National Guideline Centre

Draft

End of life care for adults in the last year of life: service delivery

Cost Analysis: Illustrative example costs of out-of-hours, end-of-life community services with a threshold analysis

Economic appendix

Methods, results, conclusions

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Appendix A: Cost analysis

A.1 Introduction

The guideline committee prioritised out-of-hours services and community-based interventions as the areas of the guideline for health economic analysis to be undertaken. The committee's rationale for prioritising these areas was largely due to the high likeliness that potential recommendations would result in significant resource impact, and its view that service delivery improvements in these areas could benefit people in the last year of life or people caring for those in the last year of life. The 2 prioritised areas cover 3 of the guideline review questions, as detailed in Table 1.

Table 1: Areas of the guideline and review questions covered by the costing analysis

Area of the guideline	Review Questions
Out-of-hours services	• What are the best out of hours services, models and policies to support people in their last year of life to stay in their preferred place of care?
Community-based interventions	• What provision of additional community services should be available to reduce inappropriate/avoidable admissions in people in their last year of life? • What additional community services are needed to support people in their last year of life to stay in their preferred place of care?

There is some overlap between the 2 prioritised areas given that many community-based interventions can be accessed out-of-hours. To incorporate both areas into 1 analysis, the committee decided to focus the analysis on end-of-life care services in the community, which have some degree of out-of-hours access to them. This could be that they are open extended hours, available at weekends or 24/7.

The a priori view of the committee was that providing out-of-hours services in the community (to people identified as in the last year of life) could lead to improved outcomes, such as reducing avoidable hospital admissions in the last year of life, reducing length of stay in hospital admissions in the last year of life, increasing the proportion of people being cared for in their preferred place of care and increasing the proportion of people dying in their preferred place of death. Both preferred places of care and of death are usually outside hospital. This, in turn, could help maintain quality of life for people in the last year of life and maintain or improve the quality of life of those caring for people in the last year of life, and could potentially also lead to a more efficient use of NHS resources.

It was expressed by the committee that there has been a recent push to shift more end-of-life care out of a hospital setting and into the community; often with the assumption that this will reduce NHS costs. As the demand for hospital capacity outstrips supply, shifting end-of-life care into the community will not 'free up' hospital capacity in such a way that it would reduce any operational costs for hospitals (for example, closing whole wards or buildings) as the spare hospital beds will always be filled. Therefore, sunk costs and ongoing costs of running hospitals will not be recovered from reducing demand. Nevertheless, improving outcomes such as reducing avoidable hospital admissions will improve short-term outcomes such as reduced waiting times in Accident and Emergency departments or reduced readmission rates, and would contribute towards providing a more efficient system.

This analysis focuses on the estimated cost savings of the NHS resources required to care for people identified as thought to be in the last year of life. Although these savings would not necessarily translate into cost savings for the NHS overall, if achievable, they could translate into improved outcomes for the same or increased costs, and therefore could lead to a more efficient use of NHS resources.

If the costs of providing services in the community were lower than the costs saved from improving outcomes (such as reduced hospital admissions and hospital deaths) then providing the additional services would be considered an efficient use of resources. On the other hand, if the additional community costs were greater than the cost savings produced, then providing the additional community services might not be considered an efficient use of resources. It is important to note however, that achieving 'cost savings' is certainly not the only driver to shift more end-of-life care into the community. Enabling more people to be cared for and die outside hospital, where that is their wish, increases patient choice, and is likely to help maintain the quality of life and improve the quality of death for people in the last year of life, which should ultimately be the main aim of end-of-life care services.

This guideline focusses specifically on the service delivery of end-of-life care services for adults identified as thought to be in the last year of life. Throughout guideline development, identifying evidence that could accurately attribute the cause and effect of different components of service delivery models of end-of-life care to improved outcomes proved a great challenge. Due to ethical and practical reasons, research designed to analyse the outcomes of models of service delivery of end-of-life care is not suited to being conducted under the same level of control required for the highest standard of clinical research. For this reason, the results of such research are significantly more challenging to interpret. For example, if a particular region implements a bundle of end-of-life service delivery upgrades simultaneously (which is commonly how end-of-life service improvements are implemented) and compares outcomes after implementation to outcomes collected prior to implementation, a positive change in the outcomes would suggest that the service upgrades were having a positive effect. However, determining what is actually causing the improved outcomes still remains unknown. In addition, there are also a number of other reasons why a change may have occurred, that are unrelated to the intervention or service model being evaluated. Examples might include temporal changes (such as an aging population), regression to the mean (for example if data were initially collected when admissions were exceptionally high such as during winter) as well as other external factors.

The results of such research cannot therefore be extrapolated to determine what would result in improved outcomes in other regions, where baseline levels of services available vary significantly, especially because a service delivery model (made up of multiple elements) suitable to 1 region will not necessarily be suitable for another region.

Due to the lack of appropriate and applicable evidence identified for the 2 prioritised areas, estimated outcomes of the individual service components included in this analysis could not be accurately quantified, and therefore a more sophisticated type of analysis such as a cost–utility or cost-effectiveness analysis could not be undertaken. Nevertheless, a cost analysis, including a threshold analysis, was conducted; the aim being to provide illustrative examples of the potential costs (assumed to be borne by the NHS) of introducing various out-of-hours, community-based services, and the improvements in outcomes that would be required to make these services cost neutral.

It must be noted that the costs presented in this analysis were to aid the committee's consideration of cost effectiveness, when formulating its recommendations. They are not intended to provide accurate estimates of the likely costs to commissioners or people planning or providing end-of-life care services of implementing these services in practice.

In practice there are a number of reasons why the real costs of providing the service components would differ to the costs presented in this analysis. One reason being that for this analysis it was assumed that the NHS bears the entire cost, however in reality, the cost of many community services are shared between third party organisations and the NHS. Another reason is that the population characteristics of a region, as well as baseline levels of out-of-hours, end-of-life and community services prior to implementation will all significantly affect the costs. The costs presented in this analysis were estimated assuming the services were to serve a region with a population the size of the average clinical commissioning group (CCG). The costs of implementing the services in any existing region would be very specific to that particular region and differ (potentially significantly) to the costs presented here.

A.2 Methods

A.2.1 The services

Clinical and economic evidence reviews were conducted for all 3 of the review questions covered by the areas of the guideline on out-of-hours end-of-life care and community-based services. Although some evidence was identified, the guideline committee did not identify any particular services presented in the evidence reviews that it would consider recommending and therefore wanted to include in the costing analysis. During guideline development a call for evidence was conducted covering all areas of the guideline. Three grey literature reports were identified through the call for evidence that provided useful information regarding required resource levels for the implementation of some community-based out-of-hours services. These services were: care coordination centres, an out-of-hours end-of-life advice line and a hospice at home/specialist palliative care in the community service. The committee wanted to consider recommending these services and therefore they were included in the analysis.{Wye, 2012 #3470;Kowalewski, 2016 #3471;Macmillan Cancer Support, 2011 #3472}

As well as the services identified through the call for evidence, the committee also noted 2 additional services it wanted to consider (an out-of-hours end-of-life medication provision service and a dedicated end-of-life ambulance service); therefore these were also included in the analysis. All of the services included were thought to be able to enhance out-of-hours end-of-life care, with the potential to reduce 'avoidable' hospital admissions in the last year of life, reduce length of stay in hospital admissions in the last year of life, or increase the proportion of people dying outside of hospital; all of which were assumed to be indicators of improvements in the service delivery of end-of-life care. The committee also wanted to include an out-of-hours equipment provision service, however we were not able to acquire any information on estimated resource use from an existing equipment provision services and therefore we were not able to include it in the analysis.

