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Economic impact of hospitalisations amongst patients in the last year of life: An observational study

Abstract

Background: Hospital admissions amongst patients at the end of life have a significant economic impact. Avoiding unnecessary hospitalisations has the potential for significant cost savings, and is in line with patient preference.

Objective: To determine the extent of potentially avoidable hospital admissions amongst patients admitted to hospital in the last year of life, and to cost these accordingly.

Design: An observational retrospective case note review with economic impact assessment

Setting: Two large acute hospitals in the North of England, serving contrasting socio-demographic populations

Patients: 483 patients who died within one year of admission to hospital

Measurements: Data were collected across a range of clinical, demographic, economic and service use variables and were collected from hospital case notes and routinely collected sources. Palliative medicine consultants identified admissions that were potentially avoidable.

Results: Of 483 admissions, 35 were classified as potentially avoidable. Avoiding these admissions and caring for the patients in alternative locations would save the two hospitals £5.9 million per year. Reducing length of stay in all 483 patients by 14% has the potential to save the two hospitals £47.5 million per year, however this cost would have to be offset against increased community care costs.

Limitations: A lack of accurate cost data on alternative care provision in the community limits the accuracy of economic estimates.

Conclusions: Reducing length of hospital stay in palliative care patients may offer the potential to achieve higher hospital cost savings than preventing avoidable admissions. Further research is required to determine both the feasibility of reducing

length of hospital stay for patients with palliative care needs, and the economic impact of doing so.

What is already known about the topic?

- Hospital admissions amongst patients at the end of life have a significant economic impact.
- A proportion of hospital admissions at the end of life may be avoidable
- The prevention of avoidable hospital admissions has the potential to generate significant cost savings.

What this paper adds?

- 7.2% of hospital admissions amongst patients in the last year of life were classified as potentially avoidable.
- The economic impact of avoiding these admissions in the two hospitals studied would be a £5.9 million a year cost saving
- Reducing length of stay amongst patients in the last year of life has the potential to save the two hospitals £47.5 million per year, however this cost would have to be offset against increased community care costs.

Implications for practice, theory or policy?

- The proportion of avoidable hospital admissions at the end of life is relatively low.
- Reducing length of stay in palliative care patients may offer the potential to achieve higher cost savings than preventing avoidable admissions
- Further research is required to explore the feasibility of reducing length of stay, and the economic impact of doing so.

Background

The total cost of UK hospital admissions in the last year of life for adults admitted with a primary diagnosis indicating palliative care need has been estimated to be in the region of £1.3billion.[1]A lack of timely access to services in the community may result in people with palliative care needs being unnecessarily admitted to hospital.[2]It has been suggested that improving and expanding community services may reduce avoidable hospital admissions amongst patients with palliative care needs, thus reducing related hospital costs.[3]

A study of final hospital admissions to a UK District General Hospital (DGH) in 2006-2007 reported that 20-33% of admissions in the last year of life could have been avoided if more comprehensive community services were available.[4] It was estimated that preventing these admissions would amount to an annual cost saving of up to £612,000 for this hospital.[4] A National Audit Office review of patients dying in a hospital in Sheffield in 2007 reported that 40% of admissions were avoidable.[5] It was estimated that annual savings of £4.5 million could be achieved by this hospital, by avoiding a similar number of admissions annually. A more recent study by Ward et al., found a lower proportion of avoidable admissions during a survey of palliative care patients at two hospitals in the North of England.[6] In this exploratory study only 7% of admissions were reported as avoidable. The estimated cost saving of avoiding these admissions and supporting these patients in the community was £1527 for both hospitals over the survey period, amounting to potential savings of around£180,000 per annum. This study was however limited by the relatively small sample size and lack of accurate cost data.

Evidence relating to the economic impact of avoidable hospitalisations at the end of life is limited. There is a lack of consensus regarding the proportion of admissions that are avoidable and the cost of these admissions, in addition to a lack of clarity and consistency regarding definitions of avoidable admissions. A recent review of the evidence reported a lack of high quality studies, and a limited evidence base. The review concluded that the case for offsetting the additional costs of providing high-

quality community support through a reduction in hospital admissions was inconclusive.[7]

The aim of this study was therefore to determine the extent of potentially avoidable hospital admissions amongst patients admitted to hospital in the last year of life, and to cost these accordingly.

