Intermediate care

Appendix C3: Economic report

This 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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1 OVERVIEW AND AIMS

The aim of the economic work was to contribute to the guideline's development by providing evidence on the cost-effectiveness of intermediate care interventions or approaches towards intermediate care.

This was achieved by:
(a) Systematic literature review of existing economic evidence
(b) Decision-analytic economic modelling.

Scoping and systematic reviews of economic literature were conducted for all areas covered by the guideline and in particular for the review questions in the guideline that referred to cost-effectiveness questions. Economic modelling was undertaken in accordance with *The Guidelines Manual* (NICE, 2015) for areas: with large resource implications, with substantial uncertainty over cost-effectiveness, and in which economic analysis was expected to reduce this uncertainty. Prioritisation of areas for economic modelling was a joint decision between the Economist working on this Guideline, the Guideline Committee (GC), the NCCSC and NICE.

The rationale for prioritising review questions for economic modelling was set out in an Economic Plan, which had been developed by the Economist and agreed with the GC, NCCSC and NICE. The following review questions were selected as priority areas that were addressed by economic modelling:

- **Q2. What is the effectiveness and cost-effectiveness of bed based intermediate care?**
- **Q4. What is the effectiveness and cost-effectiveness of reablement?**

Briefly, the rational for choosing these areas was based on their expected impact on costs and outcomes, which related to a large proportion of the population covered in the scope. It is important to note that hospital-at-home services (as a form of home based intermediate care) were initially selected as a priority area in addition to reablement. However, the GC discussed the challenges of defining hospital-at-home as a form of intermediate care. After lengthy discussions as well as consultation with a researcher specialised in this area it was agreed that only certain forms of hospital-at-home services would fall under the category of intermediate care and the GC agreed that the applicability of those few schemes to current practice was limited. The GC also thought that the control groups (i.e. acute hospital care) in the reviewed studies did not reflect current practice, which included other types of intermediate care. The GC decided that modelling in this area would not be relevant and that it was more relevant to investigate the cost-effectiveness of certain forms of bed based intermediate care.

In terms of potential resource impact, it is important to note that both, bed based intermediate care and reablement, are publicly funded interventions. However, bed based intermediate care is funded by the NHS, whereas reablement is funded by local authorities or jointly between local authorities and NHS.

2 SYSTEMATIC LITERATURE REVIEW

Search strategy for economic evidence

Scoping searches

The NCCSC carried out a broad preliminary search of the literature in December 2014 to obtain an overview of the issues likely to be covered by the scope, and help define key areas. Searches were conducted in the following databases using the terms: reablement, intermediate care and cost-effectiveness:

- Social Care Online
- NHS Evidence
- TRIP Database
- PUBMED
- The Cochrane library (containing economic studies)
- The CRD library
- The Campbell library
- Google and Google Scholar

In addition, searches were carried out using a range of organisational websites.

Relevant economic evidence arising from the general scoping searches was also made available to the Economist during the same period and was reviewed by the Economist to inform the Economic Plan.

Systematic literature searches

After the scope was finalised, a variety of systematic search strategies (protocols) were developed to locate the relevant evidence to each review question. This also included a final update search (protocol) for the time period covering development (1 year).

The balance between sensitivity (the power to identify all studies on a particular topic) and specificity (the ability to exclude irrelevant studies from the results) was carefully considered, and a decision made to utilise a broad approach to searching to maximise retrieval of evidence to all parts of the guideline.

In addition to searches of EconLit, CRD, NHS EED and the Cochrane Library, the following searches were carried for the two review questions Q2. and Q4.:

Q2: What is the cost-effectiveness of bed based intermediate care?

Searches were restricted to 2005 - 2015 and the following databases were searched:

- British Nursing Index (BNI)
- Medical Literature Analysis and Retrieval System Online (MEDLINE)
- ProQuest Hospital Collection – Nursing & Allied Health source
- Cumulative Index to Nursing and Allied Health Literature (CINAHL)
- Health Management Information Consortium (HMIC)
- Social Policy and Practice (SPP)
- Abstracts in Social Gerontology
- SocINDEX
- ECONLIT

In addition, a number of organisational websites were searched.

A Medline test search strategy was agreed with the GC within the formulation of the review protocol (for full detail of search strategy and rational see Appendix A).

Q4. What is the cost-effectiveness of reablement?

Searches were not restricted by date to capture all information surrounding the reablement as an intervention (as agreed with GC) and for question four the following databases were searched:

Databases

- Allied and Complementary Medicine Database (AMED)
- Cochrane Database of Systematic Reviews (Cochrane Library)
- Cumulative Index to Nursing and Allied Health Literature (CINAHL)
- Excerpta Medica database (Embase)
- Medical Literature Analysis and Retrieval System Online (MEDLINE)
- British Nursing Index (BNI)
- Applied Social Sciences Index and Abstracts (ASSIA)
- Social Policy and Practice (SPP) Inc. Social Online & others
- SocINDEX
- Ageline
- Social Services Abstracts
- IBSS International bibliography of social sciences

- PsycINFO

In addition, a number of organisational websites were searched.

A Medline test search strategy was agreed with the GC within the formulation of the review protocol (for full detail of search strategy and rational see Appendix A).

Additional pragmatic searches were carried out by the Economist following snowballing and similar approaches in line with the NICE Manual.

3 ECONOMIC MODELLING

2.1 Economic area C (Review question Q.2): Cost-effectiveness of bed based intermediate care

Introduction: Summary of economic evidence and the aims of economic modelling

Evidence that we reviewed in the area of bed-based intermediate care referred to four economic evaluations, all of which were carried out in England. Two of the studies referred to nurse-led bed based intermediate care (Walsh et al 2005; Harris et 2005). A third study was a cost-utility analysis (Reilly et al 2008) embedded within a randomised controlled trial and compared a multi-disciplinary post acute care intervention provided to older people in community hospitals with provision in general hospitals. Reilly et al (2008 ++) presented incremental cost-effectiveness ratios suggesting that the cost-effectiveness of post-acute rehabilitation for older people was similar in community hospitals and general hospitals. The fourth study by Ellis et al (2006 ++) compared a short-term rehabilitation unit with standard care and did not find that this type of intervention was likely to be cost-effective (measured in cost per day living which were higher in the intervention group. The GC decided for both studies that findings could be used to inform recommendations and that no further analysis was required.

In regards to nurse-led bed intermediate care, the two reviewed studies referred to older people in hospital who were stable but not ready yet for discharge. The two economic evaluations (Harris et al 2005 ++; Walsh et al 2005 ++) compared nurse-led units (in hospital or on hospital site) with standard care in medical wards; both studies evaluated costs and outcomes between baseline and follow-up of 6 months. The cost-effectiveness study by Harris et al (2005; N=175) compared a nursing-led inpatient unit situated in an acute hospital with standard care in medical wards. The intervention led to non-significantly higher mean change (improvement) in physical functioning (including Activities of Daily Living and mobility) measured with the Barthel Index (3.6 vs. 2.6; p-value not reported). There was no difference in any of the other outcomes i.e. mortality, discharge destination or readmission (P-values not reported). The mean cost per hospital stay (when using a detailed, bottom-up costing approach) was £5,144 in the intervention and £4,100 in the comparison group but the difference (£1,044) was not significant (P=0.15). Using a (less accurate) top-down costing approach (from budget data), mean difference in costs became significant (£1,607; P=0.05). Using a mixed method approach, the mean difference was, again, not significant (£1,019; P=0.142). Mean costs of post-discharge care per week including discharge destination were non-significantly lower in intervention group (£374.9 vs. £402; P=0.25). Despite these lower post-discharge costs (indicating a substitution effect between inpatient and community health and social care provision), the greater length of stay led to overall higher total costs. In this study, post-discharge costs were estimated based on information recorded in the discharge plan and included occupational, physio- and speech therapists, social worker, and dieticians; the study did not specify a time period over which those were collected. Furthermore, the cost perspective was limited to activity of the participating hospital and did not include important costs such as those of care home, home care, and hospital readmission.

Due to the chosen outcome measure and a limited cost perspective it was not possible to derive final conclusions about the cost-effectiveness of nurse-led bed based intermediate care from this study. In addition, whilst the study presented the incremental cost-effectiveness ratio of £1,044 per point improvement of Barthel Index, this could not be compared with findings from other studies in this or in related areas, since this is not a common way of reporting findings at the moment.

