Appendix C3

Guideline topic: Transition between inpatient hospital settings and community or care settings for adults with social care needs (Trans HHCH)

Economic priority area: Assessment and care planning at admission to inpatient hospital settings from community or care home settings

Review questions: 5. How do different approaches to care planning and assessment affect the process of admission to inpatient hospital settings from community or care home settings?

This technical report was produced by the Personal Social Services Research Unit at the London School of Economics and Political Science. PSSRU (LSE) is an independent research unit and is contracted as a partner of the NICE Collaborating Centre for Social Care (NCCSC) to carry out the economic reviews of evidence and analyses.

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Abbreviations

CI	confidence interval
HCHS	hospital and community health services
LSE	London School of Economics and Political Science
NCCSC	NICE Collaborating Centre for Social Care
OR	odds ratio
p	p-value
PSS	Personal Social Services
PSSRU	Personal Social Services Research Unit
RR	relative risk
SMD	standardised mean difference

1 BACKGROUND

1.1 Economic work as part of guideline development

This report was produced for the NCCSC guideline 'Transition between inpatient hospital settings and community or care home settings for adults with social care needs'. NCCSC guidelines provide recommendations in regards to good social care practice, which are informed by evidence including cost-effectiveness evidence. As part of the guideline development reviews of the economic literature are carried out. The review of economic evidence is presented in the long version of the guideline, which also demonstrates how it has been used to inform the review questions identified in the scope and the recommendations drawn from it by the Guideline Committee.

Additional economic analysis is carried out in areas where it is considered feasible and useful. Feasibility refers to the availability of data, whilst a decision about usefulness is based on the expected ability of additional economic analysis to reduce uncertainty over existing cost-effectiveness results from the literature. The decision whether additional economic analysis is useful also considers the likelihood that a resulting recommendation will lead to considerable changes in social care outcomes or costs.

1.2 Economic analysis for this guideline

It was agreed that additional economic analysis would be carried out for review question 5:

'How do different approaches to care planning and assessment affect the process of admission to inpatient hospital settings from community or care home settings?'

The reasons were: first, recommendations in this area were expected to have important economic implications; second, there was relevant economic evidence (presented in Section 1.3); and, third, additional analysis was expected to be able to address the gaps in knowledge about cost-effectiveness.

For the other review areas covered by the scope, there was either sufficient economic evidence to answer the review question[1] and additional economic analysis would not have added value; or there was a lack of economic evidence and additional analysis was not considered feasible.[2]

An exception to this was review question 11 which looked at support for families and unpaid carers during admission to or discharge from hospital. Two good quality studies were identified, which evaluated the costs and outcomes of a specific training intervention for carers of people with stroke at hospital discharge (Patel et al 2004, Forster et al 2013). Findings of a more recent larger trial did not suggest that this particular intervention was cost-effective. The authors concluded that a different type of intervention, provided in the form of comprehensive community support, might be more appropriate. It was also likely that practice had improved and that the comparison group was receiving appropriate support in a less formalised way. In principle, additional economic analysis could have been useful to achieve greater clarity about the likely cost effectiveness of this intervention. However, the Guideline Committee decided, based on the authors' conclusions and recommendation that this type of intervention was not sufficiently relevant to carry out further analysis.

Detail on the economic evidence that was identified for each review question and economic considerations is provided in the long guideline.

1.3 Evidence review for this economic analysis

The review of the literature for review question 5 identified 2 studies that met the inclusion criteria. Both were meta-analyses (combined with systematic reviews) which found that comprehensive geriatric assessment and care provided in dedicated specialist units in hospital led to a reduction in the risk of care home admission (Ellis et al 2011; Fox et al 2012) and in the length of the initial hospital stay (Fox et a. 2012). In addition, comprehensive geriatric assessment and care led to improvements to individuals' health, measured in reduced deterioration (Ellis et al 2011),[3] improved cognitive function,[4] fewer falls (Fox et al 2012),[5] less delirium[6] and less functional decline.[7]

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[1] This was the case for review questions 6, 7 and 9.
[2] This was the case for review questions 1 to 4, 8 and 10.
3 OR=0.76; p=0.001.
4 SMD 0.08, p=0.02.
5 RR=0.51, 95% CI=0.29-0.88.
6 RR=0.73, 95% CI=0.61-0.88.
7 RR = 0.87, 95% CI.

