

Hospital costs of older people in New South Wales in the last year of life

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As life expectancy increases, the proportion of people in the population who are aged 65 years and older grows. By 2021, 19% of the Australian population is expected to be aged over 65 years, and 2.5% aged over 85 years.¹ Health care costs for older people at the end of life change with increasing age and over time, and the way in which they are distributed across sectors of care have important implications for health financing and policy.²

Recent literature on end-of-life health care costs has focused on the relative roles of age at death and imminence of death. Studies in the United Kingdom,³ Switzerland⁴ and Western Australia⁵ concluded that proximity to death is a more important determinant of health care costs than age per se.

Also in question is the state of health in which older people will spend their added years of life, with consequent implications for health care costs. The “compression of morbidity” hypothesis suggests that better lifestyle and health care will delay the onset of chronic illness, extending the period of healthy life. Alternatively, older people could spend their added years of life sick and disabled (“expansion of morbidity”).⁶ Available evidence tends to support compression of morbidity in developed countries, although this may be threatened by current increases in the prevalence of chronic diseases such as diabetes.⁶⁻⁸

Two studies in Western Australia have examined hospital care at the end of life, based on data for 1985–1994⁹ and 2002.⁵ Despite the increasing attention being paid to the potential impact of population ageing on the costs and sustainability of health care in New South Wales, exemplified by current “Future directions” planning,¹⁰ no local information is available on health care costs at the end of life. Our primary aim in this study was to estimate inpatient hospital costs by age, proximity to death and underlying cause of death in the last year of life for NSW residents aged 65 years and over. A secondary aim was to estimate the proportion of total annual inpatient costs expended on end-of-life care for older people, for which no Australian information currently exists.

ABSTRACT

Objective: To estimate hospital inpatient costs by age, time to death and cause of death among older people in the last year of life.

Design and setting: Cross-sectional analytical study of deaths and hospitalisations in New South Wales from linked population databases.

Participants: 70 384 people aged 65 years and over who died in 2002 and 2003.

Main outcome measures: Hospital costs in the year before death.

Results: Care of people aged 65 years and over in their last year of life accounted for 8.9% of all hospital inpatient costs. Hospital costs fell with age, with people aged 95 years or over incurring less than half the average costs per person of those who died aged 65–74 years (\$7028 versus \$17 927). Average inpatient costs increased greatly in the 6 months before death, from \$646 per person in the sixth month to \$5545 in the last month before death. Cardiovascular diseases (43.1% of deaths) were associated with an average of \$11 069 in inpatient costs, while cancer (25.0% of deaths) accounted for \$16 853. The highest average costs in the last year of life were for people who died of genitourinary system diseases (\$18 948), and the highest average costs in the last month of life were for people who died of injuries (\$8913).

Conclusion: Population ageing is likely to result in a shift of the economic burden of end-of-life care from the hospital sector to the long-term care sector, with consequences for the supply, organisation and funding of both sectors.

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METHODS

The NSW Admitted Patient Data Collection (APDC) contains records of all discharges, transfers and deaths from all NSW public and private sector hospitals and day-procedure centres. The NSW Registry of Births, Deaths and Marriages (RBDM) compiles death registrations for NSW. This information is forwarded to the Australian Bureau of Statistics (ABS), where codes for cause of death are assigned according to the International statistical classification of diseases (ICD-10-AM).¹¹

Using probabilistic record linkage techniques (Autostan, version 4.1 and Automatch, version 4.01 [MatchWare Technologies, Burtonsville, Md, USA]), we created a persons file by linking records for episodes of care from the APDC for the period 1 January 2001 to 31 December 2003. This file was then linked with RBDM data for deaths registered in the same period. Finally, the linked APDC–RBDM data were linked with ABS mortality data for deaths registered in the same period.

A file containing records of all people aged 65 years or older who died in the

period 1 January 2002 to 31 December 2003 was extracted from the linked APDC, RBDM and ABS data. The 1434 linked records that contained inconsistent dates were excluded, leaving 357 605 hospitalisation records for 70 384 people for analysis.

