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The extent and cost of potentially avoidable admissions in hospital in-patients with palliative care needs: a cross sectional study

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Abstract

Objective

More than 90% of people spend time in hospital in the last year of life and, in many developed countries, hospitals are the setting in which most people will die. Previous research indicates that a proportion of these hospital admissions could have been avoided. The objective of this study was to establish the extent and cost of potentially avoidable hospital admissions amongst patients with palliative care needs.

Methods

A prospective survey of hospital inpatients was undertaken to identify patients who met clinical criteria indicating palliative care need. Case notes were reviewed by two expert palliative care clinicians to determine if the hospital admission was potentially avoidable. An analysis of the cost of potentially avoidable admissions compared to all other admissions for those patients identified as being in the last year of life was carried out using the statistical analysis software R version 2.15.1. Logistic regression was performed using the logit (log of odds ratio) link. The binary outcome of the logistic regression model was a potentially avoidable admission.

Results

Of the 99 patients who met criteria for palliative care need, 22 patients were deemed to have experienced a potentially avoidable admission. Those living in a residential aged care facility were more at risk of experiencing such admissions. The mean total cost of hospital care for those with palliative care needs was lower for those whose admission was deemed potentially avoidable.

Conclusions

A significant proportion of patients with palliative care needs experience a potentially avoidable admission. Although these admissions are relatively short compared to those whose admissions are unavoidable, any hospital admission impacts on the experiences of patients and families and may contribute to unnecessary hospital expenditure.

INTRODUCTION

More than 90% of people spend time in hospital in the last year of life and in many developed countries, hospitals are the setting in which most people will die.¹ Hospitals are often where the diagnosis of a life limiting illness is made and where treatment and investigation of symptoms occurs.²

Although a slight trend towards home deaths is being seen in some countries (Gomes et al), the number of people dying in hospitals remains relatively high. A recent comparison of institutional deaths across 45 countries concluded that, for half of those countries, more than 54% of deaths occur in hospital.³ This trend is not in line with patient preference and has significant implications for health care funding. Studies estimating palliative care need in the hospital setting in the United Kingdom and New Zealand have concluded that approximately 23% of adult hospital inpatients meet criteria for palliative care need.^{4,5} Projections from the UK indicate that both the proportion and numbers of people dying in acute hospitals are likely to rise in coming decades.⁶

Costs associated with hospital admissions represent the principal component of statutory palliative care cost.⁷ Furthermore, average costs associated with hospital inpatient care are known to increase exponentially in the last three months of life.⁸ Certain groups have been identified as being more likely to experience a hospital admission in the last year of life. For example, those with a non-cancer diagnosis spend more time in hospital compared to those with cancer and younger patients spend more time in hospital than older patients.⁹

The circumstances by which patients with palliative care needs are admitted to hospital are complex. Studies have attempted to identify the factors associated with hospital admissions for patients with palliative care needs. Disease progression and development of complications have been shown to be a primary cause of readmission to hospital¹⁰ and a lack of access to out of hours community services has been shown to be a reason why patients present to the emergency department.² Although there are valid reasons for patients with palliative care needs to be admitted to hospital, it is thought that a number of these admissions could be avoided.¹¹

Whilst we know that there are a high proportion of hospital inpatients with palliative care needs, our understanding of the proportion of patients whose admission could be avoided is limited. A number of studies have highlighted this issue, with 7-20% of hospital inpatient

admissions amongst patients with palliative care needs deemed to be ‘potentially avoidable’.^{12, 13} However, drawing comparisons across these studies is difficult as there is currently no agreed definition of what constitutes an avoidable admission within a palliative care context.

As the illness progresses and care needs increase it may not be surprising to see an increase in admissions for patients with palliative care needs. Whilst a number of studies have looked at hospital use in the last year of life^{9, 14} there are no studies that the authors are aware of that have looked at survival after an avoidable admission. Understanding the proportion and characteristics of potentially avoidable hospital admissions amongst patients with palliative care needs, and the economic impact these have on the health care system, is essential in ensuring that scarce hospital resources are most appropriately deployed to meet patient preferences for palliative and end of life care.