Comprehensive geriatric assessment and care referred to older people above 65 years who were admitted to hospital in an unplanned manner. Usual care involved the admission to any care not provided on a specialist geriatric unit which generally referred to care on a general medical ward under non-specialist care. The scope is described slightly differently in the 2 papers: Ellis is focused on components of service delivery such as a multidisciplinary care plan and a specialist team whilst Fox et al (2012) describe the principles and objectives of care such as patient-centred care and preventing functional decline. The Ellis review has a wider remit and included 'mobile teams' not provided at specialist units. However, findings were analysed and presented separately; in this analysis only findings that concern the specialist units informed this analysis. There is a large overlap of studies identified in between the 2 meta-analyses. Whilst Ellis et al (2011) calls the intervention 'comprehensive geriatric assessment' they clarify in their description that this refers to both, diagnosis and treatment. They explain that an alternative term for specialist multidisciplinary care on wards is 'acute care for elders' which is the term used in the Fox review.

During the critical appraisal process, both studies were assessed as being of good quality. Whilst Fox et al (2012) reviewed effectiveness studies only, the Ellis study specifically included economic evaluations but found that findings on costs could not be synthesised. This was because studies varied highly in terms of the types of costs they collected and the level of detail that they reported. In the critical appraisal the meta-analysis by Ellis et al was considered of high quality and effect sizes for the main outcomes, taken in relative terms, were likely to be robust and sufficiently applicable to the current UK context. The reviewed studies did not measure the wider impact on community health and social care or on unpaid care. A full list of information that was extracted from those studies as well as their critical appraisal can be found in the economic evidence table and methods checklists in Appendix C1 of the guideline.

2 AIMS

The aim of the additional economic analysis was to examine the cost-effectiveness of interventions covered by review question 5 of the guideline. Based on the identified studies (Section 1.3) this was narrowed down to comprehensive geriatric assessment and care.

The question subject to additional analysis was:

'Is hospital based comprehensive geriatric assessment and care likely to be cost-effective (or cost-saving) in the context of the English care system?'

Comprehensive geriatric assessment and care referred to specialist unit provision in hospital provided to older people of 65 years and older admitted on an emergency basis. The comparison involved the admission to a general medical ward under non-specialist care. Members of the Guideline Committee agreed that both the intervention and usual care were applicable and highly relevant to the English care system.

The population was older people of 65 years and above who had been admitted to hospital on an emergency basis.

Whilst the economic evidence review showed that the intervention was likely to lead to improved individual wellbeing and functioning outcomes, those were not measured on standardised scales and could not be easily used for economic analysis. The economic question was thus focused on whether the intervention led to cost savings, based on the 2 main service use outcomes measured in the identified studies (Section 1.3).

3 METHOD

3.1 General approach

The analysis was carried out with 1-way sensitivity (threshold) analysis in Microsoft Excel 2010 (function: data table). Some procedures needed to be carried out first to provide the data that could inform the threshold analysis. The following steps were undertaken:

- relative effect sizes for service use outcomes (measured in risk or odds ratio) from the 2 meta-analyses were transformed into absolute effect sizes (percentage points) applicable to the UK context

- unit costs were attached to change in units of service use outcomes to derive potential costs (savings) per person

- since no data were available on the impact of the intervention on community health and social care, thresholds were explored: the estimated potential cost savings per person from the intervention were compared against the average costs of community health and social care for an older person with social care needs in England

- those thresholds were examined if cost estimates for unpaid care were also included – i.e. the likely average cost of unpaid care provided for older people similar to the population examined.

Threshold analysis was considered the most appropriate method as it allowed us to explore by how much the costs of community services – as the largest unknown cost – could increase before potential cost savings linked to the identified changes in service use outcomes would be zero. Together with information about the expected average costs of community care services for older people, this could then provide some helpful indication of whether comprehensive geriatric assessment and care was likely to be cost-saving.

3.2 Estimating costs linked to changes in service use

First, the relative effect sizes for the two service use outcomes – admission to a care home and hospital length of stay – as available from the 2 meta-analyses needed to be applied to appropriate baseline probabilities.[8] This step generated absolute effect sizes applicable to the English care system.

A meta-analysis uses statistical methods to identify and combine shared patterns in the results of different studies that evaluate the same type of intervention. Meta-analysis produces a weighted average of the included study results that can be generalised to other populations. In the 2 meta-analyses used for the analyses effect sizes were expressed as relative

8 This referred to the expected probability of an event under provision of usual care, i.e. without the occurrence of a particular intervention.

measures which meant they measured the change in outcomes between the intervention and comparison groups proportionally to one another.