Methods

Data collection

This observational study involved a retrospective case note review and economic impact analysis of patients who died within a year of admission to two contrasting hospitals in the North of England. Sheffield's Northern General Hospital (SNGH) serves a largely urban, economically disadvantaged and ethnically diverse area; in contrast the Royal Lancaster Infirmary (RLI) serves a predominantly white Caucasian semi-rural / remote rural population.

Data were collected for all inpatients present in SNGH at midnight on the 10th May 2010 or in RLI at midnight on the 15th Nov 2010, and who had died within one year of those dates. The selected dates were chosen to coincide with other research being undertaken at the two hospitals at that time.[8] Patients were identified by the respective hospitals' Information Service Departments, using data derived from patient administration systems. The complete hospital case notes of all identified patients were retrieved from medical records, and data were extracted by two senior nursing staff using a standardised proforma. Further information was collected from hospital Information Services and from routinely collected mortality data. Data were collected across a range of clinical, demographic, economic and service use variables and are summarised in table 1. Where the 'index admission' is referred to, this is the admission spanning the 10th May 2010 for SNGH patients, and 15th Nov 2010 for RLI patients.

Data were examined for all patients, and patients were excluded where death was due to trauma or sudden unpredictable causes. There is evidence to suggest that selecting people who died from non-sudden causes is an appropriate way to obtain a sample that could benefit from palliative care.[9]

Source of data	**Data collected**
Hospital case notes	• Living arrangements at time of index admission • Gender • Ethnicity • Age at death • Reason for index admission, taken from patient admission record • Time/date of index admission • Number of hospital admissions in 12 months prior to death • Number of days spent in hospital in 12 months prior to death
Hospital Information Services	• Health Resource Group (HRG) code for index admission[1] • Length of stay (days) for index admission
ONS-HES linked mortality data (from the Medical Research Information Service)	• Cause of death • Place of death • Underlying cause of death (up to four iterations) • Coroners verdict (if inquest held)

Table 1: Data collected during the retrospective review.

Appropriateness of index admission

All data were reviewed by two palliative medicine consultants from the two hospitals, in order to assess appropriateness of the index admission. Consultants reviewed the

[1]HRG codes are clinically meaningful groupings of patient activity, based on both diagnoses and clinical procedures undertaken. HRG codes are allocated locally by 'coding teams'. Standard costs are assigned to each HRG and these are used across the NHS in England to calculate the cost of a hospital admission and generate reimbursement through a system known as Payment by Results (DOH, 2011-12).

notes from the hospital at which they worked, as knowledge of local service provision and organisation were considered critical for informing decision making. Data were reviewed and a decision was made as to whether the index admission was 'appropriate' or 'potentially avoidable'. Potentially avoidable admissions were defined as admissions that could have been prevented given local service configurations and capacity at the time of the index admission , taking into account clinical need, patient social and demographic circumstances and availability of community health and social care services For admissions deemed potentially avoidable, an alternative to hospital admission was suggested. To ensure consistency in clinical decision-making between the two consultants, a random sample of 10% of notes were subject to double blind review. The level of agreement between the consultants was assessed using Cohen's Kappa measure of chance corrected agreement.

Data analysis

All data were entered onto an SPSS database and were analysed by a Health Economist (SW). For each of the potentially avoidable index admissions, the cost of the admission was calculated using the assigned HRG code. HRG codes and non-elective tariffs for 2010/11 were used, except in three cases where the code was not identifiable and the code and tariff for 2011/12 were used.[10, 11] For patients whose hospital stay exceeded the expected upper length of stay for the HRG (trim point) an additional long stay or excess bed day payment was added. This was derived by multiplying the per day long stay payment for the relevant HRG by the number of days that the hospital spell exceeded the HRG trim point. The same method was also used to estimate the cost of unavoidable index admissions.

The cost of the alternative place of care suggested by the consultants was estimated, based on costs taken from published national sources, and inflated to 2011 prices where required. The cost of nursing home care was estimated at £106/day, based on data obtained from the PSS Research Unit's Costs of Health and Social Care 2010.[12] The cost of hospice care (including that funded by both NHS and charitable sources) was estimated at £325/day, based on data obtained from research commissioned by the National Audit Office.[13] The cost of home care was estimated at £50/day, based on

data derived from a Kings Fund report.[14] Key assumptions were tested in a sensitivity analysis.