The other paper referred to a cost-minimisation study by Walsh et al (2005; N=238) carried out as part of a multi-centre RCT. The study compared a nurse-led unit located on the site of (but not in) the hospital with care in the general ward. Outcomes measured included length of stay in hospital, physical functioning (measured with the Barthel Index), mortality and destination of discharge. As in Harris et al (2005) the mean length of hospital stay was significantly longer in the intervention group (41.1 days vs. 39.5 days; standard deviations 32 vs. 31). Other outcomes such physical functioning did not significantly change (values were not published in this paper but in paper to parent study by Steiner et al 2001). The study found that initial admission costs were significantly higher in the intervention group (£7,892 vs. £4,810; diff CI: +£3,082, CI: £1,161 to £5,002); costs of readmissions were lower during the period measured (6 months follow up) £1,444 vs. £1,879 (diff -435, CI: -£1,406 to - £536); but total costs were still significantly higher (£10,529 vs. £7,819; diff +£2,710, CI: £518 to £4,903). Confirming the findings from Harris et al (2005), post-discharge costs were significantly lower in the intervention group but not low enough to offset the higher costs of the initial hospital and intermediate care episode. Post-discharge costs in Walsh et al (2005) referred to physiotherapist, outpatient care, primary and community care (including long-term care) over the period of six months. Authors concluded that acute hospitals might not be cost-effective settings for nurse-led intermediate care. However, they also explained that the small size of the unit and the location distant from the main hospital site contributed to higher costs. The authors thus suggest that implementing the intervention in community hospitals may be more appropriate in order to reduce costs.

However, as with Harris et al the cost perspective was focused primarily on secondary care NHS services and did not include the costs of care home and home care for example. For both studies it was unclear whether the intervention would offset costs if a follow-up time of more than 6 months and a more comprehensive cost perspective was applied. This is important as social care and health care costs are closely interlinked, and investing in health intervention at the interface between hospital and home is likely to have positive knock-on effects on social care (Forder et al 2009).

In addition, a Cochrane systematic review by Griffith et al (2007) on nurse-led bed based intermediate care was identified. Whilst the study was not included in the overall systematic review work because the single studies included in the review were of older date (so has not been quality assessed), synthesised findings on effects could importantly inform the modelling. The review showed - in addition to significantly higher increases in functioning outcomes measured with Barthel Index (SMD=0.37, 95% CI 0.2 to 0.54) - the following:

- A significant reduction in discharge to a care home (OR 0.44 95% 0.22 to 0.89 (but no significant reduction in institutional care at follow up of 6 months),
- A significant increase in inpatient stay (WMD 5.13 days 95% CI -0.5days to 10.76 days);
- A significant reduction in hospital early readmission (OR 0.33 95% CI 0.12 to 0.94).

The GC decided that modelling in this area would be important for two reasons in particular: i) the two economic evaluations did not include the costs linked to care home admission which – as suggested by findings of the systematic review – were important to consider; ii) the average length of hospital stay had substantially changed since the time when the studies were carried out and this was likely to influence the relative difference in acute care costs between intervention and control group (possibly to the benefit of the control group as the average length of stay on the general medical ward were longer). The GC agreed that area of bed-based intermediate care was an area of substantial resource implications and that modelling would add importantly to the evidence required to make recommendations. The GC decided that the nurse-led model of bed based intermediate care was sufficiently applicable to the current context of care provision. The group agreed that this type of service was nowadays more commonly led by therapists rather than nurses, but that the model itself was relevant as it followed the same principles of provision and consisted of the same elements of care. This decision was made by the GC based on the description of nurse-led bed based intermediate care as provided in Griffith et al (2007). It referred to non-medical rehabilitation with a therapeutic focus. Principles and elements of care included:

- Nurse acting as identified leader of a clinical team replacing medical management; this included an authority to admit and discharge patients;
- Discharge planning as common part of the care package;
- Patient-centeredness as reflected for example in a more therapeutic and homely environment.

In addition to the evidence described above, the GC pointed towards the 2015 National Audit on Intermediate Care (NAIC) as an important data source for economic modelling.

Since evidence from the systematic review and the trials that informed the economic evaluations consistently showed that outcomes at follow-up (such as functional status) were either the same or better (although not significantly) for nurse-led bed based intermediate care, it was agreed with the GC that it was appropriate to answer the economic question by examining cost savings (i.e. initial costs and cost consequences) of nurse-led bed based intermediate care in comparison to standard care. Furthermore, it was agreed that a perspective of one year was appropriate since the evidence did not suggest an impact on costs (or outcomes) beyond one year.

Therefore, an economic model was developed to examine the cost savings (i.e. initial costs and cost consequences) of nurse-led bed based intermediate care for older people in England compared with standard care.

Study population

The baseline model was developed for a hypothetical cohort of 1,000 older people (mean age 70yrs) who were stable hospital patients post-acute care but not yet ready for discharge. The age of 70 years was chosen because it was the mean age found in the systematic review by Griffith et al (2007).

Economic modelling methods

Interventions

Older people in the intervention group received acute care followed by nurse-led bed based intermediate care provided in the way described earlier with the following elements in place: Nurse leading clinical team including authority to admit and discharge patients; discharge planning; patient-centeredness. Based on figures in the Walsh et al study, a very small proportion also received an episode of intermediate care provided in community hospital. Older people in the standard care group received acute care and (for a proportion of individuals) traditional rehabilitation or referral to community hospitals. In addition, as discussed in Griffith et al (2207) people in the standard care group receive additional home care for the time that people were on average at home earlier than people in the intervention group.

Type of economic analysis

The analysis was a cost savings one. This method was judged appropriate and the most suitable option by the economist and the GC because studies showed that nurse-led bed based intermediate care led either to the same or better outcomes in functioning. Previous studies in this area suggested that nurse-led bed based intermediate care might be more costly but such studies did not consider costs of social care in form of care home provision, which according to Griffith et al (2007) were lower in the intervention group (although only at discharge and not at 6 months).

It is important to note that the same systematic review found some evidence suggesting that – whilst improvements in functioning and other health and wellbeing outcomes were greater in the intervention group – short-term mortality at discharge (but not at follow up) might be negatively affected by nurse-led bed based intermediate care. This aspect is was included in the analysis as explained later on.

Model structure

A decision-analytic model was developed using Microsoft Office Excel 2010. A model covering the period of one year was judged as the most appropriate method because evidence from the systematic review by Griffith et al (2007) suggested that effects, including for cost-relevant outcomes did not extend beyond one year. In the model, a hypothetical cohort of 1,000 post-acute care patients with a mean age of 70 years was followed over. At the beginning patients could either be referred to nurse-led bed based intermediate care or they received standard care. During the year persons could experience the following events: they could either be discharged to a care home, they could die during the hospital stay or they could move to their own home. People who did not die during the hospital stay could either have an early hospital readmission (within 3 months of discharge) or they could have no further event.

Perspective used in the economic model
The economic modelling adopted the perspective of the NHS and Personal Social Services (PSS). This meant only health and social care costs from a public sector perspective were considered. Costs included those of: hospital care (for initial hospital episode and early readmission), nurse-led bed based intermediate care, other forms of intermediate care (typically community hospital), home care and care home. The modelling did not include individuals' health and wellbeing outcomes because the chosen type of analysis was a costs savings one.

Input parameters to the economic model
All parameters that were used in the model are shown in Table 1. The following is a detailed explanation of how they were derived.

Costs of interventions
Costs of the interventions referred to costs of the initial care package provided for people who received nurse-led bed based intermediate care and those who received standard care.

Costs of this care package included the following elements:
- Costs of acute care in general medical ward;
- Costs of nurse-led bed based intermediate care
- Costs of alternative forms of intermediate care (provided in a community hospital);
- Costs of home care (for those receiving standard care).

Each of these elements of care were included as part of the initial care package (or episode) as they were interdependent: for example people in the intervention group typically had a shorter stay on acute wards because they were referred earlier to nurse-led bed based intermediate care; and people in the control group returned home earlier because they had overall shorter inpatient stays (this referred to acute medical ward plus if all care facilities were considered) and thus required – on average - additional home care.

In order to estimate the mean costs of care packages, unit costs (i.e. costs per day or week) for such services were multiplied with the mean service use (measured in days or weeks) per person in each of the two groups. Unit costs were available from national sources representing latest figures applicable to England. They are presented in Table 2. The mean use of services could be derived from Walsh et al (2005): the study presented mean costs of each service per person and unit costs so that mean frequencies could be derived by simple division.

- The mean length of hospital acute care was 5.7 days in the intervention group and 20.2 days in the control group. However, because the mean hospital length of stay had substantially reduced since the time of the study, an adjustment was made. National audit data from 2014-15 showed an average length of hospital stay for older people of 11.9 days reflecting a 59% reduction compared with the length of stay in the control group in Walsh et al (2005). This proportion was applied to the Walsh et al. data for acute care: the new mean length of acute care was 3.4 days in the intervention group (versus 11.9 days in the standard care group).