The service model components in the analysis were not analysed as comparators to each other, as in reality they would not be implemented in isolation. Instead they would be likely to complement each other and be provided as part of 1 element of a wider end-of-life care service model. The purpose of the costing analysis was to help the committee consider the cost effectiveness of the individual components, and identify which ones it felt would help lead to an efficient use of NHS resources. For some of the components more than 1 cost example was presented. This was to illustrate different examples of similar services, serving different populations. Table 2 lists the services included in the analysis, for which total costs of providing the services for 1 year were estimated, along with the cost per person who 'should' have access to them. Table 2 also provides descriptions of each of the services in the analysis.

The rows shaded in darker grey are the service cost examples that formed the base-case analysis for a threshold analysis. These are hypothetical examples of services. They were all adapted by the

guideline committee from the existing services in the analysis, but were assumed to serve a population of roughly 265,000, the average size of a CCG.

Table 2: Service included in the cost analysis

Service delivery component	Region/population served	Description and aims of service	Operational hours of the service	Source
End-of-life care coordination service/centre	North Somerset CCG	To organise and coordinate packages of care that potentially impact on avoiding hospital admissions and reducing length of hospital stay. To free up the time of community nurses previously spent on organising packages of care. To provide a central point of information on palliative care patients and local care services for health and social care professionals. To provide a 'helicopter' view of available resources for commissioners and service providers relating to demand and capacity of services.	Core opening times: Monday to Friday 8am to 6pm. The shifts of the Generic Support Workers are 8am to 4pm and 1pm to 9pm.	Wye (2012){Wye, 2012 #3470}
	Somerset CCG	Organise packages of care for palliative care patients in respect of the following services: Social care; Somerset Palliative Care Partnership; Marie-Curie Nursing Service; nursing care from a nursing agency; and care home placements. Provide service advice and signposting for palliative care patients and their carers/families. A central point of communication relating to care packages for palliative care patients and health and social care professionals. Establish, maintain and review the end-of-life care register including information on preferred place of care and death. Maintain and update the palliative care website in conjunction with other providers. Coordination of information regarding palliative care services in the county, providing a signposting function for professionals. Provide commissioners and providers with information relating to demand and capacity of services.	The Centre is open from 8am to 6pm Monday to Friday and from 10am to 3pm on Saturday and Sunday.	Wye (2012){Wye, 2012 #3470}
	Wandsworth CCG	Care Coordination, through a team of Care Coordinators who approve, organise and coordinate packages of care, including fast-track continuing care and specialist equipment. Community Nursing provided through a dedicated EoL Community Nurse, offering patients extra support, advice and care. Overnight Nursing Care, provided by Marie Curie staff organised through the Centre. Daytime Health and Personal Care provided by Marie Curie Health and Personal Care Assistants (HPCAs) for CHC fast-track patients; and through organising care agency support.	The Centre's opening hours are Mondays to Fridays from 7am to 10.30pm; Saturdays, Sundays and public holidays from 9am to 5pm. Weekends the Centre is staffed with coordinators only.	Kowalewski (2016){Kowalewski, 2016 #3471}
	Average CCG	To organise and coordinate packages of care, including fast-track continuing care and specialist equipment that potentially impact on avoiding hospital admissions and reducing length of hospital stay.	Mondays to Fridays from 7am to 10.30pm; Saturdays, Sundays 9am to 5pm.	Guideline committee

Service delivery component	Region/population served	Description and aims of service	Operational hours of the service	Source
		Coordination of information regarding palliative care services, providing a signposting function for professionals. Provide service advice and signposting for palliative care patients and their carers/families. Provide commissioners and providers with information relating to demand and capacity of services. Short term community care provided by health care assistants and a community nurse.	Weekends the Centre is staffed with coordinators only.	
Out-of-hours end-of-life advice line	Somerset CCG	To provide telephone advice to patients and carers on symptom control, support services available, practical, emotional and psychological issues. Triaging of out-of-hours services with existing services for end-of-life patients (for example district nursing teams, out-of-hours GPs, ambulance service, emergency duty social worker). Planned or proactive telephone support to patients and carers who require reassurance or are in crisis, as identified by professionals (for example discharge in reach nurses, community palliative care teams, Somerset Care Coordination Centre), or patients that have been categorised as red, according to the Palliative Care Framework. Generalist palliative care advice to professionals working out-of-hours including clinical support regarding prioritisation of care. Linking to the coordination centre (when open) to provide details regarding packages of care.	The out-of-hours service for the advice and response line is manned by 1 dedicated registered nurse 7 days a week, from 5pm to 1am on Monday to Friday and from 8am to 1am on weekends and bank holidays.	Wye (2012){Wye, 2012 #3470}
	Average CCG	To provide telephone advice to patients and carers on symptom control, support services available, practical, emotional and psychological issues. Triaging of out-of-hours services with existing services for end-of-life patients. Planned or proactive telephone support to patients and carers who require reassurance or are in crisis, as identified by professionals, or patients that have been categorised as Red, according to the Palliative Care Framework. Generalist palliative care advice to professionals working out-of-hours including clinical support regarding prioritisation of care. Linking to the coordination centre (when open) to provide details regarding packages of care.	7 days a week, from 5pm to 1am on Monday to Friday and from 8am to 1am on weekends and bank holidays.	Guideline committee
Hospice at home/specialist palliative care in the community	Hampshire, Surrey and West Sussex PCTs	To put in place a sustainable an affordable specialist palliative care service for the population within the Midhurst and surrounding areas. To ensure that patient choice is maximised by providing as much treatment and support in the home/community setting as possible, and reduce acute	7 days a week 8.30am to 8.30pm	Macmillian (2011){Macmillan Cancer Support, 2011 #3472}

Service delivery component	Region/population served	Description and aims of service	Operational hours of the service	Source
		hospital interventions and inpatient hospice stays. To achieve close working between the NHS, voluntary, charitable and private sectors. To increase compliance with NICE guidelines. Provide a consultant led multi-disciplinary team that aims to provide 24/7 'hands on' care and advice at home, in community hospitals and in nursing / residential homes. The community team provides a range of palliative interventions, including blood / blood product transfusions, blood treatments, IV antibiotics, IV bisphosphates, fluids, paracentesis and intrathecal analgesia.		
	Average CCG	A hospice at home service to deliver multi-professional end-of-life care services to people in their own homes. The service aims to increase the proportion of people dying outside hospital and reduce emergency admissions and days spent in emergency admissions for people in the last year of life.	7 days a week 8.30am to 8.30pm	Guideline committee
Ambulance dedicated to end-of-life	People registered with a GP practice in Leeds	To develop and help provide the best possible service for palliative care patients, allowing them to be cared for in the place of their choice. To provide a dedicated resource supported by staff with additional clinical skills in order to operate a flexible and responsive service to patients. To provide a responsive service to transfer patients approaching the end-of-life to their preferred place of care. The ambulance can also transport patients for palliative treatment and investigations.	Monday to Friday between 6am and 8.30pm and Saturday to Sunday 7am to 6.30pm.	Leeds Palliative Care Transport Working Group{Leeds Palliative Care Transport Working Group, 2013 #3476}
	Average CCG	To develop and help provide the best possible service for end-of-life/palliative care patients, allowing them to be cared for in the place of their choice. To provide a dedicated resource supported by staff with additional clinical skills in order to operate a flexible and responsive service to patients. To provide a responsive service to transfer patients approaching the end-of-life to their preferred place of care. The ambulance can also transport patients for palliative treatment and investigations.	Monday to Friday between 6am and 8.30m and Saturday to Sunday 7am to 6.30pm.	Guideline committee

Service delivery component	Region/population served	Description and aims of service	Operational hours of the service	Source
Out-of-hours end-of-life medication provision service	Average CCG	To provide a service where end-of-life medication can be provided out-of-hours.	NA[(a)]	Guideline committee

(a) this will depend on the individual pharmacies who hold contracts with the NHS to provide access to end-of-life medication out-of-hours

A.2.2 The population

The hypothetical cost examples (the examples shaded in darker grey in Table 2) were assumed to serve a semi-rural region with a population the size of the average CCG, roughly 265,000. The services were assumed to serve all adults identified as thought to be in the last year of life. Due to the current widespread under-identification, a proxy measure of 0.8% of the population was used to estimate the number of people who 'should' be identified as thought to be in the last year of life (see section A.2.5.2 for more details).