Ethical approval was provided by the Nottingham 1 Research Ethics Committee and the National Information Governance Board (NIGB) Ethics and Confidentiality Committee.

Results

In total, 513 patients who were present in the two hospitals on the given dates had died within one year. Medical records were unable to locate twenty nine sets of notes. Notes were reviewed for the remaining 484 patients (return rate 94.3%). Routinely collected data were available for 480 patients, for four patients cause and place of death data were retrieved from hospital case notes. One patient met the exclusion criteria of dying from a sudden cause, the final analyses were therefore undertaken on 483 patients (fig. 1).

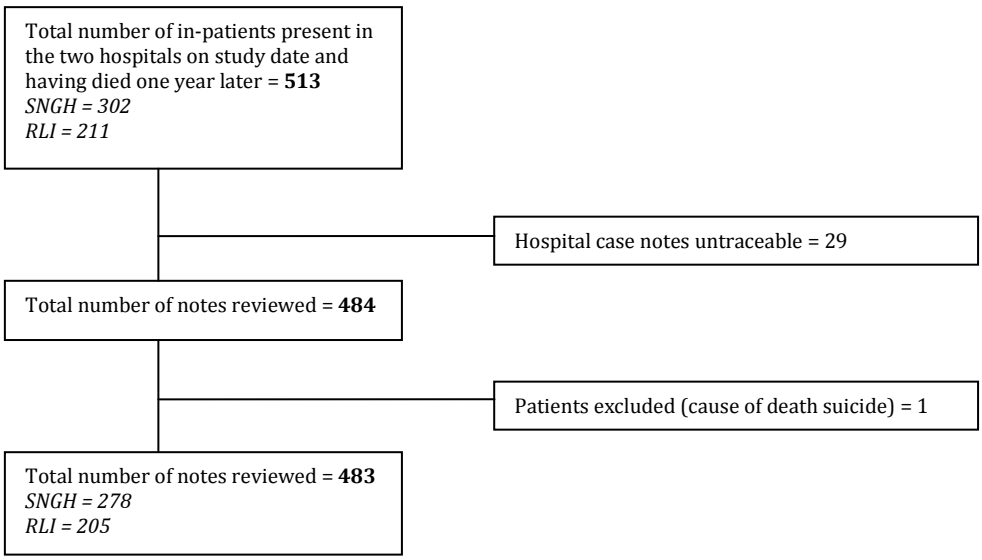

Figure 1: Details of recruitment for hospital in-patients who died within one year of a hospital admission

Demographic data for all patients

Table 2 presents demographic data for all 483 patients. The median age at death was 82 years and just over half of patients were female (52.2%). Most of the patients lived independently at the time of their index admission, either living alone or cohabiting (70.4%). The majority of patients died in hospital (65.4%), with nursing or residential care the next most common place of death (21.3%). Only 8.7% of patients died in their own home. The most common cause of death was broncho-pneumonia, which accounted for almost a third of all deaths (27.5%). (table 2).

Gender	Male Female	231 (47.8%) 252 (52.2%)
Living arrangements prior to index admission	Co-habits Lives alone Nursing home or residential care Not stated	172 (35.6%) 168 (34.8) 91 (18.8%) 52 (10.8%)
Place of death	Hospital Nursing Home Own Home Hospice Residential home	316 (65.4%) 88 (18.2%) 42 (8.7%) 22 (4.6%) 15 (3.1%)
Cause of death	Broncho-pneumonia Cancer Heart disease (including cardiac arrest) Other Congestive heart failure Septicaemia Frailty/Old age Renal failure Multiple organ failure COPD/Pulmonary fibrosis Dementia Stroke Liver disease	133 (27.5%) 88 (18.2%) 42 (8.7%) 37 (7.7%) 34 (7.0%) 29 (6.0%) 23 (4.8%) 22 (4.6%) 14 (2.9%) 12 (2.5%) 20 (4.1%) 25 (5.2%) 4 (0.8%)
Median age at death Age range at death	82 years 23 – 103 years	

Table2: Demographic information for in-patients who died within one year of a hospital admission (n=483)

Potentially avoidable admissions

Of the 483 patients included in the case note review, 35 (7.2%) index admissions were classified by the two palliative medicine consultants as potentially avoidable.