Australian refined diagnosis related group (AR-DRG) costs¹² were assigned to the hospital records. Average AR-DRG costs for acute-care public hospitals were obtained from the NSW Hospital Cost Data Collection (HCDC). These costs were calculated by NSW standard costing methods, which comprise a combination of patient-level costing and cost-modelling techniques.¹³ The data were then combined to produce average AR-DRG costs. Hospitals contributed costs for about 1.2 million separations per year — about 43% of all hospital separations in NSW public hospitals. Costs included the following components: imaging; allied health; pharmacy; operating rooms; emergency departments; supplies and ward overheads; specialists' procedure suites; prostheses; pathology tests; on-costs (superannuation, leave entitlements and other employment-related costs); medical,

1 Number of days in hospital and hospital inpatient costs by age at death and time before death for the 70 384 people aged 65 years or older who died in New South Wales in 2002 and 2003*

Age at death		Time before death (days)						Total	
		30	60	90	120	150	180		210-360
65-74 years									
Hospital days	Total number	135 141	61 678	41 359	31 607	24 418	21 455	88 735	404 393
	Per person	8.8	4.0	2.7	2.1	1.6	1.4	5.8	26.4
Hospital costs	Total (million \$)	115.3	32.5	23.8	18.2	14.6	13.4	57.0	274.8
	Per person (\$)	7525	2119	1553	1190	950	873	3719	17 927
75-84 years									
Hospital days	Total number	223 222	104 449	68 000	51 403	41 578	36 335	151 775	676 762
	Per person	7.9	3.7	2.4	1.8	1.5	1.3	5.4	24.0
Hospital costs	Total (million \$)	170.6	50.7	34.0	26.3	21.8	19.6	86.7	409.6
	Per person (\$)	6039	1793	1202	930	772	693	3068	14 498
85-94 years									
Hospital days	Total number	142 600	68 223	46 396	35 330	29 137	25 370	109 045	456 101
	Per person	6.1	2.9	2.0	1.5	1.3	1.1	4.7	19.6
Hospital costs	Total (million \$)	95.0	30.0	21.1	16.1	13.2	11.2	55.0	241.6
	Per person (\$)	4092	1290	907	694	567	484	2369	10 403
≥ 95 years									
Hospital days	Total number	13 642	6428	4719	3952	3195	2907	12 049	46 892
	Per person	3.8	1.8	1.3	1.1	0.9	0.8	3.4	13.1
Hospital costs	Total (million \$)	9.3	3.1	2.2	1.7	1.4	1.3	6.1	25.2
	Per person (\$)	2595	872	622	473	403	354	1710	7028
Total									
Hospital days	Total number	514 605	240 778	160 474	122 292	98 328	86 067	361 604	1 584 148
	Per person	7.3	3.4	2.3	1.7	1.4	1.2	5.1	22.5
Hospital costs	Total (million \$)	390.3	116.2	81.1	62.3	51.0	45.5	204.8	951.1
	Per person (\$)	5545	1651	1152	886	724	646	2910	13 513

* Includes people who died and were not admitted to hospital during their last year of life. ◆

nursing and non-clinical salaries; and non-clinical services.

Average AR-DRG costs for acute-care public hospitals were obtained from the HCDC. National public sector costs¹⁴ were used for AR-DRGs without attached costs in the HCDC. Private hospital costs were obtained from national private sector cost data for the financial years 2000-01 to 2002-03.¹⁴ Private hospital costs for the 2003-04 financial year were projected from the average annual increase over the period 2000-03.

SAS software (version 8.2, SAS Institute, Cary, NC, USA) was used for analysis. Hospital inpatient days and costs were allocated to 30-day periods for people admitted to hospital in the 12-months before death. Day-only separations were assigned a stay length of 1 day. Costs for 30-day periods were apportioned at the unit record level: period cost = (number of days patient stayed during the 30-day period divided by total

length of stay) multiplied by total diagnosis-related group (DRG) cost. Underlying causes of death were grouped according to ICD-10-AM codes.¹¹

Ethical approval for the study was obtained from the NSW Department of Health Ethics Committee. The study was funded by the NSW Department of Health.

RESULTS

In the years 2002 and 2003, 70 384 NSW residents aged 65 years and over died — 4.0% of the total population in this age group in this period. Mean age at death was 80 years for men and 84 years for women. Just over half (51.8%) of those who died were women; this proportion increased from 37.8% among people aged 65-74 years at death to 78.6% among those aged ≥ 95 years.

