National Institute for Health and Care Excellence

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Diverticular disease: diagnosis and management

[M] Evidence review for primary versus secondary anastomosis (timing of anastomosis) in complicated acute diverticulitis

NICE guideline NG147

Intervention evidence review

November 2019

Final

This evidence review was developed by the National Guideline Centre

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Contents

1 Management of acute diverticulitis 5

1.1 Review question: What is the most appropriate time of anastomosis in people with complicated acute diverticulitis? 5

1.2 Introduction 5

1.3 PICO table 5

1.4 Clinical evidence 6

1.4.1 Included studies 6

1.4.2 Excluded studies 6

1.4.3 Summary of clinical studies included in the evidence review 7

1.4.4 Quality assessment of clinical studies included in the evidence review 20

1.5 Economic evidence 35

1.5.1 Included studies 35

1.5.2 Excluded studies 35

1.5.3 Summary of studies included in the economic evidence review 36

1.5.4 Unit costs 37

1.6 Evidence statements 38

1.6.1 Clinical evidence statements 38

1.6.2 Health economic evidence statements 39

1.7 The committee's discussion of the evidence 39

1.7.2 Cost effectiveness and resource use 41

Appendices 48

Appendix A: Review protocols 48

Appendix B: Literature search strategies 51

B.1 Clinical search literature search strategy 51

B.2 Health Economics literature search strategy 55

Appendix C: Clinical evidence selection 60

Appendix D: Clinical evidence tables 61

Appendix E: Forest plots 133

Appendix F: GRADE tables 148

Appendix G: Health economic evidence selection 161

Appendix H: Health economic evidence tables 163

Appendix I: Excluded studies 165

I.1 Excluded clinical studies 165

1 Management of acute diverticulitis

1.1 Review question: What is the most appropriate time of anastomosis in people with complicated acute diverticulitis?

1.2 Introduction

Over the last decade, there have been marked changes in the surgical management of patients with complications of acute complicated diverticular disease. Resections are now frequently undertaken laparoscopically with the use of laparoscopic lavage in the emergency setting. The thresholds for elective resection after recurrent episodes of acute diverticulitis have changed with a greater focus on tailored decision making with the patient. There have been alterations to the threshold for primary anastomosis especially in the emergency setting. This review of the evidence aimed to provide information for both clinicians and patient on what were the clinically and cost effective surgical approaches to the management of acute complicated diverticular disease.

1.3 PICO table

For full details see the review protocol in appendix A.

Table 1: PICO characteristics of review question

Population	Adults 18 years and over with complicated acute diverticulitis
Interventions	Primary anastomosis Temporary stoma Permanent stoma
Comparisons	Compared to each other

Outcomes	**Critical outcomes:**
	• Quality of life
	• Mortality
	• Morbidity
	• Progression of disease
	• Complications:
	  ○ infections
	  ○ abscesses
	  ○ perforation
	  ○ fistula
	  ○ stricture
	• Recurrence rates of acute diverticulitis
	• Hospitalisation
	• Need for further surgery
	• Anastomotic leak
	• Stoma complications
	
	Important outcomes:
	Symptom control/recurrence, for example pain relief, bowel habit

Study design	Randomised controlled trials (RCTs), systematic reviews of RCTs.

If no RCT evidence is available, search for observational studies.

1.4 Clinical evidence

1.4.1 Included studies

Twenty-seven studies were included in the review;[8-10, 12, 14, 17, 27, 29, 32, 34, 35, 42, 47, 49, 52, 53, 56, 59, 61, 64-71] these are summarised in Table 2 below. Evidence from these studies is summarised in the clinical evidence summaries below (Table 3 and 4).

Although three RCTs were identified and included in the review, observational studies were also included as the RCTs did not cover all of the critical outcomes listed in the protocol. The majority of the included studies compared primary anastomosis (with or without a protective stoma) with Hartmann's procedure, which involves the creation of a stoma at initial operation and subsequent secondary anastomosis at a stoma reversal operation where possible.

Outcomes from observational studies that had adjusted for potential confounders were presented separately to outcomes from those that had not adjusted for confounders.

See also the study selection flow chart in appendix C, study evidence tables in appendix D, forest plots in appendix E and GRADE tables in appendix F.

1.4.2 Excluded studies

See the excluded studies list in appendix I.

1.4.3 Summary of clinical studies included in the evidence review

Table 2: Summary of studies included in the evidence review

Study	Intervention and comparison	Population	Outcomes	Concomitant treatment	Patient selection for intervention
Binda 2012[9] RCT N=90	Primary anastomosis: Left colon resection with primary anastomosis and loop ileostomy. Ileostomy reversal performed with trephine incision. Temporary stoma: Nonrestorative colon resection - left colon resection with end colostomy. Reversal of colostomy performed by laparotomy or laparoscopy.	Patients aged 18 years and over undergoing emergency operation for peritonitis secondary to perforated diverticulitis of the left colon. Diagnosis by clinical examination, plain X-ray and CT scan	Mortality Morbidity Complications (infections) Anastomotic leak	All patients received intravenous antibiotics and deep vein thrombosis prophylaxis prior to surgery. Intraoperative lavage of peritoneal cavity also performed.	Randomised
DIVERTI trial: Bridoux 2017[14] RCT N=102	Primary anastomosis: Primary anastomosis with or without protective stoma. Stoma reversal operations performed at least three months after first operation. Temporary stoma: Hartmann's procedure. Consisted of sigmoid resection, rectal closure and end colostomy.	Patients aged 18 years and over undergoing emergency operation for perforated diverticulitis of the left colon with faecal or purulent peritonitis (Hinchey stages III and IV). Diagnosis by clinical examination and CT scan	Mortality Morbidity Complications (abscesses) Complications (stricture) Need for further surgery Anastomotic leak	Primary anastomosis: Decisions to clean colon intraoperatively, to place a drain, and to perform ileostomy or colostomy were at discretion of surgeon. Not all patients had a protective stoma.	Randomised

Study	Intervention and comparison	Population	Outcomes	Concomitant treatment	Patient selection for intervention
	Stoma reversal operation at least 6 months after Hartmann's procedure by laparotomy or laparoscopy.				
Oberkofler 2012[53] RCT N=62	Primary anastomosis: Surgical resection of sigmoid colon with primary anastomosis and a diverting ileostomy. Stoma reversal operation set to take place up to 3 months after first operation. Temporary stoma: Hartmann's procedure. Surgical resection of the sigmoid colon with closure of the rectal stump and formation of an end colostomy. Stoma reversal operation planned at later stage.	Patients aged 18 years and over undergoing surgery for perforated diverticulitis with faecal or purulent peritonitis (Hinchey stages III and IV). Diagnosis by computed tomography and/or clinical and radiography evidence.	Mortality Morbidity Complications (infections): wound, intra-abdominal, urinary tract reported separately. Need for further surgery Anastomotic leak Stoma complications Extracted separately for initial and reversal operations.	Decisions to take down splenic flexure or clean colon intraoperatively made individually by surgeons.	Randomised
Belmonte 1996[8] Non-randomised retrospective N=227	Primary anastomosis: Primary anastomosis with or without diverting ileostomy. Intraoperative lavage used selectively in patients with no or poor bowel preparation to allow anastomosis and avoid colostomy.	Patients aged 18 years or over undergoing surgery for diverticular disease. Extracted data for those with pericolonic or mesenteric abscess, pelvic abscess, or faecal or purulent peritonitis. Method of diagnosis	Mortality	All patients received perioperative intravenous broad spectrum antibiotics. Patients not undergoing emergency or urgent surgery underwent mechanical bowel preparation prior to surgery. Percutaneous drainage of	Surgeon selected type of operation based on condition of patient, status of abdomen, blood supply of bowel, completeness of bowel preparation and experience of operating team. No data to compare age or other prognostic factors

Study	Intervention and comparison	Population	Outcomes	Concomitant treatment	Patient selection for intervention
	Temporary stoma: Hartmann's procedure.	unclear – operative and pathological findings used to classify patients		abscess performed in 2 patients.	between the two interventions. Majority of those with faecal/purulent peritonitis underwent HP.
Binda 1993[10] Non-randomised retrospective N=92	Primary anastomosis: Resection with immediate anastomosis with/without colostomy. Temporary stoma: Hartmann's procedure.	Patients aged 18 years or over undergoing emergency surgery for complicated colonic diverticulitis - surgery within 48 h of hospitalisation. Includes those with localised or diffuse peritonitis. Method of diagnosis not stated.	Mortality Morbidity Complications (infections) Complications (fistula)	Not reported.	Method of assignment not reported – likely to have been selected by surgeon based on severity of disease and condition of patients. No data to compare age between the two interventions. Higher proportion of diffuse peritonitis in HP group compared with PA group (81 vs. 28%).
Blair 2002[12] Non-randomised retrospective N=97	Primary anastomosis: Primary anastomosis with/without proximal protective stoma. No patients had on-table colonic lavage. Temporary stoma: Hartmann's procedure.	Patients aged 18 years or over undergoing emergency surgery for complicated acute diverticulitis - surgery within 48 h of hospitalisation. Method of diagnosis not stated.	Mortality Complications (infections) Hospitalisation Anastomotic leak	Not reported.	Type of operation decided upon by surgeon. Median age: lower in PA group compared with HP group (54±14.8 vs. 64.6±15.7 years). Proportion over 70 years of age: higher in HP group compared with PA group (49% vs. 17%). Higher proportion of ASA III and IV score patients in HP group compared with PA group (65.6% vs.

Study	Intervention and comparison	Population	Outcomes	Concomitant treatment	Patient selection for intervention
					30.3%). Higher proportion of Hinchey stages III and IV in HP group compared with PA group (50.8% vs. 27.3%)
Cauley 2018[17] Non-randomised retrospective N=67,721	Primary anastomosis: Colectomy with primary anastomosis and proximal diverting ileostomy. Temporary stoma: Colectomy with end colostomy.	Patients aged 18 years or over undergoing emergency or urgent surgery for acute diverticulitis - surgery on first or second day of admission. Method of diagnosis not stated.	Mortality Morbidity Complications (infections)	Not reported.	Method of assignment not reported – likely to have been selected by surgeon based on severity of disease and condition of patients. Higher proportion of those aged 80 years or over in the PA with DI group compared with end colostomy group (28.8% vs. 15.9%). Higher proportion of those with Charlson comorbidity score of 2+ in PA with DI group compared with end colostomy group (28.9% vs. 19.7%).
Gawlick 2012[27] Non-randomised retrospective N=2,018	Primary anastomosis: Partial colectomy with primary anastomosis and proximal diversion with loop ileostomy. Temporary stoma: Hartmann's procedure - partial colectomy with colostomy.	Patients aged 18 years or over undergoing emergency surgery for perforated diverticulitis. Method of diagnosis not stated.	Mortality Complications (infections) Need for further surgery	Not reported.	Method of assignment not reported – likely to have been selected by surgeon based on severity of disease and condition of patients. Age, comorbidities and ASA scores similar between the two groups.

Study	Intervention and comparison	Population	Outcomes	Concomitant treatment	Patient selection for intervention
					Higher proportion of those with severe preoperative sepsis in HP group compared with PA group (5.6% vs. 2.4%).
Gooszen 2001[29] Non-randomised retrospective N=60	Primary anastomosis: Acute sigmoid resection followed by primary anastomosis covered by a defunctioning stoma (7 loop ileostomy and 25 transverse colostomy). Temporary stoma: Hartmann's procedure.	Patients aged 18 years or over undergoing urgent surgery for acute complications of diverticular disease within 24 hours of admission (pericolic abscess, walled-off pelvic abscess, generalised purulent peritonitis or faecal peritonitis). Method of diagnosis not stated.	Mortality Complications (infections) Complications (abscesses) Need for further surgery Anastomotic leak Stoma complications	Not reported.	Surgeon decided which intervention patients received – surgeon preference and not based on intraoperative findings such as degree of faecal contamination or severity of peritonitis. Mean age similar between two interventions. Higher proportion of those with diffuse faecal contamination in HP group compared with PA group (21.4% vs. 6.25%).
Gregg 1987[32] Non-randomised retrospective N=208	Primary anastomosis: Combined one-stage and resection, primary anastomosis and temporary transverse colostomy groups reported in this study. Temporary stoma: Hartmann's procedure	Patients aged 18 years or over undergoing emergency surgery for complications of diverticular disease – at admission or after failure of medical therapy. Diagnosis by flat films, contrast radiography,	Mortality	Not reported.	Method of assignment not reported – likely to have been selected by surgeon based on severity of disease and condition of patients. No data to compare age or other prognostic factors between the two interventions.

Study	Intervention and comparison	Population	Outcomes	Concomitant treatment	Patient selection for intervention
		ultrasonography and/or computerised axial tomography.			
Herzog 2011[34] Non-randomised retrospective N=40	Primary anastomosis: Midline laparotomy. Primary anastomosis with/without diverting ileostomy. Ileostomy performed in those with MP scores >21 (n=7). Temporary stoma: Hartmann's procedure. Performed in all cases of faecal peritonitis, severe comorbidity, need for high dose catecholamine or multiple organ failure. Surgeon free to choose between primary anastomosis and Hartmann's in other cases of peritonitis.	Patients aged 18 years or over undergoing emergency surgery due to complicated diverticulitis (perforation, abscess with sepsis, local or diffuse peritonitis, ileus secondary to recent diverticulitis episodes or haemorrhage). Triple contrast CT scan performed on admission.	Mortality Morbidity Complications (infections) Complications (abscesses) Need for further surgery Anastomotic leak Stoma complications	All patients received systemic antibiotics including metronidazole and a third generation cephalosporin before laparotomy. Depending on degree of peritonitis, patients received a combination of sulbactam and ceftazidime or a carbapenem unless change indicated by sensitivity of identified microorganisms. All patients had abdominal lavage with at least 5 litres of warm saline solution. Treatment of peritonitis included clearance of pus, faeces, exudates and as much debris and pseudomembranous material as possible.	Type of operation selected by surgeon depending on patient condition – Hartmann's performed in presence of faecal peritonitis, severe comorbidity, need for high dose catecholamine or multiple organ failure. In other cases surgeon free to choose. Mean age similar between groups. Proportion >65 years higher in HP group compared with PA group. Higher proportion of patients with comorbidity in HP group compared with PA group. Higher proportion of patients with MPI score >21 in HP group compared with PA group.
Hold 1990[35] Non-randomised retrospective N=241	Primary anastomosis: Primary resection and anastomosis with/without protective proximal colostomy Temporary stoma:	Patients aged 18 years or over undergoing emergency surgery for perforated diverticulitis (walled-off perforation with peritonitis, localised peritonitis and diffuse peritonitis).	Mortality Morbidity Anastomotic leak	Not reported.	Method of assignment not reported – likely to have been selected by surgeon based on severity of disease and condition of patients. No data to compare age or

Study	Intervention and comparison	Population	Outcomes	Concomitant treatment	Patient selection for intervention
	Hartmann's procedure - primary resection with end colostomy.	Diagnostic procedures included plain abdominal film, enema with water-soluble contrast media, colonoscopy and/or computed tomography.			other prognostic factors between the two interventions.
Kriwanek 1994[42] Non-randomised retrospective N=112	Primary anastomosis: When extracting, combined primary anastomosis and primary anastomosis with stoma groups reported in this study. Temporary stoma: Hartmann's procedure.	Patients aged 18 years or over undergoing surgery for perforated diverticulitis. Method of diagnosis not stated.	Mortality	Not reported.	Method of assignment not reported – likely to have been selected by surgeon based on severity of disease and condition of patients. No data to compare age or other prognostic factors between the two interventions.
Medina 1991[47] Non-randomised retrospective N=6	Primary anastomosis: Primary resection and immediate anastomosis. Temporary stoma: Hartmann's procedure with terminal colostomy.	Patients aged 18 years or over undergoing emergency surgery for faecal peritonitis secondary to perforated diverticular disease (Hinchey stage IV). Diagnosis by clinical findings and symptoms. Radiology also mentioned.	Mortality Complications (abscesses)	Resuscitative measures established for all patients prior to surgery (administration of supplemental oxygen, insertion of large-bore intravenous catheters). Balanced salt solution (e.g. Ringer's Lactate) given intravenously and titrated according to vital signs and urine output. Patients underwent copious peritoneal lavage with warm saline at	Method of assignment not reported – likely to have been selected by surgeon based on severity of disease and condition of patients. Mean age higher in the HP group compared with the PA group (78.7 vs. 63.7 years). No data to compare other prognostic factors between the two interventions.

Study	Intervention and comparison	Population	Outcomes	Concomitant treatment	Patient selection for intervention
				completion of procedure.	
Mueller 2011[49] Non-randomised retrospective N=73	Primary anastomosis: Sigmoid colectomy and primary anastomosis with/without diverting loop ileostomy. Temporary stoma: Hartmann's procedure.	Patients aged 18 years or over undergoing emergency surgery for perforated diverticulitis (Hinchey stages I-IV). Perforation confirmed by X-ray or CT scan prior to surgery.	Mortality Morbidity Complications (infections) Complications (abscesses) Anastomotic leak Stoma complications	Not reported.	Method of assignment not reported – likely to have been selected by surgeon based on severity of disease and condition of patients. Mean age similar between the two groups. Proportion of patients with ASA III and IV scores higher in HP group compare with PA group (76% vs. 31%). Proportion of Hinchey stage III and IV patients higher in HP group compared with PA group (46% vs. 4%). Comorbidity higher in HP group compared with PA group.
Netri 2000[52] Non-randomised retrospective N=239	Primary anastomosis: Resection with immediate anastomosis with or without a protective colostomy. Temporary stoma: Hartmann's procedure with stoma.	Patients aged 18 years or over undergoing emergency surgery for acute diverticulitis with signs of generalised or localised peritonitis Clinical evaluation, blood tests and ECG performed. Upright abdominal radiographs most utilised visual diagnostic test.	Mortality	All patients received antibiotic and infusion therapy prior to surgery.	Surgeon selected type of operation performed based on severity of disease and patient condition. No data to compare age or other prognostic factors between the two interventions.

Study	Intervention and comparison	Population	Outcomes	Concomitant treatment	Patient selection for intervention
		Abdominal ultrasound reserved for clarifying uncertain diagnoses.			
Pasternak 2010[56] Non-randomised retrospective N=111	Primary anastomosis: Primary anastomosis with/without loop ileostomy. Surgeon decided whether a protective loop ileostomy was necessary in each patient depending on the quality of the anastomosis. Temporary stoma: Hartmann's procedure with stoma.	Patients aged 18 years or over undergoing emergency surgery within 6 h of decision to operate for perforated diverticulitis of left colon. Diagnosis by clinical evaluation and/or X-rays or triple contrast CT scan.	Mortality Morbidity Complications (abscesses) Need for further surgery Anastomotic leak Stoma complications	Primary anastomosis: Intraoperative colonic lavage only performed in cases where a protective loop ileostomy was considered.	Surgeon selected type of operation performed based on severity of peritonitis and grade of abdominal contamination, comorbidities, and general condition of the patient. Age similar between the two groups. Proportion of patients with immunosuppression higher in HP group compared with PA group (33.8% vs. 4.3%). Higher proportion of Hinchey stage III and IV patients in HP group compared with PA group (73.9% vs. 26.1%). Higher mean MPI in HP compared with PA group (21.2 vs. 13.9).
Richter 2006[59] Non-randomised retrospective N=41	Primary anastomosis: One-stage sigmoid resection and primary anastomosis with/without protective ileostomy. Temporary stoma: Hartmann's procedure.	Patients aged 18 years or over undergoing emergency surgery for complicated sigmoid diverticulitis (Hinchey stages III and IV). All patients underwent triple contrast CT scan.	Mortality Anastomotic leak	Treatment of peritonitis comprised the use of 30 litres of warm Ringer's lactate for abdominal lavage to dilute the bacterial load of the abdominal cavity and postoperative antibiotic	Surgeon selected type of operation performed based on clinical condition of patient – Hartmann's performed in critically ill patients where anastomotic healing was considered doubtful.

Study	Intervention and comparison	Population	Outcomes	Concomitant treatment	Patient selection for intervention
				therapy that was maintained for at least 5 days.	Higher mean MPI in HP compared with PA group (35 vs. 18.4). No data to compare age or other prognostic factors between the two interventions.
Schilling 2001[61] Non-randomised retrospective N=55	Primary anastomosis: One-stage sigmoid colon resection and primary anastomosis without protective colostomy. Temporary stoma: Primary sigmoid colon resection, Hartmann's procedure and descending colostomy.	Patients aged 18 years or over undergoing emergency surgery for perforated diverticulitis with peritonitis. Method of diagnosis not stated.	Mortality Morbidity Stoma complications	Extensive abdominal lavage with at least 20 litres of warm (37°C) ringers lactate solution performed in all patients.	Method of assignment not reported – likely to have been selected by surgeon based on severity of disease and condition of patients. Mean age similar between the two groups. ASA and MPI at admission similar between the two groups. Higher proportion of patients with diffuse peritonitis in HP group compared with PA group (61.9% vs. 46.1%).
Stumpf 2007[64] Non-randomised retrospective N=66	Primary anastomosis: No further details given. Temporary stoma: Hartmann's procedure with stoma.	Patients aged 18 years or over undergoing emergency surgery within same hospital admission for complications of left-sided diverticulitis (perforation, peritoneal signs, abscess,	Mortality Morbidity Complications (infections) Complications (abscesses) Need for further surgery	Most surgeons performed mini colonic lavage with saline. Seven patients were able to be prepped the night before the operation as they were operated on due to failure of medical therapy	Method of assignment not reported – likely to have been selected by surgeon based on severity of disease and condition of patients. Proportion of patients >80 years of age similar between groups.

Study	Intervention and comparison	Population	Outcomes	Concomitant treatment	Patient selection for intervention
		obstruction or failure of medical therapy). Method of diagnosis unclear – may have been confirmed in operation	Anastomotic leak		Higher proportion of patients with comorbidity in HP group compared with PA group (83.3% vs. 58.3%). Higher proportion of patients with ASA score >3 in HP group compared with PA group (23.3% vs. 5.6%). Higher proportion of patients with ASA score >2 in HP group compared with PA group (50% vs. 16.6%).
Thaler 2000[65] Non-randomised retrospective N=82	Primary anastomosis: One-stage primary sigmoid resection with primary anastomosis. No protective stomas were employed. Temporary stoma: Primary sigmoid resection with Hartmann's procedure.	Patients aged 18 years or over undergoing emergency surgery for perforated sigmoid diverticulitis with generalised peritonitis. Method of diagnosis not stated.	Mortality Morbidity	Broad spectrum antibiotics routinely administered in all patients starting preoperatively and given for at least 7 days after surgery.	Surgeons selected type of operation performed based on MPI and ASA classification of each patient. Mean age similar between the two groups. Higher proportion of ASA IV/V in HP group compared with PA group (71% vs. 35%). MPI score higher in HP group compared with PA group (23 vs. 18).
Trenti 2011[66] Non-randomised retrospective N=87	Primary anastomosis: Resection of affected bowel segment with primary anastomosis, with or without protective	Patients aged 18 years or over undergoing emergency surgery for diverticular peritonitis (Hinchey stages III and	Mortality Morbidity Complications (infections) Complications	All patients were treated with an extensive intraabdominal lavage with warm saline solution and post-operative antibiotic	Method of assignment not reported – likely to have been selected by surgeon based on severity of disease and condition of

Study	Intervention and comparison	Population	Outcomes	Concomitant treatment	Patient selection for intervention
	stoma (derivative ileostomy). Temporary stoma: Hartmann's procedure.	IV). Method of diagnosis not stated.	(abscesses) Need for further surgery Anastomotic leak	therapy for at least 14 days. All patients underwent the same postoperative care in the intensive care unit and in the ward with the same team of physicians. From 2007 onwards, only patients undergoing primary anastomosis with protective ileostomy received intraoperative colonic lavage.	patients. Mean age higher in HP group compared with PA group (69.7 vs. 58.1 years). Higher proportion of ASA score III and IV patients in HP group compared with PA group (80% vs. 18.5%). Higher proportion of Hinchey stage IV in HP group compared with PA group (23.3% vs. 3.7%).
Tucci 1996[67] Non-randomised retrospective N=43	Primary anastomosis: Resection and primary anastomosis with/without stoma. Temporary stoma: Hartmann's procedure.	Patients aged 18 years or over undergoing urgent or emergency surgery for perforated diverticular disease (Hinchey stages I-IV). Acute condition or following failure of medical therapy. Method of diagnosis unclear – operative and pathological reports used to determine degree of peritoneal contamination.	Mortality	Not reported.	Method of assignment not reported – likely to have been selected by surgeon based on severity of disease and condition of patients. Higher proportion of Hinchey stages III and IV patients in HP group compared with PA group (87.5% vs. 4.2%). No data to compare age or other prognostic factors between the two interventions.
Tudor 1994[68] Non-randomised	Primary anastomosis: Resection with primary anastomosis with or	Patients aged 18 years or over undergoing emergency surgery for	Mortality	Primary anastomosis: On-table colonic lavage performed in some of	Method of assignment not reported – likely to have been selected by surgeon

Study	Intervention and comparison	Population	Outcomes	Concomitant treatment	Patient selection for intervention
prospective N=300	without a stoma. Temporary stoma: Hartmann's procedure.	complications of diverticular disease (acute phlegmon, peircolic abscess, purulent peritonitis, faecal peritonitis, bowel obstruction and fistula). Method of diagnosis unclear – mentions use of clinical features, ultrasonography, confirmation at surgery and radiology for various complications.		these patients. Preoperative percutaneous drainage in certain cases of abscess and purulent peritonitis was performed.	based on severity of disease and condition of patients. No data to compare age or other prognostic factors between the two interventions.
Vermeulen 2007[69] Non-randomised prospective N=200	Primary anastomosis: Primary anastomosis with/without diverting ileostomy. Colon resections consisted of sigmoid resection, left hemicolectomy or anterior resection. Temporary stoma: Hartmann's procedure with stoma.	Patients aged 18 years or over undergoing surgery acute perforated sigmoid diverticulitis (Hinchey stages I-IV). Diagnosis based on clinical signs of diffuse peritonitis with acute abdominal pain, free gas on plain abdominal radiography or specific findings at ultrasonography or computerised tomography.	Mortality Need for further surgery Anastomotic leak	All patients received preoperative and postoperative broad-spectrum intravenous antibiotics. Preoperative bowel preparation was not used in any patients.	Surgeon selected which operation was performed in each patient. Higher mean age in HP group compared with PA group (69 vs. 62). Higher proportion of patients with Hinchey stages III and IV in HP group compared with PA group (68.3% vs. 42.6%). Higher proportion of patients with ASA scores III and IV in HP group compared with PA group (59.7% vs. 41%). Higher MPI in HP group compared with PA group (21 vs. 17).

Study	Intervention and comparison	Population	Outcomes	Concomitant treatment	Patient selection for intervention
Vermeulen 2010 and 2011[70, 71] Non-randomised retrospective N=340	Primary anastomosis May include some with and some without loop ileostomy. Not all of those with loop ileostomy had it reversed. Temporary stoma: Hartmann's procedure with stoma. Not all stomas were reversed.	Patients aged 18 and over undergoing emergency surgery for perforated diverticulitis (Hinchey stages I-IV). Diagnosis based on clinical signs, radiography and/or CT scans.	Quality of life Mortality Need for further surgery	Not reported.	Surgeon selected which operation was performed in each patient. Median age similar between groups. Higher proportion of patients with ASA grades III or IV in HP group compared with PA group (47% vs. 25%). Higher proportion of patients with Hinchey III or IV scores in HP group compared with PA group (64% vs. 34%).

See appendix D for full evidence tables.

1.4.4 Quality assessment of clinical studies included in the evidence review

Table 3: Clinical evidence summary: Primary anastomosis vs. temporary stoma - RCTs

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with temporary stoma	Risk difference with Primary anastomosis (95% CI)
Anastomotic leak (first operation)	254 (3 studies)	⨁⊖⊖⊖ VERY LOW[b,c]	OR 4.24 (0.71 to	7 per 1000	27 more per 1000 (from 8 fewer to 63

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with temporary stoma	Risk difference with Primary anastomosis (95% CI)
		due to risk of bias, imprecision	25.21)		more)[a]
Anastomotic leak (second operation)	162 (3 studies)	⨁⊖⊖⊖ VERY LOW[b,c,d] due to risk of bias, inconsistency, imprecision	RR 0.6 (0.16 to 2.24)	49 per 1000	24 fewer per 1000 (from 82 fewer to 34 more)[a]
Complications - deep incisional surgical site infections (first operation)	90 (1 study)	⨁⊖⊖⊖ VERY LOW[b,c] due to risk of bias, imprecision	RR 1.1 (0.43 to 2.81)	Moderate	
				161 per 1000	16 more per 1000 (from 92 fewer to 291 more)
Complications - deep incisional surgical site infections (second operation)	56 (1 study)	⨁⊖⊖⊖ VERY LOW[b,c] due to risk of bias, imprecision	OR 0.18 (0.02 to 1.92)	Moderate	
				88 per 1000	88 fewer per 1000 (from 204 fewer to 28 more)[a]
Complications - organ space site infections (first operation)	90 (1 study)	⨁⊖⊖⊖ VERY LOW[b,c] due to risk of bias, imprecision	OR 0.18 (0.03 to 1)	Moderate	
				107 per 1000	107 fewer per 1000 (from 199 fewer to 16 more)[a]
Complications - organ space site infections (second operation)	56 (1 study)	⨁⊖⊖⊖ VERY LOW[b,c] due to risk of bias, imprecision	OR 0.19 (0 to 10.66)	Moderate	
				29 per 1000	29 fewer per 1000 (from 119 fewer to 60 more)[a]
Complications - superficial incisional surgical site infections (first operation)	90 (1 study)	⨁⊖⊖⊖ VERY LOW[b,c] due to risk of bias, imprecision	RR 1.35 (0.62 to 2.91)	Moderate	
				196 per 1000	69 more per 1000 (from 74 fewer to 374 more)
Complications - superficial incisional surgical site infections (second operation)	56 (1 study)	⨁⊖⊖⊖ VERY LOW[b,c]	OR 0.17 (0.03 to	Moderate	
				147 per	147 fewer per 1000

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with temporary stoma	Risk difference with Primary anastomosis (95% CI)
		due to risk of bias, imprecision	1.09)	1000	(from 282 fewer to 13 more)[a]
Complications - urinary tract infections (first operation)	152 (2 studies)	⊕⊖⊖⊖ VERY LOW[b,c,e] due to risk of bias, inconsistency, imprecision	RR 0.98 (0.09 to 11.24)	47 per 1000	1 fewer per 1000 (from 68 fewer to 66 more)[a]
Complications - urinary tract infections (second operation)	97 (2 studies)	⊕⊖⊖⊖ VERY LOW[b,c] due to risk of bias, imprecision	RD 0 (-0.06 to 0.06)	Moderate	
				0 per 1000	0 fewer per 1000 (from 60 fewer to 60 more)[f]
Overall morbidity (first operation)	254 (3 studies)	⊕⊖⊖⊖ VERY LOW[b,c,g] due to risk of bias, inconsistency, imprecision	RR 1.24 (0.77 to 1.99)	Moderate	
				423 per 1000	102 more per 1000 (from 97 fewer to 419 more)
Overall morbidity (second operation)	121 (2 studies)	⊕⊖⊖⊖ VERY LOW[b,c] due to risk of bias, imprecision	RR 0.32 (0.12 to 0.85)	Moderate	
				283 per 1000	192 fewer per 1000 (from 42 fewer to 249 fewer)
Mortality (first operation)	254 (3 studies)	⊕⊖⊖⊖ VERY LOW[b,c] due to risk of bias, imprecision	RR 0.58 (0.22 to 1.55)	Moderate	
				107 per 1000	45 fewer per 1000 (from 83 fewer to 59 more)
Mortality (second operation)	162 (3 studies)	⊕⊖⊖⊖ VERY LOW[b,i] due to risk of bias, imprecision	RD -0.03 (-0.08 to 0.03)	24 per 1000	30 fewer per 1000 (from 80 fewer to 30 more)[h]
Complications - intra-abdominal abscess (first operation)	102	⊕⊖⊖⊖	RR 0.52	Moderate	

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with temporary stoma	Risk difference with Primary anastomosis (95% CI)
	(1 study)	VERY LOW[b,c] due to risk of bias, imprecision	(0.1 to 2.71)	77 per 1000	37 fewer per 1000 (from 69 fewer to 132 more)
Complications - intra-abdominal abscess (second operation)	65 (1 study)	⊕⊖⊖⊖ VERY LOW[b,c] due to risk of bias, imprecision	OR 0.14 (0 to 7.03)	Moderate	
				30 per 1000	30 fewer per 1000 (from 111 fewer to 50 more)[a]
Complications - anastomotic stricture (first operation)	102 (1 study)	⊕⊖⊖⊖ VERY LOW[b,c] due to risk of bias, imprecision	OR 7.69 (0.15 to 387.87)	Moderate	
				0 per 1000	20 more per 1000 (from 33 fewer to 73 more)[a]
Need for further surgery - reoperation (first operation)	102 (1 study)	⊕⊖⊖⊖ VERY LOW[b,c] due to risk of bias, imprecision	RR 0.52 (0.1 to 2.71)	Moderate	
				77 per 1000	37 fewer per 1000 (from 69 fewer to 132 more)
Need for further surgery - reoperation (second operation)	106 (2 studies)	⊕⊖⊖⊖ VERY LOW[b,c,j] due to risk of bias, inconsistency, imprecision	RR 0.31 (0.03 to 3.71)	83 per 1000	66 fewer per 1000 (from 151 fewer to 19 more)[a]
All complications - Clavien-Dindo I-V (first operation)	62 (1 study)	⊕⊖⊖⊖ VERY LOW[b,c] due to risk of bias, imprecision	OR 1.35 (0.36 to 4.99)	Moderate	
				800 per 1000	44 more per 1000 (from 210 fewer to 152 more)
All complications - Clavien-Dindo I-V (second operation)	41 (1 study)	⊕⊕⊖⊖ LOW[b] due to risk of bias	OR 5 (1.26 to 19.84)	Moderate	
				400 per 1000	369 more per 1000 (from 57 more to 530 more)
Intra-abdominal infection (first operation)	62	⊕⊖⊖⊖	RR 0.31	Moderate	

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with temporary stoma	Risk difference with Primary anastomosis (95% CI)
	(1 study)	VERY LOW[b,c] due to risk of bias, imprecision	(0.07 to 1.43)	200 per 1000	138 fewer per 1000 (from 186 fewer to 86 more)
Intra-abdominal infection (second operation)	41 (1 study)	⊕⊖⊖⊖ VERY LOW[b,k] due to risk of bias, imprecision	RD 0 (-0.1 to 0.1)	Moderate	
				0 per 1000	0 fewer per 1000 (from 100 fewer to 100 more)[h]
Wound infection (first operation)	62 (1 study)	⊕⊖⊖⊖ VERY LOW[b,c] due to risk of bias, imprecision	RR 0.79 (0.42 to 1.49)	Moderate	
				433 per 1000	91 fewer per 1000 (from 251 fewer to 212 more)
Wound infection (second operation)	41 (1 study)	⊕⊖⊖⊖ VERY LOW[b] due to risk of bias, imprecision	RR 0.58 (0.13 to 2.51)	Moderate	
				200 per 1000	84 fewer per 1000 (from 174 fewer to 302 more)
Stoma complications (first operation)	62 (1 study)	⊕⊖⊖⊖ VERY LOW[b,c] due to risk of bias, imprecision	OR 0.12 (0.01 to 1.18)	Moderate	
				100 per 1000	100 fewer per 1000 (from 219 fewer to 19 more)[a]

[a]Absolute risk difference calculated directly from risk difference as 0 events in some arms of some studies.
[b]Downgraded by 1 increment if the majority of the evidence was at high risk of bias, and downgraded by 2 increments if the majority of the evidence was at very high risk of bias
[c]Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs
[d]Wide variation in point estimates between studies. All studies have wide confidence intervals which may mask heterogeneity in heterogeneity statistics.
[e]I2 = 45% and wide variation in point estimates of studies.
[f]Absolute risk difference calculated from risk difference as 0 events in both arms of all studies.
[g]Variation in point estimates of studies. I2 =67%.
[h]Control group risk calculated directly as 0 events in intervention group.
[i]Serious imprecision due to sample size >70 and <350.
[j]Variation in point estimates. I2 = 36%.

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with temporary stoma	Risk difference with Primary anastomosis (95% CI)
[k]Very serious imprecision due to sample size <70.					