Double coding of a random sample of 10% of notes indicated moderate levels of agreement between consultants, using the Kappa measure of chance corrected agreement (Kappa = 0.474, n = 52).[15] Perfect agreement would not be expected as knowledge of local services was central to assessments, and the non-local clinician would not be expected to have this knowledge. Of the potentially avoidable admissions, 21 (60%) were male and 14 (40%) were female. The majority lived in nursing or residential care at the time of the index admission (n=26, 74.3%). The most commonly recommended alternative place of care was a nursing home (n=28). In addition it was considered that three patients could have been cared for in a hospice, and four in their own homes with appropriate support (Table 3). The most common cause of death was bronchitis/pneumonia (n=11), followed by frailty/old age (n=8).

Alternative place of care	Nursing Home	28 (80%)
	Own Home	4 (11.4%)
	Hospice	3 (8.6%)
Cause of death	Bronchitis/pneumonia	11 (31.4%)
	Frailty/old age	8 (22.9%)
	Dementia	4 (11.4%)
	Renal failure	3 (8.6%)
	Cancer	3 (8.6%)
	Multiple Organ Failure	2 (5.7%)
	Congestive heart failure	1 (2.9%)
	Cardiac arrest	1 (2.9%)
	Upper airway obstruction	1 (2.9%)
	Clostridium Difficile infection	1 (2.9%)

Table 3: Suggested alternative place of care and cause of death for patients whose index admission was classified potentially avoidable (n=35).

Economic impact of potentially avoidable admissions

The mean cost of the 35 potentially avoidable index admissions was £6,068 (range: £1,571 to £27,343). This compares to a mean cost of £6,573 for all 483 index admissions. For 13 of the 35 potentially avoidable admissions the length of stay of the

hospital spell exceeded the HRG trim-point and costs relating to the excess bed days were included. The mean length of stay of all potentially avoidable admissions was 40.4 days and the total hospital costs were £212, 397. The distribution of costs per index admission is given in Figure 2, showing the breakdown by basic HRG cost and the excess bed-day cost, where relevant. The mean cost of the potentially avoidable admissions excluding the excess bed day costs was £3,179.

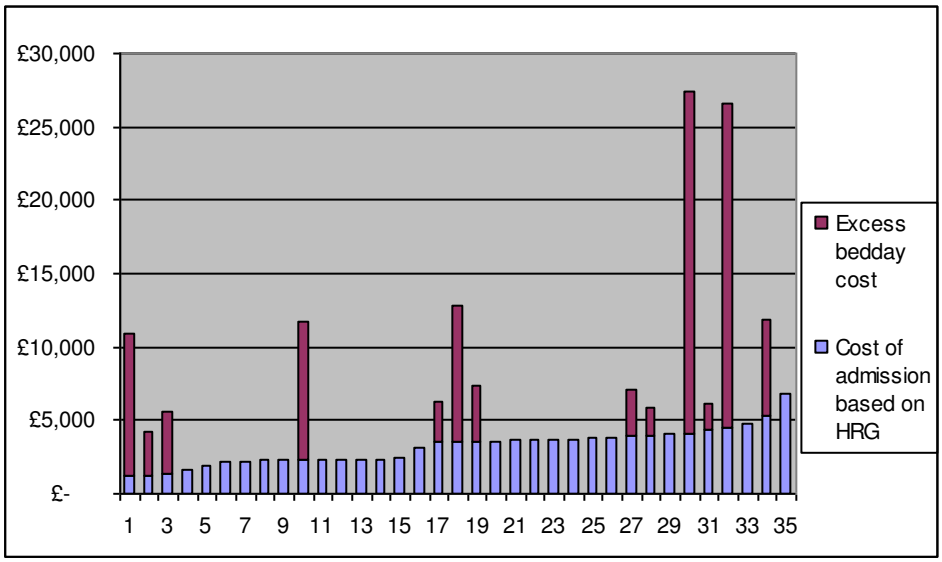

Figure 2: Distribution of cost per admission

The total cost of alternative places of care was £162,209, based on the cost estimates detailed in the methods (Table 4).Taking into account the avoided hospital costs and the cost of providing support in alternative locations, the estimated economic impact of preventing these avoidable admissions would be a cost saving of £50,188. This is a potential cost saving across two hospitals for in-patients in the last year of life, relating to in-patients present on a single day. Our previous work indicated the total number of resident in-patients at the two hospitals was 1,359 during the study period (equivalent to a single day).[8] These admissions during the study period accounted for 0.9% of total admissions over the year. Assuming that the proportion of potentially avoidable admissions identified in this study is indicative of those which would be identified over the course of a year, the annual economic impact for the two hospitals is estimated as a cost saving of just under £5.9 million.