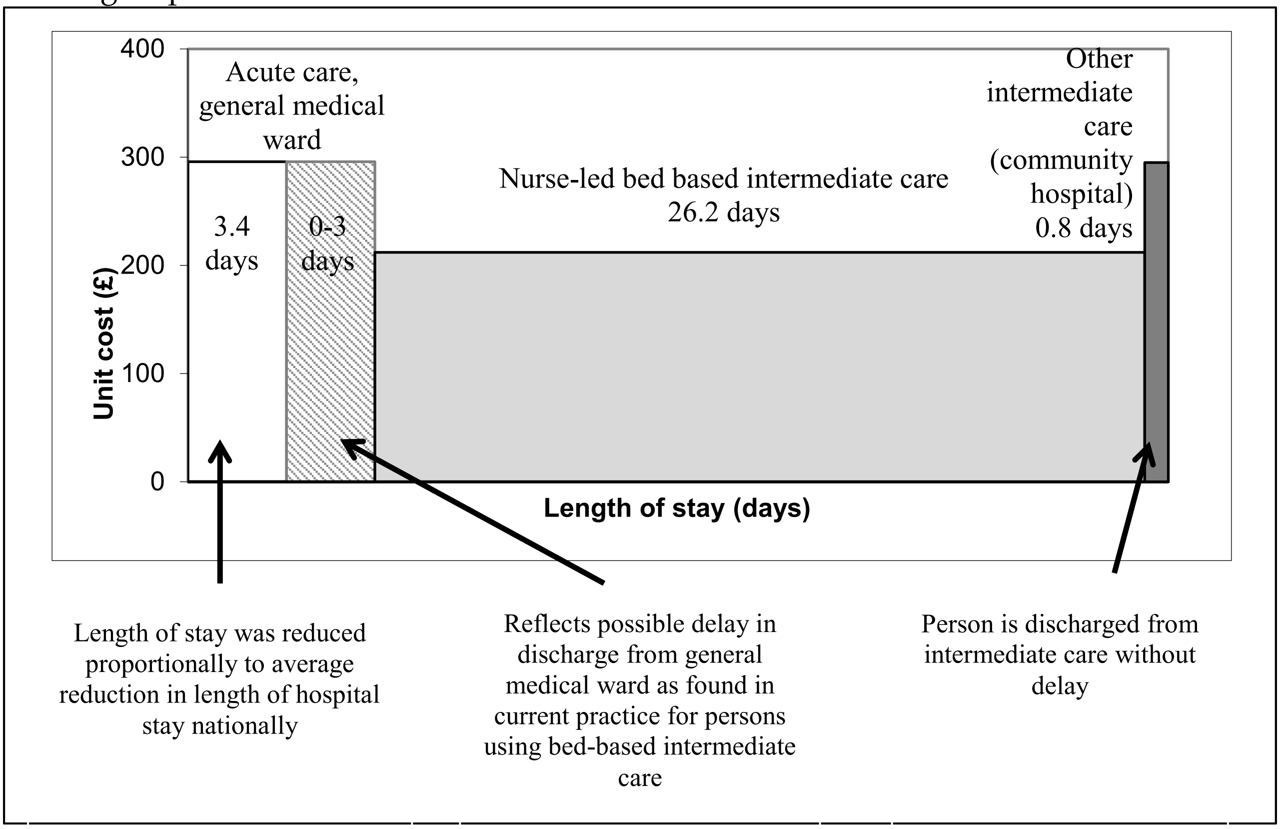
- The mean length of stay for nurse-led bed based intermediate care in the intervention group in the Walsh study of 26.2 days was almost the same as the current one of 26.8 days (NAIC 2015) so that no adjustment was required. Other forms of intermediate care used by both the intervention and control groups referred to community hospital services. They were 0.8 days in the intervention and 8.3 days in the control group and no further adjustments were made.

- People receiving standard care were likely to require additional home care as they were – on average - discharged home earlier and with lower functioning status compared to people receiving nurse-led bed based intermediate care. However, none of the studies measured the use of home care. The GC agreed that it should be assumed that people receiving standard care got additional home care for the days that they were discharged home earlier compared to the intervention group. Since economic analysis is always incremental, only the difference in days of home care provided between intervention and control group was needed. This meant the additional number of days of home care was calculated as the difference between the mean number of days in acute care and intermediate care spent by people receiving the intervention (30.4 days) and those not receiving the intervention (20.2 days). The figure was 10.2 days.

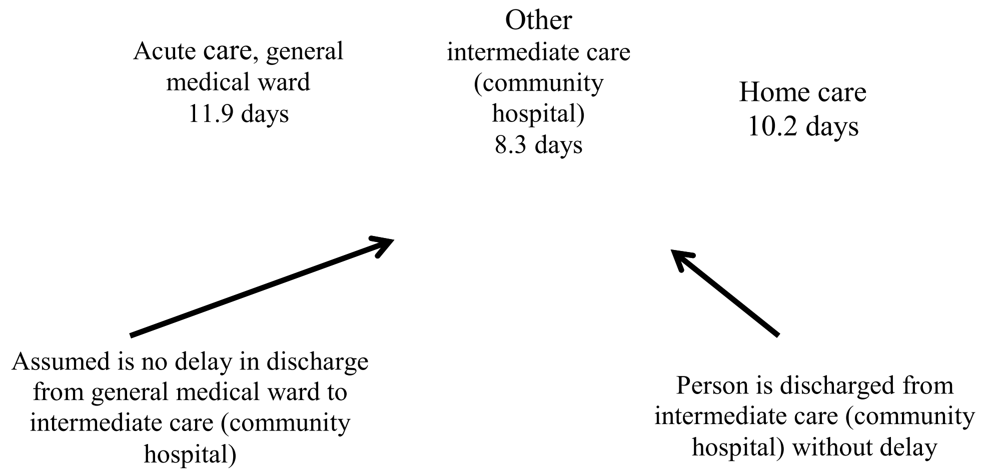
Graphs 1 and 2 illustrate how costs have been derived for the initial care packages or episodes of the two groups (nurse-led bed based intermediate care and standard care) by showing the pathway assumed in the calculations. Information is provided about unit costs, mean lengths of stays and the underlying assumptions.

The mean costs of the care packages as shown in Graphs 1 and 2 were £6,783 for people receiving nurse-led bed based intermediate care and £6,252 for people receiving standard care. This referred to the mean lengths of stay and unit costs shown in Graphs 1 and 2 and described above.

Graph 1: Illustration of initial care episode (care package) in intervention group



Graph 2: Illustration of initial care episode (care package) in control group



Cost consequences
In addition to the initial costs of care, costs were calculated that referred to differences in cost-relevant outcomes as a result of nurse-led bed based intermediate care. Those cost-consequences included hospital costs after discharge due to early hospital readmission (measured up to at 30 days after discharge) and costs of care home admission. To calculate the cost consequences, probabilities for each outcome were derived for people receiving the intervention and those receiving standard care.

Probabilities in standard care were derived from odds that were available from Steiner et al (2001), which presented the detailed results from the mother trial of the Walsh et al study.

Probabilities (p) were derived from odds using the standard formula:

$$p = \exp(\ln(\text{odds})) / (1 + \exp(\ln(\text{odds})))$$

Effect sizes in form of odds ratios were taken from Steiner et al (2001). They were multiplied with the odds of outcomes in standard care to get the odds of outcomes for people receiving the intervention; odds were then transformed into probabilities.

Resource use and cost data
Costs associated with the alternative strategies were calculated combining resource use estimates with respective national unit costs. National unit costs were taken from recognised sources including the most recent versions of PSSRU Unit Costs for Health and Social Care and the NHS reference costs 2014 to 2015.

In regards to valuing costs of care home admission, an assumption was made regarding the average number of days that the control group stayed longer in a care home compared to the intervention group. Since there was evidence from Griffith et al (2007) suggesting that there were no longer significant differences between intervention and control groups at 6 months the GC agreed that it was appropriate to refer the costs of care home stay to a 3 months period.

In addition, an adjustment was made to reflect a non-significant higher risk of mortality during the inpatient stay in the intervention group (OR=1.1, 95% CI 0.56 to 2.16). Since patients who died in hospital were likely to be discharged to a care home if they had survived the inpatient stay, the cost of care home stay of 3 months was assigned to this additional risk of death in hospital.