Table 4: Clinical evidence summary: Primary anastomosis vs. temporary stoma – observational studies

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with temporary stoma	Risk difference with Primary anastomosis (95% CI)
Anastomotic leak (first operation)	664 (8 studies)	⨁⊖⊖⊖ VERY LOW[b] due to risk of bias	OR 15.41 (4.53 to 52.47)	Moderate	
				0 per 1000	79 more per 1000 (from 47 more to 110 more)[a]
Anastomotic leak (second operation)	118 (3 studies)	⨁⊖⊖⊖ VERY LOW[b,d] due to risk of bias, imprecision	OR 0.1 (0.02 to 0.51)	96 per 1000	80 fewer per 1000 (from 190 fewer to 30 more)[c]
Anastomotic leak/rectal stump leak (first operation)	111 (1 study)	⨁⊖⊖⊖ VERY LOW[b] due to risk of bias	RR 9.18 (2.18 to 38.77)	Moderate	
				31 per 1000	254 more per 1000 (from 37 more to 1000 more)
Abscess (first operation)	370 (6 studies)	⨁⊖⊖⊖ VERY LOW[b,e,f] due to risk of bias, inconsistency, imprecision	RR 0.69 (0.23 to 2.03)	107 per 1000	41 fewer per 1000 (from 98 fewer to 16 more)[c]
Abscess (second operation)	49	⨁⊖⊖⊖	RD 0 (-	Moderate	

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with temporary stoma	Risk difference with Primary anastomosis (95% CI)
	(1 study)	VERY LOW[b,g] due to risk of bias, imprecision	0.08 to 0.08)	0 per 1000	0 fewer per 1000 (from 80 fewer to 80 more)[a]
Abscess/peritonitis (first operation)	73 (1 study)	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 1.66 (0.18 to 15.16)	Moderate	
				39 per 1000	26 more per 1000 (from 32 fewer to 552 more)
Fistula (first operation)	39 (1 study)	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	OR 6.74 (0.4 to 112.7)	Moderate	
				0 per 1000	95 more per 1000 (from 56 fewer to 246 more)[a]
Septic shock (first operation)	39 (1 study)	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 0.17 (0.02 to 1.34)	Moderate	
				278 per 1000	231 fewer per 1000 (from 272 fewer to 95 more)
Wound sepsis (first operation)	39 (1 study)	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 1.71 (0.17 to 17.38)	Moderate	
				56 per 1000	40 more per 1000 (from 46 fewer to 917 more)
Intra-abdominal infection (first operation)	94 (1 study)	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 0.62 (0.07 to 5.69)	Moderate	
				49 per 1000	19 fewer per 1000 (from 46 fewer to 230 more)
Wound infection (first operation)	334	⊕⊖⊖⊖	RR 0.64	Moderate	

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with temporary stoma	Risk difference with Primary anastomosis (95% CI)
	(5 studies)	VERY LOW[b,f] due to risk of bias, imprecision	(0.37 to 1.12)	154 per 1000	81 fewer per 1000 (from 153 fewer to 9 fewer)[c]
Wound infection (second operation)	49 (1 study)	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 1.22 (0.22 to 6.68)	Moderate	
				91 per 1000	20 more per 1000 (from 71 fewer to 517 more)
Postoperative complications - infection (first operation)	67721 (1 study)	⊕⊖⊖⊖ VERY LOW[b] due to risk of bias	RR 1.88 (1.67 to 2.11)	Moderate	
				53 per 1000	47 more per 1000 (from 36 more to 59 more)
Sepsis (first operation)	220 (3 studies)	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 0.49 (0.24 to 1.01)	Moderate	
				214 per 1000	109 fewer per 1000 (from 163 fewer to 2 more)
Sepsis (second operation)	49 (1 study)	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	OR 0.1 (0.01 to 1.72)	Moderate	
				91 per 1000	91 fewer per 1000 (from 227 fewer to 45 more)[h]
Urinary infection (first operation)	100 (2 studies)	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 0.22 (0.05 to 0.99)	Moderate	
				143 per 1000	112 fewer per 1000 (from 1 fewer to 136 fewer)

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with temporary stoma	Risk difference with Primary anastomosis (95% CI)
Urinary infection (second operation)	49 (1 study)	⨁⊖⊖⊖ VERY LOW[b,g] due to risk of bias, imprecision	RD 0 (-0.08 to 0.08)	Moderate	
				0 per 1000	0 fewer per 1000 (from 80 fewer to 80 more)[a]
Emergency readmission (first operation)	97 (1 study)	⨁⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 1.08 (0.39 to 2.96)	Moderate	
				141 per 1000	11 more per 1000 (from 86 fewer to 276 more)
Hospital readmission (first operation)	97 (1 study)	⨁⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	OR 0.21 (0.03 to 1.36)	Moderate	
				78 per 1000	78 fewer per 1000 (from 157 fewer to 1 more)[h]
Overall surgical morbidity (first operation)	150 (2 studies)	⨁⊖⊖⊖ VERY LOW[b,f,i] due to risk of bias, inconsistency, imprecision	RR 1.07 (0.44 to 2.61)	Moderate	
				338 per 1000	24 more per 1000 (from 189 fewer to 544 more)
Overall morbidity (first operation)	68155 (5 studies)	⨁⊖⊖⊖ VERY LOW[b,f,i] due to risk of bias, inconsistency, imprecision	RR 1.07 (0.75 to 1.52)	Moderate	
				233 per 1000	16 more per 1000 (from 58 fewer to 121 more)
Intraoperative morbidity (first operation)	111 (1 study)	⨁⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 1.61 (0.63 to 4.14)	Moderate	
				108 per 1000	66 more per 1000 (from 40 fewer to 339 more)

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with temporary stoma	Risk difference with Primary anastomosis (95% CI)
Postoperative medical morbidity (first operation)	177 (2 studies)	⨁⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 0.45 (0.24 to 0.81)	Moderate	
				318 per 1000	175 fewer per 1000 (from 60 fewer to 242 fewer)
Postoperative major morbidity (first and second operations combined)	55 (1 study)	⨁⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 0.65 (0.08 to 5.04)	Moderate	
				119 per 1000	42 fewer per 1000 (from 109 fewer to 481 more)
Postoperative minor morbidity (first and second operations combined)	55 (1 study)	⨁⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 1.79 (0.73 to 4.41)	Moderate	
				214 per 1000	169 more per 1000 (from 58 fewer to 730 more)
Major general complications (first operation)	40 (1 study)	⨁⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 0.11 (0.02 to 0.82)	Moderate	
				421 per 1000	375 fewer per 1000 (from 76 fewer to 413 fewer)
Minor general complications (first operation)	40 (1 study)	⨁⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 0.45 (0.09 to 2.2)	Moderate	
				211 per 1000	116 fewer per 1000 (from 192 fewer to 253 more)
Major surgical complications (first operation)	40 (1 study)	⨁⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 0.15 (0.02 to 1.14)	Moderate	
				316 per 1000	269 fewer per 1000 (from 310 fewer

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with temporary stoma	Risk difference with Primary anastomosis (95% CI)
					to 44 more)
Major postoperative complications (first operation)	73 (1 study)	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 0.65 (0.35 to 1.18)	Moderate	
				462 per 1000	162 fewer per 1000 (from 300 fewer to 83 more)
Perioperative mortality (first operation)	111 (1 study)	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 0.61 (0.06 to 6.48)	Moderate	
				39 per 1000	15 fewer per 1000 (from 37 fewer to 214 more)
30-day surgical mortality (first operation)	39 (1 study) 30 days	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 0.14 (0.02 to 1.08)	Moderate	
				333 per 1000	286 fewer per 1000 (from 326 fewer to 27 more)
Mortality	641 (9 studies)	⊕⊖⊖⊖ VERY LOW[b] due to risk of bias	RR 0.39 (0.25 to 0.63)	Moderate	
				167 per 1000	143 fewer per 1000 (from 195 fewer to 91 fewer)[c]
Mortality	331 (1 study) 59 months	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias	RR 0.55 (0.41 to 0.75)	Moderate	
				601 per 1000	270 fewer per 1000 (from 355 fewer to 150 fewer)
In-hospital mortality (first operation)	68518 (8 studies)	⊕⊖⊖⊖ VERY LOW[b,f,j] due to risk of bias,	RR 0.56 (0.23 to 1.41)	Moderate	
				242 per 1000	106 fewer per 1000 (from 186

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with temporary stoma	Risk difference with Primary anastomosis (95% CI)
		inconsistency, imprecision			fewer to 99 more)
In-hospital mortality (second operation)	49 (1 study)	⨁⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	OR 0.11 (0 to 5.55)	Moderate	
				46 per 1000	46 fewer per 1000 (from 158 fewer to 67 more)[h]
Postoperative mortality (first and second operations combined)	55 (1 study)	⨁⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 0.81 (0.1 to 6.6)	Moderate	
				95 per 1000	18 fewer per 1000 (from 86 fewer to 532 more)
Reintervention (first operation)	406 (5 studies)	⨁⊖⊖⊖ VERY LOW[b,f,k] due to risk of bias, inconsistency, imprecision	RR 0.9 (0.58 to 1.38)	197 per 1000	20 fewer per 1000 (from 100 fewer to 50 more)[3]
Reintervention (second operation)	49 (1 study)	⨁⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 0.49 (0.13 to 1.82)	Moderate	
				227 per 1000	116 fewer per 1000 (from 197 fewer to 186 more)
Stoma dysfunction (first operation)	60 (1 study)	⨁⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	RR 0.38 (0.11 to 1.31)	Moderate	
				250 per 1000	155 fewer per 1000 (from 222 fewer to 77 more)
Colostomy insufficiency/stump insufficiency (first operation)	113 (2 studies)	⨁⊖⊖⊖ VERY LOW[b] due to risk of bias	OR 0.11 (0.02 to 0.56)	Moderate	
				158 per 1000	111 fewer per 1000 (from 207 fewer

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with temporary stoma	Risk difference with Primary anastomosis (95% CI)
					to 15 fewer)[h]
Stoma necrosis (first operation)	73 (1 study)	⊕⊖⊖⊖ VERY LOW[b] due to risk of bias	OR 0.05 (0.01 to 0.43)	Moderate	
				154 per 1000	154 fewer per 1000 (from 297 fewer to 10 fewer)[h]
Stoma morbidity (first operation)	111 (1 study)	⊕⊖⊖⊖ VERY LOW[b] due to risk of bias	OR 0.16 (0.04 to 0.69)	Moderate	
				123 per 1000	123 fewer per 1000 (from 209 fewer to 37 fewer)[h]
Stoma complications (first and second operations combined)	55 (1 study)	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	OR 0.26 (0.02 to 3.87)	Moderate	
				71 per 1000	71 fewer per 1000 (from 20 fewer to 56 more)[h]
30-day organ space infection (first operation)	2018 (1 study) 30 days	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	OR 0.71 (0.35 to 1.42)	Moderate	
				55 per 1000	15 fewer per 1000 (from 35 fewer to 21 more)
30-day postoperative sepsis (first operation)	2018 (1 study) 30 days	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	OR 1.02 (0.67 to 1.55)	Moderate	
				142 per 1000	2 more per 1000 (from 42 fewer to 62 more)
Wound infection (first operation)	2105 (2 studies)	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	OR 0.88 (0.59 to 1.32)	Moderate	
				226 per 1000	22 fewer per 1000 (from 79 fewer to

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with temporary stoma	Risk difference with Primary anastomosis (95% CI)
					52 more)
Postoperative morbidity (first operation)	87 (1 study)	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	OR 0.21 (0.05 to 0.84)	Moderate	
				867 per 1000	289 fewer per 1000 (from 21 fewer to 621 fewer)
Postoperative mortality (first operation)	2305 (3 studies)	⊕⊖⊖⊖ VERY LOW[b,f,l] due to risk of bias, inconsistency, imprecision	OR 0.83 (0.34 to 2.03)	Moderate	
				338 per 1000	40 fewer per 1000 (from 190 fewer to 171 more)
Reoperation (first operation)	2305 (3 studies)	⊕⊖⊖⊖ VERY LOW[b,f,m] due to risk of bias, inconsistency, imprecision	OR 0.78 (0.38 to 1.6)	Moderate	
				200 per 1000	37 fewer per 1000 (from 113 fewer to 86 more)
Long term mortality post-hospital discharge - HR	243 (1 study) 59 months	⊕⊖⊖⊖ VERY LOW[b,f] due to risk of bias, imprecision	HR 0.54 (0.3 to 0.97)	Moderate	
				417 per 1000	164 fewer per 1000 (from 10 fewer to 268 fewer)

[a]Absolute risk difference calculated directly as 0 events in control group.
[b]Downgraded by 1 increment if the majority of the evidence was at high risk of bias, and downgraded by 2 increments if the majority of the evidence was at very high risk of bias
[c]Absolute risk difference calculated directly as 0 events in some studies in some arms.
[d]Serious imprecision as sample size >70 and <350
[e]I2=39% and wide variation in point estimates across studies.
[f]Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs
[g]Very serious imprecision as sample size <70.

Outcomes	No of Participants (studies) Follow up	Quality of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects	
				Risk with temporary stoma	Risk difference with Primary anastomosis (95% CI)
[h]Absolute risk difference calculated directly as 0 events in intervention group. [i]I2=67% and wide variation in point estimates between studies. [j]I2=89% with point estimate of one study widely different to the other studies. [k]I2=19% and wide variation in point estimates across studies. [l]I2=56% and wide variation in point estimates across studies. [m]I2=44% and wide variation in point estimates across studies.					

See appendix F for full GRADE tables.

Outcomes not suitable for meta-analysis (observational studies)

Quality of life

Vermeulen 2010 and 2011 [70, 71] assessed the general quality of life of patients undergoing primary anastomosis or Hartmann's procedure (temporary stoma) for emergency surgery due to perforated diverticulitis (Hinchey grades I-IV) using EuroQol EQ-VAS and EQ-5D index measures. A higher score for both of these outcomes indicates a higher quality of life. Quality of life was demonstrated to be higher in the primary anastomosis group compared with those undergoing Hartmann's procedure for both the EQ-VAS (P<0.05) and EQ-5D index (P<0.05) measures, based on mean values and ranges:

- Mean EQ-VAS score: Primary anastomosis, 74 (range, 10-100, n=53); Hartmann's procedure, 65 (range, 20-100, n=76)
- Mean EQ-5D index score: Primary anastomosis, 77 (range, 67-93, n=53); Hartmann's procedure, 67 (range, -18-100, n=76)

1.5 Economic evidence

1.5.1 Included studies

One health economic study was identified with the relevant comparison and it has been included in this review. [53] This study is summarised in the health economic evidence profile below (Table 5) and the health economic evidence table in appendix H.

1.5.2 Excluded studies

No health economic studies that were relevant to this question were excluded due to assessment of limited applicability or methodological limitations.

See also the health economic study selection flow chart in appendix G.

1.5.3 Summary of studies included in the economic evidence review

Table 5: Health economic evidence profile: Primary anastomosis with diverting ileostomy versus Hartmann's Procedure

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
Oberkofler 2012 [53] (Switzerland)	Partially applicable (a)	Potentially serious limitations (b)	Within-trial analysis of a multicentre randomised controlled trial. The study was discontinued after the interim analysis due to low accrual rates and significant differences in relevant secondary outcomes (total number of complications).	Primary anastomosis saves £1,919 per patient (c)	Mortality: -2% Overall complication rate: +4% Severe complications (including reoperations): -6% Stoma reversal: -32%	Indeterminate	Not reported

Abbreviations: ICER: incremental cost-effectiveness ratio; n/a: not applicable; QALY: quality-adjusted life years; RCT: randomised controlled trial

(a) Switzerland hospital perspective

(b) Both strategies were designed to include stoma reversal (planned for before 3 months). Cost year not reported. No detailed breakdown of cost components incorporated. Costs other than those incurred to the institutions not considered. Unclear whether the costs of any other admissions between index operation and stoma reversal are included. Stoma reversal was done after 6 months in the Hartmann's group and after 3 months in the anastomosis group. No assessment of quality of life was made. A small number of patients were included in the trial. One patient randomised to intervention 1 received a primary anastomosis, while 3 patients randomised to intervention 2 received Hartmann's procedure, at the discretion of the surgeon. No conflicts of interest reported.

(c) Converted using 2012 purchasing power parities[54]

1.5.4 Unit costs

The unit costs below were presented to the Committee, to aid consideration of cost effectiveness.

Table 6: NHS cost of non-elective sigmoid resection

Procedure (OPCS4)	Healthcare Resource Group (HRG) code and description	Unit Cost	Average Length of Stay	Source
Sigmoid colectomy and anastomosis	FF33 Distal Colon Procedures, 19 years and over, inclusive of non-elective short stay and non-elective long stay with excess bed days, weighted for complications and co morbidities for HRG codes: FF33A and FF33B; as recorded for Non-Elective Inpatients	£7,091	9.0 days	NHS Reference Costs 2016-2017
Sigmoid colectomy and ileostomy HFQ Or Sigmoid colectomy and exteriorisation of bowel NEC	FF31 Complex Large Intestine Procedures, 19 years and over, inclusive of non-elective short stay and non-elective long stay with excess bed days, weighted for complications and co morbidities for HRG codes: FF31A, FF31B, FF31C and FF31D; as recorded for Non-Elective Inpatients	£8,312	11.0 days	NHS Reference Costs 2016-2017

Table 7: NHS cost of elective sigmoid resection

	Currency Description	Unit Cost	Average Length of Stay	Source
Sigmoid colectomy and anastomosis	FF33 Distal Colon Procedures, 19 years and over, inclusive of excess bed days, weighted for complications and co morbidities for HRG codes: FF33A and FF33B; as recorded for Elective Inpatients	£6,487	5.2 days	NHS Reference Costs 2016-2017
Sigmoid colectomy and ileostomy HFQ Or Sigmoid colectomy and exteriorisation of bowel NEC	FF31 Complex Large Intestine Procedures, 19 years and over, inclusive of excess bed days, weighted for complications and co morbidities for HRG codes: FF31A, FF31B, FF31C and FF31D; as recorded for Elective Inpatients	£8,140	7.6 days	NHS Reference Costs 2016-2017
Closure of ileostomy	FF22 Major Small Intestine Procedures, 19 years and over, inclusive of excess bed days, weighted for complications and co morbidities for HRG codes: FF22A, FF22B, FF22C and FF22C; as recorded for Elective Inpatients	£5,151	5.97 days	NHS Reference Costs 2016-2017

1.6 Evidence statements

1.6.1 Clinical evidence statements

RCT evidence:

- There was no clinical difference or too much uncertainty to distinguish between primary anastomosis and temporary stoma for all outcomes measured following the first operation; anastomotic leak (3 studies, n=254), complications – deep incisional surgical site infections (1 study, n=90), complications – organ space site infections (1 study, n=90), complications – superficial incisional surgical site infections (1 study, n=90), complications – urinary tract infections (2 studies, n=152), overall morbidity (2 studies, n=121), mortality (3 studies, n=254), complications – intra-abdominal abscess (1 study, n=102), complications – anastomotic stricture (1 study, n=102), need for further surgery (1 study, n=102), Clavien-Dindo I-V complications (1 study, n=62), intra-abdominal infection (1 study, n=62), wound infection (1 study, n=62) and stoma complications (1 study, n=62). The evidence for all of these outcomes was rated as very low quality.

- A similar situation was observed for the majority of outcomes in the RCT evidence following the second operation, with substantial uncertainty or no clinical difference being identified between the primary anastomosis and temporary stoma groups; anastomotic leak (3 studies, n=162, very low quality), complications – deep incisional surgical site infections (1 study, n=56, very low quality), complications – organ space site infections (1 study, n=56, very low quality), complications – superficial incisional surgical site infections (1 study, n=56, very low quality), complications – urinary tract infections (2 studies, n=97, very low quality), mortality (3 studies, n=162, very low quality), complications – intra-abdominal abscess (1 study, n=65, very low quality), need for further surgery (2 studies, n=106, very low quality), intra-abdominal infection (1 study, n=41, very low quality) and wound infection (1 study, n=41, very low quality). however, 2 studies (n=121, very low quality) demonstrated a clinical benefit of primary anastomosis over temporary stoma for overall morbidity at the second operation, while 1 study (n=41, low quality) indicated a clinical benefit of temporary stoma over primary anastomosis for Clavien-Dindo I-V complications at the second operation.

Observational evidence:

Evidence for all outcomes extracted from observational studies was rated as very low quality.

There was no clinical difference or too much uncertainty to determine whether either intervention was beneficial for the majority of the outcomes extracted from observational studies:

- Following the first operation, those outcomes with too much uncertainty or no clinical difference included abscess (6 studies, n=370), abscess/peritonitis (1 study, n=73), fistula (1 study, n=39), septic shock (1 study, n=39), wound sepsis (1 study, n=39), intra-abdominal infection (1 study, n=94), sepsis (3 studies, n=220), emergency readmission (1 study, n=97), hospital readmission (1 study, n=97), overall surgical morbidity (2 studies, n=150), overall morbidity (5 studies, n=68155), intraoperative morbidity (1 study, n=111), minor general complications (1 study, n=40), major surgical complications (1 study, n=40), major postoperative complications (1 study, n=73), perioperative mortality (1 study, n=111), 30-day surgical mortality (1 study, n=39), in-hospital mortality (8 studies, n=68518), reintervention (5 studies, n=406), stoma dysfunction (1 study, n=60), 30-day organ space infection (adjusted outcome, 1 study, n=2018), 30-day postoperative sepsis (adjusted outcome, 1 study, n=2018),

wound infection (adjusted outcome, 2 studies, n=2105), postoperative mortality (adjusted outcome, 3 studies, n=2305) and reoperation (adjusted outcome, 3 studies, n=2305).

- Outcomes with too much uncertainty or no clinical difference following the second operation included anastomotic leak (3 studies, n=118), abscess (1 study, n=49), wound infection (1 study, n=49), sepsis (1 study, n=49), urinary infection (1 study, n=49), in-hospital mortality (1 study, n=49) and reintervention (1 study, n=49).

- In addition, 1 study (n=55) reported results for outcomes of postoperative major morbidity, postoperative minor morbidity, postoperative mortality and stoma complications for the first and second operations combined, of which all were associated with too much uncertainty to distinguish between the two interventions or no clinical difference.

There was evidence from observational studies for a clinical benefit of primary anastomosis over temporary stoma for wound infection (5 studies, n=334), urinary infection (2 studies, n=100), postoperative medical morbidity (2 studies, n=177), major general complications (1 study, n=40), mortality (median 59 months) follow-up (1 study, n=331), colostomy insufficiency/stump insufficiency (2 studies, n=113), stoma necrosis (1 study, n=73), stoma morbidity (1 study, n=111) and postoperative morbidity (adjusted outcome, 1 study, n=87) following the first operation. In addition, 9 studies (n=641) provided evidence of a clinical benefit of primary anastomosis over temporary stoma for mortality, but whether this was related to the first or second operations, or combined, was unclear. One study also reported a hazard ratio indicating a clinical benefit of primary anastomosis compared with temporary stoma in terms of mortality following discharge from hospital after surgery (n=243), which was reported as a hazard ratio and adjusted for age, ASA classification and Hinchey staging. In addition, one study (n=129) assessed quality of life following operation and indicated a better quality of life following primary anastomosis compared with temporary stoma on both EQ-VAS and EQ-5D index measures; however, only mean values were provided and this data could not be analysed.

Observational studies also conversely provided evidence of a clinical benefit of temporary stoma over primary anastomosis for certain outcomes, including anastomotic leak (8 studies, n=664), anastomotic leak/rectal stump leak (1 study, n=111) and postoperative complications – infections (1 study, n=67721) following the first operation.

1.6.2 Health economic evidence statements

One cost-consequences analysis found that primary anastomosis was less costly than Hartmann's procedure (-£1900) and led to more patients achieving stoma reversal (90% vs 58%). This study was rated as being partially applicable with potentially serious limitations.

1.7 The committee's discussion of the evidence

1.7.1.1 The outcomes that matter most

The guideline committee agreed that for this review quality of life, mortality, morbidity, progression of disease, complications (infections, abscesses, perforation, fistula, stricture), recurrence rates of acute diverticulitis, re-hospitalisation, need for further surgery, anastomotic leak rate and stoma complications were considered critical outcomes. Symptom control/recurrence, for example pain relief and bowel habit, were considered to be important outcomes in this review.

In this review, no clinical evidence was identified for the following critical outcomes; progression of disease, complications (perforation) and recurrence rates of acute diverticulitis. In addition, no clinical evidence was identified for the important outcome of symptom control/recurrence.

1.7.1.2 The quality of the evidence

In this review, clinical evidence from both RCTs and observational studies was included. The identified RCTs only covered one of the complications associated with acute diverticulitis (Hinchey stage III or IV diverticular perforation with peritonitis). Not all of the critical outcomes were provided in the RCTs. Observational studies that consisted of patients with various complications of acute diverticulitis (such as abscess, perforation and fistula) were included in the review to increase the breadth of the evidence base as RCTs only covered those with diverticular perforation.

For evidence from both the RCTs and observational studies, the quality of the evidence was rated as very low for all but one outcome. For RCTs, this was predominantly due to risk of bias and imprecision, with the main reasons for downgrading due to risk of bias being the presence of selection bias, lack of blinding and incomplete outcome data. Concerning observational studies, risk of bias and imprecision were also the main factors contributing to a quality rating of very low, with all studies having major issues with selection bias due to the fact that higher age and comorbidity were observed in the temporary stoma (for example Hartmann's procedure) groups compared with the primary anastomosis groups. A lack of blinding and incomplete outcome data were also factors that contributed to a high risk of bias in the observational studies.

1.7.1.3 Benefits and harms

The review of the clinical evidence demonstrated that for the majority of outcomes there was either no clinical difference between primary anastomosis and temporary stoma for complicated acute diverticulitis or there was too much uncertainty in the effect estimate to determine whether either intervention should be favoured.

Outcomes were reported separately for the first and second operations of each intervention where the studies provided this information. The first operation refers to the initial resection with anastomosis or stoma and the second operation refers to the operation to reverse stomas created as a result of Hartmann's procedure or temporary/diverting stomas used alongside primary anastomosis as an additional protective measure.

The included RCTs, which covered the population of diverticular perforation with peritonitis, demonstrated a clinical benefit of primary anastomosis in terms of overall morbidity at the second operation, while a clinical benefit of temporary stoma was observed for the outcome of Clavien-Dindo complications I-IV at the second operation. However, for all other outcomes reported in RCTs, no difference could be identified between primary anastomosis and temporary stoma, and the committee therefore concluded that there was insufficient evidence to favour one over the other, based on the RCT evidence for perforated diverticulitis with peritonitis. The committee also noted that the demographics of patients included in the RCTs may not accurately reflect the demographics of those that usually undergo these procedures in the UK and the RCTs may therefore have selected fitter individuals for inclusion. In particular, the average age of patients in two of the RCTs may be lower than usually observed and the BMI was reported to be within a normal range in two studies, which may not be reflective of the UK population in terms of this condition.

The observational evidence covered a more broad range of complications associated with acute diverticulitis; the population of these studies included various complications, including diverticular abscess, perforation and fistula, with a mixture of different complications present in some studies. Observational studies demonstrated a clinical benefit of one intervention for

some outcomes, including wound infection, urinary infection, postoperative medical morbidity, mortality and stoma necrosis, morbidity and insufficiency at the first operation for primary anastomosis, and anastomotic leak and postoperative complications at the first operation for temporary stoma. However, the committee agreed that they could not recommend one intervention over the other due to the uncertainty in the effect for numerous other outcomes and because of the substantial selection bias across the observational studies. This bias meant that those patients with the worst overall health at baseline were more likely to be present in the temporary stoma group, which is a confounding factor that may cause outcomes for this group to appear worse than they would if the overall health of participants at baseline was similar between temporary stoma and primary anastomosis groups. Another limitation of the observational studies was the fact that the length of follow-up for outcomes was not specified for the majority of the studies.

Due to the uncertainty observed in the clinical evidence, the committee called upon the experience of the surgeons on the committee to make a recommendation based upon the level of comorbidity and age of patients. The committee agreed that in older patients and/or those with higher levels of comorbidity, Hartmann's procedure may be safer due to the increased risk of anastomotic leak with primary anastomosis and the fact that patients are less likely to survive anastomotic leaks if they have a higher level of comorbidity. This decision was also supported by the approach taken by the observational studies included in the review, with the majority of studies reporting substantially higher age and comorbidity in the Hartmann's procedure groups compared with the primary anastomosis groups.

Overall, the lack of certainty for many outcomes reported in the clinical evidence led the committee to conclude that there was no overwhelming evidence to support recommending primary anastomosis or temporary stoma, such as by Hartmann's procedure, over one another. The committee noted that the decision should be made according to patient and/or surgeon preference, with consideration given to the age and level of comorbidity of each patient as well as the experience of the surgeon, for example, the committee mentioned that general surgeons may be less inclined to perform primary anastomosis over Hartmann's procedure than colorectal surgeons.

The committee recognised that primary anastomosis represents a more technically difficult procedure and studies reporting its use often came from dedicated colorectal surgeons rather than general surgeons. The choice to perform this technique may therefore be made based on the surgeon's experience of undertaking this type of surgery in their day-to-day practice such that colorectal surgeons would be more likely to undertake this than non-specialist surgeons.

The committee highlighted that there may be a group of patients that due to their underlying medical conditions and physiological state can only be offered a defunctioning stoma above the area of complicated disease for example with a diverticular fistula or stricture rather than a formal resection.

1.7.2 Cost effectiveness and resource use

Primary anastomosis is typically harder to perform and more costly than Hartmann's procedure. It is believed to be less safe in patients with comorbidities. However, primary anastomosis is less likely than Hartmann's procedure to leave patients with a permanent stoma, which is more costly in the longer term and less desirable to patients. The committee noted that primary anastomosis with temporary diverting ileostomy can mitigate the risk of anastomotic leakage.

There was one cost effectiveness study included in the review, based on a small (n=62), randomised controlled trial. The study found that primary anastomosis with diverting ileostomy was less costly than Hartmann's procedure by about £1,900 per patient and stoma

was reversed for more patients. It was not clear what cost components were included. Other outcomes were similar between the arms.

Given the uncertainties in the evidence and high risk of bias, the committee decided not to recommend one procedure over the other.

References

1. Ahad S, Figueredo EJ, Oelschlager BK, Pellegrini CA. Laparoscopic colectomy. Medscape General Medicine. 2007; 9(2):27

2. Alvarez JA, Baldonedo RF, Bear IG, Otero J, Pire G, Alvarez P et al. Outcome and prognostic factors of morbidity and mortality in perforated sigmoid diverticulitis. International Surgery. 2009; 94(3):240-8

3. Ambrosetti P, Robert JH, Witzig JA, Mirescu D, Mathey P, Borst F et al. Acute left colonic diverticulitis: a prospective analysis of 226 consecutive cases. Surgery. 1994; 115(5):546-50

4. Aquina CT, Probst CP, Becerra AZ, Hensley BJ, Iannuzzi JC, Noyes K et al. The impact of surgeon volume on colostomy reversal outcomes after Hartmann's procedure for diverticulitis. Surgery. 2016; 160(5):1309-1317

5. Auguste LJ, Wise L. Surgical management of perforated diverticulitis. American Journal of Surgery. 1981; 141(1):122-127

6. Bacon HE, Segar RJ. Current surgical management of diverticulitis. Southern Medical Journal. 1967; 60(6):658-60

7. Bax TW, McNevin MS. The value of diverting loop ileostomy on the high-risk colon and rectal anastomosis. American Journal of Surgery. 2007; 193(5):585-8

8. Belmonte C, Klas JV, Perez JJ, Wong WD, Rothenberger DA, Goldberg SM et al. The Hartmann procedure. First choice or last resort in diverticular disease? Archives of Surgery. 1996; 131(6):612-7

9. Binda GA, Karas JR, Serventi A, Sokmen S, Amato A, Hydo L et al. Primary anastomosis vs nonrestorative resection for perforated diverticulitis with peritonitis: a prematurely terminated randomized controlled trial. Colorectal Disease. 2012; 14(11):1403-1410

10. Binda GA, Saccomani G, Gramegna A. Emergency surgery of complicated colonic diverticulitis. Acta Chirurgica Belgica. 1993; 93(6):253-7

11. Biondo S, Pares D, Marti Rague J, Kreisler E, Fraccalvieri D, Jaurrieta E. Acute colonic diverticulitis in patients under 50 years of age. Br J Surg. 2002; 89(9):1137-41

12. Blair NP, Germann E. Surgical management of acute sigmoid diverticulitis. American Journal of Surgery. 2002; 183(5):525-8

13. Bordeianou L, Cauley CE, Patel R, Bleday R, Mahmood S, Kennedy K et al. Prospective Creation and Validation of the PREVENTT (Prediction and Enaction of Prevention Treatments Trigger) Scale for Surgical Site Infections (SSIs) in Patients With Diverticulitis. Annals of Surgery. 2018; Epublication

14. Bridoux V, Regimbeau JM, Ouaissi M, Mathonnet M, Mauvais F, Houivet E et al. Hartmann's Procedure or Primary Anastomosis for Generalized Peritonitis due to Perforated Diverticulitis: A Prospective Multicenter Randomized Trial (DIVERTI). Journal of the American College of Surgeons. 2017; Epublication

15. Caricato M, Ausania F, Ripetti V, Bartolozzi F, Campoli G, Coppola R. Retrospective analysis of long-term defunctioning stoma complications after colorectal surgery. Colorectal Disease. 2007; 9(6):559-61

16. Cartmell MT, Jones OM, Moran BJ, Cecil TD. A defunctioning stoma significantly prolongs the length of stay in laparoscopic colorectal resection. Surgical Endoscopy. 2008; 22(12):2643-7

17. Cauley CE, Patel R, Bordeianou L. Use of Primary Anastomosis With Diverting Ileostomy in Patients With Acute Diverticulitis Requiring Urgent Operative Intervention. Diseases of the Colon and Rectum. 2018; 61(5):586-592

18. Chua CL. Surgical considerations in the Hartmann's procedure. Australian and New Zealand Journal of Surgery. 1996; 66(10):676-9

19. Cirocchi R, Afshar S, Shaban F, Nascimbeni R, Vettoretto N, Di Saverio S et al. Perforated sigmoid diverticulitis: Hartmann's procedure or resection with primary anastomosis-a systematic review and meta-analysis of randomised control trials. Techniques in Coloproctology. 2018; Epublication

20. Constantinides VA, Aydin HN, Tekkis PP, Fazio VW, Heriot AG, Remzi FH. Long-term, health-related, quality of life comparison in patients undergoing single stage vs staged resection for complicated diverticular disease. Colorectal Disease. 2006; 8(8):663-71

21. Drumm J, Clain A. The management of acute colonic diverticulitis with suppurative peritonitis. Annals of the Royal College of Surgeons of England. 1984; 66(2):90-1

22. Eisenstat TE, Rubin RJ, Salvati EP. Surgical management of diverticulitis. The role of the Hartmann procedure. Diseases of the Colon and Rectum. 1983; 26(7):429-32

23. El-Haddad HM, Kassem MI, Sabry AA, Abouelfotouh A. Surgical protocol and outcome for sigmoidovesical fistula secondary to diverticular disease of the left colon: A retrospective cohort study. International Journal of Surgery. 2018; 56:115-123

24. El-Sayed C, Radley S, Mytton J, Evison F, Ward ST. Risk of recurrent disease and surgery following an admission for acute diverticulitis. Diseases of the Colon and Rectum. 2018; 61(3):382-389

25. Faltyn J, Jungwirth J. Surgical treatment of the perforated colon with peritonitis. Annali Italiani di Chirurgia. 1996; 67(2):211-3

26. Gachabayov M, Oberkofler CE, Tuech JJ, Hahnloser D, Bergamaschi R. Resection with primary anastomosis vs nonrestorative resection for perforated diverticulitis with peritonitis: a systematic review and meta-analysis. Colorectal Disease. 2018; Epublication

27. Gawlick U, Nirula R. Resection and primary anastomosis with proximal diversion instead of Hartmann's: evolving the management of diverticulitis using NSQIP data.[Erratum appears in J Trauma Acute Care Surg. 2012 Aug;73(2):534]. The Journal of Trauma and Acute Care Surgery. 2012; 72(4):807-14

28. Golda T, Kreisler E, Rodriguez G, Miguel B, Biondo S. From colorectal to general surgeon in the management of left colonic perforation: A cohort study. International Journal of Surgery. 2018; 55:175-181

29. Gooszen AW, Gooszen HG, Veerman W, Van Dongen VM, Hermans J, Klien Kranenbarg E et al. Operative treatment of acute complications of diverticular disease: primary or secondary anastomosis after sigmoid resection. European Journal of Surgery. 2001; 167(1):35-9

30. Gooszen AW, Tollenaar RA, Geelkerken RH, Smeets HJ, Bemelman WA, Van Schaardenburgh P et al. Prospective study of primary anastomosis following sigmoid

resection for suspected acute complicated diverticular disease. British Journal of Surgery. 2001; 88(5):693-7

31. Gregersen R, Andresen K, Burcharth J, Pommergaard HC, Rosenberg J. Long-term mortality and recurrence in patients treated for colonic diverticulitis with abscess formation: a nationwide register-based cohort study. International Journal of Colorectal Disease. 2018; 33(4):431-440

32. Gregg RO. An ideal operation for diverticulitis of the colon. American Journal of Surgery. 1987; 153(3):285-90

33. Haas JM, Singh M, Vakil N. Mortality and complications following surgery for diverticulitis: Systematic review and meta-analysis. United European Gastroenterology Journal. 2016; 4(5):706-713

34. Herzog T, Janot M, Belyaev O, Sulberg D, Chromik AM, Bergmann U et al. Complicated sigmoid diverticulitis--Hartmann's procedure or primary anastomosis? Acta Chirurgica Belgica. 2011; 111(6):378-83

35. Hold M, Denck H, Bull P. Surgical management of perforating diverticular disease in Austria. International Journal of Colorectal Disease. 1990; 5(4):195-9

36. Howe HJ, Casali RE, Westbrook KC, Thompson BW, Read RC. Acute perforations of the sigmoid colon secondary to diverticulitis. American Journal of Surgery. 1979; 137(2):184-7

37. Kairaluoma M, Rissanen H, Kultti V, Mecklin JP, Kellokumpu I. Outcome of temporary stomas: A prospective study of temporary intestinal stomas constructed between 1989 and 1996. Digestive Surgery. 2002; 19(1):45-51

38. Khan AL, Ah-See AK, Crofts TJ, Heys SD, Eremin O. Reversal of Hartmann's colostomy. Journal of the Royal College of Surgeons of Edinburgh. 1994; 39(4):239-242

