	Small intestine: 5 (24%) in second part of duodenum 6 (28%) in third part of duodenum 10 (48%) in or beyond 4th part of duodenum	Study period at least 3 days until either the endotracheal tube was removed or the patient discharged from the ICU	Incidence of aspiration Incidence of ventilator associated pneumonia Mean (±SEM) no. of days with diarrhoea Mean percentage (±SEM) Resting Energy Expenditure (REE) delivered	Intervention: 3 (13 ±9) % (n=23) Comparison: 5 (24 ±14) % (n=21) [not significant] Intervention: 3 (13 ±9) % (n=23) Comparison: 4 (19 ±12) % (n=21) [not significant] Intervention: 2 (±1) days (n=23) Comparison: 3 (±1) days (n=21) [not significant] Intervention: 47 (±7) % (n=23) Comparison: 69 (±7) % (n=21) **[p<0.05**] [no significant difference in REE before study]	Study concludes there is no clear difference in the incidence of ventilator-associated pneumonia in gastric compared with small intestine enteral tube feeding.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Mean (±SEM) weight change Mortality Mean (±SEM) no. of days in ICU Mean (±SEM) no. of days in hospital Mean (±SEM) no. of days in study Mean (±SEM) intake of calories per day	Intervention: -2 (±2) kg (n=23) Comparison: -1 (±2) kg (n+21) [not significant] Intervention: 6 (26%) (n=23) Comparison: 5 (24%) (n=21) [not significant] Intervention: 16 (± 2) days Comparison: 17 (± 2) days [not significant] Intervention: 43 (± 11) days Comparison: 39 (±10) days [not significant] Intervention: 8 (±1) days Comparison: 9 (± 1) days [not significant] Intervention: 812 (±122) kcal (n=23) Comparison: 1157 (±86) kcal (n=21) **[p<0.05]**	
Kortbeek et al 1999[191]	RCT	1+	80 patients Intervention: n=43 Comparison: n=37	Adult ventilated ICU trauma patients Mean age of gastric group 34.7 years, Mean age of duodenal group 33.6 years	Naso- or orogastric	Naso- or oroduodenal	not stated	Incidence of pneumonia Time to tolerate full	Intervention: 18 (43%) (n=43) Comparison: 10 (27%) (n=37) [not significant] Intervention: 43.8 ±22.6	Study concludes that the length of stay and ventilator days are not significantly different. A larger trial would be required to determine differences in the

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								strength feeds	hours (n=43) Comparison: 34 ±7.1 hours (n=37) **[p=0.02]**	rates of pneumonia. Funding: Research and Development Committee, Centre for Advancement of Health, Calgary Regional Health Authority
								Median (range) no. of days in ICU	Intervention: 7 (3 to 32) days (n=43) Comparison: 10 (3 to 24) days (n=37) [not significant]	
								Median (range) no. of days in hospital	Intervention: 25 (9 to 88) days (n=43) Comparison: 30 (16 to 47) days (n=37) [not significant]	
								Median (range) no. of days on ventilation	Intervention: 5 (3 to 15) days (n=43) Comparison: 9 (2 to 13) days (n=37) [not significant]	
								Mortality	Intervention: 3 (7.0%) (n=43) Comparison: 4 (10.8%) (n=37) [not significant]	
Ledeboer et al 1998[200]	RCT	1+	6 patients (each participant received the intervention and the control in a randomly assigned order with an interval of >=7 days) Intervention: n=6 Comparison: n=6	Healthy subjects (18 - 27 yrs old) with no history of GI disease, gallstones or surgery and not on any medication	Nasogastric	Nasoduodenal	6 day study period	Outcomes reported: Gallbladder volume, small-bowel transit time, hormone release		Study concluded that intraduodenal feeding produced an accelerated small-bowel transit time, more rapid and stronger gallbladder contractions and increased cholecystokinin and pancreatic polypeptide release than intragastric feeding. This study is

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
										conducted on healthy patients, is this generalisable to the guideline? Also, none of the main outcomes of interest are recorded. The sample size is very small. Funding: Nutricia Research Foundation
Neumann and DeLegge 2002[247]	RCT	1+	60 patients Intervention: n=30 Comparison: n=30	Medical ICU patients aged 16-88. Mean age of Intervention group: 58.1 Mean age of Comparison group: 59.6	Nasogastric	Nasal-small-bowel	Duration of enteral feeding, until patient left ICU or a maximum of 4 days	Incidence of aspiration Mean (standard deviation) no. of hours to reach goal rate of feed from successful tube placement Mean no. of attempts at inserting feeding tube Incidence of residuals Mean no. of days to ending of study No significant difference found for	Intervention: 0 (n=30) Comparison: 1 (3.3%) (n=30) [not significant] Intervention: 17.0 (±11.9) hours (n=28) Comparison: 17.3 (±15.7) hours (n=26) [not significant] Intervention: 1.1 (±0.3) (n=30) Comparison: 1.9 (±0.7) (n=30) **[p<0.001]** Intervention: 4 (13.3%) (n=30) Comparison: 6 (20%) (n=30) [not significant] Intervention: 6.5 (±4.4) days (n=30) Comparison: 5.3 (±4.5) days (n=30) [not significant]	Study concludes gastric feeding demonstrates no increase in aspiration or other adverse outcomes compared to small bowel feeding. Gastric feeding can be started and advanced to goal sooner with fewer placement attempts than small-bowel feeding.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								adverse outcomes including vomiting		
Strong et al 1992[338]	RCT	1+	33 patients Intervention: n=17 Comparison: n=16	Malnourished, hospitalised patients needing a minimum of 3 days enteral feeding	Nasogastric	Postpyloric (beyond second portion of the duodenum)	At least 3 days until desired nutritional endpoint was reached	Incidence of radiographic aspiration pneumonia Mean (SEM) no. of days taken to achieve desired Kcal Mean (SEM) weight change in kilograms Mean (SEM) no. of days of enteral feeding Mean (SEM) no. of bowel movements per patient Clinical aspiration symptom scores also reported	Intervention: 5 (n=17) ND: 6 (n=16) [not significant] Intervention: 3.3 (3.34) days (n=12) Comparison: 2.77 (1.96) days (n=13) [not significant] Intervention: 0.517 (1.85) kg (n=12) Comparison: -1.88 (3.14) kg (n=9) **[p=0.041]** Intervention: 11.4 (3.83) days (n=17) Comparison: 9.6 (3.81) days (n=15) [not significant] Intervention: 1.04 (0.84) (n=15) Comparison: 1.72 (1.25) (n=13) [not significant]	Study concludes that there is no significant difference in complications for gastric or postpyloric fed patients A significant weight gain is shown in the nasogastric group compared to the postpyloric group but only 21 of the 38 patients in the study had their weight change reported.
Davies et al 2002[76]	RCT	1+ /1++	73 Intensive care patients Intervention: n=39 Comparison: n=34	Intensive care patients expected to require nutritional support for at least 3 days. Mean age: Intervention: 54 Comparison: 56	Naso gastric tube inserted. Enteral feed was an isomolar feed and commenced once position confirmed, administered	Naso jejunal tube inserted (nasogastric tube also inserted to measure gastric residual vols) Enteral feed was an	Until start of oral nutrition or discharged from intensive care	New onset pneumonia Diarrhoea	Intervention: 1 (3%) Comparison: 2 (6%) [p=0.60] Intervention: 3 (9%) Comparison: 4 (13%) [p=0.70]	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Data reported Intervention n=35 Comparison: n=31	% of males: Intervention: 62% Comparison: 77%	continuously at 20ml/hr and increased 20ml every 4 hours.	isomolar feed and commenced once position confirmed. Administered continuously at 20ml/hr and increased 20ml every 4 hours.		No. who met criteria for intolerance of enteral tube feeding Time to reach target nutrition in hours (mean ± SE) Duration of enteral tube feeding in days (mean ± SE) Patients with gastric residual vol >150ml in first 48 hours New onset systemic inflammatory response Severe sepsis Septic shock Gastrointestinal bleed ICU mortality rate	Intervention: 11 (31%) Comparison: 4 (13%) [p=0.09] Intervention: 23 (3.4) Comparison: 23.2 (3.9) [p=0.60] Intervention: 8.6 (1.2) Comparison: 8.2 (1.1) [p=0.82] Intervention: 26 (74%) Comparison: 10 (32%) **[p=0.001]** Intervention: 7 (20%) Comparison: 2 (6%) [p=0.16] Intervention: 10 (29%) Comparison: 3 (10%) [p=0.07] Intervention: 1 (3%) Comparison: 1 (3%) [p=1.0] Intervention: 0 (0%) Comparison: 3 (10%) [p=0.10] Intervention: 5 (13%) Comparison: 4 (11%) [p=0.58]	
Gowardman et al 2003[134]	RCT	1+	43 patients Intervention:	Mechanically ventilated patients in a multidisciplinary ICU	Continuous gastric feed 24 hours per day (not stated	Continuous jejunal feed 24 hours per day (not stated	12 days	Mortality	7 out of 41 (17%) not stated from which arms of trial	Insignificant p values were reported in the paper as "not

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			n=12 Comparison: n=14 3rd arm to this study: intermittent gastric feed (16 hours per day) (n=15) not recorded here	comprising trauma, burns, acute medical and surgical cases, and elective postoperative cases. Median age: Intervention: 30 Comparison: 32 Males:Females Intervention: 7:5 Comparison: 10:4	whether naso-, oro- or percutaneous route of entry)	whether naso-, oro- or percutaneous route of entry)		Percentage of daily predicted calorie intake Median daily calorie intake Median days ventilated Median gastric aspiration volume Median daily gastric pH at 06.00 hours	Intervention: 53% per day (n=12) Comparison: 63% per day (n=14) [p value not reported] Intervention: 1173 (420-1640) calories (n=12) Comparison: 1,461 (427-2265) calories (n=14) Intervention: 14 days (n=12) Comparison: 10 days (n=14) [not significant] Intervention: 751 ml/day (n=12) Comparison: 540 ml/day (n=14) [not significant] Intervention: 5.0 (n=12) Comparison: 3.2 (n=14) [not significant]	significant". These applied to all 3 arms of the study. Funding: Waikato Medical Research Foundation
Montecalvo et al 1992[235]	RCT	1+	38 ICU patients (at least 3 days of tube feeding anticipated, some had received PN) Intervention: n=19 Comparison: n=19	Intervention: n =19 (68% male) Ideal body weight at Rx, (mean and SD) n=16 118.6 ± 30.5 Comparison: n=19 (53% female) Ideal body weight at Rx, (mean and SD) n=19	NG/ORO gastric n =19 Isomolar enteral feed (new trition Isofibre) Started at 25ml/hr x 24 hours and then increased 25ml/hr/day until protein and caloric requirements met.	NJ /ORO jejunal n=19 Isomolar enteral feed (new trition Isofibre) Started at 25ml/hr x 24 hours and then increased 25ml/hr/day until protein and caloric requirements met.	Patients followed for 72 hours post feeding or a maximum of 6 weeks if still having enteral feeds	Tube feeding days (mean, sd) Kcals/day (mean, sd) Daily goal caloric intake (%)	Intervention: 10.3 ±10.0 (n=19) Comparison: 10.4 ±7.3 (n=19) Intervention: 1182 ±603 (n=19) Comparison: 1466 ±398 (n=19) Intervention: 46.9 ± 25.9 (n=19) Comparison: 61 ± 17 (n=19)	% daily goal caloric intake is the only outcome that differs significantly between the groups and although not reported in this table, there was significant difference in change pre-albumin for the jejunally fed group. Concern about the process of

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				107.3. ± 21.9					**[p=<0.05]**	randomisation since 69 initially considered eligible and also seems that an ITT analysis was not done. Only significant p values were reported.
								No. Times tube clogged	Intervention: 5 (n=19) Comparison: 4 (n=19)	
								No. Patients with tube replaced	Intervention: 6 (31.6%) (n=19) Comparison: 2 (10.5%) (n=19)	
								No. Patients with diarrhoea	Intervention: 9 (47.4%) (n=19) Comparison: 12 (63.2%) (n=19)	
								No. Patients with vomiting	Intervention: 3 (15.8%) (n=19) Comparison: 3 (15.8%) (n=19)	
								No. times residuals > 250ml	Intervention: 3 (n=19) NJ: 0 (n=19)	
								Gastrointestinal bleeding	Intervention: 6 (31.6%) (n=19) Comparison: 7 (36.8%) (n=19)	
								Definite pneumonia (%)	Intervention: 10% (n=19) Comparison: 0% (n=19) [not significant]	
Montejo et al 2002[236]	RCT	1+	Recruitment from 11 ICU in teaching hospitals 101 patients Intervention: n=51	Eligibility for study entry = anticipated need for >5 days enteral tube feeding in ICU Intervention n=51 69% male Age (mean, sd) 59 ±18 APACHE II score	Nasogastric tube placed at admission to ICU (n=51)	Nasojejunal tube placed within 36 hours of admission to ICU (n= 50)	28 days or until discharge from ICU	Nosocomial pneumonia	Intervention: 20 (40%) Comparison: 16 (32%) [p=0.40]	Patients who were NG had significantly less vomiting and lower multiple organ dysfunction scores at discharge compared to the patients fed NJ. However patients who were NJ fed had a
								Mortality	Intervention: 22 (43%) Comparison: 19 (38%) [p=0.60]	
								Length of stay (ICU) (mean ± SD) in days	Intervention: 18± 16 Comparison: 15 ± 10	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Comparison: n=50	(mean, sd) 19 ± 7 **[p=0.05]** Comparison: n=50 72% male Age (mean, sd) 57 ±17 APACHE II score (mean, sd) 19 ± 7 **[p=0.05]**				Multiple organ dysfunction score at discharge Duration in days of enteral tube feeding Complications: Abdominal distension Vomiting Diarrhoea Constipation High Gastric residuals No of patients with one of the above 5 complications Difference between planned and administered calories (mean ± SD) Reasons for	[p=0.20] Intervention: 4.2±3.8 (n=43) Comparison: 4.9 ± 3.9 (n=43): [p=0.60] Intervention: 12±10 Comparison:11± 8 [p=0.60] Intervention: 4 (8%) Comparison: 5 (10%) [p=0.70] Intervention: 2 (4%) Comparison: 4 (8%) [p=0.40] Intervention: 7 (14%) Comparison: 7 (14%) [p=0.97] Intervention: 3 (6%) Comparison: 2 (4%) [p=1.0] Intervention: 25 (49%) Comparison: 1 (2%) **[p=<0.001]** Intervention: 29 (57%) Comparison: 12 (24%) **[p=<0.001]** Intervention: 223 ± 173 Comparison: 211 ± 183 [p=0.70] Intervention: 14 (28%)	significantly shorter length of ICU stay, less incidence of nosocomial pneumonia, fewer incidences of high gastric residuals and fewer overall complications. It would appear that the patients fed NJ did better. Although the overall sample size is underpowered. A fairly well conducted study with apparent ITT. p values not given for Reasons for withdrawal

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								withdrawal: ICU discharge Oral ETF complications Tube complications Terminal illness Death	Comparison: 6 (12%) Intervention: 14 (28%) Comparison: 18 (36%) Intervention: 3 (6%) Comparison: 1 (2%) Intervention: 0 Comparison: 9 (18%) Intervention: 1 (2%) Comparison: 1 (2%) Intervention: 17 (33%) Comparison: 15 (30%)	

Table 43: Nasogastric feeding vs percutaneous endoscopic gastrostomy (PEG)

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Baeten and Hoefnagels 1992[15]	RCT	1-	90 patients Intervention: n=46 Comparison: n=44	In-patients with Neurological, ENT and Surgical problems. 56 men and 34 women. Mean Age: 72.2	Nasogastric	Percutaneous Endoscopic Gastrostomy	Not reported	Mean time on enteral tube feeding Failure rate of enteral feeding Time needed for tube insertion (not reported for all patients)	Intervention: 14.4 (±16.6) days Comparison: 21.6 (±22.4) days [p value not reported] Intervention: 12 (26%) Comparison: 3 (7%) [p value not reported] Intervention: 8.4 ± 6.2min (n=26) Comparison: 11.4 ± 5.6min (n=41) [p value not reported]	The difference in death rates could not be explained. Autopsy showed bronchopneumonia in 2 patients from each group. There was no suspicion of a method-related cause of death. Complications led to the termination of NG feed in 8 patients. Six switched to PEG feed

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Complications: Aspiration Mortality Fixation of tube to patient (to prevent removal of tube) Clotting Abdominal Pain Abdominal Bleeding Convenience of care score: NURSES: 1=very convenient to 5=very inconvenient PATIENTS: 1 = very good to 5 = very bad	Intervention: 3 (7%) (n=46) Comparison: 3 (7%) (n=44) [p value not reported] Intervention: 5 (n=46) Comparison: 13 (n=44) [p value not reported] Intervention: 10 (22%) (n=46) Comparison: 3 (7%) (n=44) [p value not reported] Intervention: 7 (15%) (n=46) Comparison: 7 (16%) (n=44) [p value not reported] Comparison: 5 (11%) (n=44) Comparison: 1 (2%) (n=44) Intervention: 2.6 (n=30) Comparison: 2.0 (n=38) [p value not reported] Intervention: 2.3 (n=21) Comparison: 1.8 (n=22) [p value not reported]	without further complications. Cost of both methods was almost equal So far, there is a preference both by patients and nurses for PEG. With Minor complications PEG seemed to score better. However with severe complications PEG is more dangerous than NG tube. There a possibility of Allocation Bias, with more ill patients selected for PEG, this could serve to explain the number of deaths in this group. No ITT analysis This study reports "this is a preliminary report and the study has not yet been finished". Have not found any other report for this study.
Norton et al 1996[251]	RCT	1+	30 patients Intervention: n=14	Patients with persisting dysphagia persisting for greater then 8 days after stroke.	Nasogastric tube feed	Percutaneous Endoscopic Gastrostomy	6 weeks	Six week mortality	Intervention: 8 (57%) (n=14) Comparison: 2 (12.5%) (n=16)	NG patients received a significantly smaller proportion of the prescribed feed.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Comparison: n=16	Mean age: 77 Rate of Delivery of feed: 50ml/hr x 24hrs gradually increasing to 100ml/hr for both groups. Enteral Feed Given: Nutrison				Treatment failure (defined as failure to site tube or recurrent displacement of tube in patients in whom it was thought inappropriate to persevere with treatment) Mean percentage of prescribed feed received Weight change (percentage who gained weight) Length of Hospital stay (% Discharged after 6 weeks)	**[p<0.05]** Intervention: 3 (21.4%) Comparison: 0 (0%) [No p value given but reported as not significant] Intervention: 78% Comparison: 100% **[p<0.05]** Intervention: 1 (12%) (n=8) Comparison: 10 (77%) (n=13) **[p<0.03]** Intervention: 0% Comparison: 37.5% **[p<0.05]**	Tube insertion was much easier and there were fewer attempts with the PEG group Clear preference for early gastrostomy as the choice for nutritional treatment for patients with acute dysphagic stroke. Study demonstrated fewer complications and much better tolerance as well as greater improvement on those with PEG.
Park et al 1992[267]	RCT	1-	40 patients Intervention: n=20 Comparison n=20	Neurological patients with dysphagia ≥4weeks duration. Mean Age (Intervention): 65 Mean Age (Comparison): 56 50ml/hr x 24hrs increased in 2 stages up to 100ml/hr by day 3. Liquid Diet: Ensure used for both groups (except 1 patient in PEG = Peptamen)	Nasogastric tube feed	Percutaneous Endoscopic Gastrostomy	28 days for study period. Median (range) follow-up 184 (30-390) days	No. of patients where treatment failed at 28 days Mean (standard error) percent of prescribed feed received Mortality (both died after randomisation but before intubation) Complications:	Intervention: 18 (95% 9) (n=19) Comparison: 0 (0%) (n=19) [p value not reported] Intervention: 55% (4%) (n=17) Comparison: 93% (2%) (n=19) **[p<0.001]** Intervention 1 (n=20) Comparison 1 (n=20) [p value not reported]	One patient in each group died after randomisation but before intubation and feeding was started. No other mortality reported. Patients given routine antibiotic prophylaxis an hour before procedure The single patient who completed the NG tube feed opted for PEG after the study.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Patients allowed to drink clear fluids during the day				Incidence of aspiration pneumonia Incidence of wound infection Mean (SE) weight gain after 1 week (after 1 week groups too small to make statistical comparison) Mean (SE) no. of days feeding Percent of patients completing 28 days of feeding	Intervention: 0 (0%) (n=17) Comparison: 2 (10.5%) (n=19) [p value not reported] Intervention: 0 (0%) (n=17) Comparison: 1 (5.2%) (n=19) [p value not reported] Intervention: 0.6 (0.1) kg Comparison: 1.4 (0.5) kg **[p< 0.05]** Intervention: 5.2 (1.5) days Comparison: 28 days [p value not reported] Intervention: 5.3% Comparison: 100% [p value not reported]	Patients who had treatment failure on NG opted for PEG which was successful Statistic analysis after the first week was impossible because of the small numbers in the NG group. The results of the study not really valid as most people crossed over to the other arm less than halfway through the study Funding: Scottish Motor Neurone Disease Association; Bard Ltd (tube supply)
Food Trial Collaboration 2005[343]	Multi-centre internat-ional RCT	1++	321 patients (47 hospitals in 11 countries) Intervention: n=159 Comparison: n=162	Mostly patients suffering from dysphagia following acute stroke. Patients were allocated to PEG or NG tubes within 3 days of enrolment. If during the first 30 days of admission the clinician was uncertain whether to insert a PEG or NG (or to continue with an existing NG) patients was enrolled in this group.	Nasogastric tube feed	Percutaneous Endoscopic Gastrostomy		Primary outcomes: Death Modified Rankin Scale (MRS) at 6months	PEG: Death: 79(48.8%) Alive with poor outcomes: 65(40.1%) Good outcomes: 18(11.1%) NG: Death: 76(47.8%) Alive with poor outcomes: 53(33.3%) Good outcomes: 30(18.9%) PEG feeding associated with:	Patients in both arms were kept nil by mouth whilst team felt it was necessary but could be fed orally instead of/in addition to tube feeding if their swallowing abilities improved. Of the 159 patients allocated NG, 137 received NG including 44 who later swapped to a PEG. 9 received neither and 13

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Absolute increase in risk of death:1.0% (-10.0 to 11.9, [p=0.9]) Increased risk of death or poor outcome: 7.8% (0.0 to 15.5, **[p=0.05]**) NG: 3 out of 76 deaths were attributed to treatment PEG: 8 out of 79 deaths were attributed to treatment GI haemorrhage: NG: 18 PEG: 5 **[p=0.005]** Not all these occurred when the tube was in place Pressure Sores: NG: 4 PEG: 12 **[p=0.04]**	received PEG tubes (this last group being the only strict 'cross-overs'. Of the 162 patients allocated PEG, 78 received PEG within 3 days and 115 received a PEG tube prior to any NG. 21 received neither. 17 received a. NG tube then a PEG and 9 received feed via NG tube only. Only these last 2 groups are strictly 'cross-overs'. Results do not therefore support the policy of early initiation of PEG feeding in dysphagic stroke patients. Complications need to be interpreted with caution as allocation to treatment was not masked and also it not feasible for local source data to be verified for the occurrence of complications.

Table 44: Continuous feeding vs bolus feeding

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Beau and Labat 1994[24]	RCT	1+	12 patients Intervention: n=6 Comparison: n=6 ETF via gastric route	Neurological patients with severe swallowing disorders	Continuous feeding: 23hrs/day polymeric diet. Infusion rate: 5.56kJ/min	Bolus feeding: 3 x 500ml/day	7 days	Biochemical		ETF well tolerated in both groups. Significant reduction in total serum cholesterol in Continuous feeding as opposed to those on Bolus feed.
Campbell et al 1983[54]	RCT	1+	10 patients Intervention: n=5 Comparison: n=5 Both groups fed via NG route	Male patients undergoing major surgery for Squamous Cell Carcinoma of buccopharynx and Larynx	Continuous feeding: 24 hrs/day	Bolus feeding Feed similar in content to intervention group	5 days	Oxygen consumption (ml/min) Biochemical Energy levels Complications included: Abdominal discomfort	[No p-values given]	Those on bolus feed appeared to have healthier outcomes i.e. lower resting oxygen consumption & better cumulative nitrogen balance than those on Continuous feed. Funding: Roussel Laboratories Ltd
Ciocon et al 1992[66]	RCT	1+	60 patients Intervention: n=30 Comparison: n=30	Mean age: 72±9 Prescribed ETF feed via NG tubes because of difficulty in swallowing	Continuous feeding: isotonic formula (Time period not stated)	Bolus feeding: isotonic formula	7 days	Diarrhoea Clogged tubes Aspiration Pneumonia Self extubation	Diarrhoea: 96% affected in Bolus group and 66% in Continuous group. Also more prolonged in the Bolus group. Clogged tubes: 3 times more in the Continuous group (X2 [1, n=60] =6.07, **[p=0. 01]** Aspiration pneumonia and self extubation: Were more frequent in the Bolus group though difference was insignificant	The Continuous method of NG feeding caused less Diarrhoeal complications but more clogged tubes. ETF intake achieved for both groups were similar despite the time lag that occurred due to cleansing of clogged tubes.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Staff time Used	Staff time Used: No significant difference between the groups	
Heymsfield et al 1987[154]	Double crossover RCT		4 patients Intervention: n=2 Comparison: n=2	Healthy adults Age: 21-52	Continuous nasogastric feed 24 hours per day	Bolus feed: 3 times per day over a 30 to 40 minute period at 9am, 2pm & 7pm	1 month	Mean (standard deviation) change in body weight Thermic effect of food	Intervention: -20 +/- 9g/day (n=8 (4x2)) Comparison: 50 +/- 15 g/day (n=8 (4x2)) [Not significant]	Each patient received 2 continuous feeding protocols and 2 bolus feeding protocols. The overall results for the 4 participants were recorded for 8 continuous feeds and 8 bolus feeds
Kocan and Hickisch 1996[188]	RCT	1-	34 patients Intervention: n=17 Comparison: n=17	Neurosurgical ICU adults	Continuous gastric feed 24 hours per day	Bolus feed: 1 hour every 4 hours	10 days	Mean stools per day Mean stool consistency rate (no attempt to control for types of medication) Mean number of days taken to reach nutritional goal Mean weight loss over study period	Intervention: 1.56 stools/day (n=17) Comparison: 1.48 stools/day (n=17) [Not significant] Intervention: 3.69 (n=17) Comparison: 3.97 (n=17) [Not significant] Intervention: 4.18 days (n=17) Comparison: 5.20 days (n=17) [Not significant] Intervention: 1.21kg (n=17) Comparison: 1.68kg (n=17 [Not significant]	17 patients (7 continuous group, 10 in bolus group) lost to follow up.
Lee and Auyeung 2003[201]	RCT	1-	105 patients	Mean age: continuous group: 81.3	Continuous feeding: (1 –2 ml/min x 16hrs	Bolus feeding: 6 x 250ml/day	3 days (extended to	Diarrhoea	Diarrhoea scores: BL, D3, D5	No significant difference was found

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Intervention: n=53 Comparison: n=52	bolus group: 82.8 Elderly patients who had developed Diarrhoea while on Bolus tube feed previously	/day)	(10ml/min)	5 in some cases)	Volume Consistency Anti-Diarrhoea drug use	Baseline Score: Intervention: 12(4 -33) n=37 Comparison: 10(3 – 40) n=37 [p=0.175] Day 3: Intervention: 4(0 – 29) n=37 Comparison: 6(0 - 27) n=37 [p = 0.230] Day 5: Intervention: 5(0 – 19) n=28 Comparison: 4(0 – 23) n=20 [p= 0.833] N/A N/A N/A	in the Diarrhoea (median) scores for both groups. Clostridium difficile associated with tube feeding accounted for 14% of the Diarrhoea in this study. Their results where however excluded from the final analysis No Intention To Treat Analysis was documented. Funding: Hong Kong Geriatrics Society
Pichard and Roulet 1984[276]	RCT	1+	31 patients Intervention: n=16 Comparison: n=15	Mean age: 54.8±9.7 Patients with bucco-pharyngeal cancer necessitating the need for NG tube feeding	Continuous feeding: graded from 20ml/hr (6hrs post-op) to 2/3rds of total daily volume to full volume over 3 days. 8400 – 12600kJ depending on patients weight	Bolus feeding: 5 x 1250ml/day (36hrs post-op) increased to 2000ml (72 hrs post-op) 9660k/J/day depending on patient tolerance	≥10days	Anthropometric parameters (Weight& left arm muscle circumference (AMC)) Biochemical	Weight: Intervention: Gained 1.8±0.2kg **[p<0.01]** Comparison: Lost 2.3± 0.2kg **[p<0.01]** AMC: Intervention: Increased by 1.8±0.2cm **[p<0.01]** Comparison: Decreased by 0.7±0.1cm [p not significant]	Better tolerance was reported in those on Continuous feed, allowing appropriate protein & calorie intake. The absence of gastric discomfort was attributed to continuous buffering of gastric acid by diet which obviated the need for antacid drugs which were required in the bolus group.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Steevens et al 2002[332]	RCT	1+	18 Patients Intervention: n=9 Comparison: n=9 Route=NG feed	Head injury trauma patients with Injury Severity Score≥20. Age: 18-70 No feeding was done intraduodenal or intrajejunally	Continuous feeding: 25ml/h increased by 25ml/12hrly until patient's goal was attained	Bolus feeding: 125ml/4hrly (for 15mins) and increased to 125ml/12hrly until goal volume attained	7days	Interruption in ETF delivery Diarrhoea Aspiration Biochemical Nurses Preference	Interruption of feed: Continuous: 33% Bolus: 55% Diarrhoea: Intervention: 22% (for 6/49 days) Comparison: 55% (for 14/65 days) [No p-values given] Aspiration: Intervention: None Comparison: 11.1% [No p-values given] Nurses (n=25): 84% preferred continuous feed as opposed to 12% who preferred bolus feed	Study demonstrated better patient tolerance with continuous feed and thus higher nutrient intake. Interruption of feed was largely due to elevated residual volume and emesis. Nurses associated Bolus feeding with increased nursing time/patient and higher rates of tube clogging as compared to continuous feeding.
Serpa et al 2003[314]	RCT	1+	28 Patients Intervention: n=14 Comparison: n=14	Critically ill patients, males and females, aged 18-80 who were unable to ingest an oral diet, but who had conserved GI function	Continuous feeding: daily desired amount was offered continuously for 24hrs. All patients received a complete, polymeric, immune stimulating commercial preparation (1.0kcal/mL, 56g protein/mL), via NG Dobhoff tube (10 French) & electronic infusion pump.	Intermittent feeding: total daily feeding period was also 24hrs, 8 aliquots were administered over a 1hr period each at intervals of 3hrs (1hr infusion period followed by a 2hr standby period). All patients received a complete, polymeric, immune stimulating commercial preparation (1.0kcal/mL, 56g protein/mL), via NG Dobhoff tube (10 French) & electronic	Over 3 day period	High gastric residue, pulmonary aspiration, abdominal distension, nausea, vomiting, diarrhoea, tube obstruction and tube displacement.	For all complications: Intervention: [not significant] Comparison: [not significant]	There were discrepancies between the prescribed and administered diet with the diet volume (mL/24hr) – Prescribed day 1 diet volume: Continuous: 800 Intermittent: 800 Administered day 1 diet volume: Continuous: 614 ± 169 Intermittent: 766 ± 55 P<0.05

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
						infusion pump.				

Table 45: Continuous (16 or 18 hours) feeding vs continuous (24 hours) feeding

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Bonten et al 1996[35]	RCT	1+	60 patients Intervention: n=30 Comparison: n=30	Mechanically ventilated patients from 2 mixed ICUs and one cardiosurgical ICU Median age: continuous: 65 intermittent: 68	Continuous nasogastric feed 24 hours per day	Intermittent nasogastric feed 18 hours per day, 08.00 to 0200	14 days	Mortality during study Mortality during ICU stay after study Incidence of ventilator associated pneumonia (VAP): Before study During study After study Intragastric pH Other outcomes: acquired colonization	Intervention: 2 (n=30) Comparison: 7 (n=30) [p=0.06] Intervention: 4 (n=30) Comparison: 2 (n=30) [Not significant] Intervention:3 (n=30) Comparison: 2 (n=30) Intervention: 3 (n=30) Comparison: 5 (n=30) Intervention: 2 (n=30) Comparison: 0 (n=30) [Not significant] In both study groups intragastric pH was not different before and after institution of enteral feeding.	
Campbell et al 1990[55]	RCT	1+	18 patients Intervention: n=9 Comparison: n=9	Patients with major head and neck surgery. Both groups fed with Clinifeed-iso via NG tube. Day 1 = 4.7MJ Day 2-5 = 10MJ/day [4.18kJ/mL]	Continuous feeding: 25ml/h with increments of 25ml x 24hrs. Followed by 100ml/h from day 2	Night feeding: 5pm to 9am. 25ml/h with increments of 25ml x 16hrs. Followed by 150ml/h from day 2. Clear fluids allowed during the day	5 days	Biochemical outcomes recorded: oxygen consumption, urinary nitrogen & catecholamines		The study suggests that 24hour post-op feeding is associated with higher oxygen consumption, less energy efficiency but better nitrogen balance as opposed to night feeding only. Funding: Roussel Laboratories Ltd

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Gowardman et al 2003[134]	RCT	1+	43 patients Intervention: n=12 Comparison: n=15 3rd arm to this study -- continuous jejunal feeding for 24 hours per day: n=14 -- not recorded here	Mechanically ventilated patients in a multidisciplinary ICU	Continuous gastric feed 24 hours per day	Intermittent gastric 16 hours per day, 06.00-22.00	12 days	Mortality Median daily calorie intake Median days ventilated Median gastric aspiration volume Median daily gastric pH at 06.00 hours	7 out of 41 (17%) not stated from which arms of trial Intervention: 1173 (420-1640) calories (n=12) Comparison: 553 (167-2,918) calories (n=15) Intervention: 14 days (n=12) Comparison: 11 days (n=15) Intervention: 751 ml/day (n=12) Comparison: 866 ml/day (n=15) Intervention: 5.0 (n=12) Comparison: 4.0 (n=15)	Funding: Waikato Medical Research Foundation
Skiest et al 1996[323]	RCT	1-	16 patients Intervention: n=7 Comparison: n=9	Critically ill patients receiving mechanical ventilation. Mean age: cont feed: 76 intermittent feed: 67	Continuous feeding: 24hrs at constant rate	Intermittent feeding: 16 hrs continuous. Hourly rate increased on day2 to 150% of continuous group so as to equalise the number of calories received by each group	5 days	Gastric pH Rate of gastric colonisation		Study demonstrated lower a.m. gastric pH and lower rates of colonisation with Intermittent feeding.
van Berge Henegouwen et al 1997[360]	RCT	1+	57 patients Intervention: n=30 Comparison: n=27	Patients who had undergone Major Gastro-intestinal surgery (Pylorus-preserving pancreatoduodenectomy) Age: 37-78 (median	Continuous feed: Nutrison enteral nutrition 1500kCal(6300kJ)/24hrs from day4 onwards	Cyclic feed: Nutrison enteral nutrition. 1125kCal(4725kJ)/18hrs (feed was stopped for 6hrs at night) Both groups received an equal		Days of NG intubation First day when normal diet was tolerated orally	NG Intubation: Continuous: 9.1 days Intermittent: 6.7 days [p=0.82] Orally Tolerated Diet: Continuous: 15.7days Intermittent: 12.2 days **[p=0.04]**	Cyclic nutrition following PPPD is associated with shorter periods ETF dependency Continuous feed is also associated with continuously high

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				age: 64)		calorific load of 1kCal(4.4kJ)/min		Hospital Stay No of days of Enteral Nutrition Biochemical	Hospital stay: Continuous: 21.4days Intermittent: 17.5days **[p=0.04]** Enteral Nutrition: Continuous: 10.3days Intermittent: 9.3days [p=0.60]	levels of cholecystokinin which may be responsible for delayed gastric emptying

Table 46: Early vs late nutritional supplementation after PEG installation

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Brown et al 1995[46]	RCT PEG sub-group		57 patients Intervention: n=27 Comparison: n= 30	Mean age: 67 (range 22-91) 38 male, 19 female PEG due to oropharyngeal dysphagia (46), chronic poor oral intake (8), oesophageal cancer (3).	Within 3h after PEG installation All patients Bowel sound confirmed before feeding Delivery method, feed formula, and rate of delivery left to attending physician	Next day All patients: 20_Fr Bard PEG tube inserted, with a push-pull technique. Antibiotic prophylaxis	2 weeks	Complications: Wound infection Bleeding (transient melena); controlled Feeding intolerance	Intervention vs Comparison 1 vs 3 0 vs 1 All tolerated; no problem	No baseline report No report on the way physicians' handled the feedings No report on what was the result of looking for bowel sounds before starting feeding. Were they able to start for early group within 3h?
Choudhry et al 1996[63]	RCT PEG sub-group		44 patients considered, 41 included Intervention: n=21	Mean age: 72.3 (range 32-93) All male (Veterans hospital) Neurological and other	3h after PEG installation All patients: PEG installed using Ponsky pull technique. All	24h after PEG	3 days (30 days for mortality)	Mortality: At day 30 Gastric RV (ml): Day 1 Day 2	Intervention vs Comparison 3 (14%) vs 4 (20%) 17.4 vs 8.5 14.9 vs 13.2	Paper talks of elderly patients while age range is 32 to 93.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Comparison: n=20	multiple medical problems. Only 9 out of 41 were able to provide consent themselves. Exclusion criteria: inability to consent, not expected to survive the study period, contradiction for endoscopy, inability to transilluminate abdominal wall, ascites, massive organomegaly, coagolopathy, systematic infection. Patient followed at hospital or nursing homes.	received antibiotic prophylaxis. Iso-osmolar formula, continuous feeding pump, 30ml/h for 1 day, then increase to 70ml/h. after 72h feeding adjusted according to needs. Physician visit 1/day for 3 days. If RV > 60ml, feeding held 2h.			Day 3 RV > 60 ml Complications: Vomiting Fever Local infection	8.1 vs 16.5 2 vs 1 1 vs 0 1 vs 0 1 vs 0	
McCarter et al 1998a[223] RCT PEG sub-group			112 patients Intervention: n=57 Comparison: n=55	Mean age: 63 (SD 22) 63 male, 49 female Exclusion criteria: age < 16, life expect of < 30 days, prior gastric surgery, gastrointestinal obstruction, intestinal dysmotility, marked ascites, infection at PEG site, proximal small bowel fistula, gastric wall neoplasm, morbid obesity, extensive scarring of abdominal wall, prolonged prothrombin time, platelet count <50k.	ETF feeding through PEG, 4h after installing the PEG All received prophylactic antibiotic; Full-strength Isocal 100ml/4h day 1; 200ml/4h day 2. Gastric residual was measured before each feeding. All patient kept NPO for 8h before PEG placement.	Late start of feeding, 24h after PEG. The rest similar to the intervention.	Outcomes measured at days 1, 2, 7, 30 days	Safety of early PEG Day 1: Gastric retention Day 2: Gastric retention Death Diarrhoea Other complications: PEG cite bleeding, hyperglycaemia, Gastroesophageal Reflux	Intervention vs Comparison 14 (25%) vs 5 (9%), **[p=0.029]** 13 (23%) vs 7 (13%) 0 vs 1 5 vs 5 3 vs 0 (one each)	It's good to see how many times successful feeding was possible in each group within the first 72h after PEG instalment. If many of early are failed, then added benefit might be small. This is not reported. Nor the LOS. Outcomes at day 30 are not reported either.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Stein et al 2002[333]	RCT PEG sub-group		80 patients Intervention: n=40 Comparison: n=40	Mean age 68 (SD 20) 47 male, 33 female ICU / intermediate care patients requiring nutrition for min 1 month 65% with CVA, others trauma, malignancy, other neurologic At the time of PEG 40% on artificial ventilation, 60% intermediate care, 40% receiving antibiotic for concomitant disease, 40% receiving prokinetics (10mg cisapride)	Immediate PEG feeding (1h) All patients: Polymeric iso-osmolar 1kcal/ml by continuous feeding pump Day 1: 30ml/h in 20h Day 2: 70ml/h in 20h Day 3: 100 Gastric residue checked every 6h for 72h by aspiration; if >100ml feeding stopped for 2h	Next day PEG feeding (24h) All patients: examined by physician 1/day for 3 days	3 days and 30 days	Mortality: Day 3 Day 30 Gastric RV: Day 1 mean (SD) Day 2 mean (SD) Day 3 mean (SD) RV > 100ml Complications: Stomatitis Leakage Bleeding Vomiting	Early vs late 2(5%) vs 3 (7.5%) 12 (30%) vs 10 (25%) 58ml (76) vs 50 (65) [not significant] 76 (47) vs 48 (39) **[p=0.01]** 93 (111) vs 63 (79) 13 (33%) vs 11(28%) 2 vs 0 0 vs 2 0 3 vs 5	

Table 47: Enteral + Erythromycin vs enteral + placebo

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Berne et al 2002[30]	RCT	1+	68 patients Intervention: n=32 Comparison: n=36	Critically injured patients who received intragastric tube feeding within 72 hrs of admission After consent obtained enteral feed, Impact with Fibre commenced and advanced to pre-determined target by increasing 30ml/hr every 4 hours. Patients eligible for enrolment into study if they failed to tolerate enteral feeding within 48 hours of commencing feeds i.e. >150 gastric residual vols	Erythromycin: Lactobionate 250 mg IV every 6 hrs	Placebo: (equivalent vol of 5% dextrose in water every 6 hrs)	26 days	Mortality ICU days (mean) Hospital stay (mean) Infections: a) Ventilator associated pneumonia b) UTI c) Bacteremia d) Wound infection Mean % of target volume of enteral feed tolerated at 48hours after starting treatment. Mean % of target volume of enteral feed tolerated during the whole study. % of patients successfully tolerating feeds (i.e. <150ml GRV) at 48	Intervention: 2/32 (6%) Comparison: 2/32 (6%); [p=1.00] Intervention: 17.7 Comparison: 16; [p=0.71] Intervention: 25.5 Comparison: 22.2; [p=0.35] Intervention: 13/32, Comparison: 18/36 ; [p=0.47] Intervention: 4/32 Comparison: 8/36 ; [p=0.35] Intervention: 6/32 Comparison: 7/36 [p=1.0] Intervention: 2/32 Comparison: 2/36 ; [p=1.0] Intervention: 58% Comparison: 44% **[p= 0.001]** Intervention: 65% Comparison: 59% [p= 0.061] Intervention: 56% Comparison: 39% [p= 0.22]	1) IV Ery reduces delayed gastric emptying in critically ill trauma patients during the first 48 hrs 2) Use of Ery in trauma patients does not affect the rate of Nosocomial infection

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								hrs of commencing treatment.		
Chapman et al 2000[61]	RCT	1+	20 patients Intervention: n=10 Comparison: n=10	Critically ill, mechanically ventilated patients who had failed NG feeding i.e. ≥ 250ml gastric aspirate after 6 hours enteral feeding of 40ml/hr. At start of treatment, initial aspirate was discarded and enteral feeding continued at 40ml/hr for 4 hrs.	Erythromycin: 200 mg in 20 ml normal saline IV over 20 mins, 3 hours after initial gastric aspirate	Placebo: over 20 mins, 3 hours after initial gastric aspirate		Mean volume of enteral feed infused over 4 hours Mean (+/-SEM) volume of aspirate before drug Mean volume of aspirate after drug No of patients categorised as success of enteral feeding defined as <250ml gastric volume after 4 hours of feeding 40ml/hr, Ensure, post initial gastric aspirate.	Intervention:248ml Comparison:192ml Intervention:378ml (40ml) Comparison:371ml (30ml) Intervention:109ml (28ml) Comparison:194ml (40ml After 1 hr : Intervention: 9/10 vs Comparison: 5/10 **[p=0.05]** After 12hr : Intervention : 10/10 vs Comparison: 5/10; **[p=0.01]** After 24hr : Intervention : 7/10 vs Comparison: 3/10; [not significant]	Number enrolled is small – reflects in significant p values.
MacLaren et al 2000[212]	Random-ised crossover study		10 patients Intervention 1: erythromycin n=10 Intervention 2: metoclopramide n=10 Intervention 3: cisapride n=10	Critically ill mechanically ventilated adults, (18-75 years) who were not tolerating a fibre-containing enteral feed by NG or orogastric tube i.e. a single gastric aspirate >150ml or >120ml x 2 over a 12 hour period. During the study enteral feed was	Erythromycin: 200mg as 5mL of suspension (200mg/5mL) followed by 10 ml of sterile water by naso- or orogastric tube	Placebo: 20mL of sterile water	Study conducted over 48 hours with 12 hours between each arm	12 hour enteral intake and gastric residual volumes at baseline, 180min, 360min,720min and total residual (mean, +/-SEM)	Intervention: Enteral intake: 455ml (144) Gastric residual volumes Baseline: 16 (17) 180min: 19 (22) 360min: 13 (26) 720min: 22 (27) Total: 69 (25) Comparison: Enteral intake:	Not an intention to treat analysis. 2 patients were excluded from analysis because of intolerance to enteral feeds with gastric residuals >250ml. Funding: supported in part by research funds from Department of Clinical Pharmacy,

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Also 10 placebo patients. See respective tables	administered continuously at ≤50ml/hr. All patients received histamine-2 receptor antagonists and 4 patients received intermittent opioid bolus doses				Mean (SEM) residence time for acetaminophen absorption. Acetaminophen absorption model used to assess gastric emptying. 1000mg of enteral acetaminophen as 31.25mL of solution followed by 10mL of sterile water.	395ml (131) Gastric residual volumes Baseline: 27 (25) 180min: 27 (37) 360min: 59 (79) 720min: 14 (10) Total: 127 (115) Intervention: 28.1 (±5.1) min Comparison: 20.5 (±5.1) min [not significant], [p value not reported]	University of Tennessee, Memphis
Reigner et al 2002[289]	RCT	1+	40 patients Intervention: n=20 Comparison: n=20	Critically ill patients receiving invasive mechanical ventilation and early nasogastric feeding. Patients were supine with bed elevated 15 degrees. Enteral feed from start of study. Feed given via a 14fr NG tube continuously from 9am – 3am,	Erythromycin: Lactobionate 250 mg in 50 ml of 5% Dextrose injected IV at 8am first day over 15mins and then every 6 hrs for 5 days	Placebo: (50 ml of 5% dextrose injected IV at 8am first day over 15mins and then every 6 hrs for 5 days	26 days	Residual gastric volume (RGV) (primary outcome) Day 1 Day 2	3 pm - Intervention: 15 ± 7 ml, Comparison: 52 ± 14 ml, **[p=0.05]**; 9 pm - Intervention: 29 ± 15 ml, Comparison: 100 ± 20 ml, **[p=0.01]** 3 am - Intervention: 11 ± 4 ml, Comparison: 54 ± 13 ml, **[p=0.05]** 9 pm - Intervention: 33 ± 11 ml, Comparison:	1) Ery improves tolerance to early ETF in heterogenous population of mechanically ventilated patients in ICU. 2) Improves gastric emptying as assessed based on RGV and facilitates early ETF.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				500ml day 1, 1000ml day 2, 1500ml day 3, 2000ml day 4 and 5. Residual gastric volume (RGV) measured every 6hrs and feed discontinued if RGV >250ml or patient vomiting.				Day 3 Day 4 & 5 Success of early enteral nutrition:	83 ± 19 ml, **[p=0.01]** 3 pm – Intervention: 39 ± 15 ml, Comparison: 88 ± 19 ml, **[p=0.05]** RGV: not significant for both groups Intervention: tolerated ETF 13/20 (feeds stopped for 7 patients). Comparison: tolerated ETF 6/20 (feeds stopped for 14 patients) **[p<0.001]**	
Yeo et al 1992[381]	RCT	1+	118 patients Intervention: n=58 Comparison: n=60	Patients undergoing pancreaticoduoden-ectomy who were also tube fed	Erythromycin: Lactobionate 200 mg IV infusion every 6 hrs from the 3rd to the 10th postoperative day	Placebo: (Identical volume of 0.9% saline infusion every 6 hrs from the 3rd to the 10th postoperative day)	2 weeks	Wound infection Total complications Total no. of pts with complications DGE Total post operative days	Intervention: 4 (7%), Comparison: 3 (5%); [p=not significant] Intervention: 23, Comparison: 26; [p=not significant] Intervention: 16(28%), Comparison: 22(37%); [p=not significant] Intervention: 11(19%), Comparison: 18(30%); [p=0.20] Intervention: 18.6 ± 1.4, Comparison: 17.7 ± 1.2, [p=0.65]	Erythromycin is safe, inexpensive, significantly accelerates gastric emptying after pancreaticoduoden-ectomy and reduces the incidence of DGE by 37%.