A.2.3 Time horizon, perspective, discount rates

As the guideline covers adults in the last year of life, the costs in this analysis covered the cost of providing the services for 1 year (last year of life). The perspective taken was that of the National Health Service (NHS) and personal social services (PSS). It was assumed that the NHS and PSS would bear the entire costs of providing the services. Due to the 1-year time horizon costs were not discounted.

A.2.4 Baseline level of service available

It was assumed that the services would be implemented in addition to a minimum core level of services available out-of-hours. The baseline level of out-of-hours NHS services available to people in the last year of life was assumed to be: 999 emergency services, NHS 111, out-of-hours GP services, hospital services and out-of-hours community nurse services.

A.2.5 Approach to the analysis

A.2.5.1 Total costs

Once the committee had decided on the service to be included in the analysis, the annual total costs of providing each of the different examples of the services were estimated. Different approaches to estimate the total costs were used for different services. As the care coordination service, ambulance service, and hospice at home are available in hours and out-of-hours, the costs of these services in this analysis represent the cost of providing the whole services, for all the hours they would be available. An additional sensitivity analysis was conducted breaking down the cost estimates of the care coordination service by different levels of operational hours (please see A.3.7 for details).

In order to standardise the costs of the different services for the threshold analysis, the hypothetical examples were established. These provide total costs estimates of each of the services assuming they were to serve a semi-rural region with a population equivalent to the size of an average CCG (approximately 265,000). Although the individual services were not intended as comparators, it was still important that the costs represented the services serving the same population. The average CCG population was calculated by dividing the population of England by the current number of CCGs. These data were obtained from the office of national statistics (ONS). This population size was then examined against the population sizes of the existing CCGs to ensure that CCGs exist that are of a similar size. Although 265,000 is not the typical size of a CCG, there are a number of existing CCGs of a similar size population, for example North Somerset (209,944).

All of the estimated total costs of the hypothetical average CCG examples were estimated by amending resource use or costs of the existing services. Cost examples of the existing services that the hypothetical example costs were based on were also estimated for additional information. Table 3 lists the cost examples that are reported in this analysis with links to the relevant results tables for each example.

Table 3: The cost examples included in the analysis

Service delivery element	Examples included	Source of resource use of existing service
Care coordination service/centre	Average CCG (See Table 6)	Guideline committee
	Wandsworth (See Table 7)	Kowalewski (2016){Kowalewski, 2016 #3471}
	North Somerset (See Table 8)	Wye (2012){Wye, 2012 #3470}
	Somerset (See Table 9)	Wye (2012){Wye, 2012 #3470}
End-of-life advice line	Average CCG (See Table 11)	Guideline committee
	Somerset (See Table 12)	Wye (2012){Wye, 2012 #3470}
hospice at home/specialist palliative care in the community	Average CCG (See Table 19)	Guideline committee
	Midhurst (See Table 20)	Macmillan (2011){Macmillan Cancer Support, 2011 #3472}
Ambulance dedicated to end-of-life	Average CCG (See Table 14)	Guideline committee
	Leeds (See Table 15)	Leeds Commissioner (Personal communication)
Out-of-hours end-of-life medication provision service	Average CCG(See Table 17)	Guideline committee

Care coordination service, out-of-hours advice line and hospice at home

For the care coordination service, out-of-hours advice line and hospice at home, the committee used the level of resources reported in the literature reports to base the hypothetical estimate on; however it adapted the resource levels of the different staff members. This was considered necessary as some of the services reported in the literature had arisen through unplanned closures of other services, or they were not NHS provided, and therefore did not accurately reflect appropriate levels of likely resource use if there was planned implementation of the same types of services provided by the NHS. The services reported in the literature were also serving different regions with differing population characteristics which was another reason the resource use needed to be adapted.

The costs of these services to the NHS were assumed to be the cost of the staff time required to provide the services. It was acknowledged that there would be other costs, such as training of staff and overheads, however it was considered to be too difficult to estimates these costs. It was also assumed that most of the additional costs would already be captured in the Personal Social Services Research Unit (PSSRU) cost estimates{Curtis, 2016 #3469} of the hourly costs of staff time, from which the hourly cost of staff time were sourced.

Dedicated end-of-life ambulance service

For the dedicated ambulance service, costs were obtained through personal communications with commissioners of end-of-life services regarding an ambulance service dedicated to palliative care that is currently operational in Leeds. The service is provided by Yorkshire Ambulance Service (YAS) who deliver around 15,000 patient journeys per month just for Leeds. The palliative care ambulance carries out about 156 journeys per month. These journeys include some renal transport as the ambulance is used for renal patients in downtime. The current service has 2 transport vehicles in operation to serve anyone who is registered with a Leeds GP practice. Annual cost estimates were

provided by commissioners of the service. They were said to cover all the staff training costs, operational costs and costs of quarterly meetings that are set up with local providers as well as other service providers such as funeral and bereavement services. The committee used this estimate but scaled down the cost of the service in Leeds to a level it thought appropriate to serve the average CCG.

Out-of-hours end-of-life medication provision service

For the out-of-hours end-of-life medication provision service, costs were supplied by an NHS CCG (who asked to stay anonymous). The CCG supplied information on the costs borne by the NHS of setting up contracts with community pharmacies, open out-of-hours, to stock end-of-life/palliative care medications. The costs include costs of the set up and management of contracts, the minimum payment to each pharmacy at the start of the contract (which is the cost of end-of-life/specialist palliative care medications) and a stock audit declaration cost (a quarterly payment made to each pharmacy). The CCG supplied information on the number of pharmacies with contracts within their CCG. The committee used this information to estimate how many pharmacies would be required to stock end-of-life medication out-of-hours to serve the average CCG. It was acknowledged that there would be costs to the pharmacies, such as the costs of overheads and staff costs of staying open extended hours, however these were excluded as they were not considered to be a cost to the NHS.

A.2.5.2 Cost per person needing access to the service

Once the total costs of providing the services to the average CCG for 1 year were estimated as well as the total costs of the existing services, the costs were then also presented as costs per person needing access to the service. The costs per person needing access were calculated by dividing the estimated total costs by the estimated number of people who 'should' be identified as thought to be in the last year of life. It was assumed that if a person is identified as thought to be in the last year of life, they would then be given access to end-of-life community services, should they require them.

Cost per person who should have access to the service = Total cost / 0.8% of total population of CCG

The estimated number of people who should be identified was assumed to be 0.8% of the population. This estimate was used as the guideline committee was informed (by the 2 commissioners on the guideline committee) that it is a figure commonly used by commissioners when commissioning end-of-life services. The figure is commonly used as it is estimated that roughly 1% of a given population will die every year, and roughly 20% of deaths are unpredictable, therefore the resulting 0.8% of the population whose deaths are not predictable, should be identified as thought to be in the last year of life, and therefore receive access to end-of-life care services. It is important to note that the scenario that everyone who is in the last year of life, dying from a 'predictable cause' is actually identified is hypothetical and a massive assumption to make, as in reality there are currently large gaps in the identification of people in the last year of life. Some research was identified{Marie Curie Cancer Care, 2013 #3474} that estimated that in 2013 only 27% of people who die each year are actually placed on an end-of-life register. This indicates that currently the majority of people who die won't have been identified as being in the last year of life and therefore will not have had access to end-of-life services that they or those caring for them may have benefitted from, that could have helped them to be cared for in their preferred place or care or die in their preferred place of death.