Price levels and discounting
All costs were valued in 2014/15 UK pounds. Where necessary costs were uprated to 2014/15 prices using the Hospital and Community Health Services (HCHS) pay and price inflator. Since the model was a short-term one of one year discounting was not required.

Data analysis and presentation of results
In order to take into account the uncertainty of some of the model input parameters probabilistic sensitivity analysis was carried out using the following distributions for the parameters identified at high risk of uncertainty:

- Beta distributions were applied to probabilities of discharge into care home, death in hospital and early hospital readmission in the standard care group;

- Normal distribution was applied to relative risk of early hospital readmission, death in hospital and discharge into care home.

The choice of distributions was made following recommended standards (Sculpher, 2004)

Where estimates were provided in the literature as deterministic values, and no further information was available on upper or lower ranges, a lower and upper bound was set as -/+ 10% (and 20%) of the deterministic value.

Uncertainty was then propagated through the model using 1,000 Monte Carlo simulations. Probabilistic sensitivity analysis has the advantage that it takes account of the full distribution of parameters based on available evidence

In addition to the baseline scenario, the impact of changing particular uncertain parameters on findings was explored:

- The 2015 NAIC report showed that people spent on average 3 days on an acute ward waiting for bed based intermediate care. The impact of adding those to the current mean of 3.4 days for people receiving nurse-led bed based intermediate care was thus examined.

- Estimates for the unit costs for nurse-led intermediate care were derived from the NIAC report, which presents national averages of costs of different models of intermediate care based on annual budget data. It needs to be noted that the estimate referred to different types of bed-based intermediate care (not just nurse-led ones) but the Guideline Committee agreed that the estimates were appropriate and reflected costs of nurse-led intermediate care. The impact of decreasing or increasing this particular cost by 10% and 20% was explored in one-way sensitivity. Since all values were also subject to probabilistic sensitivity analysis and the Guideline Committee was confident about the robustness and applicability of these cost estimates, the 10% and 20% boundaries were considered appropriate to explore an impact on findings.

Table 1: Input parameters for modelling (for baseline scenario)

	Mean or deterministic value	Value range	Source of data – comments
Probabilities in standard care group			
Early hospital re-admission	20%	-	Steiner et al (2001); derived from odds of readmission in control group
Discharge from hospital into care home	14.5%	-	Steiner et al (2001); derived from odds of care home admission at discharge in control group
Death during initial hospital stay	6.5%	-	Steiner et al (2001); derived from odds of death during initial hospital stay in control group
Relative risks (nurse-led bed based intermediate care vs. standard care)			
Early hospital re-admission	0.55	0.36-0.83	Derived from Steiner et al (2001)
Discharge from hospital into care home	0.54	0.23-0.9	Derived from Steiner et al (2001)
Death during initial hospital stay	0.81	0.57-1.9	Derived from Steiner et al (2001)

Table 2 Unit costs (£, in 2014/15 prices)

Cost parameter	Deterministic value	Value Range	Source of data, comments

Cost of acute care during initial hospital stay, per day	295.8	-*	National Schedule of Reference costs year: 2014-15; refers to mean unit cost for non-elective excess bed day
Cost of nurse-led bed based intermediate care, per day	212	-*	NAIC (2015); refers to mean costs of bed-based intermediate care per service user (£5,672) divided by average length of stay (26.8days)
Costs of home care, per week	195	-*	Personal Social Services (PSS): Expenditure and Unit Costs, England, 2013-14 Final release, Table 6.1, uprated to 2014/15 price levels using the HCHS pay and price inflator
Cost of community hospital, per day	301	143 - 459	Young J et al (2013); uprated to 2014/15 price levels using the HCHS pay and price inflator
Costs of care home	842	758-926	Derived from PSSRU Unit Costs for Health and Social Care (2015); present an average of establishment costs for local authority residential care (£1,100), private sector residential care (£595) and private sector nursing home (£821); +/-10% for value range

* Value range of +/-10%/20% was applied

Findings and discussion

The findings showed that costs for individuals receiving nurse-led bed based intermediate care compared to those for individuals receiving standard care were lower with 81% probability. The mean cost per person for the intervention group was £8,570 and for the standard care group £9,180. The mean cost saving per person was £610.

The results were highly sensitive to the length of stay in acute care on the general medical ward before transfer to nurse-led bed based intermediate care (see Table 3). For example, the mean cost saving became negative leading to additional costs of £213 when the additional 3 days waiting list was applied and the probability that the intervention was cost saving was only 39.4%. The threshold was between 2 and 2.5 days suggesting that any delay in the transfer from acute setting to nurse-led based intermediate care of more than 2 days would mean the intervention was no longer saving costs.

Table 3 One-way sensitivity analyses: Delay in discharge from acute medical ward to nurse-led bed based intermediate care

Delay in discharge	1 day	2 days	2.5 days	3 days
Mean cost saving (in £)	352	42.1	-106.2	-213
Probability of cost saving (in %)	69.3%	52%	44%	39.4%

Findings were also sensitive – although to a lesser extent – to an increase of the unit costs of nurse-led bed based intermediate care (Table 4): If unit costs increased by 10% the intervention was still just about cost-saving (the probability that the intervention led to cost savings was 52.3% and the mean cost saving was only £4.4) but if it increased by 20% the intervention was not cost-effective any longer (the probability that the intervention led to cost savings was 23.3% and the average cost saving was only -£535).

Table 4 One-way sensitivity analyses: Unit costs of nurse-led bed based intermediate care and of community hospital

	Unit cost of nurse-led bed based intermediate care		Unit cost of community hospital (=other intermediate care)	
	+10%	*-10%*	*+10%*	*-10%*
Mean cost saving (in £)	4.35	1,145	841.5	396.7
Probability of cost saving (in %)	52.3	96.2	90.1	73.5
	+20%	*-20%*	*+20%*	*-20%*
Mean cost saving (in £)	-535	1,1735	1,034	173
Probability of cost saving (in %)	23.3	99.6	94.0	61.8

The results of the economic analysis suggested that nurse-led bed based intermediate care was cost-effective in the base case scenario: Whilst outcomes in functioning were the same or better (although sometimes not significantly) compared with standard care (as shown in the evidence presented above), costs of this particular bed-based intermediate care model were lower than the costs of standard care. **However, results were highly sensitive** to changes in parameters such as the number of days that patients stayed on the general medical ward and – although to a lesser extent - the costs of nurse-led bed based intermediate care. In current practice (which according to NAIC 2015 includes a waiting time of 3 days on the general medical ward), the intervention is unlikely to be cost effective. Thus, this type of bed based intermediate care interventions was a cost-effective option only under certain conditions such as when costs did not exceed £233 per day and when the referral from the acute wards is made promptly without delay.

One of the main limitations of the economic analysis was that, due to lack of available evidence, a number of the estimates used in the economic model were based on single studies and on expert opinion. This included in particular the estimation of home care in the comparison group. The use of probabilistic sensitivity analysis was thus particularly important as it sought to reduce the impact of those limitations.

As noted before, the GC decided that findings in relation to outcomes and costs of the nurse-led bed based intermediate care model were applicable to the therapist-led model of bed based intermediate care and supported the use of bed based intermediate care more generally. The Committee agreed that costs were likely to be the same or very similar in both types of models because they employed the same staff and differences between the models only referred to the arrangement in leadership role. Furthermore the Committee agreed that there was no reason to belief that outcomes were affected by whether it was a nurse or a therapist taking lead positions.

2.2 Economic area D (Review question Q.4): Cost-effectiveness of reablement

Introduction: Summary of economic evidence and the aims of economic modelling

Four economic studies were identified, which evaluated costs and resource use linked to reablement (McLeod and Mair 2009; Glendinning et al, 2010; Lewin et al, 2013; Lewin et al, 2014). Each of the four studies had control groups; only one study was an RCT (Lewin et al, 2014) and only one study evaluated individual health and wellbeing outcomes in addition to costs and resource use (Glendinning et al, 2010). Studies varied in the way they evaluated resource use; two studies applied a very narrow cost perspective in which only the use of home care was evaluated (Lewin et al 2013; McLeod and Mair 2009). The same two studies also had low reporting quality. For example, they used matched control groups without reporting in sufficient detail how other factors, that might have influenced the findings, were statistically controlled for. In addition, they did not present uncertainties of findings in form of p-values or confidence intervals. Furthermore, one of the two studies had a very short time horizon (McLeod and Mair 2009). As a result the two studies were assessed as insufficiently applicable to the review question.