AIMS

The aim of this study was to establish the extent and cost of potentially avoidable hospital admissions amongst patients in the last year of life and to identify particular patient sub-groups with a high risk of a potentially avoidable hospital admission.

METHODS

This study comprised one phase of a larger research project exploring key aspects of palliative care management in one large urban acute hospital in New Zealand. Auckland City hospital is a 710 bed teaching hospital which provides care for a local population of 480,000 and tertiary services to a regional population of 1.4 million people. It is the largest hospital in New Zealand in terms of budget. Ethics approval was obtained from the Auckland Northern Region Ethics Committee. Ethics approval did not require written consent from patients however permission to access clinical notes was obtained from the Auckland District Health Board Research Office.

A prospective census of adult hospital inpatients (n=501) was undertaken to identify the prevalence of patients likely to be in the last year of life. The Gold Standards Framework prognostic indicator (GSF-PIG) guide has been shown to be an effective tool in identifying hospital in-patients who might be in the last year of life.¹⁵ Using the GSF-PIG, case notes were examined for evidence of palliative care need. Data were collected sequentially from

each ward between 2 May and 17 June 2011 with data collection for each ward completed within one day. This provided a ‘snapshot’ of the cases present in a single point of time. The study population excluded those patients in the intensive care setting as it would be rare in New Zealand (NZ) for patients with palliative care needs in the last year of life who have an incurable illness to be admitted to an intensive care setting. Case notes were reviewed by two expert palliative care clinicians, a palliative medicine physician (AOC) and a palliative care nurse practitioner (JR). Patients were included in the study if they met one or more of the Gold Standards Framework Prognostic Indicators (GSFPI)¹⁶ indicating palliative care need and likely prognosis of less than 12 months (n=99). Results of the census study have been reported elsewhere.⁵

The reviewers examined the clinical notes of the patients who met one of the GSFPI’s looking for evidence that the current hospital admission was potentially avoidable. The following definition of a “potentially avoidable admission” was adopted during the study:

“An admission whereby the deterioration or event resulting in hospitalisation could have been anticipated and managed by generalist services such as general practice and district nursing teams with support from a specialist palliative care team such as hospice”.

A process of cross checking between JR and AOC was carried out on each case. In cases where disagreement occurred consensus was reached by discussion. In the absence of validated protocols to determine an avoidable admission within a palliative care context and given the need to contextualise decisions within a local context, expert clinical judgement was used to determine if an admission was potentially avoidable or not. This approach has been used in a similar study in the UK to identify avoidable hospital admissions in palliative care.¹² Similar approaches to examining clinical decision making using retrospective case note data have also been used in other studies.^{17, 18}

Data Analysis

Supplementary data gathered from clinical notes (details of which have been reported elsewhere⁵) were analysed to identify 1) factors that increased risk of a potentially avoidable admission and 2) groups of patients that were more at risk of such admissions. Six factors were hypothesised to predict the likelihood of a potentially avoidable admission to hospital. These factors included living in residential aged care, ethnicity, comorbidities, age, diagnosis and gender. For the purposes of the logistic regression diagnosis was considered as cancer or

non-cancer, age as >65 years or not and comorbidities present or not. Ethnicity was considered as NZ (NZ) European (the largest ethnic group) or not. Non NZ European consisted of multiple ethnicities including Maori, Pacific and Asian people.

Logistic regression was performed using the logit (log of odds ratio) link. The binary outcome of the logistic regression model was a potentially avoidable admission. Due to the relatively small sample it was not possible to estimate the pair-wise interactions between variables therefore only the main effects were considered.