Most people (87.2%) were hospitalised at least once in their last year of life (mean

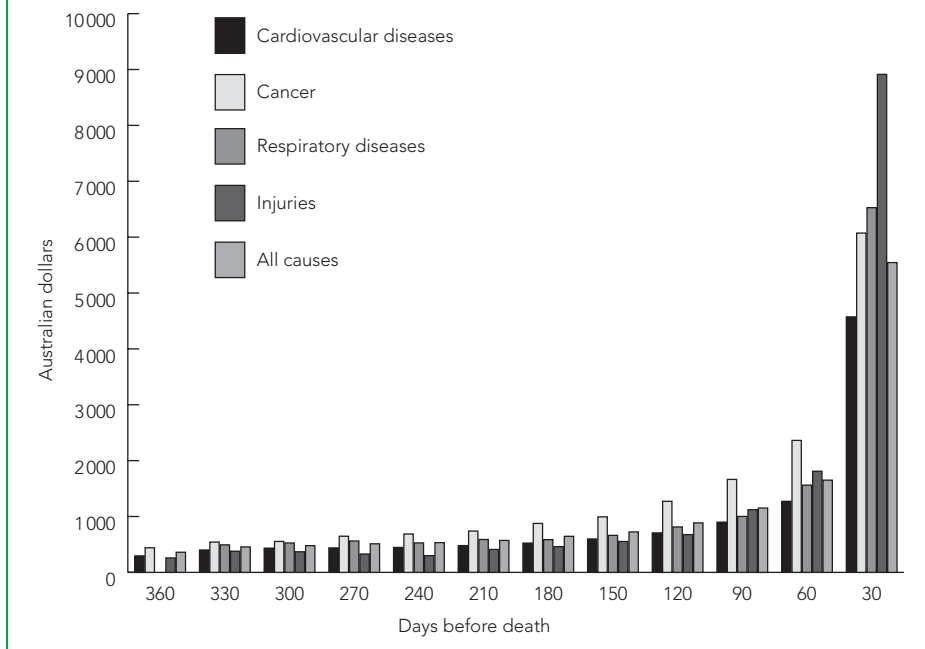
number of hospitalisations, 3.74; median, 2), but this proportion decreased with age, from 93.2% in the 65-74 year age group to 78.9% in the ≥ 95 years age group.

Half of the deaths (50.5%) occurred in hospital. This proportion declined steeply with age at death, from 61.1% at age 65-74 years to 27.3% at age ≥ 95 years. Specific information on the location of deaths that occurred outside hospital was not available.

Cardiovascular diseases accounted for most deaths (43.1%), followed by cancer (25.0%) and respiratory diseases (10.1%). Cancer was the most frequent cause of death (41.2%) among decedents aged 65-74 years, while cardiovascular diseases dominated in all older age groups.

Average number of days in hospital and hospital inpatient costs dropped sharply with age in each 30-day period in the last year of life (Box 1). People who died at age 65-74 years had a mean of 8.8 inpatient

2 Average hospital costs per person by cause of death and time before death for the 70 384 people aged 65 years or older who died in New South Wales in 2002 and 2003



days and \$7525 in inpatient costs in their last 30 days of life, while those dying at age ≥ 95 years had a mean of 3.8 inpatient days costing \$2595. For all age groups, the number of days spent in hospital and inpatient costs increased dramatically in the 3 months before death. People aged 65 years or older in their last year of life spent an average of 22.5 days in hospital and incurred \$13 513 in inpatient costs (Box 1). Almost a third (32.4%) of beds (7.3/22.5) and two-fifths (41.0%) of inpatient costs (\$5545/\$13 513) were incurred in the last month of life.

Number of days in hospital and hospital inpatient costs varied according to cause of death. The highest averages for bed days (32.8) and inpatient costs (\$18 948) in the last year of life were recorded for people who died from diseases of the genitourinary system, while the lowest averages (13.5 days and \$6194) were recorded for those who died from mental or behavioural disorders. People who died from cardiovascular diseases spent an average of 18.2 days in hospital and incurred \$11 069 in inpatient costs in the last year of life, compared with 29.1 days and \$16 853 for people who died from cancer.

Cause of death influenced the distribution of days in hospital and inpatient costs over the period before death (Box 2). The number of days in hospital and, especially, costs for people who died from injury were

heavily weighted towards the last month of life. For such people, the last 30 days of life accounted for 39.8% of the days in hospital (7.8/19.6) and 57.2% of total inpatient costs (\$8913/\$15 582) incurred in the last year of life. By contrast, the hospital costs incurred by people who died of cancer were spread over a longer period before death. In terms of costs at the very end of life, people who died from injury incurred an average of \$8913 in inpatient costs in their last 30 days, compared with \$6073 for people who died from cancer, \$4573 for those who died from cardiovascular diseases, and \$2113 for those who died from mental or behavioural disorders.

Days in hospital and inpatient costs in the last year of life decreased with age for all major causes of death except for injuries (data not shown). The hospital costs incurred by people who died at age 95 years or older from either cardiovascular diseases or cancer (\$6478 and \$9461, respectively) were less than half those for people who died at age 65–74 years (\$13 831 and \$19 567, respectively). By contrast, hospital costs for injury deaths were similar for people who died at 95 years or older (\$14 486) and at 65–74 years (\$13 777).