The two studies assessed as sufficiently applicable were Glendinning et al (2010 +; N=974) and Lewin et al (2014 ++; N=750). The England-based study (Glendinning et al, 2010) was a large prospective longitudinal study, which compared reablement offered in different local authority sites with standard home care and found that reablement had a probability to be cost-effective at 12 months of just under 100%. Findings of the sensitivity analysis showed, that in a worst-case scenario the probability that reablement was cost-effective was still 70%. Costs included those to the NHS and Personal Social Services. Individuals' health outcomes were measured with the EQ-5D and were significantly greater in the intervention group (mean diff. 0.1, 95% CI 0.02 to 0.18). Total social care costs (without the costs of reablement) were significantly lower in the reablement group than in the comparison group at 10 months (£790 vs. £2,240; p<0.001). Total health care costs were higher in the reablement group (£3,455 vs. £3,235) but this was not significant (p>0.05). Overall total costs at 12 months (with imputed missing values) were £7,890 (SD £5,380) in the reablement group and £7,560 (SD £6,090) in the comparison group. The matched control group differed significantly from the intervention group in terms of proportions referred from hospital, which was much greater in the reablement group. A wide range of statistical methods were applied to test differences in baseline; a sometimes low reporting quality made it difficult to understand to what extent other factors had been appropriately controlled for. However, sensitivity analysis for the costs of reablement and bootstrapping was applied on combined cost-effectiveness results, which increased reliability of those findings. Altogether, the study had some potentially serious limitations and findings about cost-effectiveness could not directly inform the recommendations.

The other study was a RCT carried out in Australia (Lewin et al, 2014, ++, N=750) and compared a reablement intervention, called the Home Independence Program, with standard home and community care. The population were older people of 65 years or above, who were referred to home care. The intervention had a time limit of 3 months and, in addition to delivering a strongly independence focused approach, provided access to assistive technology, mobility, self-management, falls prevention, medication, continence and nutrition management programmes as well as assistance with social support. The study was a cost saving analysis, which evaluated health and social care service use and respective costs. Mean total home care cost per person over the two years period were AU $5,833 in the reablement group versus AU $8,374 in the comparison group (p-value not reported); costs of emergency visits over the two years were AU $686 in the reablement group versus AU $708 in the comparison group and costs of hospital admissions over the same period were AU $13,369 versus AU $13,675 (p-values not reported). Total costs were lower by a factor of 0.83 in the reablement group (RR 0.83; 95% CI 0.72 to 0.99); total costs in the reablement group were AU $19,090 and AU $ 23,428 in the comparison group. The study also evaluated the number of individuals needing personal care and individuals approved for residential care (or equivalent home care package) and found, at study end, a significantly lower number in the intervention group for both outcomes (11.4% vs. 34.5%; p<0.001 and 64.3% vs. 56%; p=0.021). Altogether the study was of overall good quality; however, the study looked at cost savings in the Australian system so that the transferability of findings on service use would need to be analysed in a UK context. Furthermore, it is important to note that the study referred to an average intervention period of 12 weeks (3 months) whereas reablement in England is typically provided for 6 weeks (1.5 months).

The GC decided that modelling in this area would be important. The area of reablement was considered by the GC as an area of substantial resource implications, with care being fully funded to those who are eligible. Evidence from Lewin et al (2014 ++) was judged to be appropriate to inform economic modelling. In addition, the GC pointed towards the 2015 National Audit on Intermediate Care (NAIC 2015) as an important data source for economic modelling.

In regards to the choice of type of economic evaluation, this was informed by the evidence and available data. Here it is important to note that the only source for health and wellbeing outcome data was the one full economic evaluation from Glendinng et al, (2010). The study measured individuals' health and wellbeing outcomes using health assessment tools that would have allowed the transformation into quality adjusted life years (QALY), the measure required for cost utility analysis. The study showed that health improved more in the intervention than in the control group. However, because of the methodological limitations, including differences in characteristics that were likely to have influenced differences in health outcomes between the two groups, data could not be used to inform the modelling. In particular, the non-randomised control group differed significantly from the intervention group in regards to the proportion of people referred from hospital, and this could have influenced their motivation and capacity for improvement. It was agreed with the GC that it was appropriate to address the economic question by examining costs and economic consequences of reablement (in comparison with home care). This decision was informed by the review of effectiveness evidence in this area, which consistently showed that reablement was linked to positive functioning and possibly wider health and wellbeing outcomes. There was no evidence of negative effects.

Therefore, a decision-analytic Markov model in form of a cost saving analysis was developed to examine the life-long economic consequences of reablement in England for older people compared with standard home care.

Study population

The baseline model was developed for a hypothetical group of 1,000 older people starting from when they were 65yrs. Sixty-five was the starting age used in the modelling as this was the age threshold applied in most studies (including in Lewin et al 2014) for recruiting older people. In additional sub-group analysis, 75yrs and 85yrs were used as starting ages reflecting the higher mean ages in when older people were offered reablement. It should be noted that the model focused on older people using publicly funded home care in the community (reablement as an 'intake' service) because there is currently a lack of data on privately funded home care (this is a general phenomena in social care, which was confirmed by the systemic review as part of this guideline).

Economic modelling method

Interventions

Reablement in the economic analysis referred to an intervention (called Home Independence Program) that was described in the Lewin study as a short-term individualised service that was usually funded for 12 weeks, and that was designed to promote the independence and minimise the need for ongoing support services. The intervention was goal oriented and promoted the active engagement of individuals in daily living activities using home and task redesign, work simplifications and assistive technology. It included one or several of the following components: Strength, balance and endurance programmes for improving or maintaining mobility, chronic disease self-management, falls prevention strategies, medication, continence and nutrition management, strategies to assist individuals to connect socially. The authors referred in their description of the intervention to the reablement model in the UK; vice versa UK studies on reablement often refer to similarities in approach with the Australian model. An important difference between England and Australia was the time period over which reablement was typically funded, which was on average double the length in Australia than in England (average time period reablement is currently funded in England is 6 weeks). The GC agreed that it was important to examine potential implications on costs of the interventions as well as on effects in the economic model.

Reablement was compared with standard home care, which in the Lewin study referred to on average three visits per week in which individuals received assistance with bathing/showering and with certain household tasks (such as cleaning and heavy laundry); social support and respite care was available on demand. In England, publicly funded home care primarily refers to personal care and we considered the average weekly use of home care by an older person above 65 years.

Type of economic analysis
The analysis was a cost-savings analysis which included the costs of interventions and valued the consequences linked to improved service outcomes in monetary terms.

Model structure
A decision-analytic model in the form of a Markov model was developed using Microsoft Office Excel 2010. A Markov model was considered the most appropriate model as the decision problem (reablement vs. standard home care) involved the risks of needing on-going home care and of hospital admissions that was continuous over time. Thus, a life time horizon was chosen in this model.

The model structure was based on two studies: Findings from Lewin and colleagues (2014) showed that these two service outcomes (need for ongoing home care and hospital admission) were affected by the intervention at follow-ups in the first and second year. Findings from the earlier study led by the same researcher (Lewin et al 2013) suggested that there were still differences in the need for on-going home care between the two groups at 3 years. The Lewin et al (2013) study was not of good enough quality to inform the parameters of the model but provided the rational for applying a longer time horizon within a Markov modelling approach.

In the baseline model, a hypothetical group of 1,000 home care users was followed starting from when individuals were 65 years to when they died. At the beginning, individuals either received reablement or continued using standard home care. Individuals in the model could experience a number of events that were modelled at a cycle of one year. The one-year cycle was chosen because most data were available at a yearly interval.