An analysis of the cost of potentially avoidable admissions compared to all other admissions for those patients identified as being in the last year of life was carried out using the statistical analysis software R version 2.15.1 from the R Foundation for Statistical Computing. Cost data were obtained from hospital reimbursement records based on the patients' discharge Diagnosis Related Groups (DRG) classification. This included both inpatient and outpatient hospital visits for the financial years beginning 1 July 2009 to 31 June 2012. The currency is the NZ (NZD), at the values obtaining in the years 2009—2012. In view of the relatively short period of time involved, (three years) we did not standardise dollar values to any single year, neither did we discount costs for time.

The raw data were provided by the hospital's Clinical Decision Support Unit. Patients were identified by means of the National Hospital Index Number (NHI), a unique identifying number assigned to each individual person receiving health care in NZ. The time interval for costs analysis started with the date of each individual's admission (as identified at the time of the hospital inpatient survey), and ended with the date of death or censoring (censored on 15 May 2012). For patients with a known date of death, costs in the final year of life were analysed. Total recorded reimbursements were totalled for all inpatient and outpatient episodes associated with each NHI across these intervals.

RESULTS

Ninety nine (19%) patients were identified as having met one of the GSF prognostic indicators indicating palliative care need and a likely prognosis of less than 12 months (see table 1). Twenty two (22%) of these patients were deemed to have experienced a potentially avoidable admission.

Table 1 Demographics of patients with palliative care needs (n=99)

	Frequency	Percent
Gender		
Male	47	47.5
Female	50	50.5
Transgender	1	1.0
Unspecified	1	1.0
Age		
≤ 49	11	11.1
50-60	17	17.2
61-71	20	20.2
72-82	22	22.2
> 83	29	29.3
Ethnicity		
NZ European	62	62.6
Pacific	15	15.2
Asian	5	5.1
Other	9	9.1
Unspecified	8	8.1
Living Arrangements		
Residential aged care	16	16.2
Co-habits	62	62.6
Lives alone	14	14.1
Unknown	4	4.9
Diagnosis		
Cancer	46	46.5
Non-Cancer	48	42.4
Unspecified	11	11.1
Comorbidities		
Yes	59	59.6
No	40	40.4

Predictors of potentially avoidable admissions

Although little is known about the factors that influence potentially avoidable hospital admissions in a palliative care context, a number of factors are known to influence the amount of time spent in hospital in the last year of life, including residing in a residential aged care facility (RACF), diagnosis, age and ethnicity.^{10, 19, 20}

Logistic regression was performed to assess the impact of demographic and health status factors on the likelihood that an admission was avoidable. The model contained six independent variables (sex – female, age over 65 years, living in residential aged care,

comorbidities – yes, ethnicity – NZ European and diagnosis – cancer). The full model containing all predictors was statistically significant ($\chi^2=12.62$, df 6), $p<.05$, (N=73) indicating that the model was able to distinguish between avoidable and unavoidable hospital admissions. The Hosmer and Lemeshow goodness of fit test was not significant ($p=.92$) indicating that the model was a good fit. The model as a whole explained between 15.9% (Cox and Snell R square) and 24.0% (Nagelkerke R square) of the variance in admission status, and correctly classified 79.5% of cases. Only one of the independent variables – living in residential aged care (livingred2reg(1), made a statistically significant ($p<.05$) contribution to the model. The odds ratio of 6.48 for livingred2(1) suggests that patients living in residential aged care facilities are over 6 times more likely to have an avoidable hospital admission compared to those patients who do not live in aged care facilities, controlling for all other factors in the model. European ethnicity recorded an odds ratio of a 3.62 greater likelihood of an avoidable admission although the result was not significant ($p>.05$). See table 2