Table 48: Enteral + Metoclopramide vs enteral + placebo

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Jooste et al 1999[176]	RCT, crossover trial	1+	10 patients Intervention: n=5 Comparison: n=5	Critically ill without renal failure, enterally (nasogastric) fed patients Enterally fed Enrich via NGT at 50ml/h for 5 hours on two consecutive days	Metoclopramide: IV day 1 10 mg in 2 ml one dose 2 ml saline IV 24 h later	Placebo: 2 ml saline IV day 1 Metoclopramide IV day 1 10 mg in 2 ml one dose	2 days	Gastric emptying measured indirectly using small bowel absorption of paracetamol administered via NG tube with a 100ml bolus of Enrich. Increase in max. paracetamol concentration Increase in area under paracetamol absorption curve at 120 min (the rate of gastric emptying is directly proportional to the area under paracetamol absorption)	Intervention : 9/10 Comparison : 1/10 Intervention: 8/10 Comparison: 2/10 **[p= 0.04]**	Enteral feeding with Enrich no report on volumes tolerated during study period. This study indicates a significant increase in gastric emptying following metoclopramide administration.
MacLaren et al 2000[212]	Random-ised crossover study		10 patients Intervention 1: erythromycin n=10 Intervention 2: metoclopramide n=10 Intervention 3: cisapride n=10 Also 10 placebo patients. See respective tables	Critically ill mechanically ventilated adults, (18-75 years) who were not tolerating a fibre-containing enteral feed by NG or orogastric tube i.e. a single gastric aspirate >150ml or >120ml x 2 over a 12 hour period. During the study enteral feed was administered continuously at ≤50ml/hr.	Metoclopramide: 10mg as 10 mL of syrup (1mg/mL) followed by 10 ml of sterile water by naso- or orogastric tube	Placebo: 20mL of sterile water	Study conducted over 48 hours with 12 hours between each arm	12 hour enteral intake and gastric residual volumes at baseline, 180min, 360min,720min and total residual (mean, +/-SEM)	Intervention: Enteral intake: 448ml (220) Gastric residual volumes Baseline: 28 (36) 180min: 30 (66) 360min: 27 (42) 720min: 40 (84) Total: 125 (164) Comparison: Enteral intake: 395ml (131) Gastric residual volumes Baseline: 27 (25)	Not an intention to treat analysis. 2 patients were excluded from analysis because of intolerance to enteral feeds with gastric residuals >250ml. Funding: supported in part by research funds from Department of Clinical Pharmacy, University of Tennessee, Memphis.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				All patients received histamine-2 receptor antagonists and 4 patients received intermittent opioid bolus doses				Mean (SEM) residence time for acetaminophen absorption. Acetaminophen absorption model used to assess gastric emptying. 1000mg of enteral acetaminophen as 31.25mL of solution followed by 10mL of sterile water.	180min: 27 (37) 360min: 59 (79) 720min: 14 (10) Total: 127 (115) Intervention: 8.6 (±5.1) min Comparison: 20.5 (±5.1) min [not significant, p value not reported]	
Yavagal et al 2000[380]	RCT	1+	305 patients Intervention: n=131 Comparison: n=174	ICU patients requiring nasogastric placement for > 24 hours. Enteral feed – 'blenderised hospital formulation' administered according to ICU practice	Metoclopramide: 10 mg every 8 hrs through nasogastric tube	Identical placebo: every 8 hrs through nasogastric tube	18 months	Nosocomial pneumonia ICU Mortality rate Interval between ICU admission and pneumonia development (mean, SD)	Intervention: 22(16.8%), Comparison: 24(13.8%); [p>0.05] Intervention: 56%, Comparison: 53%; [p>0.05] Intervention: 5.95 days; SD: 1.78; Comparison: 4.46 days; SD: 1.72l, **[p=0.006]**	10 mg of Meto every 8 hrs did not reduce the risk of nosocomial pneumonia in NG fed pts. Delayed onset of pneumonia by 1.5 days. No effect on mortality rate or length of ICU stay. No details on vols of enteral feed administered or tolerated. Funding: Supported in part by IPCA laboratories, India & Dr. R. Chatopadhyay

Table 49: Enteral + motility agent vs enteral + other motility agent

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
MacLaren et al 2001b[213]	RCT	1+	14 patients Intervention: n=7 Comparison: n=7	Critically ill, mechanically ventilated patients unable to tolerate a fibre-containing ETF product, Jevity, by continuous naso- or orogastric tube. Intolerance measured as a single aspirated gastric residual volume ≥150mL or 2 such measurements ≥120mL over a 24 hour period. Where possible ETF feeding continued during study. Age: 18-45 Age (mean ± SD) Intervention: 48 ± 18.5 Comparison: 54.8 ± 18.5 Gender (no. males): Intervention: 4/7 Comparison: 5/7	10 mg Cisapride suspension (1mg/mL) via naso- or orogastric route every 6 hours for a total of 7 doses	10mg Metoclopramide syrup (1mg/mL) via naso- or orogastric route every 6 hours for a total of 7 doses	Not stated. Study period around 42 hours	Goal caloric feeding rate (mean ±SD mL/hour) - measured at baseline and after each dose Residual volume measured at baseline and after each dose Residual volume (mean ±SD) after dose 7 Mortality, length of stay at hospital or ICU, time on enteral feeding not reported.	Intervention: 83.3 (21.4) Comparison: 77.5 (8.8) No significant difference recorded for feeding rate at baseline or after any dose. Gastric residual volume did not decline significantly from baseline with cisapride Metoclopramide significantly reduced gastric residual volume after dose 3 of 7 and continued to show a significant decrease after dose 5, 6 and 7 of 7 **[p<0.05]** Intervention: 41.4 ±39.7 mL Comparison: 5.3 ±8.2 mL **[p=0.05]** no significant difference recorded for residual volume between 2 agents after any other dose	Study stopped before full enrolment was achieved because cisapride was removed from North American market 7-8-2000 Funding: Queen Elizabeth II Health Sciences Centre Research Foundation

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
MacLaren et al 2000[212]	Random-ised crossover study		10 patients Intervention 1: erythromycin n=10 Intervention 2: metoclopramide n=10 Intervention 3: cisapride n=10 Also 10 placebo patients. See respective tables	Critically ill mechanically ventilated adults, (18-75 years) who were not tolerating a fibre-containing enteral feed by NG or orogastric tube i.e. a single gastric aspirate >150ml or >120ml x 2 over a 12 hour period. During the study enteral feed was administered continuously at ≤50ml/hr. All patients received histamine-2 receptor antagonists and 4 patients received intermittent opioid bolus doses	Erythromycin 200mg as 5mL of suspension (200mg/5mL) followed by 10 ml of sterile water by naso- or orogastric tube	Metoclopramide 10mg as 10 mL of syrup (1mg/mL) followed by 10 ml of sterile water by naso- or orogastric tube Cisapride: 10mg as 10 mL of syrup (1mg/mL) followed by 10 ml of sterile water by naso- or orogastric tube	Study conducted over 48 hours with 12 hours between each arm	12 hour enteral intake and gastric residual volumes at baseline, 180min, 360min,720min and total residual (mean, +/-SEM) Mean (SEM) residence time for acetaminophen	Ery: Enteral intake: 455ml (144) Gastric residual volumes Baseline: 16 (17) 180min: 19 (22) 360min: 13 (26) 720min: 22 (27) Total: 69 (25) Met: Enteral intake: 448ml (220) Gastric residual volumes Baseline: 28 (36) 180min: 30 (66) 360min: 27 (42) 720min: 40 (84) Total: 125 (164) Cis: ETF intake: 448ml (208) Gastric residual volumes Baseline: 49 (84) 180min: 25 (32) 360min: 32 (48) 720min: 35 (61) Total: 142 (146) Placebo: Enteral intake: 395ml (131) Gastric residual volumes Baseline: 27 (25) 180min: 27 (37) 360min: 59 (79) 720min: 14 (10) Total: 127 (115) Ery : 28.1 (+/-5.1) Met : 8.6 (+/-5.1) Cis : 6.5 (+/-6.1)	Values compared to placebo listed with sections relating to specific motility agents. Not an intention to treat analysis. 2 patients were excluded from analysis because of intolerance to enteral feeds with gastric residuals >250ml. Supported in part by research funds from Department of Clinical Pharmacy, University of Tennessee, Memphis

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								absorption. Acetaminophen absorption model used to assess gastric emptying. 1000mg of enteral acetaminophen as 31.25mL of solution followed by 10mL of sterile water	Placebo : 20.5 (+/-5.1) Significant p values : Cis vs Ery **[p<0.05]** Met vs Ery **[p<0.05]**	

Table 50: Elective pre-operative/perioperative enteral nutrition support in surgical patients

Removed from the guideline

Table 51: Enteral vs nil -- upper GI surgery

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Brooks et al 1999[45]	RCT	1-	26 patients randomised intraoperatively, of these: 5 were excluded and 2 refused Total= 19, Int: 8 patients Non-fed: 11 patients	Patients undergoing complete resection of upper GI malignancy Age (years) (median, range) Int: 60.5 (48-76) Cont: 67.5 (28-75) NS Weight loss (kg) (median, range) Int: 1.7 (0-12.7) Cont: 1.0 (0-21.1) NS	ETF jejunostomy. Formula supplemented with arginine, RNA, and □-3 fatty acids. Starting postoperative day (POD) 1 at low rate and advanced toward a goal of 25 kcal/kg/d by POD 4	IV fluid until they were able to tolerate normal diet	5 days Intestinal permeability study on PODs 1 and 5. All patients fasted at least 8 hours before administration of test solution: 10 g lactulose and	Mean ratio of recovered lactulose to mannitol (L/M) in the urine (means +/- SEM)	Control (had one test only) 0.262 +/- 0.1 POD 1 Int: 0.893 +/- 0.24 vs control: 0.262 +/- 0.1 **[p=0.05]** Nonfed: 1.895 +/- 0.34 vs Control: 0.262 +/- 0.1 **[p<.008]**	The ratio L/M recovered in urine indicates intestinal permeability. The greater the ratio the more intestinal permeability indicating decreased intestinal barrier function ie, pathologic state This study indicates that routine ETF has no effect on intestinal permeability by POD 5

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Control: 6 non-operative volunteers	Nutritional risk index (median, range) Int: 108.8 (90.7-113.3) Cont: 110.1 (103.6-114.8) NS Control: 6 nonoperative healthy male volunteers		Control: Underwent an overnight fast and took the test solution orally	5 g manitol in a total volume of 35 ml. Via jejunostomy (Int group), NG (nonfed group POD 1) or orally (control and nonfed group POD 5)		Int: 0.893 +/- 0.24 vs Nonfed: 1.895 +/- 0.34 **[p<.02]** POD 5 Int: 0.606 +/- 0.12 vs control: 0.262 +/- 0.1 **[p<.03]** Nonfed: 0.533 +/-0.1 vs control: 0.262 +/- 0.1 **[p=.06]** Intervention POD 1= 0.893 +/- 0.24 vs POD 5= 0.606 +/- 0.12 [NS] Nonfed group POD 1 = 1.895 +/- 0.34 vs POD 5 = 0.533 +/- 0.1 **[p<.02]**	26% patients (n=7) dropped out before the study was completed
Heslin et al 1997[148]	RCT	1+	195 patients Int: 97 patients, Con: 98 patients	Patients with preop diagnosis of esophageal, gastric, peripancreaticor bile duct cancer undergoing resection	Immune enhancing formula containing arginine, RNA and omega-3 fatty acids via jejunostomy En feed started within 24hours of operation and oral diet when clinically feasible	IV crystalloid fluids and oral diet when clinically feasible		Caloric intake (% kcal goal/day) Minor complications (%) Hospital mortality (%) Median length of Hospital stay (days)	Int: 61%, Con: 22% Int: 25.22%, Con: 15.68% **[p=0.08]** 2.5% in both groups 11 days in both groups	Routine post-op ETF for pts undergoing major GI surgery is not beneficial & should not be std of care. a) The IEF arm received significantly more protein, carbohydrates, lipids and immune-enhancing nutrients than the control arm.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
										b) There was 1 bowel necrosis associated with IEF requiring reoperation. LOS reported in the abstract and not in the text. Mortality reported as an average of the total. LOS and mortality not suitable for meta-analysis
Page et al 2002[263]	RCT	1+	40 patients	Postoperative transthoracic esophagectomy n=20	Nasojejunal feeding of 1048 kcal & 40g protein per litre n = 20 During surgery and over the following 24 h IV crystalloid was given for hydration and additional colloid or blood transfused depending on volume status. Standard isocaloric enteral feed (1048 kcal and 40 g protein per litre) was infused into the distal (jejunal) port of the naso-jejunal feeding tube (timing not stated). Energy and fluid requirements were calculated according to individual patient	Intravenous crystalloid solution (NJ tube placed but not used) During surgery and over the following 24 h IV crystalloid was given for hydration and additional colloid or blood transfused depending on volume status. Hydration was maintained with IV crystalloid using a combination of 5% dextrose, 0.9% saline and potassium supplements as indicated by daily serum electrolyte measurements. Oral intake was forbidden until day 4 after surgery when	7 days study. Patients followed until discharge	Length of stay in hospital (mean +/- SD (range)) Mortality Post-operative weight loss (day 7 minus day 0) (mean +/- SD) BMI (day 7 minus day 0) (mean +/- SD) Protein (day 7 minus day 0) (mean +/- SD) Complications Pleural effusion requiring aspiration	ETF 13.6 +/- 5.2 (9-20) days IV 13.4 +/- 5.0 (8-27) days ETF n = 0 IV n = 0 ETF 0.0 +/-1.6 kg IV -0.6 +/-2.3 kg [not significant] ETF -0.1 +/-1.0 kg/m3 IV -0.3 +/-0.7 kg/m3 [not significant] ETF 10.1 +/-5.7 g/l IV -11.3 +/-9.8 g/l [not significant] ETF n = 5 IV n = 5 ETF n = 2 IV n = 0	No significant differences for outcomes measured between ETF group and IV crystalloid group Other outcomes looked at: nutritional measurements (body fat, lean mass, body water), haematoligical parameters (haemoglobin, white cell count, ablumin, transferrin, C-reactive), serological parameters (urea, creatinine, sodium, potassium, chloride) Enteral feeding was discontinued prematurely in seven out of the 20 patients because of accidental dislodgement of the

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					needs taking into account total body weight and bioelectrical impedance parameters. Infusion of feed commenced at 25 ml/h and increased by 25 ml/h every 4 h until the calculated target volume was reached (35 ml/kg body weight/day- e.g. for a 70 Kg patient= 2000-2500 Kcal and 80-85 g of protein per day). Supplementation of the feed with water was carried out as indicated to ensure adequate patient hydration. IV crystalloids were reduced proportionally as the enteral feeding was increased and discontinued once the target rate of enteral feeding was achieved. Oral intake was established as in the control group, and enteral feeding discontinued when a free oral fluid intake had been achieved, usually by the end of day 6. The NJ tube was then removed.	water was introduced at a rate of 30ml/h for 24 h, rising to an unrestricted intake of water by the start of day 6. Nutritional oral intake was introduced in largely liquid form on day 7, and further increments of semi-solid and solid diet introduced depending on patients tolerance, aiming for a free and unrestricted diet by day 10. Neither enteral nor parenteral nutritional substances were given.				NJ feeding tube, occurring most frequently on the 5th post-op day. Overall feeding time was 5.3 +/- 1.0 days (range = 3-7 days)
Swails et al 1995[341]	RCT	1+	25 patients	Post surgical patients undergoing	Feeding jejunostomy n=13	No feeding jejunostomy	Hospital stay	Hospital duration	Hospital duration (mean, sd)	Of the various outcomes reported

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				esophagogastrectomy for Ca oesophagus Feeding jejunostomy n=13 Age yrs (mean,sd) 65 +/-14 Male/Female 10/3 No feeding jejunostomy n=12 Age yrs (mean,sd) 57 +/-15 Male/Female 7/5	Full strength elemental or polymeric diet (Vivonex- Formula 9119). Timing of intervention: 10mL/hr within 24hours of operation. Enteral feeds subsequently increased by 10mL/hr every 12-24 hours until nutritional requirements met (approx 25-30kcal/kg). Oral feeding started once radiograph confirmed intact anastomosis, around day 4-5.	n=12 Intravenous fluid and electrolyte replacement until day 4-5 when radiograph confirmed intact anastomosis. A clear liquid diet was initially provided and was gradually progressed over a period of one to three days to a regular post-esophagogastrectomy diet consisting of six small meals daily. Patients in whom an anastomotic leak was demonstrated were provided with total parenteral nutrition in order to meet their full nutritional and metabolic needs until their anastomotic leak healed.		ICU stay Wound healing anastomotic leaks wound dehiscence Infectious catheter related infection wound infection urinary tract infection clostridium difficile diarrhoea positive sputum culture No. patients infectious complications Total no. of patients	J tube: 12 +/- 5 days IV fluid: 15 +/- 7 days [p=0.3] ICU stay (mean, sd) J tube: 0.5 +/- 1.4. days IV fluid: 1.3 +/- 3.2 days [p=0.4] Wound healing anastomotic leaks J tube: 0 IV fluid: 3 [p=0.06] wound dehiscence J tube: 1 IV fluid: 0 [p=0.3] catheter related infection J tube: 0 IV fluid:2 wound infection J tube: 0 IV fluid:1 urinary tract infection J tube: 1 IV fluid:1 clostridium difficile diarrhoea J tube: 2 IV fluid: 0 positive sputum culture J tube: 0 IV fluid: 1 No. patients infectious	patients fed jejunally had a significantly shorter hospital stay and ICU stay. They also had significantly fewer anastomatic leaks and in general post op complications. Those fed jejunally were less likely to received PN and if they did for a significantly shorter time than those fed IV. The IV group only seemed to do better for wound dehiscence. Although the method of randomisation is not clear and neither is blinding it appears that an ITT analysis was done. It seems that those fed jejunally did better than those fed IV.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								experiencing post op complications Nos requiring TPN or PPN Duration PN required for those who received it.	complications J tube: 3 IV fluid: 3 [p=0.9] Total no. of patients experiencing post op complications J tube: 3 (23%) IV fluid: 6 (50%) [p=0.2] Nos requiring TPN or PPN J tube: 2 (15%) IV fluid: 5 (43%) Duration PN required for those who received it. mean +/- SD J tube: 5 +/- 0 IV fluid: 12 +/- 8 [p=0.3]	
Watters et al 1997[367]	RCT	1+	28 patients	post surgical patients undergoing esophagogastrectomy or pancreaduodenectomy	Conventional enteral nutrient solution (Jevity) via jejunostomy tube. Timing of intervention: commenced within 6 hours post op and increased to full feeds over 2 days. No oral food allowed until 6th day Full strength feeding was begun within 6 h after surgery at a rate of 20 mL/ h until the first post op. morning, increased to half the target rate at that time, and	No feed, no oral or enteral feed given until the 6th post op day. Patients received enteral tube feeding at the discretion of the attending service no sooner than the sixth postoperative day. n=15	6 days	Post op vital capacity (VC) Forced expiratory volume(FEV) Hand grip strength Fatigue	Post op vital capacity (VC), mean +/- sd: Fed – 1.8 +/-1.0 Unfed – 2.4+/-0.6 **[p<0.05]** FEV mean +/- sd,: Fed – 1.4 +/-0.8 Unfed – 1.7+/-0.5 [p=0.07] Hand grip strength, mean +/- sd: Fed – 33+/-11 Unfed – 32 +/- 11 [NS] Fatigue : increased after surgery for both groups, no significant	Only one patient in the unfed group was severely malnourished. Immediate post op vital capacity and FEV was consistently lower in the fed group compared to the unfed group. There was no difference between the groups for grip strength, fatigue and vigour. For protein and creatinine both the fed and unfed groups experienced significant change. For phosphate, the

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					increased as tolerated to the target rate on the second post op. morning. The maximum rate of feeding was the lesser of 125% of preoperative (measured or estimated) caloric expenditure, or 2500 mL per day. The enteral preparation provided 4.4 g protein and 445 kJ/100 mL. Intolerance of feeding was managed by decreasing or discontinuing feeding for 12 to 24 h or until clinical resolution. n=13				difference Vigour: increased after surgery for both groups, no significant difference Total protein (g/l) mean +/- sd: Pre op fed: 74+/-4 Post op fed: 58+/- 5 Unfed: pre op 70+/-6 post op:57+/-4 significant decrease in protein levels from preop to day 6 p,0.001 creatinine: significant decrease in creatinine levels from preop to day 6 for both groups p,0.001 phosphate: significant decrease in phoshpate levels from in fed v unfed p <0.05 Int: 1 Cont: 4 [p=0.23] Int: 2.9 +/- 1.7 Cont: 2.3 +/- 1.2 Int: 17 +/- 9 Cont: 16 +/- 7	unfed group had significantly higher levels preoperatively and on day 6.

Table 52: Enteral vs nil -- lower GI surgery

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Magnusson et al 1989[215]	RCT	1+	20 patients	Post-operative colorectal carcinoma	ETF glucose polymer (10% Caloreen) by nasojejunal tube started day 1 post op n = 10 and oral diet day 5	Intravenous glucose n = 10 and oral diet day	4 days study, Patients followed until discharge	No of doses of pain killer per patient (mean +/- s.e.m) Total dose of pain killer per patient (mean +/- s.e.m) Postoperative discomfort measuring catheter inconvenience, nausea, abdominal distention, thirst, sleeping problems, and restriction of personal hygiene, dressing and ambulation. Experience of diarrhoea over 4 days Resumption of oral intake (mean +/- s.e.m) Postoperative days in hospital (mean +/- s.e.m) Complications	ETF 6.7 +/- 1.3 doses IV 11.7 +/- 2.5 doses **[p<0.05]** ETF 46.5 +/- 11.0 mg IV 66.5 +/- 14.5mg **[p>0.05]** **[p<0.05]** (Cumulative scores obtained by adding the ranks for each day in each patient and then adding the rank sums for the whole group) ETF n = 0 IV not reported ETF 4.5 +/- 0.3 days IV 5.9 +/- 0.4 days **[p < 0.05]** ETF 13.8 +/- 1.5 days IV 17.5 +/- 2.6 days **[p>0.05]** ETF n = 2 IV n = 66	ETF group showed more favourable outcomes in: post-operative discomfort was significantly less, resumption of oral intake was sooner and there were less complications Other outcomes looked at: number of doses and total dosage of pain killers, laboratory values in blood, glucose, insulin, C-peptide, glucagon concentrations Funding: Medical Faculty of Lund University
Sagar et al 1979[301]	RCT		30 patients, Int: 15 patients, Con: 15 patients	Patients undergoing major intestinal surgeries	Double-lumen tube: naso-gastric (aspirating portion)-upper small intestine (feeding portion).	1 l saline (0.9%) and 2 l dextrose (5%) IV, nil by mouth for 2 days. On the 3rd post day 30 ml drink	N/K	Mean energy Intake /day Median weight loss	Int: upto 1000, Con: less than 500 Int: 0 (range 1kg loss to 5.3kg gain) and Con:	Provided elemental feeding is used with caution, it may be given from the first pre-op day. Patients

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					Flexical. Timing of intervention: For the first 24 hrs a half strength solution was infused at 25 ml/hr. Thereafter, undiluted Flexical was infused at 25 ml/hr on the 2nd post op. day, 50 ml/hr on the 3rd post. Op day and 100ml/hr on the fourth and fifth days. If there were no complications the double-lumen tube was removed on the sixth day and the patient given as much Flexical as he could take by mouth on the sixth and 7th day. In addition, all intervention patients were given 2 l dextrose (5% w/v) and 1 l saline (0.9% w/v) IV from the first to 3rd post operative days.	of water if there were no contraindications. Thereafter, oral intake was gradually increased until by the fifth day the patients could take as much fluid as desired. IV fluids were stopped on the fifth day post op and light diet introduced on the 6th and 7th days. NG tube for aspiration only.		Wound infection Length of stay (Median days)	1.85kg (range 5.8kg loss to 0.5kg gain). **[p<0.01]** Int: 3 Con: 5 Int: 14 days (range 10-26 days) and Con: 19 days (range 10-46 days). **[p=0.05]**	do better metabolically and require shorter hospital stay
Schroeder et al 1991[310]	RCT		32 patients Int: 16 (feeding had to be abandoned in 4 patients: 1 tube slipped back to stomach, 2 suffered severe nausea due to	Patients undergoing small or large bowel resection or reanastomosis	ETF NJ/ND Immediate infusion post op with full strength Osmolite at a rate 50 mL/h via continuous infusion pump. One patient had chronic renal failure, and was given a low-protein modificaion	Normal saline and 5% dextrose IV Oral fluids and food were recommenced at the discretion of the clinical team, and usually depended on the presence of bowel sounds.	Not clear	Time until passage of flatus First bowel motion LOS	Int: 58 +/- 32 h Cont: 70 +/- 31 h [NS] Int: 77 +/- 36 h Cont: 100 +/- 32 h [NS] Int: 10 +/- 14 days Cont: 15 +/- 10 days [NS]	Immediate enteral tube feeding was feasible in 75% of patients undergoing bowel resection, but adequate nutritional intake is not really achieved for more than 24 hours in most patients. The major proven advantage is a

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			metronidazole and narcotics and 1 could not tolerate tubes) Control: 16		of Osmolite. The patient was also encouraged to drink water. If absorption was occurring with no problem, the infusion rate was increased. On the morning of the 3rd day post. op day tubes were removed and the patient allowed to take whatever he/she liked by mouth.			Post op. caloric intake (Kcal/day) (mean) Complications (Num. of cases) -Myocardial infarction -Atelectasis -Pneumonia -Small bowel obstruction Body composition. Changes over the 2 post op weeks: Weight loss (mean +/- SEM) Protein loss (mean +/- SEM) Water losses (mean +/- SEM) Fat losses (mean +/- SEM) Fatigue scores Preoperative (arbitrary units,	Int: 1179 +/- 388 Cont: 382 +/- 71 **[p=0.0001]** No complications attributable to the feeding Int: 1 Cont: 1 Int: 2 Cont: 2 Int: 1 Cont: 0 Int: 0 Cont: 4 Int: 3.0 +/- 0.7 Kg Cont: 4.2 +/- 0.5 Kg [NS] 0.363 +/- 0.261 kg Cont: 0.671 +/- 0.119 kg [NS] Int: 1.6 +/- 0.7 L Cont: 1.2 +/- 0.5 L [NS] Int: 1.0 +/- 0.7 kg Cont: 2.1 +/- 0.6 kg) [NS] Int: 3.9 +/- 2.1 Cont: 3.6 +/- 1.2	significantly improved wound healing response in those patients being fed. However the other expected advantages of protein preservation and shortened hospital stay were not achieved.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								mean +/- SD)	[NS]	
								Day 7	Int: 6.5 +/- 2.4 Cont: 6.3 +/- 2.1 [NS]	
								Day 14	Int. 5.1 +/- 2.1 Cont. 6.1 +/- 2.0 [NS]	
								Day 30	Int: 3.7 +/- 2.0 Cont: 4.2 +/- 1.5 [NS]	
								Day 90	Int: 2.7 +/- 2.0 Cont: 3.3 +/- 2.0 [NS]	
								Muscle function		
								Grip strength (mean +/- SD)		
								- Preop	Int: 29 +/- 13 kg Cont: 34 +/- 14 kg [NS]	
								- Day 14	Int: 27 +/- 11 kg Cont: 31 +/- 15 kg [NS]	
								Max. ventilatory volume		
								- preop	Int: 121 +/-42 L/min Cont: 129 +/- 51 L/min [NS]	
								- Day 7	Int: 71 +/- 34 L/min Cont: 87 +/- 49 L/min [NS]	
								- Day 14	Int: 132 +/- 57 L/min Cont: 105 +/- 36 L/min [NS]	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Wound healing Hydroxiproline deposited in subcutaneous tubes over the first postoperative week (tested in 11 patients in intervention group and 12 controls)	Int: 2.50 +/- 1.17 nmol hydroxyproline/g Gortex Cont: 1.49 +/- 0.88 nmol/g **[p=0.02]**	

Table 53: Enteral vs nil -- upper and lower GI

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Beier-Holgersen and Brandstrup 1999[28]	RCT	1+	60 patients, Int: 30 patients Con: 30 patients	Patients with GI diseases undergoing major abdominal surgery All patients were stratified on the basis of nutritional status. Malnutrition was defined as an unattended weight loss of 5% during the 3 months before operation. Gender (male/female ratio) Int: 18/12 Cont: 20/10	Nutridrink, Nutricia, the Netherlands (150kcal/100 ml and 5 g protein/100 ml) feeding through nasoduodeal tube Timing of intervention: On the day of operation: 600 ml, increasing by 400 ml daily until the 4th post-operative day. (Additional tea, coffee and water were permitted, and intravenous isotonic glucose or saline was given until the	Placebo (Water with orange flavour, no energy, vitamins or trace elements) through nasoduodenal tube. Timing: On the day of operation: 600 ml, increasing by 400 ml daily until the 4th post-operative day. (Additional tea, coffee and water were permitted, and intravenous isotonic glucose or saline was given until the patients could drink	30 days after surgery	Cell mediated immunity (median) scores Pre-op Post-op day 3 Post–op day 7	Pts. Without complications: 9.5 (95% CI: 5.5 and 16.0mm) ; Pts. With complications: 17.0 (95% CI: 10.5 and 24.0mm) **[p<0.05]** Int: 1.25; Con :5.0 (95% CI: 2.0 and 7.0) No significant differences in the scores were seen between the pre-op & post-op day 7 groups	Continuation of above study. Nutritional status had no significant influence on CMI score. The CMI score did not predict post-op surgical complications pre-operatively If a patient had more than one complication, only the first complication was noted in this study.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Age (years) (median-range) Int: 66.5 (27-93) Cont: 61.5 (27-80) Height/weight (median): Int: 169.5 cm/71.2 kg Cont; 172 cm/ 68.5 KG No. malnourished: Int: 4 Cont: 5 Exclusion criteria: Patients with insulin dependent diabetes mellitus, inadequate renal or hepatic functions or inflammatory bowel disease.	patients could drink sufficiently)	sufficiently)				
Carr et al 1996[58]	RCT	1+	28 patients, Int: 14 patients Con: 14 patients	Patients undergoing intestinal resection Exclusion criteria: Emergencies and allergy or intolerance to the constituents of the feed.	Enteral standard isocaloric feed (Fresubin, Fresenius) feeding through nasojejunal tube Timing of intervention: Feeding was started 2 to 3 hours after surgery and continued until normal diet was possible. Initial feeding 25ml/h, increased by 25 ml four hourly until target volume was reached at which point IV fluids were stopped. Distension	Intravenous fluids Timing: IV fluids with nil by mouth until passage of flatus.	Until discharge	Mean (SD) Nutritional Intake (energy /day in kcal) Mean (SD) Nitrogen balance (g) Post op complications Mean days to oral intake	Int: 1622 (energy /day in kcal) ± 375, Con: 377(energy /day in kcal) ± 34. Pre-op: Int: 1.5 (g) ±1.9, Con: 1.7(g) ±2.2 Post-op day 1: Int: 5.3 (g) ± 2.7, Con: -13.2 (g) ± 11.6 Post-op day 5: Int: 1.2 (g) ± 1.2, Con: 1.0 (g) ±0.8 Fewer complications with Int group. **[p<0.005]** Int: 6, Con: 6.	Immediate ETF is safe & well tolerated by pts undergoing bowel resection. Funding: Departments of surgery & intensive care

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					or pain would lead to cessation of the feed. Oral fluid started on passage of flatus and increased to normal diet over 48 hrs. IV fluids and enteral feeding stopped with the introduction of diet.			Length of stay (mean days with SD)	Int: 9.8 (6.6), Con: 9.3 (2.8).	
Hoover et al 1980[160]	RCT	1+	51 patients Int: 26 Con: 22	Patients undergoing extensive esophageal, gastroduodenal, bilary or pancreatic procedures.	Enteral feeding of 10% high nitrogen Vivonex (25% is full strength, manufactured by Eaton laboratories, Norwich, New York) via jejunostomy tube. Timing of intervention: Enteral feeding were started on arrival in the recovery room at 50 cc/hr. On first post operative morning rate increased to 100 cc/hr. On day 2 the IV catheter was usually removed and jejunal infusion increased to 125 cc/hr. On day 4 the conc increased to 15% and full strength was reached on day 7 or 8. The elemental diet was continued for a minimum of 10 days unless the patient was ready for	Intravenous therapy of isotonic glucose until patients had an adequate oral intake. Oral diet ad libitum offered as soon as clinically feasible.	10 days	Mean (SD) Total Nutritional Intake (energy /day in cal) Total Nitrogen Intake (Mean in g) Mean cumulative Nitrogen balance (g) Mean weight loss (kg)	Int: 1815 (energy /day in cal) ± 208, Con: 810(energy /day in cal) ± 94. Int: 10.9 (g) ± 1.5, Con: 1.71 (g) ± 0.58 **[p=0.0001]** nt: 11.7 (g) ± 5.4, Con: -44.7 (g) ± 6.5 **[p=0.0001]** Int: 0.02 (kg) ± 0.5, Con: 3.8 (kg) ± 0.3	The only complications were diarrhoea in 34% of the intervention patients and one broken catheter.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					discharge earlier. Oral diet ad libitum offered as soon as clinically feasible. Blood products given only to replace measured losses.					
Ryan et al 1981[298]	RCT	1-	16 patients	Elective partial colectomy	n=9 early post op jejunostomy feeding with elemental diet (1000 calories/Litre) Timing of intervention: OR post op day- solution 10% weight/volume @ 50 ml/hr Day 1 post op (discontinue IV) - 10% weight/vol @ 100 ml/hr, Day 2 10% w/vol @ 125 ml/hr, Day 3 15% w/vol @ 125 ml/hr, Day 4 20% w/vol @ 125 ml/hr, Day 5 20% w/vol @ 125 ml/hr, Day 6 25% w/v @ 125 ml/hr, Day 7 25% w/vol @ 125 ml/hr (2 excluded from the final analysis)	n= 7 Isotonic IV infusions of dextrose	10 days	Mean daily calorie intake over 10 days % weight change at 2 weeks % weight change at 4 weeks Mean days of IV fluids Complications	Mean daily calorie intake: Int: 2283 (n=7) Con: 800 (n=7) **[p<0.005]** % weight change at 2 weeks Int: -3.7+/- 1.34 SE (n=7) Con: -5.6 +/-0.7SE **[p<0.005]** % weight change at 4 weeks Int: -2.8+/- 1.16SE (n=7) Con: -6.1 +/-1.35SE **[p<0.05]** Mean days of IV fluids Int: 1.8 Con:6.6 **[p<0.05]** No of complications: Int: n=2 (catheter related phlebitis) Control: n=7 (4 minor, 2 major and one septic case of phlebitis)	An ITT was not carried out. 2 patients fell out of the intervention group and data on their outcomes is not reported.
Singh et al 1981[321]	RCT		43 patients: 21 in intervention	Patients with non traumatic intestinal perforation and	IV fluids and electrolytes plus feeding jejunostomy.	IV fluids and electrolytes. Oral feeding resumed	Days for nutritional evaluations	Anthropometric measures Serum albumin	Caloric intake (mean +/- SEM): Day 1- treatment: 825	There does not appear to be a significant difference

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			22 in control	peritonitis treated in a single surgical unit	A low- residue, milk-based diet was used. Timing of intervention: Enteral nutrition support: 12-24 h post op. normal saline and 5% dextrose solution in a 1:3 ratio at 100 mL/h; 24-48 h post op.- 1.0 L of half-strength feed at 50 mL/h; 48-72 h post-op-2.0 L of half-strength feed at 100 mL/h; and 72 h onward- at least 2.0 L of full strength feed per 24 h. The rate of feeding was decreased of stopped if the patient experience abdominal pain or distention and was restarted 12 h later. Enteral nutrition consisted of a low residue, easily absorbable, milk-based, blenderised diet made in hospital. Proprietary vitamin supplements were added. Oral feeding was resumed once bowel activity returned and was increased gradually. Jejunostomy feeding was stopped when the oral intake was	once return to bowel activity. n=22	and then till discharge from hospital.	levels Nutritional intake Complications Mortality	+/- 90 kcals control: 430+/-92 Day 7 – treatment: 2610+/-337 control:516 +/-156 Complications in number of patients- Treatment: n=11 Control: n = 13 Mortality Treatment: 4/21 (19.1%) Control: 4/22 (18.6%)	in patient outcomes between the treatment/intervention group and the control group.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					adequate. Patients received jejunostomy feeds for a mean duration of 6.5 days (range, 1-14 days) n=21					
Smith et al 1985[328]	RCT	1+	50 patients	Patients had GI malignancy requiring surgical treatment	Insertion of a fine bore jejunostomy catheter and enteral feed Isocal was administered. IV isotonic fluids were used until adequate oral or enteral intake was achieved. Timing of intervention: Days 1 and 2 postoperatively- 2 litres crystalloid/day; Day 3 post op. ¼ strength Isocal 1 litre/25 kg/day- Day 4 post op ½ strength Isocal 1 litre/25 kg/day Day 5 to 10 Full strength Isocal 1 litre/25 kg/day Oral food was encouraged as soon as patients had return of bowel function. n=25	Intravenous isotonic fluids until an adequate oral intake was achieved. Oral food was encouraged as soon as patients had return of bowel function. n=25	Before and after study measures compared over 10 days. But patients also followed up until adequate enteral intake was established or discharge home.	Death rate Fall out Length of stay Nutritional measurements including change in weight, body fat, fat mass, prealbumin, albumin, transferrin: Complications Calorie intake	Deaths: Treatment:4/25. (1 due to aspiration pneumonia) Control: 1/25 Fall out Treatment: 11/25 Control: 4/25 LOS: mean (sd) Treatment: 20 +/- 8.9 days Control 15 +/- 6.4 days Nutritional measurements: both groups significant change from start to end no difference between the groups. 1 Complications Treatment: total reported = 24 Control: total reported 20 Mean calorie intake for treatment group: n= 14 1372 +/- 336 kcals.	This appears a well conducted study, for some outcomes there was not an intention to treat analysis. Of the 25 patients in the intervention group, 5 did not have jejunal feeding because of dislodgement, blockage or ileus. 6 patients had had functioning catheters but were unable to tolerate the planned nutritional regimen because of diarrhoea in 3 and distension in one, ileus in one, nausea and vomiting in one. The mean catheter intake achieved in these six patients was 354 +/- 227 kcal per day. In 14 patients (the 'successful treatment' subgroup) satisfactory amounts of jejunal catheter feeding were delivered. These patients received a mean of 1372 +/- 336 kca/day, averaged over the first 10 post

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
										op days. This amount of nutrition was in addition to any hospital food they were able to take by the oral route.

Table 54: Enteral vs nil -- hepatobiliary surgery

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Frankel and Horowitz 1989[117] This paper differs from several other papers here	RCT	1+/1-?	69 patients (19 excluded) 50 randomised	Patients with chronic or acute cholecystitis undergoing op for cholecystectomy Nasoduodenal group (ND) Age (mean, range) 43.4 yrs (18-74) No nasoduodenal group (NIL) Age (mean, range) 40.4 yrs (18-61)	Nasoduodenal tube with esophagastric decompression Timing of intervention: Enteral feedings were initiated in the recovery room with an elemental feed (Viivonex T.E.N.) full strength, 40kcals per kg for 24 hours then stopped and then a clear liquid diet begun n=25	No nasoduodenal tube but NG tube inserted for gastric decompression this was removed in recovery. No enteral feeding allowed but sips of clear liquid diet on first post op night. n=25	Until discharge from hospital	Post op diarrhoea Post op ileus Post op length of stay	Post op diarrhoea ND: 1 NIL: 0 Post op ileus ND: 1 NIL: 0 Post op length of stay days, (mean, sd) ND: 2.0 +/-0.2 NIL: 1.7+/-0.1	The methods of randomisation, blinding are not clear and the sample size is small. This study differs from the many other studies included in this review – since it is cholecystectomy patients and enteral feeding only lasted for 1 day. However and ITT was done and it would seem that although probably not significant patients randomised to the not fed group, no intervention did better than those randomised to ND

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
										feeding.
Hasse et al 1995[145]	RCT	1-	50 patients	Liver transplant	Immediate post op naso jejunal feeding full-strength Reabilan HN (n=25) Timing of intervention: Patients began to receive a continuous pump infusion of full-strength Reabilan HN 12 hrs after surgery. Infusion rate started at 20 mL/h and was increased to 40 mL/h 24 hrs after the initiation of the tube feeding. If the patient tolerated 40 mL/h, the tube feeding (TF) rate was increased to 60 mL/h 12 hrs after the previous rate increase. If patients required more than 60 mL/h, the TF rates were adjusted individually on the basis of measured energy and protein needs. NG placed. Blue food colouring was added to TF formula. If the NG aspirate became blue or if patients showed other signs of intolerance the tube feeding was withheld for a few hours and then restarted. The	IV electrolyte fluid until oral feeding established (NG tubes placed but not used. NG tube removed when patients had bowel sounds. Clear liquid diets were initiated within 24 hrs of removal of the NG tube, and the diet was advanced to a general diet as tolerated) (n=25)	12 days for some measures and until discharge	Length of stay after transplant: Mean nitrogen balance at 4 and 12 days post transplant Overall infection rate in the first 21 days after transplantation Mean daily total calorie intake Cumulative mean total calorie intake at day 12	Length of stay after transplant mean +/- SD: Int: 16 (17.3 +/- 5.4) (n=14) Cont: 18 (27.1 +/ 37.1) (n=17) [not significant] Approximate mean nitrogen balance Day 4: Int: -5 grams (n=14) Cont: -10 grams (n=17) **[p<0.03]** Day 12: Int: -6.5 grams (n=14) Cont: -2.5 grams (n=17) (not significant) Overall infections in the first 21 days after transplantation Int: 3 (21.4%) (n=14) Cont: 8 (47.1%) (n=17) (not significant) Approximate mean daily total calorie intake Day 4 Int: 2,500 kcal (n=14) Cont: 1,300 kcal (n=17) Day 12 Int: 1,300 kcal (n=14) Cont: 1,600kcal (n=17) (**[p<0.05]** days 1-6) Cumulative mean total calorie intake at day 12 (mean +/- range) Int: 22,464 +/- 3,554	31 patients completed the study Int:(n=14) Con (n=17) An intention to treat analysis was not done. The figures for the mean nitrogen balance figures were read from the graphs in the papers and should not be taken as exact values. However, the paper does report that there was a significant difference on day 4. The figures for the mean daily total calorie intake at day 4 and day 12 were read from the graphs in the papers and should not be taken as exact values. Funding: Nutrition Support Practice Group Member Research Award, Elan Pharma, Dallas Transplant Surgeons Associates

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					NG tube was removed and diets were initiated when patient had bowel sounds. Diet progression followed the same pattern as for the control group. NJ tube remained in place until the patients were able to meet at least 66 % of nutritional needs by oral intake.				kcal (n=14) Cont: 15,474 +/- 5,265 kcal (n=17) **[p=0.0006]**	
Hwang et al 1991[163]	RCT	1+	24 patients	Post-op biliary surgery (common bile duct or intrahepatic duct stones, treated by choledocholithotomy); uncomplicated surgeries sepsis, jaundice, or other complications excluded. Nasoduodenal tubes inserted during the operation. Mean age 52.	Nasodudonal tube feeding within 1 day of operation. Blenderised diet (17% protein, 33% fat and 50% carbohydrate)	Nasodudonal feeding in day 4th of operation	8 days outcomes measured post-surgery days 1 and 8	No intended clinical outcome? Wound infection Nutritional status A range of outcomes	Early vs late 0/12 vs 1/12 Increase pre-albumin rate and lymphocyte count for early group. All others no difference	Not all relevant outcomes are reported. Quality of life should have been considered. Allocation procedure and also the total number of eligible patients unclear

Table 55: Enteral vs nil -- acute trauma

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Chuntrasakul et al 1996[65]	RCT	1+	38 patients Int: n= 21 Cont: n= 17	Patients with Injury Severity Score between 20-40 Gender (male/female): Int: 19/2 Cont: 12/5 Age: between 26-33 (information not provided by group) ISS (mean): Int: 29.33 +/- 2.05 Cont: 29.41+/- 1.26 [NS] Trauma score: Int: 13.33 +/- 0.29 Cont: 13.53 +/- 0.29 [NS]	Patients received nutritional support immediately after resuscitation or operation when hemodynamic status was stable. Enteral nutrition was fed via NG tube with an enteral pump at a rate of 30 ml per hour and a dilution of 0.75 kcal/ml. The concentration was increased until it reached the daily requirement. If enteral nutrition was insufficient, PN was added.	Patients were administered with hypo caloric intravenous solution (5% D/NSS) as fluid maintainance and supplemented with oral nutrition as soon as bowel function was detected. Oral nutrition was begun with fluid or soft diet without calculation of the caloric requirement	Two weeks	Deaths Mean +/- SEM ICU stay (days) Mean +/- SEM Ventilator (days) Systemic complications Percentage of body weight change Nitrogen balance Serum pre-albumin and albumin	Int: n= 1 Cont: n= 3 Int: 8.14 +/- 1.37 Cont: 8.35 +/- 1.16 [NS] Int: 5.29 +/- 1.37 Cont: 6.12 +/- 1.29 [NS] There were more systemic complications in the control group than in the study group (Data not provided) Week 1: Int: -6.17 +/- 1.12 Cont: -10.26 +/- 2.49 Week 2: Int: -9.81 +/- 1.53 Cont: -16.55 +/- 2.20 **[p=0.0311]** Data not extracted Data not extracted	Patients in the Int. group also received PN if ETF was insufficient. Details on baseline characteristics: age, weight (apart from gender) not reported per group.
Eyer et al 1993[98]	RCT	1+	52 patients 38 completed 5 days course of study 38 patients; 19 in each group	Blunt trauma ICU patients Age: > 17 years, Injury severity score: > 13, feeding support anticipated for at least 7 days & ability to start ETF feeding (peptide based formula – Riabilin HN) via tube placed distal to pylorus within 24 hrs after ICU admission.	Early <24h after ICU admission Enteral feeding Nasoduodenal rapid advance feeding. to full volume in 24h	Late >72h after ICU admission Enteral feeding	10 days (please check this)	Days in ICU (mean, ?sd) Ventilator days (mean, ?sd) Organ failure Mortality Total Infections	Early: 11.8 ± 7.9; Late: 9.9 ± 6.7. Early: 10.2 ± 8.1; Late: 8.1 ± 6.8. Early: 2; Late: 2. Early: 2; Late: 2. Early: 29; Late: 14. **[p<0.05]**	In this study, early ETF feeding after blunt trauma neither attenuated the stress response nor altered patient outcome. Urinary catecholamine, cortisol, total Nitrogen and plasma lactate measurements were similar irrespective of

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				ICU admit to feeding (hours): Early: 31 ± 13; Late: 82 ± 11. **[p<0.001]**						the timing of ETF nutrition. In addition, early ETF feeding did not alter ICU stay, ventilator days or mortality. Total infectious complications were increased in the early feeding group. The mean time from ICU admission to early feeding was 31 □ 13 hours and from injury to early feeding: 39 □ 12 hours. These times may be too long to prevent an enhanced macroendocrine response to injury. Funding: Supported in part by a grant from Hoechst- Roussel, Paris, France.
Jones et al 1989[175]	RCT		130 patients (7 were excluded from analysis because of reoperation within 72 h (4), mechanical small bowel obstruction (2) and underlaying Crohn's disease (1) Remaining 123	Patients undergoing emergent laparotomy with an abdominal trauma index (ATI) >= 15	ETF jejunostomy. Vivonex starting at 12 h post op (0.25 kcal/ml) 50 ml/h. The rate and concentration of the diet were increased at 8-h intervals to deliver full strength solution of 100 to 125 ml/h by post. op day 3 Mean duration of jejunal feeding was 7	Total 52 patients. No enteral nutrition during the first 5 days N= 29 Conventional 5% dextrose in water solution (D5W) IV N=23 started on TPN by central vein within 12 h of surgery and continued through post op day 5	Not clear	GI complaints Overall complaints Minor Moderate Severe	Int: n=71; Cont: n=52 Int: 83% (n=59) Cont: 50% (n=26) Int: 32 % (n=23) Cont: 39% (n=20) Int: 35% (n=25) Cont: 12% (n=6) Int: 16% (n=11) Cont: 0% (Mean ATI for patients with severe complaint	Of the 52 patients in the control group, 23 received PN (1983-1986) and 29 received IV fluids only (1981-1983). 13% of the ETF patients were converted to PN during the study Symptoms of GI complaints were monitored daily by the same individual.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			patients, Int: 71 (1981-1986) (9 were converted to PN during the study) Cont: 52 -IV- 29 (1981-1983) -PN-23 (1983-1986)		days (range 5 to 20)				was 34.7 +/-2.8) No p values reported 9 (13%) of the 59 ETF patients that experience GI symptoms failed to improve despite feeding adjustment and were converted to TPN	Nausea and cramping were based on the patient's subjective appraisal. Other GI complaints monitored were: abdominal distention, vomiting and diarrhoea With attentive monitoring and close management by an experienced nutritional support service, 87% of the patients in this study tolerated full-scale feeding via jejunostomy. Patients with ATI>= 40 TPN should be initiated with transition to jejunostomy feeding in 3 to 5 days.
Malhotra et al 2004[216]	RCT	1+	200 patients randomised ETF: 100 Nil: 100 Total completed the trial: n=164 ETF: n=83 Nil: n= 81	Patients with enteric perforations undergoing emergency surgery and had not undergone ileostomy. Mean age: ETF: 38 Nil: 36 Gender (M/F): ETF: 78/22 Nil: 81/19	ETF feeding (NG tube) within 48 hours. NG tube was used for both feeding and aspiration. From the fifth postoperative day, in addition to enteral feeds patients were kept on intravenous patency line. Between the 8th and 10th day the NG tube was removed and complete oral feeds in the form of	Calories only in the form of dextrose-containing fluids IV. Patients were assessed for the feasibility of oral intake on the fifth postoperative day and those found suitable were given sips or an appetising liquid. Those tolerating sips graduated to 500-ml liquids and then semi-solids over the next two days.	Until discharge	Abdominal distension Vomiting Diarrhoea Pneumonia	ETF: n= 100 Nil: n= 100 ETF: 20 Nil: 18 [p=0.823] ETF: 13 Nil: 7 [p=0.157] ETF: 16 Nil: 11 [p=0.303] ETF: 21 Nil: 30 [p=0.145]	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					semi-solid diet were commenced.	Those who did not tolerate oral feeds stayed on intravenous fluids till they could take feeds orally.		Wound infection Wound dehiscence Leak Septicaemia Mortality Mean duration of stay Mean duration of ICU stay Mean weight loss between day 1 and 10 (kg) Duration of complications in terms of man-days lost	ETF: 27 Nil: 31 [p=0.103] ETF: 4 Nil: 9 [p= 0.157] ETF: 7 Nil: 13 [p=0.157] ETF: 20 Nil: 30 [p=0.103] ETF: 12 Nil: 16 [p=0.417] ETF: 10.59 Nil: 10.70 [NS] ETF: 1.59 Nil: 2.10 [NS] ETF: 3.10 Nil: 5.10 Significantly lower in ETF group than nil group. Data not extracted.	
Moore and Jones 1986[238]	RCT		63 patients Int: 32 Con: 31 (Patients with A.T.I > than 40	Patients undergoing emergency celiotomy with an abdominal trauma index (A.T.I) of > 15. (Patients with A.T.I > than 40 were	Needle cathether jejunostomy (Vivonex HN, calories: nitrogen= 150:1). Timing of	Conventional D5W 100 gm/day IV for first 5 post operative days, and then begun on high nitrogen (calories:	N/K	Overall study (63 patients) Postoperative complications	Int: n=32 Cont n=31 Int: 44% (n=14), Con: 48% (n=15) [no p value] reported	Moore 1983 and Jones 1989 reporting same study. Some patients in this study required total

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			were significantly more intolerant to jejunostomy feeding than those with an A.T.I < 40. For this reason, the impact of early enteral feeding was also analysed in the randomized study subjects with an A.T.I < 40; 53 patients had an A.T.I between 15 and 40) 53 patients, Int: 26 patients, Con: 27 patients	significantly more intolerant to jejunostomy feeding than those with an A.T.I < 40. For this reason, the impact of early enteral feeding was also analysed in the randomized study subjects with an A.T.I < 40)	intervention: Infusion was begun at 12 to 18 hr postoperatively. The solution was initiated at one-quarter strength (0.25 kcal/ml) and at a rate of 50 ml/hr. The rate and concentration were increased at 8-hour intervals to deliver full-strength solution at 125 ml/hr, the targeted goal at 72 hr. Infusions were continued until the patient tolerated adequate oral intake. 19 (73%) of the 26 enteral patients were maintained on the elemental diet 5 or more days (range, 5-20; mean, 9 days); 2 (8%) received total parenteral nutrition	nitrogen = 133:1) total parenteral nutrition (TPN) by central vein if they were not tolerating a regular oral diet at that time. Nine (29%) of the 31 control patients required TPN for a mean duration of 21.8 days (range, 5 to 83)		Sepsis Average Hospital stay 53 patients ATI 15-40 Postoperative complications Sepsis	Int: 9% (n=3), Con: 29% (n=9) **[p<0.05]** Int: 25.3 days ± 5.8, Con: 28.6 days ± 6.1 Int: n=26 Cont n=27 Int: 35% (n=9) Cont: 41% (n=11) no p value reported Int: 4% (n=1), Con: 26% (n=7); **[p<0.05]**	parenteral nutrition: Overall study n= 63 Int. 12% Cont. 29% Patients ATI between 15-40 n= 53 Int. 8% Cont. 26%
Pupelis et al 2001[281]	RCT	1+	60 patients	Post-operative secondary peritonitis and severe pancreatitis patients n=30	Nasojejunal tube feeding of 20 to 25 mL/h providing at least 300mL per day n=30	Intravenous fluids	Until discharge	Mean (SD) length of stay in hospital Mean (SD) length of stay in intensive care unit Mortality Total daily mean (SD) caloric intake	ETF 35.3 (22.9) days IV 35.8(32.5) days [not significant] ETF 13.9 (14.6) days IV 16 (20.5) days [not significant] ETF n = 1 (3.3%) IV n = 7 (23.0%) **[p<0.05]** ETF 1294.6 (362.6) kcal IV 472.8 (155.8)	ETF group had significantly fewer deaths than IV group and also succeeded in gaining significantly more calorie intake. Other outcomes looked at none of which showed a significant difference between groups: evidence of multiple organ dysfunction syndrome, incidence of systemic

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Complications: Unresolved peritonitis with relaparotomies	kcal mean (SD) **[p<0.0001]** ETF n = 8 (26.7%) IV n = 1 (3.3%) **[p<0.05]**	inflammatory response syndrome (SIRS) and other complications (wound septic, renal, pulmonary, postoperative ileus, bleeding, gastrointestinal fistulas) Funding: Amaja Ltd supplied ETF feed

Table 56: Enteral nutrition -- Economic evaluations: characteristics of studies

Bibliographic reference	Comparison	Patient group	Incremental analysis	Measure of effectiveness	Cost components included	Method
Beier-Holgersen and Boesby 1996, Denmark[27]	1) Nutridrink[7] 2) Nil-coloured fluid	Patients who had major abdominal surgery (n_1=30, n_2=30)	Cost-effectiveness	Total infectious complications	Hospital costs	RCT (30 days follow-up after surgery)
Feo et al 2204, Italy[104]	1) Nasogastric catheter and fasting until passage of flatus feeding 2) Early oral feeding (liquids day 1, soft food day 2)	Patients undergoing elective colorectal resection for cancer (n_1=50, n_2=50)	Cost consequences analysis	No overall measure of effect	Total Hospital cost	RCT (follow-up to discharge)
Hasse et al 1995, USA[145]	1) Enteral formula[8] 2) IV fluid	Patients who had liver transplant (n_1=14, n_2=17)	Cost-effectiveness	Overall infections in the first 21 days after transplantation	Hospital costs	RCT (21 days follow-up after surgery)

[7] Intervention group received Nutridrink through a nasoduodenal feeding tube within four hours postoperatively until the fourth day. Nutridrink contained 150kcal/100 ml and 5g protein/100ml.
[8] Enteral formula was Reabilan HN nasointestinal feeding tubes

Bibliographic reference	Comparison	Patient group	Incremental analysis	Measure of effectiveness	Cost components included	Method
Hedberg et al 1999[147]	1) Jejunal feeding tube placed during surgery 2) Usual care	Patients undergoing bowel resections (n_1=66, n_2=159)	Cost-effectiveness	Patient developing no postoperative infection	Hospital costs	Prospective non-randomized study (follow-up up to 3 months after discharge)
Mack et al 2004, USA[210]	1) Double-lumen gastrojejunostomy tube 2) Routine care (determined by individual surgeon)	Patients immediately after pancreaticoduodenectomy (n_1=20, n_2=16)	Cost consequences analysis	Complications averted	a) Total hospital charges b) Sensitivity analysis: Hospital cost of PN, complications & LOS	RCT (30 days follow-up)
Mitchell et al 2003A, USA[234]	1) Tube-fed 2) Oral feeding by nurse	Nursing home residents aged 65 and over with advanced dementia (n_1=11, n_2=11)	Cost analysis	N/A	Cost of intervention and care[9]	Retrospective study (6 months)
Ofman and Koretz 1997[256]	1) Preop ETF 2) No preop ETF	Not specified	Cost analysis	Absolute reduction in post-op complication rate	Preop bed days and administration of ETF	Sensitivity analysis based on two RCTs[112,116]

Table 57: Enteral nutrition -- Economic evaluations: results

Study	Comparison	Effectiveness (per patient)	Cost (per patient)	Incremental cost-effectiveness ratio (ICER)
Beier-Holgersen 1996, Denmark[27]	1) Nutridrink (4 days) 2) Nil-coloured fluid (4 days)	Total Infectious complications: 1) 2 2) 14	1) DKK 43,270 (median) (£3,938) 2) DKK 58,365 (median) (£5,314)	Since costs were expressed as median, ICER was not calculated
Feo et al 2204, Italy[104]	1) Nasogastric catheter and fasting until passage of flatus feeding 2) Early oral feeding (liquids day 1, soft food day 2)	Zero mortality No statistically significant differences in other variables	1) €2,380 ± 247 2) €2,298 ± 309 (no statistically significant difference)	N/A

[9] Cost of nursing time, physician assessments, food, hospitalizations, emergency room visits, diagnostic tests, treatment with antibiotics and parenteral hydration and feeding tube insertion. Food costs did not differ between the two groups.

* Studies reporting hospital length of stay (LoS) as a clinical outcome are reported in Clinical Evidence Tables. LoS has an obvious implication in terms of resource use, but in order to avoid duplication we do not report these studies in Economic Evidence Tables.

Study	Comparison	Effectiveness (per patient)	Cost (per patient)	Incremental cost-effectiveness ratio (ICER)
Hasse et al 1995, USA[145]	1) Enteral formula (feeding within 12 hours) 2) IV fluid	Overall Infections (not significant): 1) 3 2) 8	1) $99,637 ± 21,640 2) $97,560 ± 16,403 (no statistically significant difference)	$415.4 per reduced infection
Hedberg et al 1999, USA[147]	1) Jejunal feeding tube placed during surgery (feeding within 12 hours) 2) Usual care	% of patients with no post-operative infection: 1) 91 % 2) 83 %	Not stated*	Intervention 1) was dominant*
Mack et al 2004, USA[210]	1) Double-lumen gastrojejunostomy tube 2) Routine care (determined by individual surgeon	Zero mortality: Major complications: 1) 1/20 2) 4/16 (p=0.15) Gastroparesis: 1) 0/20 2) 4/16 (p=0.03)	a) Total hospital charges: 1) 52,589 2) 82,151 **[p=0.036]**	a) Total hospital charges: 1) dominates b) Hospital costs – sensitivity analysis: 1) was cost saving in all scenarios except when gastroparesis only occurs in <5% of patients, the stay in hospital for gastroparesis is <20 days *and* TPN is only required in 20% of patients receiving 2)
Mitchell et al 2003A, USA[234]	1) Tube-fed 2) Oral feeding by nurse	N/A	Cost of nursing staff and antibiotics: 1) $2,379 2) $4,219, **[p=0.006]** Cost of emergency room, hospital and physician: 1) $ 6,994 2) $ 959, **[p<0.001]** Costs of physician visits: 1) $ 1,394 2) $ 812, **[p=0.009]** Costs of diagnostic tests: 1) $ 304 2) $ 147, **[p=0.04]** Total costs per patient: 1) $ 9,373 2) $ 5,178, **[p=0.04]**	N/A
Ofman and Koretz 1997[256]	1) Preop ETF 2) No preop ETF	Absolute reduction in post-op complication rate: 1) vs 2) 10%-25%	Not reported	1) vs 2) $9,000-$94,500 per complication averted depending on assumptions about cost of ETF, no. days of ETF and efficacy

N/A: Not applicable, * The ICER was presented. This was inappropriate since an ICER is meaningless when one intervention is dominant. Furthermore it was calculated incorrectly so that the incremental cost could not be derived.