For the purpose of this analysis, those relative measures needed to be transformed to absolute effects applicable to the context of the English care system. The systems of residential care and hospital provision are different in the US than in the UK, therefore it could not be assumed that the absolute effect size was the same. For example, the point at which an older person gets admitted to a residential care home and the length of hospital stay will be different. For this reason it was necessary to apply the relative effect (between intervention and comparison) to the expected baseline probability of care home admission and hospital length of stay based on English data.

3.2.1 Care home admission

Ellis et al (2011) measured the relative effect of the intervention on admission to care home in the form of odds ratios.[9] The mean odds ratio from the meta-analysis by Ellis et al (2011) for a significant reduction in admission to residential care was 0.73 ($p<0.001$).

In order to transform the odds ratio in the Ellis study to the English context, a suitable baseline probability needed to be identified. During the economic literature review 2 English-based studies were identified which were considered suitable to provide such estimates (Miller et al 2005; Ellis et al 2006). They evaluated interventions provided to a similar population of older people admitted to and discharged from hospital over a 12-month period, and collected data on care home admission rates. Because the baseline probability needed to refer to a probability of care home admission without a particular intervention taking place, the rates found in the comparison groups of those studies were taken.

Using a standard formula[10] the rates in the studies were converted into annual probabilities and a mean probability of 20.1% was derived. The mean probability presented the average between the 2 probabilities. In the absence of a known statistical distribution this assumption of a uniform distribution was considered the best possible approach as it gave equal chance for the findings from both studies – Miller et al 2005, Ellis et al 2006 – to be true. The

9 The odds ratio is a statistical measure which quantifies the strength of association between the exposure (here: to the intervention) and the outcome (here: residential care home admission).
10 Probability = 1-EXP (-rate); e.g. Welton et al (2012, p51)

mean probability was then transformed into odds[11] so that it could be multiplied with the odds ratio from the Ellis systematic review and meta-analysis by Ellis et al (2011). The absolute difference in risk per person measured in percentage points was calculated.[12] A reduction by half was applied to the annual risk assuming that the event of care home admission happened halfway through the year. This was done because it was not known from the published data when – within the period of a year – the transition to a care home occurred. The event of care home admission is a continuous process, which might have occurred at any time within the cycle of a year. Taking the probability as if the care home admission occurred at the end of the year would have led to bias in the form of an overestimation of the costs linked to the risk of care home admission. Therefore a correction was used to compensate for the timing of the transition assuming that, on average, the transition occurred half way through the year. This approach is called half-cycle correction and is commonly applied in cost-effectiveness analysis (e.g. Gray et al 2010). The resulting risk difference was 3.4 percentage points per person. This value was used for the threshold analysis.

Next, unit costs of care home stays were applied from Personal Social Services (PSS) data for England: the average unit cost for residential and nursing care for an older person was £538 per week in 2013/14 (HSCIC 2014, Table 1).

Table 1: Unit costs used in threshold analysis (in 2013/14 prices)

Service	**Price and unit**	**Description and source**
Care home (C_{Res})	£538 per week	Personal social services data for England, HSCIC (2014)
Hospital (C_{Hosp})	£275 per day	Costs of an excess bed day, NHS Reference costs 2013/14
Unpaid care – For a person being cared for at home ($C_{UC\ Com}$) – For a person being cared for in a care home ($C_{UC\ Res}$)	 £19,714 per year £1,067 per year	Prince et al (2014); estimates referred to people with different severities of dementia; for this analysis values for people with mild dementia were taken

11 Odds = probability/ (1-probability).
12 odds x odds ratio – odds.

3.2.2 Hospital use[13]

For studies that also evaluated hospital costs, Ellis et al (2011) reported that the majority of those studies found lower costs in the intervention group linked to a reduction in the index hospital length of stay. In their review, out of 9 trials that measured costs, only 2 trials reported greater costs in the treatment group. Similarly, the review by Fox et al (2012) found a reduction in length of hospital stay and costs which was significant. Since both studies were good quality systematic reviews which applied recommended critical appraisal and selection procedures, their synthesised findings were considered robust. However, caution needed to be applied in the use of their results because, as explained in Section 1.3, most studies were from the US, which has an on average longer hospital length of stay than the UK (although this is also highly dependent on hospital type). And Ellis et al (2011) did not include length of stay in their analysis because of significant heterogeneity.