Table 2: Predictors of a potentially avoidable admission

Model	Variable Name	B	SE	Wald	Odd ratio	p	95% CI Exp(B)	
							Lower	Upper
<i>Avoidable Admissions</i>								
Living arrangement	livingred2reg(1)	1.86	.85	4.81	6.48	.028	1.22	34.41
Ethnicity – NZ European	ethnic2reg(1)	1.28	.85	2.25	3.62	.134	.67	19.45
Comorbidities- Yes	numcomorbidreg2(1)	.27	.83	.10	1.31	.745	.25	6.69
Age	agecatreg(1)	-.30	.75	.16	.73	.688	.16	3.22
Diagnosis - Cancer	diagreg(1)	-.29	.79	.14	.74	.707	.15	3.51
Gender	gendereg(1)	.326	.63	.26	1.38	.608	.39	4.80
Constant		-2.59	.92	7.96	.07	.005		

Patient survival

For the purposes of this study survival was defined as the time from hospital census until death. The median survival of all patients identified as having palliative care needs was 121 days from the start of the census admission (see figure 1 for Kaplan Meier survival curve). A significant difference in survival was found between those whose admissions identified as potentially avoidable and those identified as unavoidable, with a median of 45.5 days and 168 days respectively (log-rank test $p=0.027$; see figure 2 for the Kaplan Meier survival curve comparison).

Figures 1 and 2 here

Length of admission

The length of stay or % of time spent in hospital refers to the cumulative length of all hospital stays from the start of the census admission (usually a date prior to the actual census date as most patients had been in hospital for some time prior to the census date) to the 15/05/12 when the analysis was carried out. Mean days in hospital was longer for patient admissions identified as unavoidable compared to those identified as potentially avoidable, 31.4 days ct 13.8 day. Patients who were thought to have had a potentially avoidable admission spent 39% of their subsequent time in hospital. However, the mean proportion of time spent in hospital after the census admission was similar between the two groups, 39% ct 38% (see table 3).

Table 3 – Economic analysis

	Potentially avoidable admissions	Unavoidable admissions
Number of patients	22	77
Mean LOS from census admission (days)	13.8	31.4
Mean % time in hospital from census admission†	39%	38%
Costs of hospital care from census admission†		
Minimum	3,658	2,919
1st Quartile	6,339	15,980
Median	14,180	29,590
Mean*	23,430	50,490
3rd Quartile	26,130	60,490
Maximum	115,400	285,800
Number of patients dying in follow-up	18	47
Costs of hospital care in final year of life		
Minimum	5147	3164
1st Quartile	16460	20230
Median	27710	37220
Mean*	35040	59260
3rd Quartile	33460	75500
Maximum	117700	235600

† costs from date of census admission are calculated across the interval from the date of that admission (usually a date prior to the date of census) to 15/05/2012

* the mean is the appropriate central estimator for cost

Cost of hospital care in the last year of life

The mean total cost of hospital care in the final year of life was lower for those whose census admission was deemed potentially avoidable compared to the remainder (see table 3). Figure 3 shows accelerating costs of care as the end of life approaches for those patients identified as having palliative care needs.

Figure 3 here

The total costs of public hospital care are lower for the subset of patients identified as experiencing a potentially avoidable admission. The sum of public hospital costs from date of census admission for the 22 patients who met GSF criteria and were judged to be experiencing a potentially avoidable admission was NZD\$15,358 (mean per patient cost

NZD23,430). Patients who were thought to have had a potentially avoidable admission spent 39% of their subsequent time in hospital. Given that our census included every patient experiencing a potentially avoidable admission in the hospital on a single day, we could estimate the total number of patients who may experience a potentially avoidable admission across a year. Based on the reasoning that we identified 22 patients, who had a 39% chance of being in hospital on any given day, we infer a total population of such people as $22 / 39\% = 57$ at any time. The total hospital expenditure for all such patients in a year is estimated to be $\text{NZD}515358 / 0.39 = \text{NZD}1,321,431$. The Auckland District Health Board (ADHB) provides care for approximately 468,000 people. The NZ population is just over 4.4 million, which means the ADHB cares for about 10% of NZ population. The subsequent cost of care for all NZ patients who have a preventable admission is therefore estimated to be in the order of \$13.5 million.