Despite the issue of under identification, even if everyone was correctly identified, the 0.8% figure still does not accurately reflect the demand for the services. If someone is identified as thought to be in the last year of life, this does not mean that they will necessarily require all end-of-life services, especially services available out-of-hours. Although the 0.8% figure is somewhat subjective, and is a vast overestimation of the service demand, the committee did not think it was possible to accurately estimate the demand for the services, and felt that although 0.8% is not necessarily a good proxy for service demand, it was still useful as an indication of the number of people who 'should' have access

to the services to support their needs, regardless of whether they would actually be a service user. The committee decided upon using 0.8% of the population to estimate the cost per person served after being presented with the alternative options of using the total population, the number of people likely to die and the number of people over 65.

A.2.5.3 Threshold analysis

In order for the committee to consider the cost effectiveness of the service components, and establish whether it felt that they would provide good value for money, a threshold analysis was undertaken. The threshold analysis determined the level of specific outcomes that would need to be achieved, in order to make each of the services cost neural, due to estimated cost savings arising from the improvements in outcomes achieved. Once these levels had been established, the committee could then use its expert judgement on whether it felt the services would be likely to achieve the required outcomes.

The committee identified 3 outcomes for the threshold analysis. These outcomes were:

- Increased proportion of deaths occurring outside hospital
- Reduction in the number of days spent in an emergency admission in the last year of life
- Reduction in avoidable emergency admissions in the last year of life

The estimated cost savings that were attached to the outcomes are presented in Table 4.

Table 4: Estimated costs saved from effectiveness outcomes of the service components

Outcome	Estimated Cost Saved	Source
Death occurring outside hospital instead of in hospital	£958	National End of Life Intelligence Network (2012){National End of Life Care Intelligence Network, 2012 #3475}
Inpatient day reduced in an end-of-life emergency admission	£254	PHE (2017){Public Health England, 2017 #3473}
End-of-life emergency admission avoided	£2,919	PHE (2017){Public Health England, 2017 #3473}

Data on the total number of annual deaths, deaths in hospital, emergency admissions in the last year of life and number of days spent in emergency admissions were used to convert the absolute levels of outcomes required (to make the services cost neutral) into relative percentage reductions (see Table 22). The data used to convert the absolute reductions into percentage reductions are presented in Table 5 and were obtained from the Public Health England end-of-life economic tool.{Public Health England, 2017 #3473}

Table 5: Data used to convert the absolute reductions to percentage reduction in threshold analysis

Data items	Values[(a)]	Number of CCGs	Estimated total number of events for the average CCG
Number of deaths in hospital among residents in England with death registered 2013-2014	225,942	207	1,092
Average annual days (nights) spent in emergency hospital admissions during the last	9,297,455	207	44,915

Data items	Values[(a)]	Number of CCGs	Estimated total number of events for the average CCG
year of life among residents in England who died 2013–2015			
Average total number of emergency hospital admissions during the last year of life among residents in England who died 2013–2015	808,670	211	3,907

(a) Source of data: PHE Economic analytical tool {Public Health England, 2017 #3473}

A.2.5.4 Uncertainty

The costs of providing end-of-life services in particular regions depend on a number of factors. Some of the factors include: baseline level of services already available, the size of the population and population characteristics such as age distribution, demographics and epidemiology of the people identified as requiring provision of the services, and the geographical location of the regions. Implementing a community out-of-hours service in a region that already has well established community services, would have significantly different set-up costs and downstream cost savings to an area that does not have well established services already available. The widespread national variation in the provision of community out-of-hours services means this is of particular importance when estimating their costs. Demographics and epidemiology are also important factors as demand will depend on the types of conditions people are dying from. The costs to the NHS will also depend on the proportion of service costs that are funded by the NHS, local authority or third party organisations. Geographical location is also an important factor as some services would have different costs depending on the type of region they are provided in (for example, urban versus rural). As well as there being uncertainty around the required levels of resource use, there is also uncertainty around the estimated cost savings from improving outcomes. If providing community services in a region is particular costly, or the cost of hospital care is lower than average, then avoiding hospital admissions or reducing hospital deaths may not amount to large cost savings.

There are many levels of uncertainty which makes estimating the costs of the services extremely challenging as, in reality, the costs will be highly specific to each locality. It was unfeasible to explore all scenarios which might eliminate some of the uncertainty in the estimates however the committee discussed how different factors would be likely to affect the costs. The committee's view of uncertainty and other factors that will affect the costs has been presented narratively in section A.3.8.

A.3 Results

The following sections report the total cost estimates, cost per person needing access to the service and the results of the threshold analysis for each of the services. For the care coordination service, end-of-life advice line and hospice at home the levels of resource use provided in the reports on the existing services has also been costed. The costs supplied for the existing end-of-life ambulance service have also been provided.

A.3.1 Care-coordination service/centre

A.3.1.1 Total annual cost estimates

Table 6 provides the total annual cost estimates for the guideline committee's estimates of resource use required for a care coordination service to serve the average CCG.

Table 6: Annual cost estimate for the average CCG's care coordination service

Resource	Cost per hour	Hours worked per year	Unit cost per year (per WTE)	WTE	Total cost	Source
Lead Nurse (Band 6)	£44	1,573	£69,212	1	£69,212	PSSRU{Curtis, 2016 #3469}
Facilitator (Band 7)	£52	1,590	£82,680	1	£82,680	PSSRU{Curtis, 2016 #3469}
Administrators (Band 3)	£25	1,569	£39,225	3	£117,675	PSSRU{Curtis, 2016 #3469}
Health Care Assistants (Band 3)	£25	1,569	£39,225	8	£313,800	PSSRU{Curtis, 2016 #3469}
Community Nurse (Band 5)	£36	1,573	£56,628	1	£56,628	PSSRU{Curtis, 2016 #3469}
Volunteers	£7.50	312	£2,340	-	£2,340	PHE (2017) {Public Health England, 2017 #3473}
TOTAL COST					**£642,335**	

Abbreviations: WTE: whole time equivalent

Table 7 provides the total annual cost estimates for the resource use reported for the existing care coordination centre operational in Wandsworth CCG.

Table 7: Annual cost estimate for Wandsworth's care coordination centre

Resource	Cost per hour	Hours worked per year	Unit cost per year (per WTE)	WTE	Total cost	Source
Head of Centre/Lead Nurse (Band 6)	£44	1,573	69,212	1	£69,212	PSSRU{Curtis, 2016 #3469}
Coordinators/Administrators (Band 3)	£25	1,569	39,225	5.5	£215,738	PSSRU{Curtis, 2016 #3469}
Marie Curie health and Personal Care Assistants/Health Care Assistants (Band 2)	£23	1,569	36,087	6.5	£234,566	PSSRU{Curtis, 2016 #3469}

Resource	Cost per hour	Hours worked per year	Unit cost per year (per WTE)	WTE	Total cost	Source
Community Nurse (Band 3)	£24	1,553	37,272	1	£37,272	PSSRU{Curtis, 2016 #3469}
Volunteers (6 hrs a week)	£7.50	312	2,340	-	£2,340	Public Health England{Public Health England, 2017 #3473}
TOTAL COST					**£559,127**	

Abbreviations: WTE: whole time equivalent

Table 8 provides the total annual cost estimates for the resource use reported for the existing care coordination centre operational in North Somerset.

