



Healthcare services funded by Counties Manukau District Health Board for people in the last year of life

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Abstract

Introduction The last year of life is often associated with a high level of healthcare utilisation and cost. To date, little information is available regarding the healthcare utilisation patterns in the last year of life in New Zealand.

Aim To describe the healthcare utilisation patterns and costs of the residents of Counties Manukau District Health Board (CMDHB) region in the 1-year period prior to death in 2008.

Method CMDHB residents who died in 2008 were identified from the National Mortality Dataset. The health services utilisation patterns and costs in the last year of life were derived from National Minimum Dataset (NMDS), Pharmaceutical Collection, Laboratory Claims Collection, and National Non-Admitted Patient Collection via encrypted NHI linkage.

Results Forty percent of all deaths in 2008 in CMDHB occurred in a publicly funded hospital. Just over 80% of people had at least one inpatient hospital stay in the last year of life. More than 75% of the healthcare costs funded by CMDHB in the last year of life were related to inpatient hospitalisations. The average cumulative length of inpatient stay over the year in the people who had an inpatient event was 20.6 days. Outpatient, pharmaceutical, and laboratory services were received by 84%, 91%, and 86% of people respectively in their last year of life.

Conclusion Consistent with the international literature, this study found that CMDHB residents in the last year of life have a high level of health service utilisation. Decisions about the appropriate use of high cost health services in people towards the end of life can be extremely challenging. These decisions are resource allocation decisions as well as clinical decisions and should be based on clinical factors, cost utilities, and patient, family, and society's expectations.

The last year of life is often associated with a high level of healthcare utilisation and cost.¹⁻⁵ Indeed, a disproportionate share of healthcare funding is spent in the last of life in many developed countries.⁶⁻⁸ The observations from international literature suggest that providing a high level of care may not necessarily translate to improvement in health outcomes.⁹

In the context of the ageing population in New Zealand, the end-of-life issues in people with chronic disease will become more common. To date, little information is available regarding the healthcare utilisation patterns in the last year of life in New Zealand.

This study aims to describe the healthcare utilisation patterns and costs of the residents of Counties Manukau District Health Board (CMDHB) region in the 1-year

period prior to death in 2008. CMDHB covers the southern third of Auckland City with a population of around 490,000, making up around 11% of the New Zealand population.

Method

The routinely collected administrative datasets were sourced from New Zealand Health Information Service (NZHIS). We examined the National Mortality Dataset to identify the CMDHB residents who died in 2008. Record linkage was made via encrypted National Health Index (NHI) to the Pharmaceutical Collection, Laboratory Claims Collection, National Minimum Dataset (NMDS, 'inpatient hospital events'), and National Non-Admitted Patient Collection ("outpatients").

The encrypted form of NHI was used to ensure privacy and anonymity of individuals. As all datasets were entirely based on anonymous administrative data no formal ethical review was required as per New Zealand ethical guidelines.¹⁰

The numbers of community pharmaceutical and laboratory claims, and inpatient and outpatient events as well as their associated costs were collated for the last year prior to the date of death for each individual. Each of the inpatient events was categorised into one of the diagnostic groups as per Table 1.

Table 1. ICD code definitions for the inpatient diagnostic category

Diagnostic category	ICD codes (version 10)
Cardiovascular disease (including coronary heart disease, stroke, peripheral vascular disease and heart failure)	I20x to I25x, E1053, E1153, E1453, E1059, E1159, E1459, I60x to I69x, and G45x to G46x, I70x to I79x and E1050, E1051, E1052, E1150, E1151, E1152, E1450, E1451, E1152. I50x, I11.0, I13.0, I13.2
Malignant cancer	C00 to C97
Chronic respiratory disease	J41 to J47, E84, Z942.
Chronic liver disease	B18, B19, K70 to K77, I85, Q446-Q448, T864, Z944.
Chronic renal failure	N01 to N19, N25-N29, T861, Z992, Q601, Q604, Q606, Q611, Q619
All other causes of hospitalisation	Any episode that did not have any of the other named ICD codes above in the primary or secondary diagnostic fields

These diagnostic groups were chosen to determine the relative burden of these common diseases in the last year of life. Formal diagnosis coding is not available in outpatient, pharmaceutical or laboratory databases. The diagnostic category refers to the discharge diagnosis of people who had a publicly funded inpatient event within the last year of life. Both primary and secondary codes were searched for a diagnosis related to the first five categories.

To avoid double counting, each hospital event was assigned with only one of the six categories listed. If a hospital event had more than one diagnosis from the first five categories then the diagnosis taken was based on the order of the hospital diagnostic codes in which they appear for the hospital event. One person may have more than one type of hospital admission during the last year of life. This means one person may be classified into multiple diagnostic categories.

All cost estimates were derived from the NZHIS datasets. Total healthcare costs refer to the inpatient and outpatient events (including ED attendance), community pharmaceutical dispensing and community laboratory tests in the year prior to death. Cost estimates were based on the national cost weights in 2008.

Results

Hospitalisation—A total of 2290 deaths occurred in 2008 in CMDHB. In the 12-month period prior to death there were 6296 inpatient hospital events associated with 1835 people. Therefore there were 455 (20%) people who did not have a public hospital admission in the year prior to death.

Malignant cancer had the highest number of hospitalisations partly because malignant cancer was associated with the highest number of disease specific readmissions (average 3.4) (see Table 2).