39. Khoury GA, Lewis MC, Meleagros L, Lewis AA. Colostomy or ileostomy after colorectal anastomosis?: a randomised trial. Annals of the Royal College of Surgeons of England. 1987; 69(1):5-7

40. Kirson SM. Diverticulitis: management patterns in a community hospital. Southern Medical Journal. 1988; 81(8):972-7

41. Kreis ME, Mueller MH, Thasler WH. Hartmann's procedure or primary anastomosis? Digestive Diseases. 2012; 30(1):83-5

42. Kriwanek S, Armbruster C, Beckerhinn P, Dittrich K. Prognostic factors for survival in colonic perforation. International Journal of Colorectal Disease. 1994; 9(3):158-62

43. Lacy AM, Garcia-Valdecasas JC, Delgado S, Grande L, Fuster J, Tabet J et al. Postoperative complications of laparoscopic-assisted colectomy. Surgical Endoscopy. 1997; 11(2):119-22

44. Maggard MA, Chandler CF, Schmit PJ, Bennion RS, Hines OJ, Thompson JE. Surgical diverticulitis: treatment options. American Surgeon. 2001; 67(12):1185-9

45. Maitra RK, Pinkney TD, Mohiuddin MK, Maxwell-Armstrong CA, Williams JP, Acheson AG. Should laparoscopic reversal of Hartmann's procedure be the first line approach in all patients? International Journal of Surgery. 2013; 11(9):971-976

46. Makela JT, Kiviniemi H, Laitinen S. Prognostic factors of perforated sigmoid diverticulitis in the elderly. Digestive Surgery. 2005; 22(1-2):100-6

47. Medina VA, Papanicolaou GK, Tadros RR, Fielding LP. Acute perforated diverticulitis: primary resection and anastomosis? Connecticut Medicine. 1991; 55(5):258-61

48. Miccini M, Borghese O, Scarpini M, Cassini D, Gregori M, Amore Bonapasta S et al. Urgent surgery for sigmoid diverticulitis. Retrospective study of 118 patients. Annali Italiani di Chirurgia. 2011; 82(1):41-8

49. Mueller MH, Karpitschka M, Renz B, Kleespies A, Kasparek MS, Jauch KW et al. Co-morbidity and postsurgical outcome in patients with perforated sigmoid diverticulitis. International Journal of Colorectal Disease. 2011; 26(2):227-34

50. National Institute for Health and Care Excellence. Developing NICE guidelines: the manual. London. National Institute for Health and Care Excellence, 2014. Available from: http://www.nice.org.uk/article/PMG20/chapter/1%20Introduction%20and%20overview

51. Nespoli A, Ravizzini C, Trivella M, Segala M. The choice of surgical procedure for peritonitis due to colonic perforation. Archives of Surgery. 1993; 128(7):814-8

52. Netri G, Verbo A, Coco C, Cogliandolo S, Mattana C, Salvadori L et al. The role of surgical treatment in colon diverticulitis: indications and results. Ann Ital Chir. 2000; 71(2):209-15

53. Oberkofler CE, Rickenbacher A, Raptis DA, Lehmann K, Villiger P, Buchli C et al. A multicenter randomized clinical trial of primary anastomosis or Hartmann's procedure for perforated left colonic diverticulitis with purulent or fecal peritonitis. Annals of Surgery. 2012; 256(5):819-827

54. Organisation for Economic Co-operation and Development (OECD). Purchasing power parities (PPP). 2012. Available from: http://www.oecd.org/sdd/prices-ppp/ Last accessed: 02/02/18

55. Parisi A, Gemini A, Desiderio J, Petrina A, Trastulli S, Grassi V et al. Laparoscopic peritoneal lavage: our experience and review of the literature. Wideochirurgia i Inne Techniki Maloinwazyjne. 2016; 11(2):83-7

56. Pasternak I, Dietrich M, Woodman R, Metzger U, Wattchow DA, Zingg U. Use of severity classification systems in the surgical decision-making process in emergency laparotomy for perforated diverticulitis. International Journal of Colorectal Disease. 2010; 25(4):463-70

57. Regenet N, Pessaux P, Hennekinne S, Lermite E, Tuech JJ, Brehant O et al. Primary anastomosis after intraoperative colonic lavage vs. Hartmann's procedure in generalized peritonitis complicating diverticular disease of the colon. International Journal of Colorectal Disease. 2003; 18(6):503-7

58. Reyes-Espejel L, Ruiz-Campos M, Correa-Rovelo JM, Garcia-Osogobio S. Sigmoidectomy with primary anastomosis for complicated diverticulitis. Revista de Gastroenterología de México. 2015; 80(4):255-9

59. Richter S, Lindemann W, Kollmar O, Pistorius GA, Maurer CA, Schilling MK. One-stage sigmoid colon resection for perforated sigmoid diverticulitis (Hinchey stages III and IV). World Journal of Surgery. 2006; 30(6):1027-32

60. Salem L, Flum DR. Primary anastomosis or Hartmann's procedure for patients with diverticular peritonitis: a systematic review (Provisional abstract). Diseases of the Colon and Rectum. 2004; 47(11):1953-1964

61. Schilling MK, Maurer CA, Kollmar O, Buchler MW. Primary vs. secondary anastomosis after sigmoid colon resection for perforated diverticulitis (Hinchey Stage

III and IV): a prospective outcome and cost analysis. Diseases of the Colon and Rectum. 2001; 44(5):699-705

62. Schlegel RD, Dehni N, Parc R, Caplin S, Tiret E. Results of reoperations in colorectal anastomotic strictures. Diseases of the Colon and Rectum. 2001; 44(10):1464-8

63. Schmidt S, Ismail T, Puhan MA, Soll C, Breitenstein S. Meta-analysis of surgical strategies in perforated left colonic diverticulitis with generalized peritonitis. Langenbecks Archives of Surgery. 2018; 403(4):425-433

64. Stumpf MJ, Vinces FY, Edwards J. Is primary anastomosis safe in the surgical management of complications of acute diverticulitis? American Surgeon. 2007; 73(8):787-91

65. Thaler K, Neumann F, Gero A, Kreuzer W. Utility of appropriate peritonitis grading in the surgical management of perforated sigmoid diverticulitis. Colorectal Disease. 2000; 2(6):359-363

66. Trenti L, Biondo S, Golda T, Monica M, Kreisler E, Fraccalvieri D et al. Generalized peritonitis due to perforated diverticulitis: Hartmann's procedure or primary anastomosis? International Journal of Colorectal Disease. 2011; 26(3):377-84

67. Tucci G, Torquati A, Grande M, Stroppa I, Sianesi M, Farinon AM. Major acute inflammatory complications of diverticular disease of the colon: planning of surgical management. Hepato-Gastroenterology. 1996; 43(10):839-45

68. Tudor RG, Farmakis N, Keighley MR. National audit of complicated diverticular disease: analysis of index cases. British Journal of Surgery. 1994; 81(5):730-2

69. Vermeulen J, Akkersdijk GP, Gosselink MP, Hop WC, Mannaerts GH, van der Harst E et al. Outcome after emergency surgery for acute perforated diverticulitis in 200 cases. Digestive Surgery. 2007; 24(5):361-6.

70. Vermeulen J, Gosselink MP, Busschbach JJ, Lange JF. Avoiding or reversing Hartmann's procedure provides improved quality of life after perforated diverticulitis. Journal of Gastrointestinal Surgery. 2010; 14(4):651-7

71. Vermeulen J, Gosselink MP, Hop WC, van der Harst E, Hansen BE, Mannaerts GH et al. Long-term survival after perforated diverticulitis. Colorectal Disease. 2011; 13(2):203-9

72. Vermeulen J, Leijtens JW, Mannaerts GH. Reversal of Hartmann's procedure after perforated diverticulitis through the stomal side without additional incisions: the SIR procedure. Digestive Surgery. 2010; 27(5):391-6

73. Wedell J, Banzhaf G, Chaoui R, Fischer R, Reichmann J. Surgical management of complicated colonic diverticulitis. British Journal of Surgery. 1997; 84(3):380-3

74. Zhang YC, Jin XD, Zhang YT, Wang ZQ. Better functional outcome provided by short-armed sigmoid colon-rectal side-to-end anastomosis after laparoscopic low anterior resection: a match-paired retrospective study from China. International Journal of Colorectal Disease. 2012; 27(4):535-41

75. Zorcolo L, Covotta L, Carlomagno N, Bartolo DC. Safety of primary anastomosis in emergency colo-rectal surgery. Colorectal Disease. 2003; 5(3):262-9

Appendices

Appendix A: Review protocols

Table 8: Review protocol: Primary vs. secondary anastomosis

Field	Content
Review question	What is the most appropriate time of anastomosis in people with complicated acute diverticulitis?
Type of review question	intervention review A review of health economic evidence related to the same review question was conducted in parallel with this review. For details see the health economic review protocol for this NICE guideline.
Objective of the review	To determine the most appropriate timing for of anastomosis in people with complicated acute diverticulitis
Eligibility criteria – population / disease / condition / issue / domain	Adults aged 18 years and over with complicated acute diverticulitis
Eligibility criteria – intervention(s) / exposure(s) / prognostic factor(s)	• Primary anastomosis • Temporary stoma • Permanent stoma
Eligibility criteria – comparator(s) / control or reference (gold) standard	Compared to each other

Outcomes and prioritisation	Critical outcomes:
	• Quality of life
	• Mortality
	• Morbidity
	• Progression of disease
	• Complications:
	  ○ infections
	  ○ abscesses
	  ○ perforation
	  ○ fistula
	  ○ stricture
	• Recurrence rates of acute diverticulitis
	• Hospitalisation
	• Need for further surgery
	• Anastomotic leak
	• Stoma complications
	Important outcomes:
	Symptom control/recurrence, for example pain relief, bowel habit

Eligibility criteria – study design	Randomised controlled trials (RCTs), systematic reviews of RCTs. If no RCT evidence is available, search for observational studies
Other inclusion exclusion criteria	Exclusions: • Children and young people aged 17 years and younger • Prevention
Proposed sensitivity /	Subgroups:

subgroup analysis, or meta-regression	• Age: >50 vs <50 years • people of Asian family origin as they are known to develop right-sided diverticula
Selection process – duplicate screening / selection / analysis	Studies are sifted by title and abstract. Potentially significant publications obtained in full text are then assessed against the inclusion criteria specified in this protocol.
Data management (software)	• Pairwise meta-analyses performed using Cochrane Review Manager (RevMan5). • GRADEpro used to assess the quality of evidence for each outcome • Bibliographies, citations and study sifting managed using EndNote • Data extractions performed using EviBase, a platform designed and maintained by the National Guideline Centre (NGC)
Information sources – databases and dates	Medline, Embase, The Cochrane Library
Identify if an update	Not applicable
Author contacts	https://www.nice.org.uk/guidance/conditions-and-diseases/digestive-tract-conditions/diverticular-disease
Highlight if amendment to previous protocol	For details please see section 4.5 of Developing NICE guidelines: the manual.
Search strategy – for one database	For details please see appendix B
Data collection process – forms / duplicate	A standardised evidence table format will be used, and published as appendix D of the evidence report.
Data items – define all variables to be collected	For details please see evidence tables in Appendix D (clinical evidence tables) or H (health economic evidence tables).
Methods for assessing bias at outcome / study level	Standard study checklists were used to critically appraise individual studies. For details please see section 6.2 of Developing NICE guidelines: the manual The risk of bias across all available evidence was evaluated for each outcome using an adaptation of the 'Grading of Recommendations Assessment, Development and Evaluation (GRADE) toolbox' developed by the international GRADE working group http://www.gradeworkinggroup.org/
Criteria for quantitative synthesis	For details please see section 6.4 of Developing NICE guidelines: the manual.
Methods for quantitative analysis – combining studies and exploring (in)consistency	For details please see the separate Methods report (Chapter R) for this guideline.
Meta-bias assessment – publication bias, selective reporting bias	For details please see section 6.2 of Developing NICE guidelines: the manual.
Confidence in cumulative evidence	For details please see sections 6.4 and 9.1 of Developing NICE guidelines: the manual.
Rationale / context – what is known	For details please see the introduction to the evidence review.
Describe contributions of authors and guarantor	A multidisciplinary committee developed the evidence review. The committee was convened by the National Guideline Centre (NGC) and chaired by James Dalrymple in line with section 3 of Developing NICE guidelines: the manual. Staff from NGC undertook systematic literature searches, appraised the evidence, conducted meta-analysis and cost-effectiveness analysis where appropriate, and drafted the evidence review in

	collaboration with the committee. For details please see Developing NICE guidelines: the manual.
Sources of funding / support	NGC is funded by NICE and hosted by the Royal College of Physicians.
Name of sponsor	NGC is funded by NICE and hosted by the Royal College of Physicians.
Roles of sponsor	NICE funds NGC to develop guidelines for those working in the NHS, public health and social care in England.
PROSPERO registration number	Not registered

Table 9: Health economic review protocol

Review question	All questions – health economic evidence
Objectives	To identify health economic studies relevant to any of the review questions.
Search criteria	• Populations, interventions and comparators must be as specified in the clinical review protocol above. • Studies must be of a relevant health economic study design (cost–utility analysis, cost-effectiveness analysis, cost–benefit analysis, cost–consequences analysis, comparative cost analysis). • Studies must not be a letter, editorial or commentary, or a review of health economic evaluations. (Recent reviews will be ordered although not reviewed. The bibliographies will be checked for relevant studies, which will then be ordered.) • Unpublished reports will not be considered unless submitted as part of a call for evidence. • Studies must be in English.
Search strategy	A health economic study search will be undertaken using population-specific terms and a health economic study filter – see appendix B below.
Review strategy	Studies not meeting any of the search criteria above will be excluded. Studies published before 2002, abstract-only studies and studies from non-OECD countries or the USA will also be excluded. Each remaining study will be assessed for applicability and methodological limitations using the NICE economic evaluation checklist which can be found in appendix H of Developing NICE guidelines: the manual (2014).[50] **Inclusion and exclusion criteria** • If a study is rated as both 'Directly applicable' and with 'Minor limitations' then it will be included in the guideline. A health economic evidence table will be completed and it will be included in the health economic evidence profile. • If a study is rated as either 'Not applicable' or with 'Very serious limitations' then it will usually be excluded from the guideline. If it is excluded then a health economic evidence table will not be completed and it will not be included in the health economic evidence profile. • If a study is rated as 'Partially applicable', with 'Potentially serious limitations' or both then there is discretion over whether it should be included. **Where there is discretion** The health economist will make a decision based on the relative applicability and quality of the available evidence for that question, in discussion with the guideline committee if required. The ultimate aim is to include health economic studies that are helpful for decision-making in the context of the guideline and the current NHS setting. If several studies are considered of sufficiently high applicability and methodological quality that they could all be included, then the health economist, in discussion with the committee if required, may decide to include only the most

	applicable studies and to selectively exclude the remaining studies. All studies excluded on the basis of applicability or methodological limitations will be listed with explanation in the excluded health economic studies appendix below. The health economist will be guided by the following hierarchies. *Setting:* • UK NHS (most applicable). • OECD countries with predominantly public health insurance systems (for example, France, Germany, Sweden). • OECD countries with predominantly private health insurance systems (for example, Switzerland). • Studies set in non-OECD countries or in the USA will be excluded before being assessed for applicability and methodological limitations. *Health economic study type:* • Cost–utility analysis (most applicable). • Other type of full economic evaluation (cost–benefit analysis, cost-effectiveness analysis, cost–consequences analysis). • Comparative cost analysis. • Non-comparative cost analyses including cost-of-illness studies will be excluded before being assessed for applicability and methodological limitations. *Year of analysis:* • The more recent the study, the more applicable it will be. • Studies published in 2002 or later but that depend on unit costs and resource data entirely or predominantly from before 2002 will be rated as 'Not applicable'. • Studies published before 2002 will be excluded before being assessed for applicability and methodological limitations. *Quality and relevance of effectiveness data used in the health economic analysis:* • The more closely the clinical effectiveness data used in the health economic analysis match with the outcomes of the studies included in the clinical review the more useful the analysis will be for decision-making in the guideline.

Appendix B: Literature search strategies

The literature searches for this review are detailed below and complied with the methodology outlined in Developing NICE guidelines: the manual 2014, updated 2017

For more detailed information, please see the Methodology Review.

B.1 Clinical search literature search strategy

Searches were constructed using a PICO framework where population (P) terms were combined with Intervention (I) and in some cases Comparison (C) terms. Outcomes (O) are rarely used in search strategies for interventions as these concepts may not be well described in title, abstract or indexes and therefore difficult to retrieve. Search filters were applied to the search where appropriate.

Table 10: Database date parameters and filters used

Database	Dates searched	Search filter used
Medline (OVID)	1946 – 13 November 2018	Exclusions Randomised controlled trials Systematic review studies

Database	Dates searched	Search filter used
		Observational studies
Embase (OVID)	1974 – 13 November 2018	Exclusions Randomised controlled trials Systematic review studies Observational studies
The Cochrane Library (Wiley)	Cochrane Reviews to 2018 Issue 11 of 12 CENTRAL to 2018 Issue 11 of 12 DARE, and NHSEED to 2015 Issue 2 of 4 HTA to 2016 Issue 2 of 4	None

Table 11: Medline (Ovid) search terms

1.	diverticul*.mp.
2.	limit 1 to English language
3.	letter/
4.	editorial/
5.	news/
6.	exp historical article/
7.	Anecdotes as Topic/
8.	comment/
9.	case report/
10.	(letter or comment*).ti.
11.	or/3-10
12.	randomized controlled trial/ or random*.ti,ab.
13.	11 not 12
14.	animals/ not humans/
15.	exp Animals, Laboratory/
16.	exp Animal Experimentation/
17.	exp Models, Animal/
18.	exp Rodentia/
19.	(rat or rats or mouse or mice).ti.
20.	or/13-19
21.	2 not 20
22.	randomized controlled trial.pt.
23.	controlled clinical trial.pt.
24.	randomi#ed.ti,ab.
25.	placebo.ab.
26.	randomly.ti,ab.
27.	Clinical Trials as topic.sh.
28.	trial.ti.
29.	or/22-28
30.	Meta-Analysis/
31.	exp Meta-Analysis as Topic/
32.	(meta analy* or metanaly* or metaanaly* or meta regression).ti,ab.

33.	((systematic* or evidence*) adj3 (review* or overview*)).ti,ab.
34.	(reference list* or bibliograph* or hand search* or manual search* or relevant journals).ab.
35.	(search strategy or search criteria or systematic search or study selection or data extraction).ab.
36.	(search* adj4 literature).ab.
37.	(medline or pubmed or cochrane or embase or psychlit or psyclit or psychinfo or psycinfo or cinahl or science citation index or bids or cancerlit).ab.
38.	cochrane.jw.
39.	((multiple treatment* or indirect or mixed) adj2 comparison*).ti,ab.
40.	or/50-59
41.	Epidemiologic studies/
42.	Observational study/
43.	exp Cohort studies/
44.	(cohort adj (study or studies or analys* or data)).ti,ab.
45.	((follow up or observational or uncontrolled or non randomi#ed or epidemiologic*) adj (study or studies or data)).ti,ab.
46.	((longitudinal or retrospective or prospective or cross sectional) and (study or studies or review or analys* or cohort* or data)).ti,ab.
47.	Controlled Before-After Studies/
48.	Historically Controlled Study/
49.	Interrupted Time Series Analysis/
50.	(before adj2 after adj2 (study or studies or data)).ti,ab.
51.	or/30-39
52.	exp case control study/
53.	case control*.ti,ab.
54.	or/41-42
55.	40 or 43
56.	Cross-sectional studies/
57.	(cross sectional and (study or studies or review or analys* or cohort* or data)).ti,ab.
58.	or/45-46
59.	40 or 47
60.	40 or 43 or 47
61.	21 and (29 or 40 or 60)

Table 12: Embase (Ovid) search terms

1.	diverticul*.mp.
2.	limit 1 to English language
3.	letter.pt. or letter/
4.	note.pt.
5.	editorial.pt.
6.	case report/ or case study/
7.	(letter or comment*).ti.
8.	or/3-7
9.	randomized controlled trial/ or random*.ti,ab.
10.	8 not 9
11.	animal/ not human/
12.	nonhuman/

13.	exp Animal Experiment/
14.	exp Experimental Animal/
15.	animal model/
16.	exp Rodent/
17.	(rat or rats or mouse or mice).ti.
18.	or/10-17
19.	2 not 18
20.	random*.ti,ab.
21.	factorial*.ti,ab.
22.	(crossover* or cross over*).ti,ab.
23.	((doubl* or singl*) adj blind*).ti,ab.
24.	(assign* or allocat* or volunteer* or placebo*).ti,ab.
25.	crossover procedure/
26.	single blind procedure/
27.	randomized controlled trial/
28.	double blind procedure/
29.	or/20-28
30.	systematic review/
31.	meta-analysis/
32.	(meta analy* or metanaly* or metaanaly* or meta regression).ti,ab.
33.	((systematic* or evidence*) adj3 (review* or overview*)).ti,ab.
34.	(reference list* or bibliograph* or hand search* or manual search* or relevant journals).ab.
35.	(search strategy or search criteria or systematic search or study selection or data extraction).ab.
36.	(search* adj4 literature).ab.
37.	(medline or pubmed or cochrane or embase or psychlit or psyclit or psychinfo or psycinfo or cinahl or science citation index or bids or cancerlit).ab.
38.	cochrane.jw.
39.	((multiple treatment* or indirect or mixed) adj2 comparison*).ti,ab.
40.	or/30-39
41.	Clinical study/
42.	Observational study/
43.	family study/
44.	longitudinal study/
45.	retrospective study/
46.	prospective study/
47.	cohort analysis/
48.	follow-up/
49.	cohort*.ti,ab.
50.	48 and 49
51.	(cohort adj (study or studies or analys* or data)).ti,ab.
52.	((follow up or observational or uncontrolled or non randomi#ed or epidemiologic*) adj (study or studies or data)).ti,ab.
53.	((longitudinal or retrospective or prospective or cross sectional) and (study or studies or review or analys* or cohort* or data)).ti,ab.
54.	(before adj2 after adj2 (study or studies or data)).ti,ab.

55.	or/41-47,50-54
56.	exp case control study/
57.	case control*.ti,ab.
58.	or/56-57
59.	55 or 58
60.	cross-sectional study/
61.	(cross sectional and (study or studies or review or analys* or cohort* or data)).ti,ab.
62.	or/60-61
63.	55 or 62
64.	55 or 58 or 62
65.	19 and (29 or 40 or 64)

Table 13: Cochrane Library (Wiley) search terms

#1.	diverticul*.mp.

B.2 Health Economics literature search strategy

Health economic evidence was identified by conducting a broad search relating to Diverticular Disease population in NHS Economic Evaluation Database (NHS EED – this ceased to be updated after March 2015) and the Health Technology Assessment database (HTA) with no date restrictions. NHS EED and HTA databases are hosted by the Centre for Research and Dissemination (CRD). Additional searches were run on Medline and Embase for health economics, economic modelling and quality of life studies.

Table 14: Database date parameters and filters used

Database	Dates searched	Search filter used
Medline	1946 – 13 November 2018	Exclusions Health economics studies Health economics modelling studies Quality of life studies
Embase	1974 – 13 November 2018	Exclusions Health economics studies Health economics modelling studies Quality of life studies
Centre for Research and Dissemination (CRD)	HTA - Inception – 13 November 2018 NHSEED - Inception to March 2015	None

Table 15: Medline (Ovid) search terms

1.	diverticul*.mp.
2.	limit 1 to English language
3.	letter/
4.	editorial/
5.	news/

6.	exp historical article/
7.	Anecdotes as Topic/
8.	comment/
9.	case report/
10.	(letter or comment*).ti.
11.	or/3-10
12.	randomized controlled trial/ or random*.ti,ab.
13.	11 not 12
14.	animals/ not humans/
15.	exp Animals, Laboratory/
16.	exp Animal Experimentation/
17.	exp Models, Animal/
18.	exp Rodentia/
19.	(rat or rats or mouse or mice).ti.
20.	or/13-19
21.	2 not 20
22.	Economics/
23.	Value of life/
24.	exp "Costs and Cost Analysis"/
25.	exp Economics, Hospital/
26.	exp Economics, Medical/
27.	Economics, Nursing/
28.	Economics, Pharmaceutical/
29.	exp "Fees and Charges"/
30.	exp Budgets/
31.	budget*.ti,ab.
32.	cost*.ti.
33.	(economic* or pharmaco?economic*).ti.
34.	(price* or pricing*).ti,ab.
35.	(cost* adj2 (effective* or utilit* or benefit* or minimi* or unit* or estimat* or variable*)).ab.
36.	(financ* or fee or fees).ti,ab.
37.	(value adj2 (money or monetary)).ti,ab.
38.	or/22-37
39.	exp models, economic/
40.	*Models, Theoretical/
41.	markov chains/
42.	monte carlo method/
43.	exp Decision Theory/
44.	(markov* or monte carlo).ti,ab.
45.	econom* model*.ti,ab.
46.	(decision* adj2 (tree* or analy* or model*)).ti,ab.
47.	Models, Organizational/
48.	*models, statistical/
49.	*logistic models/

50.	models, nursing/
51.	((organi?ation* or operation* or service* or concept*) adj3 (model* or map* or program* or simulation* or system* or analys*)).ti,ab.
52.	(econom* adj2 (theor* or system* or map* or evaluat*)).ti,ab.
53.	(SSM or SODA).ti,ab.
54.	(strateg* adj3 (option* or choice*) adj3 (analys* or decision*)).ti,ab.
55.	soft systems method*.ti,ab.
56.	(Meta-heuristic* or Metaheuristic*).ti,ab.
57.	(dynamic* adj2 (model* or system*)).ti,ab.
58.	(simulation adj3 (model* or discrete event* or agent)).ti,ab.
59.	(microsimulation* or "micro* simulation*").ti,ab.
60.	((flow or core) adj2 model*).ti,ab.
61.	(data adj2 envelopment*).ti,ab.
62.	system* model*.ti,ab.
63.	or/41-64
64.	quality-adjusted life years/
65.	sickness impact profile/
66.	(quality adj2 (wellbeing or well being)).ti,ab.
67.	sickness impact profile.ti,ab.
68.	disability adjusted life.ti,ab.
69.	(qal* or qtime* or qwb* or daly*).ti,ab.
70.	(euroqol* or eq5d* or eq 5*).ti,ab.
71.	(qol* or hql* or hqol* or h qol* or hrqol* or hr qol*).ti,ab.
72.	(health utility* or utility score* or disutilit* or utility value*).ti,ab.
73.	(hui or hui1 or hui2 or hui3).ti,ab.
74.	(health* year* equivalent* or hye or hyes).ti,ab.
75.	discrete choice*.ti,ab.
76.	rosser.ti,ab.
77.	(willingness to pay or time tradeoff or time trade off or tto or standard gamble*).ti,ab.
78.	(sf36* or sf 36* or short form 36* or shortform 36* or shortform36*).ti,ab.
79.	(sf20 or sf 20 or short form 20 or shortform 20 or shortform20).ti,ab.
80.	(sf12* or sf 12* or short form 12* or shortform 12* or shortform12*).ti,ab.
81.	(sf8* or sf 8* or short form 8* or shortform 8* or shortform8*).ti,ab.
82.	(sf6* or sf 6* or short form 6* or shortform 6* or shortform6*).ti,ab.
83.	or/22-40
84.	21 and (38 or 63 or 83)

Table 16: Embase (Ovid) search terms

1.	diverticul*.mp.
2.	limit 1 to English language
3.	letter.pt. or letter/
4.	note.pt.
5.	editorial.pt.
6.	case report/ or case study/
7.	(letter or comment*).ti.

8.	or/3-7
9.	randomized controlled trial/ or random*.ti,ab.
10.	8 not 9
11.	animal/ not human/
12.	nonhuman/
13.	exp Animal Experiment/
14.	exp Experimental Animal/
15.	animal model/
16.	exp Rodent/
17.	(rat or rats or mouse or mice).ti.
18.	or/10-17
19.	2 not 18
20.	Economics/
21.	Value of life/
22.	exp "Costs and Cost Analysis"/
23.	exp Economics, Hospital/
24.	exp Economics, Medical/
25.	Economics, Nursing/
26.	Economics, Pharmaceutical/
27.	exp "Fees and Charges"/
28.	exp Budgets/
29.	budget*.ti,ab.
30.	cost*.ti.
31.	(economic* or pharmaco?economic*).ti.
32.	(price* or pricing*).ti,ab.
33.	(cost* adj2 (effective* or utilit* or benefit* or minimi* or unit* or estimat* or variable*)).ab.
34.	(financ* or fee or fees).ti,ab.
35.	(value adj2 (money or monetary)).ti,ab.
36.	or/20-35
37.	statistical model/
38.	*theoretical model/
39.	nonbiological model/
40.	stochastic model/
41.	decision theory/
42.	decision tree/
43.	exp nursing theory/
44.	monte carlo method/
45.	(markov* or monte carlo).ti,ab.
46.	econom* model*.ti,ab.
47.	(decision* adj2 (tree* or analy* or model*)).ti,ab.

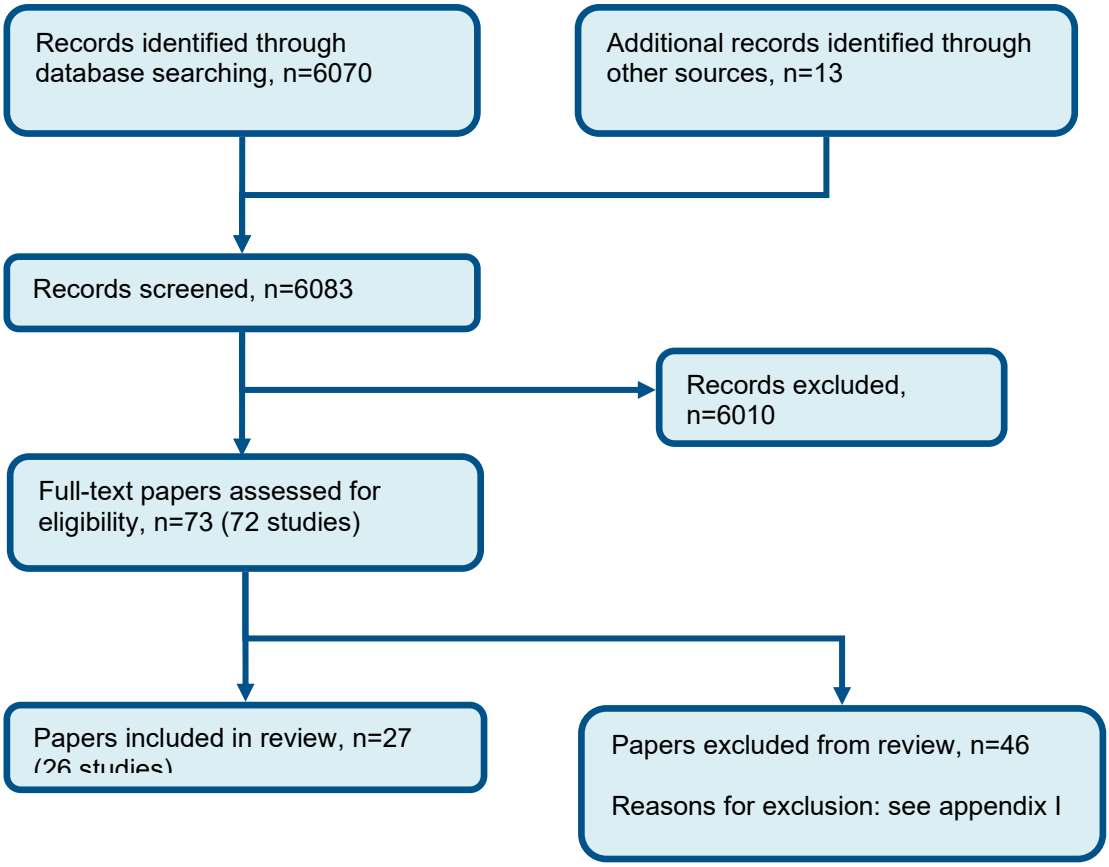
48.	((organi?ation* or operation* or service* or concept*) adj3 (model* or map* or program* or simulation* or system* or analys*)).ti,ab.
49.	(econom* adj2 (theor* or system* or map* or evaluat*)).ti,ab.
50.	(SSM or SODA).ti,ab.
51.	(strateg* adj3 (option* or choice*) adj3 (analys* or decision*)).ti,ab.
52.	soft systems method*.ti,ab.
53.	(Meta-heuristic* or Metaheuristic*).ti,ab.
54.	(dynamic* adj2 (model* or system*)).ti,ab.
55.	(simulation adj3 (model* or discrete event* or agent)).ti,ab.
56.	(microsimulation* or "micro* simulation*").ti,ab.
57.	((flow or core) adj2 model*).ti,ab.
58.	(data adj2 envelopment*).ti,ab.
59.	system* model*.ti,ab.
60.	or/39-61
61.	quality adjusted life year/
62.	"quality of life index"/
63.	short form 12/ or short form 20/ or short form 36/ or short form 8/
64.	sickness impact profile/
65.	(quality adj2 (wellbeing or well being)).ti,ab.
66.	sickness impact profile.ti,ab.
67.	disability adjusted life.ti,ab.
68.	(qal* or qtime* or qwb* or daly*).ti,ab.
69.	(euroqol* or eq5d* or eq 5*).ti,ab.
70.	(qol* or hql* or hqol* or h qol* or hrqol* or hr qol*).ti,ab.
71.	(health utility* or utility score* or disutilit* or utility value*).ti,ab.
72.	(hui or hui1 or hui2 or hui3).ti,ab.
73.	(health* year* equivalent* or hye or hyes).ti,ab.
74.	discrete choice*.ti,ab.
75.	rosser.ti,ab.
76.	(willingness to pay or time tradeoff or time trade off or tto or standard gamble*).ti,ab.
77.	(sf36* or sf 36* or short form 36* or shortform 36* or shortform36*).ti,ab.
78.	(sf20 or sf 20 or short form 20 or shortform 20 or shortform20).ti,ab.
79.	(sf12* or sf 12* or short form 12* or shortform 12* or shortform12*).ti,ab.
80.	(sf8* or sf 8* or short form 8* or shortform 8* or shortform8*).ti,ab.
81.	(sf6* or sf 6* or short form 6* or shortform 6* or shortform6*).ti,ab.
82.	or/20-40
83.	19 and (36 or 60 or 82)

Table 17: NHS EED and HTA (CRD) search terms

#1.	diverticul*

Appendix C: Clinical evidence selection

Figure 1: Flow chart of clinical study selection for the review of primary vs. secondary anastomosis



Appendix D: Clinical evidence tables

Table 18: Clinical evidence tables

Study	Belmonte 1996[8]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=227)
Countries and setting	Conducted in USA; Setting: University of Minnestoa-affiliated hospitals.
Line of therapy	1st line
Duration of study	Intervention + follow up: Mean follow-up, 23 months (range, 1-132 months).
Method of assessment of guideline condition	Unclear method of assessment/diagnosis: Operative and pathological findings used to classify patients.
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Patients undergoing resection for diverticular disease.
Exclusion criteria	Not reported.
Recruitment/selection of patients	Consecutive patients treated for diverticular disease between 1988 and 1993 at hospitals affiliated with University of Minnesota.
Age, gender and ethnicity	Age - Mean (range): Whole cohort, 66 (25-98) years. Not available separately for complicated cases or to compare between intervention groups. Gender (M:F): Whole cohort, 84/143. Not available separately for complicated cases or to compare between intervention groups. Ethnicity: Not reported.
Further population details	
Extra comments	Mixture of emergent, urgent and elective surgery. Extracted for those with pericolonic or mesenteric abscess, pelvic abscess, or purulent or faecal peritonitis only (stages III-V as described in study).
Indirectness of population	No indirectness
Interventions	(n=85) Intervention 1: Primary anastomosis. Primary anastomosis with or without diverting ileostomy. . Duration Not reported. Concurrent medication/care: All patients received perioperative intravenous broad spectrum antibiotics. Patients not undergoing emergency or urgent surgery underwent mechanical bowel preparation prior to surgery.