Parenteral nutrition support

Table 58: Parenteral nutrition vs no parenteral nutrition

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Kamei et al 2005[178]	RCT	1+	48 Patients ETF: n=27 TPN: n=21	Patients with gastric cancer undergoing total gastrectomy. Sex (M:F): ETF: 19:8 TPN: 16:5 Age (yrs): ETF: 62 ± 10 TPN: 65 ± 11	TPN: Patients followed a standard protocol. TPN started on POD 3 through a central vein. A standard TPN solution was used containing glucose, amino acids, minerals (Aminotripa No. 2), vitamins (Ootsuka M.V., Ootsuka Seiyaku Co), & trace elements (Elemenmic, Morisita Ruseru Co, Tokyo). On day 7, a barium swallow was performed to check the integrity of the anastomosis. If there were no problems, patients started a liquid diet (72kcal/d) on POD 8. TPN was continued until patients were consuming 540kcal/d orally.	Oral: received 4.3% glucose through a peripheral vein on postoperative day (POD) 1 & 2. On the morning of POD 3, barium swallow was performed to verify the integrity of the anastomosis and, if intact, enteral feeding was started by mouth. On POD 3, the patients drank Racol 400mL (Ootsuka Seiyaku Co, Tokyo) flavoured with coffee, grapefruit juice, or lemon squash to improve taste according to patient preference. From POD 4 onward, Racol 600mL was given daily. Additionally, 1000 to 1500mL was infused (Aminofurido & Intralipid, Ootsuka Seiyaku Co, Tokyo). Food intake (540kcal/d) was begun on POD 7.	Until hospital discharge	Postoperative complications – Esophagojejunal leak: Leakage of duodenal stump: Ileus: Pancreatitis: Wound infection: Deep Vein Thromobosis (DVT): Digestive symptoms - Abdominal cramps: Diarrhoea:	 Oral: 0/27 TPN: 2/21 (9.52%) [Not significant] Oral: 1/27 (3.7%) TPN: 0/21 [Not significant] Oral: 1/27 (3.7%) TPN: 1/21 (4.7%) [Not significant] Oral: 1/27 (3.7%) TPN: 0/21 [Not significant] Oral: 2/27 (7.4%) TPN: 1/21 (4.7%) [Not significant] Oral: 0/27 TPN: 1/21 (4.7%) [Not significant] Oral: 2/27 (7.4%) TPN: 1/21 (4.7%) [Not significant] Oral: 7/27 (25.9%) TPN: 4/21 (19.0%)	Barium swallow test revealed anastomosis was intact in all patients in the ETF group. However, 2 patients in the oral group were withdrawn from treatment. 1 patient developed pancreatitis on POD 3 & the other could not tolerate the supplement without vomiting. A CVC was inserted when ETF was stopped & the patients were switched to TPN. These patients recovered uneventfully. Overall incidence of postoperative complication was similar in the 2 groups. LOS was significantly shorter in the ETF group compared to the TPN group.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									[Not significant]	
								Nausea:	Oral: 4/27 (14.8%) TPN: 2/21 (9.5%) [Not significant]	
								Hospital stay (days):	Oral: 23.1 ± 7.2 TPN: 27.6 ± 4.7 **[p<0.05]**	
								Mortality:	Oral: 0 TPN: 0	
Koretz et al 2001[190]	Systematic review	1+	See individual groups within the systematic review (below). RCTs from 1978-1998	Most of the RCTs evaluated well-nourished or mildly-to-moderately malnourished hospitalised patients receiving PN for at least 7 days. RCT were excluded if: -controls received some form of ETF -controls received more than 10 kcal•kg-1day-1 IV (not standard care) -trials not randomised -Quasi-randomisation -data not reported in a usable format -different forms of PN being compared -no N was provided IV. -severely malnourished patients This SR included different patient gps & has also been arranged like this in this appraisal. The patient were grouped as	Treated patients received IV fluids containing a source of N (as amino acids or protein hydrolase) & at least 10 kcal•kg-1day-1 of nonprotein calories.	Control patients received no nutrient intake beyond that contained in ad libitum feedings and/or 5% dextrose IV as maintenance fluid.	Different depending on which group of patients they belonged to.	See individual groups within the systematic review (below)	See individual groups within the SR (below)	The authors search began 2 decades ago and they did not only rely on computer searching. Combining data from all patient groups did not show that there is an overall benefit of PN (including Protein-sparing therapy (PST)). Some conditions PN resulted in net harm, i.e. more infections.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				follows: -perioperative trials -oncologic trials -liver disease -acute pancreatitis -Inflammatory Bowel Disease (IBD) -Acquired Immunodeficiency Syndrome (AIDS) -pulmonary disease						
			Meta-analysis of perioperative trials:							
			61 RCTs From 1976-1999 (41 RCTs on PN & 60 RCTs on PST) Largest RCT (Doglietto et al. (1996) of 678 patients.	Perioperative patients. Patients treated before and/or after surgery.	Treated patients received IV fluids containing a source of N (as amino acids or protein hydrolase) & at least 10 kcal•kg^{-1}day^{-1} of nonprotein calories.	Control patients received no nutrient intake beyond that contained in ad libitum feedings and/or 5% dextrose IV as maintenance fluid.	Not stated in SR	For PN trials: Mortality: Total complications: Infectious complications: Major complications: Wound complications: Intra-abdominal complications:	Absolute Risk Diff: 0% CI: -2% to +2% No. of studies: 37 No. of patients: 2164 Absolute Risk Diff: -6% CI: -13% to +1% No. of studies: 32 No. of patients: 2062 Absolute Risk Diff: -2% CI: -8% to +3% No. of studies: 29 No. of patients: 1612 Absolute Risk Diff: -3% CI: -9% to +3% No. of studies: 22 No. of patients: 1648 Absolute Risk Diff: -2% CI: -6% to +2% No. of studies: 29 No. of patients: 1800 Absolute Risk Diff: 0% CI: -5% to +4% No. of studies: 21 No. of patients: 1375	Neither PN nor PST affected postoperative mortality. Subgroup analyses did not identify any sig. beneficial or harmful effects. PN had no sig. effect on various postoperative complication rates. Directions of absolute risk diff. were always negative. When only trails containing patients with upper GI cancer were considered, the absolute risk diff. were always negative. In this subgroup, PN sig. reduced the major complication rate. PN had no effect on duration of hospitalisation of

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Postoperative pneumonia: For PST trials: Mortality: Total complications: Infectious complication rate: Major complications: Wound complications: Intra-abdominal complications: Postoperative pneumonia:	Absolute Risk Diff: -2% CI: -4% to +2% No. of studies: 23 No. of patients: 1684 Absolute Risk Diff: +1% CI: -2% to +3% No. of studies: 13 No. of patients: 1033 Absolute Risk Diff: -3% CI: -7% to +1% No. of studies: 16 No. of patients: 1182 Absolute Risk Diff: +2% CI: -1% to +5% No. of studies: 16 No. of patients: 1109 Absolute Risk Diff: -1% CI: -6% to +4% No. of studies: 6 No. of patients: 773 Absolute Risk Diff: 0% CI: -4% to +3% No. of studies: 11 No. of patients: 1005 Absolute Risk Diff: +1% CI: -3% to +5% No. of studies: 10 No. of patients: 950 Absolute Risk Diff: +1% CI: -2% to +3% No. of studies: 10 No. of patients: 957	surgical patients. Although, PN was not shown to reduce postoperative complications with statistical certainty, almost all the absolute risk diff. were negative. VA cooperative study suggested that severely malnourished patients (as defined by the Nutrition Risk Index or the Subjective Global Assessment) may have benefited from preoperative PN. The diff. did not achieve stats sig. the rates of major postoperative complications were 20%-25% in severely malnourished patients given PN & 40%-50% in the nutritionally comparable controls. Note: Degree of malnutrition was not present in most or all of the patients enrolled in other trials. This SR data are inadequate to confirm or refute this conclusion from the VA trial. Most of the trials provided PN for at least a week.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
										20 RCTs of PST (usually in the postoperative period) found no benefit.
			Meta-analysis of oncologic trials:							
			19 RCTs 1050 patients (studies from 1978-1993) – Within the 19 RCTs there were: 3 RCTs (studies from 1978-1982) - 4 RCTs (studies from 1986-2000) -	Oncologic therapy PN in cancer patients receiving chemotherapy Cancer patients treated with radiation therapy with or without concomitant chemotherapy. Patients undergoing bone marrow transplantation.	Treated patients received IV fluids containing a source of N (as amino acids or protein hydrolase) & at least 10 kcal•kg^{-1}day^{-1} of nonprotein calories.	Control patients received no nutrient intake beyond that contained in ad libitum feedings and/or 5% dextrose IV as maintenance fluid.	Not stated in SR	Mortality:	Absolute Risk Diff: 0% CI: -5% to +5% No. of studies: 19 No. of patients: 1050	RCT were included if the report explicitly stated that the patient groups were randomised. No apparent effect of PN on mortality. Weisdorf et al (1987), this bone marrow transplantation trial reported an improved survival rate but this was not demonstrated when all 4 trials were combined (not sig. survival diff). Charuhas et al. (1997) assessed role of HPN after the patients were discharged. No sig. trend for PN to improve mortality. 1 RCT Solassol et al. (1979) treated patients lived sig. longer (46 days) compared to controls (7 days). This RCT assessed the value of PN provided to patients with end–stage malignancies receiving no specific cancer therapy.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Total Complication Rate: Infectious Complication Rate: Tumour Response: Bone marrow toxicity: GI toxicity:	Absolute Risk Diff: +40% CI: +14% to +66% No. of studies: 8 No. of patients: 333 Absolute Risk Diff: +16% CI: +8% to +23% No. of studies: 18 No. of patients: 823 Absolute Risk Diff: -7% CI: -12% to -1% No. of studies: 15 No. of patients: 910 Absolute Risk Diff: +22% CI: -10% to +54% No. of studies: 3 No. of patients: 134 Absolute Risk Diff: +1% CI: -9% to +11% No. of studies: 6 No. of patients: 31	Use of PN resulted in increased total complication rate. PN increased the incidence of infectious complications. 13/15 trials were chemotherapy trials. Tumour–response rates were adversely affected by PN. Absolute risk dif. In the subgroup analyses favoured the control group but the diff did not always achieve stats sig. (maybe related to exogenous nutrients stimulating tumour growth. PN did not appear to benefit either bone marrow or GI toxicity. No effect was observed in any of the subgroup analyses.
			Meta-analysis of liver disease:							
			2 RCTs (Simon et al. (1986) & Naveau et al. (1988)) – 5 RCTs (Achord (1987), Bonkovsky et al.(1991), Diehl et al.(1985),	2 trials comparing PN to standard treatment in patients with alcoholic hepatitis. 5 trials comparing protein-sparing therapy (PST) to standard treatment in patients with alcoholic hepatitis.	Treated patients received IV fluids containing a source of N (as amino acids or protein hydrolase) & at least 10 kcal•kg^{-1}day^{-1} of nonprotein calories.	Control patients received no nutrient intake beyond that contained in ad libitum feedings and/or 5% dextrose IV as maintenance fluid.	Not stated in SR	Mortality:	Simon et al: Int: 27% Cont: 18% Naveau et al: Int: 5% Cont: 5% From 4 out of 5 PST	Results were grouped into PN and protein sparing separately in this SR, however our clinical question includes protein-sparing within PN treatment group. Neither PN nor PST

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Mezey et al.(1991) & Nasrullah et al.(1980)) No. of patients not stated in SR.					Total Complication Rate: Encephalopathy developed or worsened:	trials (excl: Diehl et al.(1991)) - 155 patients: Est Risk Diff: -6% CI: -18% to +5% Simon et al. & Naveau et al: No data Data from 2 out of 5 PST trials: Bonkovsky et al. - 39 patients Int: 5% Cont: 0% Nasrullah et al. - 35 patients): Int: 6% Cont: 22% Simon et al: Int: 0% Cont: 11% Naveau et al: Int: 10% Cont: 20% 5 PST trials: Not data	improved survival. There was no effect demonstrated in the total complication rate in the 2 PST trials. No sig. trends in the 2 trials for PN to be associated with less encephalopathy. Only limited no. of trials are available. Role of PN after liver transplantation is unknown. Trials were so small that marked differences between groups would be needed to achieve stats sig.
			Meta-analysis of acute pancreatitis:							

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			2 RCTs (Floch & Hyde (1984) & Sax et al. (1987)) No. of patients not stated in SR.	PN in patients with acute pancreatitis. Excluded: Patients with severe disease.	Treated patients received IV fluids containing a source of N (as amino acids or protein hydrolase) & at least 10 kcal•kg^{-1}day^{-1} of nonprotein calories. Floch & Hyde included a 2nd treatment arm (PST).	Control patients received no nutrient intake beyond that contained in ad libitum feedings and/or 5% dextrose IV as maintenance fluid.	Not stated in SR	Mortality: Total Complication: Infectious Complication: LOS:	Floch & Hyde: Int group 1 (PN): 0/7 (0%) Int group 2 (PST): 0/8 (0%) Cont: 2/8 (25%) Sax et al: Int: 1/29 (3%) Cont: 1/26 (4%) Floch & Hyde: No data Sax et al: Int: 6/29 (21%) Cont: 0/26 (0%) **[p<0.05]** (assuming the 6 complications were each in different patients). Floch & Hyde: No data Sax et al: Int: 3/29 (10%) Cont: 0/26 (0%) Floch & Hyde: No data Sax et al: Int: 16 days Cont: 10 days **[p<0.05]**	No differences in mortality between the patients who received PN & the controls. SR did not report data for total complications, infectious complications & LOS in Floch & Hyde study. Sax et al. – PN resulted in sig. more complications & sig. longer hospitalisation & higher costs compared with standard therapy. Only few RCTs have evaluated the clinical efficacy of PN in patients with acute pancreatitis. Difficult to draw conclusions when the only data available are from a few small trials. However, the data suggests that PN not only is not beneficial, but also causes net harm in patients with mild pancreatitis.
			Meta-analysis of Inflammatory Bowel Disease (IBD):							
			2 RCTs (Dickinson (1980) &	Patients with acute ulcerative or Crohn's colitis	Treated patients received IV fluids containing a source	Control patients received no nutrient intake beyond that	Not stated in SR	Mortality:	Dickinson: Int: 0/19 (0%) Cont: 1/19 (6%)	No difference of PN on mortality compared to control group.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			McIntyre (1986)). No. of patients not stated in SR.		of N (as amino acids or protein hydrolase) & at least 10 kcal•kg^{-1}day^{-1} of nonprotein calories.	contained in ad libitum feedings and/or 5% dextrose IV as maintenance fluid.		Remission: Surgery required:	McIntyre: Int: 1/27 (4%) Cont: 1/20 (5%) Dickinson: Int: 10/19 (53%) Cont: 11/17 (65%) McIntyre: Int: 16/27 (59%) Cont: 12/20 (60%) Dickinson: Int: 9/19 (47%) Cont: 6/17 (35%) McIntyre: Int: 11/27 (41%) Cont: 5/20 (25%)	No effect on disease remission or subsequent need for surgery was shown when comparing PN with control group. None of the trials addressed the duration of diarrhoea. PN provided no benefit in the treatment of Crohn's or ulcerative colitis.
			Meta-analysis of Acquired Immunodeficiency Syndrome (AIDS):							
			1 RCT (Melchior (1996 & 1998)) 31 patients	Malnourished patients with AIDS	Patients with AIDS receiving HPN for 2 months	Patients with AIDS receiving nutritional counselling	Not stated in SR	Mortality: Morbidity:	Int: 3 patients died Cont: 3 patients died Int: Improved anthropometric measurements & weight gain & the subjectively felt better. No actual data reported in the SR.	No difference in survival was reported in the initial report. Investigators reported that survival was improved in patients of PN (Melchior (1998)) but these data were not analysed in accordance with the initial treatment assignment. No difference in the incidence of AIDS-

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
										related complications. This single RCT did not show that PN altered the progression of AIDS. It did improve body weight & subjective feelings of well-being but study was not blinded.
			Meta-analysis of pulmonary disease:							
			2 RCTs (Kirvela et al. (1993) & Song et al. (1993). No. of patients not stated in SR.	Kirvela et al. - patients with cystic fibrosis. Song et al. – malnourished hospitalised patients with chronic obstructive pulmonary disease (COPD).	Kirvela et al. - HPN Song et al. - Treated patients received IV fluids containing a source of N (as amino acids or protein hydrolase) & at least 10 kcal•kg^{-1}day^{-1} of nonprotein calories.	Kirvela et al. – No nutritional support. Song et al. - Control patients received no nutrient intake beyond that contained in ad libitum feedings and/or 5% dextrose IV as maintenance fluid.	Kirvela et al. – 4 months HPN vs no nutritional support.	Mortality: Catheter Infections (catheters placed for IV antibiotics): LOS:	Kirvela et al: Int: 0/10 (0%) Cont: 2/10 (20%) Song et al: Int: 0/12 (0%) Cont: 2/13 (15%) Kirvela et al: Int: 2/10 (20%) Cont: 1/8 (13%) - (data only from the 8 surviving patients) Song et al: No data Kirvela et al: Int: 26 days Cont: 16 days (data only from the 8 surviving patients) Song et al: No data	Kirvela et al, data from the 1st 4 months are reported. No sig. diff. although mortality rates in control group of both trials were higher than those in the PN group. No sig. diff. in the rates of catheter infections. Kirvela et al, the average no. of days spent in hospital over a 4 month period was not sig. different between the 2 groups. Only limited data available. No benefit of PN was established.
Roberts et al	RCT	1+	55 patients	Mean age (mean ±	TPN initiated in the	Patients given	Not stated	Weight (kg) (means	TPN (n=27):	Control group patients

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
2003[296]			TPN: 27 Cont: 28 (Cont group: Oral Diet- OD) was later spilt into 2 groups: -Delayed TPN: 14 patients -Cont: 14 patients	SD): TPN: 41.6 ± 6.6 Cont: 45.6 ± 7.3 Breast cancer disease stage: TPN: 13 stage II-III 14 stage IV Cont: 10 stage II-III 18 stage IV Source of transplant: TPN: 3 peripheral blood 24 marrow Cont: 4 peripheral blood 24 marrow No. of patients given TPN: TPN: 26 (1 patient randomised to the TPN group never received TPN due to excellent oral intake. Cont: 14 No. of days on TPN: TPN: 17.5 ± 7.4 Cont: 5.3 ± 5.9 Well nourished, hospitalised females with stage II-IV breast cancer patients undergoing high-dose chemotherapy and hematopoietic cell transplantation (HCT). Excluded:	TPN group on the day prior to HCT (day 1). Group also was provided IV fluids. Patients received a standard 3-in-1 admixture formula (17.5% dextrose, 5% amino acids, 10% lipids-final concentration) 3 times per week. The other 4 days the patients received a standard 2-in-1 formula (25% dextrose, 5% amino acids-final concentration). TPN was provided as a continuous infusion until the patients were close to discharge; then it was changed to nocturnal infusion. Group was allowed to eat ad libitum. TPN was discontinued when the patients' oral intake met >50% of nutrient needs for 2 consecutive days.	standard IV fluids of either 5% dextrose or normal saline, whichever was appropriate. Group was allowed to eat ad libitum. Control group patients were given TPN if one of the following occurred: -oral intake below 40% of nutrient needs for 10 consecutive days. -weight loss of 10% of admit body weight. -need for mechanical ventilation.		± SD) Admit (day of entry): Day +30 (30 days posttx): Nutritional status: Admit: Day +30: Total nutrient intake levels (Calories & grams of protein per day):	67.5 ± 13.4 66.4 ± 13.8 Decrease: 2% DTPN (n=14): 71.7 ± 12.9 67.7 ± 12.0 Decrease: 6% Cont (n=14): 80.7 ± 22.5 75.0 ± 21.9 Decrease: 7% TPN (n=27): Intact Intact DTPN (n=14): Intact Depleted Cont (n=14): Intact Depleted TPN: 1494 ± 197 & 60 ± 11 DTPN: 1069 ± 125 & 41 ± 5.9 Cont: 833 ± 173 30 ± 11	were given TPN if one of the following occurred: -oral intake below 40% of nutrient needs for 10 consecutive days. -weight loss of 10% of admit body weight. -need for mechanical ventilation. Weight decreased sig. more in the DTNP & OD groups compared to the TPN group. Based on the % of body weight lost & loss of lean body mass from admission to day +30, the TPN group maintained their intact nutritional status while the OD & DTPN groups became depleted. Nutrient intake was calculated for the entire study period by averaging calorie & protein intake. The nutrient intake includes the days with & without TPN for both groups. While TPN preserved nutritional status, no differences were found in clinical outcomes or survival. Note: Differences

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				malnourished patients.						could be less due to well nourished state of patients at the beginning of trial.
Woolfson and Smith 1989[377]	RCT	1+	122 patients Int: n=62 Cont: n=60	Patients were recruited from those admitted for one the several operations to the hospital: 1. Oesophageal resection for carcinoma. 2. Thoraco-abdominal gastric resection for carcinoma. 3. Total cystectomy & conduit construction for carcinoma. 4. Pharyngo-laryngo-oesophagectomy. Age (yr) (mean ± SD): Int: 63.3 ± 8.9 Cont: 62.0 ± 9.2 Sex: Int: 45 M, 17 F Cont: 41 M, 19 F Weight (kg) (mean ± SD): Int: 66.2 ± 10.4 Cont: 67.1 ± 12.4 Weight loss (%) (mean ± SD): Int: 7.8 ± 7.9 Cont: 7.5 ± 7.8 Operations of patients recruited: Oesophagectomy+	Patients were fed intravenously for an initial period of 6 days using CVC. This solution contained: -Glucose: 9.2 g/kg previous body weight/ 24hrs (35kcal/kg/24hrs). -Amino acids as FreAmine II (McGaw) (1mg amino acid N/175kcal.non-N energy). -Intralipid 20% (Kabitvitrum): 500ml on the nights of the 2nd & 5th treatment days. -Na, K, phosphates, micronutrients & water. Any other solutions (non-nutrient) were allowed at the discretion of the surgical team & were recorded if given.	Patients were given a conventional postoperative IV regimen. The basics solutions were 1000 ml 0.9% saline & 2000 ml 5% glucose. All the other electrolytes & additives were given, calculated as if the patients were being fed.	Not stated	Time to discharge of survivors days (median+ range): Died in hospital: Anastamotic leak: Wound infection: Catheter complications N balance (g/24hr) (mean ± SD): Outcomes in the selected gp who completed the study period & received 80% or more of the fluid that they were prescribed. Time to discharge of survivors days (median+ range): Died in hospital: Anastamotic leak: Wound infection:	Int: 14 (9-87) Cont: 13 (9-95) Int: 8 Cont: 8 Int: 6 Cont: 4 Int: 7 Cont: 4 Int: 16 Cont: 22 Int: -4.7 ± 5.4 Cont: -12.3 ± 5.2 **[p<0.001]** Int: 14 (9-64) Cont: 13 (9-95) Int: 4 Cont: 0 Int: 5 Cont: 1 Int: 5 Cont: 3	There was a highly sig. diff. (p<0.001) in N balance between the int & cont. group. Otherwise there was no diff. between the 2 groups; in particular, an equal no. died & the time to discharge was not altered. The comp. rate was not lessened greatly by feeding. Total of 16 patients died in hospital & were not distinguishable in any way from those who survived on the simple criterion of nutritional status that was used in this study nor was there any predominance of a single operation. The surgeons did not see anything that would help to identify the patients particularly at risk of death or major comp. In order to look more closely at the effect of nutrition, the authors analysed the data after exclusion of the 6 patients in the int.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				oesophago-gastrectomy: Int: 35 Cont: 27 Oesophageal bypass: Int: 3 Cont: 1 Total gastrectomy: Int: 3 Cont: 5 Pharyngo-laryngo-oesophagectomy: Int: 3 Cont: 6 Total cystectomy & conduit: Int: 18 Cont: 21 Excl: If patients had chronic renal or hepatic disease, or diabetes mellitus requiring regular insulin treatment. Also any use of systemic corticosteroids in the month prior to operation & patients could be withdrawn at any time by the surgeon in charge if it was felt to be not in their interests to continue.				Catheter complications N balance (g/24hr) (mean ± SD): The surgeons withdrew 10 patients during the 1st 7 days of the study period because: Patient requiring feeding: Metabolic upset: Catheter problems: CVA: Renal failure: Peritonitis Outcomes in the group of patients withdrawn from the study during the 1st 7 days treatment period; Died in hospital: Anastamotic leak:	Int: 10 Cont: 12 Int: -4.5 ± 5.4 Cont: -12.1 ± 5.3 Int: 1 Cont: 1 Int: 2 Cont: 0 Int: 1 Cont: 2 Int: 1 Cont: 0 Int: 1 Cont: 0 Int: 0 Cont: 1 Int: 4 Cont: 3 Int: 1 Cont: 2	group & 11 in the cont. group who received less than 80% of the fluids that they were prescribed. Also excluded 6 patients in the int. group & 4 in the cont. group who were withdrawn from the study. This left groups with: Int: 50 patients Cont: 45 patients They were otherwise treated in the same way. The characteristics of the patients after the exclusions were well matched. The results were similar to those of the entire group & do not support the possibility that a failure of the study to detect diff. in outcome might be due to inequalities of fluid administration or to confounding factors associated with withdrawal of patients. Patients in the withdrawn group had a very high rate of death & comp., not surprising as it is the comp. themselves that may precipitate the withdrawal.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Wound infection: Catheter complications	Int: 1 Cont: 1 Int: 2 Cont: 2	This study took place in 2 centres 3 years to recruit patients. Funding: Boots Co. plc.
Sandstrom et al 1993[304]	RCT	1+	300 Patients Originally randomised to: Group 1 (TPN): 150 Group 2 (Cont): 150 Later: Group 3: 24/150 (glucose to TPN, patients from group 2) Group 4: 28/150 (modified TPN, patients from group 1)	Sex: Group 1: 94 M, 56 F Group 2: 94 M, 56 F Average male age: Group 1: 64 ± 4 Group 2: 65 ± 4 Average female age: Group 1: 64 ± 4 Group 2: 64 ± 4 Weight (kg): Group 1: 70.3 ± 1.1 Group 2: 70.0 ± 1.2 Weight reduction (%): Group 1: 8.3 ± 2.0 Group 2: 8.7 ± 2.0 Type of surgery: Cystectomy: Group 1: 19 Group 2: 19 Hepatic-pancreatic surgery: Group 1: 35 Group 2: 33 Intestinal surgery: Group 1: 22 Group 2: 20 Major vascular surgery: Group 1: 42 Group 2: 44 Gastro-esophageal operation: Group 1: 32	Group 1: Treatment started at 7.00am the next morning (1st postoperative day). Patients received continuous complete IVN (TPN) until the patient had recovered enough to drink or eat freely without any need of parental fluid. The IVN was given as recommended by the manufacturer that is, lipids & amino acids were infused simultaneously through the same central line during the day & the glucose was given during the night. Group 4: If metabolic or circulatory comp. occurred that made the prescribed complete IVN impossible to fulfil, the patient was transferred to this group in whom TPN treatment was insufficient or problematic. Such comp. could be	Group 2: Treatment started at 7.00am the next morning (1st postoperative day). Patients received plain D-glucose (250 to 300g per day) with standard electrolytes until the patient had recovered enough to drink or eat freely without any need of electrolyte support. Group 3: If the patients in the cont group could not drink or eat freely on day 15 this was regarded therapeutic failure in the “glucose-arm” & the patients were transferred to TPN according to the principals for the “TPN-arm” until freely eating was possible.	Not stated	Body weight (kg): Hospital stay (days) : Theoretical hospital stay (days): Mortality: Complications: Myocardial infarction:	Group 1: 65.3 ± 1.3 Group 2: 66.4 ± 1.4 Group 3: 60.9 ± 1.0 (**[p<0.05]** group 1 vs group 3) Group 4: 60.6 ± 1.0 Group 1: 23.4 ± 1.4 Group 2: 24.5 ± 1.6 Group 3: 36.3 ± 3.9 (group 1 vs group 3) Group 4: 39.3 ± 5.3 **[p<0.0001]** Group 1: 17.3 ± 0.9 Group 2: 16.2 ± 0.9 Group 3: 20.6 ± 4.1 Group 4: 40.0 ± 8.3 (group 3 vs group 4) **[p<0.0001]** Group 1: 2 Group 2: 6 ([p<0.15] group 2 vs group 1) Group 3: 4 Group 4: 10 ([p<0.10] group 4 vs group 3) **[p<0.0001]** Group 1: 2 Group 2: 2 Group 3: 2 (**[p<0.05]** group 3 vs group 1) Group 4: 3	28/150 patients randomised to Group 1 did not tolerate the therapy according to the protocol & were given modified TPN (Group 4). 24/150 patients randomised to the Group 2 were transferred to TPN therapy after 14 days on glucose therapy only according to the protocol (Group 3) because they were unable to start eating within 15 days. This group of patients could start freely eating at 20 ± 4 days after operation, which was sig. later compared with patients on uncomplicated TPN (9 ± 1days) & glucose (8 ± 1days) treatment. The patients were randomised according to Simon & Pocock by means of a computer-based algorithm stratifying for sex, age. Type of surgery, nutritional state,

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Group 2: 32 No operation: Group 1: 0 Group 2: 2 Patients included from 6 surgical wards & 1 urology ward. Patients were undergoing acute or elective major general surgical procedures. Patients with acute multiple trauma treated in ICU were also included even without expected operation. Excl: minor surgical procedures.	acute cardiac & pulmonary insufficiency, progressive kidney dysfunction, etc.			 Myocardial insufficiency: Myocardial arrhythmia: Thrombosis: Suture insufficiency: Wound rupture: Wound infection:	**[p<0.02]** Group 1: 10 Group 2: 13 Group 3: 4 ([p<0.10] group 3 vs group 1) Group 4: 12 (**[p<0.05]** group 4 vs group 3) **[p<0.0001]** Group 1: 11 Group 2: 10 Group 3: 5 Group 4: 7 **[p<0.03]** Group 1: 2 Group 2: 4 Group 3: 4 (**[p<0.05]** group 3 vs group 1) Group 4: 3 **[p<0.004]** Group 1: 3 Group 2: 5 Group 3: 2 ([p<0.10] group 3 vs group 1) Group 4: 1 Group 1: 4 Group 2: 4 Group 3: 4 (**[p<0.05]** group 3 vs group 1) Group 4: 1 **[p<0.03]** Group 1: 14 Group 2: 11 Group 3: 4	operation time, blood loss, experience of the surgeon, the particular ward the patient were treated in, complicating factors & “physiologic associated variable”. There were no diff. among TPN vs glucose treatment when results were analysed according to intent to treat. Several sig. diff. were found when results were analysed according to actual treatment usually dependent on diff. between group 1 & group 2 (uncomplicated treatments) vs group 3 & group 4 (complicated treatment). Outcome variables showed a sig. worse outcome in group 3 & group 4 compared with group 1 & group 2 including prolonged theoretical & actual hospital stay. Group 3 (cont to TPN) did sig. worse in several aspects (hospital stay, need of IV line, ICU treatment etc) compared with

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Group 4: 3	uncomplicated TPN patients (Group 1) & short term treated glucose patients (Group 2). The overall mortality rate (7.3%) during the hospital was not diff. between TPN & glucose treatments, when analysed according to intent to treat. The mortality was sig. diff. among groups 1 to 4 which was due to high mortality rate in group 3 (21%) & group 4 (36%). This pattern was also seen with regard to other serious complications (myocardial infarction, myocardial insufficiency, arrhythmia, thrombosis, suture insufficiency, sepsis, and arrhythmia). Group 1 did not differ in any respect to the short-term Group 2, although the mortality rate was threefold higher [p<0.15] in Group 2 vs Group 1. There was also a trend to higher mortality rates in Group 4 vs Group 3 [p<0.10] & this trend reached stat. sig. with regard to myocardial
								Pneumonia:	Group 1: 12 Group 2: 9 Group 3: 1 Group 4: 3	
								Atelectasis:	Group 1: 18 Group 2: 12 Group 3: 4 Group 4: 11 (**[p<0.05]** group 4 vs group 3) **[p<0.001]**	
								UTI:	Group 1: 12 Group 2: 6 Group 3: 2 Group 4: 6 **[p<0.04]**	
								Sepsis:	Group 1: 29 Group 2: 13 Group 3: 11 ([p<0.10] group 4 vs group 3) Group 4: 12 **[p<0.0001]**	
								Phlebitis:	Group 1: 3 Group 2: 2 Group 3: 0 Group 4: 0	
								Central venous line comp:	Group 1: 7 Group 2: 5 Group 3: 4 Group 4: 5 **[p<0.02]**	
								CNS dysfunction (stroke or confusion):	Group 1: 18 Group 2: 19 Group 3: 9 (**[p<0.05]** group 3 vs	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									group 1) Group 4: 15 (**[p<0.05]** group 4 vs group 3) **[p<0.0001]**	insufficiency **[p<0.05]**. Because of the poor outcome in Group 4, overall recalculations were performed with exclusion of patients in Group 4. This indicated that mortality rate still was sig. higher in Group 3 compared with both Group 1 & Group 2. This was true for the occurrence of thrombosis, wound rupture, sepsis & cerebral dysfunction. Patients in Group 2 during 14 days had a sig. higher mortality rate **[p<0.05]** than patients on in Groups 1, 3 & 4. Similar results for mortality rates were seen with regard to severe comp., functional disturbances, the need for additional medical support & abnormalities in nutritional state.

Table 59: Parenteral vs enteral nutrition: acute pancreatitis

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Marik and Zaloga[219]	SYSTEMATIC REVIEW: 6 RCTs with 263 particip-ants were analysed		6 RCTs with 263 participants were analysed	Patients with acute pancreatitis	Parenteral nutrition	Enteral nutrition		Incidence of infections Surgical interventions to control pancreatitis (4 studies) Length of hospital stay Mortality Non-infectious complications	Incidence of infections: ETF vs PN (RR) 0.45; 95% CI 0.26 to 0.78 **[p=0.004]** ETF associated with sig. lower infections Surgical interventions to control pancreatitis: ETF vs PN (RR) 0.48; 95% CI 0.22 to 1.0 **[p=0.05]** ETF associated with sig. lower surgical interventions Length of hospital stay: ETF vs PN (mean reduction:2.9days, 1.6days to 4.3days) **[p<0.001]** ETF associated with sig. shorter days in hospital Mortality: ETF vs PN (RR) 0.66; 95% CI 0.32 to 1.37) [p=0.3] No sig. diff Non-infectious	Meta-analysis shows that in patients with acute pancreatitis TPN as compared with ETF significantly increases the risk of infective complications, the likelihood to surgical intervention (to control pancreatic infection) and increases the length of hospital stay Non-infectious complications were complications other than infections such as multiple organ failure, acute pseudocyts, respiratory distress syndrome & acute pancreatic fistula

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								(from 5 studies)	complications: ETF vs PN (RR) 0.61; 95% CI 0.31 to 1.22) [p=0.16] No sig. diff	

Table 60: Parenteral vs enteral nutrition: major GI Surgery

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Bower et al 1986[38]	RCT		20 patients ETF: n=10 TPN: n=10	Patients undergoing operations on the upper GI tract or pancreaticobiliary tree. Gender (M/F): ETF: 4/6 TPN: 7/3 Mean age +/- SEM: ETF: 50.2 +/- 5.8 TPN: 44.7 +/- 6.1 Mean preoperative weight +/- SEM: ETF: 74.3 +/- 7.7 TPN: 64.0 +/- 5.5 Inclusion criteria: Operations of sufficient magnitude to require nutritional support for at least seven days postop. Patients had to be candidates for postoperative nutritional support by the technique of needle-catheter	Nutritional support started on the first POD and continued until at least day 7. Patients were only allowed protein-free clear liquids by mouth beginning on day 5. TPN via subcutaneously inserted subclavian CVC. Infusion of 4.25% crystalline amino acids, 25 % dextrose, multivitamins, trace elements and appropriate electrolyte additives. Intravenous fat emulsion was administered as 500 mL twice weekly. Diet composition:	Nutritional support started on the first POD and continued until at least day 7. Patients were only allowed protein-free clear liquids by mouth beginning on day 5. Jejunal infusion (needle-catheter jejunostomy) of new elemental diet consisting of crystalline amino acids, carbohydrate as maltodextrin, and fat as 3 g of safflower oil per litre of full-strength feeding. The non-protein calorie to nitrogen ratio was 148:1. Diet composition: Amino acids:	Until at least POD 7	Nitrogen intake-Daily mean (Mean +/- SEM) Nitrogen balance: Nitrogen equilibrium: Mean weight- kg (+/- SEM)	ETF : n=10 ; TPN : n=10 ETF : 108.11 +/- 18.17 mg/kg/d TPN : 202. 54 +/- 15.27 mg/kg/d **[p<0.002]** Greater in TPN than ETF : Day 1 : **[p< 0.05]** Day 2 : **[p< 0.001]** Day 4 : **[p< 0.05]** Achieved by day 2 in TPN and by day 4 in ETF group. Prestudy : ETF : 74.32 +/- 7.66 TPN : 64.04 +/- 5.47 Poststudy : ETF : 71.96 +/- 6.98 TPN : 62.77 +/- 5.81 % change : ETF : -2.88	Patients in the TPN group might have had more extensive dissections than those in the NCJ group. One patient in ETF group required termination of feeding on day 5 due to intolerance. Funding: The Clinfo Computer System (University of Cincinnati Clinical Research Center) used in this study was supported by National Institutes of Health GCRC grant.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				jejunostomy.	Amino acids: 14.5 % - Branched chain: 23.3 % - Essential: 47.8% -Nonessential 52.2% Carbohydrates: 85.5 % (dextrose) Fat: 10 (intravenous fat emulsion: 10% soybean oil emulsified with phospholipids). Each patient was advanced to his/her individual estimated energy expenditure unless hyperglycaemia or GI intolerance necessitated slower advancement.	15.2 % - Branched chain: 33.1 % - Essential: 52.3% -Nonessential 47.7% Carbohydrates: 82.4% (maltodextrin) Fat: 2.5% (safflower oil) Each patient was advanced to his/her individual estimated energy expenditure unless hyperglycaemia or GI intolerance necessitated slower advancement.		Septic complications: Complications with advancement schedules: Serum levels of albumin, transferring, prealbumin, retinol-binding protein, C3, opsonic index Serum levels of SGOT, SGPT, alkaline phosphatase, serum urea nitrogen	TPN : -1.35 [Not significant] ETF : 0 TPN : 0 ETF : n=3 patients experience symptoms of intolerance : nausea, abdominal cramping and pain accompanied by abdominal distention. TPN : n=1 diabetic patient, hyperglycaemia Data not extracted Data not extracted	

Table 61: Parenteral vs enteral nutrition: cancer

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Baigrie et al 1996[16]	RCT	1+	97 patients	Patients undergoing oesophagectomy or	TPN administered through 16 G CVC.	ETF through a 16 G catheter	Until discharge		ETF : n= 50 TPN : n= 47	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			ETF: n= 50 TPN: n= 47	gastrectomy. Gender (M/F): ETF: 30/20 TPN: 28/19 Age: < 60 years old: ETF: 19 TPN: 18 > 60 years old: ETF: 31 TPN: 29 Malnourished: ETF: 17 TPN: 17 Not malnourished: ETF: 33 TPN: 30	TPN started from the first postop day.	jejunostomy. ETF started on the third post-op day with infusion of 5% dextrose. Osmolyte HN was commenced on day four and over the following 48 hours was increased to 100 mL/h. Feeding was continued until patients were able to tolerate an oral diet of 2000 calories per day.		Catheter-related morbidity Non- catheter related morbidity	Total (n=num. of complications) : ETF :n= 20 TPN : n= 21 [Not significant] (TPN group had major morbidity complications : septicaemia secondary to catheter infection n=7, axillary vein thrombosis n=2) Life-threatening complications : - Anastomotic leak (major) ETF :n= 3 TPN :n= 3 - Respiratory failure : ETF : n= 3 TPN : n=6 - Pulmonary embolus : ETF : n=1 TPN : n= 1 - Renal failure : ETF : - TPN : n=1 - Myocardial infarct/arrhymia : ETF : n=1 TPN : n= 2 - Cerebrovascular accident : ETF : n=1 TPN : n=1	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									- Aortic false aneurysm : ETF : - TPN : 1 Total : ETF : n= 9 TPN : n=15 Non-life threatening complications : - Anastomotic leak (minor) ETF : n=2 TPN : n=6 - Gastric outlet obstruction (temporary) ETF : n= 1 TPN : n= 1 - Pneumotorax : ETF : n= 2 TPN : - - Deep vein thrombosis : ETF : n=1 TPN : - - Wound infection/ haematoma : ETF : n= 2 TPN : n= 3 - Recurrent laryngeal nerve palsy : ETF : - TPN : n=1 Total : ETF : n= 8 TPN : n= 11	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Total non-catheter-related complications (life-threatening and non-life-threatening) ETF : n=17 TPN : n= 26 **[p<0.05]**	
								Mortality	Total : ETF : n=4 TPN : n=6 - Respiratory failure : ETF : n=1 TPN : n=3 - Myocardial infarct/arrest : ETF : n=1 TPN : n=1 - Anastomotic leak (fatal) : ETF : n=2 TPN : n=1 - Cerebrovascular accident : ETF : - TPN : n=1	
Bozzetti et al 2001[41]	RCT	1+	317 patients randomised ETF: n=159 PN: n=158	Cancer patients undergoing elective surgery with a weight loss greater than or equal to 10% of the usual bodyweight in the past 6 months. Mean age (SD): ETF: 64.8 (10.8) PN: 64.1 (9.8)	Nutrition regimens started at 0800 h the morning after surgery and were continued until patients were able to tolerate adequate oral food intake. All patients had a CVC placed during operation.	Nutrition regimens started at 0800 h the morning after surgery and were continued until patients were able to tolerate adequate oral food intake. ETF: either jejunostomy feeding catheter or	Until discharge	Mean duration of artificial nutrition (SD, range) Major complications Minor complications	ETF : n=159 PN : n=158 ETF : 8.4 days (2.5, 3-21) PN: 9.6 days (4.3, 7-39) ETF: 20 (13%) PN: 30 (19%) ETF: 60 (38%)	Multicentre trial: 10 institutions. 34 patients (21%) in the ETF group were unable to tolerate the schedule infusion; 20 had a reduced enteral intake (mean 5292 kJ/day, SD 1462, range 3108-6972) and 14 (9%) switched to

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Sex (M/F): ETF: 93/66 PN: 92/66 Proportion of bodyweight lost (%, mean SD): ETF: 14.2 (4.0) PN: 13.4 (3.4) Exclusion criteria: less than 18 years old, hepatic dysfunction (Child-Pugh>2), renal dysfunction (serum creatinine concentration > 265.2µmol/L, haemodialysis, or both), or cardiac dysfunction (New York Heart Association functional class >III, stroke history); had Karnofsky performance status less than 60; were pregnant; had ongoing infection; or had intestinal anastomosis of the large bowel without a diverting stoma.	PN nutrition included electrolytes, vitamins, and trace elements according to current standards.	nasojejunal feeding tube placed during surgery, according to the preference of the centre. All patients had a CVC placed during operation. Nutritional regimens were designed to be isocaloric and isonitrogenous over 1 week, and to deliver, for an average individual with a weight of 70 kg, 1.4 aminoacid/kg/day and 112 kJ/kg/day. Enteral nutrition was based on a standard formula, with a kJ to mL ratio of 5 to 1 and glucose to lipid ratio of 70 to 30. The diet was infused continuously over 24 h with a peristaltic pump with controlled flow rate.		Total number of complications Patients with postoperative complications Mean duration of complications (SD,	PN: 88 (56%) ETF: 80 (50%) PN: 118 (75%) Minor complications: ETF: 40 (25%) PN: 57 (36%) RR (95% CI): 0.70 (0.50-0.98) p= 0.035 Major complications: ETF: 14 (9%) PN: 21 (13%) RR (95% CI): 0.66 (0.35-1.24) p= 0.207 Total: ETF: 54 (34%) PN: 78 (49%) RR (95% CI): 0.69 (0.53-0.90) p=0.005 Infectious complications : ETF : 25 (16%) PN : 42 (27%) RR (95% CI) : 0.59 (0.38- 0.92) p= 0.018 Non-infectious complications : ETF : 42 (26%) PN : 57 (36%) RR (95%CI) : 0.73 (0.52-1.02) p=0.064 ETF: 4.7 days (2.3, 1-14)	PN. (Intention to treat analysis). No patient switched from PN to ETF.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								range): Patients transferred to ICU: Mortality Mean LOS (Hospital) Adverse effects of artificial nutrition:	PN : 6.8 (4.2, 2-21) ETF: n=8 PN: n= 12 Mean LOS in ICU (n=20): ETF : 5.7 days (SD 2.9, range 2-12) PN : 10.4 days (SD 4.5, 2-18) ETF : n= 2 (1.3%) PN : n= 5 (3.2%) ETF : 13.4 days (4.1, 7-39) PN : 15.0 (5.6, 7-42) p=0.009 Abdominal distension : ETF : 23 (14%) PN : 10 (6%) RR (95% CI) : 2.29 (1.15-4.60) p= 0.018 Abdominal carmps : ETF : 21 (13%) PN : 8 (5%) RR (95% CI) : 2.51 (1.22 -5.63) p= 0.012 Diarrhoea : ETF : 13 (8%) PN : 9 (6%) RR (95% CI) : 1.41 (0.65-3.20) p=0.385 Vomiting : ETF : 4 (3%)	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									PN : 3 (2%) RR (95% CI) : 1.33 (0.34-5.22) p= 0.709 Any adverse effect : ETF : 56 (35%) PN : 22 (14%) RR (95% CI) : 2.53 (1.64-3.94) p<0.0001	
								Mean (SD) distress scores (patients responded by scoring their distress from zero (very bad) to five (very well)	Day 1 : ETF : 1.8 (1.2) PN : 2.0 (1.0) Day 2 : ETF : 2.2 (1.2) PN : 2.4 (1.0) Day 3 : ETF : 2.7 (1.1) PN : 2.9 (0.8) Day 4 : ETF : 3.2 (1.0) PN : 3.1 (1.1) Day 5 : ETF : 3.5 (0.9) PN : 3.5 (0.8) Day 6 : ETF : 3.8 (0.9) PN : 3.7 (0.8) Day 7 : ETF : 4.1 (0.8) PN : 3.8 (0.9)	
Braga et al 2001[43]	RCT	1+	257 patients ETF: n= 126	Patients with cancer of the upper GI tract suitable for curative surgery.	TPN started on POD 1 by giving 50% of the nutritional goal and from POD 2,	ETF through either jejunostomy or nasojejunal tube.	Until discharge	Mean (+/- SD)	ETF :n= 126 PN : n= 131 ETF : 12.8 +/- 5.5	In 8 patients (6.3%), a permanent stop of the infusion of enteral diet was necessary

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			PN: n= 131	Mean +/- SD age: ETF: 64.1 +/- 13.1 PN: 62.9 +/- 12.4 Gender (M/F): ETF: 68/58 PN: 71/60 Body weight (kg): ETF: 65.9 +/- 13.7 PN: 66.8 +/- 14.9 Malnourished patients: n (%) (patients who had experienced an involuntary weight loss> 10% with respect to their usual body weight in the preceding 6 months were defined as malnourished): ETF: 43 (34.1) PN: 48 (36.6) Karnofsky score: ETF: 75 +/- 12 PN: 76 +/- 13 Exclusion criteria: renal (creatinine level > 30 mg/dL, hemodialysis), hepatic (ascites, portal hypertension, encephalopathy), cardiac (New York Heart Association class >3), or pulmonary dysfunction (arterial PaO2 of < 70 torr [9.3 kPa]), ongoing infection, neoadjuvant radiochemotherapy,	patients received full regimen. Nutritional goal: 25 kcal/kg/day. Artificial nutrition was continued until patients achieved as adequate oral food intake (800 kcal/day). Composition (per 100 mL): Proteins (g): 4.0 Carbohydrates (g): 12.7 Lipids (g):5.0 Total calories (kcal): 110 + vit and minerals	ETF starting 6 hours after the end of operation at a 10 mL/hr with a progressive increase to reach the full regimen on POD 4. Nutritional goal: 25 kcal/kg/day. Artificial nutrition was continued until patients achieved as adequate oral food intake (800 kcal/day). Composition (per 100 mL): Proteins (g): 4.1 Carbohydrates (g): 14.2 Lipids (g): 3.5 Total calories (kcal): 115 + vit and minerals		duration of artificial nutrition (days): Mean (SD, range) energy (kcal) intake per day in first post-op week: N patients achieve nutritional goal within 4 days postop: Percentage of patients experienced abdominal cramps: Percentage of patients experienced abdominal distention: Percentage of patients experienced diarrhoea: Time to first flatus (days) (mean +/- SD): Time to first bowel movement (days) (mean +/- SD): Patients with infectious complications (%): Patients with non-infectious complications (%): Overall patients with any complications	PN : 13.2 +/- 4.9 ETF : 1522 +/- 317 (564-2420) PN : 1632 +/- 281 (855-2518) [p=0.11] ETF : 100/126 (79.3%) PN : 128/131 (97.7 %) **[p<0.001]** ETF : 14.2 % PN : 4.5 % ETF : 12.6% PN : 5.3% ETF : 11.1 % PN : 3.8% ETF : 2.4 +/- 1.3 PN : 4.6 +/- 2.0 **[p= 0.003]** ETF : 4.2 +/- 1.6 PN : 6.3 +/- 2.1 **[p= 0.001]** ETF : 25 (19.8) PN : 30 (22.9) [Not significant] ETF : 20 (15.8) PN : 23 (17.5) [Not significant] ETF : 45 (35.6) PN : 53 (40.4)	because of jejunostomy or NJ tube dislocation (n=5), emesis (n=2), and aspiration (n=5). These patients were switched to TPN but for outcome evaluation were considered in ETF group on an intent-to-treat basis.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				and immune disorders (neutrophil level of < 2.0 x 109/L, hypoimmunoglobulinemia).				(%): Patients with major complications (%) (defined as the need of repeat laparotomy, percutaneous drainage of intra-abdominal deep fluid collection by interventional radiology procedures, or complications requiring patient transfer to the ICU). Death (%): Sepsis score (mean +/- SD): LOS (days) (mean +/- SD): Infectious complications: - Abdominal abscess: - Wound infections: - Infected pancreatic or biliary fistula: - Pneumonia:	[Not significant] Total : ETF : 16 (12.6) PN : 21 (16) - Repeat operation : ETF : 8 (6.3) PN : 10 (7.6) - ICU transfer : ETF : 4 (3.1) PN : 5 (3.8) - Interventional radiology : ETF : 4 (3.1) PN : 6 (4.5) ETF : 3 (2.3) PN : 4 (3.0) [Not significant] ETF : 8.5 +/- 3.5 PN : 10.4 +/- 3.7 [Not significant] ETF : 19.9 +/- 8.2 PN : 20.7 +/- 8.8 [Not significant] ETF : 27 PN : 36 ETF : 9 PN : 11 ETF : 6 PN : 8 ETF : 4 PN : 5 ETF : 3	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									PN : 6	
								- Urinary tract infection:	ETF : 4 PN : 4	
								- Sepsis:	ETF : 1 PN : 2	
								Noninfectious complications:	ETF : 35 PN : 38	
								- Anastomotic leak:	ETF : 9 PN : 11	
								- Delayed gastric emptying:	ETF : 7 PN : 9	
								- Sterile pancreatic fistula:	ETF : 7 PN : 8	
								- Hemoperitoneum	ETF : 5 PN : 4	
								- GI bleeding	ETF : 3 PN : 3	
								- Respiratory failure:	ETF : 2 PN : 2	
								- Cardiac failure:	ETF : 2 PN : 1	
								Overall (infectious and non-infectious)	ETF : 62 PN : 74	
								Outcomes in the subgroup of malnourished patients (n=91):	ETF : n=43 ; PN : n=48	
								- Patients with infectious complications (%):	ETF : 6 (13.9) PN : 12 (25.0) [p= 0.33]	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								- Patients with noninfectious complications (%): - Overall patients with any complication (%): - Patients with major complications (%): - Repeat operation: - ICU transfer: - Interventional radiology: Death (%): Sepsis score (mean +/- SD): LOS (days) (mean +/- SD): CD4/CD8 ratio (normal value, >1):	ETF : 10 (23.2) PN : 13 (27.0) ETF : 16 (37.1) PN : 25 (52.0) [p= 0.23] ETF : 9 (20.9) PN : 12 (25.0) ETF : 4 (9.3) PN : 5 (10.4) ETF : 3 (6.9) PN : 3 (6.2) ETF : 2 (4.6) PN : 4 (8.3) ETF : 1 (2.3) PN : 2 (4.1) ETF : 9.2 +/- 3.6 PN : 11.3 +/- 3.3 ETF : 19.8 +/- 8.9 PN : 22.6 +/- 9.7 **[p=0.042]** ETF : n= 20 ; PN : n= 20 Baseline : ETF : 2.0 +/- 1.2 PN : 2.1 +/- 1.3 POD 1 : ETF : 1.6 +/- 1.5 PN : 1.6 +/- 1.4 POD 8 : ETF : 1.8 +/- 1.3 PN : 1.9 +/- 1.6	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Plasma levels of albumin, prealbumin, Retinol-binding protein, C-reactive protein, IL-6, PMN, IL-2, total lymphocytes Delayed hypersensitivity response (performed in 40 consecutive patients 20 per group, using seven recall antigens according to the procedure suggested by the manufacturer-Multitest, Pasteur Merieux, Lyon, France).	Data not extracted (at any time point, no significant differences were found between the two groups in all the nutritional variables, immune function variables, and inflammatory response indices). Data not extracted.	
Iovinelli et al[165]	RCT		48 patients Intervention (TPN): n=24 Age:60.2±15 M/F:22/2 Comparison (ETF): n=24 Age:58.3±12 M/F:21/3	Patients undergoing total laryngectomy Severely malnourished patients were excluded	Parenteral nutrition (subclavian venous catheter) From 24hrs post-op	Enteral nutrition (PEG)		Length of hospital stay Wound infection Surgical complications	Length of hospital stay (days) Intervention:34±11 Comparison:26±11 **[p<0.05]** Wound infection Intervention:3 Comparison:3 [no diff] Surgical complications (pharyngocutaneous fistulas) Intervention:2 Comparison:1 [no diff]	PEG complications were clinically less significant than those associated with TPN Most common ETF complication was diarrhoea. Most common PN complication was catheter related. The most serious being sepsis. There was mild worsening of the nutritional status for both groups in approximately the first