Thus, in the absence of further detail of the types of hospitals and their average length of stays, the weighted mean difference of just above half a day (-0.61; 95% CI = -1.16 to -0.05) was taken from Fox et al (2012) but reduced by half to avoid an overestimation.

The weighted mean difference in the Fox study presented the shorter length of stay linked to the intervention per average person. The weighted mean difference is calculated as the sum of the differences in the individual studies, weighted by the individual variances for each study. A unit cost of £275 was applied taking the average costs of an excess bed day from NHS Reference costs 2013/14 (Table 1).

For the reduced length of stay in hospital there was an equivalent increase in the time spent in the community. The additional costs of community services for this time period were considered in the threshold analysis (Section 4.3).

3.3 Estimating costs linked to unpaid care

Although reductions in the use of residential care can lead to cost-savings for the public purse, supporting people for longer in the community often increases the inputs by informal (‘unpaid’) carers. Unpaid care is typically valued using either the replacement cost approach, which assigns the unit cost of a professional carer, or the opportunity cost approach, which assigns a

13 This referred to total hospital costs including the costs of the intervention.

costs for the value of activity forgone by caring for someone (such as employment or leisure).

The most accurate and recent UK unit cost estimates for unpaid care were found to be the ones produced by Prince et al (2014). It referred to people with dementia. Values related to carers of people with mild dementia were likely to be applicable to the population in our study of older people with geriatric needs including dementia. Positively, the study by Prince et al (2014) adopted both of the 2 approaches (opportunity and replacement cost approach). Furthermore, estimates were based on information about the types of activities that were provided by carers and included data of both, co-resident and non-co-resident carers. The study used a wide range of information about carer characteristics and circumstances. Estimates for hours of unpaid care came from the time that carers reported spending on caring or – in case of co-resident carers – time they could spend away from the person they cared for.

The average annual cost of unpaid care for an older person living with dementia in the community was £19,714; the average annual cost for an older person living in a care home was £1,067 (Table 1).

The potential increase in costs of unpaid care per person linked to the intervention was calculated by multiplying the reduced risk of admission to a care home (3.4 percentage points; Section 3.2.1) with the difference in annual costs for a person living at home versus in a care home.

3.4 Identifying threshold values

For the threshold analysis the following equations for total cost (savings) linked to comprehensive geriatric assessment and care were used.

$$C_{T\,Ps} = RD_{Res} * (-C_{Res} + C_{HSC}) + WMD_{Hosp\,LOS} * (-C_{Hosp} + C_{HSC})$$

$$C_{T\,S} = RD_{Res} * (-C_{Res} + C_{HSC}) + RD_{Res} * (C_{UC\,Res} - C_{UC\,Com}) + WMD_{Hosp\,LOS} * (-C_{Hosp} + C_{HSC})$$

$C_{T\,Ps}$ Total costs from a public sector perspective
$C_{T\,S}$ Total costs from a societal perspective
RD_{Res} Risk difference reduction in residential care linked to intervention
C_{Res} Costs of residential care
C_{HSC} Costs of community health and social care
$C_{UC\,Res}$ Costs of unpaid care per person cared for in residenyial care
$C_{UC\,Com}$ Costs of unpaid care per peron cared for in the community
$WMD_{Hosp\,LOS}$ Weighted mean difference hospital length of stay
C_{Hosp} Costs of hospital

The first equation reflected the costs of health and social care from a public sector perspective. The second equation also included the costs of unpaid care reflecting a wider, societal perspective. The impact of different values for the unknown costs of community based health and social care on total costs from the perspective of the public sector and society was then explored.

In order to derive conclusions about the likelihood that comprehensive geriatric assessment and care provided in hospital was likely to offset costs and thus be cost-effective, an estimate was needed for any potential additional costs not incorporated in the analysis. This referred primarily to the impact on the use of community based health and social care.

A suitable source that provided expected costs of community care for this population was Glendinning et al (2008). This study evaluated in detail – among other service use – the health and social care use of 518 older people living in the community and presented costs in 2007/8 prices. Table 2 presents the unit costs of community health and social care from this source uprated to 2013/14 prices with the Hospital and Community Health Services (HCHS) price index and the PSS for adult services price index. The total expected costs for community based health and social care were £11,658 per year.