	Intraoperative lavage used selectively in patients with no or poor bowel preparation to allow anastomosis and avoid colostomy. Percutaneous drainage of abscess performed in 2 patients (unclear which intervention group these were in). Indirectness: No indirectness (n=26) Intervention 2: Temporary stoma. Hartmann's procedure. Duration Not reported. Concurrent medication/care: All patients received perioperative intravenous broad spectrum antibiotics. Patients not undergoing emergency or urgent surgery underwent mechanical bowel preparation prior to surgery. Percutaneous drainage of abscess performed in 2 patients (unclear which intervention group these were in). Indirectness: No indirectness Comments: Classed as temporary stoma as aim was to reverse stomas where possible.
Funding	Funding not stated
RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH/WITHOUT DIVERTING ILEOSTOMY) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE) Protocol outcome 1: Mortality at Define - Actual outcome: Perioperative mortality at Perioperative; Group 1: 2/85, Group 2: 1/26; Comments: All those that died has stage IV disease (pelvic abscess), as defined by the study. Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: No details given for separate interventions.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:	
Protocol outcomes not reported by the study	Quality of life at Define; Morbidity at Define; Progression of disease at Define; Complications (infections) at Define; Complications (abscesses) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Need for further surgery at Define; Anastomotic leak at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Binda 1993[10]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=92)
Countries and setting	Conducted in Italy; Setting: Secondary care - two hospital surgery units
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective review of cases between 1980 and 1990
Method of assessment of guideline condition	Method of assessment /diagnosis not stated
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Emergency surgery for complicated colonic diverticulitis.
Exclusion criteria	Those undergoing elective or deferred emergency surgery.
Recruitment/selection of patients	All eligible cases recorded between 1980 and 1990.
Age, gender and ethnicity	Age - Mean (range): Whole cohort, 66.7 (30-92) years. Not available separately for each intervention. Gender (M:F): Whole cohort, 44/48. Not available separately for each intervention. Ethnicity: Not reported.
Further population details	
Extra comments	Emergency surgery for complicated colonic diverticulitis - surgery within 48 h of hospitalisation (no adequate bowel preparation). Includes those with localised or diffuse peritonitis, or intestinal occlusion. Intestinal inclusion group was not extracted as the majority of this group had experienced recurrent episodes of diverticulitis which is not the correct review population.
Indirectness of population	No indirectness
Interventions	(n=21) Intervention 1: Primary anastomosis. Resection with immediate anastomosis with/without colostomy. Duration Not reported. Concurrent medication/care: Not reported. Indirectness: No indirectness (n=18) Intervention 2: Temporary stoma. Hartmann's procedure. Duration Not reported. Concurrent medication/care: Not reported. Indirectness: No indirectness
Funding	Funding not stated

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH OR WITHOUT COLOSTOMY) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE)

Protocol outcome 1: Mortality at Define
- Actual outcome: Surgical mortality at 30 days post-surgery; Group 1: 1/21, Group 2: 6/18
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Data not available to compare baseline factors between intervention groups. Distribution of age, gender and severity of disease may differ substantially between groups.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 2: Morbidity at Define
- Actual outcome: Overall surgical morbidity at Not reported; Group 1: 6/21, Group 2: 8/18
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Data not available to compare baseline factors between intervention groups. Distribution of age, gender and severity of disease may differ substantially between groups.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 3: Complications (infections) at Define
- Actual outcome: Wound sepsis at Not reported; Group 1: 2/21, Group 2: 1/18
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Data not available to compare baseline factors between intervention groups. Distribution of age, gender and severity of disease may differ substantially between groups.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Septic shock at Not reported; Group 1: 1/21, Group 2: 5/18
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Data not available to compare baseline factors between intervention groups. Distribution of age, gender and severity of disease may differ substantially between groups.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 4: Complications (fistula) at Define
- Actual outcome: Fistula at Not reported; Group 1: 2/21, Group 2: 0/18
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Data not available to compare baseline factors between intervention groups. Distribution of age, gender and severity of disease may differ substantially between groups.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcomes not reported by the study	Quality of life at Define; Progression of disease at Define; Complications (abscesses) at Define; Complications (perforation) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Need for further surgery at Define; Anastomotic leak at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Binda 2012[9]
Study type	RCT (Patient randomised; Parallel)
Number of studies (number of participants)	1 (n=90)
Countries and setting	Conducted in France, Israel, Italy, Norway, Poland, Slovenia, Spain, Turkey; Setting: 14 centres within eight different countries.
Line of therapy	1st line
Duration of study	Intervention + follow up: Follow-up up to 30 days following ostomy reversal.
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: Clinical examination, plain X-rays and CT scan.
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Aged 18 years and older with peritonitis secondary to perforated diverticulitis of the left colon.
Exclusion criteria	Failure to sign consent; peritonitis secondary to perforated diverticulitis of the right colon.
Recruitment/selection of patients	All patients who were hospitalised or came through the emergency room department of the participating centres.
Age, gender and ethnicity	Age - Mean (SD): Primary anastomosis, 63.5 (2.2); Nonrestorative colon resection, 65.7 (1.8). Gender (M:F): Primary anastomosis, 12/22; Nonrestorative colon resection, 29/27. Ethnicity: Not reported.
Further population details	
Extra comments	Patients undergoing emergency operation.
Indirectness of population	No indirectness
Interventions	(n=34) Intervention 1: Primary anastomosis. Left colon resection with primary anastomosis and loop ileostomy. Ileostomy reversal performed with trephine incision. Duration Not reported. Concurrent medication/care: All patients received intravenous antibiotics and deep vein thrombosis prophylaxis prior to surgery. Intraoperative lavage of peritoneal cavity also performed. Indirectness: No indirectness (n=56) Intervention 2: Temporary stoma. Nonrestorative colon resection - left colon resection with end colostomy. Reversal of colostomy performed by laparotomy or laparoscopy. Duration Not reported. Concurrent medication/care: All patients received intravenous antibiotics and deep vein thrombosis prophylaxis prior to surgery. Intraoperative lavage of peritoneal cavity also performed. Indirectness: No indirectness
Funding	Academic or government funding (Western Norwegian Health Authority)

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH LOOP ILEOSTOMY) versus TEMPORARY STOMA (NONRESTORATIVE RESECTION)

Protocol outcome 1: Mortality at Define
- Actual outcome: Mortality (first operation) at First operation; Group 1: 1/34, Group 2: 6/56
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Mortality (second operation) at Second operation; Group 1: 0/22, Group 2: 0/34
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 12, Reason: One patient died after first operation. Others did not receive stoma ileostomy reversal for unknown reasons.; Group 2 Number missing: 22, Reason: Six patients died after the first operation. Others did not receive stoma reversal for unknown reasons.

Protocol outcome 2: Morbidity at Define
- Actual outcome: Overall morbidity (first operation) at First operation; Group 1: 12/34, Group 2: 26/56
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Overall morbidity (second operation) at Second operation; Group 1: 1/22, Group 2: 12/34
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 12, Reason: One patient died after first operation. Others did not receive stoma ileostomy reversal for unknown reasons.; Group 2 Number missing: 22, Reason: Six patients died after the first operation. Others did not receive stoma reversal for unknown reasons.

Protocol outcome 3: Complications (infections) at Define
- Actual outcome: Superficial incisional surgical site infections (first operation) at First operation; Group 1: 9/34, Group 2: 11/56
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Superficial incisional surgical site infections (second operation) at Second operation; Group 1: 0/22, Group 2: 5/34
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 12, Reason: One patient died after first operation. Others did not receive stoma ileostomy reversal for unknown reasons.; Group 2 Number missing: 22, Reason: Six patients died after the first operation. Others did not receive stoma reversal for unknown reasons.
- Actual outcome: Deep incisional surgical site infections (first operation) at First operation; Group 1: 6/34, Group 2: 9/56
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: ; Group 2 Number missing:

- Actual outcome: Deep incisional surgical site infections (second operation) at Second operation; Group 1: 0/22, Group 2: 3/34
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 12, Reason: One patient died after first operation. Others did not receive stoma ileostomy reversal for unknown reasons.; Group 2 Number missing: 22, Reason: Six patients died after the first operation. Others did not receive stoma reversal for unknown reasons.
- Actual outcome: Organ space surgical site infections (first operation) at First operation; Group 1: 0/34, Group 2: 6/56
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Organ space surgical site infections (second operation) at Second operation; Group 1: 0/22, Group 2: 1/34
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 12, Reason: One patient died after first operation. Others did not receive stoma ileostomy reversal for unknown reasons.; Group 2 Number missing: 22, Reason: Six patients died after the first operation. Others did not receive stoma reversal for unknown reasons.
- Actual outcome: Urinary tract infections (first operation) at First operation; Group 1: 0/34, Group 2: 3/56
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Urinary tract infections (second operation) at Second operation; Group 1: 0/22, Group 2: 0/34
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 12, Reason: One patient died after first operation. Others did not receive stoma ileostomy reversal for unknown reasons.; Group 2 Number missing: 22, Reason: Six patients died after the first operation. Others did not receive stoma reversal for unknown reasons.

Protocol outcome 4: Anastomotic leak at Define
- Actual outcome: Anastomotic leak (first operation) at First operation; Group 1: 1/34, Group 2: 1/56
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Anastomotic leak (second operation) at Second operation; Group 1: 1/22, Group 2: 2/34
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 12, Reason: One patient died after first operation. Others did not receive stoma ileostomy reversal for unknown reasons.; Group 2 Number missing: 22, Reason: Six patients died after the first operation. Others did not receive stoma reversal for unknown reasons.

Protocol outcomes not reported by the study	Quality of life at Define; Progression of disease at Define; Complications (abscesses) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Need for further surgery at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Blair 2002[12]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=97)
Countries and setting	Conducted in Canada; Setting: Secondary care - Royal Columbian Hospital, Vancouver, Canada.
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective chart review of patients undergoing surgery between 1989 and 2000.
Method of assessment of guideline condition	Unclear method of assessment/diagnosis: Not reported.
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Patients undergoing emergency surgery for acute diverticulitis within 48 hours of admission
Exclusion criteria	Uncomplicated diverticulitis cases; colovesical fistula and obstruction; any patient undergoing preoperative bowel preparation.
Recruitment/selection of patients	Consecutive patients undergoing emergency surgery for complicated acute diverticulitis between 1989 and 2000.
Age, gender and ethnicity	Age - Mean (SD): Primary anastomosis, 54 (14.8) years; Hartmann's procedure, 64.6 (15.7) years. Proportion >70 years: 17% vs. 49%. Gender (M:F): ~2/3 of patients in each group (primary anastomosis and Hartmann's procedure) reported to be male. Ethnicity: Not reported.
Further population details	
Extra comments	Emergency cases - operated on within 48 hours of admission.
Indirectness of population	No indirectness
Interventions	(n=33) Intervention 1: Primary anastomosis. Primary anastomosis with/without proximal protective stoma. Duration Not reported. Concurrent medication/care: No patients had on-table colonic lavage. Indirectness: No indirectness (n=64) Intervention 2: Temporary stoma. Hartmann's procedure. Duration Not reported. Concurrent medication/care: Not reported. Indirectness: No indirectness Comments: Classed as temporary stoma as aim is usually to reverse where possible. Study does not specify.
Funding	Funding not stated

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH OR WITHOUT PROXIMAL PROTECTIVE STOMA) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE)

Protocol outcome 1: Mortality at Define
- Actual outcome: Mortality at Not reported; Group 1: 3/33, Group 2: 13/64
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Mean age differed: 54 vs. 64.6 years. Higher proportion >70 years in Hartmann group. ASA grade and Hinchey staging differed: Hartmann higher proportion of ASA 3 and 4; higher Hinchey stage 3 and 4 proportion in Hartmann; higher proportion Hinchey stage 1 in anastomosis group.; Key confounders: Age, gender; Group 1 Number missing: 0, Reason: Not applicable.; Group 2 Number missing: 0, Reason: Not applicable.

Protocol outcome 2: Complications (infections) at Define
- Actual outcome: Wound infection at Not reported; Group 1: 7/33, Group 2: 15/62
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Mean age differed: 54 vs. 64.6 years. Higher proportion >70 years in Hartmann group. ASA grade and Hinchey staging differed: Hartmann higher proportion of ASA 3 and 4; higher Hinchey stage 3 and 4 proportion in Hartmann; higher proportion Hinchey stage 1 in anastomosis group.; Key confounders: Age, gender; Group 1 Number missing: 0, Reason: Not applicable.; Group 2 Number missing: 2, Reason: Not reported.
- Actual outcome: Intra-abdominal infection at Not reported; Group 1: 1/33, Group 2: 3/61
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Mean age differed: 54 vs. 64.6 years. Higher proportion >70 years in Hartmann group. ASA grade and Hinchey staging differed: Hartmann higher proportion of ASA 3 and 4; higher Hinchey stage 3 and 4 proportion in Hartmann; higher proportion Hinchey stage 1 in anastomosis group.; Key confounders: Age, gender; Group 1 Number missing: 0, Reason: Not applicable.; Group 2 Number missing: 3, Reason: Not reported.

Protocol outcome 3: Hospitalisation at Define
- Actual outcome: Emergency readmission at Not reported; Group 1: 5/33, Group 2: 9/64
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Mean age differed: 54 vs. 64.6 years. Higher proportion >70 years in Hartmann group. ASA grade and Hinchey staging differed: Hartmann higher proportion of ASA 3 and 4; higher Hinchey stage 3 and 4 proportion in Hartmann; higher proportion Hinchey stage 1 in anastomosis group.; Key confounders: Age, gender; Group 1 Number missing: 0, Reason: Not applicable.; Group 2 Number missing: 0, Reason: Not applicable.
- Actual outcome: Hospital readmission at Not reported; Group 1: 0/33, Group 2: 5/64
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Mean age differed: 54 vs. 64.6 years. Higher proportion >70 years in Hartmann group. ASA grade and Hinchey staging differed: Hartmann higher proportion of ASA 3 and 4; higher Hinchey stage 3 and 4 proportion in Hartmann; higher

proportion Hinchey stage 1 in anastomosis group.; Key confounders: Age, gender; Group 1 Number missing: 0, Reason: Not applicable.; Group 2 Number missing: 0, Reason: Not applicable. Protocol outcome 4: Anastomotic leak at Define - Actual outcome: Anastomotic leak at Not reported; Group 1: 1/33, Group 2: 0/64; Comments: Note NA in HP group as anastomosis not attempted. Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Mean age differed: 54 vs. 64.6 years. Higher proportion >70 years in Hartmann group. ASA grade and Hinchey staging differed: Hartmann higher proportion of ASA 3 and 4; higher Hinchey stage 3 and 4 proportion in Hartmann; higher proportion Hinchey stage 1 in anastomosis group.; Key confounders: Age, gender; Group 1 Number missing: 0, Reason: Not applicable.; Group 2 Number missing: 0, Reason: Not applicable.	
Protocol outcomes not reported by the study	Quality of life at Define; Morbidity at Define; Progression of disease at Define; Complications (abscesses) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Need for further surgery at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Cauley 2018[17]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=67,721)
Countries and setting	Conducted in USA; Setting: Extracted data from Nationwide Inpatient Sample which includes hospital discharges across USA - secondary care.
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective review of patients between 1998 and 2011
Method of assessment of guideline condition	Method of assessment /diagnosis not stated
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Patients with diagnosis of diverticulitis admitted emergently or urgently to hospital - resection performed on first or second day of admission.
Exclusion criteria	<18 years of age; concurrent pathology such as colorectal cancer, Crohn's disease or ulcerative colitis; patients undergoing colectomy with no designation for the type of diversion (e.g. colostomy or ileostomy); patients that did not undergo a diversion.
Recruitment/selection of patients	All patients matching criteria between 1998 and 2011.
Age, gender and ethnicity	Age - Other: Primary anastomosis: 18-39 years, 3.9%; 40-49 years, 8.00%; 50-59 years, 13.2%; 60-69 years, 21.3%; 70-79 years, 24.8%; ≥80 years, 28.8%. Resection with end colostomy: 18-39 years, 7%; 40-49 years, 15.3%; 50-59 years, 19.9%; 60-69 years, 21.0%; 70-79 years, 20.8%; ≥80 years, 15.9%. . Gender (M:F): Primary anastomosis, 1,267/1,370; resection with end colostomy, 32,447/32,637. Ethnicity: Primary anastomosis: White, 69.5%; Black, 21.6%; Hispanic, 3.4%; Asian, 0.5%; Native American, 0.5%; missing, 13.5%. Colectomy with end colostomy: White, 74.7%; Black, 4.9%; Hispanic, 4.9%; Asian, 0.5%; Native American, 0.3%; missing, 14.7%.
Further population details	
Extra comments	Those undergoing emergency or urgent resection for acute diverticulitis.
Indirectness of population	No indirectness
Interventions	(n=2637) Intervention 1: Primary anastomosis. Colectomy with primary anastomosis and proximal diverting ileostomy. Duration Not reported. Concurrent medication/care: Not reported. Indirectness: No indirectness

	(n=65084) Intervention 2: Temporary stoma. Colectomy with end colostomy. Duration Not reported. Concurrent medication/care: Not reported. Indirectness: No indirectness
Funding	Funding not stated

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH DIVERTING ILEOSTOMY) versus TEMPORARY STOMA (COLECTOMY WITH END COLOSTOMY)

Protocol outcome 1: Mortality at Define
- Actual outcome: In-hospital mortality at In-hospital; Group 1: 422/2637, Group 2: 4164/65084
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Some differences with proportion of different age groups and Charlson score - higher proportion Charlson score 2+ and age >80 years in primary anastomosis group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 2: Morbidity at Define
- Actual outcome: Overall postoperative complications at Not reported; Group 1: 847/2637, Group 2: 15145/65084
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Some differences with proportion of different age groups and Charlson score - higher proportion Charlson score 2+ and age >80 years in primary anastomosis group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 3: Complications (infections) at Define
- Actual outcome: Postoperative complications - infection at Not reported; Group 1: 263/2637, Group 2: 3459/65084
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Some differences with proportion of different age groups and Charlson score - higher proportion Charlson score 2+ and age >80 years in primary anastomosis group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcomes not reported by the study	Quality of life at Define; Progression of disease at Define; Complications (abscesses) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Need for further surgery at Define; Anastomotic leak at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	DIVERTI trial: Bridoux 2017[14]
Study type	RCT (Patient randomised; Parallel)
Number of studies (number of participants)	1 (n=102)
Countries and setting	Conducted in France; Setting: Four tertiary care referral hospitals in France.
Line of therapy	1st line
Duration of study	Intervention + follow up: Follow-up up to 18 months after emergency operation
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: Clinical assessment and CT scan.
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Aged 18 years or older. Perforated diverticulitis with fecal or purulent peritonitis (Hinchey stage III and IV).
Exclusion criteria	Failure to provide consent. Physical states preventing participation (e.g. septic shock or multivisceral failure).
Recruitment/selection of patients	Not reported.
Age, gender and ethnicity	Age - Median (range): Hartmann's procedure, 61.5 (29-92); Primary anastomosis, 61 (25-93). Gender (M:F): Hartmann's procedure, 23/29; Primary anastomosis, 28/22. Ethnicity: Not reported.
Further population details	
Extra comments	Patients undergoing emergency surgery.
Indirectness of population	No indirectness
Interventions	(n=50) Intervention 1: Primary anastomosis. Performed through midline laparotomy according to standard technique. Anastomosis performed on well-vascularised segments according to preference of individual surgeons (mechanical or manual anastomosis; end to end or side to end). Stoma reversal operations performed at least three months after first operation and after performing barium enema to check for absence of fistula or stenosis at level of the anastomosis. Duration Median (range) operating time - primary anastomosis + stoma reversal, 197.5 (74-510) min. Concurrent medication/care: Decisions to clean colon intraoperatively, to place a drain, and to perform ileostomy or colostomy were at discretion of surgeon. Not all patients had a protective stoma. Indirectness: No indirectness (n=52) Intervention 2: Temporary stoma. Hartmann's procedure. Consisted of sigmoid resection, rectal closure and end colostomy, according to preferences of surgeon. Stoma reversal operation at least 6 months after Hartmann's procedure. Reversal performed by laparotomy or laparoscopy according to surgeon preference following rectal enema to assess length of rectal stump and confirm absence of fistula. Duration Median (range) operating time - Hartmann's

	procedure + stoma reversal, 235 (45-650) min. Concurrent medication/care: Not reported. Indirectness: No indirectness
Funding	Academic or government funding (French Ministry of Health provided funding.)

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH/WITHOUT DIVERTING STOMA) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE)

Protocol outcome 1: Mortality at Define
- Actual outcome: Mortality (first operation) at First operation; Group 1: 2/50, Group 2: 2/52
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 5, Reason: 5 did not receive allocated intervention - received Harmann's procedure instead. Analysed in original group.; Group 2 Number missing: 1, Reason: 1 did not receive allocated intervention - total coloproctectomy instead. Analysed in original group.
- Actual outcome: Mortality (second operation) at Second operation; Group 1: 0/32, Group 2: 2/33
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 18, Reason: 2 patients died before second operation, 2 were unfit for surgery and 14 did not receive a stoma in the first operation (not applicable). Analysed in original group.; Group 2 Number missing: 19, Reason: 2 patients died before second operation, 8 patients chose not to have reversal and 9 were unfit for surgery. Analysed in original group.

Protocol outcome 2: Morbidity at Define
- Actual outcome: Overall morbidity (first operation) at First operation; Group 1: 27/50, Group 2: 22/52
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 5, Reason: 5 did not receive allocated intervention - received Harmann's procedure instead. Analysed in original group.; Group 2 Number missing: 1, Reason: 1 did not receive allocated intervention - total coloproctectomy instead. Analysed in original group.
- Actual outcome: Overall morbidity (second operation) at Second operation; Group 1: 4/32, Group 2: 7/33
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 18, Reason: 2 patients died before second operation, 2 were unfit for surgery and 14 did not receive a stoma in the first operation (not applicable). Analysed in original group.; Group 2 Number missing: 19, Reason: 2 patients died before second operation, 8 patients chose not to have reversal and 9 were unfit for surgery. Analysed in original group.

Protocol outcome 3: Complications (abscesses) at Define
- Actual outcome: Intra-abdominal abscess (first operation) at First operation; Group 1: 2/50, Group 2: 4/52
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 5, Reason: 5 did not receive allocated intervention - received

Harmann's procedure instead. Analysed in original group.; Group 2 Number missing: 1, Reason: 1 did not receive allocated intervention - total coloproctectomy instead. Analysed in original group.
- Actual outcome: Intra-abdominal abscess (second operation) at Second operation; Group 1: 0/32, Group 2: 1/33
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 18, Reason: 2 patients died before second operation, 2 were unfit for surgery and 14 did not receive a stoma in the first operation (not applicable). Analysed in original group.; Group 2 Number missing: 19, Reason: 2 patients died before second operation, 8 patients chose not to have reversal and 9 were unfit for surgery. Analysed in original group.

Protocol outcome 4: Complications (stricture) at Define
- Actual outcome: Anastomotic stricture (first operation) at First operation; Group 1: 1/50, Group 2: 0/52
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 5, Reason: 5 did not receive allocated intervention - received Harmann's procedure instead. Analysed in original group.; Group 2 Number missing: 1, Reason: 1 did not receive allocated intervention - total coloproctectomy instead. Analysed in original group.

Protocol outcome 5: Need for further surgery at Define
- Actual outcome: Reoperation (first operation) at First operation; Group 1: 2/50, Group 2: 4/52
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 5, Reason: 5 did not receive allocated intervention - received Harmann's procedure instead. Analysed in original group.; Group 2 Number missing: 1, Reason: 1 did not receive allocated intervention - total coloproctectomy instead. Analysed in original group.
- Actual outcome: Reoperation (second operation) at Second operation; Group 1: 1/32, Group 2: 1/33
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 18, Reason: 2 patients died before second operation, 2 were unfit for surgery and 14 did not receive a stoma in the first operation (not applicable). Analysed in original group.; Group 2 Number missing: 19, Reason: 2 patients died before second operation, 8 patients chose not to have reversal and 9 were unfit for surgery. Analysed in original group.

Protocol outcome 6: Anastomotic leak at Define
- Actual outcome: Anastomotic leak (first operation) at First operation; Group 1: 2/50, Group 2: 0/52
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 5, Reason: 5 did not receive allocated intervention - received Hartmann's procedure instead. Analysed in original group.; Group 2 Number missing: 1, Reason: 1 did not receive allocated intervention - total coloproctectomy instead. Analysed in original group.
- Actual outcome: Anastomotic leak (second operation) at Second operation; Group 1: 1/32, Group 2: 0/33
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Group 1 Number missing: 18, Reason: 2 patients died before second operation, 2 were unfit

for surgery and 14 did not receive a stoma in the first operation (not applicable). Analysed in original group.; Group 2 Number missing: 19, Reason: 2 patients died before second operation, 8 patients chose not to have reversal and 9 were unfit for surgery. Analysed in original group.	
Protocol outcomes not reported by the study	Quality of life at Define; Progression of disease at Define; Complications (infections) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Gawlick 2012[27]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=2018)
Countries and setting	Conducted in USA; Setting: 211 hospitals - secondary care
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective review of cases between 2005 and 2009
Method of assessment of guideline condition	Method of assessment /diagnosis not stated: Cases identified using CPT codes in database. Method of diagnosis not stated.
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Emergent operation for perforated diverticulitis; cases classified as dirty/infected; primary procedure was partial colectomy with primary anastomosis and proximal diversion with loop ileostomy (CPT code 44141) or partial colectomy with colostomy (Hartmann's procedure, CPT code 44143)
Exclusion criteria	Cases where contamination was the result of unintentional spillage during surgery (those with wound classification of clean/contaminated).
Recruitment/selection of patients	All cases of perforated diverticulitis requiring operative intervention between 2005 and 2009 matching inclusion criteria.
Age, gender and ethnicity	Age - Mean (SD): Primary anastomosis, 63.4 (15.8) years; Hartmann's procedure, 63.0 (15.0) years. Gender (M:F): Primary anastomosis, 164/176; Hartmann's procedure, 814/864. Ethnicity: Primary anastomosis: 85.3% white non-Hispanic, 0.6% Hispanic, 10.3% African American, 3.8% Asian, American Indian or Pacific Islander. Hartmann's procedure: 90.2% white non-Hispanic, 2.3% Hispanic, 6.0% African American, 1.5% Asian, American Indian or Pacific Islander.
Further population details	
Extra comments	Perforated diverticulitis requiring emergent operation.
Indirectness of population	No indirectness
Interventions	(n=340) Intervention 1: Primary anastomosis. Partial colectomy with primary anastomosis and proximal diversion with loop ileostomy. Duration Mean (SD) operative time: 136 (64.9) min. Concurrent medication/care: Not reported. Indirectness: No indirectness

	(n=1678) Intervention 2: Temporary stoma. Hartmann's procedure - partial colectomy with colostomy. Duration Mean (SD) operative time: 131 (56.5) min. Concurrent medication/care: Not reported. Indirectness: No indirectness Comments: Classed as temporary stoma as aim is usually to reverse where possible. Study does not specify.
Funding	Funding not stated

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH PROXIMAL LOOP ILEOSTOMY DIVERSION) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE)

Protocol outcome 1: Mortality at Define
- Actual outcome: Mortality at 30 days post-operation; OR; 1.51 (95%CI 0.82 to 2.79, Comments: Controlled for potential confounders as identified in the study);
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Comparable for age, gender, race, comorbidities, ASA class, preoperative lab values and wound classification. Double amount with severe sepsis preoperatively in HP group vs. PA but this considered in confounding analysis.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 2: Complications (infections) at Define
- Actual outcome: Wound infection at 30 days post-operation; OR; 0.91 (95%CI 0.59 to 1.39, Comments: Controlled for potential confounders as identified in the study);
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Comparable for age, gender, race, comorbidities, ASA class, preoperative lab values and wound classification. Double amount with severe sepsis preoperatively in HP group vs. PA but this considered in confounding analysis.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Organ infection at 30 days post-operation; OR; 0.71 (95%CI 0.35 to 1.42, Comments: Controlled for potential confounders as identified in the study);
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Comparable for age, gender, race, comorbidities, ASA class, preoperative lab values and wound classification. Double amount with severe sepsis preoperatively in HP group vs. PA but this considered in confounding analysis.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Postoperative sepsis at 30 days post-operation; OR; 1.02 (95%CI 0.68 to 1.55, Comments: Controlled for potential confounders as identified in the study);
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Comparable for age, gender, race, comorbidities, ASA class, preoperative lab values and wound classification. Double amount with severe sepsis preoperatively in HP group vs. PA but this considered in confounding analysis.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 3: Need for further surgery at Define

- Actual outcome: Return to operating room at 30 days post-operation; OR; 0.99 (95%CI 0.58 to 1.69, Comments: Controlled for potential confounders as identified in the study); Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Comparable for age, gender, race, comorbidities, ASA class, preoperative lab values and wound classification. Double amount with severe sepsis preoperatively in HP group vs. PA but this considered in confounding analysis.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:	
Protocol outcomes not reported by the study	Quality of life at Define; Morbidity at Define; Progression of disease at Define; Complications (abscesses) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Anastomotic leak at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Gooszen 2001[29]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=60)
Countries and setting	Conducted in Netherlands; Setting: Secondary care - hospital
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective review of cases between 1979 and 1993
Method of assessment of guideline condition	Method of assessment /diagnosis not stated
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Acute complications of diverticular disease (perforated diverticulitis with paracolic abscess, localised peritonitis or colonic obstruction as result of recurrent episodes with stenosis) requiring urgent operation within 24 hours of admission.
Exclusion criteria	Not reported.
Recruitment/selection of patients	Patients admitted between 1979 and 1993 with acute complicated diverticular disease requiring urgent operation.
Age, gender and ethnicity	Age - Mean (SD): Primary anastomosis, 63 (17) years; Hartmann's procedure, 68 (16) years. Gender (M:F): Whole cohort, 18/42. Ethnicity: Not reported.
Further population details	
Extra comments	Acute complications of diverticular disease requiring urgent operation within 24 hours of admission.
Indirectness of population	No indirectness
Interventions	(n=32) Intervention 1: Primary anastomosis. Acute sigmoid resection followed by primary anastomosis covered by a defunctioning stoma (7 loop ileostomy and 25 transverse colostomy). Duration Mean (range) operation duration: initial operation - 172 min (75 - 300 min); second operation - 75 min (30 - 150 min). Concurrent medication/care: Not reported. Indirectness: No indirectness (n=28) Intervention 2: Temporary stoma. Hartmann's procedure. Duration Mean (range) operation duration: initial operation - 150 min (60 - 240 min); second operation - 172 min (90 - 195 min). Concurrent medication/care: Not reported. Indirectness: No indirectness Comments: Classed as temporary as study aimed to reverse stomas where possible.

Funding	Funding not stated

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH DEFUNCTIONING STOMA) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE)

Protocol outcome 1: Mortality at Define
- Actual outcome: In-hospital mortality (first operation) at In-hospital (first operation); Group 1: 5/32, Group 2: 6/28
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in grade of peritonitis and faecal contamination between groups. Some differences in % with cardiovascular disease - higher in PA group. Gender distribution not stated in different groups.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: In-hospital mortality (second operation) at In-hospital (second operation); Group 1: 0/27, Group 2: 1/22
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in grade of peritonitis and faecal contamination between groups. Some differences in % with cardiovascular disease - higher in PA group. Gender distribution not stated in different groups.; Key confounders: Age, gender; Group 1 Number missing: 5, Reason: Patients died prior to second operation.; Group 2 Number missing: 6, Reason: Patients died prior to second operation.

Protocol outcome 2: Complications (infections) at Define
- Actual outcome: Sepsis (first operation) at Not reported; Group 1: 3/32, Group 2: 6/28
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in grade of peritonitis and faecal contamination between groups. Some differences in % with cardiovascular disease - higher in PA group. Gender distribution not stated in different groups.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Sepsis (second operation) at Not reported; Group 1: 0/27, Group 2: 2/22
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in grade of peritonitis and faecal contamination between groups. Some differences in % with cardiovascular disease - higher in PA group. Gender distribution not stated in different groups.; Key confounders: Age, gender; Group 1 Number missing: 5, Reason: Patients died prior to second operation.; Group 2 Number missing: 6, Reason: Patients died prior to second operation.
- Actual outcome: Wound infection (first operation) at Not reported; Group 1: 1/32, Group 2: 4/28
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in grade of peritonitis and faecal contamination between groups. Some differences in % with cardiovascular disease - higher in PA group. Gender distribution not stated in different groups.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Wound infection (second operation) at Not reported; Group 1: 3/27, Group 2: 2/22
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover -

Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in grade of peritonitis and faecal contamination between groups. Some differences in % with cardiovascular disease - higher in PA group. Gender distribution not stated in different groups.; Key confounders: Age, gender; Group 1 Number missing: 5, Reason: Patients died prior to second operation.; Group 2 Number missing: 6, Reason: Patients died prior to second operation.
- Actual outcome: Urinary infection (first operation) at Not reported; Group 1: 1/32, Group 2: 4/28
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in grade of peritonitis and faecal contamination between groups. Some differences in % with cardiovascular disease - higher in PA group. Gender distribution not stated in different groups.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Urinary infection (second operation) at Not reported; Group 1: 0/27, Group 2: 0/22
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in grade of peritonitis and faecal contamination between groups. Some differences in % with cardiovascular disease - higher in PA group. Gender distribution not stated in different groups.; Key confounders: Age, gender; Group 1 Number missing: 5, Reason: Patients died prior to second operation.; Group 2 Number missing: 6, Reason: Patients died prior to second operation.

Protocol outcome 3: Complications (abscesses) at Define
- Actual outcome: Intra-abdominal abscess (first operation) at Not reported; Group 1: 3/32, Group 2: 4/28
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in grade of peritonitis and faecal contamination between groups. Some differences in % with cardiovascular disease - higher in PA group. Gender distribution not stated in different groups.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Intra-abdominal abscess (second operation) at Not reported; Group 1: 0/27, Group 2: 0/22
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in grade of peritonitis and faecal contamination between groups. Some differences in % with cardiovascular disease - higher in PA group. Gender distribution not stated in different groups.; Key confounders: Age, gender; Group 1 Number missing: 5, Reason: Patients died prior to second operation.; Group 2 Number missing: 6, Reason: Patients died prior to second operation.