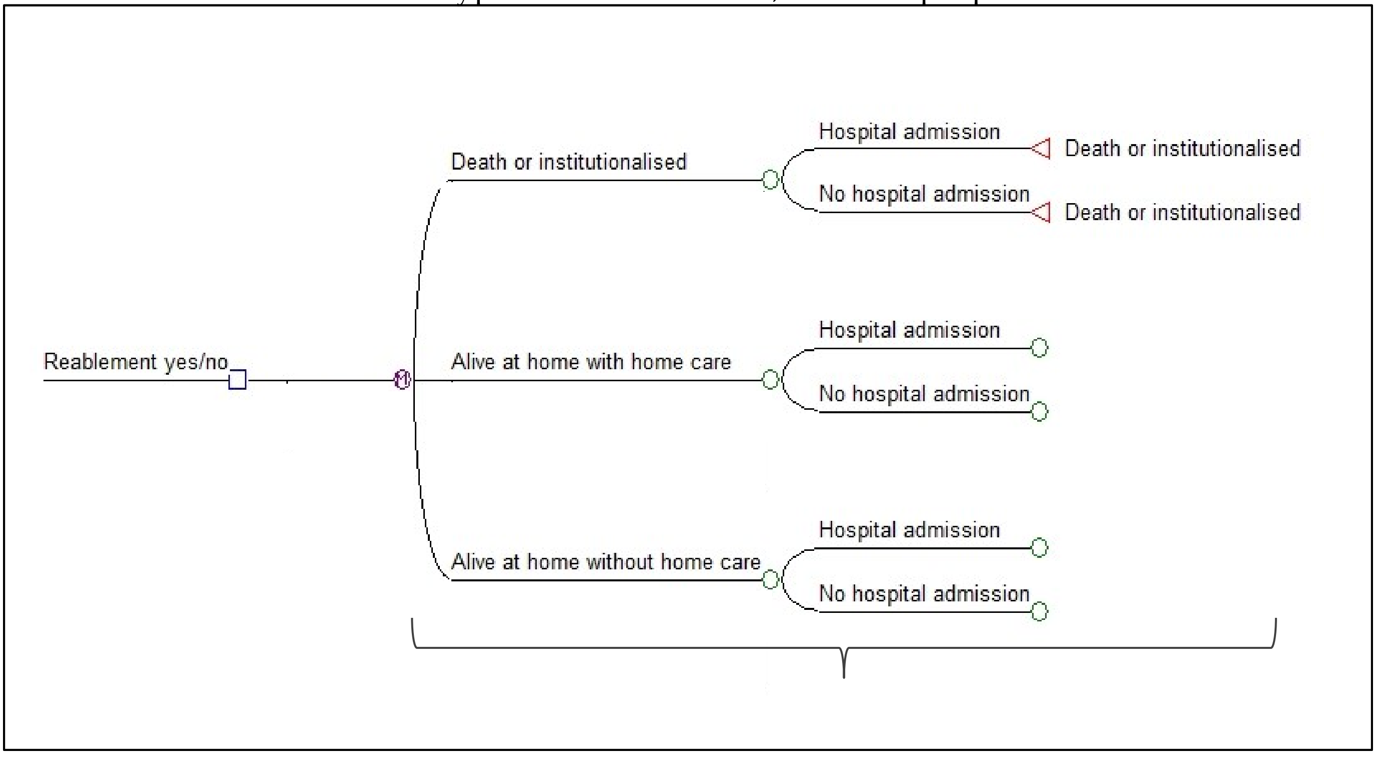
At each end of a cycle individuals were in one of the following states:

- Alive at home with *no further home care* required
- Alive at home with *further home care* required
- *Death* or admitted to a *care home*

Individuals could move from one state to another. The structure of the model included death and admission to care home as the absorbing states. Absorbing states are states that, once entered, cannot be left. The two states were summarized into one because there was no evidence that reablement or home care had an effect on the two outcomes and it was assumed that a person admitted to a care home could not return home, which reflects the reality for the vast majority of people admitted to a care home (e.g. Bebbington et al 2001).

As illustrated in Graph 3, during each of the states people can have an admission to a hospital. The inclusion of the risk of hospital admission into the model is discussed later on. The following section is concerned with describing the transition into the main event states, which informed the Transition Matrix.

Graph 3: Illustration of Markov model structure for reablement versus standard home care for a hypothetical cohort of 1,000 older people



1 cycle = 12 months

Transition matrix
In a Markov model, time is shown as discrete time points; in this case the transition from *one year* to the next; the relevant time parameters are transition probabilities.

Table 1 shows the transition matrix that informed the Markov model. In the table, t refers to the current year within the model and t+1 refers to the following year. The table can be thus read as follows: Someone being alive at home using home care in the current year has a 64% probability to still be alive at home requiring home care the following year, a 25% probability to be alive at home not requiring home care any longer and a 11% chance of being dead or admitted to a care home. Someone who is alive at home without home care in the current year has a 75% probability to require home care again in the following year, a 14% probability to remain at home without using home care and an 11% probability for dying or being admitted to a care home. The latter was based on an age-adjusted annual probability for death of 5.9% and an estimated annual probability of 4.9% for being admitted to care home (Table 2). Someone dead or in a care home in the current state remains dead or in a care home in the following year and cannot move to the other states anymore (which is why they are referred to as absorbing states and have a 100% probability). This assumption was made because only few people return home after being admitted to a care home and numbers on those are not available.

Transition probabilities were derived from national data sources that provided information on registered deaths and population estimates: Community Care Statistics 2014-15 and Office for National Statistics (ONS). There were no data on the probability for someone to move from being 'alive at home without care' to 'alive at home with care'. Instead, the Guideline Committee agreed to take a conservative probability of 75% assuming that a large majority of older people using home care who 'recovered' (i.e. did not require home care) in the current year (t) were then requiring home care again in the subsequent year (t+1). This was informed by GC's knowledge about current practice i.e. it was common that older aged service users after an episode of not requiring home care returned to needing home care again. Initial discussions were to take a lower value of 50% and 75% in one-way sensitivity analysis but the Guideline Committee agreed to take this conservative value of 75% for the base case.

In this context, it is important to note that Markov models make the simplifying assumption that the transition probabilities only depend on current state that an individual is in (memoryless property). For example, the model cannot consider the fact that a person might have a history of using home care, which determines their probabilities of needing home care in the future. To address this limitation, a relatively high estimate of 75% was taken for the baseline and the impact of even higher values was explored in sensitivity analysis. The probability for someone to move into the state 'alive at home without care' was a residual probability (with the sum of the values in each of the rows amounting to 100%).

Table 5 Transition matrix (for baseline scenario: 65yrs group)

	t+1		
t	Alive at home with care	Alive at home without care	Death or institutionalised
Alive at home with care	64%	25%	11%
Alive at home without care	75%	14%	11%
Death or institutionalised	0	0	100%

Perspective used in the economic model
The economic modelling adopted the perspective of the NHS and Personal Social Services. Therefore only health and social care costs from a public sector perspective were considered. Costs included the costs of reablement, costs of home care and hospital costs. The modelling did not include individuals' health and wellbeing outcomes because the chosen type of analysis was a costs saving one. It was not feasible to include unpaid care cost as none of the studies evaluated the impact of home care reablement on carers in form of hours of unpaid care. Qualitative evidence from Glendinning et al (2010) study suggests that adverse effects on carers - including an increase in the time spent caring - were unlikely.

Input parameters to the economic model
All parameters that were used in the model are shown in Table 2, 3 and 4 together with their source and an explanation of how they had been derived.

Note, that for the two service outcomes, hospital admission and ongoing use of home care, the Guideline Committee was asked whether they thought an adjustment should be applied to account for a potentially reduced effect due to the shorter length of the intervention in England (which is 6 weeks rather than 12 weeks). The alternative to not carry out an adjustment (since there is a lack of evidence about a relationship between duration and effectiveness of social care interventions) was presented to them as well. After discussing both options, the Guideline Committee decided to follow a conservative approach, in which the effect size was reduced by 50% assuming a linear relationship between duration of intervention and effectiveness. This was done using the following formula: RR (reduced) = RR + 0.5 * |(1 – RR)|. It is important to note that this and other input parameters were also subject to probabilistic sensitivity analysis (see section on data analysis and presentation of results).

Probabilities of ongoing home care in reablement group
Relative risk data from Lewin et al (2014) – adjusted with the formula above - were applied to probabilities in the standard care group for continuous home care in order to derive probabilities of ongoing need for home care for the reablement group. The effect was applied to the transition from the first to second year. The Committee discussed estimates that would have reflected an ongoing effect after the first year but decided to follow a conservative approach, which did not assume an ongoing effect after the first year.

Hospital admission probabilities in standard care group
Annual hospital admission probabilities for the general population were derived from hospital admission rates (source: Hospital Episodes Statistics, Admitted Patient Care, England, 2013-2014) for people using a standard formula for transforming rates (rt) into probabilities p = 1 – exp (1 - rt). Hospital admission rates were based on hospital admissions among older people and respective population estimates available from the Office for National Statistics (ONS). Age adjustments were carried out. A multiplier of 1.25 was applied to these data in order to estimate the hospital admission probabilities for users of publicly funded social care. This multiplier was based on data from Bardsley et al (2012), which linked individual data from information systems of the local NHS with those of local authorities for four areas in England and found that older people using social care were 1.25 more likely to use a hospital service than older people not using social care ($P < 0.001$).

Hospital admission probabilities for reablement group
Annual hospital admission probabilities were calculated for the first two years (as evidence supported that rates were different for this time and there was no evidence showing that effects lasted beyond this period). First, relative risk data were derived from odds ratios as they were presented in the paper by Lewin et al (2014). Relative risk data were then applied to probabilities of outcomes in the standard care group. Hospital admission probabilities in the reablement group were the same as in standard care group from year two onwards.