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
										10days post-op and a subsequent return toward pre-op values in the following days.
Lim et al 1981[208]	RCT		24 patients Intervention (TPN): n=12 Age:63.7 M/F:10/2 Comparison (ETF): n=12 Age:64.3 M/F:9/3	Patients with total dysphagia due to carcinoma of the oesophagus	Total parenteral nutrition	Gastrostomy tube Glucose and water were given via the tube after 12hrs. Half strength of the solution was given for the firsts 2 days to prevent diarrhoea		Mortality Intervention: n=10 Comparison: n=10 Anastomic leak Wound infection Weight gain Nitrogen balance	Mortality Intervention:1 Comparison:2 [no diff] Anastomic leak Intervention:1 Comparison:4 [no diff] Wound infection Intervention:3 Comparison:5 [no diff] Weight gain TPN had a final gain of 6.3% at the end of 4weeks **[p<0.05]**	TPN was found to be superior in achieving an earlier positive nitrogen balance & greater weight gain during a 4 week period. However gastrostomy is still preferred as the safe, cheap and safe method.
Reynolds et al 1997[292]	RCT	1+	67 patients ETF: 33 PN: 34	Patients undergoing major upper GI surgery for esophageal, gastric, or pancreatic malignancy. Age (median-interquartile ranges): ETF: 69 (51-81) PN: 67 (25-86) Gender (M/F): ETF: 26/7 PN: 27/7	TPN CVC. Standard parenteral formula: 2500 mL providing 9.4 g nitrogen and 1800 nonprotein kcal/24 h. Lipid constituted 55% of the nonprotein calories. Feeding initiated at 9.00 am on the first pos op. day. All patients were continued on their	ETF via jejunostomy. Osmolite providing 12.8 g nitrogen and 1680 nonprotein kcal (31% lipid) in 2000 mL per 24 hours once stabilised. Introduced at 30 mL/h and the rate increased incrementally, depending on tolerance, up to 100 mL/h. The regimen	30 days	ETF: n= 33; PN: n= 34 Mean (SEM) Caloric intake (kcal/d) for the first 7 days Mean (SEM) nitrogen intake (g) for the first 7 days Intra-abdominal/thoracic abscess Major complications:	 ETF : 1300 +/- 300 PN : 1800 +/- 100 [Not significant] ETF : 8 +/- 3 PN : 10 +/- 1 [Not significant] ETF : 3 PN : 7 [p=0.3]	No attempt was made to enforce an isocaloric, isonitrogenous intake. 30 patients from this study (15 from each group) were also randomised for a second study to assess gut permeability. Results from this second study have not been extracted. These 30 patients had a needle

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Subjective global assessment: Well-nourished: ETF: 6 PN: 7 Mildly malnourished: ETF: 16 PN: 20 Severely malnourished: ETF: 11 PN: 7 Preoperative jaundiced: ETF: 1 PN: 4 Exclusion criteria: administration of steroids or immunosuppressive medication, abnormal renal function (serum creatinine > 1.5 mg/dL); preoperative evidence of bacteraemia; preoperative radiation therapy; history of intestinal disease precluding enteral feeding; preoperative TPN	nutritional regimen for seven days. No attempt was made to enforce an isocaloric, isonitrogenous intake.	was based on four 5-hourly feeds with a 1-hour rest period between each. Feeding initiated at 9.00 am on the first pos op. day. All patients were continued on their nutritional regimen for seven days. No attempt was made to enforce an isocaloric, isonitrogenous intake.		Pneumonia Pneumonia or abscess Central line sepsis Total infection episodes Infection episodes per patient Infections per infected patients Noninfective complications: Diarrhoea Anastomotic leak Organ failure Hemorrhage	ETF : 6 PN : 9 [p=0.2] ETF : 9 PN : 16 [p=0.1] ETF : 1 PN : 3 [p=0.2] ETF : 13 PN : 20 [p=0.2] ETF : 0.4 PN : 0.5 [p=0.8] ETF : 1.2 PN : 1.1 [p=0.8] ETF : 5 PN : 1 [p=0.2] ETF : 1 PN : 1 [p=0.4] ETF : 4 PN : 3 [p=0.9] ETF : 1 PN : 0 [p=0.9]	catheter jejunostomy inserted to enable comparative postoperative permeability studies to be performed in both groups.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Bowel necrosis Cardiac complication Thromboembolism Mortality Number of patients with complications	ETF : 2 PN : 0 [p=0.4] ETF : 2 PN : 2 [p=0.6] ETF : 1 PN : 0 [p=0.9] ETF : 2 PN : 1 [p=0.6] ETF : 13 PN : 17 [p=0.3]	
Sand et al 1997[303]	RCT		29 Intervention: n=16 Comparison: n=13	Patients undergoing curative total gastrectomy for gastric cancer	Total parenteral nutrition	Enteral nutrition by nasojejunal tube		Infective complications Diarrhoea Mortality Post-op complications	Infective complications Intervention: 5 Comparison:3 [Not significant] Diarrhoea began Intervention: 3-5days Comparison:5-7days But there was a tendency to an increased risk of diarrhoea in the TPN group (Intervention) Mortality Intervention: 1 Comparison: 0 (on day 45 from complications of oesophageal leakage) Post-op complications Intervention: 8 Comparison:5	Parenteral nutrition was four times more expensive than Enteral nutrition Pre-op nutrition not used

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Serum CRP concentration	[Not significant]	
von Meyenfeldt et al 1992[366]	RCT		100 (only 2 groups of interest) Intervention: n=51 Age:67.3±10.2 M/F:29/22 Comparison: n=50 Age:65.7±9.3 M/F:32/18	Patients with newly detected histological proven gastric or colorectal carcinoma requiring surgical treatment.	Total parenteral nutrition	Enteral nutrition	10days	Mortality Intra-abdominal abscess Sepsis Sepsis related mortality Wound infection Wound dehiscence Anastomotic leakage Complication rate of septic complications in patients with percentage weight loss over 10% of body weight PN group: n=18 ETF group: n=13 Length of hospital	Mortality Intervention: 2 Comparison: 4 Intra-abdominal abscess Intervention: 4 Comparison: 4 Sepsis Intervention: 1 Comparison :1 Sepsis related mortality Intervention: 1 Comparison: 2 Wound infection Intervention: 8 Comparison: 7 Wound dehiscence Intervention: 2 Comparison: 1 Anastomotic leakage Intervention: 5 Comparison: 4 Intra-abdominal abscess Intervention: 0 Comparison: 2 **[p<0.05]** Length of hospital stay	ETF was given either by NG tube or by mouth. The presence of depletion was defined using albumin, total lymphocyte counts & % ideal body weight – but the depleted & non depleted group not reported in this appraisal. It is difficult to say if the same people suffer from more than one complication. There were 4 groups in the study P values not provided for direct comparison for TPN v ETF.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								stay	Intervention: 36.3±17.7 Comparison: 33.3±20.2	
Zhu et al 2003[383]	RCT	1+	40 Patients ETF: n=20 PN: n=20	Patients were admitted for: Total gastrectomy: ETF: 6/20 PN: 8/20 Radical gastrectomy for cancer: ETF: 12/20 PN: 11/20 Resection of esophageal carcinoma: ETF: 2/20 PN: 1/20 Sex (M:F): ETF: 12:8 PN: 10:10	ETF: The nasal tube was kept to superior jejunum. Patients were given 250ml rice water 24hrs after operation & nutrition through infusion pump. ETF was given continuously for 7days	PN: Patients given liquid of double power through central venous & peripheral venous. PN was given continuously for 7days	7 days	Time of hospitalisation (days): Incidence rate of diarrhoea:	ETF: 25 ± 8 TPN: 28 ± 8 [P>0.05] Not significant ETF: 15% PN: Not reported	

Table 62: Parenteral vs enteral nutrition: abdominal trauma

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Seri and Aquilio 1984[313]	RCT		18 patients Intervention: n=8 Age:33.2 M/F:5/3 Comparison: n=10 Age:29.7 M/F:7/3	Early nutritional support in patients with acute abdominal trauma	Received glucose-amino acids infusion by peripheral vein. Calories nitrogen ratio was 150:1	Enteral nutrition Was started 12hrs post-op reaching 3000kcal/day within 72hrs	7 days	AMC Septic complications N2 balance Albumin Complement 3 Transferrin	AMC(% normal) Day 7 Intervention: 99±4 Comparison:105±6 [no sig diff] Sepsis Intervention:25% Comparison:10% [no sig diff] N2 balance Intervention: -6.5±0.8 Comparison: +2.9±0.6 **[p<0.01]**	For uniformity the enteral group was called the control group by the reviewer Nutritional assessment was preformed within 12hrs after laparotomy and repeated on day 7

Table 63: Parenteral vs enteral nutrition: liver Disease

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Hu and Zheng 2003[162]	RCT		135 patients TPN group: n=40 ETF group: n=65 Control group: n=30	Patients with chronic liver damage requiring operative treatment. They had liver function of child B or C grade	Parenteral nutrition was given peripherally from day 1 post-op and lasted at least 7 days	Enteral nutrition ETF (jejunostomy) was begun on the 3rd day after 2 days of TPN Control		Accumulated nitrogen balance	Accumulated nitrogen balance TPN group: 105.3±9.4 mg.kg-17 d-1 Cont group : 32.4±10.8 mg.kg-17 d-1 ETF group : 185.3±8.4 mg.kg-17 d-1	In the ETF gp 32 patients complained for abdominal distension & diarrhoea but disappeared by adjusting the temperature & infusion rate, given domperidone or antidiarrhoeal agent

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									(ETF reached positive nitrogen balance the earliest **[p<0.05]**)	
								Weight change	Weight change TPN group: -2.4±1.1 Cont group: -3.3±1.7 ETF group: -2.1±0.9 (Weight loss in cont psig. more than in ETF & TPN group)	
								Liver & Kidney function		
								Circumference of upper arm		
								Electrolytes		
Wicks et al 1994[372]	RCT		24 patients Intervention: n=10 M/F :5/5 Comparison: n=14 M/F:5/9	Patients undergoing primary liver transplantation	Parenteral nutrition	Enteral nutrition (nasojejunal tube)		Length of hospital stay	Length of hospital stay Intervention: 32±29 days Comparison: 31±15 days [Not significant]	Causes of mortality in both groups was not related to feeding There were no significant differences in anthropometric indices
								Mortality	Mortality Intervention: 2 Comparison: 2 [Not significant]	
								Diarrhoea	Diarrhoea Intervention: 2 Comparison: [Not significant]	
								Infections	Infections Intervention: 7 (10 episodes of infection, 5 of which were gut related)	
								Biochemical	Comparison: 10 (14	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								outcomes	episodes of infection, 6 of which were gut related) [Not significant]	
Shirabe et al 1997[317]	RCT		26 patients Intervention: n=13 Age:60±11 Comparison: n=13 Age:63±11	Japanese patients who underwent major hepatic resection for either primary or metastatic liver cancer	Parenteral nutrition through CVC. Fed with hypertonic glucose & amino acids starting from 19.3 Kcal/kg/day on the 2nd day post-op	Early enteral nutrition by nasojejunal tube-feeding was started with 17.7Kcal/kg/day on the 2nd day post-op		Infectious complications Immunological outcomes Biochemical outcomes	Infectious complications Intervention: 31%(4) Comparison: 8%(1) [Not significant]	All patients were given a regular dosage of systemic antibiotics for 7 days.

Table 64: Parenteral vs enteral nutrition: Crohn's disease/ulcerative colitis

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Gonzalez-Huix et al 1993[131]	RCT		44 patients randomised 2 excluded Total: n= 42 ETF: n= 22 PN: n= 20	Adult patients admitted with attacks of ulcerative colitis. Patients were entered into the trial whenever the activity of the disease remained moderate or severe after 48 h on full intravenous steroid treatment and fluid and electrolyte reposition. Median age: ETF: 34.5 (21-46)	TPN (isocaloric, isonitrogenous) central venous silastic catheter with the aid of an infusion pump. No oral food or fluids were allowed during the trial. Nutrition support starting regimens were used with the aim of reaching	ETF polymeric diet administered intragastrically by continuous 20 to 22 h, pump-controlled infusion through a fine-bore Silktype tube. No oral food or fluids were allowed during the trial. Nutrition support starting regimens		Median time (interquartile range) on artificial nutrition support (days) Energy supply kcal/kg/day (median-interquartile range) Nitrogen supply (g/kg/day)	ETF : n= 22 ; PN : n= 20 ETF : 16.5 (8-23) PN : 16 (12-20) [Not significant] ETF : 47.3 (42-52) PN : 41.9 (36-51) [Not significant] ETF : 0.38 (0.32-0.43) PN : 0.34 (0.32-0.39) [Not significant]	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				PN: 32 (27-44) NS Gender (M/F): ETF: 12/10 PN: 9/11 Median (interquartile range) % Ideal body weight: ETF: 83.1 (73-93) PN: 84.0 (70-109) NS Exclusion criteria: patients not completing at least 7 days on artificial nutritional support. All patients were on iv prednisolone (1mg/kg/day). Intratecal triamcinolone diacetate foam (10mg bid) was added when rectal symptoms were severe. Intravenous fluids, electrolytes, albumin, or blood transfusions were administered when necessary.	100% calorie requirements by the 3rd day.	were used with the aim of reaching 100% calorie requirements by the 3rd day.		Percentage of the total daily calorie requirements administered Anthropometric parameters at the end of nutrition support Post-operative infections Complications of artificial support	ETF : 92.8 (87-96) PN : 89.4 (83-97) [Not significant] Body weight, %IBW, TSF, MAMC ETF : before and after [Not significant] PN : before and after [Not significant] PN>ETF **[p=0.028]** PN>ETF **[p=0.046]**	
Greenberg et al 1988[136]	RCT		36 patients Intervention: n=17 Age:28.8 Comparison: n=n=19 Age:31.6	Patients with Crohn's disease diagnosed by established radiological and or endoscopic findings	Total parenteral nutrition delivered via subclavian vein	Enteral nutrition (nasogastric tube). Patients received 'a defined formula diet (precision-isotonic)	21 days	Treatment failure	Treatment failure Intervention group: All patients who failed required surgical mgt. (5) Comparison group: 2 of 8 patients failing on DFD required surgery for obstruction &	The study was carried out to define the role of bowel rest as an independent variable from nutritional support. There was a 3rd group – partial protein/calorie

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									abscess respectively. ^ others were given some form of medical treatment Remission Intervention: 12 Comparison: 11 [Not significant]	supplementation (PPN) group not included in this study. None of the patients suffered any septic or metabolic complications.

Table 65: Parenteral vs enteral nutrition: critically ill

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Heyland et al 2003[152] Canadian clinical guideline	SYSTEM-ATIC REVIEW PN vs ETF (13 RCTs) Only one of them fitted the criteria of a level 1 study (concealed randomisa			Mechanically ventilated critically ill adult patients with intact GI tract in Canadian ICU's	Parenteral nutrition	Enteral nutrition		Mortality Infectious complications	Mortality ETF vs PN (RR) 1.08; 95% CI 0.70 to 1.65 [p=0.7] No sig. diff btw both groups Infectious complications ETF vs PN (RR) 0.61; 95% CI 0.44 to 0.84 **[p=0.003]**	Canadian clinical guideline There was no apparent difference in mortality rates across groups receiving ETF or PN Safety, cost & feasibility considerations favoured the use of ETF over PN

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
	tion, outcome adjudication was blinded ITT was performed)								ETF associated with significantly lower infections	
Simpson and Doig 2005[320]	SYSTEM-ATIC REVIEW This SR includes the same RCTs as Heyland 2003. This SR has been included as it covers more outcomes which Heyland 2003 do not cover	1+						Primary analysis of 9 RCTs: Mortality:	Total events: TPN: 18/285 (6.3%) ETF: 28/274 (10.2) **[p<0.05]**	The 9 trials within this SR showed statistically significant mortality benefit was evident for the use of parenteral nutrition

Table 66: Enteral vs enteral + parenteral nutrition

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Heyland et al 2003[152] Canadian clinical guideline	SYSTEM-ATIC REVIEW PN vs ETF (13 RCTs)			Mechanically ventilated critically ill adult patients with intact GI tract in Canadian ICU's	Parenteral nutrition + enteral nutrition	Enteral nutrition		Mortality	Mortality ETF vs PN+ETF (RR) 1.27; 95% CI 0.82 to 1.94 [p=0.3] No significant	Canadian clinical guideline A subgroup analysis compared trials that overfed to those that

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
	Only one of them fitted the criteria of a level 1 study (concealed randomisation, outcome adjudication was blinded ITT was performed) Combination of ETF+PN vs ETF (5 RCTs all of which were level 2 studies) started at the same time							Infectious complications Length of hospital stay	difference but shows trend towards increased mortality for PN+ETF Infectious complications ETF vs PN+ETF (RR) 1.14; 95% CI 0.66 to 1.96 [p=0.6] No significant difference Length of hospital stay ETF vs PN+ETF (SMD) 0.12; 95% CI 1.45 to 0.2 [p=0.5] No significant difference	did not and there was no difference in effect. Data pertained to those with an intact GI tract not those who have an absolute indication for PN. When aggregated statistically these studies that initiated PN at the same time as starting ETF suggest a trend towards harm. It was therefore recommended that PN not be started at the same time as PN in critically ill patients and for patients not tolerating ETF there's not enough evidence as to when to initiate PN. Safety and benefits have to be weighed case by case.

Table 67: Parenteral vs enteral + parenteral nutrition: pancreatitis

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Zhao et al 2003[382]	RCT		96 patients	Patients with severe acute pancreatitis	Parenteral nutrition + enteral nutrition	Parenteral nutrition (TPN)	2 years	Body weight	Body weight	For the intervention group when paralysis

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			PN group: n=41 PN+ ETF group: n=55	(SAP)	ETF was administered via an NG tube PN based on same elements as TPN but with 0.22g glutamine/kg ETF formula was peptide-2000 (2.9 nitrogen & 500 kcal non-protein calorie/500ml) Patients in the treatment group only received glutamine-supplemented PN. When paralysis was relieved, ETF & PN were applied at the same time.	Based on an amino solution providing 0.25g nitrogen/(kg.d) with lipid emulsion & glucose. Total calorie was 30kcal/(kg.d) Electrolytes trace elements and vitamins		Biochemical & Immunological outcomes	Day 14: TPN: 55.7±12.9 PN+ ETF: 60.4±13.4 Day21: TPN: 58.81±4.2 PN+ETF: 63.2±13.2 **[p<0.05]**	was relieved, ETF and PN were applied at the same time Body weight

Table 68: Parenteral vs enteral + parenteral nutrition: bone marrow

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Mulder et al 1989[239]	RCT		22 patients TPN group: n=11 Age:37.9 M/F:4/7 PPN/ETF	Recipients of autologous bone marrow transplantation (ABMT). Patients were eligible when they had histologically confirmed malignant tumours for which no curative or	Parenteral nutrition	Enteral nutrition + partial parenteral nutrition		Length of hospital stay Septicaemia	Length of hospital stay TPN group: 22.9±3.2 PPN/ETF group : 22.9±2.8 [Not significant] Septicaemia (nos of ppl)	This paper also had a retrospective study consisting of 10 patients. Outcomes were biochemical.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			group: n=11 Age:34.6 M/F:8/3	palliative treatment modalities existed				% of days with vomiting % of days with diarrhoea Biochemical outcomes	TPN group :4 PPN/ETF group :8 [Not significant] % of days with vomiting TPN group: 51.6±22.2 PPN/ETF group: 40.0±25.5 [Not significant] % of days with diarrhoea TPN group: 53.6±20.4 PPN/ETF group: 26.8±16.8 **[p<0.005]**	

Table 69: Parenteral vs enteral + parenteral nutrition: major abdominal surgery

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Pacelli et al 2001[261]	RCT	1+	241 patients ETF: n= 122 PN: n= 119	Patients undergoing major elective abdominal surgery (excluding appendectomy, cholecystectomy, and viscerolysis) with a Nutritional Risk Index <90%. Mean (+/- SD) age: ETF: 61.5 +/- 10.8 PN: 61.6 +/- 11.8 Gender (M/F): ETF: 73/46	TPN via CVC. PN formula: 0.2 g/kg per day of nitrogen and 25 nonprotein kcal/kg per day (30% lipids), with supplemental vitamins and minerals. Feeding initiated at 9 AM on the first post op day. All patients	ETF via jejunostomy or nasojejunal tube. (Patients also received PN supplementation during the first 3 days via peripheral or CVC see comments). Feeding initiated at 9 AM on the first post op day. Enteral feed: Nutrison (Nutricia,	Until discharge	Mean (+/- SD) duration of artificial nutrition (days): Mean (+/- SD) kcal/day Mean (+/- SD amount of nitrogen infused per day Mortality n (%):	ETF : n= 119 ; PN : n= 122 ETF : 8.7 +/- 5.9 PN : 9.6 +/- 4.5 ETF : 1650.6 +/- 87 PN : 1665 +/- 72.8 kcal/d ETF : 10.3 +/- 0.2 g PN : 12.8 +/- 0.1 g ETF : 7 (5.9%)	CVC was not required by protocol in the ETF group. However, if a CVC had been positioned immediately before or during the operation for monitoring or fluid administration or both, it was also used during the postoperative course in the ETF group. 14 patients (11.8 %) crossed over to PN

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				PN: 72/50 % usual weight: ETF: 85 +/- 4.2 PN: 85 +/- 4.7	continued their nutritional regimens until oral intake was resumed, with a target of 1000 mL of fluids per day.	Zoetermeer, the Netherlands), providing 1 kcal/mL, 40 g of proteins per litre, 123 g of carbohydrates per litre, 38.9 g of lipids per litre, plus supplemental vitamins and minerals. ETF began with a full-strength formula introduced at 30 mL/h, and increased gradually, depending on tolerance up to a goal of 25 kcal/kg per day, comparable with that of the TPN group. During the induction time of ETF (up to 3 days), TPN was added to achieve the same caloric intake of the TPN. All patients continued their nutritional regimens until oral intake was resumed, with a target of 1000 mL of fluids per day.		 Rates of major postoperative complications n (%): Rates of major infectious complications n (%): Rates of non-infectious complications n (%): Types of complications (many patients had more than one complication): Major infectious: - Pneumonia - Abdominal abscess - Septic shock - Bacteraemia Total N (%): Major non-infectious: - Anastomotic leak - Digestive fistulas	PN : 3 (2.5%) [Not significant] ETF : 45 (37.8%) PN : 48 (39.3%) [Not significant] ETF : 17 (14.3) PN : 14 (10.7) [Not significant] ETF : 23.5% PN : 27.9% [Not significant] ETF : 10 PN : 5 ETF : 5 PN : 7 ETF : 1 PN : 2 ETF : 1 PN : 2 ETF : 17 (14.3) PN : 14 (10.7) ETF : 10 PN : 14 ETF : 4	due to nutrition-related complications.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									PN : 3	
								- Wound deshidence	ETF : 5 PN : 9	
								- GI complications	ETF : 4 PN : 2	
								-Hemoperitoneum	ETF : 3 PN : 5	
								- Myocardial infarction	ETF : 1 PN : -	
								-Pulmonary failure:	ETF : 6 PN : 4	
								-Renal failure:	ETF : 1 PN : -	
								- Total:	ETF : 33 PN : 40	
								- No. of patients affected (%):	ETF : 28 (23.5) PN : 34 (27.9)	
								Minor infectious:		
								- Wound infections	ETF : 8 PN : 7	
								- Urinary tract infections	ETF : 1 PN : 2	
								- Fever	ETF : 14 PN : 15	
								- Total	ETF : 23 PN : 24	
								- No. of patients affected (%):	ETF : 23 (19.3) PN : 23 (18.9)	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Minor non-infectious: - Pleural effusion - Atelectasis - Total - No. of patients affected (%) Mean (+/-) LOS (days):	 ETF : 12 PN : 10 ETF : 7 PN : 2 ETF : 19 PN : 12 ETF : 15 (12.6) PN : 11 (9.0) ETF : 15.2 +/- 3.6 PN : 16.1 +/- 4.5	

Table 70: Parenteral nutrition (PN) route of access: PICC vs CVC

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Cowl et al 2000[71]	RCT	1+	102 patients CVC n= 51 PICC n=51	Hospitalised patients who required TPN, age 18 years or older who had a visible basilic, median cubital, or cephalic vein suitable for cannulation. Median age (range): CVC: 59 (30-80) PICC: 58 (21-81) Gender, n (%) Male:	PICC Catheter insertion: Balic vein 60.8% Cephalic vein: 17.6% Median antecubital basilic vein: 7.8% Single and double lumen silicone elastomer PICCs (60 cm, 3.0 For 5.5 F, respectively)	CVC Catheter insertion: Subclavian vein: - right: 78.4 % - left: 15.7 % Subclavian catheters with up to three lumens (5.0 F and 7.0 F). Insertion technique: Modified Seldinger technique.	Until end of PN	Difficulty in catheter insertion, n (%) (>2 and <5 attempts) Mean insertion time, min (+/- SD) Mean insertion time per catheter, min (+/- SD)	PICC (n=51) CVC (n=51) PICC : 11(21.6) CVC : 5 (9.8) **[p<0.05]** PICC : 42.1 (17.2) CVC : 36.7 (15.4) [Not significant] Study investigators : PICC : 39.6 (10.1) CVC : 32.1 (9.7)	The study design was limited in that to maintain statistical power, it could only detect a 15% or greater difference between the two catheter types. A larger data set is required before the findings noted in this study can be applied to the general population of patients

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				CVC: 24 (47.1) PICC: 32 (62.7) Female: CVC: 27 (52.9) PICC: 19 (37.3) Patients were excluded if they lacked visible venous access, possessed musculoskeletal and peripheral nervous system pathology, neutropenic (absolute neutrophil count < 500), undergone bone marrow or other organ transplantation, had suspected bacteraemia at the time catheter insertion.	inserted over a hydrophilic guide wire. No antibiotic-impregnated or antibiotic coated catheters were utilised. Once catheters were inserted, each catheter lumen was heparinised with 3cc of 100 U/cc solution. Insertion technique: Per-Q-Cath PICC catheter (Gesco International, San Antonio, TX, USA). PICC lines secured with adhesive strips placed across the wings of the catheter. All lines were dressed with sterile gauze and covered with a transparent membrane dressing (Tegaderm, Medical products Division/3M, St Paul, MN, USA) Dressing changes at aprox. 5 days intervals. The catheters were flushed with 3 cc of 100 U/cc heparin	Catheters secured with a suture. No antibiotic-impregnated or antibiotic coated catheters were utilised. Once catheters were inserted, each catheter lumen was heparinised with 3cc of 100 U/cc solution. All lines were dressed with sterile gauze and covered with a transparent membrane dressing (Tegaderm, Medical products Division/3M, St Paul, MN, USA) Dressing changes every 72 hours. The catheters were flushed with 3 cc of 100 U/cc heparin solution followed by 5 to 10cc of normal saline, each time a lumen was accessed, regardless the catheter calibre. Catheters were examined daily for leakage, discomfort mechanical failure, and dislodgement. Catheter insertions		Median duration of catheter dwell time days, (range) Aborted insertion attempt, n (%) Completion of therapy without line complication, n (%) - End of prescribed course - Patient died Clinically-evident thrombophlebitis: Total, n (%) - Mild - Moderate - Severe	[Not significant] General surgery residents : PICC : 54.9 (11.9) CVC : 41.0 (8.8) [Not significant] IV nursing team : PICC : 42.7 (12.3) CVC : - PICC : 9.6 (1-36) CVC : 10.8 (2-27) [Not significant] PICC : 7 (13.7) CVC : 3 (5.9) [Not significant] PICC : 24 (47.1) CVC : 35 (68.6) **[p<0.05]** PICC : 1 (2.0) CVC : 1 (2.0) [Not significant] PICC : 8 (15.4) CVC : 1 (2.0) **[p<0.01]** PICC : 2 (4.0) CVC : 0 (0.0) [Not significant] PICC : 2 (4.0) CVC : 1 (2.0) [Not significant] PICC : 4 (7.8)	who receive central venous catheterisation. 33% of catheters in PICC group were inserted by IV nursing team. CVC catheters were inserted by study investigators and general surgery residents only. Funding: Supported in part by National Institutes of Health Grant and a Process Improvement Grant from the University of Iowa.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					solution followed by 5 to 10cc of normal saline, each time a lumen was accessed, regardless the catheter calibre. Catheters were examined daily for leakage, discomfort mechanical failure, and dislodgement. Catheter insertions were divided randomly among senior surgical residents, specially trained intravenous nurses and study investigators. Catheter inserted by, n (%): Study investigators: 21 (41.2) General surgery residents: 13 (25.5) IV nursing team: 17 (33.0) Insertion site, n (%): - Basilic vein: 31 (60.8) - Cephalic vein: 9 (17.6)	were divided randomly among senior surgical residents, specially trained intravenous nurses and study investigators. Catheter inserted by, n (%): Study investigators: 15 (29.4) NS General surgery residents: 36(60.6) p<0.01 IV nursing team: 0 (00) p<0.0001 Insertion site, n (%): - Right subclavian: 40 (78.4) - Left subclavian: 8 (15.7) Site in hospital where inserted, n (%): ICU: 4 (7.8) Inpatient ward (not monitored): 47 (92.2) NS			CVC : 0 (0.0) **[p<0.05]** PICC : 5 (9.8) CVC : 1 (2.0) **[p<0.05]** PICC : 0 (0.0) CVC : 2 (4.0) [Not significant] PICC : 6 (11.7) CVC : 2 (4.0) [Not significant] PICC : 1 (2.0) CVC : 0 (0.0) [Not significant] PICC : 2 (4.0) CVC : 3 (5.9) [Not significant] PICC : 1 (2.0) CVC : 1 (2.0) [Not significant] PICC : 1 (2.0) CVC : 1 (2.0) [Not significant] PICC : 0 (0.0) CVC : 1 (2.0) [Not significant] PICC : 1 (2.0) CVC : 6 (11.8) **[p<0.05]** PICC : 3 (5.9) CVC : 0 (0.0) [Not significant]	

Malposition

Pneumotorax

Line occlusion

- Requiring catheter removal

Catheter infection:

- Total

- Local (purulence from site)

- Probable

- Definite

Falsely suspected line infection

Dislodge catheter

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					- Median antecubital basilic vein: 4 (7.8) Site in hospital where inserted, n (%): ICU: 2 (3.9) Inpatient ward (not monitored): 49 (96.1) Number of catheter ports, n (%): - Single: 13 (29.5) - Multiple: 31 (70.5)	Number of catheter ports, n (%): - Single: 8 (15.7) - Multiple: 40 (83.3) NS		Catheter failure/leak	PICC : 2 (4.0) CVC : 0 (0.0) [Not significant]	

Table 71: Parenteral nutrition (PN) route of access: CVC vs peripheral

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Couse et al 1993[70]	RCT		49 patients randomised Peripheral : n=23 4 withdrawn Central: n=26 3 withdrawn	Gastroenterological patients who required total parenteral nutrition. Age (mean +/- SD): Peripheral: 63 +/- 16 Central: 61 +/- 18 Gender (M/F):	Peripheral parenteral nutrition administered through a suitable forearm vein using an 18 gauge teflon IV cannula. The line was established using strict aseptic technique and	All nutrient solutions infused into the superior vena cava through a 14 gauge silicone catheter inserted using a standard infracalvicular subclavian approach. Catheters	Until resumption of oral feeding	Median duration of PPN (days) Morbidity	Peripheral: n= 19 Central: n= 23 Peripheral: 8.5 +/- 4.2 (6 converted to CPN) Central: 12 +/- 7 (2 converted to PPN) [Not significant] Peripheral:	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Total analysed: n= 42 Peripheral: n= 19 Central: n= 23	Peripheral: 7/16 Central: 8/18 Indications for TPN: Inflammatory bowel disease, enterocutaneous fistulae, acute pancreatitis, postoperative major surgery, failed enteral support, miscellaneous	covered with an occlusive transparent dressing. The infusion site was inspected daily. At the first appearance of thromboflebitis, the cannula was removed and PPN was continued through a re-sited cannula in the contralateral arm. TPN was discontinued in all cases on the resumption of oral feeding.	were removed if there was any suspicion of catheter-related sepsis which was confirmed if pyrexia settled on removal of the catheter and there were matching positive blood and catheter tip cultures. TPN was discontinued in all cases on the resumption of oral feeding.			Severe phlebitis was not encountered and no patient required any active therapy specifically for phlebitis Central: Catheter related sepsis was confirmed in one patient. Two patients developed small apical pneumothoraces	
Kohlhardt et al 1994[189]	RCT	1+	46 patients Peripheral IVN: n=23 Central IVN: n=23	Surgical inpatients requiring IVN Gender (M/F): Peripheral IVN: 16 /7 Central IVN: 14 /9 Mean age(yrs): Peripheral IVN: 61 Central IVN: 61 P IVN group; Postoperative gut rest: Pancreatic surgery =7 C IVN group: Patients with Postoperative gut rest: Pancreatic surgery =4 P IVN group; Oesophageal surgery =7	Peripheral IVN group: a paediatric fine-bore silicone catheter with an internal dia=0.3mm and external dia=0.6mm was inserted asceptically 10-15cm into the deep median basilic vein. Catheters inserted percutaneously with local anaesthesia and tourniquet-assisted venous distension. Catheters not tunnelled subcutaneously or sutured to the skin for fixation. Nutrient solutions were prepared daily	Central IVN group: single-lumen silicone catheters of internal dia=1.3mm and external dia=1.67mm were used. CVC inserted with strict asepsis using the Seldinger technique via an infraclavicular subclavian approach. All catheters were sutured to the skin for fixation. Central IVN solutions were a selection of standard amino acid and dextrose nutrient solutions, prepared aseptically in the hospital pharmacy. Synthamin and	Study was terminated when the accumulated period of treatment for both groups was at least 2yrs. Mean total patient treatment period for both groups was 365 days. Single catheter use ranged from 4 to 40 days with peripheral and 0 to 29	Problems with venous access Num. catheters used Spontaneous catheter retraction Chemical infusion thrombophlebitis Catheter related bacteraemia Incidence density of complications - RR incidence density ratio (95% CI)	Peripheral: n=23 CVC: n=23 Peripheral: 0 CVC: 1 Peripheral: 25 CVC: 30 Peripheral: 3 CVC: 0 Peripheral: 4 CVC: 0 Peripheral: 0 CVC: 3 Peripheral: 0.016 CVC: 0.025 0.66 (0.24-1.82) [Not significant]	Small sample size may not have allowed adequate stats power for significance to be demonstrated. Patients who received peripheral IVN may have been subject to greater surgical insult, undergoing more oesophageal and pancreatic ops then those who received central IVN who had gastric procedures. Two patients in the CVC group developed early infection-site infection and central lines were converted to peripheral IVN until enteral feeding was

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				C IVN group: Oesophageal surgery =4 P IVN group; Gastric surgery =2 C IVN group: Gastric surgery =7 P IVN group; Other: Inflammatory bowel disease =2 C IVN group: Other: Inflammatory bowel disease =0 P IVN group; Pancreatitis =0 C IVN group: Pancreatitis =2 P IVN group; Fistula =3 C IVN group: Fistula =4 P IVN group; Other =2 C IVN group: Other =2 Excl: Patients who received IVN treatment in ICU and those who required multiple-lumen venous access.	under aseptic conditions in the hosp. pharm from Vamin 18, Intralipid 20% and dextrose 50%. Electrolyte additions were adjusted on the basis of daily biochemical profiles and the anticipated special needs of individual patients. Vitamin and trace elements were added as recommended. Heparin 1 unit/ml was routinely added as recommended. The peripheral IVN solution provided approximately 100 kcal (0.42 MJ) per gN, with between 65 and 75 per cent of the non-protein calories supplied as lipid. Delivered continuously over 24h.	Vamin products comprised the nitrogen source with all non-protein calories supplied as glucose. These solutions provided between 100 and 150 kcal (0.42 and 0.63 MJ) per gN. A fat premix solution with 500 ml Intralipid 20% was administered twice weekly to each patient. Patients received between 0.2 and 0.4 gN per Kg per day with 35-45 kcal (150-190 kJ) per kg per day. Vitamins and trace elements were added as recommended. Insulin (20-40 units/l) was added to the solutions of patients with significant glucose intolerance.	days with central venous lines. The total treatment period for patients receiving peripheral IVN was 426 days and for central IVN 322 days.	Probability of complication-free system function with time	[Not significant] [p= 0.14]	resumed. Funding: Royal Australasian College of Surgeons
May et al 1993[221]	RCT	1+	49 patients Peripheral: n= 23 Central: n= 26	GI patients requiring PN Patients were well matched with regards	Peripheral PN. Patients received their nutritional support through a suitable forearm vein	CVC PN. The superior vena cava was cannulated with a 14 gauge silicon catheter via standard	Until resumption of oral feeding	Patients successfully finished PN in their	CVC: n= 26 Peripheral : n= 23 CVC: n= 21 (80%) Peripheral: n= 13	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				to age, sex and indication for TPN. Data not provided	using a standard 18 gauge cannula. The cannula was inserted under aseptic conditions on the ward and the site converted by an occlusive transparent dressing. PPN fluid was then infused continuously over 24 hours with an infusion pump and the infusion site was assessed daily for phlebitis by the nutrition nurse and recording to a modified Maddox scale.	infraclavular approach to the right subclavian vein. Nutrition solution was also infused continuously over 24 hours by an infusion pump.		allocated group Line fevers Pneumotorax	(56%) CVC: n= 6 Peripheral: n= 3 CVC: n= 2 Peripheral: n=0	

Table 72: Parenteral nutrition (PN) route of access: tunnelled vs non-tunnelled

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Randolph et al 1998[284]	SR	1+	Total: n= 735 Von Meyenfeldt1980 - n=150 Garden1983-n= 38 Keohane1983-n= 83	All patient populations were adults Von Meyenfeldt1980- Surgical Garden1983- 38- Surgical Keohane1983- Medical and surgical	Tunnelled short-term central venous catheters Inclusion criteria: catheters in place for an average of < 30 days Mean No. days catheters in place: Von	No tunnelling/standard placement		Catheter colonisation: Subclavian Von Meyenfeldt1980 Garden1983 Keohane1983	Individual trial data (%) Tunnel : 4/63 (6.3) Standard : 4/76 (5.3) Tunnel : - Standard : - Tunnel : 6/52 (11.5) Standard : 13/47 (27.7)	Catheterisation was used for PN in five of the seven studies included. In one study catheterisation was used for haemodialysis and in another study the use of catheterisation is not clear: inclusion criteria: patients who required a jugular venous catheter for

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Dahlberg1986- n=40 Guichard1986- n=74 De Cicco1989- n=109 Timsit1996- n=241	Dahlberg1986- Hemodialysis Guichard1986- Critical care oncology De Cicco1989- Oncology Timsit1996- Critical care general	Meyenfeldt1980- 15 d Garden1983- 13.4 d Keohane1983- 11.4 d Dahlberg1986- 10.6 d Guichard1986- 17 d De Cicco1989- 19.7 d Timsit1996- 8.5 d Site: Subclavian: 6 studies Internal jugualar: 1 study (Timsit1996)	Mean No. days catheters in place: Von Meyenfeldt1980- 12 d Garden1983- 12.3 d Keohane1983- 10.3 d Dahlberg1986- 12.2 d Guichard1986- 19 d De Cicco1989- 16.8 d Timsit1996- 8.2 d		Dahlberg1986 Guichard1986 De Cicco1989 Overall Subclavian Internal Jugular: Timsit1996 RR (95% CI) Catheter colonisation - All trials: - Subclavian Site only Clinical sepsis: Subclavian Von Meyenfeldt1980 Garden1983 - RR (95% CI) Internal Jugular Timsit1996 - RR (95% CI) Catheter-related	Tunnel : 7/23 (30.4) Standard : 6/26 (23.1) Tunnel : 5/41 (12.2) Standard : 9/39 (23.1) Tunnel : 4/51 (7.8) Standard : 18/58 (31.0) Tunnel : 26/230 (11.3) Standard : 50/246 (20.3) Tunnel : 20/117 (17.1) Standard : 29/114 (25.4) 0.61 (0.39, 0.95) 0.59 (0.32, 1.10) Tunnel : 2/63 (3.2) Standard : 3/76 (3.9) Tunnel : 9/20 (45.0) Standard : 8/24 (33.3) 1.25 (0.63-2.48) Tunnel : 7/117 (6.0) Standard : 18/114 (15.8) 0.38 (0.16-0.87)	more than 48 hours.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								sepsis with bacteriologic confirmation Subclavian Von Meyenfeldt1980 Garden1983 Keohane1983 Dahlberg1986 Guichard1986 De Cicco1989 Overall Subclavian Internal Jugular: Timsit1996 RR (95% CI) catheter -related septicemia All trials Subclavian site only	 Tunnel : 2/63 (3.2) Standard : 2/76 (2.6) Tunnel : 3/20 (15.0) Standard : 7/24 (29.2) - Tunnel : 3/23 (13.0) Standard : 3/26 (11.5) Tunnel : 2/41 (4.9) Standard : 3/39 (7/7) Tunnel : 2/51 (3.9) Standard : 4/58 (6.9) Tunnel : 12/198 (6.1) Standard : 19/223 (8.5) Tunnel : 4/117 (3.4) Standard : 13/114 (11.4) 0.56 (0.31, 1.00) 0.71 (0.36, 1.43)	
Timsit et al 1999[350]	RCT	1+	345 patients 9 patients excluded (tunnelled n=5; non tunnelled	Patients admitted to ICU expected to require femoral catheterisation for at least 48 hours. Simplified Acute	Polyurethane monolumen or bilumen tunnelled catheters, 30 cm long (Hasselcath 6 French [mono-lumen	Non-tunnelled femoral catheter. The polyurethane catheters used in the tunnelled-catheter	Until discharge from ICU		Tunnelled N= 168 Non tunnelled N= 168 Events per 100 catheter-days (n):	The catheters could be used for any purpose: total parenteral nutrition, administration of blood products, and

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			n=4) Total: n= 336 Tunnelled: n=168 No tunnelled: n=168	Physiologic Score II (SAPS II) had to be greater than 20. Mean age (SD): Tunnelled: 61.4 (16.7) Non tunnelled: 61.1 (17) [Not significant] Gender (M/F): Tunnelled: 105/63 Non-tunnelled: 104/64 [Not significant] Mean body mass index (SD) kg/m2: Tunnelled: 25.4 (5) Non- tunnelled: 23.6 (4) [Not significant] Mechanical ventilation n (%): Tunnelled: 159 (95) Non tunnelled: 148 (88) **[p=0.04]** Monolumen, n: Tunnelled: 16 Non Tunnelled: 19 Bilumen, n: Tunnelled: 151 Non tunnelled: 149 Parenteral nutrition, n (%): Tunnelled: 96 (57) Non-tunnelled: 89 (53) Type of clinician, n: Resident: Tunnelled: 122 Non-tunnelled: 130	with one 14-gauge channel] or Seldiflex 7 French [bilumen with two 16-gauge channels], Platimed, Saint Leu, France), inserted using the Seldinger method. The distance separating the cutaneous puncture site from the venous entry site had to be 10 cm. The polyurethane catheters used in the tunnelled-catheter group and in the control group were of the same external diameter (Seldiflex). Intravenous tubing and semi-permeable transparent dressing (Opsite IV3000, Smith and Nephew Med Ltd., Hull, UK) were changed immediately if the dressing was contaminated; otherwise they were changed routinely every 72 hours.	group and in the control group were of the same external diameter (Seldiflex).		Probable systemic catheter-related sepsis Catheter-related bloodstream infection Positive catheter colonisation Catheter removal Complications (n): Arterial puncture Local hematoma Femoral thrombosis Rate of catheter malfunction Episodes of catheter related sepsis - Death within the first 48 h	Tunnelled: 0.36 Non tunnelled: 1.1 RR (95% CI): 0.25 (0.09-0.72) **[p=0.005]** Tunnelled: 0.073 Non tunnelled: 0.23 RR (95% CI): 0.28 (0.03-1.92) [p=0.18] Tunnelled: 1 Non tunnelled: 1.5 RR (95% CI): 0.48 (0.23-0.99) **[p=0.045]** Study reports “did not differ between groups” 25 patients (no details provided) Tunnelled: n=10 Non tunnelled: n= 3 **[p=0.048]** Tunnelled: n= 5 Non tunnelled: n= 2 [p>0.2] Tunnelled: n= 3 Non tunnelled: n= 5 [p>0.2] Tunnelled: n= 5 Non tunnelled: n= 15 Tunnelled: n= 2 Non tunnelled: n= 4	medication. Only 57% in the tunnelled group and 53% in the non tunnelled group were used for PN. A difference was seen in the risk for substantial catheter colonisation among centres **[p= 0.03]** There were statistically significant greater numbers of patients on mechanical ventilation in the tunnelled group. Funding: Grant support: In part by the Foundation-Hospital Saint Joseph, Bellon, Eli Lilly & Co., Marion Merrell Dow, Inc., Pfizer, Inc., SmithKline Beecham Pharmaceuticals, Roche Laboratories, Roussel & Diamant, and Wyeth-Lederle. Plastimed provided 50 tunnelled catheters.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Senior staff: Tunnelled: 46 Non tunnelled:38 [Not significant] Use of broad-spectrum antimicrobial agents, n (%): Tunnelled: 40 (24) Non-tunnelled: 43 (26) [Not significant] Median time to placement: Tunnelled: 25 min Non tunnelled: 15 min **[p=0.001]** Mean duration (SD) of catheter maintenance (days): Tunnelled: 8.2 (4.7) Non tunnelled: 7.6 (4.5) [Not significant] Exclusion criteria: Patients with catheters introduced by guidewire exchange, patients who needed trilumen catheters, and patients who had local impediments to femoral cannulation (infection, inflammation, recent surgery, or hematoma). Patients with recent deep venous thrombosis or a history of phlebitis or pulmonary embolism.				Micro-organisms recovered from the catheter-tip culture	Data not extracted (study reports “micro-organism recovered from the catheter-tip culture did not differ between groups)	

Table 73: Parenteral nutrition (PN) route of access: standard vs tailored preparations

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Rhodes et al 1985[293]	RCT	1+	29 patients 9 patients were excluded: 3 because PN period < 6 days, 4 not able to perform spirometry, 2 haemodynamic problems. 20 patients Constant feeding regimen: 10 Tailored preparation: 10	Patients requiring PN after abdominal surgery. Mean +/- SD age: Constant: 47 +/- SD (2 patients < 18 years old) Tailored: 44 +/- 19 (1 patient < 18 years old) Gender (M/F): Constant: 8/2 Tailored: 8/2 Mean days on PN: Constant: 11.1 Tailored: 8.4 Mean % usual weight: Constant: 81.3 Tailored: 83 Malignant disease/non-malignant disease: Constant: 6/4 Tailored: 5/5	All patients were fed via subcutaneously tunnelled central venous catheters sited aseptically. Constant regimen: 2600 k cal and 15.55 g N2/day. The feeding solutions were prepared under aseptic conditions and filled into 3 litre EVA bags (Travenol, UK). Nitrogen was given as Aminoplex 12 (Geistlich). Carbohydrate was given as Glucoplex 1000 or 1600 (Geistlich) or as dextrose. The choice of carbohydrate solution was governed by constrains on the total volume of the regimen (2.7-3.3 l/day). Fat was given as Intralipid 20% (Kabivitrum) and comprised 40% of the non-protein calorie source. Vitamins and trace element supplements were	All patients were fed via subcutaneously tunnelled central venous catheters sited aseptically. Tailored preparation: same calorie: N2 ratio of 167:1 was maintained but the calorie content was adjusted each day according to the patient's metabolic expenditure measured the previous day (adjusted to the nearest 200 Kcals). The feeding solutions were prepared under aseptic conditions and filled into 3 litre EVA bags (Travenol, UK). Nitrogen was given as Aminoplex 12 (Geistlich). Carbohydrate was given as Glucoplex 1000 or 1600 (Geistlich) or as dextrose. The choice of carbohydrate solution was governed by constrains on the total volume of the	Duration of PN mean of 10 days (range 6-24)	Mortality while receiving PN Calorie intake (Kcal/day) Nitrogen intake (g/day) Mean +/- SD total metabolic expenditure Mean +/- SD RQ before feeding Mean +/- SD RQ during feeding Mean +/- SD CO2 production initial (l/min) Mean +/- SD CO2 production peak (l/min) Mean +/- SD Total body fat change (kg/day) Mean +/- SD Lean body mass change	Constant n=10 Tailored n=10 Constant: 1 Tailored: 1 Constant: 2,600 Tailored: 2,131 +/- 230 Constant: 15.55 Tailored: 12.70 +/- 1.39 Constant: 2,308 +/- 555 kcal/day Tailored: 2,234 +/- 252 Kcal/day [p value not reported] Constant: 0.83 +/- 0.15 Tailored: 0.86 +/- 0.11 Constant: 0.90 +/- 0.10 Tailored: 0.90 +/- 0.009 [Not significant] Constant: 0.19 +/- 0.09 Tailored: 0.17 +/- 0.04 l/min Constant: 0.25 +/- 0.05 Tailored: 0.23 +/- 0.04 [Not significant] Constant: -0.02 +/- 0.20 Tailored: -0.02 +/- 0.14 [Not significant] Constant: -0.05 +/- 0.32 Tailored: -0.04 +/- 0.35	31% patients were excluded. This study includes 3 patients (15%)< 18 years old and 2 patients with Crohn's disease.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					added (Sovito, Vitlipid and Addamel (Kabivitrum)). Electrolyte sources were NaCl 30%, KCl 15%, KH2PO4 and CaCl2. Sodium and potassium contents were adjusted daily.	regimen (2.7-3.3 l/day). Fat was given as Intralipid 20% (Kabivitrum) and comprised 40% of the non-protein calorie source. Vitamins and trace element supplements were added (Sovito, Vitlipid and Addamel (Kabivitrum)). Electrolyte sources were NaCl 30%, KCl 15%, KH2PO4 and CaCl2. Sodium and potassium contents were adjusted daily.		(Kg/day) Mean +/- Nitrogen balance Incidence of clinically important hyperglycaemia or hypophosphataemia Incidence of insulin requirement	 Constant: +3.50 +/- 2.23 Tailored: +1.71 +/- 1.97 g/day Constant: n=0 Tailored: n=0 Constant: n=0 Tailored: n=0	

Table 74: Parenteral nutrition (PN): continuous vs cyclic

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Aldamiz-Echevarria et al 1996[7]	RCT	1+	24 patients Intervention: n=12 Comparison: n=12	Patients who had undergone bone marrow transplant. Mean +/- SD Age: Intervention: 37 +/- 9.3 Comparison: 35.4 +/- 11.1 Mean Weight (kg): Intervention: 62.6 +/- 12.9	PN initiated 24 h after transplantation. Continuous: infusion pump over 24 h period. 35 kcal/kg/day (29 non-protein kcal of which 65% were carbohydrates and 35% lipids)	PN initiated 24 h after transplantation. Cyclic: infusion pump over 12 h period. 35 kcal/kg/day (29 non-protein kcal of which 65% were carbohydrates and 35% lipids)	Until end of PN	 Mean +/- SD Energy provided by PN (Kcal/kg/day) Mean +/- SD duration of PN (days)	Intervention: n=12 Comparison: n=12 Intervention: 27.2 +/- 3.7 Comparison: 25.9 +/- 4.2 [p=0.45] Intervention: 20.4 +/- 7.9 Comparison: 27.3 +/-	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Comparison: 67.1 +/- 14.6 Gender (M/F): Intervention: 7/5 Comparison: 5/7 Exclusion criteria: patients below 15 years of age, renal failure, insulin dependent diabetes mellitus and cardiac conditions. Also PN interrupted for more than 5 days and/or those with cardiac insufficiency.	administered as 140 non-protein kcal/g of nitrogen and with an energy content of 1 kcal/ml. Daily support: nitrogen 0.22 g/kg, glucose 4.9 g/kg and lipids 1.121 g/kg. Electrolytes, trace elements and vitamins were given according to individual requirements.	administered as 140 non-protein kcal/g of nitrogen and with an energy content of 1 kcal/ml. Daily support: nitrogen 0.22 g/kg, glucose 4.9 g/kg and lipids 1.121 g/kg. Electrolytes, trace elements and vitamins were given according to individual requirements.			13.4 [p=0.14] Intervention: -1.4 +/- 1.7 kg Comparison: 0.1115 +/- 2.6 [p=0.12] Intervention: 19.6 +/- 11.7 Comparison: 22.5 +/- 7.6 [p= 0.55] Intervention: n=7 Comparison: n= 9 [Not significant] Intervention: n=2 Comparison: n=2 [Not significant] Intervention: n= 0 Comparison: n= 0 Intervention: n= 7 Comparison: n= 7 Intervention: 29 +/- 18.1 Comparison: 31 +/- 15.3 [Not significant] Beginning: Intervention: 110.8 +/- 27.1 Comparison: 119.6 +/- 35.7 [p=0.50] Intervention: 153.4 +/- 40.9	
								Mean +/- SD weight change from beginning and end of PN (kg) Mean +/-SD neutropenia time (days) Use of hematopoietic growth factors Incidence of hepatic veno-occlusive disease Incidence of catheter infection Incidence of fever Mean +/- SD post-transplantation hospitalisation period (days) Mean +/- SD glucose levels (mg/dl) Mean +/- SD glucose levels during the trial		