DISCUSSION

In our study, 22% of hospital admissions for patients with palliative care needs were thought to be potentially avoidable. This was high compared to a similar study carried out in the UK¹², where only 6.7% of hospital inpatients who met GSF prognostic indicators were concluded to have experienced a potentially avoidable admission. However, an even higher estimate is provided by Abel et al.¹³ who concluded that a third of hospital inpatient deaths could have occurred at home if more comprehensive community services were available.

Our study also extends previous findings in showing that patients experiencing an avoidable admission had a shorter stay in hospital, and were more likely to have a shorter prognosis, when compared with those patients whose admission was deemed unavoidable. Moreover, the costs associated with a potentially avoidable admission were also less than those associated with an unavoidable admission.

In line with previous research in this area, clinical judgement was used in the current study to determine whether an admission was potentially avoidable. This is an approach used in previous studies which is likely to explain the wide range in estimates of avoidable admission rates across studies. Ward et al.²¹ and Gott et al.¹² for example, took into account the availability and suitability of local services to support patients with palliative care needs in the community. When local services were considered inadequate to support the patient in the community, the reviewers considered the admission to be unavoidable. In contrast, Abel et al.¹³ considered an admission to be avoidable if the patient could have stayed at home if services as described in England's End of Life Care Strategy²² were available. This included

such things as documented advance plans concerning place of death, access to care at short notice 24 hours per day and nursing care for the final stages of life which would allow the patient to die at home. In determining whether an admission was potentially avoidable, the approach adopted by the reviewers in the current study was that if “reasonable services” such as hospice, general practice teams and district nursing was available, along with a plan of care in place for when symptoms developed or the patient’s condition deteriorated, the admission was considered to have been potentially avoidable. These differences in how researchers define how a hospital admission might be avoided confound comparisons across studies. Further research is needed to clarify a process by which avoidable admissions can be identified in a more systematic way, whilst being sensitive to local context.

The only predictor of a potentially avoidable hospitalisation was patients’ living arrangements with those who lived in a residential aged care facility more likely to have experienced an avoidable admission than those who did not. Previous research has examined the reasons why patients from residential care facilities may be admitted inappropriately to acute hospitals and have found that these residential facilities are often under-resourced, that their staff lack skills in supporting residents and families to complete advance care plans and there is too little communication about end of life issues between health professionals, residential care staff, and patients and their families.²³ The impact of hospital admissions for older people, including those living in residential care, is significant. In particular, survival rates are low, with one study identifying that 33.9% of patients admitted from a residential care facility died during the hospital admission.²⁴ In addition, morbidity associated with hospitalisation is high for this population, with increased incidence of delirium, infections and overall functional decline during a hospital admission.^{25, 26} Furthermore, mortality is high in residential care settings after an admission to hospital.²⁷ Our findings therefore support a growing body of evidence which indicates that more research is needed to develop cost effective models of palliative and end of life care in aged residential care settings.

In light of the international economic recession and its impact on public health spending, interest from policy makers regarding the cost of hospital admissions in the last year of life is high. Ward et al.²¹ found the estimated mean cost of a potentially avoidable hospital admission to be around GBP2,595. Similarly, a retrospective survey of hospital deaths, which could have been managed in the community, estimated the mean hospital admission cost as being GBP3,173 based on a mean length of stay of 12 days.¹³ The data from our study estimated the cost of a potentially avoidable admission, based on a mean length of stay of 13.8 days as NZD14,860. Obviously comparison of costs across studies is problematic due to the timing of studies and the wider economic environment including the use of different currencies. However, it is apparent that costs associated with potentially avoidable

admissions are high, although further research is needed to examine the cost implications of avoiding hospitalisations for community providers and family caregivers.²⁸