Care setting	Cost per day[1]	Duration of care (days)	No. of patients	Total

Nursing home care Hospice Care Home care	£106 £325 £50	44.6 26.7 21.8	28 3 4	£131,842 £26,034 £4,333
TOTAL COST				£162,209
[1] Cost per day figures are rounded				

Table 4: Total cost of alternative places of care

Sensitivity Analyses

In order to explore the robustness of the estimates in the presence of areas of uncertainty, key assumptions were tested in a sensitivity analysis (see Table 5). The cost and associated length of stay assumptions related to the avoidable admissions were tested using estimates from two previous UK papers.[2,4] Using these estimates for cost of index admissions, savings were predicted to be as high as £85, 600 for the two hospitals over the study period, compared with our base case estimate of £50,188 (SA1 and SA2). Increasing the cost of hospice care or nursing home care by 20% results in an additional cost of alternative care provision but a small cost saving is still predicted. (SA 4 and 6). Given that home care was considered a suitable alternative for only four patients in our dataset, applying a sensitivity test of values of +/-50% to the base case cost was found to have limited impact (SA7 and SA8). Doubling the number of patients supported at home from 4 to 8 (and assuming these patients were previously allocated to nursing home care) increased the cost saving (SA9). Doubling the number of patients supported in a hospice from 3 to 6 (assuming these patients were previously allocated to nursing home care) resulted in the lowest predicted cost saving. (SA10)

	Avoided costs of hospital admissions	Cost of Care in Alternative Locations	Total Economic Impact

BASECASE	-£212,397	£162,209	-£50,188
SA1: Cost of index admission (& average LOS) - based on Abel et al	-£111,055	£49,602	-£61,453
SA2: Cost of index admission (& average LOS) - based on BOC study	-£164,150	£78,536	-£85,614
SA3: Cost of nursing home care reduced by 20%	-£212,397	£135,840	-£76,557
SA4: Cost of nursing home care increased by 20%	-£212,397	£188,577	-£23,820
SA5: Cost of hospice care reduced by 20%	-£212,397	£157,002	-£55,395
SA6: Cost of hospice care increased by 20%	-£212,397	£167,415	-£44,982
SA7: Cost of home care reduced by 50%	-£212,397	£160,042	-£52,355
SA8: Cost of home care increased by 50%	-£212,397	£164,375	-£48,022
SA9: More patients supported at home (+4)	-£212,397	£147,707	-£64,690
SA10:More patients supported in hospice (+3)	-£212,397	£174,116	-£38,281

Table 5: Sensitivity analysis to explore the impact of key areas of uncertainty

Reducing length of stay

The mean cost per day for all 483 index admissions was calculated to be £168.25, and the mean length of stay for all index admissions was 39 days. Research from The Netherlands suggests a 14% reduction in hospital LOS could be achievable, if all hospitals could work as efficiently as a 15th percentile benchmark hospital.[16]If the LOS for all 483 patients in this study was reduced by 14% (5 days), this would result in an estimated saving in hospital costs of £406,324.This compares with the hospital cost saving of £212,397 for preventing the 35 potentially avoidable index admissions. Extrapolation of this cost suggests a 14% reduction in LOS would result in an annual cost saving of £47.5 million for the two hospitals. However, it should be noted that this is not the true economic impact as it does not take into account the cost of any alternative provision that may be required to support patients elsewhere.

Discussion

Main findings and comparison with other studies

In this retrospective study, 7.2% of hospital admissions of patients in the last year of life were classified as potentially avoidable. The potential cost saving of avoiding these admissions and supporting patients in alternative places of care was estimated at just over £50,000 (↑ £85,614; ↓ £23,820) for patients in hospital on a single day,

extrapolating to an annual cost saving of approximately £5.9 million for the two hospitals.