Table 2: Cost of community health and social care (C_{HSC}) for older people, derived from Glendinning et al (2008), in £, 2013/14 prices

	Per week	Per year
HEALTH CARE		
Average inpatient stay	57.6	2997.7
Day hospital	15.8	822.9
Nurse	40.7	2116.0
Therapist	2.3	117.6

GP	5.7	293.9
A&E	0.5	23.5
Chiropodist	1.1	58.8
Total (health care)	49.7	2586.2
SOCIAL CARE		
Home care	76.8	3992.9
Meals service	2.1	109.5
Personal assistant	51.7	2688.8
Supporting people	1.1	54.8
Integrated community equipment	29.0	1508.5
Social worker/care manager	13.8	717.5
Total (social care)		
TOTAL (heath and social care)	224.2	11658

4 FINDINGS

The reduction in costs linked to the reduced risk of admission to a care home associated with the intervention was £951 per person; and the reduction in costs due to a shorter length of hospital stay associated with the intervention was £84 per person. In terms of costs that occurred for unpaid care, there was an expected increase associated with the intervention of £634 per person.

Findings thus suggested that comprehensive geriatric assessment and care provided in hospital could over the period of a year potentially achieve reductions in the costs linked to care home admission and – although to a much lesser extent – hospital costs. At the same time there were additional costs of unpaid care linked to the intervention.

Costs of community health and social care could amount to about £30,000 per person before the net effect turned negative and thus leading to additional costs. If the model included unpaid care then the respective value was much lower at about £12,000.

The expected costs of community health and social care of £11,658 per older person (as taken from the Glendinning study) constituted less than half of the potential savings estimated from a public sector perspective. In other words, even if the costs of community health and social care per person were 2.5 of the expected average costs in England, the intervention was still expected to

offset costs whilst at the same time achieving positive outcomes (and thus be cost-effective).

After considering the impact of unpaid care, the comprehensive geriatric assessment and care was still expected to offset costs but the likelihood that there were savings was much reduced and the cost-effectiveness less certain.

5 CONCLUSIONS

Based on this analysis comprehensive geriatric assessment and care was likely to lead to cost savings from a public sector perspective. Cost savings per person were reduced when the impact of unpaid care was considered and the intervention was less likely to be cost-effective.

As identified by 2 meta-analyses (Ellis et al 2011; Fox et al. 2012) comprehensive geriatric assessment and care was linked to a range of health benefits to individuals. The intervention was thus likely to achieve improved outcomes without an increase in costs (societal perspective) or at reduced costs (public sector perspective) compared with standard care. The intervention was thus found to be cost-effective.

The analysis had a number of limitations. It was a simple threshold analysis carried out based on limited data available from the literature and based on a number of assumptions.

Information of resource use linked to the intervention and usual care applicable to the UK was not directly available from the literature. Instead the analysis took synthesised data on the relative effects of the intervention on service use outcomes based on 2 high quality meta-analyses. A number of assumptions were needed in order to translate effects on service use outcomes into expected changes in resource use and costs in the UK context.

Studies did not report on the costs of the interventions separately and instead, they were presented as part of total hospital costs which were found to be lower in the intervention group. This leaves out some important information and detail that would be allowed a better insight as to whether those costs are likely to be transferable to the UK context. However, a recent study found that the average costs of comprehensive geriatric assessment in England were as low as £99 (Tanajeweski et al 2015).

The analysis had to make assumptions about the costs of unpaid care, which were not included as part of the studies reviewed in the 2 meta-analyses. They were taken from a separate source and referred to people with mild dementia. However, the source was considered high quality and the population was considered to have similar needs in regards to informal or unpaid care than the population in this study.

6 HOW FINDINGS INFORMED THE GUIDELINE RECOMMENDATIONS

The Guideline Committee used the findings of this report to develop and strengthen a number of recommendations on the provision of care for older people with complex needs specified in Section 3.8 of the guideline:

‘1.3.10 Start a comprehensive assessment of older people with complex needs at the point of admission and preferably in a specialist unit for older people.’

‘1.4.4 Provide care for older people with complex needs in a specialist, geriatrician-led unit or on a specialist geriatrician-led ward.’

Furthermore, informed by this analysis, a research recommendation was derived for this economic priority area. Based on the review of economic evidence and the findings of the economic analysis, which confirmed the likely cost-effectiveness of comprehensive geriatric assessment and care, the need for evaluative cost-effectiveness evidence of the different models of comprehensive geriatric assessment and care was identified. The research recommendation is outlined with detail on background and methodology in Section 2.4 of the long guideline.

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