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								(mg/dl) Mean +/- SD total protein levels (g/l) Hepatic parameters: Mean +/- SD aspartate aminotransferase (SGOT) values (U/l) Mean +/- SD Alanine	Comparison: 158.0 +/- 64.2 [p=0.8] Beginning: Intervention: 5.4 +/- 0.5 Comparison: 5.8 +/- 0.5 **[p=0.05]** End PN: Intervention: 5.5 +/- 0.8 Comparison: 6.2 +/- 0.7 [p=0.07] Beginning: Intervention: 27.6 +/- 16.9 Comparison: 76.2 +/- 116.3 [Not significant] 1st week: Intervention: 21.5 +/- 14.61 Comparison: 18.9 +/- 8.5 [Not significant] 2nd week: Intervention: 19.5 +/- 10.51 Comparison: 3.5 +/- 7.7 [Not significant] Month: Intervention: 28.0 +/- 13.4 Comparison: 22.2 +/- 0.5 [Not significant] Beginning:	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								aminotransferase (GPT) values (U/l)	Intervention: 43 +/- 57.7 Comparison: 74.3 +/- 98 9 [Not significant] 1st week: Intervention: 38.5 +/- 39.9 Comparison: 41.5 +/- 39.1 [Not significant] 2nd week: Intervention: 42.1 +/- 34.4 Comparison: 34.9 +/- 17.1 [Not significant] Month: Intervention: 70.3 +/- 42.5 Comparison: 22.6 +/- 6.8 [Not significant]	
								Mean +/- SD gamma glutamyl transferase (GGT) values (U/l)	Beginning: Intervention: 20.9 +/- 10.6 Comparison: 40.4 +/- 48.8 [Not significant] 1st week: Intervention: 47.6 +/- 40.9 Comparison: 78.2 +/- 68.1 [Not significant] 2nd week: Intervention: 88.3 +/- 86.8	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Comparison: 131.4 +/- 81.5 [Not significant] Month: Intervention: 192 +/- 59.2 Comparison: 124.4 +/- 91.3	
								Mean +/- SD alkaline phosphatase (U/l)	Beginning: Intervention: 72.9 +/- 42.2 Comparison: 97.7 +/- 72.4 [Not significant] 1st week: Intervention: 73.3 +/- 35.2 Comparison: 97.8 +/- 52.1 [Not significant] 2nd week: Intervention: 86.0 +/- 56.9 Comparison: 125 +/- 44.8 [Not significant] Month: Intervention: 156 +/- 124.2 Comparison: 114.0 +/- 62.5 [Not significant]	
								Mean +/- SD total bilirubin (mg/dl)	Beginning: Intervention: 0.5 +/- 0.2 Comparison: 0.6 +/- 0.3 [Not significant] 1st week:	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Intervention: 0.8 +/- 0.5 Comparison: 0.5 +/- 0.1 [Not significant] 2nd week: Intervention: 0.8 +/- 0.5 Comparison: 0.7 +/- 0.3 [Not significant] Month: Intervention: 0.7 +/- 0.1 Comparison: 0.84 +/- 0.5 [Not significant]	
								Plasma biochemical parameters: urea, sodium, chlorine, potassium, phosphorus, calcium, uric acid and creatinine	Within normal range at the beginning and subsequent analysis (Data not reported).	
								Plasma levels of cholesterol, triglycerides, albumin.	Data not extracted	
Forsberg et al 1994[115]	RCT	1+	16 patients Intervention: n=8 Comparison: n=8	Mechanically ventilated patients with trauma and/or severe infection Mean +/- SD age: Intervention: 57 +/- 7 Comparison: 69 +/- 7 Gender (M/F) Intervention: 6/2 Comparison: 5/3 Mean +/- SD BMI: Intervention: 24 +/- 2 Comparison: 25 +/- 4	First 24 h, low energy glucose infusion was administered at a constant rate of 1.25 kJ/ kg/ h. After this study was divided into four consecutive 12 h periods: Period 1: First 12 hours from 10.00 to 22.00 Period 2: From 22.00 to 10:00	First 24 h, low energy glucose infusion was administered at a constant rate of 1.25 kJ/ kg/ h. After this study was divided into four consecutive 12 h periods: Period 1: First 12 h, from 10.00 to 22.00: infusion of glucose, fat and amino acids Period 2: from 22.00	Until discharge	Mean +/- SD energy supply kJ/ kg BW /h	Intervention: n=8 Comparison: n=8 Baseline: Intervention: 1.25 +/- 0 Comparison: 1.25 +/-0 Periods 1 and 3: Intervention: 5.9 +/- 0.6 Comparison: 9.2 +/- 1.9 Periods 2 and 4: Intervention: 5.9 +/- 0.6 Comparison: 1.25 +/- 0	Energy supply in the comparison group during periods 1 and 3 was approximately 75% higher than during the corresponding periods in the intervention group. Two patients in the continuous group with a history of diabetes mellitus (type II) required insulin infusions (1-3
								Mean +/- SD amino	Baseline:	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Duration of total PN before the study (days) Mean +/- SD: Intervention: 3 +/- 2 Comparison: 7 +/-7 Exclusion criteria: renal failure requiring renal replacement therapy, insulin-dependent diabetes mellitus prior to intensive care, circulatory failure (MAP < 70 mmHg), severe hepatic failure, inspired O2 fractions above 55%, bronchopleural fistula and organ transplantation. Criteria for exclusion during the study: failure to comply with the nutritional protocol, weaning off the mechanical ventilation and re-operation.	Period 3: From 10.00 to 22.00 Period 4: From 22.00 to 10.00 Glucose, fat and amino acids infused at a constant rate (1.3 x baseline energy expenditure) throughout periods 1, 2,3, 4. In both groups the total energy supply was equal to 1.3 X baseline energy expenditure. The non-protein energy was provided as glucose and lipids (Intralipid, 20%, Kabi Pharmacia AB, Stockholm, Sweden) with a ratio of 1:1. Amino acids (Vamin 14, Kabi Pharmacia AB, Sweden) were administered with a nitrogen: energy ratio of 1.3 N/1000 KJ. Electrolytes, vitamins and trace elements were supplied daily and patients had no oral or enteral intakes during the study.	to 10.00, low energy glucose infusion 1.25 kJ/Kg/h Period 3: from 10.00 to 22.00, infusion of glucose, fat and amino acids Period 4: from 22.00 to 10.00, low energy glucose infusion 1.25 kJ/Kg/h In both groups the total energy supply was equal to 1.3 X baseline energy expenditure. The non-protein energy was provided as glucose and lipids (Intralipid, 20%, Kabi Pharmacia AB, Stockholm, Sweden) with a ratio of 1:1. Amino acids (Vamin 14, Kabi Pharmacia AB, Sweden) were administered with a nitrogen: energy ratio of 1.3 N/1000 KJ. Electrolytes, vitamins and trace elements were supplied daily and patients had no oral or enteral intakes during the study.		acid supply (mg N/ kg BW /h) Mean +/- SD energy expenditure (kJ/ kg BW/ h) (%, average increase in relation to baseline periods)	Intervention: 0 Comparison: 0 Periods 1 and 3: Intervention: 7.6 +/- 0.8 Comparison: 13.5 +/- 2.5 Periods 2 and 4: Intervention: 7.6 +/- 0.8 Comparison: 0 Baseline: Intervention: 4.5 +/- 0.5 (0) Comparison: 4.0 +/- 0.7 (0) Period 1: Intervention: 4.7 +/- 0.4 (5) Comparison: 4.5 +/- 0.8 (13) Period 2: Intervention: 4.8 +/- 0.3 (6) Comparison: 4.2 +/- 0.7 (7) Period 3: Intervention: 4.8 +/- 0.4 (6) Comparison: 4.6 +/- 0.6 (17) Period 4: Intervention: 4.7 +/- 0.4 (4) Comparison: 4.4 +/- 0.5 (11) Periods 1-4: Intervention: 4.8 +/- 0.4	units/hour) during total PN.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									(5) Comparison: 4.4 +/- 0.6 (12) **[p<0.05]** (percentage increase from the baseline)	
								Mean +/- SD respiratory quotient	Baseline: Intervention: 0.82 +/- 0.06 Comparison: 0.83 +/- 0.05 Period 1: Intervention: 0.84 +/- 0.05 Comparison: 0.86 +/- 0.04 Period 2: Intervention: 0.86 +/- 0.06 Comparison: 0.89 +/- 0.05 Period 3: Intervention: 0.86 +/- 0.05 Comparison: 0.88 +/- 0.03 Period 4: Intervention: 0.87 +/- 0.05 Comparison: 0.87 +/- 0.05 Periods 1-4: Intervention: 0.85 +/- 0.05 Comparison: 0.88 +/- 0.04	
								Mean +/- SD O2	Baseline:	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								uptake (ml x (min/m2)-1, (%)	Intervention: 151 +/- 34 (0) Comparison: 133 +/- 20 (0) Periods 1-4: Intervention: 158 +/- 37 (5) Comparison: 146 +/- 17 (11) **[p<0.05]** (percentage increase from the baseline)	
								Mean +/- SD CO2 elimination (ml x (min/m2) –1) (%)	Baseline: Intervention: 123 +/- 24 (0) Comparison: 110 +/- 17 (0) Periods 1-4: Intervention: 133 +/- 25 (9) Comparison: 129 +/- 16 (18) **[p<0.05]** (percentage increase from the baseline)	
								Mean +/- SD Nutrient-induced thermogenesis during periods 1-4	Intervention: 5.3 +/- 4.5 % Comparison: 12.4 +/- 7.1 % **[p<0.05]**	
								Mean +/- SD Energy balance (kJ/Kg BW/h)	Intervention: 1.3 +/- 0.3 Comparison: 0.8 +/- 0.4 **[p< 0.05]**	
								Mean +/- SD plasma glucose (nmol/L)	Before PN: Intervention: 8.3 +/- 4.6 Comparison: 6.4 +/- 1.5 [Not significant]	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									During PN: Intervention: 10.8 +/- 5.6 Comparison: 8.4 +/- 3.3	
								Administration of morphine equivalents (mg/24h) Mean +/- SD	Before PN: Intervention: 171+/- 328 Comparison: 48 +/- 104	
									During PN: Intervention: 118 +/- 175 Comparison: 50 +/- 105 [Not significant]	
								Benzodiazepines (mg/24h) Mean +/- SD	Before PN: Intervention: 61 +/- 84 Comparison: 55 +/- 111 [Not significant]	
									After PN: Intervention: 41 +/- 51 Comparison: 56 +/- 113 [Not significant]	
								Mean +/- SD artificial ventilation (days)	Before the study: Intervention: 2 +/- 1 Comparison: 8 +/- 9	
									After study: Intervention: 17 +/- 22 Comparison: 9 +/- 7	
								Mean +/- SD Intensive care (days)	Before study: Intervention: 3 +/- 1 Comparison: 8 +/- 8	
									After study: Intervention: 23 +/- 22 Comparison: 14 +/- 17	
								Mean +/- SD hospitalisation (days)	Before study: Intervention: 7 +/- 5	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Comparison: 11 +/- 10 After study: Intervention: 32 +/- 25 Comparison: 34 +/- 30	
								Num. patients died in the intensive care unit	Intervention: 1 Comparison: 3	
								Num. patients who died after intensive care during subsequent hospitalisation	Intervention: 0 Comparison: 2	
								Nitrogen balance and urine excretion of noradrenaline, adrenaline, cortisol and glucose.	Data not extracted	
								Plasma insulin, glucagon, , serum cortisol, triglycerides	Data not extracted	
								Heart rate, body temperature, systolic blood pressure	During periods 1-4, the average values for heart rate, systolic blood pressure and temp. did not differ from baseline, nor where there any differences between the two groups. Data not extracted	
Sandstrom et al 1995[305]	RCT	1+	65 patients Group A: n=21 (Data from this group not extracted)	Patients undergoing acute or elective major surgery. Mean +/- SEM age: Continuous: 68 +/- 2 Bolus: 63 +/- 2	Group A n=21: Fat and amino acids were infused simultaneously from 8 AM to 4 PM and glucose alone form 4 PM to 8 AM next	Group C (Bolus) n=23: Bolus infusion consisting o f the same nutrient mixture as Group B but provided in five small bags, each		Mean +/S SE total amount of fluids (mL/24 hr)	Continuous: n= 21 Bolus: n= 23 Continuous: 3027 +/- 106 Bolus: 2915 +/- 102 [Not significant]	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Group B (Continuous): n=21 Group C (Bolus): n=23	Gender (M/F): Group Continuous: 16/5 Group Bolus: 16/7 Mean SE body weight (kg): Continuous: 75 +/- 3 Bolus: 74 +/- 3 NS Mean +/- weight loss (%) Continuous: 4 +/- 1 Bolus: 5 +/- 1 Arm circumference (cm) Continuous: 30 +/- 1 Bolus: 30 +/- 1 Exclusion criteria: serum creatinine concentrations > 175 mmol/L and juvenile or adult onset diabetes mellitus that required tablet or insulin injection medication.	day. (Data from this group not extracted). Group B (Continuous) n=21: 24-hour constant infusion of an all-in-one mixture with fat, amino acids, and glucose in a 3-L plastic bag that contained the entire prescription for 24 hours. The mixture was delivered by means of a pump at 125 mL/h. Glucose only (250 g) was given on the first postoperative day. All patients started with total PN on the second postoperative day and received prescriptions for the 6 consecutive days according to randomisation. Only tap water was allowed as oral intake during the experimental period. All patients received the same composition of nutrients. Nonprotein calories were provided to cover 100% of the predicted energy expenditure	infused during 1 hour followed by 2 hours without infusions. These infusions were given during the major part of the day (12 hours). The first bag was infused beginning at 8 AM and the last bag at 8 PM. No infusion during the night hours were provided. The infusion rate was ~580 mL/h. Glucose only (250 g) was given on the first postoperative day. All patients started with total PN on the second postoperative day and received prescriptions for the 6 consecutive days according to randomisation. Only tap water was allowed as oral intake during the experimental period. All patients received the same composition of nutrients. Nonprotein calories were provided to cover 100% of the predicted energy expenditure according to the Harris and Benedict		Total amount of blood, plasma and albumin Heart rate Mean +/- SE body temperature (fC) Nausea: patients days (%) Mean +/- SE bilirubin in serum (µmol/L) Mean +/- SE Serum alkaline phosphatase (µkat/L) Mean +/- SE serum ASAT (µkat/L) Serum ALAT (µkat/L)	Data not extracted All nutrition regimens caused a significant stimulation of heart rate **[p< 0.01]** which was not statistically different on an overall daily basis among the infusion regimens. Electrocardiogram did not reveal any hazardous episodes of tachycardia or arrhythmia during bolus infusion. Data not reported. Continuous: 37.5 +/- 0.1 Bolus: 37.7 +/- 0.1 [Not significant] Continuous: 3/126 (2) Bolus: 8/138 (6) [Not significant] Continuous: 18 +/- 2 Bolus: 19 +/- 1 Continuous: 3.8 +/- 0.4 Bolus: 4.8 +/- 0.4 Continuous: 1.13 +/- 0.14 Bolus: 1.61 +/- 0.16 Continuous: 0.74 +/- 0.11 Bolus: 1.23 +/- 0.14	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					according to the Harris and Benedict formula and consisted of 40% lipids (Intralipid 20% Farmacia AB, Stockholm, Sweden) and 60% carbohydrate (D-glucose). Crystalline amino acids (Vamin 14, Kabi Pharmacia S.A, Limoges, France) were given corresponding to 0.2 g N/kg per day. Vitamins (Souvit, Vitalipid, Pharmacia AB), electrolytes (Na, K, Mg, phosphates), and trace elements (Addamel Phramacia AB, Stockholm, Sweden) were provided according to minimum requirements.	formula and consisted of 40% lipids (Intralipid 20% Farmacia AB, Stockholm, Sweden) and 60% carbohydrate (D-glucose). Crystalline amino acids (Vamin 14, Kabi Pharmacia S.A, Limoges, France) were given corresponding to 0.2 g N/kg per day. Vitamins (Souvit, Vitalipid, Pharmacia AB), electrolytes (Na, K, Mg, phosphates), and trace elements (Addamel Phramacia AB, Stockholm, Sweden) were provided according to minimum requirements.		Blood glucose in the morning (g/L) Blood glucose increase during infusion (g/L) Energy balance “Minimum” nitrogen balance (calculated accounting for the nitrogen content of infused amino acid solutions only) “Maximum” nitrogen balance (calculated accounting for measured nitrogen content in all blood and plasma products provided during operation and the entire study period in addition to the amino acid nitrogen) Daily urine excretions and external losses of nitrogen	Continuous: 8.3 +/- 0.3 Bolus: 5.8 +/- 0.2 Continuous: 1.5 +/- 0.4 Bolus: 2.7 +/- 0.4 Continuous: -368 +/- 25 kcal/d Bolus: -292 +/- 20 kcal/d Continuous: -0.2 +/- 0.6 g/d Bolus: -2.8 +/- 0.3 g/d **[p<0.01]** Continuous: +3.3 +/- 1.2 g N/d Bolus: 0.4 +/- 0.9 g N/day **[p<0.05]** Data not extracted	

Table 75: Parenteral nutrition (PN): continuous vs cyclic (peripheral PN)

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Kerin et al 1991A[184]	RCT	1+	51 patients Group 1: n=17 Group 2: n=17 Group 3: n=17	Patients requiring total PN except those in whom central venous catheterisation was necessary. Mean age (+/- SD): Group 1: 54 (+/- 16.1) Group 2: 66 (+/- 14.3) Group 3: 59 (+/- 12.7) Gender (M/F): Group 1: 7/10 Group 2: 6/11 Group 3: 3/14 Mean weight (+/- SD): Group1: 58 (+/- 17) Group 2: 60 (+/- 16) Group 3: 56 +/- 18)	Group 1: PN was given continuously. The cannula was inspected daily but only removed on suspicion of phlebitis. A cannula was resited in the in the contralateral arm to maintain uninterrupted PN administration. Group 2: Patients also received their PN continuously, but the peripheral intravenous feeding line was electively resited in the contralateral arm each day. In all patients the largest possible forearm vein was selected avoiding were possible the dorsum of the hand or the cubital fossa. Polytetrafluoroethylene Teflon cannulas size 16G or 18G were used in all cases. PN regimen was given in 2.5 l/day containing 1800 kcal/day containing	Group 3: Patients received PN as a 12 hourly infusion on completion of which the feeding cannula was withdrawn. These patient were then without intravenous access for feeding purposes for the next 12 hours, following which another cannula was established in the contralateral arm. PN regimen was given in 2.5 l/day containing 1800 kcal/day containing 1800 kcal (glucose 500, fat 1000, protein 300 kcal) with an osmolality of 600 mosmol/kg water. This provided 9.4 g of nitrogen. Trace elements, vitamins and supplemental electrolytes were added as determined by the patients' requirements. Additional crystalloid or colloid fluid requirements, IV antibiotics or any other parenteral	Until end of PN	Number of infusion days Mean duration of PN- days (range) PN > 10 days (number of patients) Cumulative Maddox score (a Maddox score > 3 was classified as severe phlebitis. Cumulative Maddox scores for each patient were calculated from the scores recorded daily in each individual patient) Daily Maddox score (Daily Maddox score for each patient group were calculated by division of the cumulative Maddox scores of all patients of each group by the	Group 1: n= 17 Group 2: n= 17 Group 3: n= 17 Group 1: 117 Group 2: 167 Group 3: 157 [Not significant] Group 1: 7.5 (1-13) Group 2: 10 (2-42) Group 3 8.2 (3-14) [Not significant] Group 1: 2 Group 2: 5 Group 3: 3 [Not significant] Group1: 84 Group 2: 69 Group 3: 39 Group 1: 0.73 Group 3: 0.25 **[p<0.001]** Group 2: 0.41 Group 3: 0.25 **[p<0.05]**	6 of 51 patients (12%) required conversion to central venous feeding prior to completion of their PN. All lines were inspected by the specialist nutrition nurse who recorded a Maddox score daily. Venous access sites were inspected at the end of each infusion period and for 3 days after completion of the PN course.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					1800 kcal (glucose 500, fat 1000, protein 300 kcal) with an osmolality of 600 mosmol/kg water. This provided 9.4 g of nitrogen. Trace elements, vitamins and supplemental electrolytes were added as determined by the patients' requirements. Additional crystalloid or colloid fluid requirements, IV antibiotics or any other parenteral drugs were given through separate venous access. Patients were classified as failures or PN therapy if converted to central venous feeding prior to completion or their PN.	drugs were given through separate venous access. In all patients the largest possible forearm vein was selected avoiding were possible the dorsum of the hand or the cubital fossa. Polytetrafluoroethylene Teflon cannulas size 16G or 18G were used in all cases. Patients were classified as failures or PN therapy if converted to central venous feeding prior to completion or their PN.		number of feeding days) Incidence of severe phlebitis Incidence of PN failures Mortality or morbidity (apart from phlebitis) Incidence of hyponatraemia necessitating supplemental sodium Incidence of hypokalaemia requiring additional potassium	 Group 1: 7 Group 2: 3 Group 3: 3 **[p<0.05]** (G.1 v G.2 and G.3) Group 1: 4 Group 2: 1 Group 3: 1 [Not significant] Group 1: 0 Group 2: 0 Group 3: 0 Group 1: 2 Group 2: 2 Group 3: 2 Group 1: 1 Group 2: 1 Group 3: 2	
May et al 1996[220]	RCT		60 patients Group 1: 15 Group 2: 15 Group 3: 17 Group 4: 13	Median (range) age: Group 1: 56 (45-78) Group 2: 64 (33-84) Group 3: 62 (37-82) Group 4: 52 (19-77) Sex ration (M:F) Group1: 8:7 Group 2: 4:11 Group 3: 6:11 Group 4: 5:8	Group 4: PPN was delivered through a fine –bore 23-G 15-cm silicone peripheral feeding line (Epicutaneo Cava Catheter; Vygon, Aachen, Germany) inserted into a suitable forearm vein. 24-h continuous PN. Cannulas were	Group 1: patients received PPN through a suitable forearm vein with a standard 18-G Teflon cannula (Venflon; Ohmeda, Swindon, UK). PN over a 12-h period, almost always at night. After infusion the cannula was removed and the	Until end of PN	Total duration of PPN (patient-days) Mean duration of PN (days)	Group 1: 116 Group 2: 135 Group 3: 92 Group 4: 65 **[p<0.01]** (group 4 versus group 2). **[p<0.05]** (group 4 versus group 1). Group 1: 7.5 Group 2: 9 Group 3: 5.5 Group 4: 5	Patients in group four received an identical feed as to those in groups 1-3, but the rate of infusion was halved. Median age is similar in the four groups although group four has a wider age range (19-77). No patient in group four was treated

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				All patients who required total PN over an 18-month period were eligibly for the study. Patients were excluded if they already had an indwelling central venous line or if after initial assessment, they were found not to have suitable forearms veins. No patient was able to take an adequate supply of nutrients by the enteral route.	changed if they become occluded or if the patient developed signs of phlebitis. Patients in group four received an identical feed as to those in groups 1-3, but the rate of infusion was halved. Cubital fossa veins were not used. Cannulas were used exclusively for nutritional support; patients who required IV antibiotics, other drugs or supplemental fluids had additional venous access. An identical commercially prepared peripheral feeding regimen was used for all patients (P3; Pharmacia, Milton Keynes, UK) to provide 30 kcal per kg day of non-protein and 0.15 gN per kg per day. Trace elements, electrolytes and vitamins were added in the pharmacy according to individual patient requirements.	patient allowed to move freely. PPN was restarted 12 h later through a forearm vein in the contralateral arm. Venous access sites on the same forearm vein were often used repeatedly on separate days but this was not a prerequisite of the protocol. Group 2: Patients had a standard 18-G cannula inserted in both forearms on entry into the study. PPN infused over 12-h period, following which the cannula was heparin-locked and left in situ. PPN was continued through the cannula in the contralateral arm on alternate days, thus allowing a rest period of 36 h before each line was reused. Cannulas were removed only if they become occluded or if there was evidence of phlebitis. Group 3: Patients had a standard 18-G cannula sited in one forearm as used in		No. of venepunctures Conversion to CPN Conversion to another form of PPN Total duration of TPN (days) Number of cannulas Mean duration of cannula survival (days) Surface area of cannula (mm2) Venous complications:	**[p<0.05]** (group 4 versus groups 1 and 2). Group 1: 116 Group 2: 64 Group 3: 50 Group 4: 24 Group 1: 3 Group 2: 0 Group 3: 4 Group 4: 1 Group 1: 0 Group 2: 0 Group 3: 0 Group 4: 3 Group 1: 184 Group 2: 135 Group 3: 157 Group 4: 92 **[p<0.05]** (group 4 versus groups 1 and 2) Group 1: 115 Group 2: 64 Group 3: 50 Group 4: 24 Group 1: Data not reported Group 2: 4.2 Group 3: Short: 3.6 Long: 3.2 Group 4: 2.7 Group 1: 176 Group 2: 176 Group 3: Short: 176 Long: 660 Group 4: 3.80	for enterocutaneous fistula. All patients were included in the analysis however, 14 patients (23%) required conversion to other methods of nutritional delivery. Mild phlebitis was scored arbitrarily as 1 and was recorded when patients complained of pain over the cannulated vein. Severe phlebitis was scored as 3 and was recorded if there was induration, tenderness or erythema over the cannulated vein. All lines were changed on the first appearance of phlebitis or occlusion. Pharmaceutical methods of reducing phlebitis, such as heparin, hydrocortisone and the use of glycerin trinitrate, were not used.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
						groups 1 and 2 and, in addition, an 18-G 15 cm polyethylene rubber catheter was sited simultaneously in a contralateral forearm vein. A Seldinger technique was used to insert the longer cannula. PPN 12 h infusion alterning forearms cannulas every other day. The cannulas were changed as necessary on occlusion or on development of phlebitis, always by placing the same type of cannula. Cubital fossa veins were not used. Cannulas were used exclusively for nutritional support; patients who required IV antibiotics, other drugs or supplemental fluids had additional venous access. An identical commercially prepared peripheral feeding regimen was used for all patients (P3; Pharmacia, Milton Keynes, UK) to provide 30 kcal per kg day of non-protein and 0.15 gN		- Mild phlebitis episodes - Severe phlebitis episodes - Phlebitis scores - Venous occlusion	Group 1: 0 Group 2: 3 Group 3: Short: 2 Long: 0 Group 4: 4 Group 1: 0 Group 2: 2 Group 3: Short: 1 Long: 5 Group 4: 4 Group 1: 0 Group 2: 9 Group 3: Short: 5 Long: 15 Group 4: 12 **[p<0.05]** (group 2 v group 1) **[p<0.05]** (long group v group 2) **[p<0.01]** (group 4 v group 1) **[p<0.02]** (group 4 v group 2) Group 1: 3 Group 2: 2 Group 3: Short: 2 Long: 3 Group 4: 8	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
						per kg per day. Trace elements, electrolytes and vitamins were added in the pharmacy according to individual patient requirements.				
Palmer et al 1996[264]	RCT		46 patients (results from 4 patients are double reported, see comments). Group A: 26 Group B: 24	All patients presenting to the Combined Gastroenterology Service at Scarborough Hospital over a 12-month period who required PN were eligible for the study. Group A: 26 Group B: 24 Male: Female: Group A: 12: 14 Group B: 15:9 Median age (range): Group A: 68 (40-85) Group B: 66 (23-84) Patients were excluded if they already had an indwelling central venous line, or if central venous cannulation was required for monitoring purposes. No patient in this study was able to take an adequate supply of nutrients by the enteral route.	Group B: PPN through an ultrafine 23 G, 15-cm long flexane catheter (Nutriline, Vygon, Aschen, Germany) which was inserted either the cephalic or basilic vein in the antecubital fossa. Continuous 24-h infusion. Cannulas were only removed if they became occluded or if the patients developed signs of phlebitis Upon removal of the ultrafine catheter, the tip was sent to the laboratory for culture and sensitivity analysis. To prevent thrombus formation 50µ (5ml) of heparin was administered as a line flush every 24 h prior to commencement of each PPN bag. All lines were changed on the first appearance of phlebitis or	Group A: PPN through a suitable forearm vein using a standard 18G Teflon cannula (Venflon, Ohmeda, Swindon, UK). 12-h infusion period. Following infusion the cannula was removed. PPN was recommenced 12 h later using a forearm vein in the contralateral limb. No restriction was placed on the siting of these cannulas and most were placed in dorsal veins of the forearm. Rarely the same vein would be used on repeated occasions. All lines were changed on the first appearance of phlebitis or occlusion. Pharmaceutical methods of reducing phlebitis such as hydrocortisone and topical glyceryl	Until end of PN	Number of failures Incidence of phlebitis Incidence of septicemia Total duration of PPN given by the designated route Mean duration of each course of PPN Mean pain rating of cannula insertion (scale from 0 to 5) % patients that reported signs of anxiety % patients that reported signs of depression % patients thought the selected	Group A: 2 Group B: 9 **[p<0.05]** Group A: 0 Group B: 4 [p value not reported] Group A: 0 Group B: 2 [p value not reported] Group A: 206 days Group B: 207 days [Not significant] Group A: 7.9 days Group B: 8.6 days Group A: 0.7 Group B: 1.3 Group A: 23% Group B: 17% [Not significant] Group A: 19% Group B: 12% [Not significant] Group A: 78% Group B: 96%	46 patients entered the study. Four patients required PPN on two separate occasions. The study double-reports results from these 4 patients. There were a total of 11 failures (24%): 2 in group A and 9 in group B. Of these 9 failures 5 completed their PPN course using a cyclical technique with rotation of venous access sites and 3 using a central line. It is not clear whether there was an intention-to-treat analysis. Phlebitis was graded as 'mild' or 'severe'. Prior to commencing PN all patients were asked to complete Hospital Anxiety and Depression Questionnaire which is a self-completion questionnaire constructed to be

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					occlusion. Pharmaceutical methods of reducing phlebitis such as hydrocortisone and topical glyceryl trinitrate or non-steroidal creams were not used in this study. All patients were offered local anaesthetic prior to cannula insertion.	trinitrate or non-steroidal creams were not used in this study. All patients were offered local anaesthetic prior to cannula insertion.		technique of PPN administration restricted their daily motility in hospital	[No p value reported]	relatively unaffected by physical illness. On completion of PPN all patients completed an independently validated questionnaire, to assess their perspective of the administration of the intravenous feeding, with particular regard to pain and restrictions of mobility. Following each cannulation, patients used a linear analogue scale to rate the pain of cannula insertion. A score of 0 reflected no pain while a score of 5 reflected severe pain.

Table 76: Elective pre-operative / perioperative parenteral nutrition support in surgical patients

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Muller et al 1982[240]	RCT	1+	Total no: n=125 PPN gp: n=66 Cont gp: n=59	Patients with carcinoma of the oesophagus, stomach, colon, rectum, or pancreas admitted to the surgical department. Patients considered malnourished if the weight loss in the 3mo	PPN gp: received 10days of PPN (1.5g amino acids/kg body weight, 11g glucose/kg body weight, electrolytes, trace elements & vitamins) by a CVC.	Cont gp: Regular hospital diet of 2400kcal/day. Those patients with partial obstruction were given a liquid diet.	Not stated	Wound infection: Pneumonia: Of those patients with pneumonia, no. of patients who needed artificial	PPN: n=14/66 Cont: n=15/59 PPN: n=20/66 Cont: n=23/59 PPN: n=4/66 Cont: n=12/59 **[p<0.05]**	The postop infusion regimen was identical for both gps but if a complication occurred the scheduled was altered as necessary. Complications related to the central catheter occurred 4 times.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				before admission was more than 5kg, the serum albumin was below 3.5g/dl & the responses to five skin tests were negative. Mean age ± SD (yr): PPN: 58.9 ± 11.5 Cont: 59.4 ± 12.6 Sex ratio (M:F): PPN: 43:23 Cont: 34:25 Type of operation: Curative procedures: PPN: n=45 (68.2%) Cont: n=45 (76.3%) Oesophagectomy: PPN: n=3 Cont: n=3 Gastrectomy: PPN: n=23 Cont: n=21 Colectomy: PPN: n=9 Cont: n=9 Abdominoperineal/low anterior resection: PPN: n=10 Cont: n=12 Palliative procedures: PPN: n=21 (31.8%) Cont: n=14 (23.7%) Mean duration of the operation ± SD (min):				respiration: Major complications (intra-abdominal abscess, peritonitis, anastomotic leakage, ileus): Mortality: For individual complications affecting the site of operation – intra-abdominal abscess, peritonitis, anastomotic leakage or ileus: Mean weight gain (kg) between admission & surgery: Mean weight loss (kg) between admission & surgery: Total serum protein (on day of admission & on day before operation):	 PPN: n=11/66 Cont: n=19/59 **[p<0.05]** PPN: n=3/66 Cont: n=11/59 **[p<0.05]** NS between the 2 gps. PPN: 1.98 Cont: 1.04 PPN: Stayed constant Cont: Dropped	There was 1 puncture of the subclavian artery, 1 pneumothorax & 2 episodes of catheter sepsis. None of the complications delayed the planned operation. 13/14 patients who died postop underwent necropsy. 11/13 deaths were caused by a major complication affecting the site of broncho-pneumonia. The 14th patient had an anastomotic leakage on the 5th day after abdominothoracic gastrectomy & died 4 days later of sepsis with pulmonary & renal insufficiency. The postop infusion scheme had to be altered for 8/59 control patients because sepsis was followed by renal failure (6 times) or liver failure (twice).

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				PPN: 229 ± 80 Cont: 235 ± 95						
Fan et al 1994[100]	RCT	1+	124 patients Periop: n=64 Cont: n=60	Patients undergoing resection of hepatocellular carcinoma. Weight loss >10% (% of patients): Periop: 18 Cont: 14 Sex (M:F): Periop: 56:8 Cont: 53:7 Age (yr) (range): Periop: 54 (28-72) Cont: 53 (33-79)	Periop gp: All patients had Broviac catheters implanted in the superior vena cava by surgical cutdown of the external jugular vein for PN. Patients given PN 12hrs a night for 7 nights before hepatectomy & was continued around the clock for 7days immediately after hepatectomy. The nutritional therapy consisted of a solution enriched with 35% branched-chain amino acids, at a dosage of approx. 1.5g of amino acid per kg of body weight per day & dextrose & lipid emulsion (50% medium-chain triglycerides) providing 30kcal per kg per day. Vitamins & trace minerals were added to the PN fluid daily. The total volume of PN fluid was limited to 1.75 litres per day.	Usual oral diet preoperatively. In postop period, patients received 5% dextrose & normal saline with a volume & sodium content approx. equal to those of the fluid given to the patients in the periop-nutrition gp.	Not stated	Total Septic complications: Breakdown of septic complications- Pulmonary infection: Wound infection: Subphrenic abscess: UTI: Infected ascites: Biliary fistula: Central-catheter sepsis: Other complications- Wound dehiscence: Myocardial infarction: Intraabdominal bleeding: Variceal bleeding:	Periop: 11/64 (17%) Cont: 22/60 (37%) **[p=0.01]** Periop: 5/64 Cont: 15/60 Periop: 3/64 Cont: 5/60 Periop: 4/64 Cont: 5/60 Periop: 0/64 Cont: 2/60 Periop: 1/64 Cont: 2/60 Periop: 4/64 Cont: 5/60 Periop: 1/64 Cont: 0/60 Periop: 1/64 Cont: 1/60 Periop: 0/64 Cont: 3/60 Periop: 4/64 Cont: 1/60 Periop: 1/64 Cont: 0/60	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Peptic ulcer bleeding: Intestinal obstruction: Pleural effusion: Hepatic coma: Renal failure: Ascites requiring diuretic agent for control: Overall postop morbidity: Hospital mortality: Weight loss (kg) (median/ range): Subgp analysis (patient gps) – Cirrhosis – no. of patients: Overall postop morbidity (%): Need for diuretic agents (%):	Periop: 1/64 Cont: 2/60 Periop: 1/64 Cont: 0/60 Periop: 9/64 Cont: 12/60 Periop: 4/64 Cont: 4/60 Periop: 2/64 Cont: 1/60 Periop: 16/64 (25%) Cont: 30/60 (50%) **[p=0.004]** Periop: 22/64 (34%) Cont: 33/60 (55%) **[p=0.02]** Periop: 5/64 (8%) Cont: 9/60 (15%) [p=0.30] Periop: 0 (-6.5 to 10) Cont: 1.4 (-1.7 to 7.0) **[p=0.01]** Periop: n=39 Cont: n=33 Periop: 31% Cont: 61% **[p=0.01]** Periop: 28% Cont: 71% **[p=0.006]**	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Body weight loss (kg) median (range): Mortality (%): Chronic active hepatitis – no. of patients: Overall postop morbidity (%): Need for diuretc agents (%): Body weight loss (kg) median (range): Mortality (%): Normal liver - no. of patients: Overall postop morbidity (%): Need for diuretc agents (%): Body weight loss (kg) median (range):	Periop: 0 (-6.5 to 12.5) Cont: 1.45 (-1.7 to 6.6) **[p=0.006]** Periop: 8% Cont: 15% Periop: n=18 Cont: n=12 Periop: 50% Cont: 25% [NS] Periop: 18% Cont: 42% [NS] Periop: 0.3 (-3.1 to 3) Cont: 2.25 (0 to 7) [NS] Periop: 5% Cont: 25% Periop: n=7 Cont: n=15 Periop: 14% Cont: 60% **[p=0.045]** Periop: 29% Cont: 36% [NS] Periop: -0.3 (-3.5 to 0.8) Cont: 1.0 (-4 to 4)	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									[NS]	
								Mortality (%):	Periop: 14% Cont: 6.7%	
								Major hepatectomy -		
								no. of patients:	Periop: n=47 Cont: n=42	
								Overall postop morbidity (%):	Periop: 36% Cont: 60% **[p=0.03]**	
								Need for diuretc agents (%):	Periop: 20% Cont: 59% **[p=0.002]**	
								Body weight loss (kg) median (range):	Periop: 0.3 (-6.5 to 12.5) Cont: 1.65 (-4 to 7) **[p=0.002]**	
								Mortality (%):	Periop: 11% Cont: 17%	
								Minor hepatectomy -		
								no. of patients:	Periop: n=17 Cont: n=18	
								Overall postop morbidity (%):	Periop: 29% Cont: 44% [NS]	
								Need for diuretc agents (%):	Periop: 41% Cont: 33% [NS]	
								Body weight loss (kg) median (range):	Periop: -0.15 (-3.2 to 30) Cont: 1.0 (-1.7 to 4) [NS]	
								Mortality (%):	Periop: 0%	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Cont: 11%	
								Cirrhosis & major hepatectomy –		
								no. of patients:	Periop: n=27 Cont: n=21	
								Overall postop morbidity (%):	Periop: 33% Cont: 67% **[p=0.02]**	
								Need for diuretc agents (%):	Periop: 22% Cont: 79% **[p<0.001]**	
								Body weight loss (kg) median (range):	Periop: 0.5 (-6.5 to 12.5) Cont: 1.7 (-2 to 6.6) **[p=0.016]**	
								Mortality (%):	Periop: 11% Cont: 14%	
								Cirrhosis & minor hepatectomy –		
								no. of patients:	Periop: n=12 Cont: n=12	
								Overall postop morbidity (%):	Periop: 25% Cont: 50% [NS]	
								Need for diuretc agents (%):	Periop: 42% Cont: 42% [NS]	
								Body weight loss (kg) median (range):	Periop: -0.5 (-3.2 to 2.7) Cont: 1.0 (-1.7 to 4) [NS]	
								Mortality (%):	Periop: 0%	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Cont: 16%	
Fan et al 1989[99]	RCT	1+	40 patients Preop PN (PPN) gp: n=20 Cont gp: n=20	Patients with oesophageal cancer Sex (M:f): PPN: 19:1 Cont: 16:4 Mean age ± SD: PPN: 64.95 ± 8.99 Cont: 64.55 ± 9.56 Dysphagia duration (wks) – median (range) PPN: 6.0 (3-12) Cont: 5.5 (3-12) Weight loss (kg) mean ± SD: PPN: 7.68 ± 5.44 Cont: 5.66 ± 4.18 No. of patients who were malnourished: PPN: n=16 Cont: n=15	Patients received synthetic amino acid (Vamin 250mg N/kg/day), glucose & lipid emulsion (40kcal/kg/day), electrolytes, trace elements & vitamins via CVC's for 14 days before surgery. Postop, no patient was allowed feeding & all received PN until a gastrografin swallow on day 7 showed no leakage from anastomoses.	Oral feeding alone.	2 weeks	Patients who developed one or more postop complication: Postop complications – Respiratory – Infection: Failure: Mortality: Anastomotic leakage – Clinical: Subclinical: Septic complications – Wound infection: Intraperitoneal abscess: Intrapleural sepsis: Septicaemia:	PPN: 17/20 (85%) Cont: 15/20 (75%) PPN: 10/20 Cont: 11/20 PPN: 7/20 Cont: 6/20 PPN: 3/20 Cont: 3/20 PPN: 3/20 Cont: 6/20 PPN: 1/20 Cont: - PPN: 3/20 Cont: 1/20 PPN: 0/20 Cont: 1/20 PPN: 1/20 Cont: 2/20 PPN: 1/20 Cont: 2/20	The incidence of respiratory, anastomotic & septic complications were similar in the 2 gps, with no difference in the gp of patients considered as malnourished (>10% body weight loss).

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Duration of hospital (median /days): Mortality:	PPN: 15 days Cont: 16 days Similar rates for both gps.	
Smith and Hartemink 1988b[327]	RCT	1+	34 Patients Preop: n=17 Cont: n=17	Patients undergoing major GI surgery who had a Prognostic Nutritional Index (PNI) score of greater than 30%. Age (yrs): Preop: 67 ± 4 Cont: 68 ± 3 Sex (M:F): Preop: 12:5 Cont:15:2	IVN was carried out for at least 10 days through a CVC, infusing 50-60 kcal/kg/day of glucose/amino acid IVN mixture containing 150 kcal/1g of nitrogen. Normal replacement of electrolytes, trace elements, vitamins & essential fatty acids was also given. After 10days the PNI was repeated & the patients were scheduled for their operation.	Patients did not receive any preop nutritional support but were scheduled for the next convenient operating list & received nutritional support postop if the surgeon caring for the patient felt it was indicated.	Not stated	Weight gain (kg): Minor Complications: Febrile episodes: Respiratory: Wound infections: Episodes of ileus: Major complications: Mortality: Overall hospital stay excluding patients who died (day):	Preop: 3.2 ± 2.3 **[p<0.01]** Preop: 2/17 Cont: 0/17 Preop: 5/17 Cont: 2/17 Preop: 2/17 Cont: 2/17 Preop: 2/17 Cont: 0/17 Preop: 3/17 Cont: 6/17 Preop: 1/17 Cont: 3/17 Preop: 44 ± 13 days Cont: 38 ± 10 days	All the deaths were associated with respiratory failure: 3 due to respiratory infection & 1 due to pulmonary emboli. The patient in the preop gp who died of respiratory failure had a PNI of 56% prior to treatment & this had only improved to 52% after treatment. Of the other 3 control patients who had major complications, 2 had major respiratory infection requiring ventilation therapy & 1 had septicaemia.
Bozzetti et al 2000a[42]	RCT	1+	90 Patients Periop: n=43 Cont: n=47	Elective surgical patients with gastric or colorectal tumours & weight loss of 10% or more of usual body weight in the previous 6mo. Sex (M:F): TPN: 21:22	Patients received either TPN for 10days periop & 9days postop. The artificial nutritional regimen was planned at 1.5-fold the resting energy expenditure, as estimated by the	Patients were given a standard hospital oral diet before surgery & a hypocaloric parental solution (940kcal nonprotein & 85g amino acid) in the postop period, until GI function had	Not stated	Infectious complications- Abdominal wound abscess: Abdominal abscess:	 Minor- TPN: 3/43 Cont: 1/47 Major - None Minor- TPN: 4/43	The most frequent complication was pulmonary tract infection. Both minor & major complications, either infectious or non-infectious were less frequent in the TPN

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				Cont: 24:23 Weight loss (%) Median (min.max): TPN: 15 (10,37) Cont: 17 (10,32) Excl: Patients older 80yrs of age, as were those requiring urgent surgery because of severe bleeding or obstruction or those with severe organ failure (jaundice, cardiac or respiratory failure, etc).	Harris Benedict equation. The nonprotein calorie source included glucose & fat (Intralipid 20%) which accounted for 70% & 30% of the energy intake, respectively. The calorie/nitrogen ratio was 143.0 (±26.9):1. The protein source was supplied by a free amino acid solution (Freamine III). Electrolytes, vitamins & trace elements were administered according to current recommendations. The daily nutritional regimen included an average of 34.6 ± 6.3 kcal nonprotein per kg body weight & 0.25 ± 0.04g of nitrogen per kg body weight. The TPN mixture was delivered through a CVC in a subclavian vein, using a ethyl vinyl acetate “all-in-one” bag, while vitamins only were infused through a separate line. During preop TPN, patients consumed very few calories by the oral route. TPN was administered postop	recovered quickly. The majority of the patients received IV feeding through a CVC 7 the nutritive solution was compounded in a single bag.		 Pulmonary tract infection: UTI: Noninfectious- Abdominal wound dehiscence: Anastomotic leakage: Respiratory insufficiency: Circulatory insufficiency:	Cont: 6/47 Major- TPN: - Cont: 2/47 Minor- TPN: 7/43 Cont: 14/47 Major- TPN: 3/43 Cont: 4/47 Minor- TPN: 2/43 Cont: 1/47 Major - None Minor- TPN: 1/43 Cont: - Major - None Minor- TPN: - Cont: 2/47 Major- TPN: 1/43 Cont: 2/47 Minor- TPN: 1/43 Cont: 4/47 Major- TPN: 2/43 Cont: 3/47 Minor- TPN: - Cont: 1/47 Major- TPN: - Cont: 1/47	group.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					in addition to the oral feeding that was provided gradually as bowel function normalised.			Renal insufficiency: Liver failure: Clotting problems: Overall complication rate: p values when considering complications – of any type: Noninfectious: Infectious: Major ones only: Mortality: Total periop & postop median length of hospitalisation	Minor- TPN: - Cont: 2/47 Major- TPN: - Cont: 1/47 Minor- TPN: - Cont: 1/47 Major- TPN: - Cont: 1/47 TPN: 16/43 (37%) Cont: 27/47 (57%) **[p=0.03]** **[p=0.03]** TPN: 12% Cont: 34% **[p=0.02]** [p=0.22] [p-0.11] TPN: 0/43 Cont: 5/47 **[p=0.05]** TPN: 33 (18-161) & 14 (7-143) Cont: 27 (15-103) & 14 (6-59) **[p=0.00]** Length of postop hospitalisation in the 2 gps did not differ.	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								(days):		
Thompson et al 1981[348]	RCT	1+	21 Patients Periop: n=9 Cont: n=12	Male surgical patients with GI cancer. Patients had significant weight loss, an average of 14% of their normal weight. Periop gp- Mean age: 63.7 ± 10.7 > than 10 lb weight loss. Cont gp- Mean age: 65.8 ± 12.0 > than 10 lb weight loss over 3 to 6mo prior to admission. Patients were admitted for: Colon resection: TPN: n=6 Cont: n=5 A-P resection: TPN: n=0 Cont: n=3 Esophageal gastrectomy: TPN: n=3 Cont: n=0 Biliary bypass: TPN: n=0 Cont: n=1 Laparotomy, no resection: TPN: n=3 Cont: n=0	Patients received IV PN consisting of crystalline amino acids in 25% Dextrose (Travasol, 4.2% with electrolytes) beginning at least 5 days preop & continuing until the patient was tolerating a regular diet (1500cal) postop. Infusion rates were calculated to provide 40-50 kcal/kg/day, or approx 2000-4000cal per day. Patients were allowed to continue a standard preop oral diet, usually clear liquids for 2days prior to operation.	Patients received conventional intravenous therapy & diet as indicated for their operation.	Not stated	Total course of PN (average/days): Mean preop course (days) (range): Major Complications (intraabdominal abscess, pelvic abscess & empyema): Minor Complications (UTI, prolonged ileus, superficial wound infection & prolonged atelectasis): Mortality: Postop weight changes (lb):	TPN: 18days TPN: 8days (5-14) TPN: 1/12 (17%) Cont: 1/9 (11%) [NS] TPN: 3/12 (25%) Cont: 2/9 (22%) [NS] None TPN: +0.1 ± 4.8 Cont: -8.4 ± 6.1 **[p<0.01]**	Majority of patients has colon resections. Very small number of subjects in this trial within each arm.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
von Meyenfeldt et al 1992[366]	RCT	1+	101 Patients TPN: n=51 Depleted cont: n=50	Patients with newly, detected, histologically proven gastric or colorectal carcinoma requiring surgical treatment who had not undergone treatment for other malignant tumours. Excl: Patients over 80yrs & patients with a normal nutritional status. Mean age (yrs) (± SEM): TPN: 67.3 ± 10.2 Depleted cont: 65.8 ± 7.5 Age range (yrs): TPN: 41-80 Depleted cont: 49-79 Gastric/Colorectal cancer: TPN: 15/36 Depleted cont: 14/36 Sex (M:F): TPN: 29:22 Depleted cont: 32:18	TPN: Received 150% of basal energy expenditure (BEE), as non-protein calories from a PN stock solution that contained 7g N/l (Synthamin 14) % 25% dextrose. Trace elements & vitamins (MVI) were added to conform to today's standards. Electrolytes were added according to the individual patient's needs. 500ml of an IV fat emulsion (Intralipid 20%) were administered at least 3 times per week. Preop nutrition lasted at least 10days. PN support was continued postop until the patients had resumed an oral diet providing 120% BEE.	Received no nutritional support & underwent surgery without surgery. Postop, patients were allowed increasing amounts of liquids & solids as tolerated. Only in the event of a major postop complication was PN started in this control gp.	Not stated	Wound infection: UTI: Respiratory tract infection: Wound dehiscence: Anastomotic leakage: Fistula: Intra-abdominal abscess: Sepsis: Respiratory insufficiency: Circulatory insufficiency: Renal insufficiency: Mortality:	TPN: 8/51 Cont: 8/50 [NS] TPN: 16/51 Cont: 10/50 [NS] TPN: 14/51 Cont: 7/50 [NS] TPN: 2/51 Cont: 2/50 [NS] TPN: 5/51 Cont: 7/50 [NS] TPN: 2/51 Cont: 1/50 [NS] TPN: 4/51 Cont: 8/50 TPN: 1/51 Cont: 4/50 TPN: 0/51 Cont: 2/50 [NS] TPN: 1/51 Cont: 0/50 [NS] TPN: 0/51 Cont: 0/50 [NS] TPN: 2/51	No significant difference between gps for the complication rates.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Cont: 2/50 [NS]	
								Sepsis related mortality:	TPN: 1/51 Cont: 2/50 [NS]	
								No complications:	TPN: 24/51 (47.1%) Cont: 32/50 (64%) [NS]	
								Minor complications:	TPN: 19/51 (37.2%) Cont: 9/50 (18%) [NS]	
								Major complications:	TPN: 6/51 (11.8%) Cont: 7/50 (14%) [NS]	
								Length of Hospitalisation (days):	TPN: 36.3 (± 17.7) Cont: 31.7 (± 22.1)	Hospital stay for TPN gp was no longer than that of the control gp, despite a longer preop hospital stay in the TPN gp.
								The stratification of weight loss (% weight loss >10% of body weight) allowed for performance of a subset analysis in the patient gp displaying more severe depletion.		Analysis of the patients with complications as a gp did not reveal a beneficial effect of periop nutrition on total hospital stay.
								No. of patients in each gp:	TPN: n=18 Cont: n=11	The subgp analysis showed a significant decrease in the no. of patients developing an intra-abdominal abscess in the TPN gp. The differences became more pronounced in the subset of patients suffering major preop
								Anastomotic leakage:	TPN: 1/18 Cont: 3/11	
								Intra-abdominal abscess:	TPN: 0/18 Cont: 4/11 **[p<0.05]**	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Sepsis: Subset analysis of complication rates of septic complications in patients with blood loss over 500ml during surgical procedure. No. of patients in each gp: Anastomotic leakage: Intra-abdominal abscess: Sepsis:	TPN: 0/18 Cont: 2/11 TPN: n=25 Cont: n=20 TPN: 3/25 Cont: 6/20 TPN: 2/25 Cont: 7/20 **[p<0.05]** TPN: 1/25 Cont: 4/20 **[p<0.05]**	blood loss. The patient characteristics were not different between gps in either of these subset analyses. Funding: Wander Research & Clintec (formerly Travenol)
The Veterans Affairs Total Parenteral Nutrition Cooperative Study Group 1991[346]	RCT	1+	395 Patients TPN: n=192 Cont: n=203	All patients were (95%male) >21yrs old, undergoing non-emergency laparotomy or thoracotomy. Excl: Patients who were expected to die of their primary disease within 90days, had received TPN in the preceding 15days or had undergone an operation in the preceding 30days. Patients were considered malnourished if they met either or both of 2	TPN: Received periop TPN through a CVC in doses increasing for 72hrs to daily caloric goal of 1000kcal above the resting metabolic expenditure. 550kcal were provided as lipid (Intralipid) & the remainder as dextrose. Crystalline amino acids (Freamine) were provided at a calorie:nitrogen ratio of 150kcal:1g of nitrogen. Vitamins (MV1-12 (10ML)), &	Control: Received oral diet. Patients underwent surgery at least 3days.	30days & 90days after surgery.	Complications observed within 30days of surgery (No. of patients episodes/no. of patients). Major, infectious - Pneumonia or empyema: Abdominal abscess: Extra-abdominal abscess: Fasciitis:	 TPN: 17/16 Cont: 9/9 TPN: 2/2 Cont: 2/2 TPN: 1/1 Cont: 0 TPN: 3/3	Of the 192 patients receiving TPN who underwent surgery, 130 completed an optimal course of TPN, 49 received suboptimal TPN, & 13 received no TPN after an initial attempt to place a central line failed & the patient refused further attempts. Of the 203 control patients who underwent surgery, 3 who could not eat were given preop TPN when clinical

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				criteria: 1) A score of 100 or less on the Nutrition Risk Index (NRI) or 2) Any 2 of the following: - a current weight that was 95% of the ideal weight or less; - a serum albumin level of 39.2g per litre or less; - or a serum prealbumin level of 186mg per litre or less.	trace elements (trace-element mix (1.0ml)) were provided daily & electrolytes was provided as clinically indicated. The daily TPN intake was considered adequate if the intake of macronutrients was ≥85% of the calculated goal. Optimal TPN was defined as 7 to 15days of preop treatment at adequate levels. Patients were permitted to eat as clinically indicated. Postop TPN was continued for 72hrs (or forced enterally feedings) before surgery or for the first 72hrs after surgery. Thereafter, TPN or tube feeding could be instituted if clinically indicated. Patients underwent surgery after receiving adequate TPN for at least 7days.			Bacteremia or fungemia: Other septic complications: Total: Patients affected (%): Major, non-infectious - Anastomotic leak: Bronchopleurocutaneous fistula: Wound dehiscence: Decubitus ulcer: Chronic respiratory failure (≥4days) GI complications (includes bleeding, obstruction, perforation & ischemia):	Cont: 0 TPN: 8/7 Cont: 5/5 TPN: 0 Cont: 1/1 TPN: 31/27 Cont: 17/13 TPN: 14.1 Cont: 6.4 Relative Risk (RR) (TPN:Control) = 2.20 95% CI = 1.19-4.05 RR with control for SGA (Subjective Global Assessment) = 2.23 TPN: 7/6 Cont: 12/11 TPN: 4/3 Cont: 6/6 TPN: 1/1 Cont: 1/1 TPN: 1/1 Cont: 1/1 TPN: 14/13 Cont: 12/11 TPN: 11/10 Cont: 17/14	conditions required that surgery be delayed by five or more days. The remaining control patients received no preop TPN or forced enteral feedings. Postop, 11 patients in the TPN gp received TPN for more than the 3days required by the protocol & TPN was instituted after postop day 3 in 24 control patients. There were more infectious complications in the TPN gp than in the control gp, but slightly more non-infectious complications in the control gp. The increased rate of infections was confined to patients categorised as either borderline or mildly malnourished, according to SGA or an objective nutritional assessment & these patients had no demonstrable benefit from TPN. Severely