Protocol outcome 4: Need for further surgery at Define
- Actual outcome: Reintervention (first operation) at Not reported; Group 1: 5/32, Group 2: 6/28
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in grade of peritonitis and faecal contamination between groups. Some differences in % with cardiovascular disease - higher in PA group. Gender distribution not stated in different groups.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Reintervention (second operation) at Not reported; Group 1: 3/27, Group 2: 5/22
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in grade of peritonitis and faecal contamination between groups. Some differences in % with cardiovascular disease - higher in PA group. Gender distribution not stated in different groups.; Key confounders: Age, gender; Group

1 Number missing: 5, Reason: Patients died prior to second operation.; Group 2 Number missing: 6, Reason: Patients died prior to second operation. Protocol outcome 5: Anastomotic leak at Define - Actual outcome: Anastomotic leak (first operation) at Not reported; Group 1: 3/32, Group 2: 0/28; Comments: Note NA for HP group as anastomosis not attempted in first operation. Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in grade of peritonitis and faecal contamination between groups. Some differences in % with cardiovascular disease - higher in PA group. Gender distribution not stated in different groups.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing: - Actual outcome: Anastomotic leak (second operation) at Not reported; Group 1: 0/27, Group 2: 3/22 Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in grade of peritonitis and faecal contamination between groups. Some differences in % with cardiovascular disease - higher in PA group. Gender distribution not stated in different groups.; Key confounders: Age, gender; Group 1 Number missing: 5, Reason: Patients died prior to second operation.; Group 2 Number missing: 6, Reason: Patients died prior to second operation. Protocol outcome 6: Stoma complications at Define - Actual outcome: Stoma dysfunction at Not reported; Group 1: 3/32, Group 2: 7/28 Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in grade of peritonitis and faecal contamination between groups. Some differences in % with cardiovascular disease - higher in PA group. Gender distribution not stated in different groups.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:	
Protocol outcomes not reported by the study	Quality of life at Define; Morbidity at Define; Progression of disease at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Gregg 1987[32]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=208)
Countries and setting	Conducted in USA; Setting: Secondary care - those admitted for operation in four different time periods.
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective review of patients admitted between different time frames.
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: Emergency operation indicated by free air/obstruction on flat films, abscesses diagnosed by contrast radiography, ultrasonography or computerised axial tomography, an extrinsic mass or leak shown by contrast study or failure to improve with medical treatment.
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Emergency operation defined as those performed at time of first admission for either acute condition or failure to respond to medical treatment.
Exclusion criteria	Not reported.
Recruitment/selection of patients	Patients admitting to various hospitals during four different time periods: one group was collected over a 30 year time period, one between 1974 and 1978, one between 1979 and 1983 and another during an 18 month period ending in July 1985.
Age, gender and ethnicity	Age - Other: Average age: primary anastomosis with/without temporary transverse colostomy, 60 years; Hartmann's procedure, 67 years. Gender (M:F): Not reported. Ethnicity: Not reported.
Further population details	
Extra comments	Extracted data only for emergency cases as the elective population consisted of unsuitable cases for this review question. One-stage and resection, anastomosis and temporary transverse colostomy groups were combined under 'primary anastomosis group' when extracting. Did not extract exteriorisation, descending colostomy or transverse colostomy groups as appear to be non-resective procedures.
Indirectness of population	No indirectness
Interventions	(n=55) Intervention 1: Primary anastomosis. Combined one-stage and resection, primary anastomosis and temporary transverse colostomy groups reported in this study. Duration Not reported. Concurrent medication/care: Not reported. Indirectness: No indirectness

	(n=23) Intervention 2: Temporary stoma. Hartmann's procedure. Duration Not reported. Concurrent medication/care: Not reported. Indirectness: No indirectness
Funding	Funding not stated
RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH OR WITHOUT TEMPORARY TRANSVERSE COLOSTOMY) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE) Protocol outcome 1: Mortality at Define - Actual outcome: Mortality at Not reported; Group 1: 0/55, Group 2: 2/23 Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age substantially different between groups: 60 years vs. 67 years. Insufficient data to compare gender proportions.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:	
Protocol outcomes not reported by the study	Quality of life at Define; Morbidity at Define; Progression of disease at Define; Complications (infections) at Define; Complications (abscesses) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Need for further surgery at Define; Anastomotic leak at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Herzog 2011[34]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=40)
Countries and setting	Conducted in Germany; Setting: Secondary care - hospital
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective review of data from all patients admitted within a period of 18 months
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: Triple contrast CT scan performed on admission
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Those undergoing emergency surgery due to complicated diverticulitis (perforated diverticulitis, abscess formation with sepsis, local or diffuse peritonitis, ileus secondary to recent episodes of diverticulitis or haemorrhage).
Exclusion criteria	Not reported.
Recruitment/selection of patients	Retrospective review of data from all cases matching inclusion criteria within 18 month period.
Age, gender and ethnicity	Age - Mean (SD): Primary anastomosis, 62 (16) years; Hartmann's procedure, 68 (13) years. Gender (M:F): Primary anastomosis, 13/8; Hartmann's procedure, 7/12. Ethnicity: Not reported.
Further population details	
Extra comments	Those undergoing emergency surgery due to complicated diverticulitis.
Indirectness of population	Serious indirectness: 3/40 patients with obstruction due to recurrent episodes of diverticulitis - unclear of distribution between two groups. Included as <10% of whole cohort.
Interventions	(n=21) Intervention 1: Primary anastomosis. Midline laparotomy. Primary anastomosis with/without diverting ileostomy. Ileostomy performed in those with MP scores >21 (n=7). Duration Mean surgery duration, 223±19 min. Concurrent medication/care: All patients received systemic antibiotics including metronidazole and a third generation cephalosporin before laparotomy. Depending on degree of peritonitis, patients received a combination of sulbactam and ceftazidime or a carbapenem unless change indicated by sensitivity of identified microorganisms. All patients had abdominal lavage with at least 5 litres of warm saline solution. Treatment of peritonitis included clearance of pus, faeces, exudates and as much debris and pseudomembranous material as possible. Indirectness: No indirectness (n=19) Intervention 2: Temporary stoma. Hartmann's procedure. Performed in all cases of faecal peritonitis, severe comorbidity, need for high dose catecholamine or multiple organ failure. Surgeon free to choose between primary

	anastomosis and Hartmann's in other cases of peritonitis. Duration Mean surgery duration, 203±27 min. Concurrent medication/care: All patients received systemic antibiotics including metronidazole and a third generation cephalosporin before laparotomy. Depending on degree of peritonitis, patients received a combination of sulbactam and ceftazidime or a carbapenem unless change indicated by sensitivity of identified microorganisms. All patients had abdominal lavage with at least 5 litres of warm saline solution. Treatment of peritonitis included clearance of pus, faeces, exudates and as much debris and pseudomembranous material as possible. . Indirectness: No indirectness
Funding	Funding not stated

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH/WITHOUT DIVERTING ILEOSTOMY) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE)

Protocol outcome 1: Mortality at Define
- Actual outcome: Postoperative mortality, in-hospital at In-hospital; Group 1: 1/21, Group 2: 6/19
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Substantial differences in gender and preoperative risk factors, including comorbidity and degree of peritonitis. Proportion >65 years was higher in the Hartmann group, with most severe cases also in this group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 2: Morbidity at Define
- Actual outcome: Major surgical complications at Not reported; Group 1: 1/21, Group 2: 6/19; Comments: Includes anastomotic leak, wound dehiscence, intraabdominal abscess and colostomy insufficiency
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Substantial differences in gender and preoperative risk factors, including comorbidity and degree of peritonitis. Proportion >65 years was higher in the Hartmann group, with most severe cases also in this group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Major general complications at Not reported; Group 1: 1/21, Group 2: 8/19; Comments: Includes cardiac, septic organ failure, pneumonia, necrotising pancreatitis, stroke and pulmonary embolism.
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Substantial differences in gender and preoperative risk factors, including comorbidity and degree of peritonitis. Proportion >65 years was higher in the Hartmann group, with most severe cases also in this group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Minor general complications at Not reported; Group 1: 2/21, Group 2: 4/19; Comments: Includes urinary tract infection and pleural effusion
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Substantial differences in gender and preoperative risk factors,

including comorbidity and degree of peritonitis. Proportion >65 years was higher in the Hartmann group, with most severe cases also in this group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 3: Complications (infections) at Define
- Actual outcome: Wound infection at Not reported; Group 1: 4/21, Group 2: 3/19
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Substantial differences in gender and preoperative risk factors, including comorbidity and degree of peritonitis. Proportion >65 years was higher in the Hartmann group, with most severe cases also in this group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Urinary tract infection at Not reported; Group 1: 2/21, Group 2: 3/19
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Substantial differences in gender and preoperative risk factors, including comorbidity and degree of peritonitis. Proportion >65 years was higher in the Hartmann group, with most severe cases also in this group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 4: Complications (abscesses) at Define
- Actual outcome: Intra-abdominal abscess at Not reported; Group 1: 0/21, Group 2: 1/19
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Substantial differences in gender and preoperative risk factors, including comorbidity and degree of peritonitis. Proportion >65 years was higher in the Hartmann group, with most severe cases also in this group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 5: Need for further surgery at Define
- Actual outcome: Unplanned early reoperation at Not reported; Group 1: 1/21, Group 2: 5/19
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Substantial differences in gender and preoperative risk factors, including comorbidity and degree of peritonitis. Proportion >65 years was higher in the Hartmann group, with most severe cases also in this group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 6: Anastomotic leak at Define
- Actual outcome: Anastomotic leak at Not reported; Group 1: 1/21, Group 2: 0/19; Comments: Note NA for HP as no anastomosis attempted
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Substantial differences in gender and preoperative risk factors, including comorbidity and degree of peritonitis. Proportion >65 years was higher in the Hartmann group, with most severe cases also in this group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 7: Stoma complications at Define - Actual outcome: Colostomy insufficiency at Not reported; Group 1: 0/21, Group 2: 3/19; Comments: Note NA for PA group as no colostomies attempted - only some with ileostomy. Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Substantial differences in gender and preoperative risk factors, including comorbidity and degree of peritonitis. Proportion >65 years was higher in the Hartmann group, with most severe cases also in this group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:	
Protocol outcomes not reported by the study	Quality of life at Define; Progression of disease at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Hold 1990[35]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=241)
Countries and setting	Conducted in Austria; Setting: Secondary care - 24 hospitals
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective review of cases between 1985 and 1987
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: Diagnostic procedures included plain abdominal film, enema with water-soluble contrast media, colonoscopy and/or computed tomography.
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Those undergoing surgery for perforated diverticulitis.
Exclusion criteria	Not reported.
Recruitment/selection of patients	Those undergoing surgery for perforated diverticulitis at 24 hospitals between 1985 and 1987.
Age, gender and ethnicity	Age - Median (range): Males, 62.13 (23-88) years; females, 68.73 (26-92) years. Gender (M:F): Whole cohort, 99/142. Not available separately for different interventions. Ethnicity: Not reported.
Further population details	
Extra comments	Those undergoing surgery for perforated diverticulitis. Note that when extracting primary anastomosis without protective colostomy and primary anastomosis with protective colostomy groups were combined.
Indirectness of population	No indirectness
Interventions	(n=99) Intervention 1: Primary anastomosis. Primary resection and anastomosis with/without protective proximal colostomy. Duration Not reported. Concurrent medication/care: Not reported. Indirectness: No indirectness (n=76) Intervention 2: Temporary stoma. Hartmann's procedure - primary resection with end colostomy. Duration Not reported. Concurrent medication/care: Not reported. Indirectness: No indirectness Comments: Classed as temporary stoma as aim is usually to reverse where possible.
Funding	Funding not stated

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH OR WITHOUT PROTECTIVE PROXIMAL COLOSTOMY) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE)

Protocol outcome 1: Mortality at Define
- Actual outcome: Mortality at Not reported; Group 1: 4/99, Group 2: 9/76; Comments: Note includes various complications such as peritonitis, ileus, colostomy infection, anastomotic leak and obstruction.
Risk of bias: All domain - --, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Cannot compare age and gender between the two groups. Difference in proportion of localised and diffuse peritonitis between the groups - higher proportion of diffuse peritonitis in Hartmann group, likely to be more severe cases.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 2: Morbidity at Define
- Actual outcome: Overall morbidity (first operation) at First operation; Group 1: 22/99, Group 2: 16/76
Risk of bias: All domain - --, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Cannot compare age and gender between the two groups. Difference in proportion of localised and diffuse peritonitis between the groups - higher proportion of diffuse peritonitis in Hartmann group, likely to be more severe cases.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 3: Anastomotic leak at Define
- Actual outcome: Anastomotic leak (second operation) at Second operation; Group 1: 1/15, Group 2: 4/42; Comments: Note number analysed are those that went on to have reversal operation in each group.
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Cannot compare age and gender between the two groups. Difference in proportion of localised and diffuse peritonitis between the groups - higher proportion of diffuse peritonitis in Hartmann group, likely to be more severe cases.; Key confounders: Age, gender; Group 1 Number missing: 84, Reason: Only 29/99 had protective colostomy and were therefore eligible for colostomy reversal - missing rate therefore 14/29 (48.28%) and more closely resembles that in the Hartmann's group. Reasons why 14/29 did not undergo reversal not clear. May have been due to deaths prior to second operation or considered unfit for reversal.; Group 2 Number missing: 34, Reason: Reasons reversal not performed unclear. May be due to deaths prior to second operation or considered unfit for reversal.

Protocol outcomes not reported by the study	Quality of life at Define; Progression of disease at Define; Complications (infections) at Define; Complications (abscesses) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Need for further surgery at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Kriwanek 1994[42]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=112)
Countries and setting	Conducted in Austria; Setting: Secondary care - hospital.
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective review of patient records treated between 1979 and 1992
Method of assessment of guideline condition	Method of assessment /diagnosis not stated
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Not reported.
Exclusion criteria	Not reported.
Recruitment/selection of patients	Records of patients treated for perforation of the colon between 1979 and 1992.
Age, gender and ethnicity	Age - Median (range): Whole cohort including all colon diseases, 68 (18-80) years. Not available separately for diverticulitis population. Gender (M:F): Whole cohort including all colon diseases, 51/61. Not available separately for diverticulitis population. Ethnicity: Not reported.
Further population details	
Extra comments	Extracted outcomes only for the diverticulitis population within this study, which gives outcomes for a larger cohort of colorectal diseases.
Indirectness of population	No indirectness
Interventions	(n=26) Intervention 1: Primary anastomosis. When extracting, combined primary anastomosis and primary anastomosis with stoma groups reported in this study. Duration Not reported. Concurrent medication/care: Not reported. Indirectness: No indirectness (n=33) Intervention 2: Temporary stoma. Hartmann's procedure. Duration Not reported. Concurrent medication/care: Not reported. Indirectness: No indirectness Comments: Classed as temporary as aim is usually to reverse stoma where possible.
Funding	Funding not stated

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH OR WITHOUT STOMA) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE) Protocol outcome 1: Mortality at Define - Actual outcome: Mortality at Not reported; Group 1: 4/26, Group 2: 5/33 Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: No data available to compare baseline between groups for the diverticulitis population.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:	
Protocol outcomes not reported by the study	Quality of life at Define; Morbidity at Define; Progression of disease at Define; Complications (infections) at Define; Complications (abscesses) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Need for further surgery at Define; Anastomotic leak at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Medina 1991[47]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=6)
Countries and setting	Conducted in USA; Setting: Secondary care - emergency presentation.
Line of therapy	1st line
Duration of study	Intervention + follow up: Review of records for those admitted between January 1983 and August 1988)
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: Clinical findings and symptoms. Radiology.
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Hinchey stage IV diverticulitis - diverticulitis with faecal peritonitis.
Exclusion criteria	Not reported.
Recruitment/selection of patients	Consecutive patients presenting with diverticulitis with faecal peritonitis between January 1983 and August 1988.
Age, gender and ethnicity	Age - Mean (SD): Primary anastomosis, 63.7 years; Hartmann's procedure, 78.7 years. Gender (M:F): Primary anastomosis, 1/2; Hartmann's procedure, 1/2. Ethnicity: Not reported.
Further population details	
Extra comments	All patients were Hinchey stage IV (perforated diverticular disease associated with faecal peritonitis). All were emergency cases.
Indirectness of population	No indirectness
Interventions	(n=3) Intervention 1: Primary anastomosis. Primary resection and immediate anastomosis. Duration Not reported. Concurrent medication/care: Resuscitative measures established for all patients prior to surgery (administration of supplemental oxygen, insertion of large-bore intravenous catheters). Balanced salt solution (e.g. Ringer's Lactate) given intravenously and titrated according to vital signs and urine output. Patients underwent copious peritoneal lavage with warm saline at completion of procedure. Indirectness: No indirectness (n=3) Intervention 2: Temporary stoma. Hartmann's procedure with terminal colostomy. Duration Not reported. Concurrent medication/care: Resuscitative measures established for all patients prior to surgery (administration of supplemental oxygen, insertion of large-bore intravenous catheters). Balanced salt solution (e.g. Ringer's Lactate) given intravenously and titrated according to vital signs and urine output. Patients underwent copious peritoneal lavage with warm saline at completion of procedure. Indirectness: No indirectness

Funding	Funding not stated
RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS versus TEMPORARY STOMA (HARTMANN'S PROCEDURE) Protocol outcome 1: Mortality at Define - Actual outcome: Mortality at Postoperative; Group 1: 0/3, Group 2: 1/3 Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Mean age substantially different between the two groups: 63.7 vs. 78.7 years.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing: Protocol outcome 2: Complications (abscesses) at Define - Actual outcome: Abscess at Postoperative; Group 1: 1/3, Group 2: 0/3 Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Mean age substantially different between the two groups: 63.7 vs. 78.7 years.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:	
Protocol outcomes not reported by the study	Quality of life at Define; Morbidity at Define; Progression of disease at Define; Complications (infections) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Need for further surgery at Define; Anastomotic leak at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Mueller 2011[49]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=73)
Countries and setting	Conducted in Germany; Setting: Hospital - secondary care.
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective review of patients between 1996 and 2006
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: Perforation confirmed by X-ray or CT scan prior to surgery.
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Patients undergoing emergency surgery for perforated diverticulitis (Hinchey I-IV).
Exclusion criteria	Not reported.
Recruitment/selection of patients	All patients matching criteria between 1996 and 2006.
Age, gender and ethnicity	Age - Mean (SD): Primary anastomosis, 63 (12) years; Hartmann's procedure, 67 (13) years. Gender (M:F): Primary anastomosis, 26/21; Hartmann's procedure, 10/16. Ethnicity: Not reported.
Further population details	
Extra comments	Patients undergoing emergency surgery for perforated diverticulitis (Hinchey I-IV).
Indirectness of population	No indirectness
Interventions	(n=47) Intervention 1: Primary anastomosis. Sigmoid colectomy and primary anastomosis with/without diverting loop ileostomy. Duration Not reported. Concurrent medication/care: Not reported. Indirectness: No indirectness (n=26) Intervention 2: Temporary stoma. Hartmann's procedure. Duration Not reported. Concurrent medication/care: Not reported. Indirectness: No indirectness Comments: Classed as temporary stoma as aim is usually to reverse stoma where possible.
Funding	Funding not stated

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH OR WITHOUT DIVERTING LOOP ILEOSTOMY) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE)

Protocol outcome 1: Mortality at Define
- Actual outcome: Postoperative mortality at In-hospital; Group 1: 2/47, Group 2: 7/26
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Difference in gender distribution. Higher comorbidity proportion in HP group. Higher proportion of ASA III and IV patients in HP group. Higher proportion of Hinchey stages III and IV perforation in HP group. HP group more critically ill.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 2: Morbidity at Define
- Actual outcome: Major postoperative complications at Not reported; Group 1: 14/47, Group 2: 12/26
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Difference in gender distribution. Higher comorbidity proportion in HP group. Higher proportion of ASA III and IV patients in HP group. Higher proportion of Hinchey stages III and IV perforation in HP group. HP group more critically ill.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 3: Complications (infections) at Define
- Actual outcome: Postoperative wound infection at Not reported; Group 1: 3/47, Group 2: 4/26
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Difference in gender distribution. Higher comorbidity proportion in HP group. Higher proportion of ASA III and IV patients in HP group. Higher proportion of Hinchey stages III and IV perforation in HP group. HP group more critically ill.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Sepsis at Not reported; Group 1: 9/47, Group 2: 5/26
Risk of bias: All domain - ; Indirectness of outcome: No indirectness

Protocol outcome 4: Complications (abscesses) at Define
- Actual outcome: Abscess/peritonitis at Not reported; Group 1: 3/47, Group 2: 1/26
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Difference in gender distribution. Higher comorbidity proportion in HP group. Higher proportion of ASA III and IV patients in HP group. Higher proportion of Hinchey stages III and IV perforation in HP group. HP group more critically ill.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 5: Anastomotic leak at Define
- Actual outcome: Anastomotic leak at Not reported; Group 1: 10/47, Group 2: 0/26; Comments: Not NA in HP as anastomosis not attempted after first operation.
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Difference in gender distribution. Higher comorbidity proportion in HP group. Higher proportion of ASA III and IV patients in HP group. Higher proportion of Hinchey stages III and IV perforation in HP group. HP group more critically ill.; Key

confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing: Protocol outcome 6: Stoma complications at Define - Actual outcome: Stoma necrosis at Not reported; Group 1: 0/47, Group 2: 4/26; Comments: Note potentially NA for PA group? Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Difference in gender distribution. Higher comorbidity proportion in HP group. Higher proportion of ASA III and IV patients in HP group. Higher proportion of Hinchey stages III and IV perforation in HP group. HP group more critically ill.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing: - Actual outcome: Hartmann stump insufficiency at Not reported; Group 1: 0/47, Group 2: 2/26; Comments: Note NA for PA group. Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Difference in gender distribution. Higher comorbidity proportion in HP group. Higher proportion of ASA III and IV patients in HP group. Higher proportion of Hinchey stages III and IV perforation in HP group. HP group more critically ill.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:	
Protocol outcomes not reported by the study	Quality of life at Define; Progression of disease at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Need for further surgery at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Netri 2000[52]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=239)
Countries and setting	Conducted in Italy; Setting: General surgery department of Catholic University of the Sacred Heart.
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective review of patients between January 1977 and December 1997.
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: Clinical evaluation, blood tests (Hct with formula, main hepatic and renal indexes) and ECG performed. Upright abdominal radiographs most utilised visual diagnostic test. Abdominal ultrasound reserved for clarifying uncertain diagnoses.
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Patients with acute diverticulitis.
Exclusion criteria	Not reported.
Recruitment/selection of patients	Patients admitted to General Surgery I Department of the Catholic University of the Sacred hearth between January 1977 and 1997 with acute diverticulitis.
Age, gender and ethnicity	Age - Other: Not reported. Gender (M:F): Not reported. Ethnicity: Not reported.
Further population details	
Extra comments	Extracted only for emergency cases as this was the only population matching protocol exactly. Consisted of emergency procedures (within 6 hours of admission), delayed emergency procedures (within 48 hours of admission) and delayed procedures (after 48 hours, but always within same admission). Emergency surgery performed in patients with instrumental and clinical signs of generalised or localised peritonitis.
Indirectness of population	No indirectness
Interventions	(n=31) Intervention 1: Primary anastomosis. Resection with immediate anastomosis with or without a protective colostomy. Duration Not reported. Concurrent medication/care: All patients received antibiotic and infusion therapy prior to surgery. Indirectness: No indirectness (n=6) Intervention 2: Temporary stoma. Hartmann's procedure with stoma. Does not specify if stomas reversed. Duration Not reported. Concurrent medication/care: All patients received antibiotic and infusion therapy prior to surgery. Indirectness: No indirectness

	Comments: Classed as temporary stoma as aim is usually to reverse stomas where possible, and study did not give details of this.
Funding	Funding not stated
RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH/WITHOUT PROTECTIVE COLOSTOMY) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE) Protocol outcome 1: Mortality at Define - Actual outcome: Mortality at Not reported; Group 1: 1/31, Group 2: 1/6 Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Unable to assess difference between primary anastomosis and Hartmann's procedure groups.; Key confounders: Age, gender; Group 1 Number missing: 0; Group 2 Number missing: 0	
Protocol outcomes not reported by the study	Quality of life at Define; Morbidity at Define; Progression of disease at Define; Complications (infections) at Define; Complications (abscesses) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Need for further surgery at Define; Anastomotic leak at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Oberkofler 2012[53]
Study type	RCT (Patient randomised; Parallel)
Number of studies (number of participants)	1 (n=62)
Countries and setting	Conducted in Switzerland; Setting: Two university hospitals.
Line of therapy	1st line
Duration of study	Intervention + follow up: Median follow-up, 47 months.
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: Computed tomography and/or clinical and radiography evidence.
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	German-language speaking. 18 years or older. Purulent of faecal peritonitis (Hinchey III and IV).
Exclusion criteria	Patients without generalised peritonitis (Hinchey I and II). Patients with evidence of metastasis.
Recruitment/selection of patients	Consecutive patients.
Age, gender and ethnicity	Age - Median (IQR): Hartmann's procedure, 74 (61-81); Primary anastomosis, 72 (60-83). Gender (M:F): Hartmann's procedure, 9/21; Primary anastomosis, 12/20. Ethnicity: Not reported.
Further population details	
Extra comments	Unclear whether all undergoing emergency surgery initially.
Indirectness of population	No indirectness
Interventions	(n=32) Intervention 1: Primary anastomosis. Surgical resection of sigmoid colon with primary anastomosis and a diverting ileostomy. Stoma reversal operation followed at later stage. Stoma reversal set to take place up to 3 months after first operation. Duration Median (IQR) operation time - primary anastomosis + stoma reversal, 240 (205-330) min. Concurrent medication/care: Decisions to take down splenic flexure or clean colon intraoperatively made individually by surgeons. Indirectness: No indirectness (n=30) Intervention 2: Temporary stoma. Hartmann's procedure. Surgical resection of the sigmoid colon with closure of the rectal stump and formation of an end colostomy. Stoma reversal operation planned at later stage. Duration Median (IQR) operation time - Hartmann's procedure + stoma reversal, 383 (280-460) min. Concurrent medication/care: Decisions to take down splenic flexure or clean colon intraoperatively made individually by surgeon. Indirectness: No indirectness

Funding	Funding not stated

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH DIVERTING ILEOSTOMY) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE)

Protocol outcome 1: Mortality at Define
- Actual outcome: In hospital mortality (first operation) at In-hospital; Group 1: 3/32, Group 2: 4/30
Risk of bias: All domain - Very high, Selection - Low, Blinding - Very high, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low, Comments - ; Indirectness of outcome: No indirectness ; Group 1 Number missing: 3, Reason: Three patients originally assigned to PA switched to HP at surgeon discretion. Analysed in original groups.; Group 2 Number missing: 1, Reason: One patient originally assigned to HP group switched to PA at surgeon discretion. Analysed in original groups.
- Actual outcome: In hospital mortality (second operation) at In-hospital; Group 1: 0/26, Group 2: 0/15
Risk of bias: All domain - Very high, Selection - Low, Blinding - Very high, Incomplete outcome data - Very high, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low, Comments - ; Indirectness of outcome: No indirectness ; Group 1 Number missing: 6, Reason: Six patients did not have ileostomy reversal in the PA group.; Group 2 Number missing: 15, Reason: Fifteen patients did not have colostomy reversal in the HP group.

Protocol outcome 2: Morbidity at Define
- Actual outcome: Morbidity (first operation) at First operation; Group 1: 24/32, Group 2: 12/30
Risk of bias: All domain - Very high, Selection - Low, Blinding - Very high, Incomplete outcome data - High, Outcome reporting - High, Measurement - High, Crossover - Low, Subgroups - Low, Other 1 - Low, Comments - ; Indirectness of outcome: No indirectness ; Group 1 Number missing: 3, Reason: Three patients originally assigned to PA switched to HP at surgeon discretion. Analysed in original groups.; Group 2 Number missing: 1, Reason: One patient originally assigned to HP group switched to PA at surgeon discretion. Analysed in original groups.

Protocol outcome 3: Complications (infections) at Define
- Actual outcome: Wound infections (first operation) at First operation; Group 1: 11/32, Group 2: 13/30
Risk of bias: All domain - Very high, Selection - Low, Blinding - Very high, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low, Comments - ; Indirectness of outcome: No indirectness ; Group 1 Number missing: 3, Reason: Three patients originally assigned to PA switched to HP at surgeon discretion. Analysed in original groups.; Group 2 Number missing: 1, Reason: One patient originally assigned to HP group switched to PA at surgeon discretion. Analysed in original groups.
- Actual outcome: Wound infections (second operation) at Second operation; Group 1: 3/26, Group 2: 3/15
Risk of bias: All domain - Very high, Selection - Low, Blinding - Very high, Incomplete outcome data - Very high, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low, Comments - ; Indirectness of outcome: No indirectness ; Group 1 Number missing: 6, Reason: Six patients did not have ileostomy reversal in the PA group.; Group 2 Number missing: 15, Reason: Fifteen patients did not have colostomy reversal in the HP group.
- Actual outcome: Intra-abdominal infection (first operation) at First operation; Group 1: 2/32, Group 2: 6/30
Risk of bias: All domain - Very high, Selection - Low, Blinding - Very high, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover -

Low, Subgroups - Low, Other 1 - Low, Comments - ; Indirectness of outcome: No indirectness ; Group 1 Number missing: 3, Reason: Three patients originally assigned to PA switched to HP at surgeon discretion. Analysed in original groups.; Group 2 Number missing: 1, Reason: One patient originally assigned to HP group switched to PA at surgeon discretion. Analysed in original groups.
- Actual outcome: Intra-abdominal infection (second operation) at Second operation; Group 1: 0/26, Group 2: 0/15
Risk of bias: All domain - Very high, Selection - Low, Blinding - Very high, Incomplete outcome data - Very high, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low, Comments - ; Indirectness of outcome: No indirectness ; Group 1 Number missing: 6, Reason: Six patients did not have ileostomy reversal in the PA group.; Group 2 Number missing: 15, Reason: Fifteen patients did not have colostomy reversal in the HP group.
- Actual outcome: Urinary tract infection (first operation) at First operation; Group 1: 3/32, Group 2: 1/30
Risk of bias: All domain - Very high, Selection - Low, Blinding - Very high, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low, Comments - ; Indirectness of outcome: No indirectness ; Group 1 Number missing: 3, Reason: Three patients originally assigned to PA switched to HP at surgeon discretion. Analysed in original groups.; Group 2 Number missing: 1, Reason: One patient originally assigned to HP group switched to PA at surgeon discretion. Analysed in original groups.
- Actual outcome: Urinary tract infections (second operation) at Second operation; Group 1: 0/26, Group 2: 0/15
Risk of bias: All domain - Very high, Selection - Low, Blinding - Very high, Incomplete outcome data - Very high, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low, Comments - ; Indirectness of outcome: No indirectness ; Group 1 Number missing: 6, Reason: Six patients did not have ileostomy reversal in the PA group.; Group 2 Number missing: 15, Reason: Fifteen patients did not have colostomy reversal in the HP group.
- Actual outcome: All complications - Clavien-Dindo I-V (first operation) at First operation; Group 1: 27/32, Group 2: 24/30
Risk of bias: All domain - Very high, Selection - Low, Blinding - Very high, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low, Comments - ; Indirectness of outcome: No indirectness ; Group 1 Number missing: 3, Reason: Three patients originally assigned to PA switched to HP at surgeon discretion. Analysed in original groups.; Group 2 Number missing: 1, Reason: One patient originally assigned to HP group switched to PA at surgeon discretion. Analysed in original groups.
- Actual outcome: All complications - Clavien-Dindo I-V (second operation) at Second operation; Group 1: 20/26, Group 2: 6/15
Risk of bias: All domain - Very high, Selection - Low, Blinding - Very high, Incomplete outcome data - Very high, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low, Comments - ; Indirectness of outcome: No indirectness ; Group 1 Number missing: 6, Reason: Six patients did not have ileostomy reversal in the PA group.; Group 2 Number missing: 15, Reason: Fifteen patients did not have colostomy reversal in the HP group.

Protocol outcome 4: Need for further surgery at Define
- Actual outcome: Need for reoperation (second operation) at Second operation; Group 1: 0/26, Group 2: 3/15
Risk of bias: All domain - Very high, Selection - Low, Blinding - Very high, Incomplete outcome data - Very high, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low, Comments - ; Indirectness of outcome: No indirectness ; Group 1 Number missing: 6, Reason: Six patients did not have ileostomy reversal in the PA group.; Group 2 Number missing: 15, Reason: Fifteen patients did not have colostomy reversal in the HP group.

Protocol outcome 5: Anastomotic leak at Define
- Actual outcome: Anastomotic leak (first operation) at First operation; Group 1: 1/32, Group 2: 0/30
Risk of bias: All domain - Very high, Selection - Low, Blinding - Very high, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low, Comments - ; Indirectness of outcome: No indirectness ; Group 1 Number missing: 3, Reason: Three patients originally assigned to

PA switched to HP at surgeon discretion. Analysed in original groups.; Group 2 Number missing: 1, Reason: One patient originally assigned to HP group switched to PA at surgeon discretion. Analysed in original groups. - Actual outcome: Anastomotic leak (second operation) at Second operation; Group 1: 0/26, Group 2: 2/15 Risk of bias: All domain - Very high, Selection - Low, Blinding - Very high, Incomplete outcome data - Very high, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low, Comments - ; Indirectness of outcome: No indirectness ; Group 1 Number missing: 6, Reason: Six patients did not have ileostomy reversal in the PA group.; Group 2 Number missing: 15, Reason: Fifteen patients did not have colostomy reversal in the HP group. Protocol outcome 6: Stoma complications at Define - Actual outcome: Stoma complications (first operation) at First operation; Group 1: 0/32, Group 2: 3/30 Risk of bias: All domain - Very high, Selection - Low, Blinding - Very high, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low, Comments - ; Indirectness of outcome: No indirectness ; Group 1 Number missing: 3, Reason: Three patients originally assigned to PA switched to HP at surgeon discretion. Analysed in original groups.; Group 2 Number missing: 1, Reason: One patient originally assigned to HP group switched to PA at surgeon discretion. Analysed in original groups.	
Protocol outcomes not reported by the study	Quality of life at Define; Progression of disease at Define; Complications (abscesses) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Pasternak 2010[56]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=111)
Countries and setting	Conducted in Switzerland; Setting: Triemli Hospital - tertiary referral centre.
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective (2001-2004) and prospective (2005-2006) review of case notes, intensive care, anaesthetic protocols and surgery reports.
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: Clinical diagnosis of generalised peritonitis, evidence of perforation indicated by free gas on plain X-rays, or localised peritonitis and contained/uncontained perforation on triple contrast CT scan.
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Emergency laparotomy for perforated diverticulitis of left colon between 2001 and 2006; clinical diagnosis of generalised peritonitis, evidence of perforation on plain X-rays or localised peritonitis and contained/uncontained perforation on triple contrast CT scan.
Exclusion criteria	Not reported.
Recruitment/selection of patients	Patients undergoing emergency laparotomy for perforated diverticulitis of left colon between 2001 and 2006.
Age, gender and ethnicity	Age - Median (range): Primary anastomosis, 71.5 (40-89); Hartmann's procedure, 78 (46-92). Gender (M:F): Primary anastomosis, 21/25; Hartmann's procedure, 25/40. Ethnicity: Not reported.
Further population details	
Extra comments	Emergency operation defined as procedure performed within 6 h of making decision to operate.
Indirectness of population	No indirectness
Interventions	(n=46) Intervention 1: Primary anastomosis. Surgeon decided whether a protective loop ileostomy was necessary in each patient depending on the quality of the anastomosis. Protective loop ileostomy performed in eleven patients. Duration Mean (standard deviation) duration of surgery, 160 (±56.9) minutes. Concurrent medication/care: Intra-operative colonic lavage only performed in cases where a protective loop ileostomy was considered. Indirectness: No indirectness (n=65) Intervention 2: Temporary stoma, Hartmann's procedure with stoma. . Duration Mean (standard deviation)

	duration of surgery, 165 (±48.7) minutes. Concurrent medication/care: Not reported. Indirectness: No indirectness Comments: Classed as temporary stoma as aim is usually to reverse stomas where possible, and study did not give details of this.
Funding	Funding not stated

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH/WITHOUT PROTECTIVE ILEOSTOMY) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE)

Protocol outcome 1: Mortality at Define
- Actual outcome: In-hospital mortality at In-hospital; Group 1: 8/46, Group 2: 19/65
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age higher in HP group. Gender distribution similar. Immunosuppression higher in HP group.; Key confounders: Age, gender; Group 1 Number missing: 0; Group 2 Number missing: 0

Protocol outcome 2: Morbidity at Define
- Actual outcome: Intraoperative morbidity at Intraoperative; Group 1: 8/46, Group 2: 7/65
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age higher in HP group. Gender distribution similar. Immunosuppression higher in HP group.; Key confounders: Age, gender; Group 1 Number missing: 0; Group 2 Number missing: 0
- Actual outcome: Postoperative overall morbidity at Not reported; Group 1: 20/46, Group 2: 33/65
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age higher in HP group. Gender distribution similar. Immunosuppression higher in HP group.; Key confounders: Age, gender; Group 1 Number missing: 0; Group 2 Number missing: 0
- Actual outcome: Postoperative surgical morbidity at Not reported; Group 1: 17/46, Group 2: 15/65
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age higher in HP group. Gender distribution similar. Immunosuppression higher in HP group.; Key confounders: Age, gender; Group 1 Number missing: 0; Group 2 Number missing: 0
- Actual outcome: Postoperative medical morbidity at Not reported; Group 1: 7/46, Group 2: 24/65
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age higher in HP group. Gender distribution similar. Immunosuppression higher in HP group.; Key confounders: Age, gender; Group 1 Number missing: 0; Group 2 Number missing: 0

Protocol outcome 3: Complications (abscesses) at Define
- Actual outcome: Post-operative intra-abdominal abscess at Not reported; Group 1: 7/46, Group 2: 5/65

Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age higher in HP group. Gender distribution similar. Immunosuppression higher in HP group.; Key confounders: Age, gender; Group 1 Number missing: 0; Group 2 Number missing: 0 Protocol outcome 4: Need for further surgery at Define - Actual outcome: Relaparotomy at Not reported; Group 1: 15/46, Group 2: 18/65 Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age higher in HP group. Gender distribution similar. Immunosuppression higher in HP group.; Key confounders: Age, gender; Group 1 Number missing: 0; Group 2 Number missing: 0 Protocol outcome 5: Anastomotic leak at Define - Actual outcome: Postoperative anastomotic/rectal stump leak at Not reported; Group 1: 13/46, Group 2: 2/65; Comments: Note anastomotic leaks apply to primary anastomosis group and rectal stump leaks apply to Hartmann's procedure. Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age higher in HP group. Gender distribution similar. Immunosuppression higher in HP group.; Key confounders: Age, gender; Group 1 Number missing: 0; Group 2 Number missing: 0 Protocol outcome 6: Stoma complications at Define - Actual outcome: Stoma morbidity at Not reported; Group 1: 0/46, Group 2: 8/65; Comments: Note only eleven in PA group had protective ileostomy. Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age higher in HP group. Gender distribution similar. Immunosuppression higher in HP group.; Key confounders: Age, gender; Group 1 Number missing: 0; Group 2 Number missing: 0	
Protocol outcomes not reported by the study	Quality of life at Define; Progression of disease at Define; Complications (infections) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Richter 2006[59]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=41)
Countries and setting	Conducted in Germany; Setting: Hospital - secondary care
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective review of patients between August 2001 and August 2003
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: All patients underwent triple-contrast CT scan.
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Patients undergoing emergency surgery for complicated sigmoid diverticulitis (Hinchey stages III and IV).
Exclusion criteria	Not reported.
Recruitment/selection of patients	All matching criteria between August 2001 and August 2003.
Age, gender and ethnicity	Age - Mean (SD): Whole cohort, 60 (2) years. Not available for the individual intervention groups. Gender (M:F): Whole cohort, 22/19. Not available for the individual intervention groups. Ethnicity: Not reported.
Further population details	
Extra comments	Patients undergoing emergency surgery for complicated sigmoid diverticulitis (Hinchey stages III and IV).
Indirectness of population	No indirectness
Interventions	(n=36) Intervention 1: Primary anastomosis. One-stage sigmoid resection and primary anastomosis with/without protective ileostomy. Three had protective ileostomy. Duration Not reported. Concurrent medication/care: Treatment of peritonitis comprised the use of 30 liters of warm Ringer's lactate for abdominal lavage to dilute the bacterial load of the abdominal cavity and postoperative antibiotic therapy that was maintained for at least 5 day. Indirectness: No indirectness (n=5) Intervention 2: Temporary stoma. Hartmann's procedure. Duration Not reported. Concurrent medication/care: Treatment of peritonitis comprised the use of 30 liters of warm Ringer's lactate for abdominal lavage to dilute the bacterial load of the abdominal cavity and postoperative antibiotic therapy that was maintained for at least 5 days. Indirectness: No indirectness Comments: Classed as temporary stoma as aim is usually to reverse where possible.