Table 8: Annual cost estimate for North Somerset's care coordination centre

Resource	Cost per hour	Hours worked per year	Unit cost per year (per WTE)	WTE	Total cost	Source
Lead Nurse (Band 7)	£52	1,573	£81,796	0.5	£40,898	PSSRU{Curtis, 2016 #3469}
Administrators	£25	1,569	£39,225	2	£78,450	PSSRU{Curtis, 2016 #3469}
Generic Support Workers offering personal care (Band 2)	£23	1,569	£36,087	8.5	£306,740	PSSRU{Curtis, 2016 #3469}
Nurse Facilitator (Band 6)	£44	1,573	£69,212	1	£69,212	PSSRU{Curtis, 2016 #3469}
Continuing health care fast track facilitator (Band 3)	£25	1,569	£39,225	0.7	£27,458	PSSRU{Curtis, 2016 #3469}
TOTAL COST					**£522,757**	

Abbreviations: WTE: whole time equivalent

Table 9 provides the total annual cost estimates for the resource use reported for the existing care coordination centre operational in Somerset.

Table 9: Cost estimate for Somerset's care coordination centre

Resource	Cost per hour	Hours worked per year	Unit cost per year (per WTE)	WTE	Total cost	Source
Lead Nurse (Band 6)	£44	1,573	£69,212	1	£69,212	PSSRU{Curtis, 2016

Resource	Cost per hour	Hours worked per year	Unit cost per year (per WTE)	WTE	Total cost	Source
						#3469}
Administrators (Band 3)	£25	1,569	£39,225	3.8	£149,055	PSSRU{Curtis, 2016 #3469}
TOTAL COST					**£218,267**	

Abbreviations: WTE: whole time equivalent

A.3.1.2 Cost per person needing access to the service

Table 10 provides estimates of the cost per person who should be identified as in the last year of life and therefore have access to the care coordination centre service (for all the care coordination centre cost examples).

Table 10: Cost of care coordination service/centres per person needing access to the services

	GC estimates for average CCG	Wandsworth	North Somerset	Somerset
Total cost estimate	£642,335	£559,127	£522,757	£218,267
Population[(a)]	266,996	316,096	211,681	549,447
% of people who should be identified as in LYOL	0.8	0.8	0.8	0.8
Total number of people who should be identified as in LYOL	2,136	2,497	1,680	4,363
Cost per person for all people who should be identified as in LYOL	£301	£223	£309	£50

Abbreviations: GC: Guideline committee; LYOL: last year of life

(a) Figures sourced from the Office of National Statistics (2016)

A.3.2 Out-of-hours end-of-life advice line

A.3.2.1 Total annual cost estimates

Table 11 provides the total annual cost estimates for the guideline committee's estimates of resource use required for an out-of-hours end-of-life advice line to serve the average CCG.

Table 11: Annual cost estimate for the average CCG's out-of-hours end -of-life advice line

Resource	Cost per hour	Hours worked per year	Unit cost per year	WTE	Total cost	Source
Nurse (Band 6)	£44	1,573	69,212	2	£138,424	PSSRU{Curtis, 2016 #3469}

Resource	Cost per hour	Hours worked per year	Unit cost per year	WTE	Total cost	Source
TOTAL COST					**£138,424**	

Abbreviations: WTE: whole time equivalent

Table 12 provides the total cost estimates for the resource use reported for the existing out-of-hours end-of-life advice line in Somerset.

Table 12: Annual cost estimate for Somerset's out-of-hours end-of-life advice line

Resource	Cost per hour	Hours worked per year	Unit cost per year	WTE	Total cost	Source
Nurse (Band 6)	£44	1,573	69,212	2	£138,424	PSSRU{Curtis, 2016 #3469}
TOTAL COST					**£138,424**	

Abbreviations: WTE: whole time equivalent

A.3.2.2 Cost per person needing access to the service

Table 13 provides estimates of the cost per person who should be identified as in the last year of life and therefore have access to the advice line service (for all the out-of-hours end-of-life advice line cost examples).

Table 13: Cost of advice line per person needing access to the service

	GC estimates for average CCG	Somerset
Total cost estimate	£138,424	£138,424
Population[(a)]	266,996	549,447
% of people who should be identified as in LYOL	0.8	0.8
Number of people who should be identified as in LYOL	2,136	4,396
Cost per person for all people who should be identified as in LYOL	£65	£31

Abbreviations: GC: Guideline committee; LYOL: last year of life
(a)Figures sourced from the Office of National Statistics (2016)

A.3.3 End-of-Life dedicated ambulance service

A.3.3.1 Total annual cost estimates

Table 14 provides the guideline committee's estimates of the total annual costs for the dedicated ambulance service to serve the average CCG.

Table 14: Annual cost estimate for the average CCG's dedicated ambulance service

Resource	Cost	Source
1 ambulance vehicle Training of staff Quarterly meetings with local providers	£100,000	Guideline committee's expert opinion

Resource	Cost	Source
TOTAL COST	**£100,000**	

Abbreviations: WTE: whole time equivalent

Table 15 provides estimates of the total annual costs for the existing dedicated ambulance service operational in Leeds.

Table 15: Annual cost estimate for the existing dedicated ambulance service operational in Leeds

Resource	Cost	Source
2 ambulance vehicles Training of staff Quarterly meetings with local providers	£200,000	Personal communication with commissioner of end-of-life services in Leeds
TOTAL COST	**£200,000**	

Abbreviations: WTE: whole time equivalent

A.3.3.2 Cost per person needing access to the service

Table 16 provides estimates of the cost per person who should be identified as in the last year of life and therefore have access to the ambulance service (for all the end-of-life dedicated ambulance cost examples).

Table 16: Cost of ambulance services per person needing access to the service

	GC estimates for average CCG	Leeds
Total cost estimate	£100,000	£200,000
Population	266,996 [(a)]	892,776[(b)]
% of people who should be identified as in LYOL	0.8	0.8
Number of people who should be identified as in LYOL	2,136	7,142
Cost per person for all people who should be identified as in LYOL	£47	£28

Abbreviations: GC: Guideline committee; LYOL: last year of life

(a)Figures sourced from the Office of National Statistics (2016)

(b) Calculated as the number of people registered with a Leeds GP in September 2017 however the service has recently opened up to non-Leeds areas accounting for roughly 5% of their journeys

A.3.4 Out-of-hours end-of-life medication provision service

A.3.4.1 Total annual cost estimates

Table 17 provides the total annual costs of the guideline committee's estimates for the total costs of an out-of-hours end-of-life medication provision service to serve the average CCG. The GC's estimates were based on data provided by a CCG (who requested to stay anonymous).

Table 17: Annual cost estimate of the average CCG's out-of-hours end-of-life medication provision service

Cost items	Unit cost	Units	Total cost
Set up and management of contract by third party NHS organisation (as part of a wider contract)	£4,400	1	£4,400
Minimum payment to each pharmacy at	£266	4 pharmacies	£1,064

Cost items	Unit cost	Units	Total cost
start of contract (cost of end-of-life/specialist palliative care medications)			
Payment to each pharmacy quarterly: stock audit declaration	£125	16(4 quarters * 4 pharmacies)	£2,000
TOTAL COST			**£7,464**

Abbreviations: WTE: whole time equivalent

A.3.4.2 Cost per person needing access to the service

Table 18 provides the cost per person who should be identified as in the last year of life and therefore have access to the out-of-hours end-of-life medication provision service.