A reduction in the number and length of hospital admissions for patients in the last year of life is a major objective for policy makers in most developed countries.^{22, 29} Data from this study showed that patients whose admission was considered potentially avoidable experienced a significantly shorter stay in hospital compared to patients whose admission was unavoidable. In addition median survival for patients experiencing a potentially avoidable admission was significantly shorter suggesting, that the risk of an avoidable admission is greater the closer the patient is to death. This finding is supported by studies that have shown hospital admissions increase exponentially in the last three last weeks before death.^{14, 19}

Limitations

Despite providing new insights into the nature, extent and cost of potentially avoidable hospitalisations amongst patients meeting criteria for palliative care need, certain limitations to this study must be acknowledged. Firstly, the application of the GSF-PIG and, judgements around the avoidability of hospital admissions, were based solely on expert clinical opinion. This may have introduced some bias to identifying those admissions thought to have been potentially avoidable. It also relied on reviewers having adequate knowledge of services available to patients in the community. Secondly, data analysis pertaining to the last year of life is less reliable for those who experienced unavoidable admissions compared to the group who experienced potentially avoidable admissions because fewer of them had died. Finally the retrospective design of the study meant the accuracy of the data was dependent on available clinical documentation.

CONCLUSIONS

This study identified that a significant proportion of patients with palliative care needs experience a potentially avoidable hospital admission. Although these admissions are relatively short compared to those admissions which are thought to be unavoidable, they are likely to impact on the experiences of patients and families and contribute to unnecessary hospital expenditure. Further research is needed to understand how these admissions could be avoided and why residents of aged care facilities are more at risk of experiencing an avoidable admission. Finally, future studies examining the economic impact of

hospitalisation within a palliative care context need to capture the total costs of healthcare expenditure including community health care costs and the costs incurred by family caregivers for whom reducing hospital admissions at the end of life is likely to have significant cost implications.

Competing interest: none declared

Authors' contributions

Authors JR, MB, AO, RF, DR, BS and MG were involved in the conception, design and implementation of the research. All authors were involved in the data analysis and interpretation and drafting of the paper. In addition GL carried out the economic analysis of cost related data. All authors were involved in the review and approval of the final article for publication. MG was the Principal Investigator of the study.