Annual probabilities of death and care home admission

The annual probability of death was derived from age-standardised death rates, which were based on number of deaths and population estimates available from the Office for National Statistics).

Costs of reablement
There was not one source that provided an accurate cost value that could have been taken for the model. Instead, different estimates were derived to establish mean, lower and upper values.

- The first estimate was based on the costs of providing reablement evaluated in the UK study by Glendinning and colleagues (2010) for five sites in England. Values, uprated to 2014/15 prices with the Hospital and Community Health Services (HCHS) Index, included a lowest cost of £1,756, a highest cost of £3,901 and mean cost of £2,279. The mean duration of reablement was 39 days and the mean number of client contact hours was 38. The advantage of using this estimate was that it had been evaluated following robust methodological standards in which costs were established using detailed bottom up calculations. The disadvantage of this approach was that the study was carried out in 2009 and referred to a small number of sites in which the study took place. The applicability to the current context of UK practice was thus limited.

- The second estimate referred to the mean cost per service users of £1,484 as established by the most recent National Audit Report for Intermediate Care (NAIC 2015). As stated in the report the value was calculated by dividing the annual service budget by the individual numbers of service users accepted during this service period. Data were collected from commissioners and providers who voluntarily participated in the audit. Furthermore, participants provided information about activity, which showed that the mean duration of reablement was 34.5 days and mean hours of client contact were 26.7 hours. The advantage of using mean costs from this source was that it best reflected current UK practice and was thus highly applicable to the current UK context of health and social care provision. The limitation was that is referred to a wide range of practices including those that might not be considered reablement practice as evaluated in this model.

- Since reablement as evaluated in this model was based on data from Australia and referred to a longer duration of on average 62 days, a third estimate was calculated in which cost per day were derived from NAIC and extrapolated to this longer duration. This was done in order to follow a conservative approach. The estimated cost of reablement was then £2,709 (which interestingly was still lower than the upper value found by Glendinning et al and reflects the high variations in costs of reablement in the UK). The strength of this estimate was that it accounted for the more costly provision of a longer duration as applied in the Lewin study. The limitation of this approach was that it assumed that intensity of service provision remained constant over this longer duration (possibly overestimating costs).

For the model, the third estimate of £2,709 was taken as mean. The estimate of £1,484 (derived from NAIC 2015) was taken to estimate the lowest value and £3,901 (derived from Glendinning et al 2010) to estimate the highest value.

Resource use and cost data
Costs of health and social care use associated with the alternative strategies were calculated combining resource use estimates with respective national unit costs. National unit costs were taken from recognised sources including the PSSRU Unit Costs for Health and Social Care and the NHS Reference cost for hospital costs. Unit costs are shown in Table 4.

Costs for standard care group
Costs for the standard care group referred to the proportion of people who continued using home care in the first year and in subsequent years. Probabilities reflected those presented in the transition matrix and the mean costs of home care used by older people in England were applied.

Costs for reablement group in first and second year
Costs for the reablement group needed to be calculated separately for the first two years taking into account the effectiveness evidence for the two service outcomes, ongoing need for home care and hospital admission.

Costs in the initial year of the reablement intervention were based on the following components:

- Costs of reablement in the initial 3 months period;
- Costs of home care for those with ongoing care needs living at home for the following 9 months (calculated from relative risks of needing ongoing home care measured at 3 months);
- Costs of hospital services in the first year (calculated from relative risks of hospital admission measured at 12 months)

Costs in the year following the reablement intervention were estimated as follows:

- Cost of home care for those with ongoing care needs living at home for the following year (calculated from relative risks of need for ongoing home care measured at 12 months)
- Costs of hospital admission in the second year (calculated from relative risks of hospital admission measured at 12 months)

Price levels and discounting

A discount rate of 3.5% was applied to costs occurring after the first year. All costs were valued in 2014/15 UK pounds. Where necessary costs were uprated to 2014/15 prices using the Hospital and Community Health Services (HCHS) pay and price inflator. Costs were uprated to 2014/15 prices.

Data analysis and presentation of results

In order to take into account the uncertainty of some of the model input parameters probabilistic sensitivity analysis (PSA) was carried out using the following distributions for the parameters identified at high risk of uncertainty:

- Lognormal distribution was applied to relative risk data for the need of ongoing home care;

- Gamma distributions were applied for hospital admission rates, for unit costs of reablement and for hospital costs.

The choice of distributions was made following recommendation for common parameter distributions (Sculpher, 2004)

Uncertainty was then propagated through the model using 1,000 Monte Carlo simulations. Probabilistic sensitivity analysis has the advantage that it takes account of the full distribution of parameters.

In addition to the baseline scenario, we also examined the impact of different alternative scenarios on the results by using different starting ages for the group population (75yrs, 85yrs). Parameters used for these scenarios are shown in Table 6.

Table 6 Input parameters (for baseline scenario)

	Mean or deterministic value	Value range	Source of data – comments
Hospital admission probabilities in standard care group			
People 65yrs+ not using home care	53.3%		Own calculations as described above, based on hospital admission rates from Hospital Episodes Statistics, Admitted Patient Care, England, 2013-2014 and ONS population estimates

			for England Mid 2014
People 65yrs+ using home care	61.4%		Own calculations as described above, based on hospital admission rates from Hospital Episodes Statistics, Admitted Patient Care, England, 2013-2014 and ONS population estimates for England Mid 2014
Relative risks of hospital admission (reablement vs. standard care)			
At 12 months, adjusted for reduced duration of reablement, all ages	0.99	0.92-1.14	Own calculations as described above, based on Lewin et al (2014)
At 24 months, unadjusted for reduced duration of reablement, all ages	0.92	0.84-1.03	Own calculations as described above, based on Lewin et al (2014)
Hospital admission probabilities in reablement group, 1st year			
Home care users, adjusted for reduced duration of reablement, 65yrs+	60.5%	56.5%-70.1%	Own calculations as described above, based on relative risk of hospital admission (Lewin et al 2014) and hospital admission probabilities in standard care group
People not using home care, adjusted 65yrs+	52.5%	49.1%-60.9.%	Own calculations as described above, based on relative risk of hospital admission (Lewin et al 2014) and hospital admission probabilities in standard care group
Hospital admission probabilities in reablement group, 2nd year			
Home care users 65yrs+	56.4%	51.3%-62.9%	Own calculations as described above, based on relative risk of hospital admission (Lewin et al 2014) and hospital admission probabilities in standard care group
People not using home care, 65yrs+	48.9%	44.5%-54.6%	Own calculations as described above, based on relative risk of hospital admission (Lewin et al 2014) and hospital admission probabilities in standard care group
Relative risk of ongoing home care (reablement vs. standard care)			

At 3 months, all ages, adjusted for reduced duration of reablement, all ages	0.66	0.62-0.71	
At 12 months, all ages, adjusted for reduced duration of reablement, all ages	0.68	0.63-0.75	Own calculations as described above, based on Lewin et al (2014)
Transition probabilities used in Transition Matrix			
Probability of person using home care in current year to continue using home care in the next year, all ages	64%	-	Community Care Statistics 2014/15, Health and Social Care Information Centre (HSCI); refers to proportion of social care users who have been accessing long-term support for more than 12 months at the year-end
Annual probability of death, 65yrs+	5.92%	5.90% - 5.94%	Age standardised death rates derived from Deaths Registered in England and Wales 2014 and Population Estimates England and Wales 2014; rates transformed into probabilities using standard formula p = 1 – exp (1 - rt)
Annual probability of care home admission, all ages	4.89%	-	Figure only available from Community Care Statistics for England 2014-15 which refers to older people with long-term support (more than 12 months) receiving planned and unplanned review who had a change in setting

Table 7 Input parameters (for scenario analysis)