Table 18: Cost of out-of-hours end-of-life medication provision services per person needing access to the service

	Guideline Committee Estimates
Total cost estimate	£7,464
Population[(a)]	266,996
% of people who should be identified as in last year of life	0.8
Number of people who should be identified as in last year of life	2,136
Cost per person for all people who should be identified as in last year of life	£3

(a)Figures sourced from the Office of National Statistics (2016)

A.3.5 Hospice at home/specialist palliative care in the community

A.3.5.1 Total annual cost estimates

Table 19 provides the total cost estimates for the guideline committee's estimates of resource use required for a hospice at home service to serve the average CCG.

Table 19: Annual cost estimates for the average CCG's hospice at home

Resource	Cost per hour	Hours worked per year	Unit cost per year	WTE	Total cost	Source
Consultant in palliative medicine	£104	1,838	£191,152	0.25	£47,788	PSSRU{Curtis, 2016 #3469}
Associate Specialist	£101	1,698	£171,498	1.5	£128,624	PSSRU{Curtis, 2016 #3469}
Lead Nurse (Band 6)	£52	1,573	£81,796	0.5	£40,898	PSSRU{Curtis, 2016 #3469}
Clinical Nurse Specialist (Band 6)	£44	1,573	£69,212	2.5	£173,030	PSSRU{Curtis, 2016 #3469}
Administrator (Band 3)	£25	1,569	£39,225	1	£39,225	PSSRU{Curtis, 2016

Resource	Cost per hour	Hours worked per year	Unit cost per year	WTE	Total cost	Source
						#3469}
Care Assistant (Band 2)	£23	1,569	£36,078	1.5	£54,131	PSSRU{Curtis, 2016 #3469}
Community Nurse (Band 5)	£36	1,573	£56,628	1.5	£84,942	PSSRU{Curtis, 2016 #3469}
Health care assistant (Band 3)	£24	1,553	£37,272	2	£74,544	PSSRU{Curtis, 2016 #3469}
Physio (Band 5)	£32	1,603	£51,296	0.5	£25,648	PSSRU{Curtis, 2016 #3469}
Occupational Therapist (Band 5)	£32	1,603	£51,296	0.5	£25,648	PSSRU{Curtis, 2016 #3469}
Counsellor (Band 6)	£42	1,590	£66,780	0.25	£16,695	PSSRU{Curtis, 2016 #3469}
Social Worker	£40	1,513	£60,520	2	£60,520	PSSRU{Curtis, 2016 #3469}
Volunteer coordinator (Band 2)	£23	1,569	£36,087	0.5	£18,044	PSSRU{Curtis, 2016 #3469}
Volunteers	£54 per visit	425 visits per year			£22,767	Midhurst (2011) {Macmillan Cancer Support, 2011 #3472}
TOTAL COST					**£873,023**	

Abbreviations: WTE: whole time equivalent

Table 20 provides the total cost estimates for the resource use reported for the existing care community specialist palliative care service operational in Hampshire, Surrey and West Sussex PCTs.

Table 20: Annual cost estimates for the existing specialist palliative care community service operational in Hampshire, Surrey and West Sussex PCTs

Resource	Cost per hour	Hours worked per year	Unit cost per year	WTE	Total cost	Source
Senior Manager (Band 8a)	73	1,573	£114,829	1	£114,829	PSSRU{Curtis, 2016 #3469}
Counsellor (Band 7)	52	1,590	£82,680	0.5	£41,340	PSSRU{Curtis, 2016

Resource	Cost per hour	Hours worked per year	Unit cost per year	WTE	Total cost	Source
						#3469}
Physiotherapist (Band 7)	52	1,590	£82,680	0.3	£24,804	PSSRU{Curtis, 2016 #3469}
Occupational Therapist (Band 7)	52	1,590	£82,680	0.3	£24,804	PSSRU{Curtis, 2016 #3469}
Clinical Nurse Specialist (Band 7)	52	1,573	£81,796	4.66	£381,169	PSSRU{Curtis, 2016 #3469}
Community Nurse (Band 5)	36	1,573	£56,628	4	£226,512	PSSRU{Curtis, 2016 #3469}
Consultant	104	1,838	£191,152	1.6	£305,843	PSSRU{Curtis, 2016 #3469} (cost of hospital based staff)
Bank Nurse: unqualified (Band 3)	24	1,553	£37,272	2	£74,544	PSSRU{Curtis, 2016 #3469}
Bank Nurse: qualified (Band 5)	36	1,573	£56,628	2	£113,256	PSSRU{Curtis, 2016 #3469}
Associate Specialist	101	1,698	£171,498	0.5	£85,749	PSSRU{Curtis, 2016 #3469} (cost of hospital based staff)
Administrator (Band 4)	30	1,569	£47,070	2	£94,140	PSSRU{Curtis, 2016 #3469}
Health Care Assistant	24	1,553	£37,272	0.6	£22,363	PSSRU{Curtis, 2016 #3469}
Care assistant	23	1,569	£36,087	1.33	£47,996	PSSRU{Curtis, 2016 #3469}
Volunteer Coordinator	23	1,569	£36,087	0.75	£27,065	PSSRU{Curtis, 2016 #3469}
Volunteer		1,342	£54	70	£71,891	Assumed
TOTAL COST					**£1,656,306**	

Abbreviations: WTE: whole time equivalent

A.3.5.2 Cost per person needing access to the service

Table 21 provides the cost per person who should be identified as in the last year of life and therefore have access to the hospice at home/specialist palliative care in the community should they require the service.

Table 21: Cost of hospice at home/specialist palliative care in the community per person needing access to the service

	GC estimates for average CCG	Hampshire, Surrey and West Sussex PCTs
Total cost estimate	£873,023	£1,656,306
Population	266,996[(a)]	180,000[(b)]
% of people who should be identified as in LYOL	0.8	0.8
Number of people who should be identified as in LYOL	2,136	1,440
Cost per person for all people who should be identified as in LYOL	£409	£1,150

Abbreviations: GC: Guideline committee; LYOL: last year of life

(a)Figures sourced from the Office of National Statistics (2016)

(b)Source Dewer (2012){Dewar, 2012 #3510}

A.3.6 Threshold analysis results

Table 22 provides the results of the threshold analysis. The threshold analysis was conducted on the total cost example estimates for the hypothetical average CCG, for each of the services. The threshold analysis was undertaken to determine the percentage reduction required in hospital deaths, emergency inpatient days or emergency admissions to make the services cost neutral. If the services led to improvements in combinations of outcomes, as they are likely to occur simultaneously, then this could reduce the required reductions needed for the outcomes individually.

Table 22: Threshold analysis results

		Total number of events avoided or reduced required to make the service cost neutral[a]			Estimated total number of events for the average CCG[b]			Percentage reduction required in outcomes to make the service cost neutral[c]		
Service Model component	**Total Cost**	**Hospital deaths**	**Emergency inpatient days**	**Emergency Admissions**	**Hospital deaths**	**Emergency inpatient days**	**Emergency Admissions**	**Hospital deaths**	**Emergency inpatient days**	**Emergency Admissions**
End-of-life care coordination service	£642,335	671	2,530	220	1,092	44,915	3,907	61%	6%	6%
End-of-life advice line	£138,424	144	545	47	1,092	44,915	3,907	13%	1%	1%
End-of-life pharmacy	£7,464	8	29	3	1,092	44,915	3,907	1%	0.06%	0.06%
End-of-life ambulance	£100,000	104	394	34	1,092	44,915	3,907	10%	1%	1%
Hospice at home	£873,023	911	3,438	299	1,092	44,915	3,907	83%	8%	8%

(a) These were calculated using the estimated cost reductions in Table 4.