Funding	Funding not stated
RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH/WITHOUT PROTECTIVE ILEOSTOMY) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE) Protocol outcome 1: Mortality at Define - Actual outcome: Mortality at Not reported; Group 1: 4/36, Group 2: 3/5 Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Cannot compare age and gender between the groups. Those selected for HP group were those surgeons considered to be unsuitable for anastomosis and were more critically ill. More severe comorbidity in the HP group. MPI higher in HP vs. PA.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing: Protocol outcome 2: Anastomotic leak at Define - Actual outcome: Anastomotic leak at Not reported; Group 1: 1/36, Group 2: 0/5; Comments: Note NA for the HP group as anastomosis not attempted in first operation. Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Cannot compare age and gender between the groups. Those selected for HP group were those surgeons considered to be unsuitable for anastomosis and were more critically ill. More severe comorbidity in the HP group. MPI higher in HP vs. PA.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:	
Protocol outcomes not reported by the study	Quality of life at Define; Morbidity at Define; Progression of disease at Define; Complications (infections) at Define; Complications (abscesses) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Need for further surgery at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Schilling 2001[61]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=55)
Countries and setting	Conducted in Switzerland; Setting: Secondary care - hospital
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective review of cases between January 1994 and January 1998.
Method of assessment of guideline condition	Method of assessment /diagnosis not stated
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Patients undergoing emergency sigmoid colon resection for perforated diverticulitis and peritonitis.
Exclusion criteria	Not reported.
Recruitment/selection of patients	Patients undergoing emergency sigmoid colon resection for perforated diverticulitis and peritonitis between January 1994 and January 1998.
Age, gender and ethnicity	Age - Mean (SD): Primary anastomosis, 65 (12) years; Hartmann's procedure, 68 (10) years. Gender (M:F): Primary anastomosis, 6/7; Hartmann's procedure, 20/22. Ethnicity: Not reported.
Further population details	
Extra comments	Patients undergoing emergency sigmoid colon resection for perforated diverticulitis and peritonitis.
Indirectness of population	No indirectness
Interventions	(n=13) Intervention 1: Primary anastomosis. One-stage sigmoid colon resection and primary anastomosis without protective colostomy. Duration Not reported. Concurrent medication/care: Extensive abdominal lavage with at least 20 litres of warm (37•C) ringers lactate solution performed in all patients. Indirectness: No indirectness (n=42) Intervention 2: Temporary stoma. Primary sigmoid colon resection, Hartmann's procedure and descending colostomy. Duration Not reported. Concurrent medication/care: Extensive abdominal lavage with at least 20 litres of warm (37•C) ringers lactate solution performed in all patient. Indirectness: No indirectness Comments: Classed as temporary as aim was to reverse stomas where possible.
Funding	Funding not stated

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITHOUT PROTECTIVE COLOSTOMY) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE)

Protocol outcome 1: Mortality at Define
- Actual outcome: Postoperative mortality (first and second operations combined) at Not reported; Group 1: 1/13, Group 2: 4/42; Comments: Note for HP group events following first and second operations are given.
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Comparable for age, gender, ASA. Some differences between groups for proportion of local/diffuse peritonitis - higher diffuse peritonitis proportion in HP group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 2: Morbidity at Define
- Actual outcome: Postoperative major morbidity (first and second operations combined) at Not reported; Group 1: 1/13, Group 2: 5/42; Comments: Major complications defined as those requiring change in therapy or prolonged therapy. Note for HP group events following first and second operations are given.
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Comparable for age, gender, ASA. Some differences between groups for proportion of local/diffuse peritonitis - higher diffuse peritonitis proportion in HP group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Postoperative minor morbidity (first and second operations combined) at Not reported; Group 1: 5/13, Group 2: 9/42; Comments: Major complications defined as those requiring change in therapy or prolonged therapy.
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Comparable for age, gender, ASA. Some differences between groups for proportion of local/diffuse peritonitis - higher diffuse peritonitis proportion in HP group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 3: Stoma complications at Define
- Actual outcome: Stoma complications (first and second operations combined) at Not reported; Group 1: 0/13, Group 2: 3/42; Comments: Note NA in PA group as no stoma.
Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Comparable for age, gender, ASA. Some differences between groups for proportion of local/diffuse peritonitis - higher diffuse peritonitis proportion in HP group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcomes not reported by the study	Quality of life at Define; Progression of disease at Define; Complications (infections) at Define; Complications

	(abscesses) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Need for further surgery at Define; Anastomotic leak at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Stumpf 2007[64]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=66)
Countries and setting	Conducted in USA; Setting: Hospital Medical Centre
Line of therapy	1st line
Duration of study	Follow up (post intervention): Retrospective review of records between 1998 and 2003.
Method of assessment of guideline condition	Unclear method of assessment/diagnosis: Diagnosis potentially confirmed in operation - brief mention but unclear.
Stratum	Overall
Subgroup analysis within study	Not applicable:
Inclusion criteria	Patients treated surgically for complications of acute diverticulitis; emergency surgery within same hospital admission as presentation to emergency department with acute abdominal pain; operated on due to perforation, peritoneal signs, abscess, obstruction or failure of medical therapy.
Exclusion criteria	Right-sided diverticulitis; patients who underwent primary anastomosis and also received a proximal diverting loop ileostomy.
Recruitment/selection of patients	Retrospective review of those undergoing emergency surgery for complications of left-sided diverticulitis between 1998 and 2003.
Age, gender and ethnicity	Age - Other: Not reported. Proportion ≥80 years: Primary anastomosis, 6/36; Hartmann's procedure, 6/30. Gender (M:F): Primary anastomosis, 15/21; Hartmann's procedure, 17/13. Ethnicity: Not reported.
Further population details	
Indirectness of population	No indirectness
Interventions	(n=36) Intervention 1: Primary anastomosis. No further details given. Duration Not reported. Concurrent medication/care: Most surgeons performed mini colonic lavage with saline. Seven patients were able to be prepped the night before the operation as they were operated on due to failure of medical therapy. Indirectness: No indirectness (n=30) Intervention 2: Temporary stoma. Hartmann's procedure with stoma. Does not specify whether stomas were reversed. Duration Not reported. Concurrent medication/care: Most surgeons performed mini colonic lavage with saline. Two patients were able to be prepped the night before the operation as they were operated on due to failure of medical therapy. Indirectness: No indirectness Comments: Classed as temporary stoma as intention is usually to reverse where possible but this study does not specify.

Funding	Funding not stated

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS versus TEMPORARY STOMA (HARTMANN'S PROCEDURE)

Protocol outcome 1: Mortality at Define
- Actual outcome: Mortality at Not reported; Group 1: 0/36, Group 2: 5/30; Comments: Note that all events occurred in patients that were considered to be high risk (≥80 years of age, ASA class >3, APACHE II score >4 and/or Hinchey score >2).
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age not stated - similar proportion of patients >80 years each group. Difference in proportion without comorbidity in each group. Differences in ASA, APACHE II and Hinchey scores.; Key confounders: Age, gender; Group 1 Number missing: 0; Group 2 Number missing: 0

Protocol outcome 2: Morbidity at Define
- Actual outcome: Overall complications at Not reported; Group 1: 5/36, Group 2: 10/30; Comments: Note that all events occurred in patients that were considered to be high risk (≥80 years of age, ASA class >3, APACHE II score >4 and/or Hinchey score >2).
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age not stated - similar proportion of patients >80 years each group. Difference in proportion without comorbidity in each group. Differences in ASA, APACHE II and Hinchey scores.; Key confounders: Age, gender; Group 1 Number missing: 0; Group 2 Number missing: 0
- Actual outcome: Other complications (medical) at Not reported; Group 1: 5/36, Group 2: 8/30; Comments: Note that all events occurred in patients that were considered to be high risk (≥80 years of age, ASA class >3, APACHE II score >4 and/or Hinchey score >2).
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age not stated - similar proportion of patients >80 years each group. Difference in proportion without comorbidity in each group. Differences in ASA, APACHE II and Hinchey scores.; Key confounders: Age, gender; Group 1 Number missing: 0; Group 2 Number missing: 0

Protocol outcome 3: Complications (infections) at Define
- Actual outcome: Wound infection at Not reported; Group 1: 0/36, Group 2: 2/30; Comments: Note that all events occurred in patients that were considered to be high risk (≥80 years of age, ASA class >3, APACHE II score >4 and/or Hinchey score >2).
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Other 1 - Low; Indirectness of outcome: No indirectness; Baseline details: Age not stated - similar proportion of patients >80 years each group. Difference in proportion without comorbidity in each group. Differences in ASA, APACHE II and Hinchey scores.; Key confounders: Age, gender; Group 1 Number missing: 0; Group 2 Number missing: 0

Protocol outcome 4: Complications (abscesses) at Define - Actual outcome: Abscess at Not reported; Group 1: 0/36, Group 2: 4/30; Comments: Note that all events occurred in patients that were considered to be high risk (≥80 years of age, ASA class >3, APACHE II score >4 and/or Hinchey score >2). Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age not stated - similar proportion of patients >80 years each group. Difference in proportion without comorbidity in each group. Differences in ASA, APACHE II and Hinchey scores.; Key confounders: Age, gender; Group 1 Number missing: 0; Group 2 Number missing: 0 Protocol outcome 5: Need for further surgery at Define - Actual outcome: Reoperation at Not reported; Group 1: 1/36, Group 2: 0/30; Comments: Note that all events occurred in patients that were considered to be high risk (≥80 years of age, ASA class >3, APACHE II score >4 and/or Hinchey score >2). Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age not stated - similar proportion of patients >80 years each group. Difference in proportion without comorbidity in each group. Differences in ASA, APACHE II and Hinchey scores.; Key confounders: Age, gender; Group 1 Number missing: 0; Group 2 Number missing: 0 Protocol outcome 6: Anastomotic leak at Define - Actual outcome: Anastomotic leak at Not reported; Group 1: 1/36, Group 2: 0/30; Comments: Note NA for Hartmann's group. Note that all events occurred in patients that were considered to be high risk (≥80 years of age, ASA class >3, APACHE II score >4 and/or Hinchey score >2). Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age not stated - similar proportion of patients >80 years each group. Difference in proportion without comorbidity in each group. Differences in ASA, APACHE II and Hinchey scores.; Key confounders: Age, gender; Group 1 Number missing: 0; Group 2 Number missing: 0	
Protocol outcomes not reported by the study	Quality of life at Define; Progression of disease at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Thaler 2000[65]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=82)
Countries and setting	Conducted in Austria; Setting: Secondary care - surgical department within hospital
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective review of patients between 1988 and 1998.
Method of assessment of guideline condition	Method of assessment /diagnosis not stated
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Those undergoing emergency surgery for perforated sigmoid diverticulitis.
Exclusion criteria	Not reported.
Recruitment/selection of patients	All eligible cases between 1988 and 1998 retrospectively reviewed
Age, gender and ethnicity	Age - Mean (SD): Primary anastomosis, 70 (13) years; Hartmann's procedure, 72 (15) years. Gender (M:F): Primary anastomosis,6/14; Hartmann's procedure, 25/37. Ethnicity: Not reported.
Further population details	
Extra comments	Emergency surgery for perforated sigmoid diverticulitis.
Indirectness of population	No indirectness
Interventions	(n=20) Intervention 1: Primary anastomosis. One-stage primary sigmoid resection with primary anastomosis. No protective stomas were employed. Duration Not reported. Concurrent medication/care: Broad spectrum antibiotics routinely administered in all patients starting preoperatively and given for at least 7 days after surgery. Indirectness: No indirectness (n=62) Intervention 2: Temporary stoma. Primary sigmoid resection with Hartmann's procedure. Duration Not reported. Concurrent medication/care: Broad spectrum antibiotics routinely administered in all patients starting preoperatively and given for at least 7 days after surgery. Indirectness: No indirectness
Funding	Funding not stated

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITHOUT PROTECTIVE STOMA) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE)

Protocol outcome 1: Mortality at Define
- Actual outcome: Mortality at Not reported; Group 1: 4/20, Group 2: 22/62
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age comparable between groups. Difference in proportion of males in each group - higher in Hartmann's. Higher proportion of those with ASA IV/V scores in Hartmann's and also higher Mannheim Peritonitis Index score - more severe cases and most unwell patients in Hartmann's group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 2: Morbidity at Define
- Actual outcome: Overall morbidity at Not reported; Group 1: 7/20, Group 2: 13/62
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age comparable between groups. Difference in proportion of males in each group - higher in Hartmann's. Higher proportion of those with ASA IV/V scores in Hartmann's and also higher Mannheim Peritonitis Index score - more severe cases and most unwell patients in Hartmann's group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Surgical morbidity at Not reported; Group 1: 6/20, Group 2: 7/62
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Age comparable between groups. Difference in proportion of males in each group - higher in Hartmann's. Higher proportion of those with ASA IV/V scores in Hartmann's and also higher Mannheim Peritonitis Index score - more severe cases and most unwell patients in Hartmann's group.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcomes not reported by the study	Quality of life at Define; Progression of disease at Define; Complications (infections) at Define; Complications (abscesses) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Need for further surgery at Define; Anastomotic leak at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Trenti 2011[66]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=87)
Countries and setting	Conducted in Spain; Setting: Secondary care - hospital
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective review of cases between January 1st 1995 and December 31st 2008.
Method of assessment of guideline condition	Method of assessment /diagnosis not stated
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Patients operated on for Hinchey stage III-IV diverticular peritonitis.
Exclusion criteria	Patients with colon cancer at definitive histopathology, Hinchey I-II peritonitis, fistula and bleeding complications.
Recruitment/selection of patients	All patients operated on for Hinchey stage III-IV diverticular peritonitis between 1st January 1995 and 31st December 2008.
Age, gender and ethnicity	Age - Mean (SD): Primary anastomosis, 58.1 (16.3) years; Hartmann's procedure, 69.7 (12.7) years. Gender (M:F): Primary anastomosis, 19/8; Hartmann's procedure, 34/26. Ethnicity: Not reported.
Further population details	
Extra comments	Patients operated on for Hinchey stage III-IV diverticular peritonitis. Emergency surgery.
Indirectness of population	No indirectness
Interventions	(n=27) Intervention 1: Primary anastomosis. Resection of affected bowel segment with primary anastomosis, with or without protective stoma (derivative ileostomy). 5 patients had protective stoma. Duration Not reported. Concurrent medication/care: All patients were treated with an extensive intraabdominal lavage with warm saline solution and post-operative antibiotic therapy for at least 14 days. All patients underwent the same post-operative care in the intensive care unit and in the ward with the same team of physicians. From 2007 onwards, only patients undergoing primary anastomosis with protective ileostomy received intraoperative colonic lavage. Indirectness: No indirectness (n=60) Intervention 2: Temporary stoma. Hartmann's procedure. Duration Not reported. Concurrent medication/care: All patients were treated with an extensive intraabdominal lavage with warm saline solution and post-operative antibiotic therapy for at least 14 days. All patients underwent the same post-operative care in the intensive care unit and in the ward with the same team of physicians. From 2007 onwards, only patients undergoing primary anastomosis

	with protective ileostomy received intraoperative colonic lavage. Indirectness: No indirectness
Funding	Funding not stated

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH OR WITHOUT PROTECTIVE ILEOSTOMY) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE)

Protocol outcome 1: Mortality at Define
- Actual outcome: Postoperative mortality (first operation) at First operation; OR; 0.47 (95%CI 0.07 to 3.23) (P-value: 0.44) ;
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Lower proportion of females and lower mean age in the PA group compared with Hartmann's. Higher proportion of ASA scores III and IV in Hartmann's. Higher proportion of Hinchey stage IV in Hartmann's.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 2: Morbidity at Define
- Actual outcome: Postoperative morbidity (first operation) at First operation; OR; 0.21 (95%CI 0.05 to 0.84) (P-value: 0.03) ;
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Lower proportion of females and lower mean age in the PA group compared with Hartmann's. Higher proportion of ASA scores III and IV in Hartmann's. Higher proportion of Hinchey stage IV in Hartmann's.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 3: Complications (infections) at Define
- Actual outcome: Wound infection (first operation) at First operation; OR; 0.68 (95%CI 0.2 to 2.33) (P-value: 0.53) ;
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Lower proportion of females and lower mean age in the PA group compared with Hartmann's. Higher proportion of ASA scores III and IV in Hartmann's. Higher proportion of Hinchey stage IV in Hartmann's.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:
- Actual outcome: Ongoing sepsis (first operation) at First operation; Group 1: 1/27, Group 2: 14/60
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Lower proportion of females and lower mean age in the PA group compared with Hartmann's. Higher proportion of ASA scores III and IV in Hartmann's. Higher proportion of Hinchey stage IV in Hartmann's.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:

Protocol outcome 4: Complications (abscesses) at Define
- Actual outcome: Intraabdominal abscess (first operation) at First operation; Group 1: 0/27, Group 2: 8/60

Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Lower proportion of females and lower mean age in the PA group compared with Hartmann's. Higher proportion of ASA scores III and IV in Hartmann's. Higher proportion of Hinchey stage IV in Hartmann's.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing: Protocol outcome 5: Need for further surgery at Define - Actual outcome: Reoperation (first operation) at First operation; OR; 1.96 (95%CI 0.28 to 14.29) (P-value: 0.49) ; Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Lower proportion of females and lower mean age in the PA group compared with Hartmann's. Higher proportion of ASA scores III and IV in Hartmann's. Higher proportion of Hinchey stage IV in Hartmann's.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing: Protocol outcome 6: Anastomotic leak at Define - Actual outcome: Anastomotic leak (first operation) at First operation; Group 1: 3/27, Group 2: 0/60; Comments: Note NA for HP group as anastomosis not attempted in first operation. Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Lower proportion of females and lower mean age in the PA group compared with Hartmann's. Higher proportion of ASA scores III and IV in Hartmann's. Higher proportion of Hinchey stage IV in Hartmann's.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing: - Actual outcome: Anastomotic leak (second operation) at Second operation; Group 1: 0/3, Group 2: 0/9; Comments: Note only 5 patients originally had protective ileostomy in PA group and were therefore eligible for the reversal operation. Only 3 of these had this reversed within the follow-up. Only 9 in the HP group had had stoma reversal within the follow-up period. Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Very high, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Lower proportion of females and lower mean age in the PA group compared with Hartmann's. Higher proportion of ASA scores III and IV in Hartmann's. Higher proportion of Hinchey stage IV in Hartmann's.; Key confounders: Age, gender; Group 1 Number missing: 24, Reason: Only 5 of PA group had protective ileostomy and were therefore eligible for this reversal operation - actual missing rate is 2/5 (40%). Of those with missing data, one died prior to the second operation and one still waiting at the end of follow-up due to kidney transplantation.; Group 2 Number missing: 51, Reason: Patients had died (nine), were considered unfit for reversal due to being a high surgical risk (four), or were still waiting for reversal (ten) at the end of the follow-up period. Follow-up not available in one patient.	
Protocol outcomes not reported by the study	Quality of life at Define; Progression of disease at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Tucci 1996[67]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=43)
Countries and setting	Conducted in Italy; Setting: Secondary care - hospital
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective review of cases between January 1975 and December 1994.
Method of assessment of guideline condition	Unclear method of assessment/diagnosis: Mention of operative and pathological reports being used to determine degree of peritoneal contamination.
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Those undergoing urgent or emergency surgery for perforated diverticular disease.
Exclusion criteria	Not reported.
Recruitment/selection of patients	Those undergoing urgent or emergency surgery for perforated diverticular disease between January 1975 and December 1994.
Age, gender and ethnicity	Age - Mean (range): Whole cohort, 62.7 (32-87) years. Not available for the different intervention groups. Gender (M:F): Whole cohort, 24/19. Not available for the different intervention groups. Ethnicity: Not reported.
Further population details	
Extra comments	Those undergoing urgent or emergency surgery for perforated diverticular disease. Acute condition or failure to respond to medical therapy.
Indirectness of population	No indirectness
Interventions	(n=24) Intervention 1: Primary anastomosis. Resection and primary anastomosis with/without stoma. Duration Not reported. Concurrent medication/care: Not reported. Indirectness: No indirectness (n=8) Intervention 2: Temporary stoma. Hartmann's procedure. Duration Not reported. Concurrent medication/care: Not reported. Indirectness: No indirectness
Funding	Funding not stated

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH OR WITHOUT STOMA) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE) Protocol outcome 1: Mortality at Define - Actual outcome: Hospital mortality at In-hospital; Group 1: 3/24, Group 2: 1/8 Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Data not available to compare between the two interventions.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:	
Protocol outcomes not reported by the study	Quality of life at Define; Morbidity at Define; Progression of disease at Define; Complications (infections) at Define; Complications (abscesses) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Need for further surgery at Define; Anastomotic leak at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Tudor 1994-1[68]
Study type	Prospective cohort study
Number of studies (number of participants)	1 (n=300)
Countries and setting	Conducted in United Kingdom; Setting: Thirty UK hospitals - secondary care.
Line of therapy	1st line
Duration of study	Intervention + follow up: 3 year prospective audit, 1985-1988
Method of assessment of guideline condition	Unclear method of assessment/diagnosis: Mentions use of clinical features as well as ultrasonography, confirmation at surgery or radiography for various complications but not clear if diagnosed by the same method in all cases.
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Complicated diverticular disease: defined as acute phlegmon, pericolic abscess, purulent or faecal peritonitis, bowel obstruction, fistula or acute gastrointestinal bleeding.
Exclusion criteria	Not reported.
Recruitment/selection of patients	Consecutive admissions of patients with complicated diverticular disease.
Age, gender and ethnicity	Age - Median (range): Whole cohort, 68 (31-94) years. Not available separately for different interventions for data extracted. Gender (M:F): Whole cohort, 115/185. Not available separately for different interventions for data extracted. Ethnicity: Not reported.
Further population details	
Extra comments	Emergency cases. Extracted and combined data for the following complications: acute phlegmon, peircolic abscess, purulent peritonitis, faecal peritonitis, bowel obstruction and fistula. . Did not extract for acute gastrointestinal bleeding complication as all were treated with primary anastomosis with/without stoma - none treated with Hartmann's/secondary anastomosis.
Indirectness of population	No indirectness
Interventions	(n=73) Intervention 1: Primary anastomosis. Resection with primary anastomosis with or without a stoma. Duration Not reported. Concurrent medication/care: On-table colonic lavage performed in some of these patients. Preoperative percutaneous drainage in certain cases of abscess and purulent peritonitis was performed. Indirectness: No indirectness (n=77) Intervention 2: Temporary stoma, Hartmann's procedure. Duration Not reported. Concurrent medication/care:

	Not reported. Indirectness: No indirectness Comments: Classed as temporary stoma as aim of HP is usually to reverse where possible. Study does not indicate whether temporary or permanent.
Funding	Funding not stated
RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH OR WITHOUT STOMA) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE) Protocol outcome 1: Mortality at Define - Actual outcome: Hospital mortality at Within 30 days of admission; Group 1: 7/73, Group 2: 16/77 Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: No data available to compare between intervention groups.; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:	
Protocol outcomes not reported by the study	Quality of life at Define; Morbidity at Define; Progression of disease at Define; Complications (infections) at Define; Complications (abscesses) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Need for further surgery at Define; Anastomotic leak at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study	Vermeulen 2007[69]
Study type	Retrospective cohort study
Number of studies (number of participants)	1 (n=200)
Countries and setting	Conducted in Netherlands; Setting: Four affiliated teaching hospitals in Rotterdam, The Netherlands.
Line of therapy	1st line
Duration of study	Intervention + follow up: Retrospective review of patients between 1995 and 2005
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: Clinical signs of diffuse peritonitis on septic status with acute abdominal pain, free gas on plain abdominal radiography or specific findings at ultrasonography or computerised tomography.
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Patients undergoing primary anastomosis or Hartmann's procedure between 1995 and 2005 for acute perforated sigmoid diverticulitis.
Exclusion criteria	Not reported.
Recruitment/selection of patients	Consecutive patients undergoing primary anastomosis or Hartmann's procedure between 1995 and 2005 for acute perforated sigmoid diverticulitis.
Age, gender and ethnicity	Age - Mean (SD): Primary anastomosis, 62 (15) years; Hartmann's procedure, 69 (13) years. Gender (M:F): Primary anastomosis, 25/36; Hartmann's procedure, 64/75. . Ethnicity: Not reported.
Further population details	
Extra comments	Acute perforated sigmoid diverticulitis (Hinchey I-IV)
Indirectness of population	No indirectness
Interventions	(n=61) Intervention 1: Primary anastomosis. Colon resections consisted of sigmoid resection, left hemicolectomy or anterior resection. Sixteen patients received a diverting ileostomy alongside primary anastomosis. Duration Not reported. Concurrent medication/care: All patients received preoperative and postoperative broad-spectrum intravenous antibiotics. Preoperative bowel preparation was not used in any patients. Indirectness: No indirectness (n=139) Intervention 2: Temporary stoma. Hartmann's procedure with stoma. Duration Not reported. Concurrent medication/care: All patients received preoperative and postoperative broad-spectrum intravenous antibiotics. Preoperative bowel preparation was not used in any patients. Indirectness: No indirectness Comments: Classed as temporary stoma as aim is usually to reverse stoma where possible, but study does not specify.

Funding	Funding not stated
RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH OR WITHOUT DIVERTING ILEOSTOMY) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE) Protocol outcome 1: Mortality at Define - Actual outcome: Postoperative mortality at 30 days; OR; 0.48 (95%CI 0.21 to 1.25) (P-value: 0.15) ; Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in age, ASA and Hinchey scores, and Mannheim peritonitis index between groups; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing: Protocol outcome 2: Need for further surgery at Define - Actual outcome: Reinterventions (percutaneous drainage, open abdominal wound management or reoperations) at Not reported; OR; 0.42 (95%CI 0.18 to 0.83) (P-value: 0.05) ; Risk of bias: All domain - Very high, Selection - High, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in age, ASA and Hinchey scores, and Mannheim peritonitis index between groups; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing: Protocol outcome 3: Anastomotic leak at Define - Actual outcome: Anastomotic leak at Not reported; Group 1: 3/61, Group 2: 0/139 Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in age, ASA and Hinchey scores, and Mannheim peritonitis index between groups; Key confounders: Age, gender; Group 1 Number missing: ; Group 2 Number missing:	
Protocol outcomes not reported by the study	Quality of life at Define; Morbidity at Define; Progression of disease at Define; Complications (infections) at Define; Complications (abscesses) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Study (subsidiary papers)	**Vermeulen 2010[70] (Vermeulen 2011[71])**
Study type	Retrospective cohort study

Number of studies (number of participants)	1 (n=340)
Countries and setting	Conducted in Netherlands; Setting: Patients following surgery - likely to be outpatients?
Line of therapy	Unclear
Duration of study	Follow up (post intervention):
Method of assessment of guideline condition	Adequate method of assessment/diagnosis: Surgery performed in all so would have been confirmed surgically. Radiography and CT scans used, as well as clinical signs.
Stratum	Overall
Subgroup analysis within study	Not applicable
Inclusion criteria	Patients undergoing emergency surgery for perforated diverticulitis between January 1990 and December 2005 at five surgical departments.
Exclusion criteria	Not reported.
Recruitment/selection of patients	Patients undergoing emergency surgery for perforated diverticulitis between January 1990 and December 2005 at five surgical departments.
Age, gender and ethnicity	Age - Other: Median only. Hartmann's procedure, 62; Primary anastomosis, 59. Gender (M:F): Hartmann's procedure, 40/36; Primary anastomosis, 21/32. Ethnicity: Not reported.
Further population details	
Extra comments	In population with diverticulitis complicated by perforation - includes Hinchey grades I, II, III and IV. None of the operations were laparoscopic. . ASA grades: Grade I, 25% in Hartmann's and 41% in primary anastomosis; Grade II, 28% in Hartmann's and 34% in primary anastomosis; Grade III, 33% in Hartmann's and 17% in primary anastomosis; Grade IV, 14% in Hartmann's and 8% in primary anastomosis. Hinchey staging: Hinchey I, 24% in Hartmann's and 23% in primary anastomosis; Hinchey II, 12% in Hartmann's and 43%

	in primary anastomosis; Hinchey III, 52% in Hartmann's and 26% in primary anastomosis; Hinchey IV, 12% in Hartmann's and 8% in primary anastomosis. MPI <26/MPI = 26: Hartmann's procedure, 93/7 %; Primary anastomosis, 86/14 %.
Indirectness of population	No indirectness
Interventions	(n=93) Intervention 1: Primary anastomosis. Type of surgery left to discretion of surgeon on call. No further details given for primary anastomosis intervention. May have involved loop ileostomy in some or all of those that received primary anastomosis. Duration Not reported. Concurrent medication/care: Not reported. Indirectness: No indirectness (n=238) Intervention 2: Temporary stoma. Hartmann's procedure. Reversed in some but not all so termed temporary stoma. No further details provided concerning the procedure. Duration Not reported. Concurrent medication/care: Not reported. Indirectness: No indirectness
Funding	Funding not stated

RESULTS (NUMBERS ANALYSED) AND RISK OF BIAS FOR COMPARISON: PRIMARY ANASTOMOSIS (WITH/WITHOUT LOOP ILEOSTOMY) versus TEMPORARY STOMA (HARTMANN'S PROCEDURE)

Protocol outcome 1: Quality of life at Define
- Actual outcome: EQ-VAS at Questionnaire performed at median of 71 months post-operation (range, 23-205 months); Group 1:,mean score 74 (range, 10-100, n=53), Group 2 : mean score 65 (range, 20-100, n=76)
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Very high, Outcome reporting - High, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in male/female ratio, Hinchey and ASA grading. Higher proportion in PA group received surgery from specialist colorectal surgeon compared to HP group.; Blinding details: Subjective assessed by those undergoing the operation.; Group 1 Number missing: 40, Reason: Lost to follow-up (moving abroad, home address not available), did not respond to questionnaire, died prior to questionnaire being sent.; Group 2 Number missing: 162, Reason: Lost to follow-up (moving abroad, home address not available), did not respond to questionnaire, died prior to questionnaire being sent.
- Actual outcome: EQ-5D index at Questionnaire performed at median of 71 months post-operation (range, 23-205 months); Group 1: mean score 77 (range, 67-93, n=53), Group 2: mean score 67 (range, -18-100, n=76)
Risk of bias: All domain - Very high, Selection - Very high, Blinding - High, Incomplete outcome data - Very high, Outcome reporting - High, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in male/female ratio, Hinchey and ASA grading. Higher proportion in PA group received surgery from specialist colorectal surgeon compared to HP group.; Blinding details: Subjective measurement.; Group 1 Number missing: 40, Reason: Lost to follow-up (moving abroad, home address not available), did not respond to questionnaire, died prior to questionnaire being sent.; Group 2 Number

missing: 162, Reason: Lost to follow-up (moving abroad, home address not available), did not respond to questionnaire, died prior to questionnaire being sent. Protocol outcome 2: Mortality at Define - Actual outcome: Perioperative mortality (initial hospital stay) at in-hospital; Group 1: 13/93, Group 2: 75/238 Risk of bias: All domain - Very high, Selection - Very high, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in male/female ratio, Hinchey and ASA grading. Higher proportion in PA group received surgery from specialist colorectal surgeon compared to HP group. ; Group 1 Number missing: 0; Group 2 Number missing: 0 - Actual outcome: Post-operative mortality (follow-up) at Median follow-up 59 months (range, 1-210); Group 1: 31/93, Group 2: 143/238 Risk of bias: All domain - Very high, Selection - Very high, Blinding - Low, Incomplete outcome data - Low, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in male/female ratio, Hinchey and ASA grading. Higher proportion in PA group received surgery from specialist colorectal surgeon compared to HP group. ; Group 1 Number missing: 0; Group 2 Number missing: 0 - Actual outcome: Long term survival after surviving initial emergency surgery for perforated diverticulitis at Median follow-up 59 months (range, 1-210 months); Group 1: n=80 ; Group 2: n=163; HR 0.54; Lower CI 0.3 to Upper CI 1.04; Test statistic: Test statistic from Cox, 0.07.; Advantage to research or control? Advantage to research; Follow up details: Median follow-up 59 months (range, 1-210 months); Comments: Adjusted HR from Cox multivariate analysis including age, ASA classification and Hinchey score. Risk of bias: All domain - Very high, Selection - High, Blinding - Low, Incomplete outcome data - High, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in male/female ratio, Hinchey and ASA grading. Higher proportion in PA group received surgery from specialist colorectal surgeon compared to HP group. Adjusted for age, Hinchey and ASA grading for this outcome.; Group 1 Number missing: 13, Reason: Did not survive perioperative period - survival only analysed for those that survived this initial operation period.; Group 2 Number missing: 75, Reason: Did not survive perioperative period - survival only analysed for those that survived this initial operation period. Protocol outcome 3: Need for further surgery at Define - Actual outcome: Reintervention (percutaneous drainage, abdominal wound management or reoperation) at Median follow-up of 69-71 months post-operation.; Group 1: 7/53, Group 2: 14/76 Risk of bias: All domain - Very high, Selection - Very high, Blinding - Low, Incomplete outcome data - Very high, Outcome reporting - Low, Measurement - Low, Crossover - Low, Subgroups - Low, Other 1 - Low; Indirectness of outcome: No indirectness ; Baseline details: Differences in male/female ratio, Hinchey and ASA grading. Higher proportion in PA group received surgery from specialist colorectal surgeon compared to HP group.; Group 1 Number missing: 40, Reason: Lost to follow-up (moving abroad, home address not available), did not respond to questionnaire, died prior to questionnaire being sent.; Group 2 Number missing: 162, Reason: Lost to follow-up (moving abroad, home address not available), did not respond to questionnaire, died prior to questionnaire being sent.	
Protocol outcomes not reported by the study	Morbidity at Define; Progression of disease at Define; Complications (infections) at Define; Complications (abscesses) at Define; Complications (perforation) at Define; Complications (fistula) at Define; Complications (stricture) at Define; Recurrence rates of acute diverticulitis at Define; Hospitalisation at Define; Anastomotic leak at Define; Stoma complications at Define; Symptom control/recurrence (e.g. pain relief, bowel habit) at Define

Appendix E: Forest plots

E.1 RCTs: Primary anastomosis vs. temporary stoma

Figure 2: Anastomotic leak (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Peto Odds Ratio Peto, Fixed, 95% CI
Binda 2012	1	34	1	56	38.4%	1.69 [0.10, 29.98]
DIVERTI trial: Bridoux 2017	2	50	0	52	40.9%	7.85 [0.48, 127.30]
Oberkofler 2012	1	32	0	30	20.6%	6.94 [0.14, 350.54]
Total (95% CI)		**116**		**138**	**100.0%**	**4.24 [0.71, 25.21]**
Total events	4		1			

Heterogeneity: Chi² = 0.64, df = 2 (P = 0.73); I² = 0%
Test for overall effect: Z = 1.59 (P = 0.11)

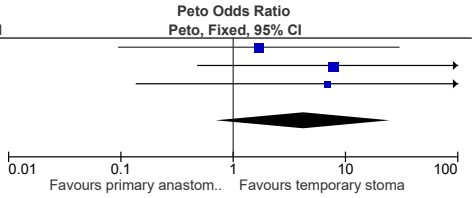


Figure 3: Anastomotic leak (second operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Binda 2012	1	22	2	34	44.7%	0.77 [0.07, 8.02]
DIVERTI trial: Bridoux 2017	1	32	0	33	26.1%	3.09 [0.13, 73.19]
Oberkofler 2012	0	26	2	15	29.2%	0.12 [0.01, 2.32]
Total (95% CI)		**80**		**82**	**100.0%**	**0.64 [0.12, 3.45]**
Total events	2		4			

Heterogeneity: Tau² = 0.23; Chi² = 2.22, df = 2 (P = 0.33); I² = 10%
Test for overall effect: Z = 0.52 (P = 0.60)

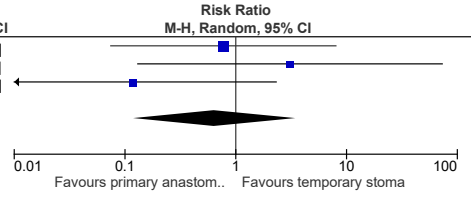


Figure 4: Complications - deep incisional surgical site infections (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Binda 2012	6	34	9	56		1.10 [0.43, 2.81]

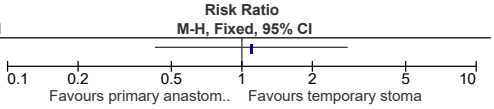


Figure 5: Complications - deep incisional surgical site infections (second operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Peto Odds Ratio Peto, Fixed, 95% CI
Binda 2012	0	22	3	34		0.18 [0.02, 1.92]

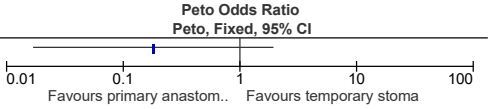


Figure 6: Complications – organ space site infections (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Peto Odds Ratio Peto, Fixed, 95% CI
Binda 2012	0	34	6	56		0.18 [0.03, 1.00]

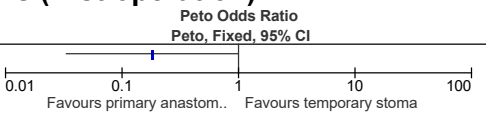


Figure 7: Complications – organ space site infections (second operation)

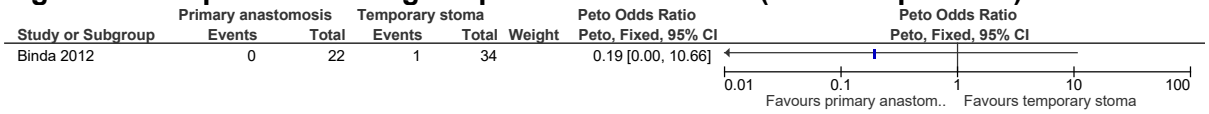


Figure 8: Complications – superficial incisional surgical site infections (first operation)

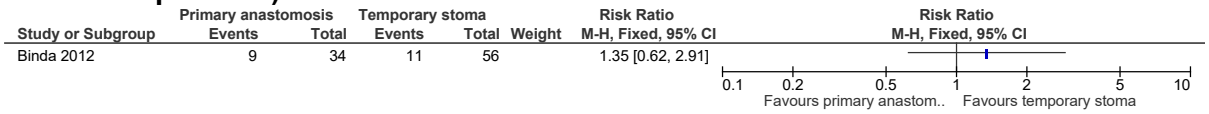


Figure 9: Complications – superficial incisional surgical site infections (second operation)

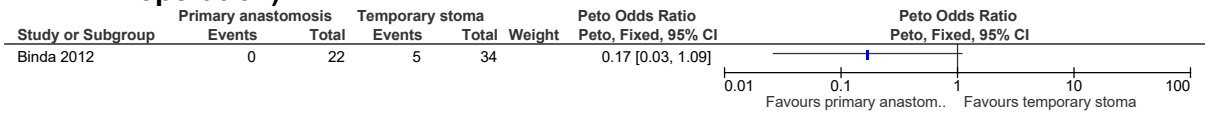


Figure 10: Complications - urinary tract infections (first operation)