	Mean or deterministic value	Value range	Source of data – comments
Hospital admission probabilities in standard care group			
People 75yrs+ using home care	71.4%	-	Own calculations as described above
People 75yrs+ not using home	63.3%	-	Own calculations as described above

care			
People 85yrs+ using home care	79%	-	Own calculations as described above
People 85yrs+ not using home care	71.4%	-	Own calculations as described above
Hospital admission probabilities in reablement group, 1st year (adjusted for reduced duration of reablement)			
People 75yrs+ using home care	70.3%	65.8%-81.6%	Own calculations as described above
People 75yrs+ not using home care	62.3%	58.3.%-72.3%	Own calculations as described above
People 85yrs+ using home care	77.8%	72.8%-90.3%	Own calculations as described above
People 85yrs+ not using home care	70.2%	65.7%-81.5%	Own calculations as described above
Hospital admission probabilities in reablement group, 2nd year (adjusted for the reduced duration of reablement)			
People 75yrs+ using home care	65.6%	59.6%-73.2%	Own calculations as described above
People 75yrs+ not using home care	58.1%	52.8%-64.8%	Own calculations as described above
People 85yrs+ using home care	72.6%	65.9%-80.9%	Own calculations as described above
People 85yrs+ not using home care	65.5%	59.5%-73.1%	Own calculations as described above
Transition probabilities used in Transition Matrix			
Annual probability of death, people 75yrs+	9.95%	9.92%-9.99%	Own calculations as described above
Annual probability of death, people 85yrs+	17.1%	16.99%-17.14%	

Table 8 Unit costs (£, in 2014/15 prices)

Cost parameter	Deterministic value	Value Range	Source of data, comments

Cost of home care per week	194.73	-	Personal Social Services (PSS): Expenditure and Unit Costs, England, 2013-14 Final release, Table 6.1, uprated to 2014/15 price levels using the HCHS pay and price inflator
Cost per hospital admission	2,570	412-4,035	PSSRU Unit costs for health and social care (2015), NHS reference costs for hospital services, uprated to 2014/15 prices levels using the HCHS pay and price inflator; weighted mix of non-elective long stay (0.25), non-elective short stay (0.25) and elective stay (0.5)
Cost of reablement	2,709	1,484-3,901	Own calculations, based on data from Glendinning et al (2010), Lewin et al (2014) and NAIC (2015)

Findings and discussion
The probability that lifetime costs for individuals receiving reablement were lower than lifetime costs for individuals receiving standard home care was very high at 94% (in the base case scenario with a starting age of the cohort of 65 years). This was based on a model, which conservatively assumed a reduced treatment effect linked to the shorter duration of reablement in England, higher mean costs of reablement covering a potentially longer duration of intervention of 3 months and high proportion of 75% who were assumed to return to using home care after an episode of not using home care. The mean cost saving per older person was £2,061 for the model in which the starting age of the cohort was 65 years. This was based on mean costs per person of £58,559 in the reablement group and of £56,498 in the standard care group. Costs referred to lifetime costs in present values using a annual discount rate of 3.5%. The probability that reablement was saving costs was above 85% for the different scenarios considered in one- and three-way(s) sensitivity analyses, which referred to different starting ages of the cohort and unit cost estimates of reablement, hospital and home care (Table 9, 10, 11, 12). It is important to note that all parameters were (in addition to one- or three way sensitivity analysis) subject to probabilistic sensitivity analysis. In addition, for parameters strongly based on assumptions (treatment effects, reablement costs, proportion of people returning to home care) the lowest estimate was taken.

Table 9 One-way sensitivity analyses: Starting ages for cohort

Starting age of cohort	*65yrs*	*75yrs*	*85yrs*
Mean cost saving for reablement versus standard care (in £)	2,061	2,021	1,968
Probability of cost saving	94%	93.4%	92.3%

Table 10 One-way sensitivity analyses: Unit costs of reablement

	Unit cost of reablement	
	+10%	*-10%*
Mean cost saving for reablement vs standard care (in £)	1,938	2,178
Probability of cost saving (in %)	94.2	95.8
	+20%	*-20%*
Mean cost saving (in £)	1,856	2,302
Probability of cost saving (in %)	93.7	96.0

Table 11 One-way sensitivity analyses: Unit costs of hospital

	Unit cost of hospital	
	+10%	*-10%*
Mean cost saving (in £)	1,938	2,178
Probability of cost saving (in %)	94.2	95.8
	+20%	*-20%*
Mean cost saving (in £)	1,856	2,302
Probability of cost saving (in %)	93.7	96.0

Table 12 Three-ways sensitivity analyses: Unit costs of reablement, hospital, home care

Mean cost saving, in £ (probability of cost saving)		**Unit cost of reablement**	
Unit cost of home care	**Unit cost of hospital**	*+20%*	*-20%*
+20%	+20%	2,320 (93.3%)	2,858 (96%)
+20%	-20%	2,560 (95.3%)	3,003 (97.8%)
-20%	+20%	1,019 (86%)	1,465 (91.8%)
-20%	-20%	1,109 (87.8%)	1,613 (94.7%)

Findings showed that home care reablement was linked to long-term cost savings when compared with standard home care. Evidence from the

largest England-based study on home care reablement (Glendinning et al 2010) showed improved health- and social care-related quality of life outcomes and no adverse effects. This meant that a conclusion from this economic analysis was that home care reablement was highly likely to be cost-effective for older people using home care. Lower costs occurred in the reablement group due to the initially greater number of people who moved from using home care to not using home care and a lower number of people admitted to hospital in the first two years. It is important to note that findings of the final model were based on the very conservative assumption that effects were only short-term and that there were longer-term effects of reablement beyond the two years. This was a decision made by the Guideline Committee in order to not overestimate potential cost savings.

The modelling was based on a number of assumptions as described in the earlier sections. Overall, all assumptions followed a conservative approach, which was done to ensure that the analysis did to not lead to an overestimation of the results. One of the main limitations of the economic analysis was that, due to lack of other evidence, estimates on relative effects were taken from a single study.

Two other limitations are particularly important to note. First, the model only referred to publicly funded home care users. Second, it only referred to people using home care and did not refer to reablement for people discharged from hospital.

In regards to the first point, it is important to note that the vast majority of data available on home care relate to local authority funded care. There is currently a scarcity of data on privately funded home care, which is particularly difficult to determine as this might include a wide range of services and support including unpaid care provided by families, friends and neighbours (e.g. Baxter and Glendinning ; Hudson and Henwood 2009). Data from the English Longitudinal Survey of Ageing (ELSA) suggest that in 2006/7 168,701 older people were paying for home care services and support but this is figure likely to have increased substantially since then due to the increasing number of older people and budget cuts in the social care area (IPC 2015). Humphries (2013) provide an estimate of 70,000 older people paying for home care and an additional 200,000 older people purchasing help with domestic tasks. It was not possible to determine how findings from this economic analysis relate to this important population who do not have access to publicly funded home care.

In regards to the second point, it was also not possible to transfer findings to reablement services provided post discharge. People discharged from hospital might differ in terms of their functioning status and their capacity to benefit from reablement. For example, findings from the qualitative part of the study by Glendinning et al (p.134) suggest that people discharged from hospital benefit to a greater extent than other groups such as those with complex and chronic health problems. Unfortunately the study did not provide data on outcomes for re-ablement users who entered the service through different referral routes so that no conclusions could be drawn. It is also noted in the study that whilst the majority of reablement services at the time of the study targeted people discharged from hospital, all had expanded their services to become more inclusive and take most people referred to home care. The findings of this economic analysis are thus likely to relate to a large population of older people using reablement.

Another main challenge concerned the transferability of data from the context of another country (Australia) to England. In order to address this a number of steps were carried out:

- Only relative effect sizes of the two outcomes were taken from the study whilst all other parameters were taken from English data;
- Effect sizes were reduced to take account of the shorter duration that reablement is currently provided for in England;
- Different unit cost estimates for reablement were derived and mean costs covered the longer reablement period of 3 months.

In this context it is interesting to note that even when mean costs of the longer reablement interventions and a reduced effect size (assuming a shorter duration of the intervention) were applied, the probability that the home care reablement was cost saving was very high (above 90% in the baseline scenario). The Guideline Committee discussed that the optimal duration of reablement was strongly dependent on the individual (although there may be similarities between certain groups of people with the same conditions) and that it was not possible to decide an optimal duration of reablement. It is possible that there is a length of the intervention below which no significant effect would be observed. **Another important challenge was that reablement in current practice is often provided several times over an older person's lifetime,** and this might affect the costs and outcomes of reablement over standard care. This model was not able to reflect this additional complexity as no data are currently available on effects of repeated reablement. The Guideline Committee agreed to address this gap by making a research recommendation (2.6) to investigate the (cost-) effectiveness of repeated episodes and longer duration of reablement .

Despite those limitations, the Guideline Committee agreed that findings from the modelling could be used to derive and support recommendations; the Guideline Committee agreed the following recommendations based on findings from the modelling (in the context of other evidence):

1.2.7 Offer reablement as a first option to people referred for home care, if it is judged that reablement could improve their independence.

1.2.8 Consider reablement for people already using home care, as part of the review or reassessment process. This might be in parallel with existing support. Take into account the person's needs and preferences when considering reablement

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