(b) This was calculated from data obtained from the Public Health England end-of-life economic tool.{Public Health England, 2017 #3473} The total number of hospital deaths in England in all CCGs (225,942) was divided by the number of CCG (207) to get the number of hospital deaths for the average CCG. The same method was used for Emergency inpatient days and emergency admissions.

(c) These estimates were calculated by dividing the total number of events avoided or reduced required to make the service cost neutral by the estimated total number of events for the average CCG. For example for hospital deaths, 671/1,092 = 0.61 (61%). These estimates assume that none of the other outcomes leading to cost savings are occurring simultaneously. If the services led to improvements in combinations of the outcomes simultaneously, then the required percentage reduction in a particular outcome (to make the service cost neural) might decrease.

A.3.7 Additional cost and threshold analysis breakdown for the care coordination service

The committee requested the costs of the care coordination service broken down into levels of availability of the service, as the total costs estimates were for all operational hours that the service can be accessed. The following cost breakdown, given in Out of hours (Extended hours + Weekends)

Table 23 and The cumulative *and incremental columns in this row are comparing out of hours + in hours provision to in hours provision alone.*

Table 24 was therefore presented to the committee.

The breakdown follows the assumption that the service could be available:

- In hours: Weekdays 9am – 5pm
- Extended hours: Weekdays 7am – 10.30pm
- Weekends: Weekdays 7am – 10.30pm and weekends 9am – 5pm (weekends staffed by administrators only)
- Out of hours (Extended hours + Weekends)

Table 23: Care coordination service cost – broken down by level of availability

Level of availability	Cumulative cost	Incremental cost	Percentage of total cost	Cumulative cost per person	Incremental cost per person
In hours	£300,065		47%	£142	
Extended hours	£581,375	£281,310	44%	£275	£133
Weekends	£642,335	£60,960	9%	£303	£29
Out of hours[(a)]	£642,335	£342,270	53%	£303	£162
Total	**£642,335**		100%	**£303**	

(a) The cumulative and incremental columns in this row are comparing out of hours + in hours provision to in hours provision alone.

Table 24: Threshold analysis – broken down by level of availability

Level of availability	Cumulative cost	Reduction in hospital deaths (cumulative)	Reduction in emergency inpatient days (cumulative)	Reduction in inpatient emergency admissions (cumulative)
In hours	£300,065	29%	3%	3%
Extended hours	£581,375	57%	5%	5%
Weekends	£642,335	61%	6%	6%
Out of hours	£642,335	61%	6%	6%
Total	£642,335	61%	6%	6%

A.3.8 Uncertainty

Table 25 provides a summary of the committee's views on how different factors would affect the costs and outcomes associated with implementing the different services.

1 **Table 25: Factors that will affect the costs and outcomes associated with providing the services**

Factors that will affect costs and outcomes of implementing the services	Discussion
Geographical region	***Costs*** The type of region will have an effect on the level of resources required for some of the service components and less effect on others. The advice line is likely to be less affected by the type of region as the service does not require the providers to physically be with the patients, carers or healthcare professionals using the service. The ambulance service will be significantly affected by the type of region as it would have to travel further distances in rural regions but may have fewer journeys due to lower population density than large urban areas where distances would be shorter but frequency likely to be higher, therefore it is difficult to tell how costs would be affected. As urban regions have higher population densities than rural areas, it is likely that you would need a greater number of pharmacies to be contracted to stock end-of-life medication than in rural areas, therefore the total cost of the service is likely to be greater but the cost per person with access could end up being lower due to higher population density. Small regions may find it difficult to implement as they have fewer pharmacies and therefore might not be able to find a pharmacy to contract with. The cost of hospice at home is likely to be higher in rural regions than in urban regions as all providers would need to travel further distances to reach patients, increasing the amount of time home visits take to carry out. The number of volunteers will differ drastically by region. If a service relies heavily on volunteers (such as the hospice at home service) than the number of available volunteers could prohibit the service from operating efficiently. ***Outcomes*** People living in rural areas are more likely to have to travel further to their nearest hospital. Reducing avoidable hospital admissions and days spent in emergency hospital admissions for people residing in rural areas will be of even greater benefit due to the increased likelihood that the nearest hospital is much further away. This also benefits carers or those important to the person in the last year of life, which would need to travel to the hospital as well. Increasing the proportion of people dying outside of hospital is estimated to be of equal benefit regardless of type of geographical region. It was not possible to determine how the type of region would affect the levels of improvements in the outcomes achieved from implementing the services.
Demographics and epidemiology	***Costs*** Demographics and epidemiology of a region will affect the level of demand for the services. Different diseases have different disease trajectories and require differing levels of care for people in the last year of life. For example, someone with multi-morbidities dying from dementia is likely to require more intensive care compared to someone frail and elderly who eventually dies of heart failure in their sleep. The lower a person's socioeconomic status, the greater their risk of both physical and psychological health problems. People of a higher socio-economic status have longer life expectancies on average. These are factors which will affect the proportion of a population that are in the last year of life and therefore the number of people who should have access to the services, which would affect the level of resources required to provide them. The demographics of a region are likely to affect the number of available volunteers. More affluent regions are likely to have more people with time to volunteer. ***Outcomes*** Avoiding hospital deaths, emergency hospital admissions and reducing the number of days spent in an emergency admission may be of greater benefit to some groups

Factors that will affect costs and outcomes of implementing the services	Discussion
	than others. For people with very complex conditions it will be less likely to achieve these outcomes as they may be better suited to being in hospital compared with being cared for at home.
Level of baseline services and efficiency of service model as a whole	***Costs*** The level of baseline services in a region will significantly affect the costs of implementing the out-of-hours community services included in this analysis. The level of resource required to provide the services is likely to be significantly lower if there are already some established services in place that would complement and support implementation of the new services. End-of-life care services are not mutually exclusive. They are often implemented at the same time and delivered simultaneously, for example a care coordination service may also deliver an end-of-life advice line and also help in the coordination of hospice at home. Having the care coordination service already established would lower the resources required to implement an out-of-hours advice line, as some of the overheads and resources could be shared among the different components. ***Outcomes*** It will be easier to achieve reductions in hospital deaths, emergency admissions and days spend in emergency admission in regions where they have a higher level of baseline services. This is because end-of-life care services are not mutually exclusive but are all part of a wider service delivery model. The more comprehensive and well integrated the model, the easier it is going to be to achieve improvements in outcomes.

A.3.9 Validation

The analysis was developed in consultation with the guideline committee; inputs and results were presented to and discussed with the committee for clinical validation and interpretation.

The analysis was systematically checked by the health economist undertaking the analysis. The analysis was peer reviewed by a second experienced health economist from the NGC.

A.3.10 Interpreting Results

NICE's report 'Social value judgements: principles for the development of NICE guidance'{NICE2008} sets out the principles that committees should consider when judging whether an intervention offers good value for money. For this analysis the services were considered good value for money if the committee judged that the component would be likely to achieve the outcomes required to make the service cost neutral.

A.4 Discussion

A.4.1 Summary of results

Hospice at home was the most expensive end–of-life care service model component in this analysis, with an estimated annual total cost of £873,023 to serve a hypothetical average CCG region, and a cost per person needing access to the service of £408. This estimate was significantly lower than the estimated cost per person needing access of the existing Midhurst service (£1,150) which has a more comprehensive set of resources than those the committee felt would be typical. Although it is the most expensive component, as it is the most comprehensive service, it is likely that it has the highest

potential to reduce the number of hospital deaths, avoid emergency admissions in the last year of life and reduce days spent in emergency admissions in the last year of life. The committee thought that it would not be possible to reduce hospital deaths by 83% but that it could potentially be possible for the intervention to reduce emergency inpatient days or emergency admissions by 8%.