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Cardiovascular complications (includes myocardial infraction, cardiogenic shock, cardiac arrest &stroke): Pulmonary embolus: Renal failure: Total: Patients affected (%): Minor, infectious - Wound infection: UTI: Minor, non-infectious - Uncomplicated arrhythmia: Atelectasis: Transient respiratory failure (respiratory	TPN: 15/15 Cont: 18/15 TPN: 0 Cont: 1/1 TPN: 0 Cont: 3/3 TPN: 53/32 Cont: 71/45 TPN: 16.7 Cont: 22.2 RR (TPN:Control) = 0.75 95% CI = 0.50-1.13 RR with control for SGA = 0.71 TPN: 14/12 Cont: 5/4 TPN: 17/13 Cont: 19/14 TPN: 14/11 Cont: 22/20 TPN: 6/6 Cont: 13/8 TPN: 6/6 Cont: 6/6	malnourished patients who receive d TPN had fewer non-infectious complications than controls with no concomitant increase in infectious complications.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								failure requiring the use of a ventilator for ≤3days postop) : Catheter-related - Pneumothorax: Mediastinal hematoma: Hydrothorax: Air or catheter embolus: Thrombosis: Rates of major complications during the first 30 postop days: Overall rates of complications (major or minor) after 30days: Rate of major complications after 90days: 30day postop mortality rate: 90day postop mortality rate:	 TPN: 4/4 Cont: 0 TPN: 1/1 Cont: 0 TPN: 2/2 Cont: 0 TPN: 3/3 Cont: 1/1 TPN: 1/1 Cont: 1/1 TPN: 49/192 (25.5%) Cont: 50/203 (24.6%) [NS] TPN: 37% Cont: 36.5% TPN: 28% Cont: 28% TPN: 14/192 (7.3%) Cont: 10/203 (4.9%) [NS] TPN: 21/192 (10.9%) Cont: 19/203 (9.4%) [NS]	
Bellantone et al	RCT	1+	66 Patients	Malnourished patients	PN support was	Received only	Not stated	Mortality rates:	Preop 1: 0/20	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
1988[29]			Preop 1: n=20 Cont 1: n=17 Preop 2: n=15 Cont 2: n=14	undergoing major GI surgery. Preop 1 & cont 1: 37 patients with serum albumin <3.5g/100ml or serum transferring <230 mg/100ml, or weight loss >10% of usual weight. Preop 2 & cont 2: 29 patients with serum albumin <3.0g/100ml or serum transferring <200 mg/100ml, or weight loss >10% of usual weight. Age (yrs) (mean): Preop 1: 56 Cont 1: 59 Preop 2: 56 Cont 2: 60 Sex (M:F): Preop 1: 12:8 Cont 1: 10:7 Preop 2: 10:5 Cont 2: 9:5	given as supplement to the peroral diet for at least 7days before surgery, providing 30cal/kg/day as glucide (20% dextrose solution) & 30% as lipidic calories (Intralipid 10%) & 200mg/kg/day of nitrogen (Solamin 7.5%).	standard hospital peroral diet.		Incidence of septic complications: Incidence of serious sepsis (sepsis score ≥10):	Cont 1: 0/17 Preop 2: 0/15 Cont 2: 0/14 [NS] Preop 1: 2/20 (10%) Cont 1: 7/17 (41.4%) **[p<0.05]** Preop 2: 2/15 (13.3%) Cont 2: 7/14 (50%) **[p<0.05]** Preop 1: 0/20 Cont 1: 3/17 (17.6%) **[P=0.08]** Preop 2: 0/15 Cont 2: 3/14 (21.4%) **[p=0.09]**	

Table 77: Parenteral nutrition vs no parenteral nutrition -- Economic evaluations: characteristics of Studies

Bibliographic reference	Comparison	Patient group	Incremental analysis	Measure of effectiveness	Cost components included	Method
Calvo 2002, Spain[53]	1) TPN 2) Intensive monitoring of daily oral food to identify patients that require TPN	Patients undergoing allogeneic haematopoietic cell transplantation	Cost consequences analysis	No overall measure of effectiveness	Monitoring time, and TPN averted	Single cohort receiving the monitoring intervention (NB 12 patients, 55% required TPN and these costs were not included)
Cardona et al 1986, Spain[57]	1) Early TPN (minimum 5 days) 2) IV fluid	Patients with gastric cancer undergoing gastrectomy (n1=10, n2=6)	Cost analysis	None	Hospital stay cost (per day) and cost of IV therapy	RCT
Eisenberg et al 1993, USA[89]	1) TPN pre and post surgery (av 16.15 days) 2) No pre-op PN (post-op PN at clinicians discretion)	Malnourished patients (99% male) who required laparotomy or non-cardiac thoracotomy (n=395)	Cost analysis	No overall measure of effectiveness	Solution costs, insertion, monitoring, NST costs, hospitalization costs, post-discharge care	RCT
Goel and Detsky 1989[129], also Detsky and Jeejeebhoy 1984[84], Detsky et al 1987[83] (using same model), Canada	1) Preop TPN for all 2) Preop TPN for high and moderate risk 3) Preop TPN for high risk (SGA) 4) No TPN	Patients undergoing major gastro-intestinal surgery A. Not cancer B. Upper GI cancer	Cost-utility analysis	Quality-adjusted life-year	Nutrition, TPN complications, surgical complications (minor & major)	Decision analysis based on literature review
Kamei et al 2005, Japan[178]	1) TPN 2) Oral diet	Patients immediately after total gastrectomy (n1=21, n2=27)	Cost consequences analysis	No overall measure of effectiveness	Treatment costs during hospital stay	RCT
Szeluga et al 1987, USA[342]	1) TPN 2) Individualised (EN/ON)	Patients in early recovery stage after bone marrow transplantation (n1=27, n2=33)	Cost analysis	No overall measure of effectiveness	Charges for ETF and PN	RCT
Twomey and Patching 1985, USA[358]	1) 10 days preoperative TPN 2) No PN	Patients undergoing surgery for gastrointestinal cancer	Cost analysis	No overall measure of effectiveness	TPN cost (including room cost), treatment cost of TPN complications, treatment costs for wound infection and major surgical complications	Simple decision model based on literature review

NA: Not applicable, SGA=Subjective Global Assessment

Table 78: Parenteral nutrition vs no parenteral nutrition -- Economic evaluations: results

Bibliographic reference	Comparison	Effectiveness (per patient)	Cost (per patient)	Incremental cost-effectiveness ratio (ICER)
Calvo 2002, Spain[53]	1) TPN 2) Intensive monitoring of daily oral food to identify patients that require TPN	N/A	1) vs 2) 200 euro	N/A
Cardona et al 1986, Spain[57]	1) early TPN (minimum 5 days) 2) iv fluid	N/A	1) $2218 2) $5364	N/A
Eisenberg et al 1993, USA[89]	1) TPN pre and post surgery (av 16.15 days) 2) No pre-op PN (post-op PN at clinicians discretion)	Major 30-day post-op complications: 25.5% 24.6% Pre-op LOS: 11.9 7.8 Post-op LOS: 20.3 20.1	1) vs 2) $3169 (incl solution $733, nursing $843, prolonged hospitalization $764) Ranged $3071-$3921 according to SGA	N/A
Goel and Detsky 1989[129], also Detsky and Jeejeebhoy 1984[84], Detsky et al 1987[83] (using same model), Canada	1) Preop TPN for all 2) Preop TPN for high and moderate risk 3) Preop TPN for high risk (SGA) 4) No TPN	Not reported	Not reported	Non cancer: 3) vs 4) $13,200 per QALY gained 2) vs 3) $37,600 per QALY gained 1) vs 2) $109,900 per QALY gained Localised stomach cancer: 3) vs 4) $9,300 per QALY gained 2) vs 3) $20,700 per QALY gained 1) vs 2) $54,400 per QALY gained Localised oesophageal cancer: 3) vs 4) $30,400 per QALY gained 2) vs 3) $67,800 per QALY gained 1) vs 2) $178,100 per QALY gained Regionalised and metastatic upper GI cancer: $57,300-$736,400 per QALY
Kamei et al 2005, Japan[178]	1) TPN 2) Oral diet	N/A	1) $1,368 2) $1,193 **[p<0.0001]**	N/A
Szeluga et al 1987, USA[342]	TPN (28 days) Individualised (EN/ON)	Infections 1) 8/27 vs 2) 5/33	Charges per patient (28 days) 1) $2579 2) $1139	N/A

Bibliographic reference	Comparison	Effectiveness (per patient)	Cost (per patient)	Incremental cost-effectiveness ratio (ICER)
		Other complications 1) 14/27 vs 2) 11/33 LOS 1) 36 vs 2) 33 [p=0.40] Survival Numbers not reported [p=0.70]		
Twomey and Patching 1985, USA[358]	1) 10 days preoperative TPN 2) No PN	1) vs 2) % of patients Systemic sepsis= +0.5% Pnemothorax= +0.4% Symptomatic subclavian vein thrombosis= +0.1% Wound infections= -11% Major surgical complications= -19%	1) vs 2) -$1,720	N/A

Table 79: Parenteral nutrition (PN) vs enteral nutrition (ETF) -- Economic evaluations: characteristics of Studies

Bibliographic reference	Comparison	Patient group	Incremental analysis	Measure of effectiveness	Cost components included	Method
Abou-Assi et al 2002, USA[4]	1) TPN[10] 2) ETF (nasojejunal feeding)	Hospitalised patients with acute pancreatitis (n_1=27, n_2=26)	Cost analysis	No overall measure of effectiveness	Hospital costs of nutritional feeding and associated complications	RCT Average days of feeding TPN: 10.8, ETF: 6.7; **[p=0.03]**
Adams et al 1986, USA[5]	1) central venous TPN 2) ETF by jejunostomy	Multiple trauma patients immediately after laparotomy (n1=23, n2=23)	Cost analysis	No overall measure of effectiveness	Cost of nutrition support, lab work & treatment of complications(?)	RCT
Bauer et al 2000, France[21]	1) ETF+PN 2) ETF+placebo (Support for 4-7 days)	Intensive care patients age >18 with life expectancy > 2 days and NOT admitted after elective surgery (n1=60, n2=60)	Cost analysis	No overall measure of effectiveness	Nutrition support in intensive care (using OMEGA score[60])	Double-blind RCT
Bozzetti 1994, USA[40]	1) Early TPN 2) ETF by jejunostomy	Adults age 18-60 with head injury and coma persisting for 24 hours	Cost-consequences analysis	No overall measure of effectiveness	Nutrition-related hospital costs	RCT non-blinded

[10] TPN was delivered via CVC in patients in ICUs and by peripheral catheter in other patients.

Bibliographic reference	Comparison	Patient group	Incremental analysis	Measure of effectiveness	Cost components included	Method
		(excl multiple injuries) (n1=9, n2=10)				
Bower et al1986, USA[38]	1) TPN 2) Needle- catheter jejunostomy (NCJ)	Patients immediately after major upper-gastrointestinal tract or pancreaticobillary surgery (n_1=10, n_2=10)	Cost analysis	Septic and technical complications related to nutritional support	Estimated patient charges for nutritional support	RCT
Braga et al 2001, Italy[43]	1) TPN[11] 2) Early ETF	Patients after undergoing curative operation for cancer of the upper gastrointestinal tract (n_1=131, n_2=126) 13 days of feeding	Cost analysis	Overall complication rate	Costs included infusion set, monitoring, nutrition formulas and sanitary personnel	RCT
Hamaoui et al 1990, USA[139]	1) TPN[12] 2) ETF	Patients immediately after major abdominal surgery (n_1=8, n_2=11)	Cost analysis	No overall measure of effectiveness	Daily cost of nutritional supplies to the hospital based on the purchase price	RCT
McClave et al 1997, USA[224]	1) TPN[13] 2) ETF	Patients suffering from acute pancreatitis (n_1=16, n_2=16)	Cost analysis	Percentage achievement of goal calories	Hospital charges for nutrition support	RCT
Mercer and Mungara 1996, Canada[229]	1) PN 2) ETF	Patients immediately after palliative or curative esophagectomy for esophageal cancer (n=27)	Cost analysis	No overall measure of effectiveness	Cost of nutrition support[14](?)	Retrospective cohort for ETF ; conjectural for PN
Ott et al 1999, USA[259]	1) PN 2) ETF[15]	Patients with severe head injury (n_1=30, n_2=27)	Cost analysis	No overall measure of effectiveness	Charges for ETF and PN	Retrospective cohort study
Page et al 1979, USA[262]	1) Central TPN 2) Peripheral TPN 3) Jejunostomy	Malnourished patients undergoing major elective or emergency abdominal surgery: a) Nutrition support >30 days (n=24) b) Nutrition support >10 days (n=111)	Cost analysis	No overall measure of effectiveness	Nutrition materials only	Cohort of patients undergoing ETF were compared with a hypothetical cohort receiving the same calories by TPN

[11] Patients received isocaloric and isonitrogenous formula
[12] Patients received Reabilan HN via jejunostomy or an equicaloric isonitrogenous TPN regimen.
[13] Patients received isocaloric and isonitrogenous either ETF via nasojejunal feeding tubeor TPN via cenatral or peripheral line
[14] The actual costs of postoperative EN was compared with a calculated cost of an equinitrugenous, equicaloric PN solution
[15] Nosoenteric nutrition delivery using PEG/J

Bibliographic reference	Comparison	Patient group	Incremental analysis	Measure of effectiveness	Cost components included	Method
Reddy and Malone 1998, USA[287]	1) Home ETF 2) Home PN	Patients >18 receiving home PN (n1=16) or ETF (n2=30) attending an o/p nutrition clinic	Cost analysis	No overall measure of effectiveness	Charges for nutrition therapy, drugs, clinic visits, nurse visits and hospitalisation	Retrospective cohort study
Sand et al 1997, Finland[303]	1) PN[16] 2) ETF[17]	Patients immediately after curative total gastrectomy for gastric cancer (n_1=16, n_2=13)	Cost analysis	Post operative complications	Cost of feeding (five days)	RCT
Trice et al 1997, USA[355]	1) TPN 2) ETF	Patients who need post operative nutritional support (trauma patients) (n_1=157, n_2=169)	Cost analysis	Frequency of septic complications and gastrointestinal complications	Hospital costs of nutritional feeding and associated complications	Pooled data from RCT (Kudsk,1986[193]) and meta-analysis (Moore, 1992[238])
Zhu et al 2003, China[383]	1) TPN 2) ETF	Patients immediately after oesophageal or gastric surgery (n_1=20, n_2=20)	Cost-consequences analysis	No overall measure of effectiveness	Total fees of hospitalisation	RCT

[16] 5% gloucose 3000ml into a central vein on day 1. From day2 Infumix Medium 2600ml was given IV. Additional salt solutions were given when necessary
[17] 10% glucose 1000 ml through the nasojejunal tube and 5% glucose 3000 ml through peripheral vein on day 1 after the operation. On day 2 a continuous infusion of Pre-Nutrison 1500ml through nasojejunal tube and 5% glucose 2000ml IV. From day 3 onwards a continuous infusion of Nutrison standard 2000mland 5%glucose or salt solution 1000-2000ml was given IV.

Table 80: Parenteral nutrition (PN) vs enteral nutrition (ETF) -- Economic evaluations: results

Bibliographic reference	Comparison	Effectiveness (per patient)	Cost (per patient)	Incremental cost-effectiveness ratio (ICER)
Abou-Assi et al 2002, USA[4]	1) TPN[18] 2) ETF	Hyperglycemia : 1) 14 2) 3) 4, **[p=0.03]** Line infection : 1) 9 2) 1, **[p=0.01]**	Total Hospital costs: 1) $34530 2) $26464 Nutritional costs: 1) $2756 2) $394; **[p=0.0004]**	N/A
Adams et al 1986, USA[5]	1) Central venous TPN 2) ETF by jejunostomy	Complications: 1) 18 2) 19	Cost per patient for 23 days 1) $3,729 2) $1,346	N/A
Bauer et al 2000, France[21]	1) ETF+PN 2) ETF+placebo (Support for 4-7 days)	Mortality (3 months): 1) 17 vs 2) 18 [not significant] LOS 1) 31.2 vs 2) 33.7 **[p=0.0022]**	Cost (euros) per patient for 7 days 1) 204+/-119 2) 106+/-47 **[p=0.0001]**	N/A
Bozzetti 1994, USA[40]	1) Early TPN 2) ETF by jejunostomy	N/A (Authors deemed the interventions to be equally effective)	Cost: 1) $224 vs 2) $120 Charge: 1) $1264 vs 2) $402 (significance not stated)	N/A
Bower et al1986, USA[38]	1) TPN 2) Needle- catheter jejunostomy (NCJ)	No complications in both groups	Mean estimated patient charges for nutritional support: 1) $3212.57 2) $849.40 **[p<0.001]**	N/A
Braga et al 2001, Italy[43]	1) TPN 2) Early ETF	Overall complication rate: 1) 40.4 2) 35.7, [p=0.52], [not significant]	Nutrition cost: 1) $91/day 2) $25/day Nutrition cost per patient: 1) $1201 2) $320	N/A

Bibliographic reference	Comparison	Effectiveness (per patient)	Cost (per patient)	Incremental cost-effectiveness ratio (ICER)
Hamaoui et al 1990, USA[139]	1) TPN 2) ETF	Total metabolic complications per patient day: 1) 0.4 vs 0.9 [not significant]	Average daily cost of supplies: 1) $102.10 2) $44.36, **[p<0.001]**	N/A
McClave et al 1997, USA[224]	1) TPN 2) ETF	% of feeding target achieved: 1) 85 2) 72, [p>0.05] [not significant] Mortality: 1) 0 vs 2) 0 LOS: 1) 11.9 vs 9.7 Nosocomial infection: 1) 12.5% vs 2) 12.5%	Nutrition support: 1) $3294 2) $761, **[p<0.001]**	N/A
Mercer and Mungara 1996, Canada[229]	1) PN 2) ETF	N/A	Cost of feeding per patient (mean 24 days): 1) $1499 2) $189	N/A
Ott et al 1999, USA[259]	1) PN 2) ETF	N/A	Cost of feeding (per day): 1) $308/ patient 2) $170/patient	N/A
Page et al 1979, USA[262]	1) Central TPN 2) Peripheral TPN 3) Jejunostomy	N/A	**A >30 days** 1) 6177, 2) 2753, 3) 1473 **B >10 days** 1) 2174, 2) 950, 3) 508	N/A
Reddy and Malone 1998, USA[287]	1) Home ETF 2) Home PN	N/A	Charges: 1) $9,605+/-9,327 2) $55,193+/-30,596	N/A
Sand et al 1997, Finland[303]	1) PN 2) ETF	No statistically significant difference [p=0.7]	Total cost of feeding (5 days): 1) $405 2) $95	N/A
Trice et al 1997, USA[355]	1) TPN 2) ETF	All septic events (%): 1) 80 2) 21.3	Daily cost of complications[19] per patient: 1) $35.16 2) $ 13.10	N/A

[19] Pneumonia, abdominal abscess and catheter sepsis

Bibliographic reference	Comparison	Effectiveness (per patient)	Cost (per patient)	Incremental cost-effectiveness ratio (ICER)
		Gastrointestinal complications (%) Diarrhea : 1) 10.8 2) 30.2 Abdominal distention: 1) 24.1 2) 45.8	Daily costs of nutrition support were reported	
Zhu et al 2003, China[383]	1) TPN 2) ETF	N/A	1) 20,455 yuan (£1,292) 2) 18,036 yuan (£1,139) **[p<0.05]**	N/A

NA: Not applicable

Table 81: Parenteral nutrition (PN) route of access -- Economic evaluations: characteristics of Studies

Bibliographic reference	Comparison	Patient group	Incremental analysis	Measure of effectiveness	Cost components included	Method
Cowl et al 2000, USA[71]	1)Central Venous Catheters (CVC) 2) Peripherally- inserted central venous catheters (PICC)	Hospitalised patients who required TPN (n_1=51, n_2=51)	Cost analysis	-	Hospital costs for catheter insertion, and costs of diagnosing and treating catheter complications	RCT
May et al 1993, UK[221]	1) CVC 2) Peripheral parenteral nutrition (PPN)	Hospitalised patients who required TPN (n_1=26, n_2=23)	Cost analysis	-	Hospital costs for CPN and PPN , and costs of treating complications	RCT (14 months)

Table 82: Parenteral nutrition (PN) route of access -- Economic evaluations: Results

Bibliographic reference	Comparison	Effectiveness	Cost (per patient)	Incremental cost-effectiveness ratio (ICER)
Cowl et al 2000, USA[71]	1)Central Venous Catheters (CVC) 2) Peripherally- inserted central venous catheters (PICC)	Completion of therapy without line complication 1) 68.6% 2) 47.1% , **[p<0.05]** Clinically-evident thrombophlebitis: 1) 2% 2) 15.4%, **[p<0.01]**	Cost per day 1) $16.20 2) $22.32, **[p=0.03]** Median duration (days) 1) 10.8 2) 9.6, [not significant] Cost per patient 1) $175 2) $214	Strategy 1 was cost saving (by $39)
May et al 1993, UK[221]	1) CVC 2) Peripheral parenteral nutrition (PPN)	NA	1) £1061 2) £936	Strategy 2 was cost saving (by £125)

NA: Not applicable

Nutrition support teams

Table 83: Nutrition support teams: enteral nutrition

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Brown et al 1987[48]	Obs. Compar-ative. Concurr-ent control		102 patients Team: n=50 No team: n=52	Patients who were started on ETF. Mean (+/- SD) age: Team: 43.6 +/- 20.3 No team: 60.5 +/- 17.4 **[p<0.01]** Male/Female: Team: 31/19 No team: 25/27 ICU patients: Team: n= 27 No team: n= 12 **[p<0.01]** Mean (+/- SD) Basal Energy Expenditure: Team: 1476 +/- 292 No team: 1312 +/- 225 **[p< 0.01]** Exclusion criteria: Patient receiving ETF for less than 24 hr	Nutritional support team: general surgery residents, pharmacists, nurses, and clinical dietitian. Team patients were referred by consultation from each patient's primary physician to the NST for ETF management.	No team. Enteral feeding was managed by primary staff and residents physicians in multiple specialities	Until end of ETF	Total feeding days Total feeding days/patient Laboratory test Laboratory test/patient Laboratory test/day Patients attaining 1.2 X BEE Days patients attained 1.2 x BEE Patients receiving nitrogen balance studies Number of nitrogen balance studies performed	Team: n= 50 No team: n= 52 Team: 632 No team: 398 Team: 12.6 +/- 12.1 No team: 7.7 +/- 6.2 **[p<0.01]** Team: 466 No team: 241 Team: 9.3 +/- 9.1 No team: 4.6 +/- 5.2 **[p<0.01]** Team: 0.74 No team: 0.61 **[p<0.01]** Team: 37 No team: 26 **[p<0.05]** Team: 348 No team: 133 **[p<0.01]** Team: 23 No team: 1 Team: 45 No team: 1	All patients were monitored by one of the authors, independent of the nutritional support team. Non-team physicians did not know that the study was being conducted. NST patients were significantly younger than no NST patients. Significantly more team patients were administered ETF in an ICU. Funding: Research grants from Mead Johnson Nutritional Division, Evansville, IN, and Ross Laboratories, Columbus, OH

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Monitoring parameters: - Gastric residuals - Glucose monitoring Mortality Complications:	 Team: 49 No team: 8 Team: 45 No team: 10 Team: 5 No team: 11 [Not significant] Total: Team: 398 No team: 390 - complications/day: Team: 0.63 No team: 0.98 **[p<0.01]** Pulmonary: Team: 0 No team: 2 - Complications/day: Team: 0 No team: 0.01 Mechanical complications: Team: 23 No team: 47 - Complications/day: Team: 0.04 No team: 0.12 **[p<0.01]** Comparison of mechanical and GI abnormalities: none of	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									the differences were statistically significant. (Data not extracted) GI complications: Team: 55 No team: 55 - Complication/day: Team: 0.09 No team: 0.14 **[p<0.05]** Metabolic complications: Team: 311 No team: 290 - Complication/day: Team: 0.49 No team: 0.72 **[p<0.01]** Metabolic complications- Number (abnormality/day) (only those parameters statistically significant have been included): Hypokalemia: Team: 32 (0.05) No team: 36 (0.01) **[p<0.05]** Hyperglycemia: Team: 63 (0.10) Mp team: 77 (0.19) **[p<0.01]** Hypophosphatemia: Team: 20 (0.03) No team: 31 (0.08)	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									[p<0.01] Untreated metabolic abnormalities: Team: 32 (0.05) No team: 60 (0.15) **[p<0.01]**	
Powers et al 1986[280]			101 patients Team : n= 50 No team : n= 51	Patients receiving ETF. Exclusion criteria: Any patient receiving ETF for less than 24 hr. Mean (+/- SD) age: Team: 64.3 +/- 16.1 No team: 64.5 +/- 11.9 ICU patients: Team: 14 No team: 8 Medicine: Team: 24 No team: 32 Surgery: Team: 26 No team: 19 Mean BEE (kcal/d): Team: 1347.2 +/- 222.3 No team: 1375.4 +/- 179.4	NST. Patients were referred by consultation from the patient's physician for ETF management. NST: physicians, clinical pharmacist, nutrition support nurse and clinical dietitian.	No team. Managed by their primary physician (intern, resident, or staff).		Total feeding days Mean (+/- SD) feeding days Laboratory tests (n) Laboratory tests/pt Laboratory test/day Patients attaining 1.2 x BEE Total feeding days at 1.2 x BEE (%) Patients receiving N balance studies Total number of N	Team: n= 50; No team: n= 51 Team: 583 No team: 740 [Not significant] Team: 11.7 (9.2) No team: 14.5 (10.3) [Not significant] Team: 1483 No team: 1621 [Not significant] Team: 29.66 No team: 31.78 [Not significant] Team: 2.54 No team: 2.19 [Not significant] Team: 47 No team: 38 **[p<0.05]** Team: 398 (68.6) No team: 281 (37.2) **[p<0.05]** Team: 43 No team: 2 **[p<0.05]** Team: 70	The collection of data was coordinated by the primary investigator independent of the nutritional support team. Significantly more postoperative patients were referred to the team-managed group.

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								balance studies	No team: 2 **[p<0.05]**	
								Patients achieving positive N balance	Team: 42 No team: 1 **[p<0.05]**	
								Patients receiving nutritional assessment	Team: 50 No team: 5 **[p<0.05]**	
								Patients with nutritional plan documented	Team: 50 No team: 6 **[p<0.05]**	
								Verification of tube placement documented	Team: 49 No team: 21 **[p<0.05]**	
								Weights obtained	Team: 50 No team: 6 **[p<0.05]**	
								Intake-output ordered	Team: 50 No team: 18 **[p<0.05]**	
								Gastric residuals ordered	Team: 50 No team: 7 **[p<0.05]**	
								Urine Sugar and Acetone ordered	Team: 50 No team: 5 **[p<0.05]**	
								Patients requiring formula modification (%)	Team: 15 (30) No team: 5 (9.8) **[p<0.05]**	
								Mortality	Team: 5 No team: 9 [Not significant]	
								Complications	Team: 160	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									No team: 695 **[p<0.05]**	
								- Pulmonary	Team: 0 No team: 5 **[p<0.05]**	
								- Mechanical	Team: 8 No team: 110 **[p<0.05]**	
								- Gastrointestinal (N)	Team: 21 No team: 67 **[p<0.05]**	
								- Metabolic (N)	Team: 131 No team: 513 **[p<0.05]**	
									Metabolic complications- Number (abnormality/day) (only those parameters statistically significant have been included):	
									Hyponatremia: Team: 11 No team: 27 **[p<0.05]**	
									Hyperkalemia: Team: 5 No team: 30 **[p<0.05]**	
									Hyperglycemia: Team: 23 No team: 84 **[p<0.05]**	
									Hypophosphatemia: Team: 16 No team: 48	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									[p<0.05] Hypocalcemia: Team: 22 No team: 48 **[p<0.05]** Untreated metabolic abnormalities: Team: 8 No team: 210 **[p<0.05]**	
Scott et al 2003[312]	RCT		112 patients randomised NST :n=55 8 died within 7 days of PEG insertion. Non-NST : n=57 3 died within 7 days of PEG insertion. Total analysed : NST : n=47 Non-NST : n=54	Adult patients referred and accepted for a PEG. No absolute exclusion criteria (patients were only excluded for logistical reasons eg. PEG inserted during NST member leave) Gender (M/F): NST: 19/28 Non-NST: 27/27 [Not significant] Mean (SD) age: NST:67.4 (17.0) Non-NST: 68.6 (17) [Not significant]	Intervention started on day 7 following the PEG insertion. Patients were visited at least weekly by the nutrition team nurse and/or dietitian while in the acute hospital and at least monthly after discharge into the community. There was liaison between the nutrition team and the ward and primary care professionals, with advice and help on pro-active basis for any problems or questions that were raised. In addition, patients and their carers were counselled, educated and trained in all relevant aspects of nutritional support and were	Patients received non specific input from the nutrition team either before or after discharge. This did not exclude referrals to the team if the ward or community team felt this was necessary. Level of input was generally limited to advice only.	12 months	Time to removal of PEG (days) (Median-range) Complications: - Diarrhoea n (%) - Vomiting n (%) - Chest infection n (%) - Peristomal infections episodes Days of antibiotic therapy: Median (range) LOS (days) in acute hospital Median	NST: n= 47; No-NST: n= 54 NST: 60 (6-366) Non-NST: 113 (11-366) [Not significant] NST: 23 (49%) Non-NST: 20 (37%) [Not significant] NST: 17 (36%) Non-NST: 23 (43%) [Not significant] NST: 32 (68%) Non-NST: 34 (63%) [Not significant] NST: 32 (68%) Non-NST: 36 (67%) [Not significant] NST: 8 (0-43) Non-NST: 11 (0-158) [Not significant] NST: 19 (1-131) Control: 22 (1-104)	8 patients in the NST and 3 patients in the control group died after randomisation within 7 days of PEG insertion (before intervention started). Funding: Nutricia Clinical Care Ltd, Trowbridge, Wiltshire, UK

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					given a telephone number to contact at any time if required.			(range) Number of patients admitted to community hospital Days in community hospital for those admitted: Median (range) Number (%) of patients receiving care from NST - 10 min contacts with NST for those receiving care- median (range) Number of patients receiving contacts with PAMs (Professions Allied to Medicine) Number of patients with contacts with GP Number of patients with contacts with district nurse Number of patients readmitted Number of readmissions Days of stay per readmission: Median (range)	[Not significant] NST: 20 (43%) Control: 28 (52%) [Not significant] NST: 76 (1-350) Control: 92 (1-349) [Not significant] NST: 45 (96%) Control: 12 (22%) **[p<0.001]** NST: 10 (1-50) Control: 2 (1-4) [No p value reported] NST: 45 (96%) Control: 53 (98%) [Not significant] NST: 16 (34%) Control: 24 (44%) [Not significant] NST: 10 (21%) Control: 15 (28%) [Not significant] NST: 10 Control: 21 [Not significant] NST: 18 Control: 29 NST: 9 (1-54) Control: 14 (1-62) [Not significant]	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
								Mortality QOL Anthropometric measurements	No significant differences between the groups (Data in figure) There was an improvement in the social functioning element of the SF36 with NST group over control **[p=0.05]**. All other elements of the SF36 were similar as were the results of the PEG-specific tool and the patient/carer satisfaction questionnaire (results not presented) No differences between the groups (data not presented)	

Table 84: Nutrition support teams: parenteral nutrition

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Fernandez et al 2003[107]	SR (11 studies)		- Hickey (1979): CVC Non- TPN team: n=55 TPN team: n=18	Adult patients receiving PN Mean age (range): 59.2 (26-93)	Multidisciplinary TPN team (Members of the TPN team and the roles and responsibilities of the team and its members varied	No TPN team		Duration of TPN:	- Hickey (1979) (mean no. days) : Non- TPN team : 21.6 TPN team : 10.9 **[p=0.05]** - Dalton (1984) (mean	The methodological quality of the studies was limited

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			- Dalton (1984): CVC/ peripheral Non-TPN team: n=28 TPN team: n=32 - Jacobs (1984): CVC Non-TPN team: n=21 Transitional TPN team (6 months): n=35 TPN team: n=22 - Traeger (1986): CVC Non- TPN team: n=45 TPN team: n=24 - Gales (1994): Non-TPN team: n=17 TPN team: n=11 -Chris Anderson (1996): CVC Non- TPN team: n=29 TPN team: n=128 -Fisher (1996): CVC		between the studies)				+/- SD days) : Non- TPN team :12.4 +/- 9.2 TPN team :10.6 +/- 7.1 [No p value reported] - Jacobs (1984) (mean +/- SD days) : Non-TPN team : 26 +/- 19 Transitional TPN team : 21 +/- 13 TPN team : 22 +/- 15 [No p value reported] - Traeger (1986) (mean +/- SD days): Non- TPN team : 18+/- 16 TPN team : 22 +/- 17 [No p value reported] - Gales (1994) (mean no. Days and range): Non- TPN team : 7.2 +/- 4.3 (2-14) TPN team : 7.1 +/- 4.6 (2-14) [No p value reported] - Chris Anderson (1996) (mean +/- SD days): Non- TPN team : 13.7 +/- 10.0 TPN team : 12.9 +/- 11.3 - Fisher (1996) : Not reported - Png (1997) : (n) TPN >= 7 days: Non- TPN team : 10	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
			Non-TPN team: n=77 TPN team: n=122 - Png (1997): CVC Non- TPN team: n=37 TPN team: n=36 - Trujillo (1999): CVC/peripheral Non-TPN team: n=150 TPN team: n=49 - Fettes (2000): CVC/ peripheral Non-TPN team: n=28 TPN team: n=19 -Oliveira (2000): CVC Non- TPN team: n=48 TPN team: n=48					Catheter related complications:	TPN team : 22 (n) TPN <7 days: Non- TPN team : 19 TPN : 7 - Trujillo (1999) : Total no. PN days: Non- TPN team: 1757 TPN team : 834 PN starts that were < 5 days : Non TPN team : 65 TPN team : 8 **[p=0.002]** - Fettes (2000) (completed episodes, mean and range) : Central PN : Non- TPN team : 9 (1-25) TPN team : 8 (1-21) Peripheric PN : Non- TPN team : 6 (1-9) TPN team : 6 (1-20) - Oliveira (2000) (mean +/- SD days): Non- TPN : 13.7 +/- 13 TPN team : 13.9 +/- 11.5 - Hickey (1979): Pnemotorax (no.) : Non- TPN team : 3/41 TPN team : 0/9 Air embolism :	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Non- TPN team : 2/41 TPN team : 0/9 Catheter sepsis (no) : - Definite Non- TPN team : 2/41 TPN team : 0/9 - Probable : No TPN team : 8/41 TPN team : 1/9 - Dalton (1984) : Incidence of catheter sepsis (no. Patients) : Non- TPN team :1 TPN team :1 Catheters removed without documentation of sepsis : Non- TPN team : 9 TPN team : 2 **[p<0.05]** - Jacobs (1984) : Catheter sepsis (no. Patients) : Non-TPN team : 5 Transitional TPN team : 1 TPN team : 0 **[p<0.05]** (First group v 2nd and 3rd groups) Mechanical complications (no. Patients) : Non-TPN team : 3 Transitional TPN team : 2 TPN team : 0 - Traeger (1986) (no. Patients):	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Infection : Non- TPN team : 8 TPN team : 1 Malposition : Non- TPN team : 5 TPN team : 1 Pneumotorax : Non- TPN team : 3 TPN team : 1 Total complications : Non- TPN team : 16 TPN team : 3 **[p<0.05]** Catheter sepsis : Non- TPN team :5 TPN team : 1 - Gales (1994) : Not reported - Chris Anderson (1996) : Not reported - Fisher (1996) : Catheter sepsis (no. Patients) : Non- TPN team : 8 TPN team : 7 - Png (1997) : Total mechanical complications : Non- TPN team : 3 TPN team : 0 Pneumotorax: Non- TPN team : 1 TPN team : 0 Catheter malposition :	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
									Non- TPN team : 1 TPN team : 0 Blocked catheter : Non- TPN team : 1 TPN team : 0 Catheter sepsis : Non- TPN team : 13/37 TPN team : 6/36 - Trujillo (1999) : Not reported - Fettes (2000): Pneumotorax : Non- TPN team : 1 TPN team : 0 No. Of CVC changed due to suspected or confirmed infection : Non- TPN team : 5 TPN team : 5 - Oliveira (2000) (mean +/- SD days): Data not extracted Data not extracted	
Kennedy and Nightingale 2005[182]			Total: n=129 Pre-NST: n=54 NST: n=75	Surgical and medical patients receiving PN Mean age (years): Pre-NST: 61 (29-89) NST: 58 (17-83)	NST The NST was formed on 27 Sep. 1999 with the appointment of a nutrition support nurse. The aims of the NST was: “To	No NST		Mortality Catheter related sepsis	NST : 18/75 (24%) Pre-NST : 23/54 (43%) **[p<0.05]** NST: 29% (mean 3.26 per 100 PN days) Pre-NST: 71% (mean 7.06 per 100 days) **[p<0.05]**	

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
					ensure that high quality, cost effective, safe nutritional support is given to all adult in-patient who are malnourished or at risk of becoming malnourished". The general objectives were: -to develop a structure for providing nutritional support, - to develop guidelines for appropriate levels of nutritional support, - to manage (implement and monitor) adult patients needing artificial nutritional support together with the patient's primary consultant team, - to act as a focal point for artificial support-related issues. There were also specific objectives for PN and ETF, education and research/audit.					

Table 85: Nutrition support teams: general nutrition support

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
Johansen et al 2004 [170] Clinical Nutrition	RCT		212 patients NST: n=108 Cont: n=104	Random sample of patients at nutritional risk according to NRS-2002 which was based on an analysis of previous RCTs of nutritional intervention. Patients with a score >=3 were included in the study. Age (mean+/- SE): NST: 62±1.6 Control: 62.4±1.7 M/F: NST: 54/54 Control: 48/56 BMI (kg/m2) (mean +/- SE): NST: 21.2 +/- 0.50 Cont: 21.8 +/- 0.48 Exclusion criteria: less than 4 days expected admissions, less than 18 years of age, less than 1 month expected survival, patients who did not understand Danish, previously participating patients, patients who were placed next to another participant in the same room, pregnant or lactating healthy women, patients with	Specialised nutritional team (nurse & dietitian) Patients received daily attention from the team consisting of: - Motivation of patient and staff - Adjusting the nutritional plan by estimation of protein- and energy requirements and ordering food in collaboration with the patient - Securing the supply of food ordered	Received standard regimen used in the department	Until discharge (with a maximum of 28 days after inclusion)	Nutritional intake Complications Length of stay (LOS28) LOS sensitive to NS(LOSNDI) Quality of life using	Int: n= 103; Control: n= 99 Protein intake ≥75% of requirement Int group: 62% Cont group: 36% **[p=0.0004]** Rates of complications, mean LOSNDI , & LOS were not significantly different between the 2 groups Not significant between the two groups neither in total, minor or major complications Int: n=82; Control: n= 90 Int group: 17± 2days (M+SE) Cont group: 22 ±2 days **[p=0.028]** Subgroup analysis: Among patients with complications with no operation, LOSNDI Int group: 14±2days(M+SE) Cont group: 20±2days (**[p=0.015]** was shorter in intervention) QoL did not show significant effect of treatment	3 hospitals participated in the study. Nutritional Discharge Index consist of 3 criteria 1. Patient able to visit toilet without assistance (mobility) 2. Patient without fever (absence of infection) 3. No intravenous access (absence of complications in general) On the day when all 3 criteria were fulfilled, hospital stay was no longer considered to be sensitive to nutritional support

Bibliographic reference	Study Type	Evidence level	No. of patients	Patients characteristics	Intervention	Comparison	Length of follow up	Outcome measures	Effect size	Comments (including source of funding)
				psychiatric disorders, patients with haemodialysis and patients who were already receiving or were planned to receive a standard parenteral or PEG tube feeding.				the SF-36 questionnaire		

Table 86: Nutrition support teams -- Economic analyses: characteristics of studies

Bibliographic reference	Comparison	Patient group	Incremental analysis	Measure of effectiveness	Cost components included	Method
ChrisAnderson et al 1996, USA[64]	1)Automatic referral to NST (n=128) 2)Ad hoc referral to NST (n=29)	Patients on TPN for >= 2 days	Cost analysis	No overall measure of effectiveness	Patient-specific charges for TPN-related pharmacy, chemistry, haematology & microbiology. Cost of NSS personnel time was NOT considered.	Prospective nonconcurrent cohort study
King's Fund 1992, UK[1]	1) NST 2) No NST	Patients receiving PN	Cost analysis	Major complication rate	Cost of treating catheter-related sepsis	Simple model combining the results of 7 cohort studies
Scott 2003, UK[312]	1)Regular follow-up from the NST (weekly in-hospital, monthly after discharge) (n=47) 2) NST involvement limited to advice and on referral only (n=54)	Adult papers referred for gastrostomy	Cost analysis	No overall measure of effectiveness	Hospital costs, community care costs, NST costs, PEG-related costs (12 months)	Randomised controlled trial
Trujillo et al 1999, USA[357]	1) Metabolic support service consultation (n=49) 2) No metabolic support service consultation (n=160)	Inpatients beginning on central or peripheral PN	Cost analysis	Metabolic complication rate	Avoidable (defined by ASPEN guidelines) PN charges	Prospective concurrent cohort study
Weinsier et al 1985, USA[368]	1) Routine referral for nutritional support (n=35) 2) Nutrition was the sole responsibility of the burn surgeon	Patients referred for 20%-50% burns who survived	Cost analysis	Major complication rate	Total hospital costs	Retrospective nonconcurrent cohort study

Bibliographic reference	Comparison	Patient group	Incremental analysis	Measure of effectiveness	Cost components included	Method
	and the clinical dietitian (n=35)					

N/A: Not applicable

Table 87: Nutrition support teams -- Economic analyses: results

Bibliographic reference	Comparison	Effectiveness (per patient)	Cost (per patient)	Incremental cost-effectiveness
ChrisAnderson et al 1996, USA[64]	1) Automatic referral to NST (n=128) 2) Ad hoc referral to NST (n=29)	N/A	Mean (SD) 1) $1,784 (1,933) 2) $2,107 (1,842) p=0.41	N/A
King's Fund 1992, UK[1]	1) NST 2) No NST	Catheter-related sepsis 1) 2.5% 2) 27%	'Best case' (low cost of treating sepsis) 1) £41 2) £446 'Worst case' (high cost of treating sepsis) 1) £125 2) £1350	N/A
Scott 2003, UK[312]	1) Regular follow-up from the NST (weekly in-hospital, monthly after discharge) (n=47) 2) NST involvement limited to advice and on referral only (n=54)	N/A	1) £13,330 (£15,505) 2) £16,858 (16,351) p=0.27	N/A
Trujillo et al 1999, USA[357]	1) Metabolic support service consultation (n=49) 2) No metabolic support service consultation (n=160)	Metabolic complications 1) 34% 2) 66% p=0.004	Avoidable charges 1) $350 2) $1,038 statistical significance not reported	1) dominates 2)
Weinsier et al 1985, USA[368]	1) Routine referral for nutritional support (n=35) 2) Nutrition was the sole responsibility of the burn surgeon and the clinical dietitian (n=35	Major complications 1) 11/35 2) 11/35	Mean (SD) 1) $17,800 (11,300) 2) $24,200 (20,000) p=0.02	1) dominates 2)

N/A: Not applicable

Appendix Five: Cost-Effectiveness Analysis of Malnutrition Screening

An original model was developed to explore the cost-effectiveness of malnutrition screening and intervention. Our main model evaluated screening of *older inpatients*, since the majority of trial evidence was for this patient group. We also conducted a more tenuous sensitivity analysis, which estimated the cost-effectiveness of screening *inpatients generally*, with results varied according to baseline risk of malnutrition and all-cause mortality.

3.3 Methods

A cost-utility analysis was undertaken from the perspective of the NHS and personal social services. Expected costs and health outcomes (quality-adjusted life-years) were calculated using decision analysis, with life expectancies being estimated by life-table analysis.

A screening strategy ('Screen') was compared with a strategy of ward nurses selecting patients for oral nutrition intervention ('Nurse') and with a strategy of no oral nutrition intervention ('Don't Treat'). The target population chosen for the base case was older inpatients. This population was chosen because it is known to have a high prevalence of malnutrition and because there have been a number of RCTs evaluating oral nutrition intervention for this group.

The analyses were designed and conducted by the health economists in discussion with the guideline development group.

3.3.1 Pathways

Figure 1 shows the decision tree pathways for each of the three strategies.

The top tree shows the Screen strategy. In this strategy, all patients in the target group are screened. Those that are found to be at low risk receive the usual hospital diet, whereas those that are at moderate or high risk receive the oral nutrition intervention.

Unless screening is 100% accurate, we can expect some malnourished patients (even if only a small proportion) to end up without intervention. Health outcomes are dependent not only on the path followed but also on the underlying risk status of the patient. Hence we add the true underlying condition to the end of the tree. The proportion of patients that end up at each endpoint will depend on the prevalence of malnutrition and risk in the population and on the accuracy of screening. The more accurate is screening, the fewer malnourished patients will be left untreated and the greater is the health gain. The yellow boxes indicate malnourished patients that are successfully treated and the orange boxes malnourished patients that are not treated.

The middle tree represents the Nurse strategy. This is similar to the Screen strategy except that the number of patients that receive the intervention will be fewer and their risk status will be lower.

In the Don't Treat strategy, bottom tree, none of the patients receive intervention, regardless of their risk status.

Decision analysis involves estimating, for each strategy, the proportion of patients going down each pathway and the outcomes (cost and QALYs) associated with each pathway. Mean cost for each strategy is then estimated by weighting the cost of each pathway with its respective probability. Mean QALYs are then calculated in the same manner.

3.3.2 Probabilities

As already noted, the proportion of patients that end up at each endpoint will depend on the prevalence of malnutrition or malnutrition risk in the population and on the accuracy of screening and nurse assessment. The base case values and the sensitivity analysis ranges used in the model are summarised in Table 88.

A recent study[337] reported an estimate of malnutrition risk for our target group – older inpatients in the UK using the 'MUST' tool: 44% (moderate and high risk).

The accuracy (sensitivity & specificity) of screening depends on the accuracy of the specific screening tool used. It cannot be determined precisely for any malnutrition screening tool because there is no recognised gold standard for the measurement of malnutrition. For our base case analysis we assumed that the sensitivity and specificity of screening are both 100%; where these measures are calculated not relative to a gold standard but relative to the selection procedures for the RCTs used to estimate effectiveness. The treatment effect observed in the trials is the average effect for patient groups who have also been selected by an imperfect screening tool. The average treatment effect therefore applies to all those identified by screening. Therefore in the base case, we are assuming that our screening strategy is no more and no less accurate than the selection procedures of the RCTs in our meta-analyses.

We assumed that all patients identified as moderate or high risk, according to the 'MUST' tool would receive the intervention.

For our sensitivity analysis, we consider the possibility that the type of screening tool is less sensitive and less specific than those used to select patients for the RCTs. In tables 4 and 5 of the study[337] that reported the prevalence of malnutrition, there were reported cross-tabulations of the results of 'MUST' (two categories) compared with the MST (two categories), n=75, and with the MNA-tool (two categories), n=85. These allowed us to estimate approximate sensitivities for 'MUST' of 77% and 66% respectively. Likewise, specificities of 'MUST' were 92% and 97%. For the sensitivity analysis we used the mid-point of the estimates for both sensitivity and specificity.

We estimated the sensitivity and specificity of assessment by ward staff using data from a UK-based cross-sectional study[132] that evaluated the prescription of oral nutritional supplements by ward staff (n=82). These were 30% (7/23; CI: 12%, 49%) and 71% (42/59; CI: 60%-83%) respectively. The benchmark used to estimate the sensitivity and specificity of nurse assessment was BMI<20. This is the same BMI threshold as used in the MUST instrument. However, the MUST tool would also categorise patients as being at risk if they have had an unplanned weight loss of >5% in the past 3-6 months or if they are unlikely to eat for >5 days. In the sensitivity analysis we assumed that nursing staff are 100% specific, such that the treatment effect is attributed to all patients identified by ward staff.

We estimated the probabilities required by the decision tree Figure 1 by applying Bayes' theorem to our estimates of disease prevalence and test accuracy. Formulae and base case estimates are given in Table 89.

3.3.3 Health outcomes

A summary of the outcome data and assumptions is given in the lower section of Table 88.

To estimate life expectancy for patients receiving (or not receiving) oral nutrition intervention we selected relevant RCTs from the systematic review of oral intervention versus standard care (see 8.2). The studies we selected were all those studies in the systematic review that targeted older patients (or those with a mean age of at least 65) and where oral nutritional supplement was administered to hospital inpatients and compared with usual hospital diet alone. We extracted from each study: data on sample size, number of deaths, complications, length of stay, weight change, duration of follow-up, age and sex of participants and details of the intervention (Table 99). When details about the duration of the intervention or the duration of follow-up were not explicitly reported, these were approximated from the reported length of stay. Where different complications were reported in the same study we included the complication that was considered most important by the study's authors.

Estimating life expectancy for the target population is problematic because during the follow-up periods of the trials, mortality was extremely high. We would not expect mortality beyond the follow-up period to be so high since the survivors would have recovered from their acute episode. However, we would not expect mortality to revert back to the population level since a large proportion of trial participants had chronic morbidity. We tackled this problem in the following way.

We estimated a daily death rate for the *control arm* of each study based on the number of deaths and length of follow-up. We then calculated the weighted mean death rate and used it to calculate remaining life expectancy for the non-intervention arm using a life-table. For the base case analysis we assumed that the observed mortality rate persisted beyond the follow-up period and was constant for 50% of patients. Since the mortality in the studies was very high this implied a life expectancy of only 244 days. For the other 50% we assumed that their mortality was that of the general population beyond the average trial follow-up period. To achieve this we constructed another life table using aggregate data for England and Wales[133]. The table estimated life expectancy for men and women from the age of 77 – the weighted mean age of participants in the RCTs. We discounted life-years at 3.5% in keeping with UK central government convention[158,245].

To estimate the life expectancy of patients in the *intervention arm*, we constructed an identical life table as for the non-intervention group except that the mortality rate was reduced during the follow-up period. The extent of the mortality risk reduction was estimated by fixed-effects meta-analysis to be a relative risk of 84% (CI: 68%, 103%) – see Figure 2. The test for inter-study heterogeneity was not significant.

Only three studies of oral nutrition interventions versus standard care in malnourished or at risk patients measured generic health-related quality of life using a single index – the EQ5D was used in all three. One study[349] had collected this data from its study population of older women with hip fracture in a Swedish hospital. They found a substantial improvement in HRQL associated with oral nutrition

intervention (0.6 v 0.5), but the study size was small (n=52) and the results were not significant. The much larger FOOD trial[344] (n=3086) found no difference (0.52 v 0.52) in EQ5D scores in its study of stroke patients. However, this study included well-nourished as well as malnourished patients. A third study[87] targeted malnourished older people in the UK – results were not reported except to say that there was no significant difference. For our base case analysis we assume no gains in HRQL from oral intervention and used 0.55 for all pathways in the base case. For the sensitivity analysis we use an upper estimate of 0.73, the estimated HRQL for patients before their hip fracture[349].

3.3.4 Resource use

The assumptions about resource use are summarised in Table 90.

For the base case analysis, we assumed that screening would be undertaken by a ward nurse and would take on average four minutes to complete[337].

To achieve this screening programme there would need to be a programme of training and quality assurance. We assumed that four times a year there would be a 2-hour session run by the dietitian and a consultant and attended by three nurses per ward. We used data from North Bristol NHS Trust (personal communication from Joanna Prickett) to estimate the number of wards (27) and number of older patients admitted per year (14,496). This allowed us to distribute the cost of the training package across the target population to calculate the cost per patient screened. In Table 91 we can see that this cost per patient screened is low in comparison with that observed by Rypkema et al(2004)[299], which spread these 'fixed' intervention costs over only 140 patients. We use the figure from the Rypkema study in a sensitivity analysis.

Nutritional intervention can take a number of forms (including menu modification, food fortification and the use of oral nutritional supplements). For the purpose of constructing the model, it simplified things to assume a single intervention. We chose an intervention of oral nutritional supplements administered twice a day, since this was typical of the interventions used in the RCTs. We included the average cost of a proprietary oral nutrition supplement. We estimated that administration would take 20 minutes a day to encourage oral intake, make up or obtain supplements and assess food intake. To ensure consistency between our measure of effect and our measure of cost we estimated the length of the intervention by the weighted mean intervention duration recorded in the RCTs. This was 30 days.

It was assumed that a proportion of patients receiving the intervention (50% in the base case) would be referred to a dietitian for assessment. Based on the expert opinion we assumed that a nutritional assessment would take 30 minutes with a follow-up consultation of 20 minutes two to three days later and then 20 minutes weekly after that.

We assumed that no additional diagnostic tests would arise from the intervention, as is consistent with our recommendations on monitoring oral nutrition support.

We used fixed effects meta-analyses to estimate the impact of oral supplementation on the number of complications (Figure 3). Complications were statistically significantly reduced. The weighted average complication rate in the control arm was 47% of patients and the risk reduction 20% which implies a number needed to treat of 11 patients to prevent one complication. We did not include in the model costs

attributable to length of stay, since this is likely to be double counting the cost of complications and also because our meta analyses did not show significant reductions in length of stay attributable to oral nutrition support (See 8.2.6).

The incremental cost of extending the life of patients who are infirmed is not just the intervention cost, but includes the cost of the care for those patients in their added days of life. We calculated the proportion of older inpatients that go on to another hospital or to an NHS or LA care home after discharge, using HES data for England - 8%. For this proportion of the subgroup of patients that were malnourished until treated we added the cost of a care-home day for every extra day of life.

3.3.5 Unit costs

The unit costs used in the model are summarised in Table 92.

The costs of staff time, complications and care-home stay were taken from the standard sources for such costs[72,250]. Staff costs included qualification costs and overheads. For the sensitivity analysis we used the cost of a health care assistant for the low estimate and the cost of an SHO for the high estimate. For care in extra days of life we used the cost per day of a voluntary residential care home and the cost per day of a hospital stay for the low and high estimates.