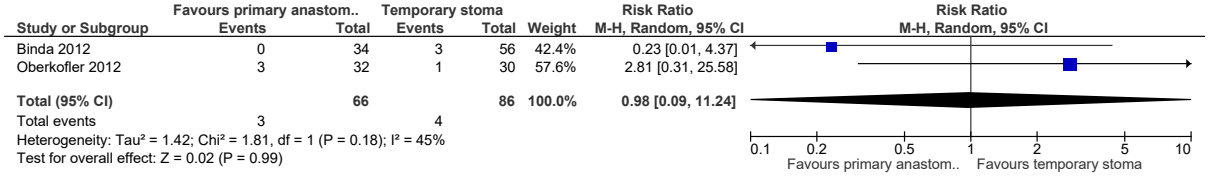


Figure 11: Complications - urinary tract infections (second operation)

Figure 12: Overall morbidity (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Binda 2012	12	34	26	56	30.6%	0.76 [0.45, 1.30]
DIVERTI trial: Bridoux 2017	27	50	22	52	36.5%	1.28 [0.85, 1.92]
Oberkofler 2012	24	32	12	30	33.0%	1.88 [1.16, 3.04]
Total (95% CI)		**116**		**138**	**100.0%**	**1.24 [0.77, 1.99]**
Total events	63		60			

Heterogeneity: Tau² = 0.12; Chi² = 6.09, df = 2 (P = 0.05); I² = 67%
Test for overall effect: Z = 0.87 (P = 0.38)

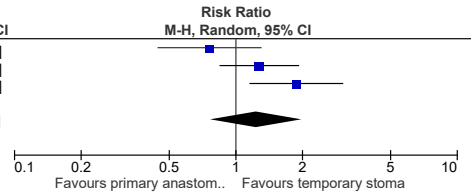


Figure 13: Overall morbidity (second operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Binda 2012	1	22	12	34	57.8%	0.13 [0.02, 0.92]
DIVERTI trial: Bridoux 2017	4	32	7	33	42.2%	0.59 [0.19, 1.82]
Total (95% CI)		**54**		**67**	**100.0%**	**0.32 [0.12, 0.85]**
Total events	5		19			

Heterogeneity: Chi² = 1.93, df = 1 (P = 0.16); I² = 48%
Test for overall effect: Z = 2.30 (P = 0.02)

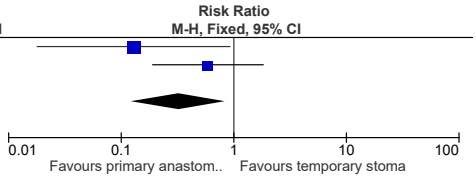


Figure 14: Mortality (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Binda 2012	1	34	6	56	42.7%	0.27 [0.03, 2.18]
DIVERTI trial: Bridoux 2017	2	50	2	52	18.5%	1.04 [0.15, 7.10]
Oberkofler 2012	3	32	4	30	38.9%	0.70 [0.17, 2.88]
Total (95% CI)		**116**		**138**	**100.0%**	**0.58 [0.22, 1.55]**
Total events	6		12			

Heterogeneity: Chi² = 0.92, df = 2 (P = 0.63); I² = 0%
Test for overall effect: Z = 1.08 (P = 0.28)

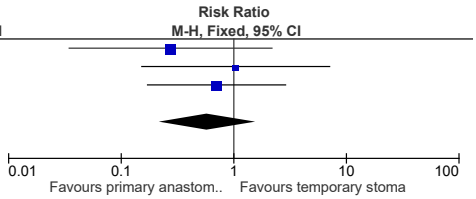


Figure 15: Mortality (second operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Difference M-H, Fixed, 95% CI
Binda 2012	0	22	0	34	34.1%	0.00 [-0.07, 0.07]
DIVERTI trial: Bridoux 2017	0	32	2	33	41.5%	-0.06 [-0.16, 0.04]
Oberkofler 2012	0	26	0	15	24.3%	0.00 [-0.10, 0.10]
Total (95% CI)		**80**		**82**	**100.0%**	**-0.03 [-0.08, 0.03]**
Total events	0		2			

Heterogeneity: Chi² = 1.24, df = 2 (P = 0.54); I² = 0%
Test for overall effect: Z = 0.90 (P = 0.37)

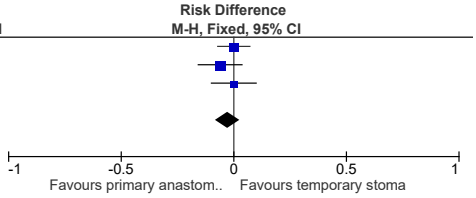


Figure 16: Complications – Intra-abdominal abscess (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
DIVERTI trial: Bridoux 2017	2	50	4	52		0.52 [0.10, 2.71]

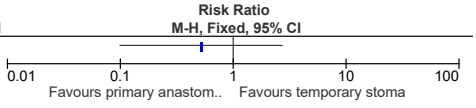


Figure 17: Complications – Intra-abdominal abscess (second operation)

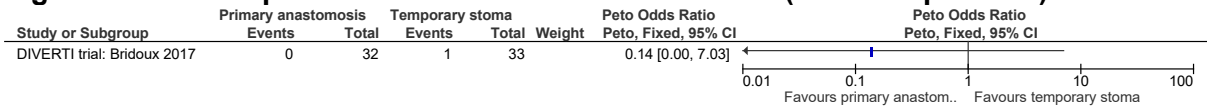


Figure 18: Complications – anastomotic stricture (first operation)

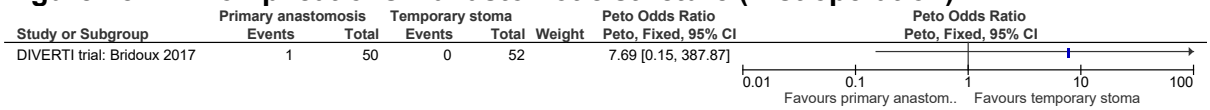


Figure 19: Need for further surgery – reoperation (first operation)

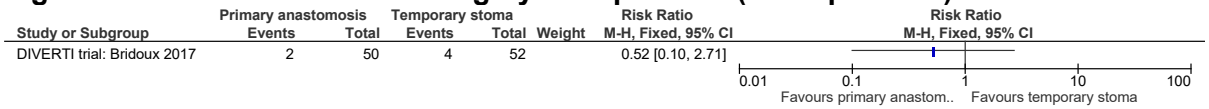


Figure 20: Need for further surgery – reoperation (first operation)

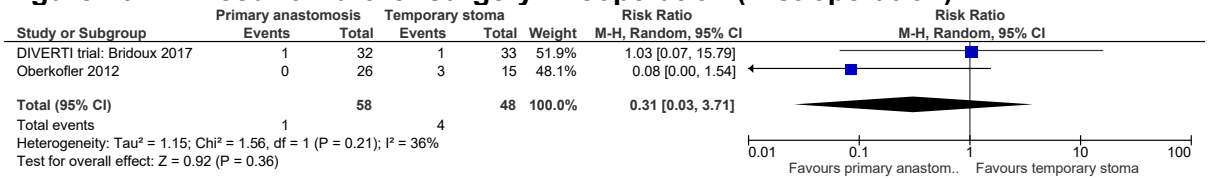


Figure 21: All complications – Clavien Dindo I-V (first operation)

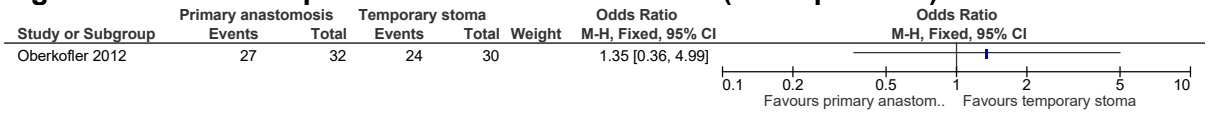


Figure 22: All complications – Clavien Dindo I-V (second operation)

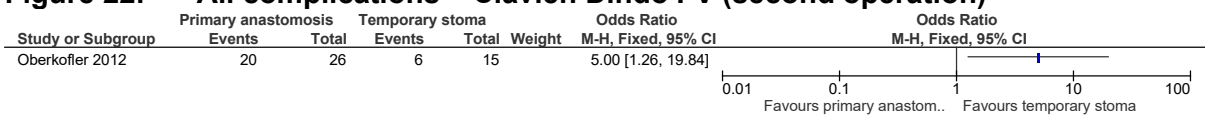


Figure 23: Intra-abdominal infection (first operation)

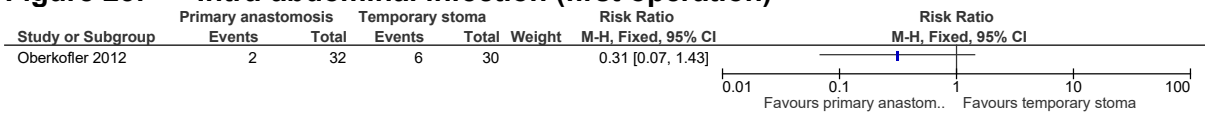


Figure 24: Intra-abdominal infection (second operation)

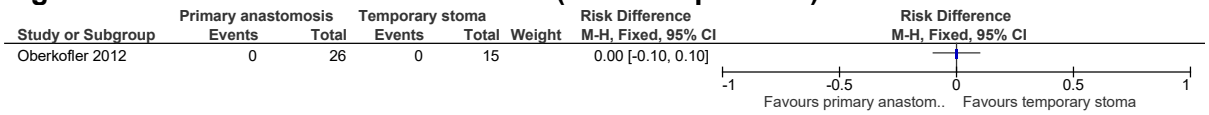


Figure 25: Wound infection (first operation)

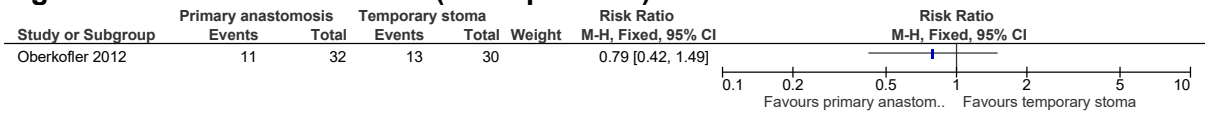


Figure 26: Wound infection (second operation)

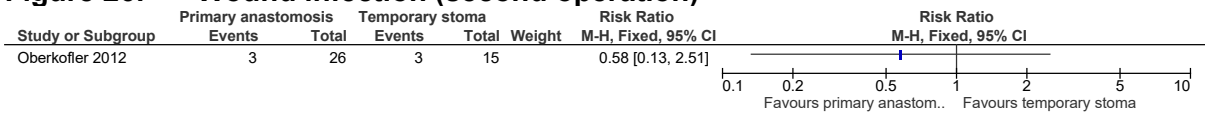
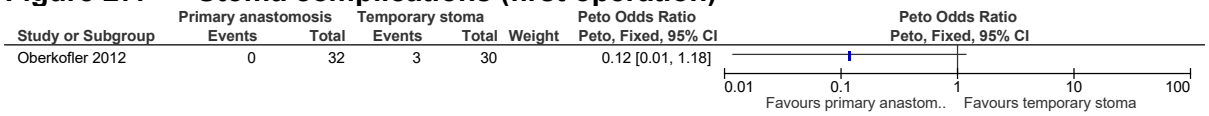


Figure 27: Stoma complications (first operation)



E.2 Observational studies: Primary anastomosis vs. temporary stoma

Figure 28: Anastomotic leak (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Peto Odds Ratio Peto, Fixed, 95% CI
Blair 2002	1	33	0	64	4.7%	18.90 [0.30, 1183.55]
Gooszen 2001	3	32	0	28	15.0%	6.96 [0.69, 70.00]
Herzog 2011	1	21	0	19	5.2%	6.72 [0.13, 340.22]
Mueller 2011	10	47	0	26	41.7%	5.90 [1.48, 23.54]
Richter 2006	1	36	0	5	2.2%	3.12 [0.01, 1246.95]
Stumpf 2007	1	36	0	30	5.2%	6.25 [0.12, 320.40]
Trenti 2011	3	27	0	60	13.0%	27.08 [2.28, 321.77]
Vermeulen 2007	3	61	0	139	13.1%	27.44 [2.32, 324.48]
Total (95% CI)		**293**		**371**	**100.0%**	**9.48 [3.88, 23.17]**
Total events	23		0			

Heterogeneity: Chi² = 2.23, df = 7 (P = 0.95); I² = 0%
Test for overall effect: Z = 4.93 (P < 0.00001)

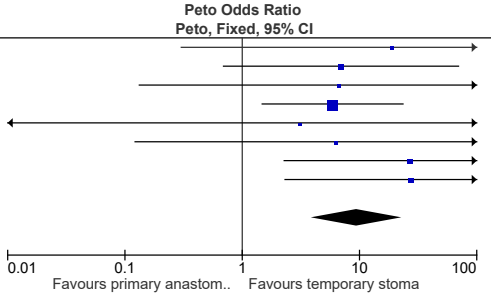


Figure 29: Anastomotic leak (second operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Difference M-H, Fixed, 95% CI
Gooszen 2001	0	27	3	22	47.7%	-0.14 [-0.29, 0.02]
Hold 1990	1	15	4	42	43.5%	-0.03 [-0.18, 0.13]
Trenti 2011	0	3	0	9	8.8%	0.00 [-0.35, 0.35]
Total (95% CI)		**45**		**73**	**100.0%**	**-0.08 [-0.19, 0.03]**
Total events	1		7			

Heterogeneity: Chi² = 1.13, df = 2 (P = 0.57); I² = 0%
Test for overall effect: Z = 1.39 (P = 0.17)

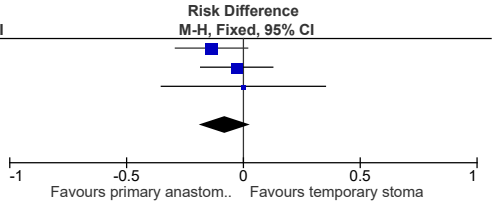


Figure 30: Anastomotic leak/rectal stump leak (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Pasternak 2010	13	46	2	65		9.18 [2.18, 38.77]

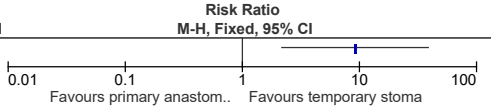


Figure 31: Abscess (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Gooszen 2001	3	32	4	28	26.0%	0.66 [0.16, 2.68]
Herzog 2011	0	21	1	19	9.5%	0.30 [0.01, 7.02]
Medina 1991	1	3	0	3	10.8%	3.00 [0.17, 53.71]
Pasternak 2010	7	46	5	65	31.7%	1.98 [0.67, 5.85]
Stumpf 2007	0	36	4	30	10.8%	0.09 [0.01, 1.66]
Trenti 2011	0	27	8	60	11.2%	0.13 [0.01, 2.14]
Total (95% CI)		**165**		**205**	**100.0%**	**0.69 [0.23, 2.03]**
Total events	11		22			

Heterogeneity: Tau² = 0.66; Chi² = 8.17, df = 5 (P = 0.15); I² = 39%
Test for overall effect: Z = 0.68 (P = 0.50)

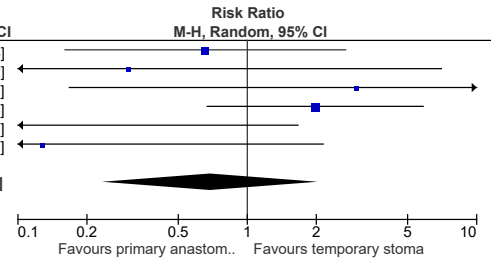


Figure 32: Abscess (second operation)

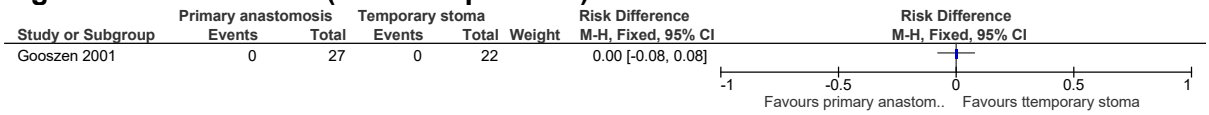


Figure 33: Abscess/peritonitis (first operation)

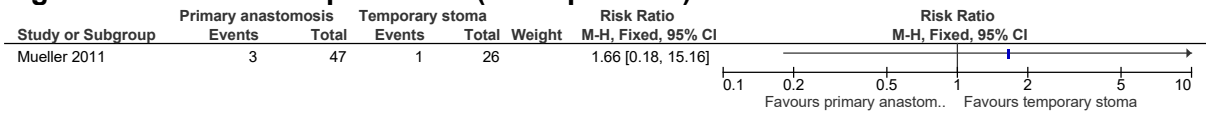


Figure 34: Fistula (first operation)

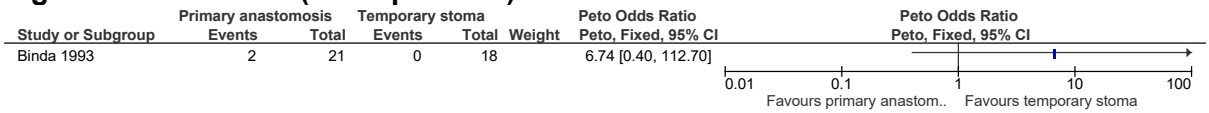


Figure 35: Septic shock (first operation)

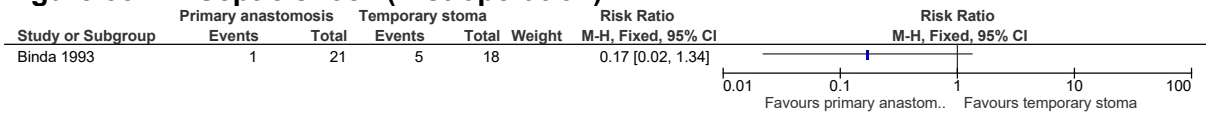


Figure 36: Wound sepsis (first operation)

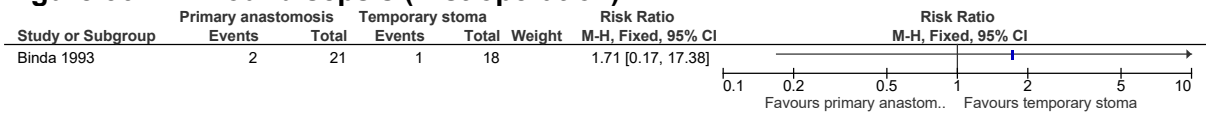


Figure 37: Intra-abdominal infection (first operation)

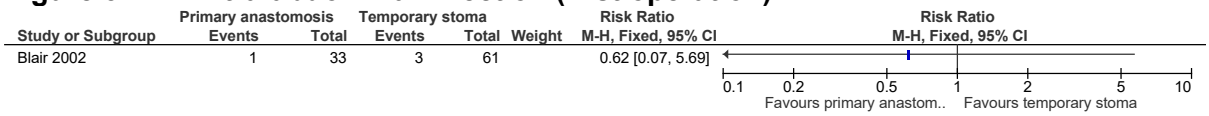


Figure 38: Wound infection (first operation)

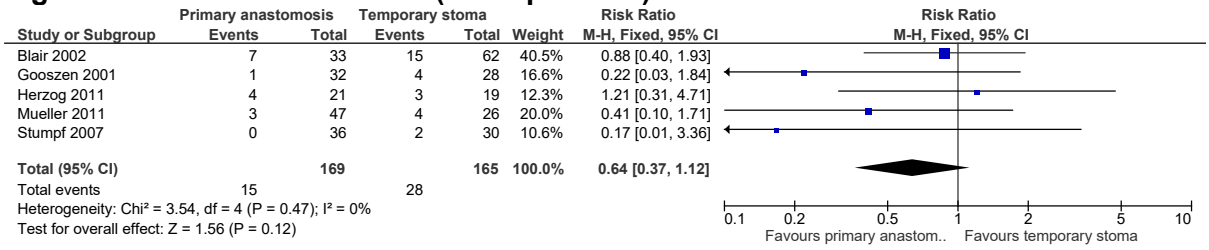


Figure 39: Wound infection (second operation)

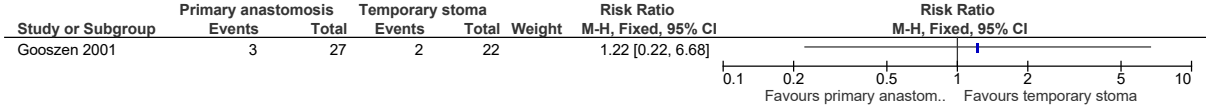


Figure 40: Postoperative complications – infection (first operation)

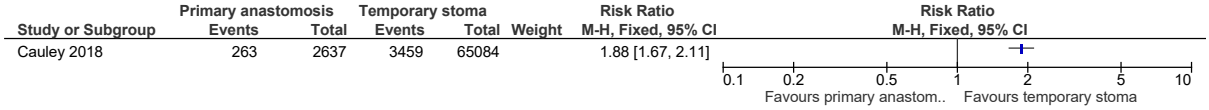


Figure 41: Sepsis (first operation)

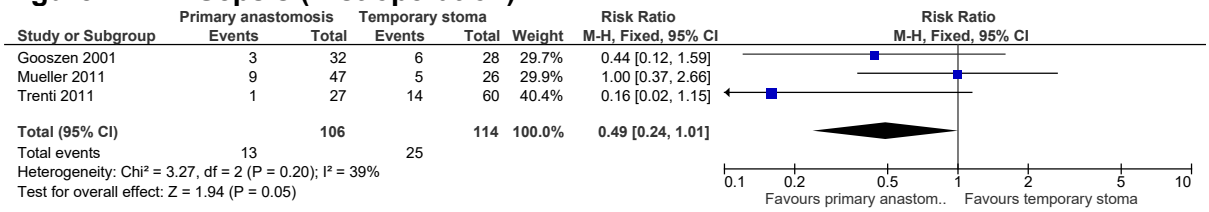


Figure 42: Sepsis (second operation)

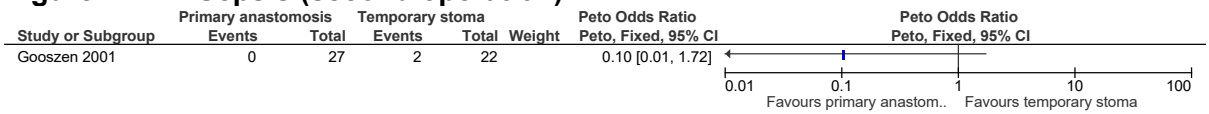


Figure 43: Urinary infection (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Gooszen 2001	1	32	4	28	57.5%	0.22 [0.03, 1.84]
Herzog 2011	2	21	3	19	42.5%	0.60 [0.11, 3.23]
Total (95% CI)		**53**		**47**	**100.0%**	**0.38 [0.11, 1.39]**
Total events	3		7			

Heterogeneity: Chi² = 0.55, df = 1 (P = 0.46); I² = 0%
Test for overall effect: Z = 1.46 (P = 0.14)

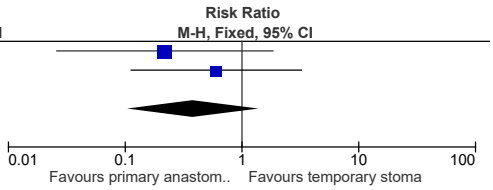


Figure 44: Urinary infection (second operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Difference M-H, Fixed, 95% CI
Gooszen 2001	0	27	0	22		0.00 [-0.08, 0.08]

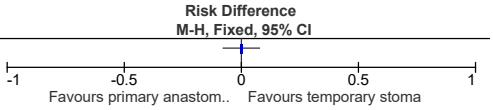


Figure 45: Emergency readmission (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Blair 2002	5	33	9	64		1.08 [0.39, 2.96]

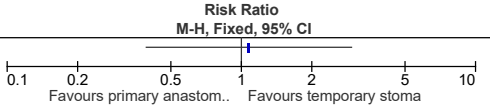


Figure 46: Hospital readmission (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Peto Odds Ratio Peto, Fixed, 95% CI
Blair 2002	0	33	5	64		0.21 [0.03, 1.36]

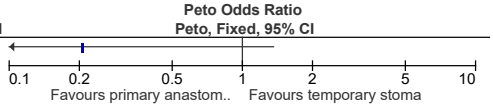


Figure 47: Overall surgical morbidity (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Binda 1993	6	21	8	18	44.0%	0.64 [0.27, 1.51]
Pasternak 2010	17	46	15	65	56.0%	1.60 [0.89, 2.87]
Total (95% CI)		**67**		**83**	**100.0%**	**1.07 [0.44, 2.61]**
Total events	23		23			

Heterogeneity: Tau² = 0.28; Chi² = 3.01, df = 1 (P = 0.08); I² = 67%
Test for overall effect: Z = 0.15 (P = 0.88)

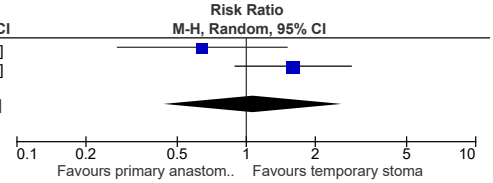


Figure 48: Overall morbidity (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Cauley 2018	847	2637	15145	65084	34.9%	1.38 [1.30, 1.46]
Hold 1990	22	99	16	76	18.3%	1.06 [0.60, 1.87]
Pasternak 2010	20	46	33	65	23.9%	0.86 [0.57, 1.29]
Stumpf 2007	5	36	10	30	9.7%	0.42 [0.16, 1.09]
Thaler 2000	7	20	13	62	13.1%	1.67 [0.77, 3.60]
Total (95% CI)		**2838**		**65317**	**100.0%**	**1.07 [0.75, 1.52]**
Total events	901		15217			

Heterogeneity: Tau² = 0.09; Chi² = 12.11, df = 4 (P = 0.02); I² = 67%
Test for overall effect: Z = 0.38 (P = 0.71)

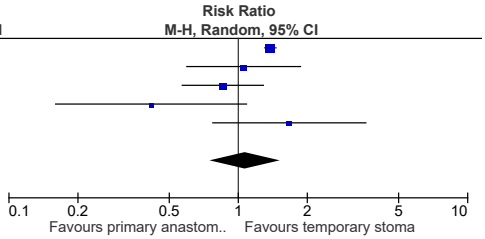


Figure 49: Intraoperative morbidity (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Pasternak 2010	8	46	7	65		1.61 [0.63, 4.14]

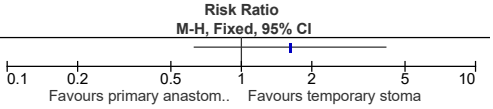


Figure 50: Postoperative medical morbidity (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Pasternak 2010	7	46	24	65	69.5%	0.41 [0.19, 0.87]
Stumpf 2007	5	36	8	30	30.5%	0.52 [0.19, 1.43]
Total (95% CI)		**82**		**95**	**100.0%**	**0.45 [0.24, 0.81]**
Total events	12		32			

Heterogeneity: Chi² = 0.13, df = 1 (P = 0.71); I² = 0%
Test for overall effect: Z = 2.63 (P = 0.009)

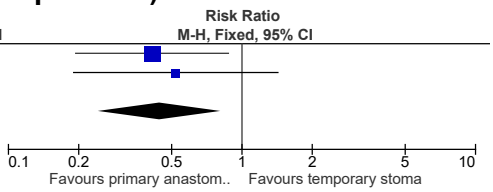


Figure 51: Postoperative major morbidity (first and second operations combined)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Schilling 2001	1	13	5	42		0.65 [0.08, 5.04]

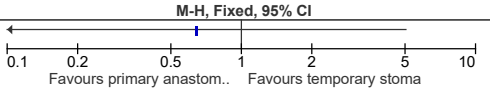


Figure 52: Postoperative minor morbidity (first and second operations combined)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Schilling 2001	5	13	9	42		1.79 [0.73, 4.41]

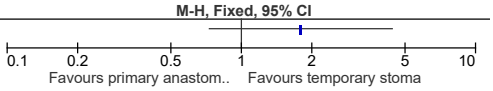


Figure 53: Major general complications (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Herzog 2011	1	21	8	19		0.11 [0.02, 0.82]

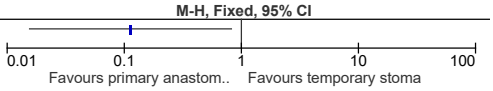


Figure 54: Minor general complications (first operation)

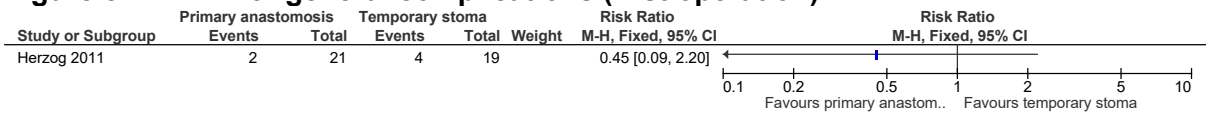


Figure 55: Major surgical complications (first operation)

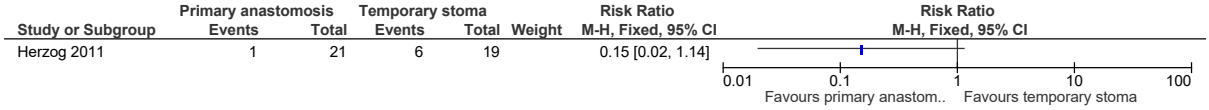


Figure 56: Major postoperative complications (first operation)

Figure 57: Perioperative mortality (first operation)

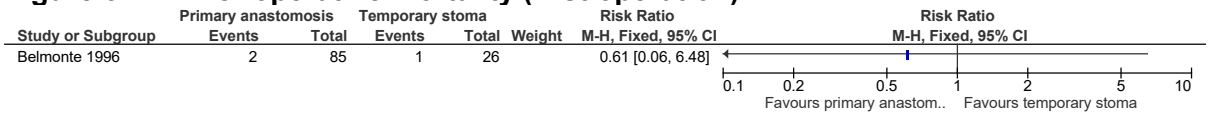


Figure 58: 30-day surgical mortality (first operation)

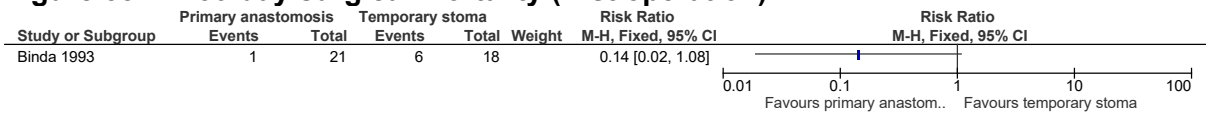


Figure 59: Mortality

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Blair 2002	3	33	13	64	17.0%	0.45 [0.14, 1.46]
Gregg 1987	0	55	2	23	6.7%	0.09 [0.00, 1.72]
Hold 1990	4	99	9	76	19.5%	0.34 [0.11, 1.07]
Kriwanek 1994	4	26	5	33	8.5%	1.02 [0.30, 3.41]
Medina 1991	0	3	1	3	2.9%	0.33 [0.02, 5.97]
Netri 2000	1	31	1	6	3.2%	0.19 [0.01, 2.69]
Richter 2006	4	36	3	5	10.1%	0.19 [0.06, 0.60]
Stumpf 2007	0	36	5	30	11.5%	0.08 [0.00, 1.32]
Thaler 2000	4	20	22	62	20.6%	0.56 [0.22, 1.44]
Total (95% CI)		**339**		**302**	**100.0%**	**0.39 [0.25, 0.63]**
Total events	20		61			

Heterogeneity: Chi² = 7.18, df = 8 (P = 0.52); I² = 0%
Test for overall effect: Z = 3.94 (P < 0.0001)

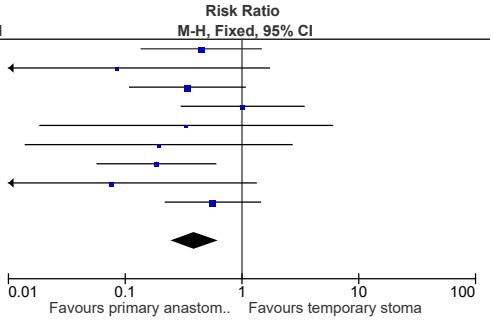


Figure 60: In-hospital mortality (first operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Random, 95% CI
Cauley 2018	422	2637	4164	65084	15.6%	2.50 [2.28, 2.74]
Gooszen 2001	5	32	6	28	12.9%	0.73 [0.25, 2.13]
Herzog 2011	1	21	6	19	8.9%	0.15 [0.02, 1.14]
Mueller 2011	2	47	7	26	11.1%	0.16 [0.04, 0.71]
Pasternak 2010	8	46	19	65	14.2%	0.59 [0.29, 1.24]
Tucci 1996	3	24	1	8	8.5%	1.00 [0.12, 8.31]
Tudor 1994	7	73	16	77	13.9%	0.46 [0.20, 1.06]
Vermeulen 2010 and 2011	13	93	75	238	14.9%	0.44 [0.26, 0.76]
Total (95% CI)		**2973**		**65545**	**100.0%**	**0.56 [0.23, 1.41]**
Total events	461		4294			

Heterogeneity: Tau² = 1.40; Chi² = 94.80, df = 7 (P < 0.00001); I² = 93%
Test for overall effect: Z = 1.22 (P = 0.22)

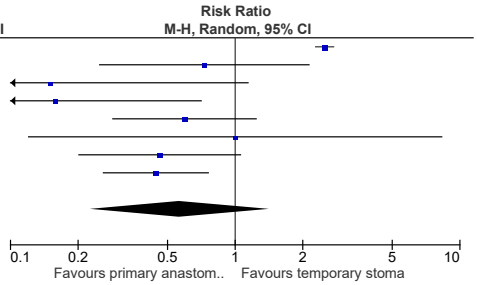


Figure 61: In-hospital mortality (second operation)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Peto Odds Ratio Peto, Fixed, 95% CI
Gooszen 2001	0	27	1	22		0.11 [0.00, 5.55]

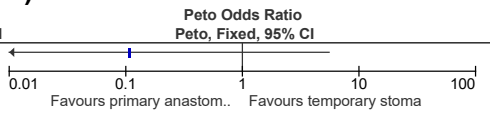


Figure 62: Mortality (median follow-up 59 months)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Vermeulen 2010 and 2011	31	93	143	238		0.55 [0.41, 0.75]

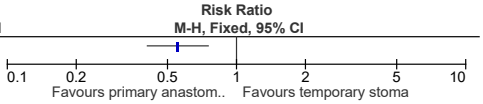


Figure 63: Postoperative mortality (first and second operations combined)

Study or Subgroup	Primary anastomosis Events	Total	Temporary stoma Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Schilling 2001	1	13	4	42		0.81 [0.10, 6.60]

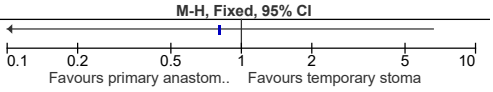


Figure 64: Reintervention (first operation)

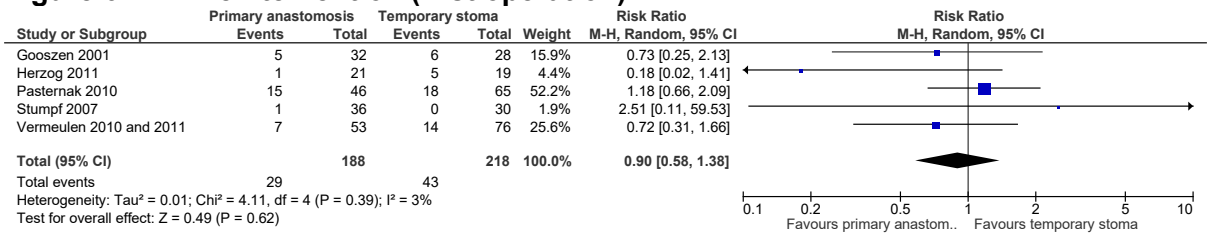


Figure 65: Reintervention (second operation)

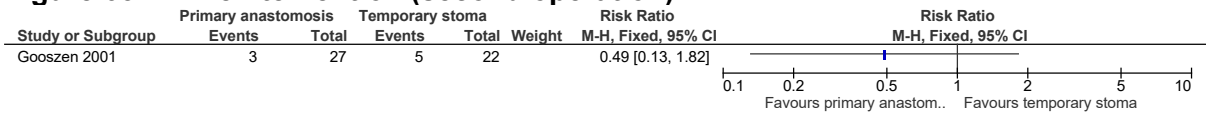


Figure 66: Stoma dysfunction (first operation)

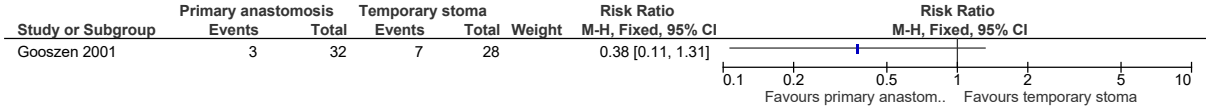


Figure 67: Colostomy/stump insufficiency (first operation)