The second most costly component in the analysis was the care coordination service with a total cost of £642,335 to serve the hypothetical average CCG region, and a cost per person who should have access to the service of £301. The cost per person who should have access to the service was lower than the existing centres in North Somerset (£308) but higher than the existing centre in the urban area of Wandsworth (£221) and the rural area of Somerset (£50). The committee thought that a care coordination service would not be likely to reduce hospital deaths by 61%. The committee thought that it could potentially be possible for the service to lead to a 6% reduction in emergency inpatient days spent in hospital in the last year of life or avoidable emergency admissions in the last year of life but that this would be more likely to be achieved if the service was complemented with other components such as the advice line and ambulance.

The third most costly component in the analysis was the advice line with a total cost of £138,424 to serve the hypothetical average CCG region, and a cost per person needing access to the service of £65. The cost per person needing access to the service was higher than that of the existing service in Somerset (£31). The committee thought that the advice line would not be likely to reduce hospital deaths by 13% but that it would be likely to be able to reduce emergency inpatient days spent in hospital in the last year of life or avoidable emergency admissions in the last year of life by 1%.

The fourth most costly component in the analysis was the end-of-life ambulance service with an estimated total cost of £100,000 to serve the hypothetical average CCG region, and a cost per person needing access to the service of £47. The cost per person needing access to the service was higher than that of the existing service in Leeds (£28). The committee thought that an ambulance service could potentially reduce hospital deaths by 10% and that it could potentially reduce emergency inpatient days spent in hospital in the last year of life or avoidable emergency admissions in the last year of life by 1%.

The least costly component in the analysis was the out-of-hours end-of-life pharmacy service with a total cost of £7,464 to serve the hypothetical average CCG region, and a cost per person needing access to the service of £3. Although this component was significantly less costly than the others it does not account for the costs to the individual pharmacies holding the contracts with the NHS, who might incur additional costs for stocking the end-of-life mediation and staying open extended hours. The committee thought that it would be possible to reduce hospital deaths by 1% and reduce emergency inpatient days spent in hospital in the last year of life or avoidable emergency admissions in the last year of life by 0.06%.

The reason that the percentage reductions required in hospital deaths was always significantly greater than the percentage reductions required in emergency admissions or inpatient days spent in emergency admissions was due to the fact that the estimated total number of hospital deaths in the average CCG was a lot lower than the total number of annual days (nights) spent in emergency hospital admissions during the last year of life or total number of emergency hospital admissions during the last year of life (see Table 5). If the total number (denominator) is smaller, the relative reduction required is greater.

A.4.2 Limitations and interpretation

A serious limitation of the analysis is that, due to the lack of appropriate available evidence and issues with data on outcomes being confounded, there are no estimates of the effectiveness of the services. Therefore the analysis was limited to a costing analysis including a threshold analysis. The cost effectiveness of the services, and whether they were considered to be good value for money for

the NHS, were based solely on the guideline committee's expert opinion and are therefore highly uncertain.

Another serious limitation is that methods for estimating the resources that would be required to provide the services were not robust. The resources required were all adapted from existing services but were adapted based solely on the committee's opinion. A different committee composition may have come up with different estimates.

Although the hypothetical region was termed the 'averaged CCG' (used to standardise the cost estimates in the analysis) it was only average in population size. Other regional characteristics would also influence the costs of the components, maybe even more so than population size.

A further limitation is that it was not possible to accurately estimate the expected demand for the services. Although the somewhat subjectivefigure of 0.8% of the population size was used, even if all people who should be identified as in the last year of life were correctly identified, this would still be a significant overestimation of the likely number of people who would actually use the services. As this figure was used to estimate the cost per person needing access to the services for all of the existing services, this is a gross underestimation of the cost per person who actually does have access to the existing services, as the regions will not be identifying 0.8% of their population as being in the last year of life.

Another limitation of this analysis is that the data used to convert the absolute reductions in outcomes required into relative reductions used figures on the average total number of emergency admissions and days (nights) spent in emergency admissions for people registered as dying in 2013–2015, however it was not possible to determine how many of these admissions could have been avoided. There is a distinct difference between emergency admissions that could be avoided had there been other end-of-life services in place, and emergency admissions where it would always have been necessary and preferred by the patient, for the patient to be admitted to hospital. These service components will only be able to reduce the number of emergency admissions that were avoidable. This limitation affects how the relative reductions in emergency admissions and days in admissions should be interpreted. If the reductions had been calculated using avoidable admissions only, then the relative reductions required would be larger, as the total numbers (the denominators) would have been lower.

Another limitation is that not all of the important costs of providing the services could be estimated and included in the analysis. Some additional costs (such as set-up costs, training costs) were considered to be too difficult to estimate therefore were not included in the cost components making up the total cost estimates; however, if high, they might affect the cost effectiveness of the services.

The guideline committee found it extremely challenging to determine estimates for the resource use required to provide the different services. The level of difficulty experienced in this exercise indicates that the estimates used in the analysis are likely to be highly uncertain and should not be interpreted as recommended levels of resources as these will be highly sensitive and dependent on the where, by who and to whom the services will be provided. Table 25 provides some discussion on factors likely to affect the costs and outcomes of providing the service component and why the results in this analysis are highly uncertain.

A.4.3 Generalisability to other populations or settings

The results of this analysis are not generalisable to other populations or settings. The costs of the services included in the analysis are likely to be highly sensitive to the characteristics of the regions they are implemented in, and therefore they cannot be generalised. The purpose of this analysis was to help the committee consider the cost effectiveness of the services it wanted to consider recommending, and to help the committee think about whether it thought they could offer good

value for money. The purpose of the analysis was not to estimate the actual costs of implementing the services in a real world setting.

A.4.4 Conclusions

The services included in the analysis would be considered good value for money for the average CCG if they achieved:

- Care coordination service:
  - 61% reduction in number of hospital deaths, or
  - 6% reduction in emergency inpatient days of people in the last year of life, or
  - 6% reduction in emergency admissions of people in the last year of life
- Out-of-hours end-of-life advice line:
  - 13% reduction in number of hospital deaths, or
  - 1% reduction in emergency inpatient days of people in the last year of life, or
  - 1% reduction in emergency admissions of people in the last year of life
- Out-of-hours end-of-life Pharmacy service:
  - 1% reduction in number of hospital deaths, or
  - 0.06% reduction in emergency inpatient days of people in the last year of life, or
  - 0.06% reduction in emergency admissions of people in the last year of life
- End-of-life ambulance service
  - 10% reduction in number of hospital deaths, or
  - 1% reduction in emergency inpatient days of people in the last year of life, or
  - 1% reduction in emergency admissions of people in the last year of life
- Hospice at home
  - 83% reduction in number of hospital deaths, or
  - 8% reduction in emergency inpatient days of people in the last year of life, or
  - 8% reduction in emergency admissions of people in the last year of life

On reflection of the results of the costing analysis, the committee felt that most of the services in the analysis could be good value for money for the NHS and could all contribute towards reducing the proportion of people dying in hospital, reducing avoidable hospital admissions in the last year of life and reducing the length of stay in emergency admissions in the last year of life. The committee was very conscious that the effectiveness of the services and their costs will be highly dependent on where they are being implemented and therefore end-of-life care service models should always be adapted to suit regional characteristics. Due to the complex nature of end-of-life service delivery, what works in one region will not necessarily be suitable in another. The committee agreed that the more expensive interventions, the care coordination service and the hospice at home service, would both be likely to improve outcomes, however the relative reduction in outcomes required to recover their costs are high. The committee was unsure as to whether the interventions would be able to meet such requirements, and concluded that it would be very much dependent on the baseline level of end-of-life services already available in the region, as well as the population characteristics.