For the daily cost of enteral nutrition, we took the average of three recent estimates: £1.50[91], £4.50 (J Prickett, unpublished data) and £11.61[182]. The cost of the oral nutritional supplements was taken from the British National Formulary September 2004[171]. The price of oral nutritional supplements is usually heavily discounted for British hospitals therefore we considered a cost of 20 pence per supplement in the base case analysis but used the full price in the sensitivity analysis.

Applying the unit costs to the resource use gives the costs in Table 93.

3.3.6 Sensitivity analysis

We conducted one-way sensitivity analyses using the parameter ranges reported in Table 88, Table 90 and Table 92.

We also constructed an additional model to see how the cost-effectiveness of screening varies for different patient populations. We used the same model as used to evaluate the screening of older inpatients with the following modifications:

- Life expectancy was calculated on the basis that beyond the trial follow-up period, mortality reverts to the population level.
- The mean age (56) of all adult inpatients and sex ratio (females=56%) was used to estimate life expectancy[3].
- An average HRQL score of 82% was used, based on UK population norms[186].
- Fixed costs of screening were averaged across all inpatients instead of just the older inpatients.

- The proportion of inpatients that go on to another hospital or to an NHS or LA care home after discharge was estimated for all adult patients (instead of just elderly inpatients) and was 5%.

We then re-estimated cost-effectiveness for different levels of malnutrition and mortality risk.

3.4 Results

3.4.1 Base case analysis

Table 94 shows that both nurse time and dietitian time is greatest for the Screen strategy and lowest for the Don't Treat strategy.

Table 95 presents the main outcomes from the base case analysis. Nurse was more effective but more costly than Don't Treat. Screen was more effective but more costly than Nurse. The Nurse strategy can be excluded due to extended dominance, that is to say that not only was it less effective than screening but also compared with Don't treat it had a higher cost per QALY gained. The incremental cost per QALY gained for Screen compared with Don't Treat was £6,600. This would suggest that screening is cost-effective when compared to a threshold of £20,000 per QALY gained.

3.4.2 Sensitivity analysis

Table 96, Table 97 and Table 98 show one-way sensitivity analyses for every model parameter. In none of the scenarios was Nurse the optimal strategy. The Screen strategy was no longer cost-effective when:

* the mortality relative risk was high (i.e. the relative risk reduction attributable to oral nutrition support was small), or

* the duration of the intervention was long (without a commensurate increase in health gain)

Table 100 shows a two-way sensitivity analysis that indicates the sensitivity of the cost per QALY gained for Screen versus Don't Treat, when the population characteristics of malnutrition risk and mortality are varied. The red (dark) shaded cells indicate the combination of assumptions where Screen would NOT be cost-effective, when compared to a threshold of £20,000 per QALY gained. So for example, with an acute background mortality of 1.5%, a prevalence of malnutrition of 3% would be enough to make screening cost-effective, according to the assumptions of the model. In hospital inpatients generally the prevalence of malnutrition has been estimated to be around 25%[336] and using HES data[3] we estimate that mortality in adult inpatients is around 4%, which would imply that screening will be very cost-effective in most hospital departments.

Figure 1: Decision tree pathways

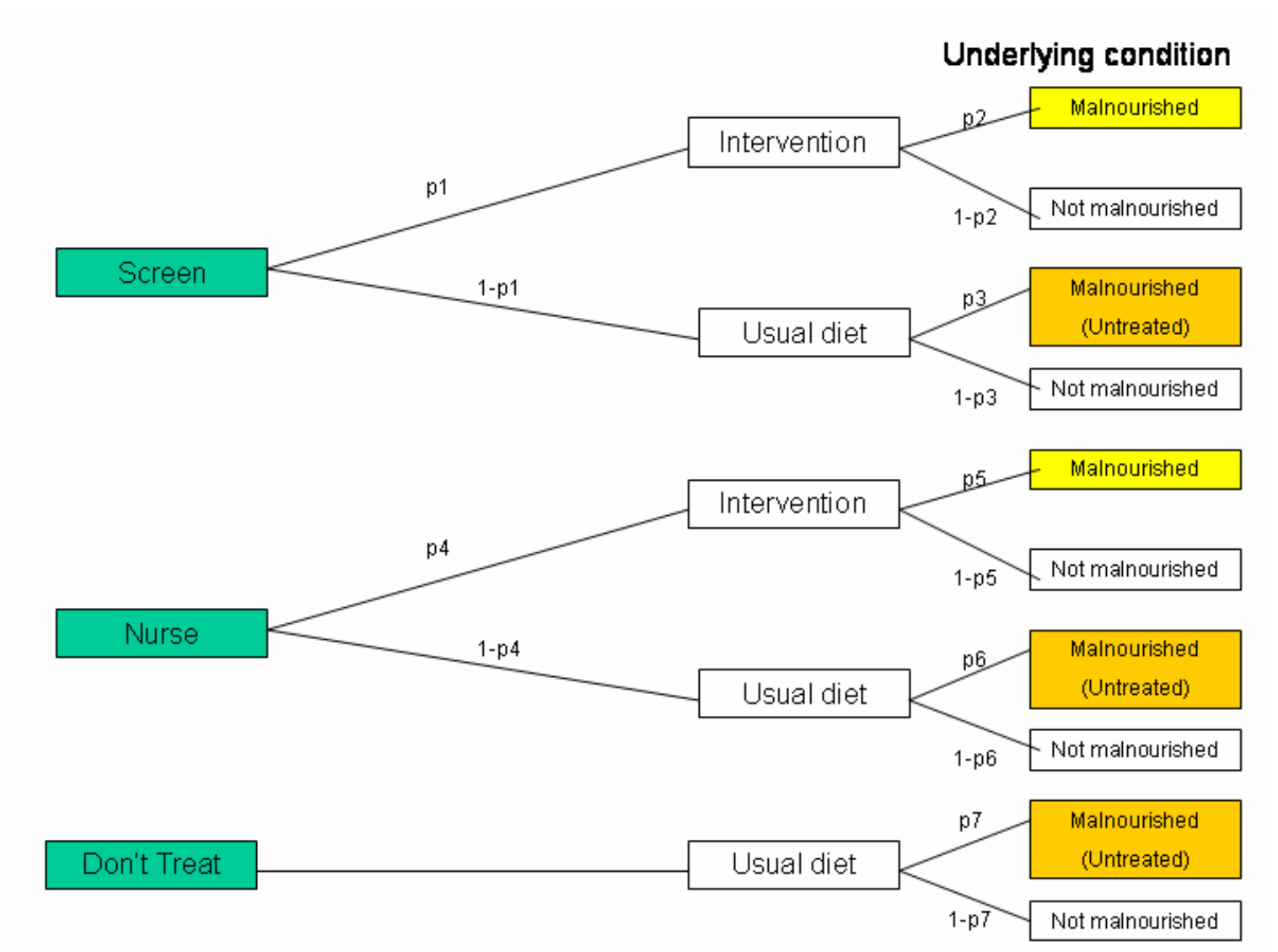


Figure 2: Meta-analysis mortality

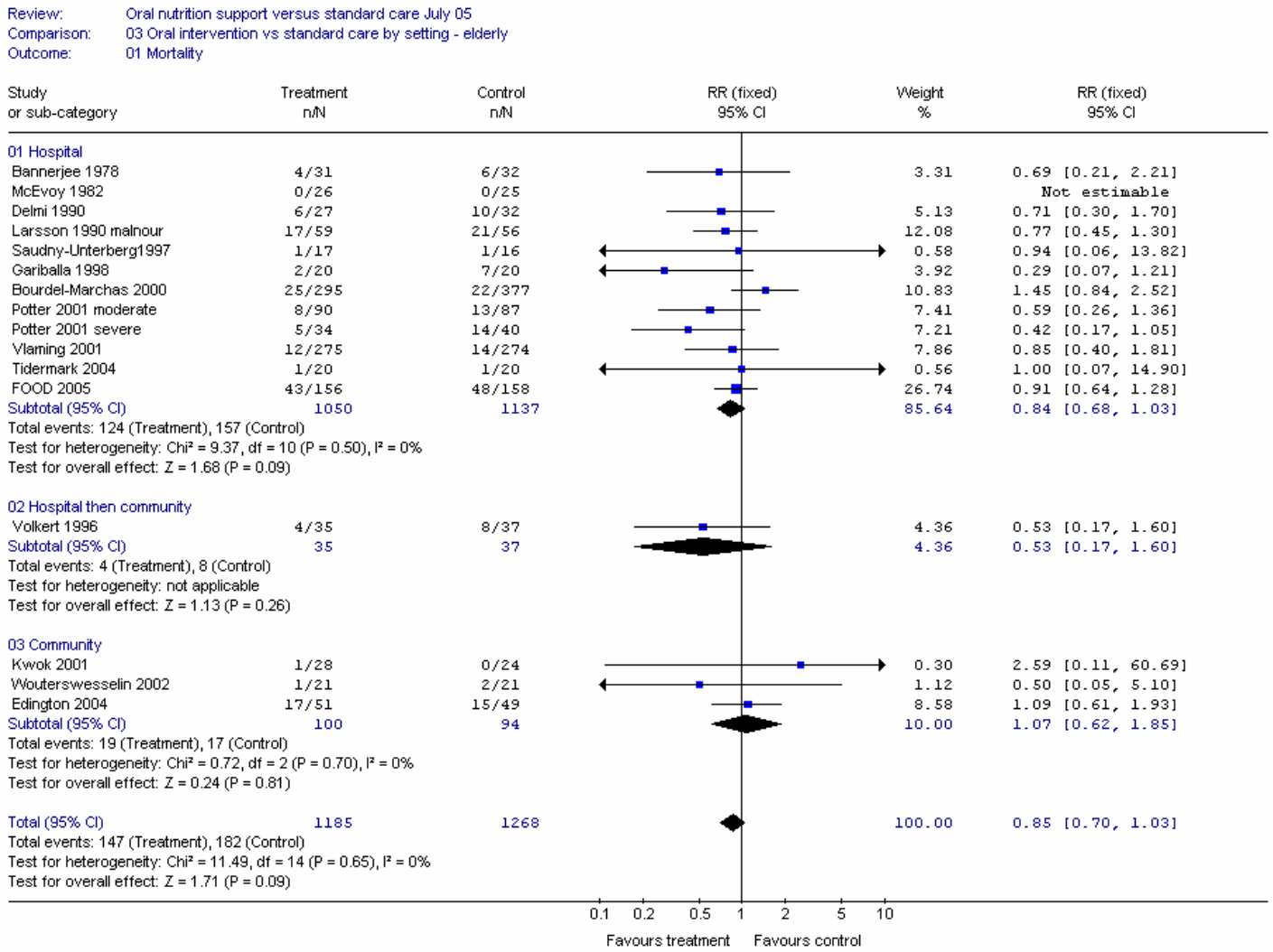


Figure 3: Meta-analysis complications

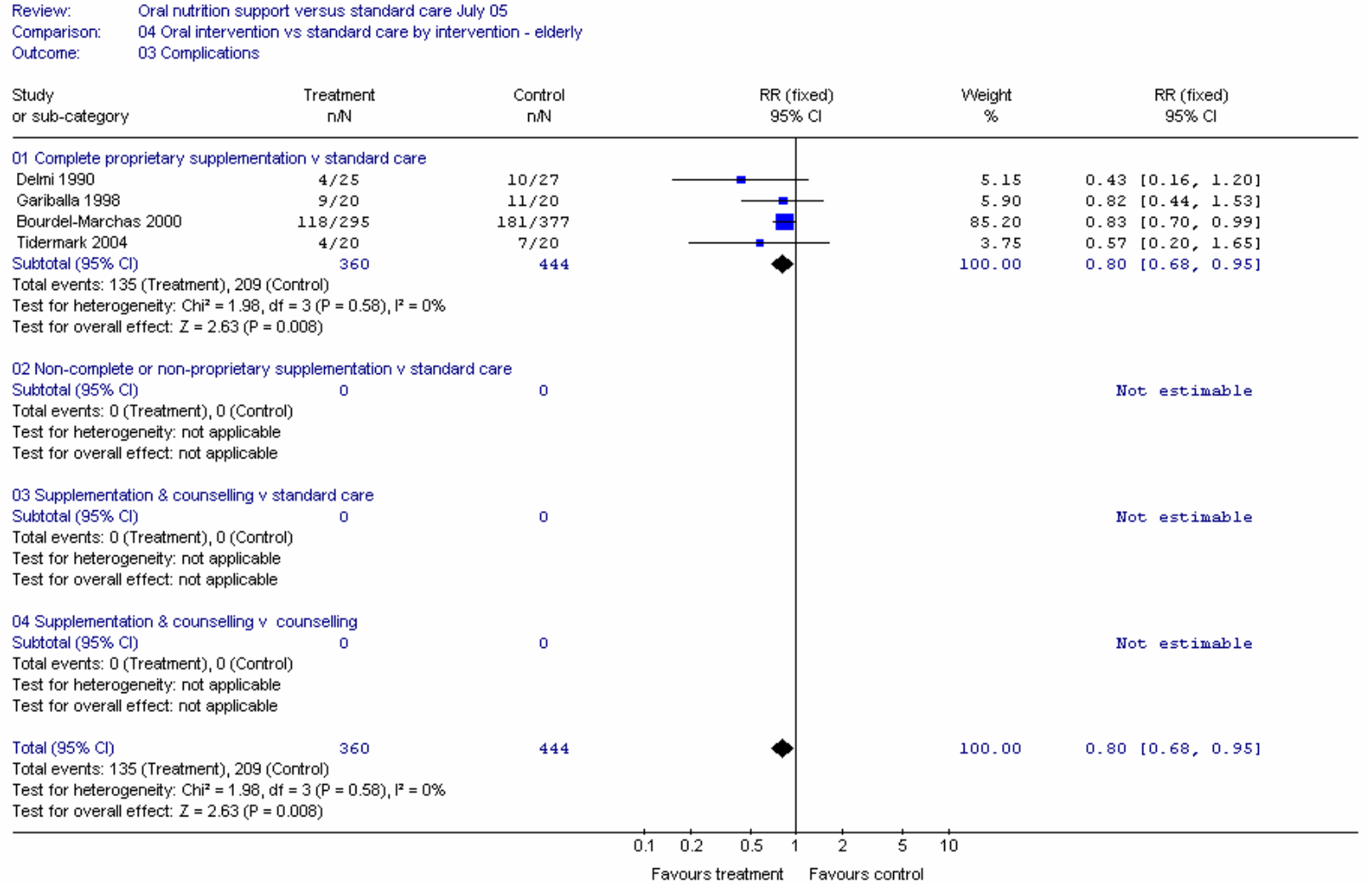


Table 88: Data and assumptions: probabilities and health outcomes

		Base case	Low	High	Source (for full details see text)
Probabilities					
x1	Prevalence of patients at moderate or high risk of malnutrition	44%	30%	65%	Derived from Stratton et al (2004)[337]
x2	Sensitivity of screening tool	100%	66%	100%	Assumed – expert opinion
x3	Specificity of screening tool	100%	94%	100%	Assumed – expert opinion
x4	Sensitivity of Nurse strategy	30%	12%	49%	Derived from Gosney (2003)[132]
x5	Specificity of Nurse strategy	71%	60%	100%	Derived from Gosney (2003)[132]
Health outcomes					
o1	Mortality (daily)	0.00411	0.00028	0.0109	Weighted average of studies in meta-analysis
o2	Relative risk - mortality - malnourished treated	0.84	0.68	1.03	Meta-analysis - see Figure 2
o3	Duration of risk change	64	10	196	Weighted average of studies in meta-analysis
o4	% reverting back to general population mortality	50%	0%	100%	Assumed
	Life expectancy (days) - malnourished and no intervention	979	244	1714	Derived from o1 and o4
	Life expectancy (days) - all other subgroups	1019	253	1786	Derived from o1, o2, o3 and o4
o5	HRQL	0.55	0.5	0.73	Derived from Tidermark et al (2004)[349] and FOOD Trial Collaboration (2005)[344]
o6	HRQL – reduction due to untreated malnutrition	0	0	0.1	Derived from Tidermark et al (2004)[349] and FOOD Trial Collaboration (2005)[344]

Table 89: Decision tree probabilities

	Formula	Base case
p1	(x1.x2)+((1-x3).(1-x1))	44%
p2	(x1.x2)/p1	100%
p3	((1-X2).x1)/(1-p1)	100%
p4	(x1.x4)+((1-x5).(1-x1))	30%
p5	(x4.x1)/p4	45%
p6	((1-x4).x1)/(1-p4)	43%
p7	x1	44%

Table 90: Data and assumptions: resource use

		Base case	Low	High	Source
Screening					
r1	Screen - ward nurse time (mins)	4	2	10	Stratton et al (2004)[337]
Dietetic assessment					
r2	Initial assessment - dietitian time (mins)	30	20	40	Assumed - expert opinion
r3	2nd assessment - dietitian time (mins)	20	10	30	Assumed - expert opinion
r4	follow-up assessment - dietitian (mins/week)	20	10	30	Assumed - expert opinion
r5	Proportion of at risk patients requiring dietetic assessment	50%	40%	65%	Assumed - expert opinion
Intervention					
r6	Oral nutritional supplements per day	2	1	3	Typical of studies in meta analyses
r7	Ward nurse time (mins/day)	20	10	30	Assumed - expert opinion
r8	Proportion of patients given ETF	10%	5%	20%	Assumed - expert opinion
r9	intervention duration (days)	30	14	183	Weighted average of studies in mortality meta-analysis
Hospitalisation					
r10	Proportion of patients discharged to publicly-funded residential care	8%	0%	20%	HES data 2003
r11	Complication rate	47%	35%	55%	Weighted average of studies in meta-analysis
r12	Complications - relative risk	0.80	0.60	0.95	Meta-analysis - see Figure 3

Table 91: Training costs

Base case						**Rypkema et al (2004)[299]**			
	Hours per meeting	**Hours per year**	**Cost per hour**	**Cost per year**			**Hours per year**	**Cost per hour**	**Cost per year**
Consultant	1	4	£ 86	£ 344		MDT meetings	152.6	£ 21	£ 3,175
Dietitian	4	16	£ 34	£ 544		Trainer	8	£ 24	£ 189
Nurse	162	648	£ 21	£ 13,608		Trainees	116	£ 15	£ 1,690
						Nurse in charge			£ 3,121
Total				£ 14,496		**Total**			£ 8,175
Older inpatients patients admitted				6980		**Older inpatients patients in intervention**			140
Cost per patient				£ 2.08		**Cost per patient**			£ 58.39

Table 92: Data and assumptions: unit costs

		Base case	Low	High	Source
c1	Dietitian time (£ per min)	£ 0.57	£ 0.20	£ 0.62	Curtis and Netten (2004)[72]
c2	Ward nurse time (£ per min)	£ 0.35	£ 0.20	£ 0.62	Curtis and Netten (2004)[72]
c3	Oral nutritional supplement (retail price)	£ 0.20	£ 0.20	£ 1.54	Elia et al (2005)[91], BNF (2004)[171]
c4	ETF (per day)	£ 5.87	£ 1.50	£ 11.61	BAPEN report[91], Kennedy and Nightingale[182], J Prickett - unpublished data
c5	Residential care (per day) LA	£ 92.14	£ 48.71	£ 166.00	Curtis and Netten (2004)[72]
c6	Screening - average fixed costs (training)	£ 2.08	£ -	£ 58.39	Assumed - expert opinion – See Table 91
c7	Complication cost	£ 1,693.00	£ 699.00	£ 2,090.00	NHS Reference costs 2004[250] – HRG=S19 (n=3750 finished consultant episodes)

Table 93: Programme unit costs

	Nurse time		Dietitian time		Cost	
	each	Per stay	each	Per stay	each	Per stay
Screening (weekly)	4	21	0	0	£ 1.88	£ 9.53
Assessment (not recurring)	0	0	68	68	£ 77.36	£ 38.68
Intervention (daily)	20	606	0	0	£ 7.95	£240.63

Table 94: Base case analysis: process outcomes

	Screen	Nurse	Don't treat
Nurse time (hours per patient)	4.8	3.0	0
Dietitian time (hours per patient)	0.5	0.3	0

Table 95: Base case analysis: main outcomes

	Screen	Nurse	Don't treat		Screen vs. Nurse	Screen vs. Don't treat
Screening (£)	10	0	0		10	10
Dietitian (£)	17	11	0		6	17
Intervention - Nurse (£)	93	63	0		31	93
Intervention - Feed (£)	13	8	0		4	13
Complications (£)	-87	-26	0		-60	-87
Total hospital cost (£)	0	0	0		0	0
Residential care (£)	**46**	**56**	**0**		**-10**	**46**
Total cost (£)	131	40	0		91	131
	177	**96**	**0**		**81**	**177**
Complications averted						
Life expectancy (days)	0.041	0.013	0.000		0.029	0.041
Quality-adjusted life days	1019	1007	1002		12.3	17.7
QALYs	**560.6**	**553.8**	**550.9**		**6.8**	**9.8**
	1.536	1.517	1.509		0.0186	0.0267
Incremental (total) cost per QALY gained (£)					**4,339**	**6,608**

Table 96: One-way sensitivity analyses (Probabilities and health outcomes): incremental cost per QALY gained

		Low		High	
		Screen vs. Nurse	**Screen vs. Don't Treat**	**Screen vs. Nurse**	**Screen vs. Don't Treat**
Probabilities					
x1	Prevalence of patients at moderate or high risk of malnutrition	3,173	7,390	6,188	7,109
x2	sensitivity of screening tool	3,127	7,408	N/A	N/A
x3	specificity of screening tool	5,460	7,575	N/A	N/A
x4	sensitivity of Nurse strategy	5,362	N/A	4,247	N/A
x5	specificity of Nurse strategy	3,982	N/A	7,380	N/A
Health outcomes					
o1	Mortality (daily)	5,455	25,726	4,929	6,276
o2	Relative risk - mortality - malnourished treated	4,923	6,034	4,548	Don't treat dominates
o3	Duration of risk change	5,222	17,109	4,924	6,075
	Mortality rate reverts to population rate after follow-up period	5,168	15,119	4,928	6,208
o4	HRQL	5,450	7,946	3,733	5,443
o5	HRQL – reduction due to untreated malnutrition	N/A	N/A	915	1,333

Table 97: One-way sensitivity analyses (Resource use): incremental cost per QALY gained

		Low		High	
		Screen vs. Nurse	Screen vs. Don't Treat	Screen vs. Nurse	Screen vs. Don't Treat
Screening					
r1	Screen - ward nurse time (mins)	4,754	7,084	5,557	7,643
Dietetic assessment					
r2	Initial assessment - dietitian time (mins)	4,933	7,177	4,977	7,271
r3	2nd assessment - dietitian time (mins)	4,933	7,177	4,977	7,271
r4	follow-up assessment - dietitian (mins/week)	4,859	7,022	5,050	7,426
r5	Proportion of at risk patients requiring dietetic assessment	4,895	7,096	5,045	7,415
Intervention					
r7	administer supplement - ward nurse time (mins)	4,130	5,478	4,339	6,608
r8	Proportion of patients given ETF	4,890	7,087	5,084	7,497
r9	intervention duration (days)	3,670	4,754	17,013	30,393
Hospitalisation					
r10	Proportion of patients discharged to publicly-funded care homes	63	2,332	12,293	14,562
r11	Complication rate	5,628	7,897	4,513	6,782
r12	Complications - relative risk	3,380	5,649	6,924	9,193

Table 98: One-way sensitivity analyses (Unit costs): incremental cost per QALY gained

		Low		High	
		Screen vs. Nurse	**Screen vs. Don't Treat**	**Screen vs. Nurse**	**Screen vs. Don't Treat**
c1	Dietitian time (£ per min)	4,760	6,812	4,983	7,284
c2	Ward nurse time (£ per min)	4,076	5,608	6,538	10,132
c3	Oral nutritional supplement (retail price)	N/A	N/A	5,524	8,427
c4	ETF (per day)	4,852	7,006	5,090	7,510
c5	Residential care (per day) LA	2,649	4,918	8,876	11,145
c6	Screening - average fixed costs (training)	4,843	7,146	7,985	9,332
c7	Complication cost	6,496	8,765	4,339	6,608

Table 99: Studies of oral nutritional supplements versus standard care included in the meta-analyses for the cost-effectiveness model

Study		Subgroup	Disease	% Female	Mean age	Intervention	Intervention Daily kCal	Outcomes	Mean intervention duration: days	Mean study duration : days
Bannerjee	1978		long term geriatrics	68	81	Complan	265	Mortality	98	196
Bourdel-marchasson	2000		'critically' ill	68	84	2x oral supplements 200 ml	200	Mortality, complications	15	15
Delmi	1990		hip fracture	89	82	'Supplement'	254	Mortality, complications	32	183
Food Trial	2005	Malnourished	stroke	46	71	1x oral protein energy supplements 360ml	N/R	Mortality	16	183
Gariballa	1998		stroke	52	79	2x Fortisip 400 ml	600	Mortality, complications	24	84
Larsson	1990	Malnourished	long term geriatrics	N/R	80	2x biosorb drink	200	Mortality	183	183
McEvoy	1982		acutely ill	N/R	N/R	2x sachet build-up	644	Mortality	28	28
Potter	2001	Malnourished	various / not specified		83	3x Entera Frusenius 120 ml	540	Mortality	17	17
Saudney-Unterberg	1997		acutely ill	38	69	Ensure plus	N/R	Mortality	10	14
Tidermark	2004		hip fracture	100	83	1x Fortimel 200 ml		Mortality, complications	183	183
Vlaming	2001		acutely ill	43	67	2x sip feed & multivitamin 400 ml	600	Mortality	14	25

Table 100: Cost-effectiveness (cost per QALY gained) of screening inpatients, by malnutrition risk and baseline mortality

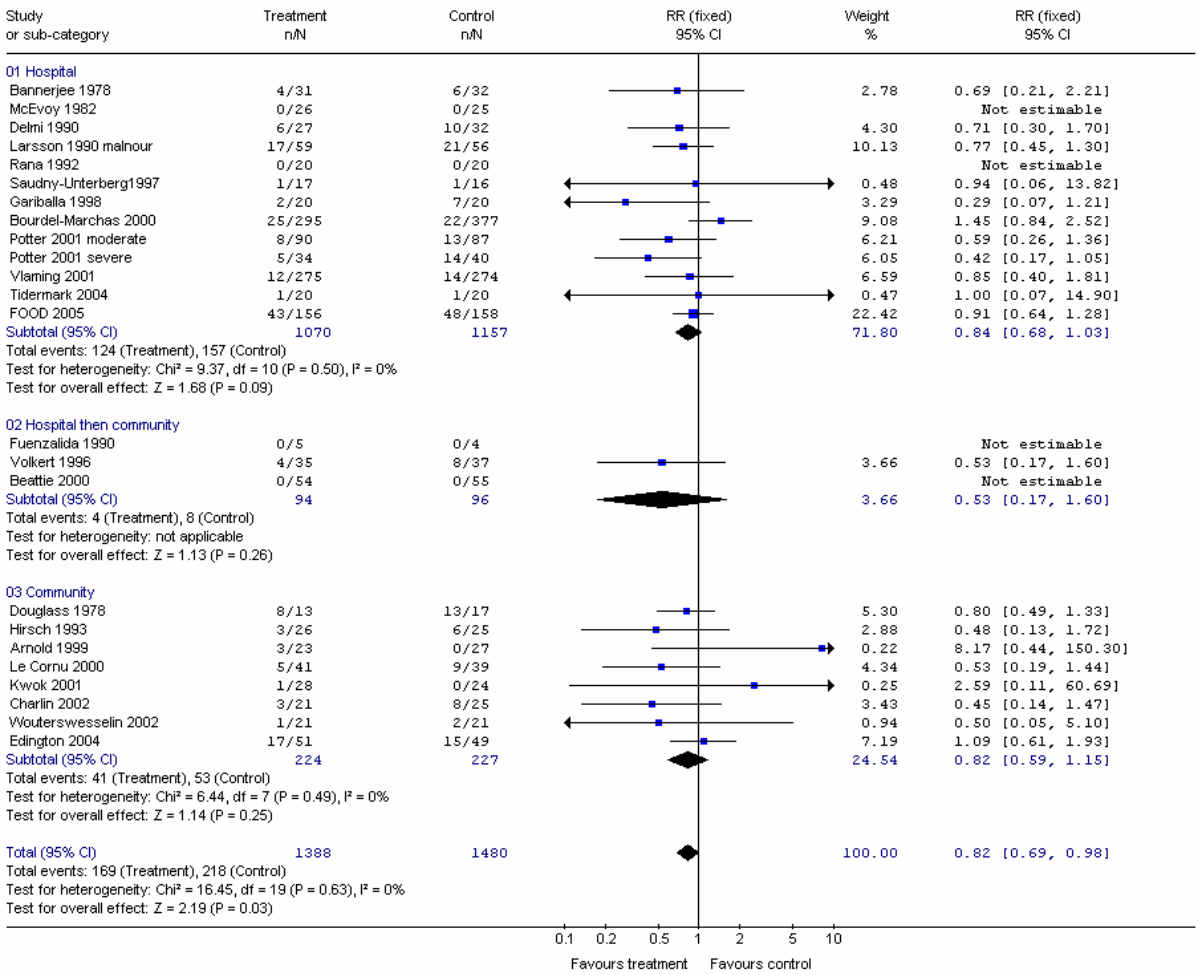
Patients at moderate or high malnutrition risk	All-cause mortality in 60 days from admission								
	1.0%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%	4.5%	5.0%
1%	65,300	44,400	33,900	27,600	23,400	20,400	18,200	16,400	15,000
2%	37,800	26,000	20,000	16,500	14,100	12,500	11,200	10,200	9,400
3%	28,600	19,800	15,400	12,800	11,100	9,800	8,900	8,100	7,500
4%	24,000	16,800	13,100	11,000	9,500	8,500	7,700	7,100	6,600
5%	21,200	14,900	11,700	9,800	8,600	7,700	7,000	6,500	6,100
6%	19,400	13,700	10,800	9,100	8,000	7,100	6,500	6,100	5,700
7%	18,100	12,800	10,200	8,600	7,500	6,800	6,200	5,800	5,400
8%	17,100	12,200	9,700	8,200	7,200	6,500	6,000	5,500	5,200

Appendix Six: Meta-Analyses Oral versus Standard Care

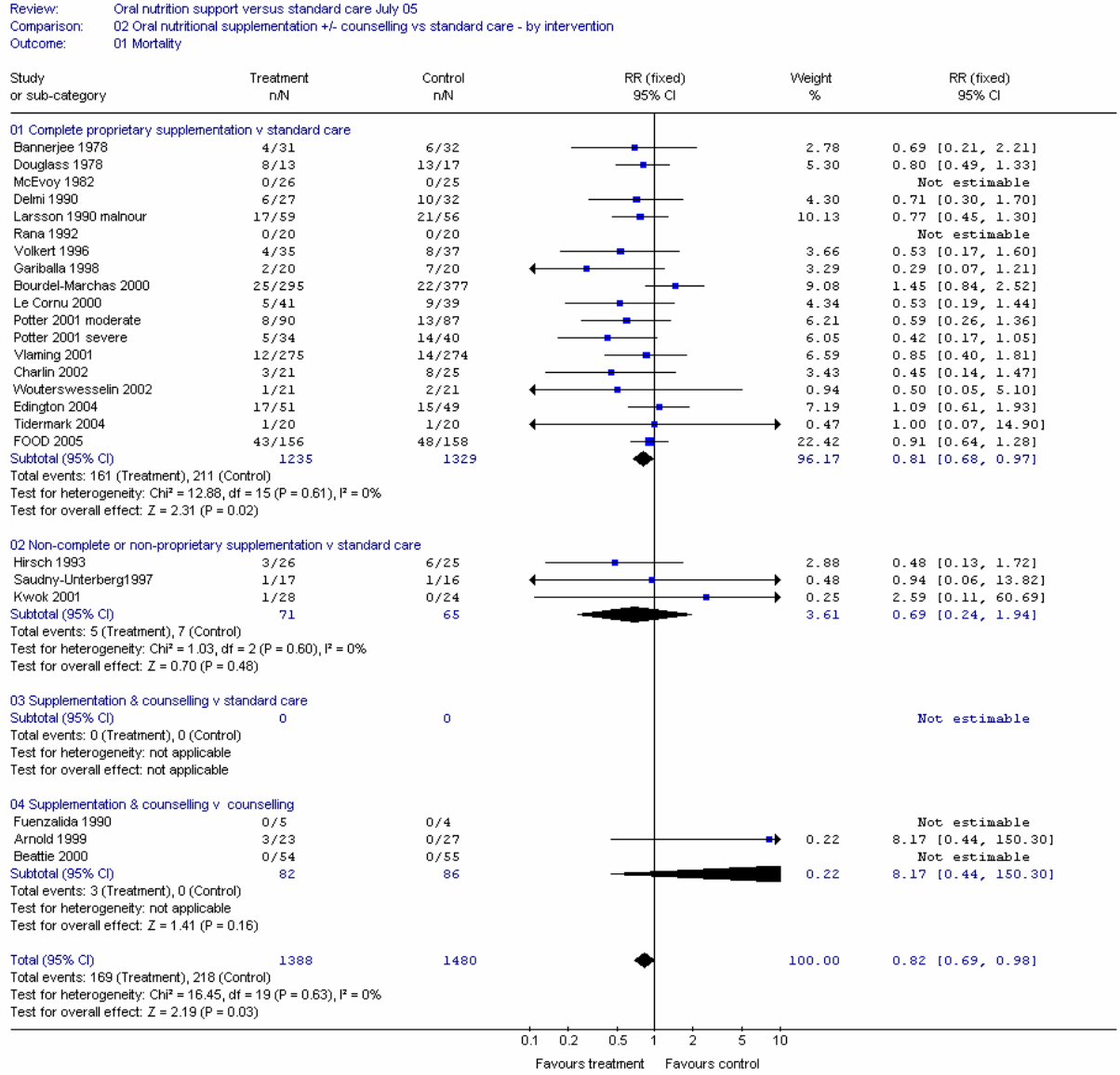
Oral versus standard care forest plots for malnourished patients or patients at risk of malnutrition (all patients)

Oral vs standard care (all patients): mortality by setting

Review: Oral nutrition support versus standard care July 05
Comparison: 01 Oral nutritional supplementation +/- counselling vs standard care - by setting
Outcome: 01 Mortality

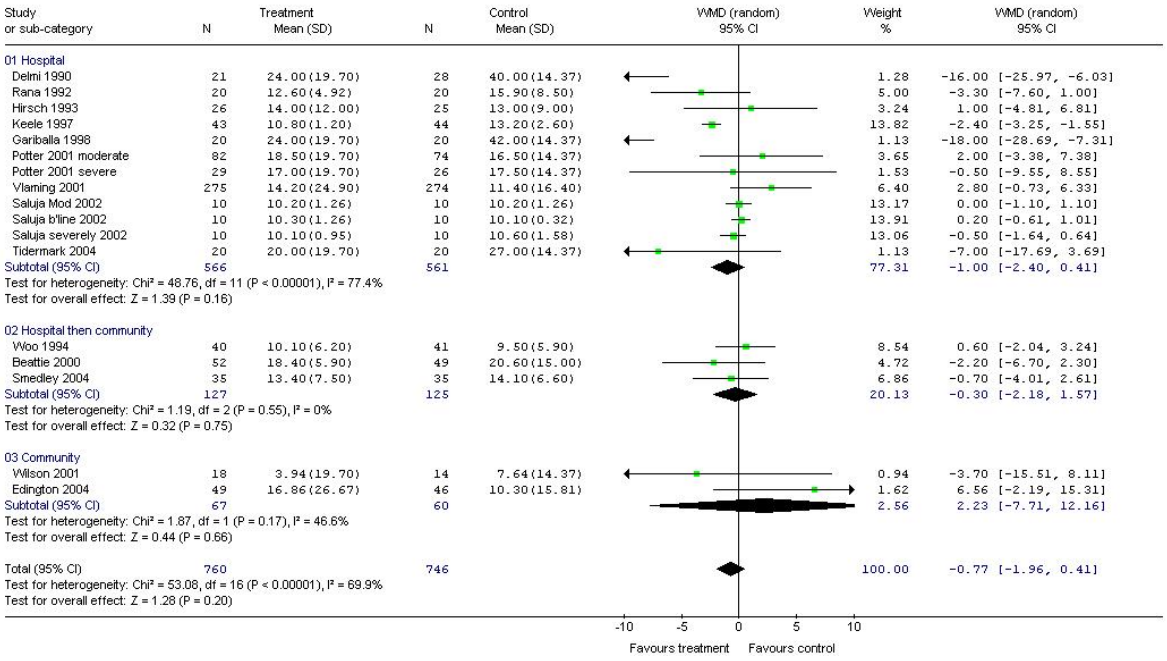


Oral vs standard care (all patients): mortality by intervention



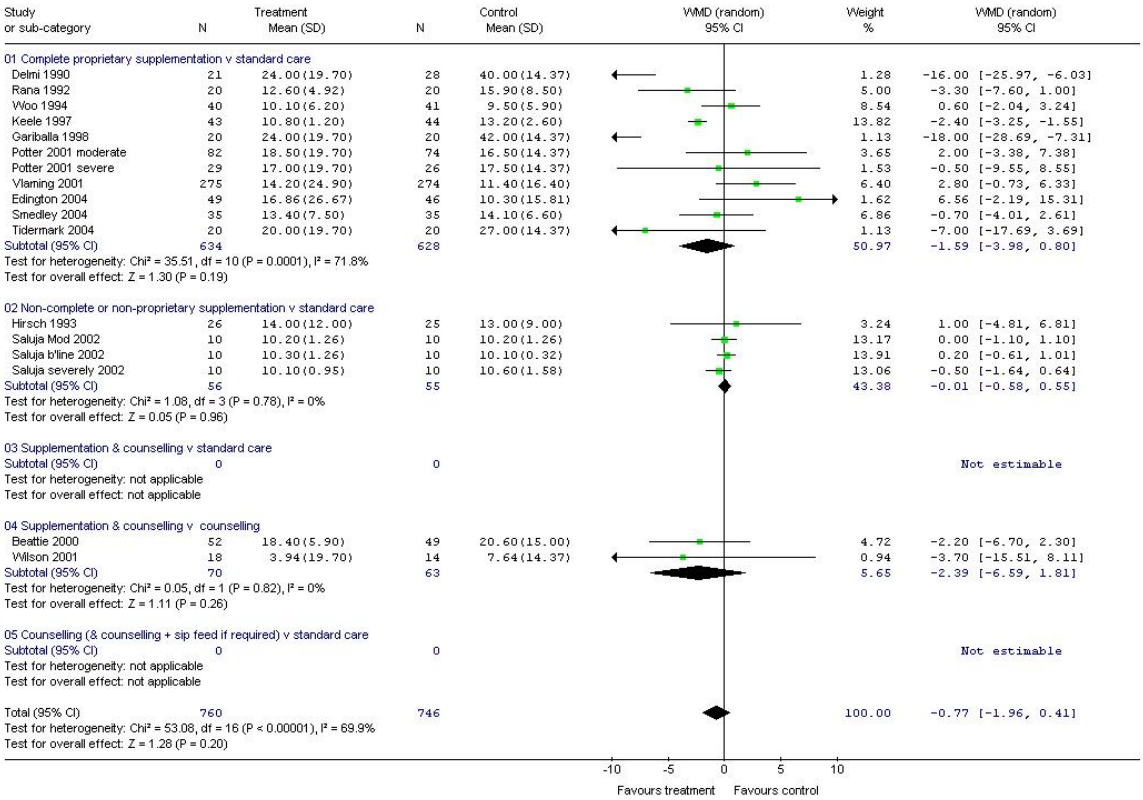
Oral vs standard care (all patients): length of stay by setting

Review: Oral nutrition support versus standard care July 05
Comparison: 01 Oral nutritional supplementation +/- counselling vs standard care - by setting
Outcome: 02 Length of stay



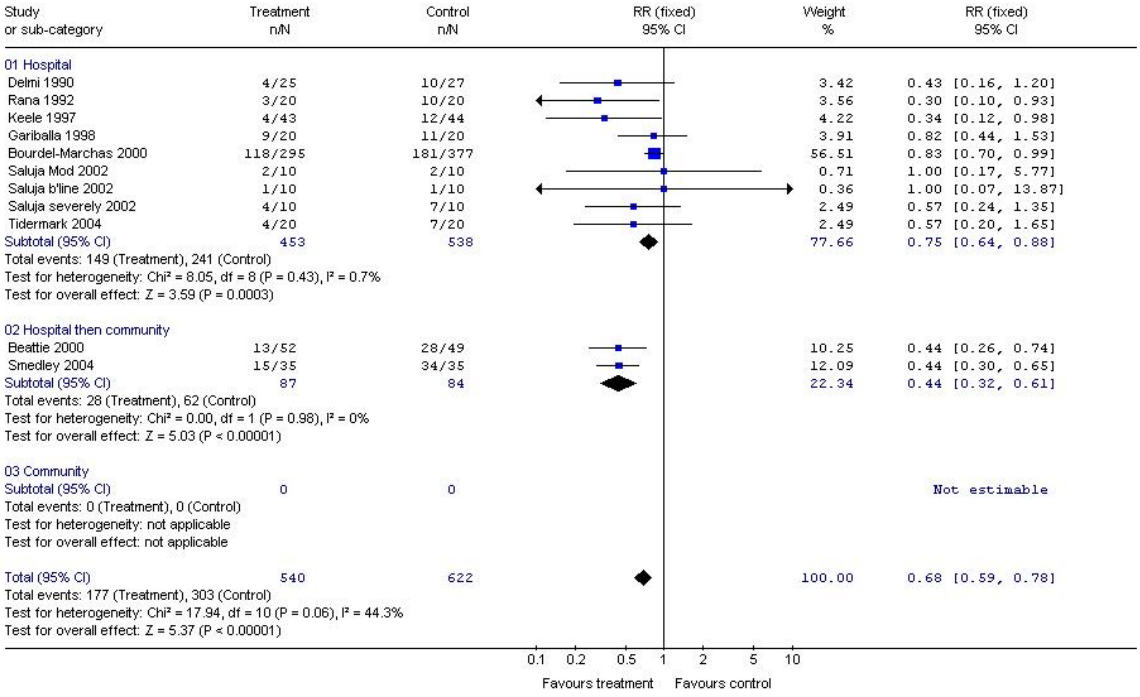
Oral vs standard care (all patients): length of stay by intervention

Review: Oral nutrition support versus standard care July 05
Comparison: 02 Oral nutritional supplementation +/- counselling vs standard care - by intervention
Outcome: 02 Length of stay



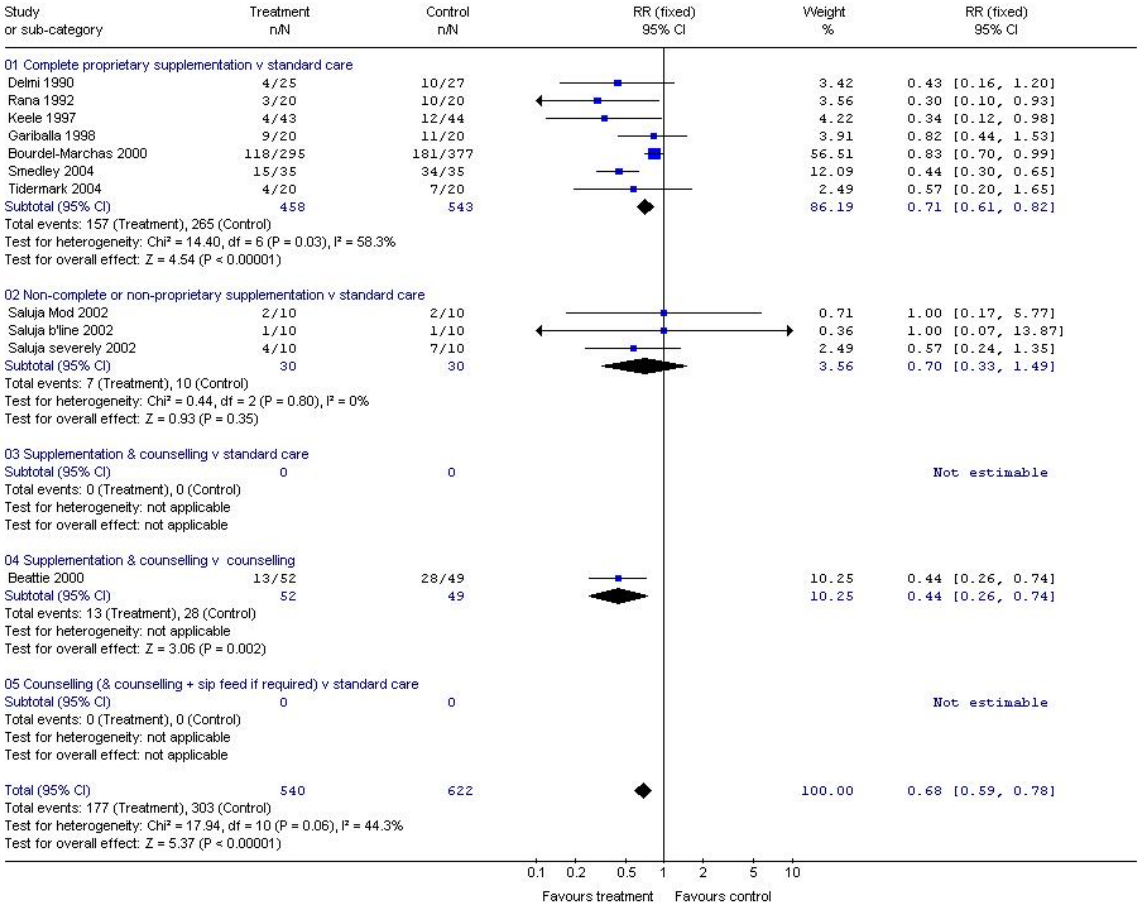
Oral vs standard care (all patients): complications by setting

Review: Oral nutrition support versus standard care July 05
Comparison: 01 Oral nutritional supplementation +/- counselling vs standard care - by setting
Outcome: 03 Complications



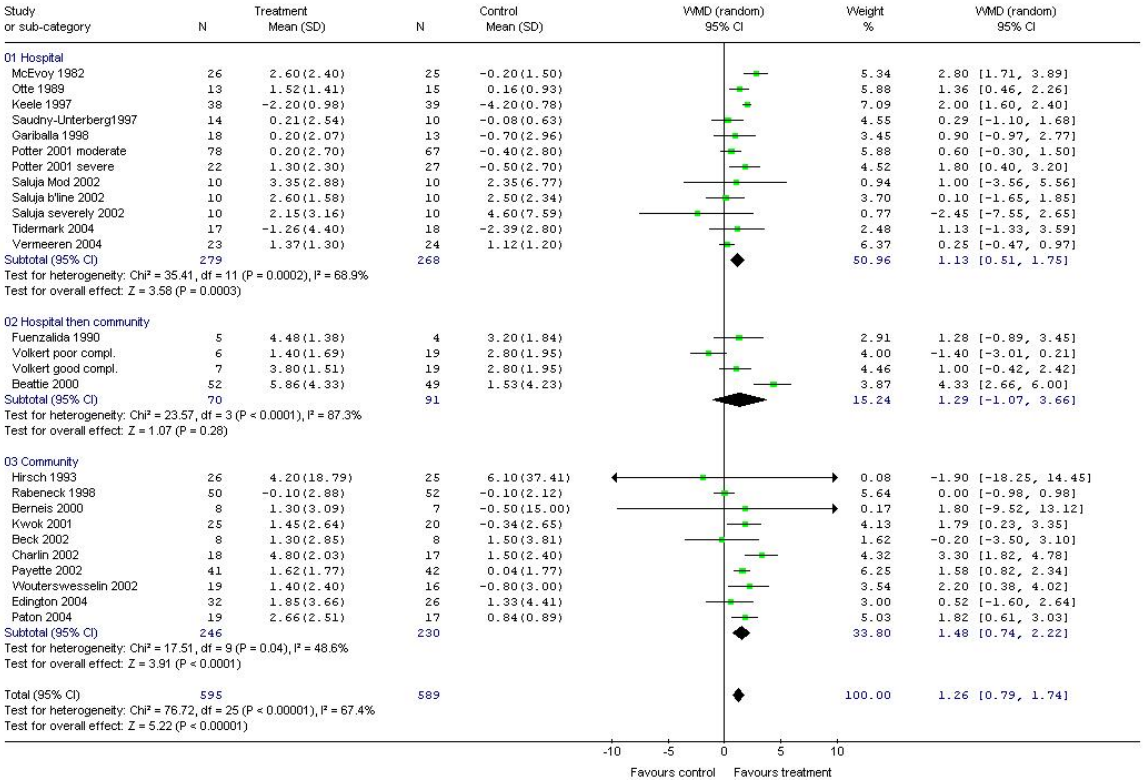
Oral vs standard care (all patients): complications by intervention

Review: Oral nutrition support versus standard care July 05
Comparison: 02 Oral nutritional supplementation +/- counselling vs standard care - by intervention
Outcome: 03 Complications



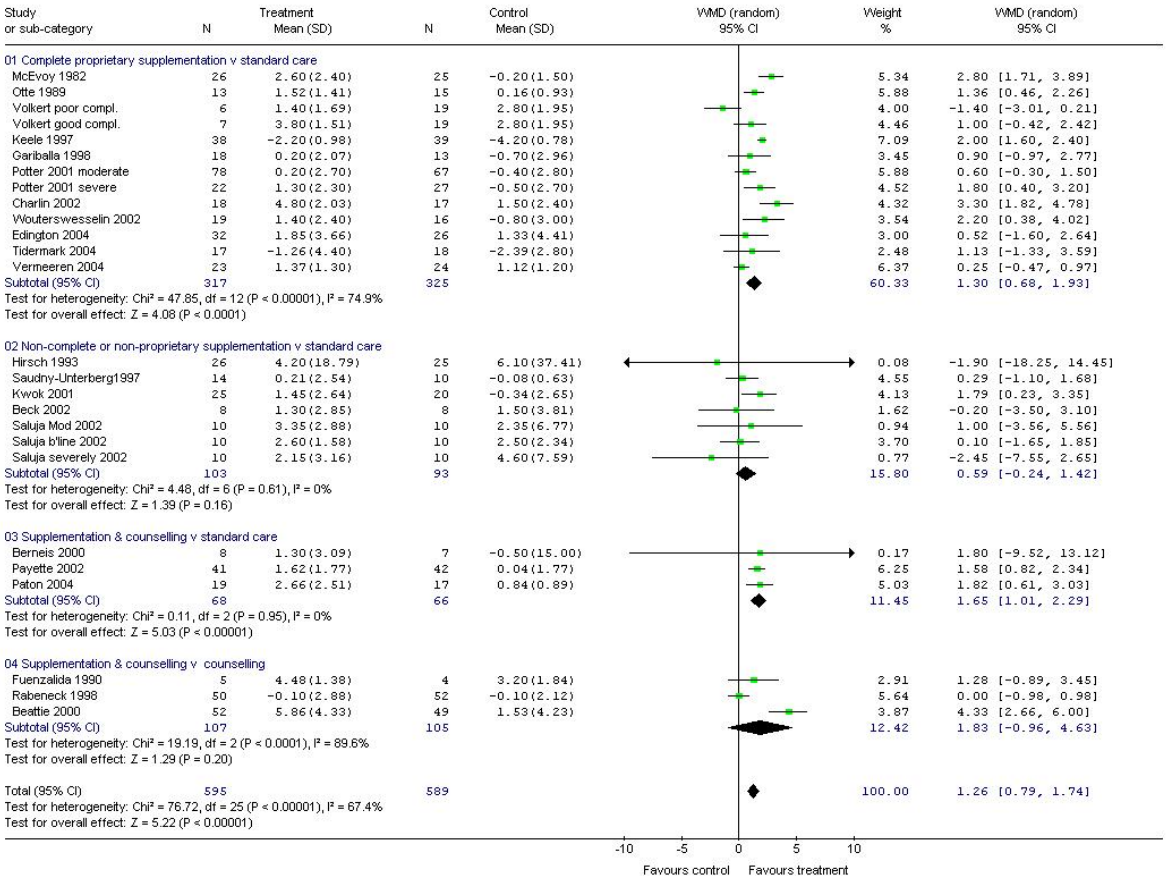
Oral vs standard care (all patients): weight change by setting

Review: Oral nutrition support versus standard care July 05
Comparison: 01 Oral nutritional supplementation +/- counselling vs standard care - by setting
Outcome: 04 Weight change



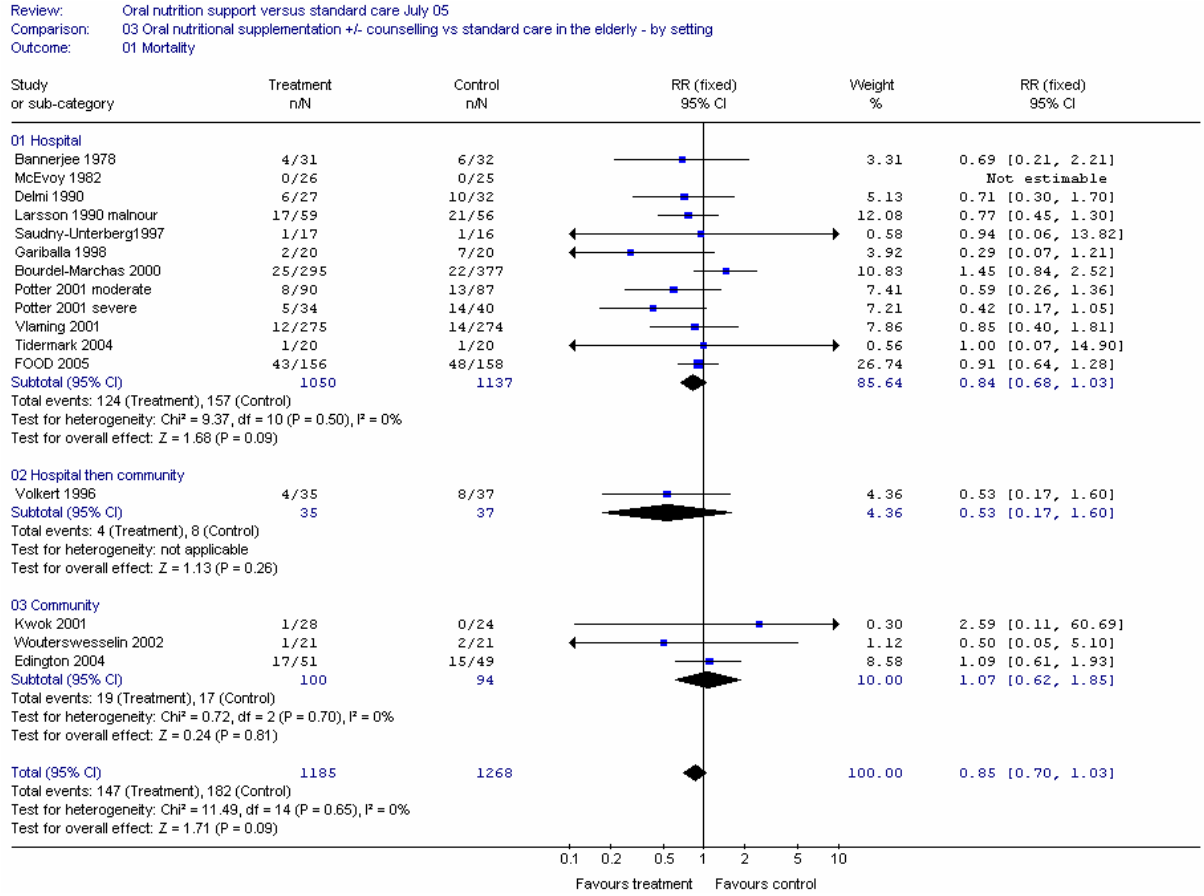
Oral vs standard care (all patients): weight change by intervention