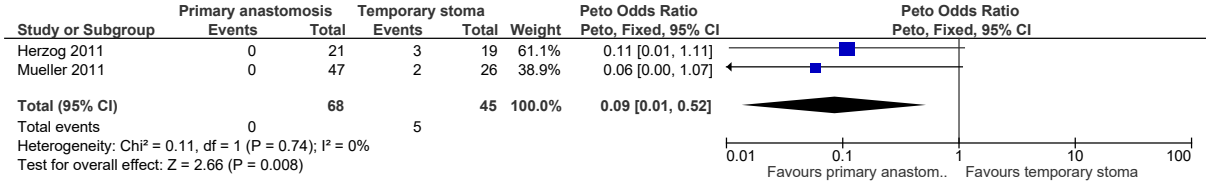


Figure 68: Stoma necrosis (first operation)

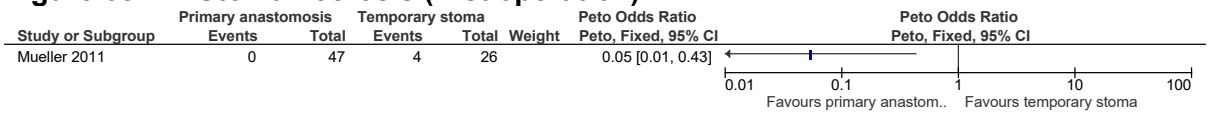


Figure 69: Stoma morbidity (first operation)

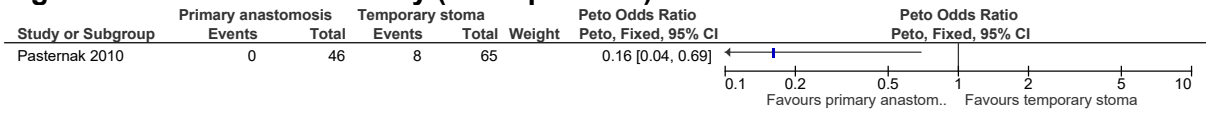


Figure 70: Stoma complications (first and second operations combined)

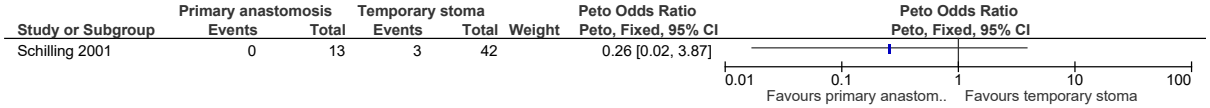


Figure 71: 30-day organ space infection (first operation)

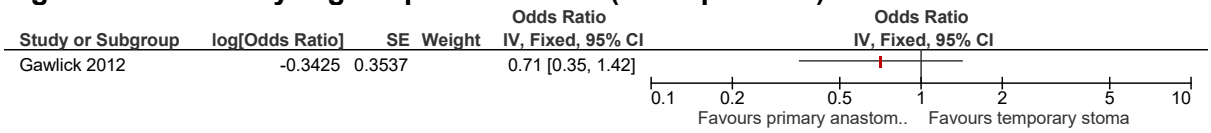


Figure 72: 30-day postoperative sepsis (first operation)

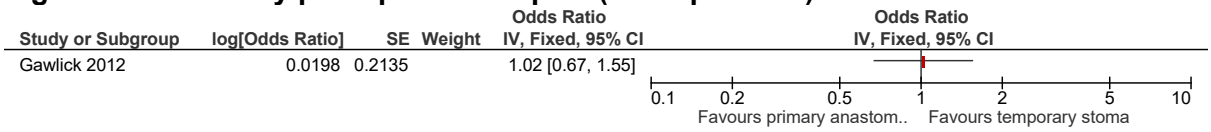


Figure 73: Wound infection (first operation)

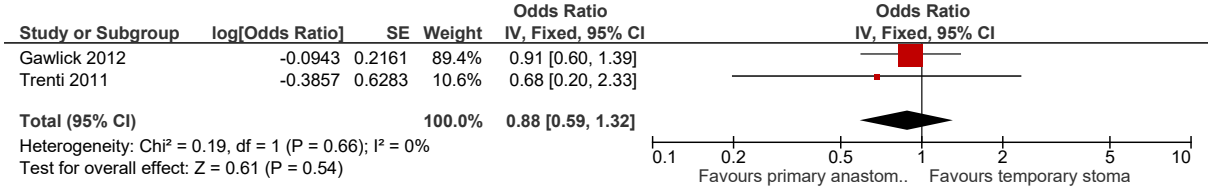


Figure 74: Postoperative morbidity (first operation)

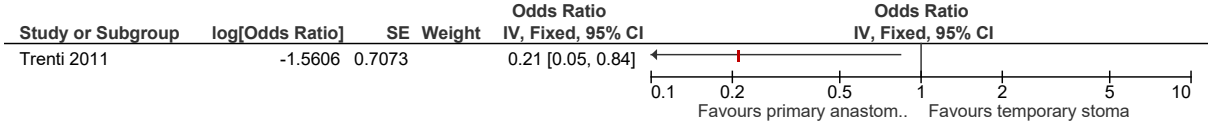


Figure 75: Postoperative mortality (first operation)

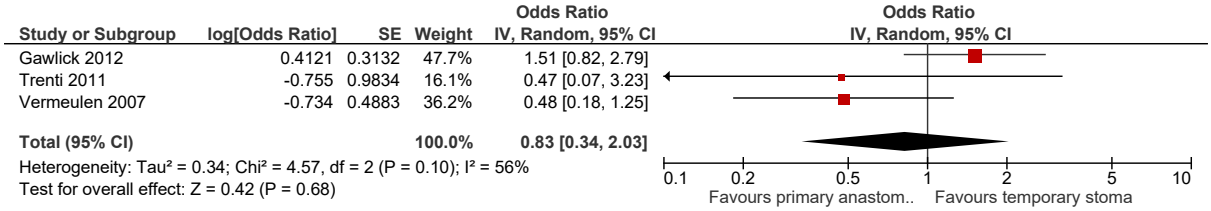


Figure 76: Reoperation (first operation)

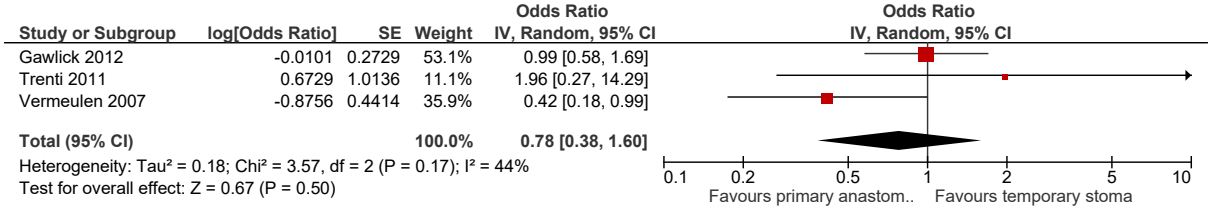
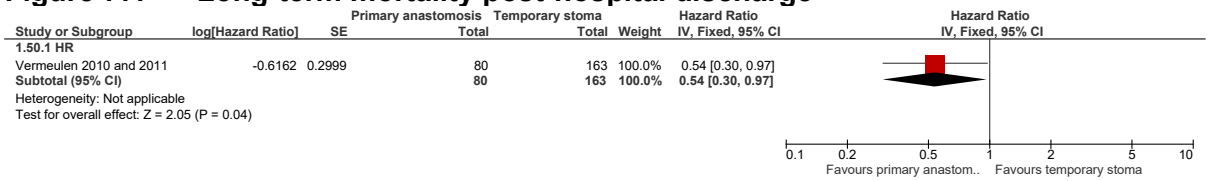


Figure 77: Long-term mortality post-hospital discharge



Appendix F: GRADE tables

Table 19: Clinical evidence profile: Primary anastomosis vs. temporary stoma - RCTs

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Primary anastomosis	temporary stoma	Relative (95% CI)	Absolute		
Anastomotic leak (first operation)												
3	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	4/116 (3.4%)	1/138 (0.72%)	OR 4.24 (0.71 to 25.21)	27 more per 1000 (from 8 fewer to 63 more)[3]	⊕OOO VERY LOW	CRITICAL
Anastomotic leak (second operation)												
3	randomised trials	very serious[1]	serious[4]	no serious indirectness	very serious[2]	none	2/80 (2.5%)	4/82 (4.9%)	RR 0.6 (0.16 to 2.24)	24 fewer per 1000 (from 82 fewer to 34 more)[3]	⊕OOO VERY LOW	CRITICAL
Complications - deep incisional surgical site infections (first operation)												
1	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	6/34 (17.6%)	16.1%	RR 1.1 (0.43 to 2.81)	16 more per 1000 (from 92 fewer to 291 more)	⊕OOO VERY LOW	CRITICAL
Complications - deep incisional surgical site infections (second operation)												
1	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	0/22 (0%)	8.8%	OR 0.18 (0.02 to 1.92)	88 fewer per 1000 (from 204 fewer to 28 more)[3]	⊕OOO VERY LOW	CRITICAL
Complications - organ space site infections (first operation)												

1	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	0/34 (0%)	10.7%	OR 0.18 (0.03 to 1)	107 fewer per 1000 (from 199 more to 16 more)[3]	⊕OOO VERY LOW	CRITICAL
Complications - organ space site infections (second operation)												
1	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	0/22 (0%)	2.9%	OR 0.19 (0 to 10.66)	29 fewer per 1000 (from 119 fewer to 60 more)[3]	⊕OOO VERY LOW	CRITICAL
Complications - superficial incisional surgical site infections (first operation)												
1	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	9/34 (26.5%)	19.6%	RR 1.35 (0.62 to 2.91)	69 more per 1000 (from 74 fewer to 374 more)	⊕OOO VERY LOW	CRITICAL
Complications - superficial incisional surgical site infections (second operation)												
1	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	0/22 (0%)	14.7%	OR 0.17 (0.03 to 1.09)	147 fewer per 1000 (from 282 fewer to 13 more)[3]	⊕OOO VERY LOW	CRITICAL
Complications - urinary tract infections (first operation)												
2	randomised trials	very serious[1]	very serious[5]	no serious indirectness	very serious[2]	none	3/66 (4.5%)	4/86 (4.7%)	RR 0.98 (0.09 to 11.24)	1 fewer per 1000 (from 68 fewer to 66 more)[3]	⊕OOO VERY LOW	CRITICAL
Complications - urinary tract infections (second operation)												
2	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[6]	none	0/48 (0%)	0%	RD 0 (-0.06 to 0.06)	0 fewer per 1000 (from 60 fewer to 60 more)[7]	⊕OOO VERY LOW	CRITICAL
Overall morbidity (first operation)												
3	randomised trials	very serious[1]	serious[8]	no serious indirectness	serious[2]	none	63/116 (54.3%)	42.3%	RR 1.24 (0.77 to 1.99)	102 more per 1000 (from 97 fewer to 419	⊕OOO VERY	CRITICAL

										more)	LOW	
Overall morbidity (second operation)												
2	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	5/54 (9.3%)	28.3%	RR 0.32 (0.12 to 0.85)	192 fewer per 1000 (from 42 fewer to 249 fewer)	⊕OOO VERY LOW	CRITICAL
Mortality (first operation)												
3	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	6/116 (5.2%)	10.7%	RR 0.58 (0.22 to 1.55)	45 fewer per 1000 (from 83 fewer to 59 more)	⊕OOO VERY LOW	CRITICAL
Mortality (second operation)												
3	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[6]	none	0/80 (0%)	2/82 (2.4%)	RD -0.03 (-0.08 to 0.03)	30 fewer per 1000 (from 80 fewer to 30 more)[9]	⊕OOO VERY LOW	CRITICAL
Complications - intra-abdominal abscess (first operation)												
1	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	2/50 (4%)	7.7%	RR 0.52 (0.1 to 2.71)	37 fewer per 1000 (from 69 fewer to 132 more)	⊕OOO VERY LOW	CRITICAL
Complications - intra-abdominal abscess (second operation)												
1	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	0/32 (0%)	3%	OR 0.14 (0 to 7.03)	30 fewer per 1000 (from 111 fewer to 50 more)[3]	⊕OOO VERY LOW	CRITICAL
Complications - anastomotic stricture (first operation)												
1	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	1/50 (2%)	0%	OR 7.69 (0.15 to 387.87)	20 more per 1000 (from 33 fewer to 73 more)[3]	⊕OOO VERY LOW	CRITICAL

Need for further surgery - reoperation (first operation)											
1	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	2/50 (4%)	7.7%	RR 0.52 (0.1 to 2.71)	37 fewer per 1000 (from 69 fewer to 132 more)	⊕OOO VERY LOW	CRITICAL
Need for further surgery - reoperation (second operation)											
2	randomised trials	very serious[1]	serious[10]	no serious indirectness	very serious[2]	none	1/58 (1.7%)	4/48 (8.3%)	RR 0.31 (0.03 to 3.71)	66 fewer per 1000 (from 151 fewer to 19 more)[3]	⊕OOO VERY LOW	CRITICAL
All complications - Clavien-Dindo I-V (first operation)											
1	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	27/32 (84.4%)	80%	OR 1.35 (0.36 to 4.99)	44 more per 1000 (from 210 fewer to 152 more)	⊕OOO VERY LOW	CRITICAL
All complications - Clavien-Dindo I-V (second operation)											
1	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	20/26 (76.9%)	40%	OR 5 (1.26 to 19.84)	369 more per 1000 (from 57 more to 530 more)	⊕⊕OO LOW	CRITICAL
Intra-abdominal infection (first operation)											
1	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	2/32 (6.3%)	20%	RR 0.31 (0.07 to 1.43)	138 fewer per 1000 (from 186 fewer to 86 more)	⊕OOO VERY LOW	CRITICAL
Intra-abdominal infection (second operation)											
1	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[11]	none	0/26 (0%)	0%	RD 0 (-0.10 to 0.10)	0 fewer per 1000 (from 100 fewer to 100 more)[9]	⊕OOO VERY LOW	CRITICAL
Wound infection (first operation)											

1	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[2]	none	11/32 (34.4%)	43.3%	RR 0.79 (0.42 to 1.49)	91 fewer per 1000 (from 251 fewer to 212 more)	⊕OOO VERY LOW	CRITICAL
Wound infection (second operation)												
1	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	very serious[1]	none	3/26 (11.5%)	20%	RR 0.58 (0.13 to 2.51)	84 fewer per 1000 (from 174 fewer to 302 more)	⊕OOO VERY LOW	CRITICAL
Stoma complications (first operation)												
1	randomised trials	very serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	0/32 (0%)	10%	OR 0.12 (0.01 to 1.18)	100 fewer per 1000 (from 219 fewer to 19 more)[3]	⊕OOO VERY LOW	CRITICAL

Table 20: Clinical evidence profile: Primary anastomosis vs. temporary stoma – observational studies

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Primary**	**secondary anastomosis**	**Relative (95% CI)**	**Absolute**		
Anastomotic leak (first operation)												
8	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	23/293 (7.8%)	0%	OR 15.41 (4.53 to 52.47)	79 more per 1000 (from 47 more to 110 more)[2]	⊕OOO VERY LOW	CRITICAL
Anastomotic leak (second operation)												
3	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	serious[3]	none	1/45 (2.2%)	7/73 (9.6%)	OR 0.1 (0.02 to 0.51)	80 fewer per 1000 (from 190 fewer to 30 more)[4]	⊕OOO VERY LOW	CRITICAL
Anastomotic leak/rectal stump leak (first operation)												

1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	13/46 (28.3%)	3.1%	RR 9.18 (2.18 to 38.77)	254 more per 1000 (from 37 more to 1000 more)	⊕OOO VERY LOW	CRITICAL
Abscess (first operation)												
6	observational studies	very serious[1]	serious[5]	no serious indirectness	very serious[6]	none	11/165 (6.7%)	22/205 (10.7%)	RR 0.69 (0.23 to 2.03)	41 fewer per 1000 (from 98 fewer to 16 more)[4]	⊕OOO VERY LOW	CRITICAL
Abscess (second operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[7]	none	0/27 (0%)	0%	RD 0 (-0.08 to 0.08)	0 fewer per 1000 (from 80 fewer to 80 more)[2]	⊕OOO VERY LOW	CRITICAL
Abscess/peritonitis (first operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	3/47 (6.4%)	3.9%	RR 1.66 (0.18 to 15.16)	26 more per 1000 (from 32 fewer to 552 more)	⊕OOO VERY LOW	CRITICAL
Fistula (first operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	2/21 (9.5%)	0%	OR 6.74 (0.4 to 112.7)	95 more per 1000 (from 56 fewer to 246 more)[2]	⊕OOO VERY LOW	CRITICAL
Septic shock (first operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	1/21 (4.8%)	27.8%	RR 0.17 (0.02 to 1.34)	231 fewer per 1000 (from 272 fewer to 95 more)	⊕OOO VERY LOW	CRITICAL
Wound sepsis (first operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	2/21 (9.5%)	5.6%	RR 1.71 (0.17 to	40 more per 1000 (from 46 fewer to 917	⊕OOO VERY	CRITICAL

									17.38)	more)	LOW	
Intra-abdominal infection (first operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	1/33 (3%)	4.9%	RR 0.62 (0.07 to 5.69)	19 fewer per 1000 (from 46 fewer to 230 more)	⊕OOO VERY LOW	CRITICAL
Wound infection (first operation)												
5	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	serious[6]	none	15/169 (8.9%)	15.4%	RR 0.64 (0.37 to 1.12)	81 fewer per 1000 (from 153 fewer to 9 fewer)[4]	⊕OOO VERY LOW	CRITICAL
Wound infection (second operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	3/27 (11.1%)	9.1%	RR 1.22 (0.22 to 6.68)	20 more per 1000 (from 71 fewer to 517 more)	⊕OOO VERY LOW	CRITICAL
Postoperative complications - infection (first operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	263/2637 (10%)	5.3%	RR 1.88 (1.67 to 2.11)	47 more per 1000 (from 36 more to 59 more)	⊕OOO VERY LOW	CRITICAL
Sepsis (first operation)												
3	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	serious[6]	none	13/106 (12.3%)	21.4%	RR 0.49 (0.24 to 1.01)	109 fewer per 1000 (from 163 fewer to 2 more)	⊕OOO VERY LOW	CRITICAL
Sepsis (second operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	0/27 (0%)	9.1%	OR 0.1 (0.01 to 1.72)	91 fewer per 1000 (from 227 fewer to 45 more)[8]	⊕OOO VERY LOW	CRITICAL

Urinary infection (first operation)												
2	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	3/53 (5.7%)	14.3%	RR 0.22 (0.05 to 0.99)	112 fewer per 1000 (from 1 fewer to 136 fewer)	⊕OOO VERY LOW	CRITICAL
Urinary infection (second operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[7]	none	0/27 (0%)	0%	RD 0 (-0.08 to 0.08)	0 fewer per 1000 (from 80 fewer to 80 more)[2]	⊕OOO VERY LOW	CRITICAL
Emergency readmission (first operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	5/33 (15.2%)	14.1%	RR 1.08 (0.39 to 2.96)	11 more per 1000 (from 86 fewer to 276 more)	⊕OOO VERY LOW	CRITICAL
Hospital readmission (first operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	0/33 (0%)	7.8%	OR 0.21 (0.03 to 1.36)	78 fewer per 1000 (from 157 fewer to 1 more)[8]	⊕OOO VERY LOW	CRITICAL
Overall surgical morbidity (first operation)												
2	observational studies	very serious[1]	serious[9]	no serious indirectness	very serious[6]	none	23/67 (34.3%)	33.8%	RR 1.07 (0.44 to 2.61)	24 more per 1000 (from 189 fewer to 544 more)	⊕OOO VERY LOW	CRITICAL
Overall morbidity (first operation)												
5	observational studies	very serious[1]	serious[9]	no serious indirectness	serious[6]	none	901/2838 (31.7%)	23.3%	RR 1.07 (0.75 to 1.52)	16 more per 1000 (from 58 fewer to 121 more)	⊕OOO VERY LOW	CRITICAL
Intraoperative morbidity (first operation)												

1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	8/46 (17.4%)	10.8%	RR 1.61 (0.63 to 4.14)	66 more per 1000 (from 40 fewer to 339 more)	⊕OOO VERY LOW	CRITICAL
Postoperative medical morbidity (first operation)												
2	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	serious[6]	none	12/82 (14.6%)	31.8%	RR 0.45 (0.24 to 0.81)	175 fewer per 1000 (from 60 fewer to 242 fewer)	⊕OOO VERY LOW	CRITICAL
Postoperative major morbidity (first and second operations combined)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	1/13 (7.7%)	11.9%	RR 0.65 (0.08 to 5.04)	42 fewer per 1000 (from 109 fewer to 481 more)	⊕OOO VERY LOW	CRITICAL
Postoperative minor morbidity (first and second operations combined)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	5/13 (38.5%)	21.4%	RR 1.79 (0.73 to 4.41)	169 more per 1000 (from 58 fewer to 730 more)	⊕OOO VERY LOW	CRITICAL
Major general complications (first operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	serious[6]	none	1/21 (4.8%)	42.1%	RR 0.11 (0.02 to 0.82)	375 fewer per 1000 (from 76 fewer to 413 fewer)	⊕OOO VERY LOW	CRITICAL
Minor general complications (first operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	2/21 (9.5%)	21.1%	RR 0.45 (0.09 to 2.2)	116 fewer per 1000 (from 192 fewer to 253 more)	⊕OOO VERY LOW	CRITICAL
Major surgical complications (first operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	serious[6]	none	1/21 (4.8%)	31.6%	RR 0.15 (0.02 to 1.14)	269 fewer per 1000 (from 310 fewer to 44	⊕OOO VERY	CRITICAL

										more)	LOW	
Major postoperative complications (first operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	serious[6]	none	14/47 (29.8%)	46.2%	RR 0.65 (0.35 to 1.18)	162 fewer per 1000 (from 300 fewer to 83 more)	⊕OOO VERY LOW	CRITICAL
Perioperative mortality (first operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	2/85 (2.4%)	3.9%	RR 0.61 (0.06 to 6.48)	15 fewer per 1000 (from 37 fewer to 214 more)	⊕OOO VERY LOW	CRITICAL
30-day surgical mortality (first operation) (follow-up mean 30 days)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	serious[6]	none	1/21 (4.8%)	33.3%	RR 0.14 (0.02 to 1.08)	286 fewer per 1000 (from 326 fewer to 27 more)	⊕OOO VERY LOW	CRITICAL
Mortality												
9	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	20/339 (5.9%)	16.7%	RR 0.39 (0.25 to 0.63)	143 fewer per 1000 (from 195 fewer to 91 fewer)[4]	⊕OOO VERY LOW	CRITICAL
Mortality (follow-up median 59 months)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision[6]	none	31/93 (33.3%)	60.1%	RR 0.55 (0.41 to 0.75)	270 fewer per 1000 (from 150 fewer to 355 fewer)	⊕OOO VERY LOW	CRITICAL
In-hospital mortality (first operation)												
8	observational studies	very serious[1]	very serious[10]	no serious indirectness[6]	very serious[6]	none	461/2973 (15.5%)	24.2%	RR 0.56 (0.23 to 1.41)	106 fewer per 1000 (from 186 fewer to 99 more)	⊕OOO VERY LOW	CRITICAL

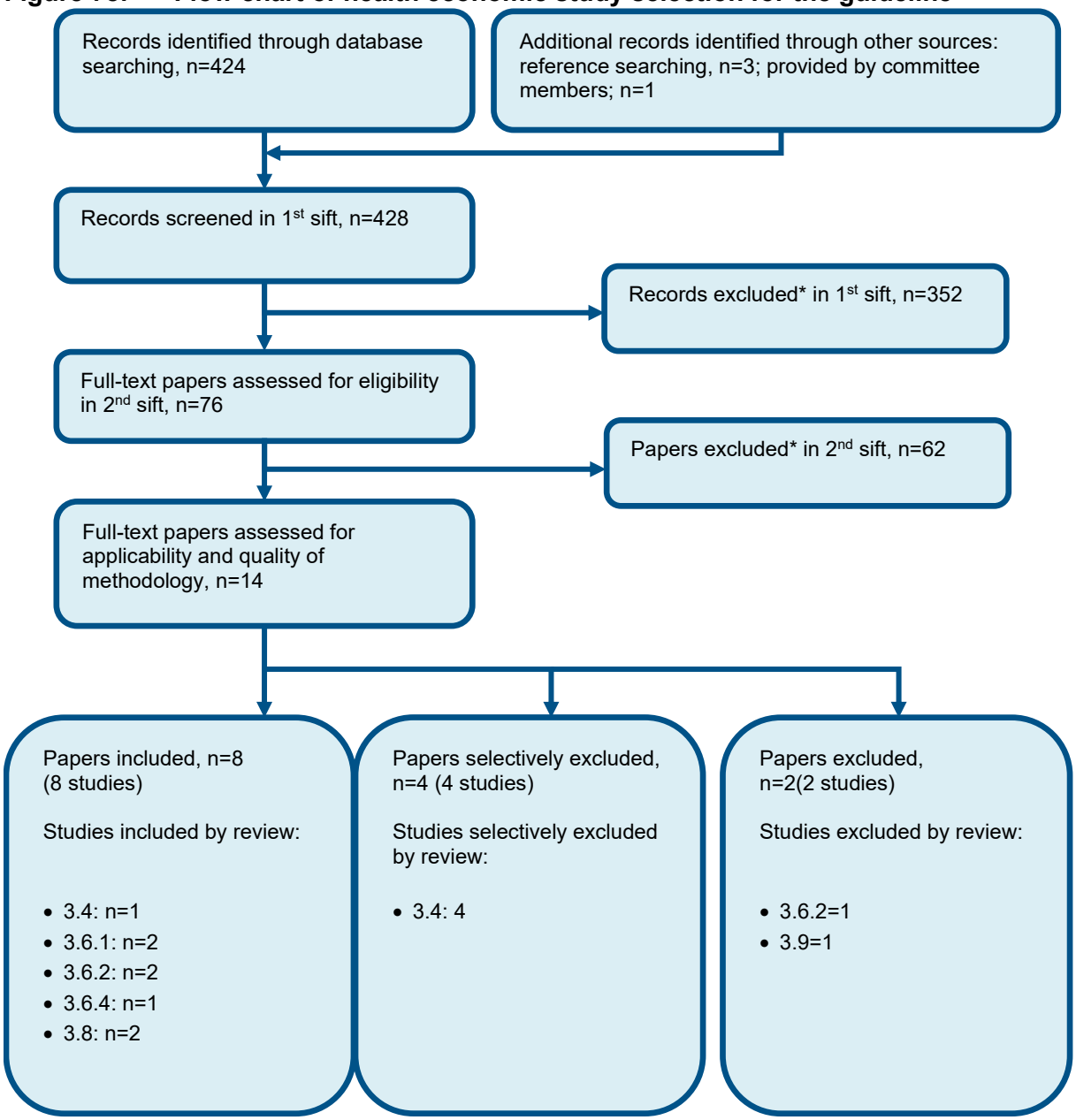
In-hospital mortality (second operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	0/27 (0%)	4.6%	OR 0.11 (0 to 5.55)	46 fewer per 1000 (from 158 fewer to 67 more)[8]	⊕OOO VERY LOW	CRITICAL
Postoperative mortality (first and second operations combined)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	1/13 (7.7%)	9.5%	RR 0.81 (0.1 to 6.6)	18 fewer per 1000 (from 86 fewer to 532 more)	⊕OOO VERY LOW	CRITICAL
Reintervention (first operation)												
5	observational studies	very serious[1]	serious[11]	no serious indirectness	very serious[6]	none	29/188 (15.4%)	43/218 (19.7%)	RR 0.9 (0.58 to 1.38)	20 fewer per 1000 (from 100 fewer to 50 more)[4]	⊕OOO VERY LOW	CRITICAL
Reintervention (second operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	3/27 (11.1%)	22.7%	RR 0.49 (0.13 to 1.82)	116 fewer per 1000 (from 197 fewer to 186 more)	⊕OOO VERY LOW	CRITICAL
Stoma dysfunction (first operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	3/32 (9.4%)	25%	RR 0.38 (0.11 to 1.31)	155 fewer per 1000 (from 222 fewer to 77 more)	⊕OOO VERY LOW	CRITICAL
Colostomy insufficiency/stump insufficiency (first operation)												
2	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	0/68 (0%)	15.8%	OR 0.11 (0.02 to 0.56)	111 fewer per 1000 (from 207 fewer to 15 fewer)[8]	⊕OOO VERY LOW	CRITICAL
Stoma necrosis (first operation)												

1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	0/47 (0%)	15.4%	OR 0.05 (0.01 to 0.43)	154 fewer per 1000 (from 297 fewer to 10 fewer)[8]	⊕OOO VERY LOW	CRITICAL
Stoma morbidity (first operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	0/46 (0%)	12.3%	OR 0.16 (0.04 to 0.69)	123 fewer per 1000 (from 209 fewer to 37 fewer)[8]	⊕OOO VERY LOW	CRITICAL
Stoma complications (first and second operations combined)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	0/13 (0%)	7.1%	OR 0.26 (0.02 to 3.87)	71 fewer per 1000 (from 20 fewer to 56 more)[8]	⊕OOO VERY LOW	CRITICAL
30-day organ space infection (first operation) (follow-up mean 30 days)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	-	5.5%	OR 0.71 (0.35 to 1.42)	15 fewer per 1000 (from 35 fewer to 21 more)	⊕OOO VERY LOW	CRITICAL
30-day postoperative sepsis (first operation) (follow-up mean 30 days)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	-	14.2%	OR 1.02 (0.67 to 1.55)	2 more per 1000 (from 42 fewer to 62 more)	⊕OOO VERY LOW	CRITICAL
Wound infection (first operation)												
2	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	very serious[6]	none	-	22.6%	OR 0.88 (0.59 to 1.32)	22 fewer per 1000 (from 79 fewer to 52 more)	⊕OOO VERY LOW	CRITICAL
Postoperative morbidity (first operation)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	serious[6]	none	-	86.7%	OR 0.21 (0.05 to 0.84)	289 fewer per 1000 (from 21 fewer to 621	⊕OOO VERY	CRITICAL

										fewer)	LOW	
Postoperative mortality (first operation)												
3	observational studies	very serious[1]	serious[12]	no serious indirectness	very serious[6]	none	-	33.8%	OR 0.83 (0.34 to 2.03)	40 fewer per 1000 (from 190 fewer to 171 more)	⊕OOO VERY LOW	CRITICAL
Reoperation (first operation)												
3	observational studies	very serious[1]	serious[13]	no serious indirectness	very serious[6]	none	-	20%	OR 0.78 (0.38 to 1.6)	37 fewer per 1000 (from 113 fewer to 86 more)	⊕OOO VERY LOW	CRITICAL
Long term survival post-hospital discharge (mortality) - HR (follow-up median 59 months)												
1	observational studies	very serious[1]	no serious inconsistency	no serious indirectness	serious[6]	none	18/80 (22.5%)	41.7%	HR 0.54 (0.3 to 0.97)	164 fewer per 1000 (from 10 fewer to 268 fewer)	⊕OOO VERY LOW	CRITICAL

Appendix G: Health economic evidence selection

Figure 78: Flow chart of health economic study selection for the guideline



* Non-relevant population, intervention, comparison, design or setting; non-English language

3.4 Non-surgical treatment of acute diverticulitis (Evidence review H)

3.6.1 Timing of surgery (Evidence review J)

3.6.2 Laparoscopic versus open resection (Evidence review K)

3.6.4 Primary versus secondary anastomosis (Evidence review M)

3.8 Laparoscopic lavage versus resection for perforated diverticulitis (Evidence review O)

3.9 Management of recurrent diverticulitis (Evidence review P)

Appendix H: Health economic evidence tables

Table 21: Health economic evidence tables

Study	Oberkofler 2012 [53]			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: CCA (health outcomes: Mortality (5 years), complication rate, severe complications, stoma reversal) **Study design:** Within-trial analysis of a multicentre randomised controlled trial **Approach to analysis:** Data were analysed based on intention to treat principle. Study discontinued at interim analysis. **Perspective:** Switzerland, hospital **Follow-up:** Costs: None; Health outcomes: None, except mortality (5 years) **Discounting:** Costs: n/a; Outcomes: n/a	**Population:** German-speaking adults with perforated left-sided diverticulitis with purulent (Hinchey III) or fecal peritonitis (Hinchey IV). **Patient characteristics:** n: Intervention 1: 30; Intervention 2: 32 Median age: Intervention 1: 74; Intervention 2: 72 Male: Intervention 1: 30%; Intervention 2: 34% **Intervention 1:** Hartmann's procedure followed by later stoma reversal before 3 months **Intervention 2:** Primary anastomosis with diverting ileostomy followed by later stoma reversal before 3 months	**Total costs (mean per patient):** Intervention 1: £54,687 (SD £35,329) Intervention 2: £52,768 (SD £40,696) Incremental (2−1): Saves £1,919 (95% CI: NR; p=0.880) **Currency & cost year:** US dollars, cost year not reported (presented here as 2012 UK pounds[(b)] **Cost components incorporated:** Both total costs (index and stoma reversal combined) and costs of index procedure and stoma reversal spell separately are presented. Fixed and variable costs for diagnostics, treatments and beds are included.	**Mortality:** Intervention 1: 4/30=13% Intervention 2: 3/32=9% **Overall complication rate:** Intervention 1: 24/30=80% Intervention 2: 27/32=84% **Severe complications** Intervention 1: 50% Intervention 2: 44% **Stoma reversal:** Intervention 1:57% Intervention 2: 90%	**ICER (Intervention 2 versus Intervention 1):** n/a **Analysis of uncertainty:** n/a
Data sources				
Health outcomes: Health outcomes obtained from Oberkofler RCT only. [53] **Quality-of-life weights:** n/a **Cost sources:** Financial departments of University Hospital Zurich, University Hospital Lausanne, Chur and Winterhur Cantonal Hospitals. [53]				

Comments
Source of funding: NR **Limitations:** Both strategies were designed to include stoma reversal (planned for before 3 months), which may limit the generalisability of the results, particularly in settings where reversal is not as common. Cost year not reported. No detailed breakdown of cost components incorporated. Costs other than those incurred to the institutions do not appear to be considered, such as GP appointments or the costs of people readmitted in other hospitals. Unclear whether the costs of any other admissions between index operation and stoma reversal are included. Stoma reversal was done after 6 months in the Hartmann's group and after 3 months in the anastomosis group. No assessment of quality of life was made. One patient randomised to intervention 1 received a primary anastomosis, while 3 patients randomised to intervention 2 received Hartmann's procedure, at the discretion of the surgeon. No conflicts of interest reported. **Other:** Stoma reversal was planned as part both interventions, but only 15 of 26 (58%) colostomies were reversed whereas 26/29 (90%) of ileostomies were reversed. The study was discontinued after the interim analysis due to low accrual rates and significant differences in relevant secondary outcomes (total number of complications).
Overall applicability: Partially applicable[c] **Overall quality:** Potentially serious limitations[d]

Abbreviations: CCA: cost–consequences analysis; 95% CI: 95% confidence interval; ICER: incremental cost-effectiveness ratio; n/a: not applicable; NR: not reported; RCT: randomised controlled trial; SD: standard deviation

(a) Converted using 2012 purchasing power parities[54]

(b) Directly applicable / Partially applicable / Not applicable

(c) Minor limitations / Potentially serious limitations / Very serious limitations

Appendix I: Excluded studies

I.1 Excluded clinical studies

Table 22: Studies excluded from the clinical review

Study	Exclusion reason
Ahad 2007[1]	Unsuitable study design
Alvarez 2009[2]	Not review population
Ambrosetti 1994[3]	Not guideline condition
Aquina 2016[4]	Inappropriate comparison
Auguste 1981[5]	Incorrect interventions
Bacon 1967[6]	Incorrect interventions
Bax 2007[7]	Not review population
Biondo 2002[11]	Not review population
Bordeianou 2018[13]	Not review population. Inappropriate comparison
Caricato 2007[15]	Not review population. Incorrect interventions
Cartmell 2008[16]	Not review population
Chua 1996[18]	Not review population. Inappropriate comparison
Cirocchi 2018[19]	Individual RCTs ordered and included
Constantinides 2006[20]	Not review population
Drumm 1984[21]	Incorrect study design
Eisenstat 1983[22]	Not review population. Inappropriate comparison
El-haddad 2018[23]	Not review population
El-sayed 2018[24]	Not review population. Incorrect interventions
Faltyn 1996[25]	Not review population
Gachabayov 2018[26]	Ordered individual studies within systematic review
Golda 2018[28]	Not review population
Gooszen 2001[30]	Inappropriate comparison
Gregersen 2018[31]	Not review population. Incorrect interventions
Haas 2016[33]	Not review population
Howe 1979[36]	Incorrect outcomes
Kairaluoma 2002[37]	Not review population
Khan 1994[38]	Inappropriate comparison
Khoury 1987[39]	Not review population. Incorrect interventions
Kirson 1988[40]	Incorrect interventions
Kreis 2012[41]	Unsuitable study design
Lacy 1997[43]	Not review population. Inappropriate comparison
Maggard 2001[44]	Not review population
Maitra 2013[45]	Not review population. Incorrect interventions
Makela 2005[46]	Not review population
Miccini 2011[48]	Inappropriate comparison
Nespoli 1993[51]	Not review population
Parisi 2016[55]	Incorrect outcomes

Study	Exclusion reason
Regenet 2003[57]	Incorrect interventions
Reyes-espejel 2015[58]	Full text not in English
Salem 2004[60]	Unsuitable study design
Schlegel 2001[62]	Not review population. Inappropriate comparison
Schmidt 2018[63]	Individual RCTs ordered and included
Vermeulen 2010[72]	Incorrect interventions
Wedell 1997[73]	Not review population
Zhang 2012[74]	Not review population. Incorrect interventions
Zorcolo 2003[75]	Not review population