The available data allowed us to estimate the proportion of total annual hospital bed days and inpatient costs incurred by older people in their last 12 months of life for the calendar year 2002 only. In that year,

801 437 hospital bed days in NSW (10.3% of total bed days or 21.6% of bed days for people aged ≥ 65 years) were used by people aged ≥ 65 years in their last year of life. These accounted for \$470.6 million in inpatient costs (8.9% of total costs or 20.1% of costs for people aged ≥ 65 years) in that year.

DISCUSSION

In NSW in 2002, people aged 65 years and over who were in their last year of life used an estimated 10.3% of all hospital days and 8.9% of total hospital inpatient costs. Their hospital care was estimated to cost an average of \$13 513, of which more than 40% was spent in the last month of life. No comparable estimates exist for other Australian states, although in Western Australia, people of all ages in their last year of life were estimated to incur an average of \$22 271 in hospital costs in 2002.⁵

Important findings of our study include skewing of inpatient costs towards the very end of life; progressive reduction in end-of-life costs with increasing age at death; and major variation in the quantum and distribution of costs according to the underlying cause of death. Consistent with other studies,^{15–20} we found an increase in hospital inpatient costs with decreasing time to death; the average number of days spent in hospital and average costs increased exponentially in the 3 months before death, across all age groups.

Our study — of deaths over a 2-year period only — could not provide direct evidence for compression of morbidity. However, it did confirm that a major part of the end-of-life morbidity burden (at least in terms of severe morbidity requiring hospitalisation) is borne shortly before death. Also, costing at a DRG level does not take into account within-DRG variations that may occur, for example, with age or disease severity. While patient-level cost information from a substantial proportion of separations in NSW was used to calculate costs for all hospitalisations in NSW, the resulting costs are nevertheless estimates.

Also consistent with other overseas^{18,21,22} and Australian⁵ studies, we found that end-of-life hospital bed days and costs declined rapidly with increasing age at death. On average, people who died aged 95 years or older used less than half the bed days and incurred less than half the inpatient costs of those who died aged 65–74 years. This difference relates at least in part to place of death. Almost three-quarters of

people who died aged 95 or more years died outside of hospital, and one-fifth had not used any inpatient hospital services in their last year of life. By contrast, most decedents aged 65–84 years died in hospital, and almost all were hospitalised at least once in the year before death.

Another likely contributor to this difference in hospital costs by age is reduced aggressiveness of medical care in the last year of life of older patients. A study in the United States found that hospital costs in the last year of life decreased with increasing age for each of the major causes of death,¹⁷ a finding that was confirmed in our study, with the notable exception of deaths from injury. Substitution of care may also contribute; the likelihood of living in residential aged care increases with age, and the threshold for admission to hospital is likely to be higher for these residents than for older people living in the community.

Because we estimated hospital costs only, our study did not shed light on the likely impact of population ageing on total health care costs at the end of life. The “cost of dying”, comprising hospital and long-term care costs, has been reported to remain stable (US study)¹⁸ or increase (Canadian studies)^{21,22} with age, the decline in hospital costs being offset by an increase in the costs of social and nursing care.

Hospital costs in the last year of life are not necessarily related to the final cause of death. Nevertheless, of the causes of death that we examined, cardiovascular diseases and cancer (which, together, accounted for more than two-thirds of all deaths) were associated with the highest total inpatient costs in the 12-months before death. This is consistent with findings from Western Australia.^{5,9} The patterns we observed in end-of-life inpatient costs according to cause of death are likely to reflect disease-related variations in place of care in the last year of life and place of death (hospital versus elsewhere) as well as the nature and intent of medical care. For example, the high average inpatient costs at the very end of life incurred by people who died from injury reflect the sudden nature of injury events, the high probability of hospitalisation after serious injuries, and the high costs associated with surgical interventions such as joint replacements.

Our study provides a baseline from which to assess the impacts of demographic change and of health system reforms — including the current Council of Australian Governments’ initiatives to improve care for older

people in hospitals²³ — on hospital costs in NSW. It suggests that population ageing is likely to result in a shift of the economic burden of end-of-life care from the hospital sector to the long-term care sector, with consequent implications for the supply, organisation and funding of both these sectors. The establishment of the new collaborative Centre for Health Record Linkage²⁴ in Sydney will facilitate the inclusion of data from aged care services in future iterations of this study, thereby allowing a more complete assessment of the “cost of dying” in NSW.

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COMPETING INTERESTS

None identified.

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