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References

1. Dixon T, Shaw M, Frankel S, et al. Hospital admissions, age and death: retrospective cohort study. *BMJ*. 2004;1-4.
2. Wallace EM, Walsh J, Conroy M, et al. Why do palliative care patients present to the Emergency Department? Avoidable or unavoidable? *Am J Hosp Palliat Med*. 2012;30(3):253-6.
3. Broad JB, Gott M, Kim H, et al. Where do people die? An international comparison of the percentage of deaths occurring in hospital and residential aged care settings in 45 populations, using published and available statistics. *Int J Public Health*. 2013;58(2):257-67.
4. Gott M, Ahmedzai SH, Wood C. How many inpatients at an acute hospital have palliative care needs? Comparing the perspectives of medical and nursing staff. *Palliat Med*. 2001;15:451-60.
5. Gott M, Frey R, Raphael D, et al. Palliative care need and management in the acute hospital setting: a census of one New Zealand Hospital. *BMC Palliat Care*. 2012;12(15):1-8.
6. Gomes B, Higginson I. Where people die (1974-2030): past trends, future projections and implications for care. *Palliat Med*. 2008;22:33-41.
7. Simoens S, Kutten B, Keirse E, et al. The costs of treating terminal patients. *J Pain Symptom Manage*. 2010;40(3):436-48.
8. Kardamanidis K, Lim K, Da Cunha C, et al. Hospital costs of older people in New South Wales in the last year of life. *Med J Aust*. 2007;187(7):383-86.
9. Rosenwax L, McNamara B, Murray K, et al. Hospital and emergency department use in the last year of life: a baseline for future modifications to end of life care. *Med J Aust*. 2011;194:1-4.
10. Grim RD, McElwain D, Hartmann R, et al. Evaluating Causes for Unplanned Hospital Readmissions of Palliative Care Patients. *Am J Hosp Palliat Care*. 2010;27(8):526-31.
11. Constantini M, Higginson I, Boni L, et al. Effect of a palliative home care team on hospital admissions among patients with advanced cancer. *Palliat Med*. 2003;17:315-21.
12. Gott M, Gardiner C, Ingleton C, et al. What is the extent of potentially avoidable admissions amongst hospital inpatients with palliative care needs? *BMC Palliat Care*. 2013;12(9).
13. Abel J, Rich A, Griffin T, et al. End of life care in hospital: a descriptive study of all inpatient deaths in 1 year. *Palliat Med*. 2009;23:616-22.
14. Van den Block L, Deschepper R, Drieskens K, et al. Hospitalisations at the end of life: using a sentinel surveillance network to study hospital use and associated patient, disease and healthcare factors. *BMC Health Serv Res*. 2007;7(69):1-9.
15. O'Callaghan A, Laking F, Frey R, et al. Can we predict which hospitalised patients are in their last year of life? A prospective cross-sectional study of the Gold Standards Framework Prognostic Indicator Guidance as a screening tool in the acute hospital setting. *Palliat Med*. In press. 2014.
16. Thomas K. Prognostic Indicator Guidance (PIG). Shrewsbury, UK: The Gold Standards Framework Centre In End of Life Care CIC 2011; 4th ed. <http://www.goldstandardsframework.org.uk/cd-content/uploads/files/General%20Files/Prognostic%20Indicator%20Guidance%20October%202011.pdf> (accessed 2013 5 Dec).
17. Ouslander J, Lamb G, Perloe M, et al. Potentially avoidable hospitalizations of nursing home residents: frequency, causes, and costs. *J Am Geriatr Soc*. 2010;58(4):327-35.
18. Ahearn D, Nidh N, Kallat A, et al. Offering older hospitalised patients the choice to die in their preferred place. *Postgrad Med J*. 2013;89(1047):20-4.
19. Huang J, Boyd C, S T, et al. Time spent in hospital in the last six months of life in patients who died of cancer in Ontario. *J Clin Oncol*. 2002;20(6):1584-92.
20. Cohen J, Bilsen J, Addington-Hall J, et al. Population-based study of dying in hospital in six European countries. *Palliat Med*. 2008;22:702-10.

21. Ward S, Gott M, Gardiner C, et al. Economic analysis of potentially avoidable hospital admissions in patients with palliative care needs *Prog Palliat Care*. 2012;20(3):147-53.
22. End of life care strategy: promoting high quality care for all adults at the end of life. London, UK: NHS Department of Health; 2008.
23. Ong A, Sabanathan K, Potter J, et al. High mortality of older patients admitted to hospital from care homes and insight into potential interventions to reduce hospital admissions from care homes: The Norfolk experience. *Arch Gerontol Geriatr* 2011;53(3):316-9.
24. Ahearn DJ, Jackson TB, McIlmoyle J, et al. Improving end of life care for nursing home residents: an analysis of hospital mortality and readmission rates. *Postgrad Med J*. 2010;86(1013):131-5.
25. Boockvar K, Gruber-Baldini A, Burton L, et al. Outcomes of infection in nursing home residents with and without early hospital transfer. *J Am Geriatr Soc*. 2005;53(4):590-6.
26. Isaia G, Maero B, Gatti A, et al. Risk factors of functional decline during hospitalization in the oldest old. *Aging Clin Exp Res*. 2009;21(6):453-7.
27. Connolly M, Broad J, Kerse N, et al. Residential Aged Care - The De Facto Hospice for New Zealand's Older People. *Australas J Ageing*. 2013;11 March [Epub before print].
28. Gardiner C, Ward S, Gott M, et al. Economic impact of hospitalisations among patients in the last year of life: An observational study. *Palliat Med*. 2013.
29. Supporting Australians to live well at the end of life. Canberra, Australia: Department of Health; 2010.