The proportion of admissions identified as potentially avoidable is in close agreement with our previously reported exploratory study.[6] It is however low relative to the proportions reported in two other recent UK studies, where 33-40% of admissions were identified as inappropriate.[4,5] It is important to note that both of these studies utilised a 'blue sky' approach to assessing appropriateness of admission, whereby researchers assumed that alternative community facilities were always available and had capacity.[4,5] Research which takes no account of the capacity of non-hospital services is inevitably going to result in a much higher rate of avoidable admissions than the present study. The low levels of potentially avoidable admissions in the present study and in our previous study may reflect the fact that community services are currently inadequately configured, or do not have capacity to provide an alternative to hospital admission for palliative care patients.[6] Whilst greater numbers of admissions may potentially be preventable, this would require significant expansion of existing community services in order that patients without medical need could be cared for elsewhere. A recent example of one such service from the UK is the Marie Curie Nursing Service (MCNS) for patients at the end of life. A 2012 evaluation of this service reported that MCNS patients had reduced hospital use and reduced costs from the hospital perspective, compared to controls. However, the authors were unable to demonstrate an overall cost saving due to a lack of data on other costs, including the cost of the MCNS intervention and possible impacts on other community services.[17]

An alternative explanation for our findings is that community services in the two localities are already preventing the majority of avoidable hospital admissions, through interventions such as advanced care planning (ACP). If services are already sufficiently well configured and resourced, this would account for the low number of potentially 'avoidable' admissions in hospital. However, previous research indicates poor uptake of ACP in the two localities [8], therefore it is unlikely that this explanation accounts for the findings.

Our study suggests that the scope for cost savings by avoiding admissions may be relatively limited given current service configurations. Our findings suggest that significant hospital cost savings could be achieved through a reduction in length of

stay for patients in the last year of life. Reducing mean length of stay by 5 days in all patients in the final year of life potentially achieves a greater reduction in hospital costs than preventing avoidable admissions. Reducing length of hospital stay (LOS) is central to guidance for improving end of life care in acute hospitals which promotes 'discharge planning, rapid discharge home to die, and fast track continuing health care'.[18] It is noteworthy that in this retrospective study, 13 (37.1%) of the potentially avoidable admissions had hospital stays that exceeded the maximum HRG trim point, driving up further the cost of avoidable admissions. This suggests that a greater emphasis could be placed on discharging patients from hospital more rapidly. Aiming to reduce hospital costs by reducing LOS may be more achievable and cost effective than avoiding admissions, particularly in light of recent evidence suggesting that the median hospital stay for patients with palliative care needs is 31 days. [19] However further research is urgently required to explore the costs of any alternative provision required to support early discharge (e.g. NHS Continuing Healthcare packages), in order to calculate the full economic impact of reducing LOS.

It is well documented that patients with complex palliative care needs often experience delayed discharge from hospital.[20] Reasons for delayed discharge may include preventable causes such as delays in organising care packages as a result of poorly coordinated paperwork, and poor communication between disciplines involved.[20] Whilst the evidence is inconclusive with regard to the impact of specialist palliative care consultations on reductions in hospital length of stay,[21] other initiatives have been proposed which attempt to support early discharge.[17,22] More work is required in evaluating the impact of these initiatives and in identifying additional ways in which length of stay can be reduced. In addition, more accurate cost data and a better understanding of the support required to enable early supported discharge is required in order to calculate the full economic impact of reducing length of stay. Capacity issues may also still remain, including to what extent there is scope to accommodate a greater throughput of patients in community locations such as nursing homes.

Study Limitations

The study used a retrospective design, prospective methods may generate more accurate findings. We relied on experienced senior clinicians to make assessments of potentially avoidable admissions; clinical decisions to admit patients to hospital are,

by definition, subjective and will vary geographically due to differing community service provision. The cost of supporting patients in other locations was derived from other published studies and these studies themselves have limitations.[7] More research is required to determine valid costings for generalist and specialist community palliative care services for England. The study took place in two hospitals in the North of England, and the findings may not be generalisable to other hospitals in areas with different community services and alternative models for preventing admissions.

Conclusions and areas for further research

Our estimate of the proportion of admissions classified as potentially avoidable provides support to the estimate from our previous exploratory study.[6] Further research is required to explore the relationship between admissions deemed avoidable given the situation at the point of admission and those deemed inappropriate in a hypothetical 'blue sky' scenario, and to demonstrate the feasibility of avoiding such admissions in clinical practice. Such research might include an examination of patients who die outside of hospital, to explore factors that mitigate against hospital admission. Our findings have highlighted that reducing length of hospital stay in palliative care patients may offer the potential to achieve higher hospital cost savings than preventing avoidable admissions. Further research is required to determine both the feasibility of reducing length of hospital stay for patients with palliative care needs, and the economic impact of doing so.

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