Review: Oral nutrition support versus standard care July 05
Comparison: 02 Oral nutritional supplementation +/- counselling vs standard care - by intervention
Outcome: 04 Weight change

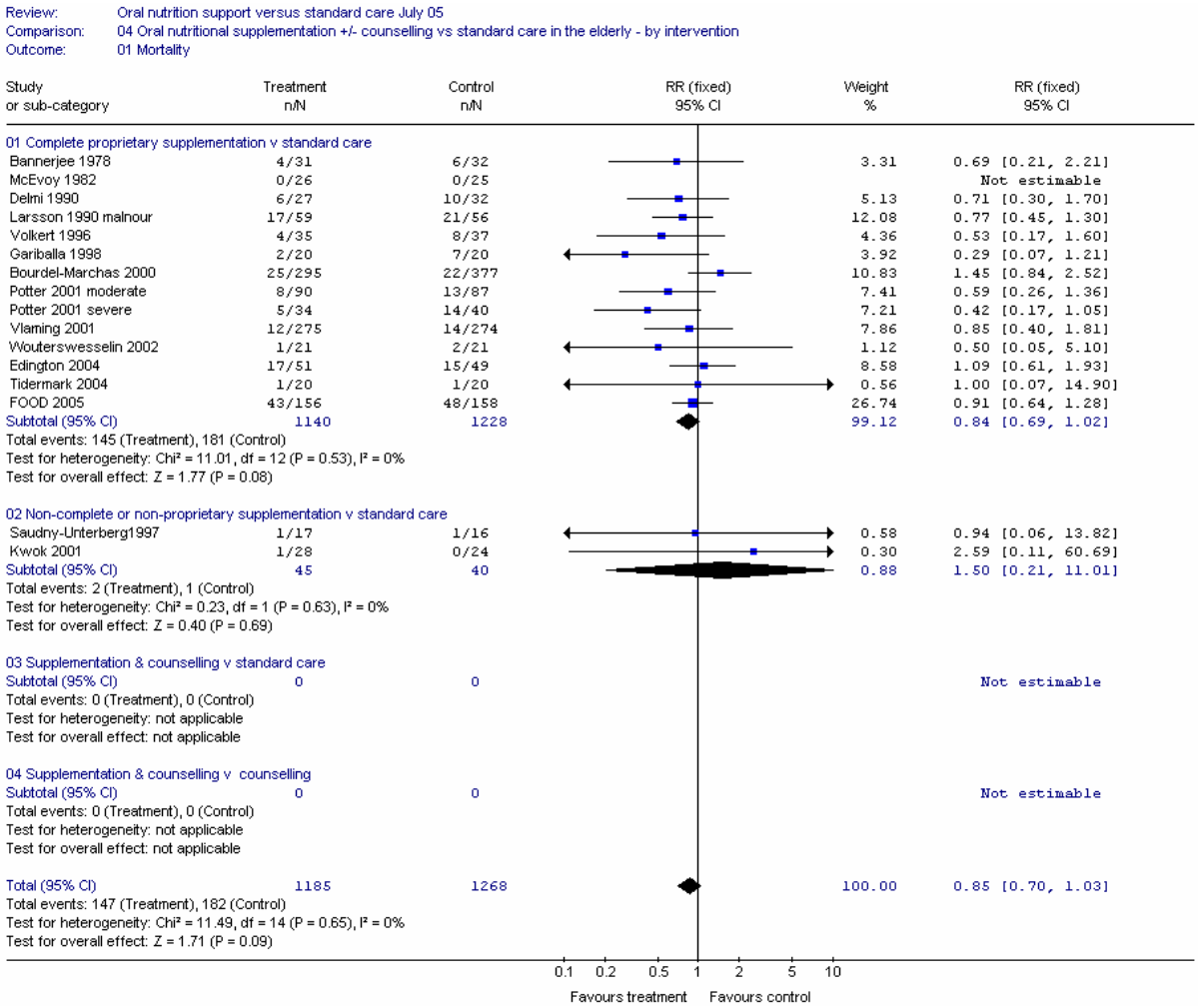


Oral versus standard care forest plots for malnourished patients or patients at risk of malnutrition (older people)

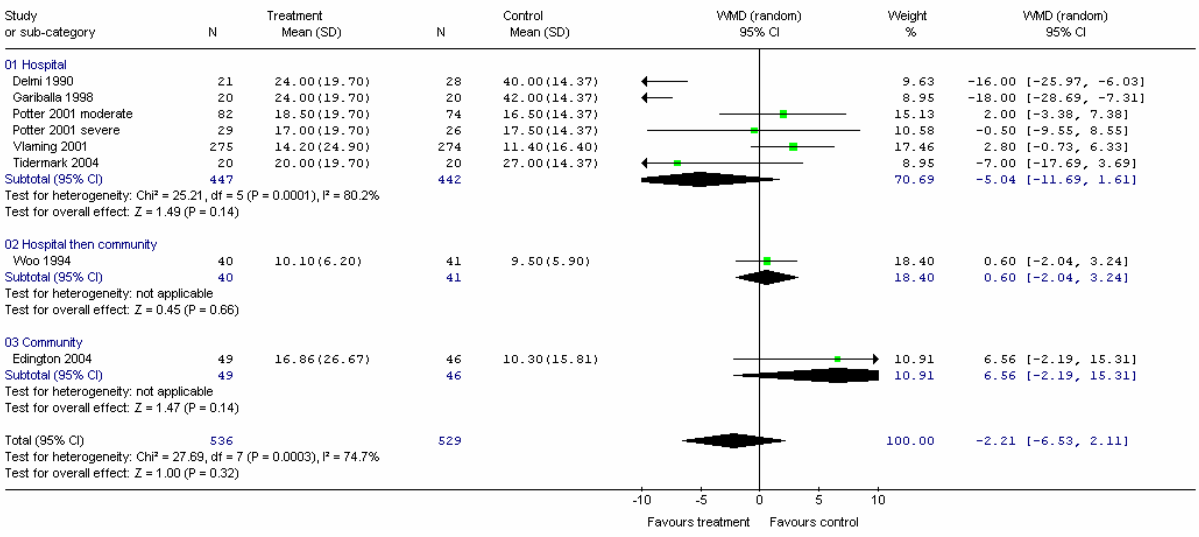
Oral vs standard care (elderly patients): mortality by setting



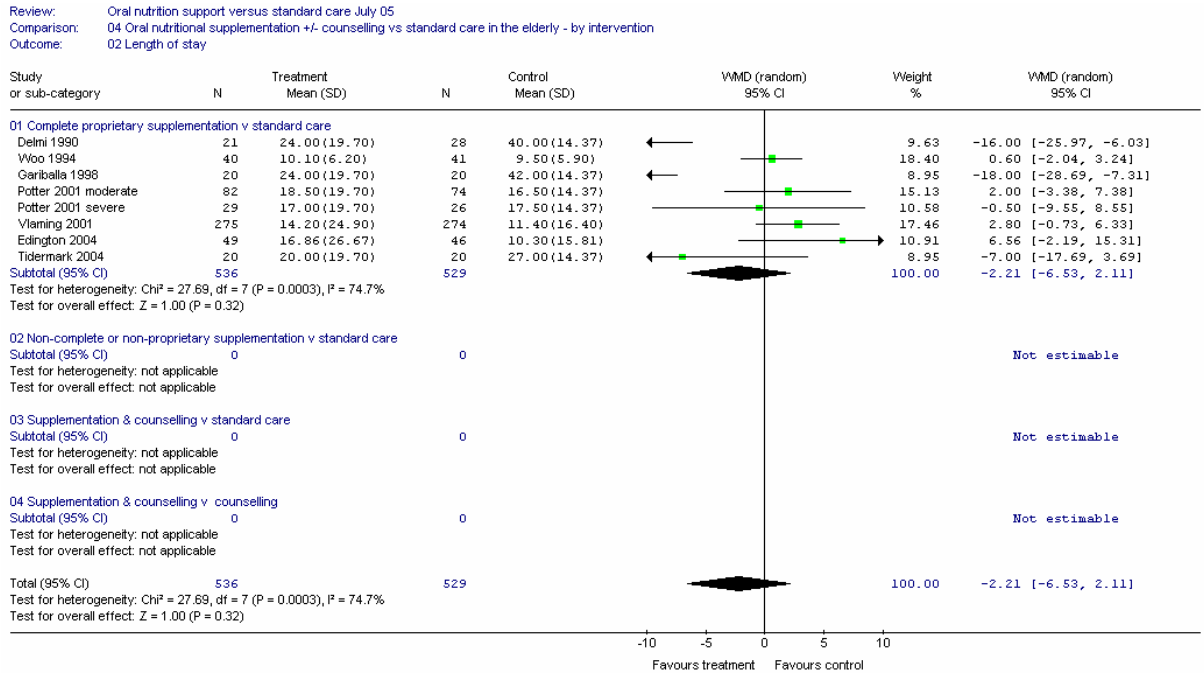
Oral vs standard care (elderly patients): mortality by intervention



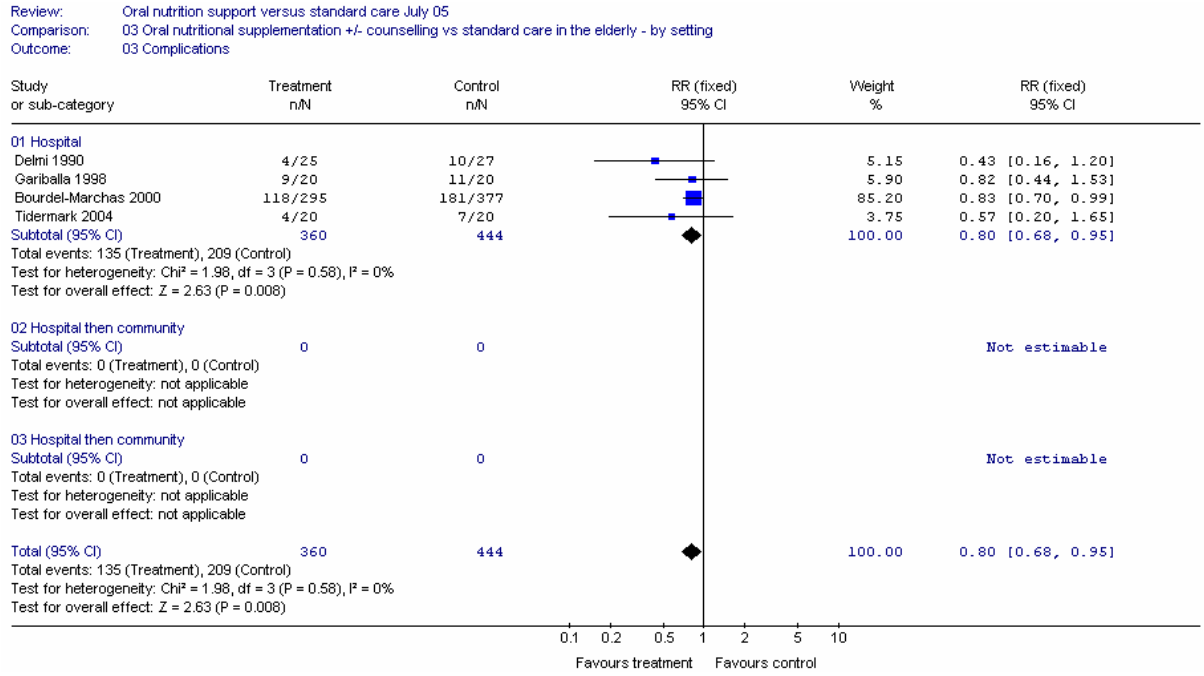
Oral vs standard care (elderly patients): length of stay by setting



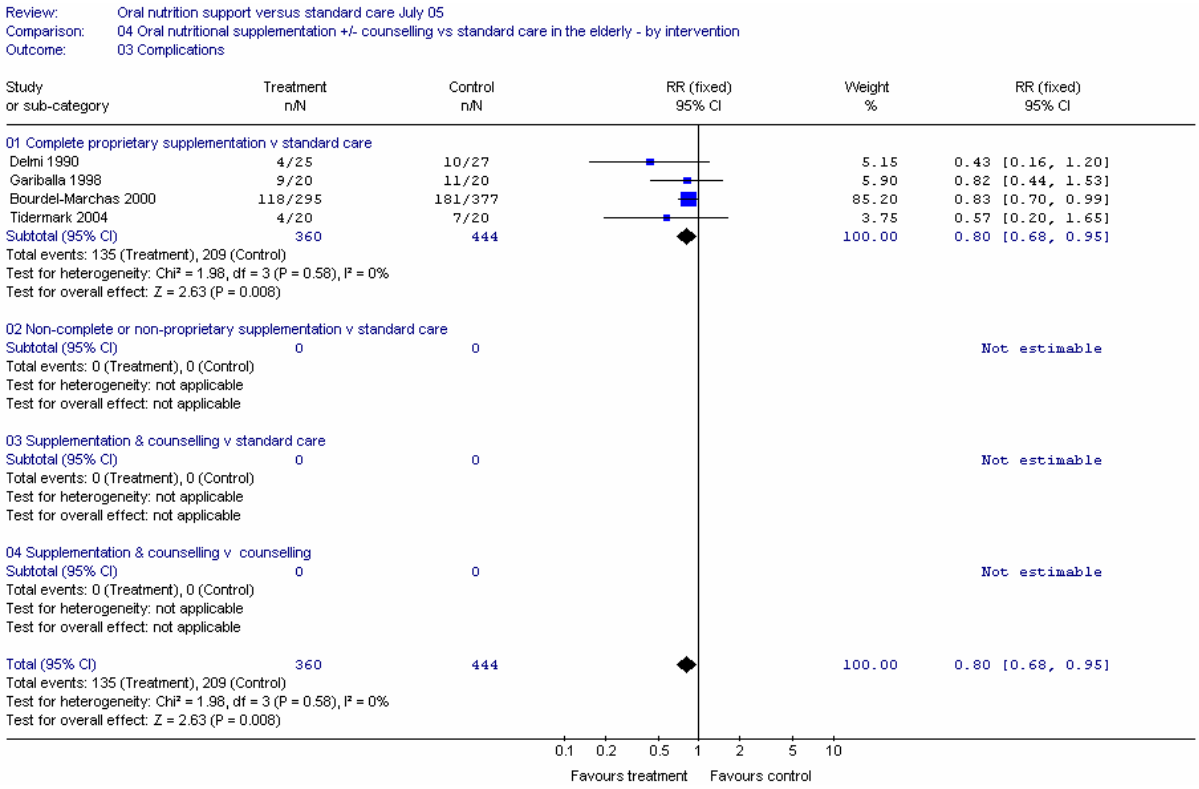
Oral vs standard care (elderly patients): length of stay by intervention



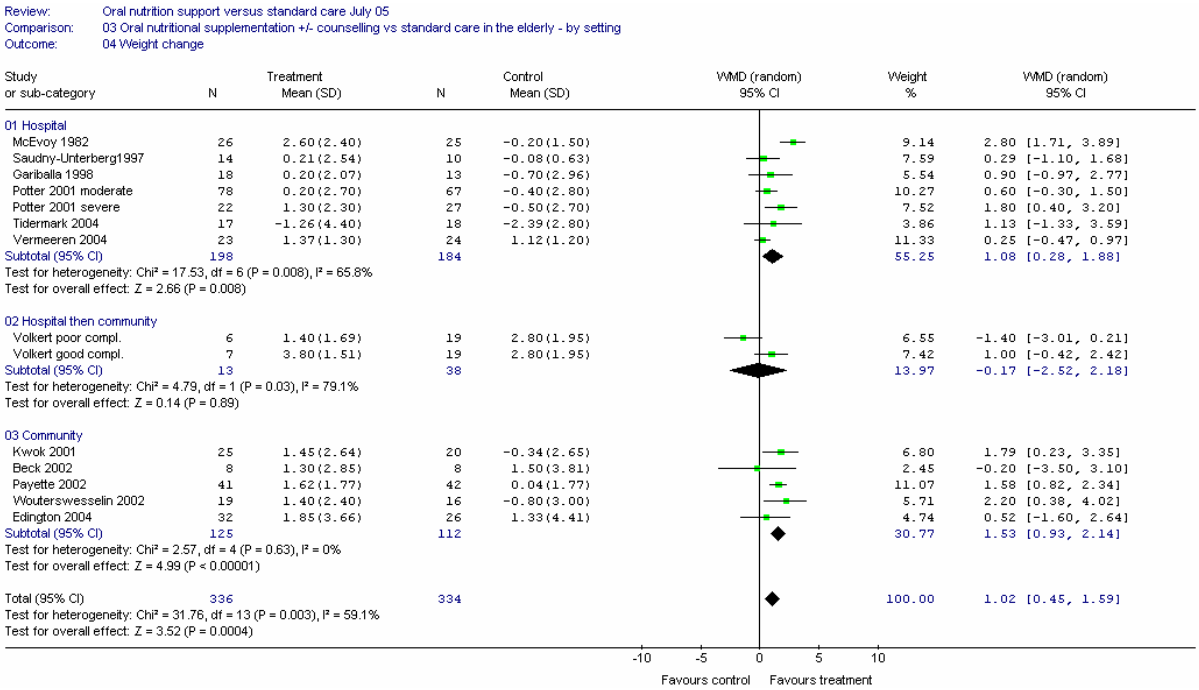
Oral vs standard care (elderly patients): complications by setting



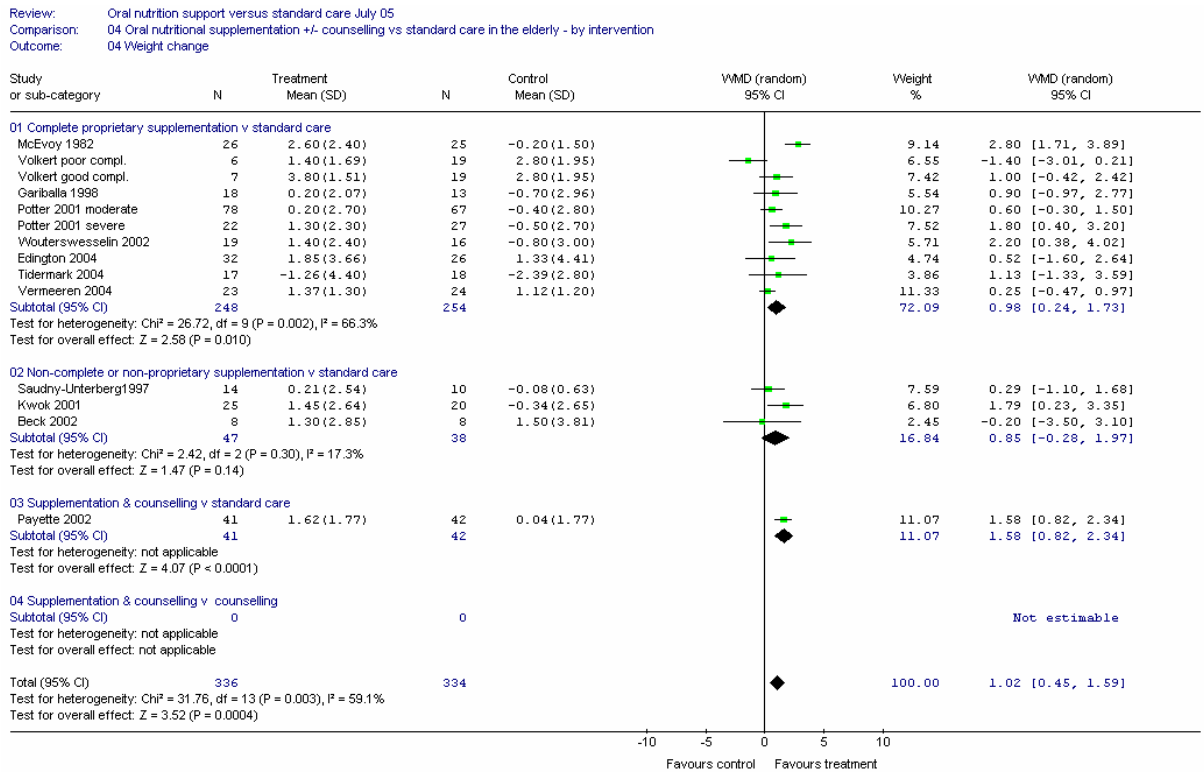
Oral vs standard care – elderly patients, complications by intervention



Oral vs standard care (elderly patients): weight change by setting



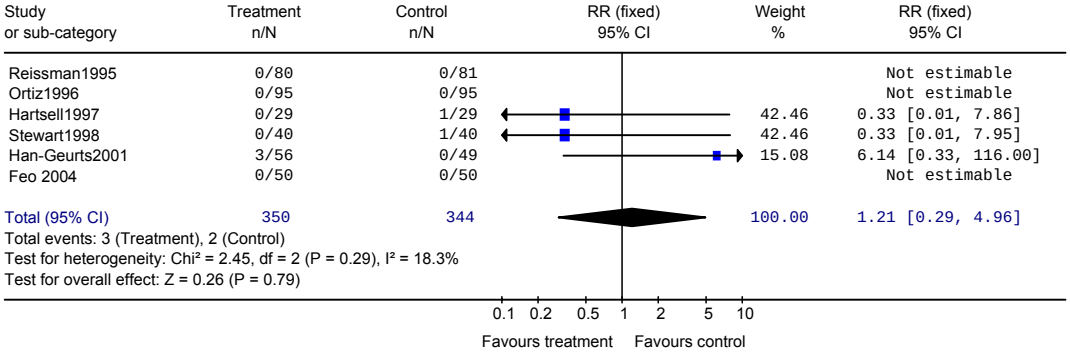
Oral vs standard care (elderly patients): weight change by intervention



Appendix Seven: Meta-Analyses Oral versus Nil Post Operative Nutrition Support

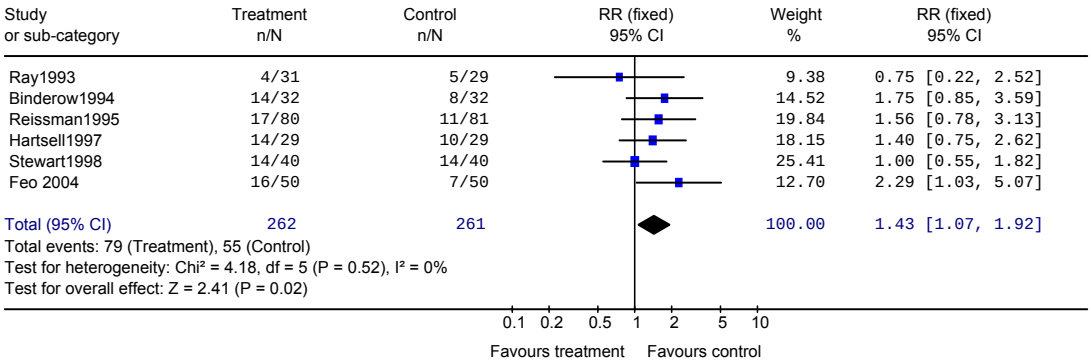
Oral versus Nil: Death

Review: Early feeding versus nil by mouth
Comparison: 17 Early oral feeding versus nil by mouth all GI surgery and general laparotomy
Outcome: 04 Death

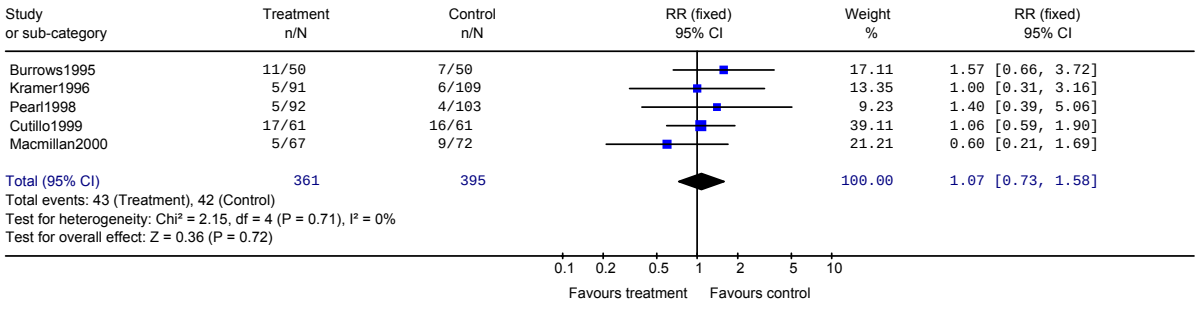


Oral versus Nil: Vomiting

Review: Early feeding versus nil by mouth
Comparison: 17 Early oral feeding versus nil by mouth all GI surgery and general laparotomy
Outcome: 01 Vomiting

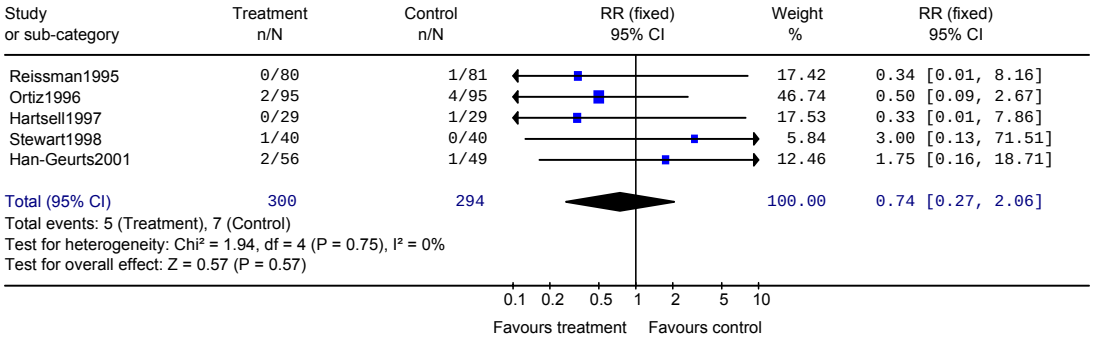


Review: Early feeding versus nil by mouth
Comparison: 15 Early oral feeding versus nil by mouth caesarean and gynaecological
Outcome: 01 Vomiting

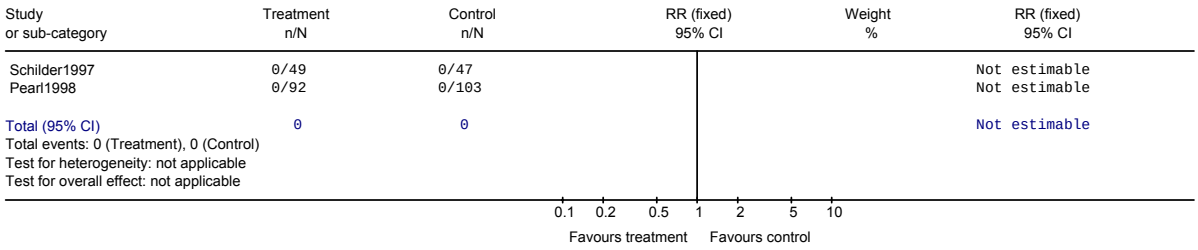


Oral versus Nil: Anastomotic Dehiscence

Review: Early feeding versus nil by mouth
Comparison: 17 Early oral feeding versus nil by mouth all GI surgery and general laparotomy
Outcome: 02 Anastomotic deshicence

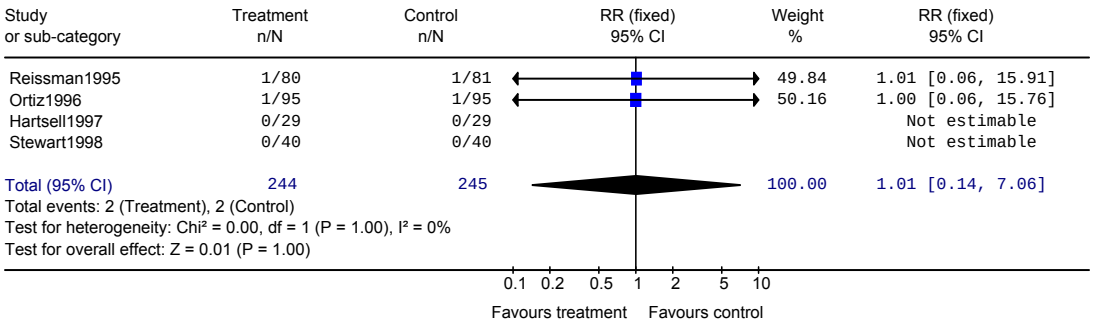


Review: Early feeding versus nil by mouth
Comparison: 15 Early oral feeding versus nil by mouth caesarean and gynaecological
Outcome: 03 Anastomotic deshicence



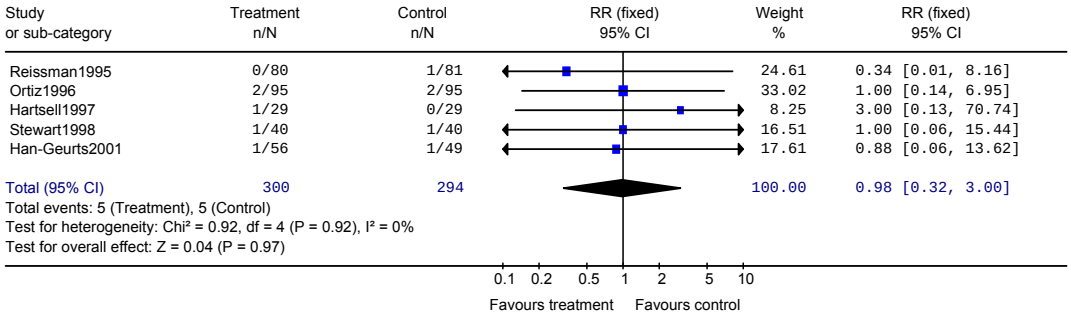
Oral versus Nil: Intra- Abdominal Abscess

Review: Early feeding versus nil by mouth
Comparison: 17 Early oral feeding versus nil by mouth all GI surgery and general laparotomy
Outcome: 05 Intra-abdominal abscess

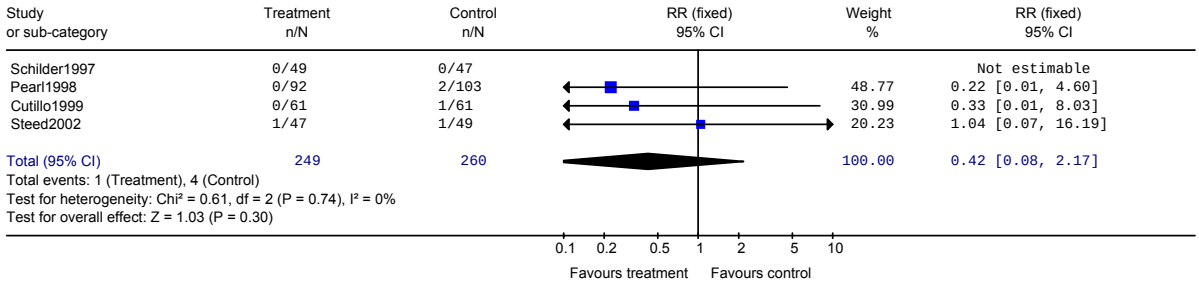


Oral versus Nil: Pneumonia

Review: Early feeding versus nil by mouth
Comparison: 17 Early oral feeding versus nil by mouth all GI surgery and general laparotomy
Outcome: 03 Pneumonia

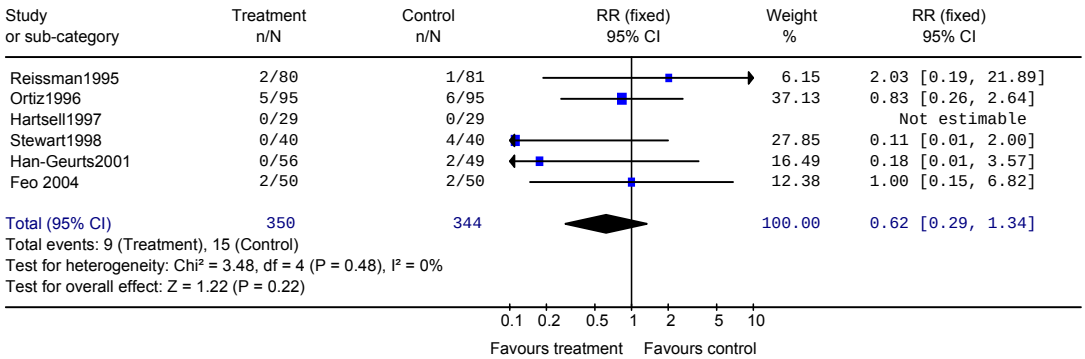


Review: Early feeding versus nil by mouth
Comparison: 15 Early oral feeding versus nil by mouth caesarean and gynaecological
Outcome: 04 Pneumonia

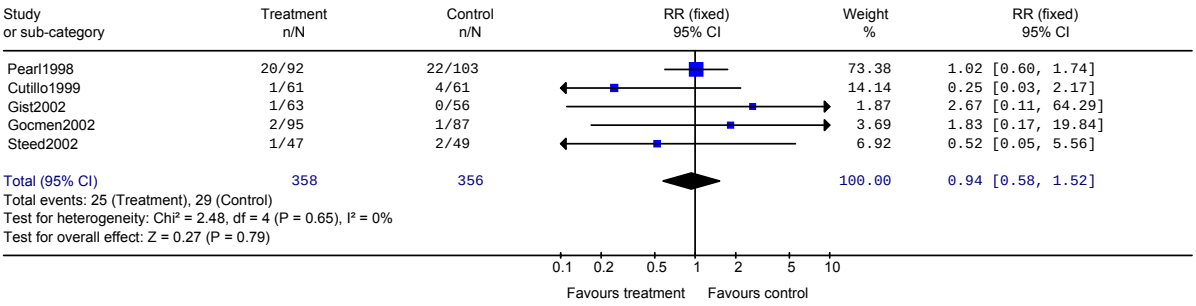


Oral versus Nil: Wound Infection

Review: Early feeding versus nil by mouth
Comparison: 17 Early oral feeding versus nil by mouth all GI surgery and general laparotomy
Outcome: 06 Wound infection

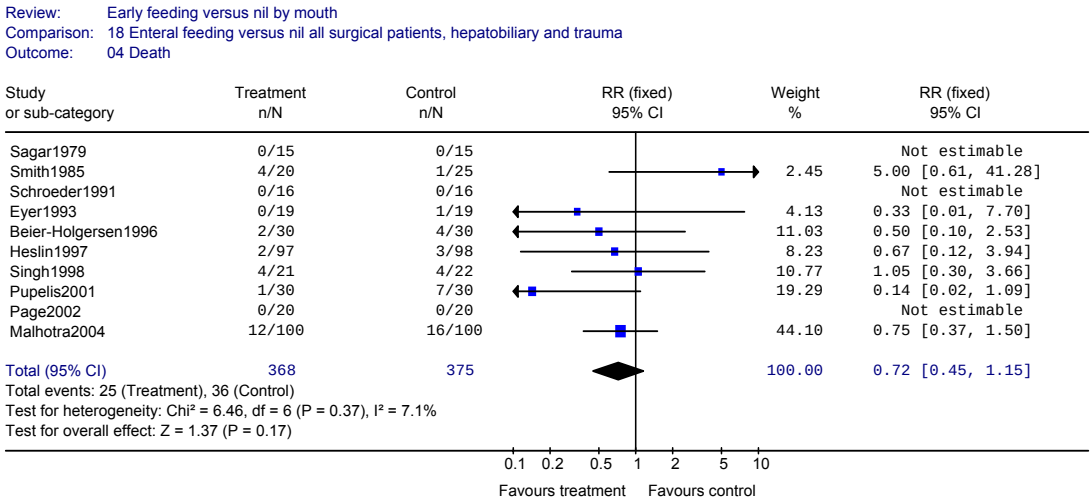


Review: Early feeding versus nil by mouth
Comparison: 15 Early oral feeding versus nil by mouth caesarean and gynaecological
Outcome: 02 Wound infection

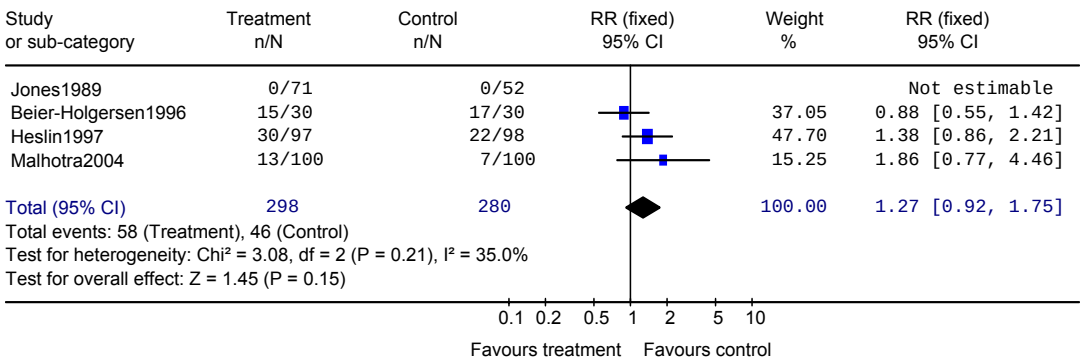


Appendix Eight: Meta-Analyses Enteral versus Nil Post Operative Nutrition Support

Enteral versus Nil: Death

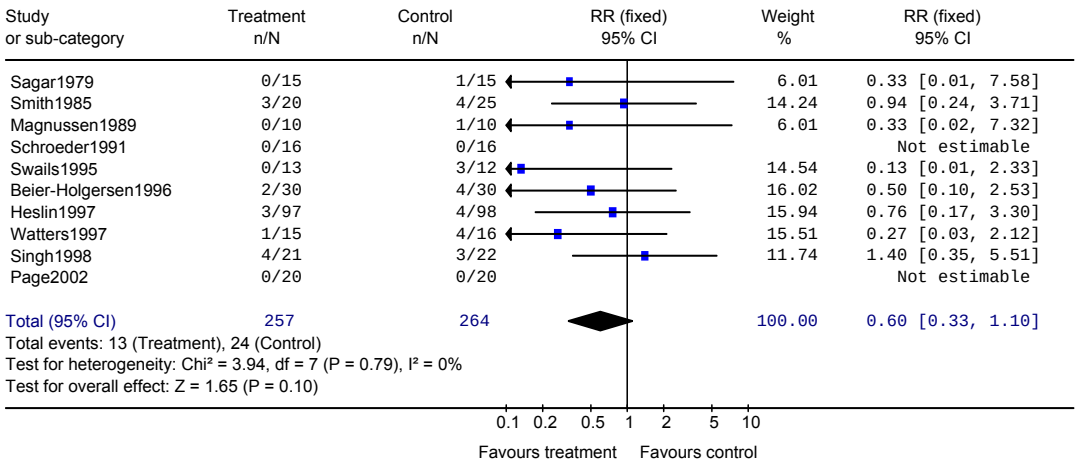


Enteral versus Nil: Vomiting



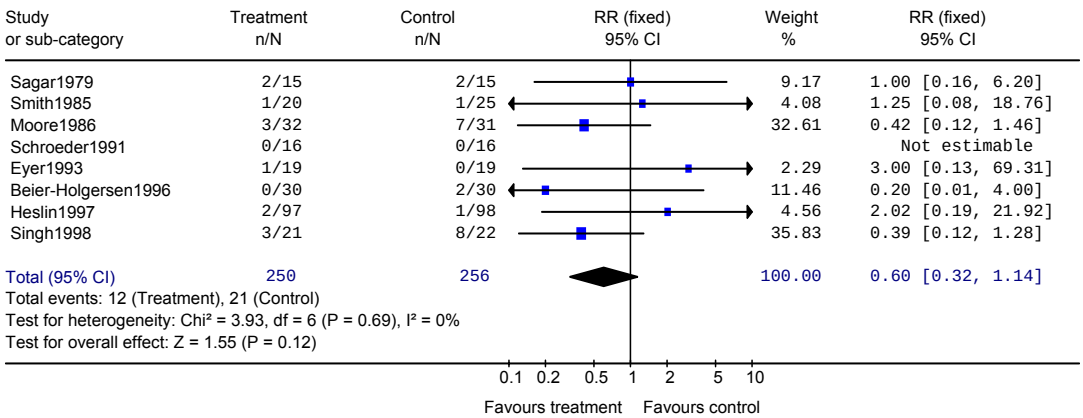
Enteral versus Nil: Anastomotic Dehiscence

Review: Early feeding versus nil by mouth
Comparison: 18 Enteral feeding versus nil all surgical patients, hepatobiliary and trauma
Outcome: 02 Anastomotic deshicence



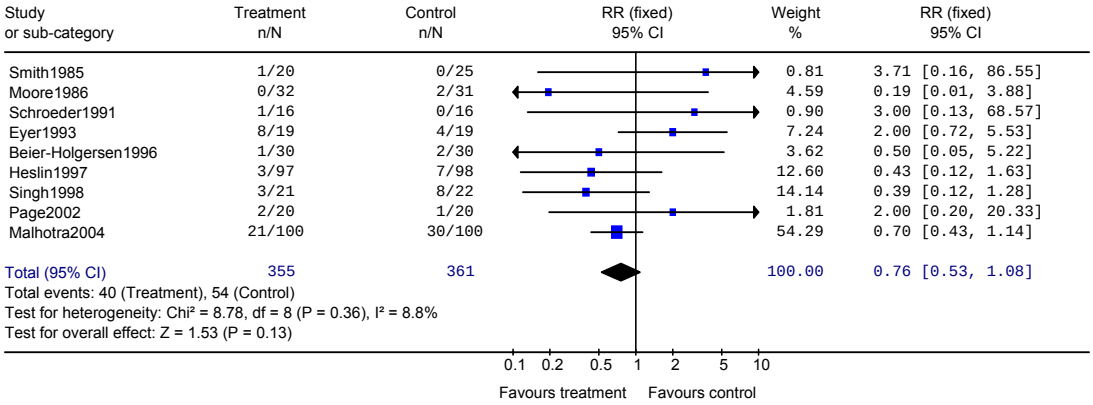
Enteral versus Nil: Intra- Abdominal Abscess

Review: Early feeding versus nil by mouth
Comparison: 18 Enteral feeding versus nil all surgical patients, hepatobiliary and trauma
Outcome: 05 Intra-abdominal abscess



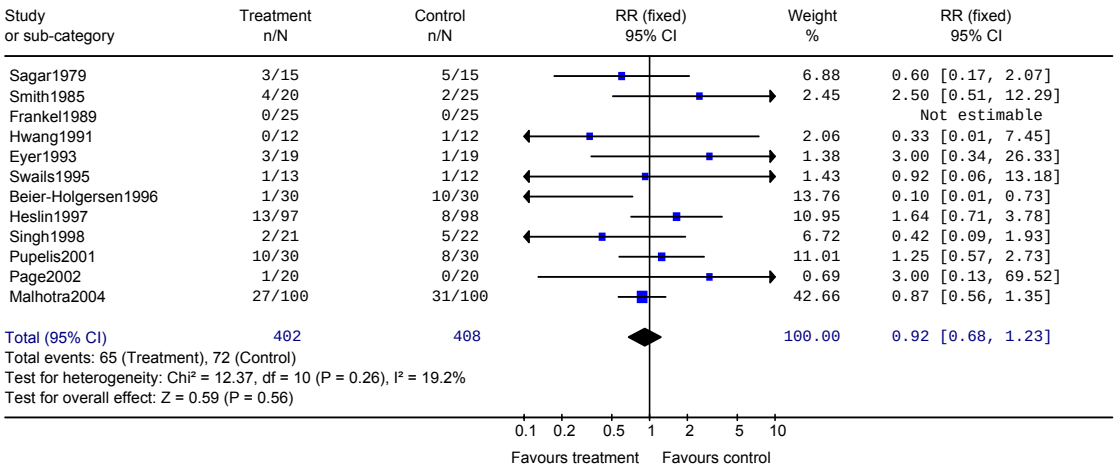
Enteral versus Nil: Pneumonia

Review: Early feeding versus nil by mouth
Comparison: 18 Enteral feeding versus nil all surgical patients, hepatobiliary and trauma
Outcome: 03 Pneumonia



Enteral versus Nil: Wound Infection

Review: Early feeding versus nil by mouth
Comparison: 18 Enteral feeding versus nil all surgical patients, hepatobiliary and trauma
Outcome: 06 Wound infection



Appendix Nine: Peripheral PN. Intervention details: continuous vs cyclical PN

Reference	N	Continuous	Cyclic
Kerin et al, 1991 [184]A}A}A}A}A}	51	**Group 1** (N=17): 16 or 18 G Teflon (4-5 cm) 24-h feed, cannula left *in situ*	**Group 3** (N=17**)**: 16 or 18 G Teflon (4-5 cm) 12-h feed, cannula removed after each infusion, new cannula resited contralateral arm for next 12-h
		Group 2 (N=17): 16 or 18 G Teflon (4-5 cm) 24-h feed cannula resited in contralateral arm each day	
May et al, 1996 [220]6}6}6}6}6}	60	**Group 4** (N=13): 23 G (15-cm) silicone, 24-h feed, cannula left *in situ*	**Group 1** (N=15): 18 G Teflon (4-5 cm), 12-h feed, cannula removed after each infusion, new cannula resited contralateral arm for next 12-h
			Group 2 (N=15): 18 G Teflon (4-5 cm) X2 (one in each arm), 12-h feed, alternate use, cannulas left *in situ*
			Group 3 (N= 17): 18 G Teflon (4-5 cm) in one arm, 18- G Silastic (15 cm), 12-h feed, alternate use, cannulas left *in situ*
Palmer et al, 1996 [264]6}6}6}6}6}	46	**Group B** (N=24): 23 G Teflon (15 cm) 24-h feed, catheter left *in situ*	**Group A** (N=26): 18 G Teflon, 12-h feed, cannula removed after each infusion, new cannula resited contralateral arm for next 12-h

Appendix Ten: Monitoring Survey

Dear GDG members,

Below is a survey designed to elicit the monitoring policies of the guideline group.

The questions are based on a monitoring document presented at an earlier GDG by Joanne Prickett and discussion with Alan Shenkin. The survey contains specific questions on monitoring patients receiving oral, enteral, parenteral or home parenteral nutrition, in addition to general questions which cover all four groups. Please read each question carefully. Each question is followed by the answers 'yes', 'no', 'don't know' and 'no explicit policy'. Choose **'yes'** if the hospital/ unit in which you work **has a policy of monitoring the parameter in question**, and choose **'no'** if the hospital/unit **has a policy of not monitoring that parameter.** If the hospital/ unit in which you work **does not have an explicit policy** regarding that specific parameter then please answer **'no explicit policy'**. If you are unsure of the policy where you work, please answer 'don't know'. Please indicate your answer clearly and use the additional space under each question for any relevant comments you have.

Please return your responses to Jenny Wood via email (JWood@rcseng.ac.uk) or post (NCC-AC, 6th Floor Nuffield Building, The Royal College of Surgeons of England, 35-43 Lincolns Inn Fields, London WC2A 3PE) by **24th January**.

The results of this survey will be presented at the GDG on 26th January. We have asked that GDG members fill in their names, hospital and speciality so that clarification can be sought. However, the collated responses will be presented anonymously.

Please do not hesitate to contact me if you have any queries.

Kind regards,

Louise Thomas

Monitoring Nutrition Support Survey

Name …… Hospital/Practice……

Speciality……

Enteral Feeding

1. Enteral Feeding (<u>excluding</u> gastrostomy and jejunostomy feeding)

1.1 Do you monitor tube position in your practice?

Yes **No** **Don't know** **No explicit policy** **N/A**

If yes, how frequent?

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Comments……
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1.2 Do you monitor nasal erosion in your practice?

Yes **No** **Don't know** **No explicit policy** **N/A**

If yes, how frequent?

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Comments……
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1.3 Do you monitor tube fixation in your practice?

Yes **No** **Don't know** **No explicit policy** **N/A**

If yes, how frequent?

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Comments……
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1.4 Do you monitor whether the tube is in working order? (all pieces intact, tube blocked/kinked)

Yes **No** **Don't know** **No explicit policy** **N/A**

If yes, how frequent?

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Comments……
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2. Gastrostomy or Jejunostomy

1.1 Do you monitor stoma site?

Yes **No** **Don't know** **No explicit policy** **N/A**

If yes, how frequent?

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Comments……
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1.2 Do you monitor tube position?

Yes **No** **Don't know** **No explicit policy** **N/A**

If yes, how frequent?

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Comments……
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1.3 Do you monitor tube rotation?

Yes **No** **Don't know** **No explicit policy** **N/A**

If yes, how frequent?

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Comments……
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1.4 Do you monitor gastric residual volume?

Yes **No** **Don't know** **No explicit policy** **N/A**

If yes, how frequent?

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Comments……
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Parenteral feeding (excluding home parenteral nutrition)

1. Do you monitor line site?

Yes **No** **Don't know** **No explicit policy** **N/A**

If yes, how frequent?

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Comments……
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2. Do you monitor skin over position of line tip? (peripherally fed patients)

Yes **No** **Don't know** **No explicit policy** **N/A**

If yes, how frequent?

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Comments……
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Please continue to the next page for laboratory parameters

3. Laboratory parameters (Parenteral nutrition excluding home parenteral nutrition)

Please indicate whether you monitor for the following (please delete as appropriate)

Parameter			If yes, how frequent	Rationale/Comments
Sodium	**Yes**	**No**		
Potassium	**Yes**	**No**		
Urea	**Yes**	**No**		
Creatinine	**Yes**	**No**		
Glucose	**Yes**	**No**		
Magnesium	**Yes**	**No**		
Phosphate	**Yes**	**No**		
Liver function tests	**Yes**	**No**		
Calcium	**Yes**	**No**		

Please continue to the next page

Parameter		If yes, how frequent	Rationale/Comments

Prealbumin	**Yes**	**No**
C-reactive protein	**Yes**	**No**
Zinc	**Yes**	**No**
Copper	**Yes**	**No**
Selenium	**Yes**	**No**
Manganese	**Yes**	**No**
Folate	**Yes**	**No**
Vit B12	**Yes**	**No**
25-OH-vitD	**Yes**	**No**
Full blood count	**Yes**	**No**

Home Parenteral Nutrition

1. Do you monitor line site?

Yes **No** **Don't know** **No explicit policy** **N/A**

If yes, how frequent?

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Comments……
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2. Do you monitor skin over position of line tip? (peripherally fed patients)

Yes **No** **Don't know** **No explicit policy** **N/A**

If yes, how frequent?

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Comments……
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Please continue to the next page for laboratory parameters

3. Laboratory parameters (home parenteral nutrition)

Please indicate whether you monitor for the following (please delete as appropriate)

Parameter			If yes, how frequent	Rationale/Comments
Sodium	**Yes**	**No**		
Potassium	**Yes**	**No**		
Urea	**Yes**	**No**		
Creatinine	**Yes**	**No**		
Glucose	**Yes**	**No**		
Magnesium	**Yes**	**No**		
Phosphate	**Yes**	**No**		
Liver function tests	**Yes**	**No**		
Calcium	**Yes**	**No**		

Please continue to the next page

Parameter		If yes, how frequent	Rationale/Comments

Prealbumin	**Yes**	**No**
C-reactive protein	**Yes**	**No**
Zinc	**Yes**	**No**
Copper	**Yes**	**No**
Selenium	**Yes**	**No**
Manganese	**Yes**	**No**
Folate	**Yes**	**No**
Vit B12	**Yes**	**No**
25-OH-vitD	**Yes**	**No**
Full blood count	**Yes**	**No**

Nutritional Parameters

1. **How do you monitor nutrient intake in your practice? (please also indicate frequency)**

   a. **Oral Nutrition**

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   b. **Enteral Nutrition**

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   c. **Parenteral Nutrition**

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   d. **Home Parenteral Nutrition**

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2. **How do you monitor actual volume of feed delivered in your practice? (please also indicate frequency)**

   a. **Oral Nutrition**

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   b. **Enteral Nutrition**

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   c. **Parenteral Nutrition**

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d. Home Parenteral Nutrition

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3. How do you monitor fluid balance in your practice? (please also indicate frequency)

a. Oral Nutrition

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b. Enteral Nutrition

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c. Parenteral Nutrition

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d. Home parenteral nutrition

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Nutritional goals

1. Do you monitor whether nutritional goals are being met?

a. Oral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?

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b. Enteral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?

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c. Parenteral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?

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d. Home Parenteral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?

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2. Do you monitor whether nutritional goals are still appropriate?

a. Oral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?

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b. Enteral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?

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c. Parenteral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?

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d. Home Parenteral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?

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Anthropometric Parameters

1. **Do you monitor weight change in your practice?**

   a. **Oral Nutrition:**

   Yes **No** **Don't know** **No explicit policy**

   If yes, how frequent?
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   b. **Enteral Nutrition:**

   Yes **No** **Don't know** **No explicit policy**

   If yes, how frequent?
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   c. **Parenteral Nutrition:**

   Yes **No** **Don't know** **No explicit policy**

   If yes, how frequent?
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   d. **Home Parenteral Nutrition:**

   Yes **No** **Don't know** **No explicit policy**

   If yes, how frequent?
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2. **Do you monitor BMI in your practice?**

   a. **Oral Nutrition:**

   Yes **No** **Don't know** **No explicit policy**

   If yes, how frequent?
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   b. **Enteral Nutrition:**

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?
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c. Parenteral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?
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d. Home Parenteral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?
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3. Do you monitor mid arm circumference in your practice?

a. Oral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?
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b. Enteral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?
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c. Parenteral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?
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d. Home Parenteral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?

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Clinical Condition

1. Do you monitor body temperature in your practice?

a. Oral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?

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b. Enteral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?

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c. Parenteral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?

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d. Home Parenteral Nutrition:

Yes **No** **Don't know** **No explicit policy**

If yes, how frequent?

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Further comments

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