Table 2. The number of hospitalisations in the last year of life of people who died in 2008 by disease category

Diagnostic category	Number of hospital admissions	Number of people	Average number of disease-specific hospitalisations per patient
Cardiovascular disease	1519	818	1.9
Malignant cancer	2168	640	3.4
Chronic respiratory disease	308	149	2.1
Chronic liver disease	63	33	1.9
Chronic renal failure	375	213	1.8
All other causes	1863	945	2.0

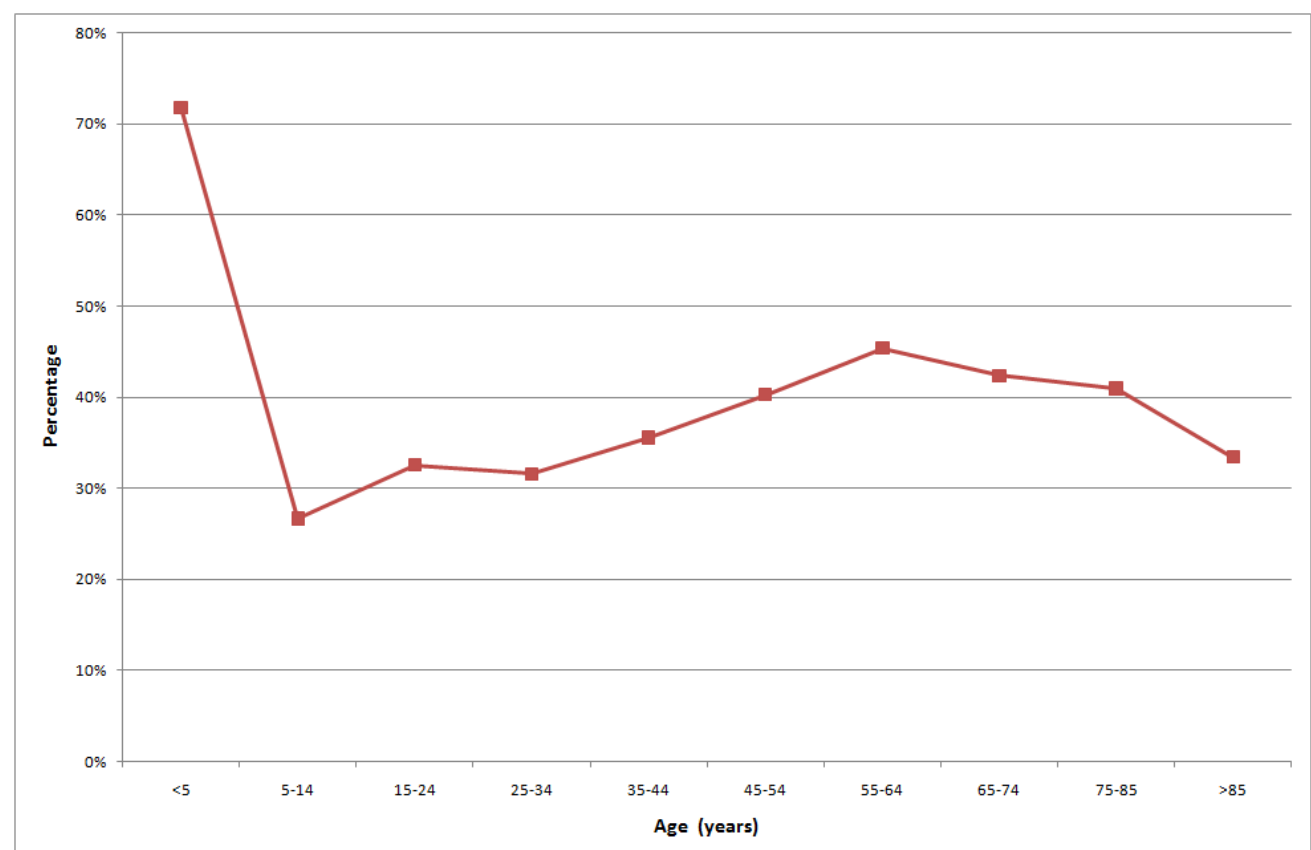
As noted, this study assigned only one disease diagnostic category to each of the inpatient event based on the order of the discharge diagnostic codes. Table 3 describes the number of people who had different disease categories of inpatient hospitalisations. Many people have more than one disease that had contributed to the inpatient events. For example, 651 people had 3010 hospitalisations in the last year of life falling into two different disease categories. The more diagnoses a person has, the higher the number of hospitalisations occurring in the last year of life. For example, 10 people with 4 different diagnosis categories apiece had a total of 94 inpatient events (an average of 9.4 admissions per person).

Table 3. Hospitalisation number in the last year of life stratified by the number of different chronic disease categories per person

Number of hospitalisations with different disease categories	Number of people	Total number of hospitalisations	Average number of hospitalisations per patient
0	455	0	0
1	1034	2292	2.2
2	651	3010	4.6
3	139	890	6.4
4	10	94	9.4
5	1	10	10.0
Total	2290	6296	2.7

Proportion of deaths that occurred in a publicly funded hospital—Overall, 40% of all deaths in CMDHB occurred in a publicly funded hospital. The proportion of deaths that occurred in hospital varies with age. The highest was in the under-5 age group, with more than 70% of all deaths occurring in a hospital.

Figure 1. Percentage of all deaths in CMDHB in 2008 that occurred in a publicly funded hospital stratified by age



Length of stay—Of those 1835 people who had a hospital admission in the last year of life, the mean and median cumulative length of stay over the year were 20.6 and 13.0 days respectively. There were 125 people who had hospital admissions but did not have an overnight stay, i.e. length of stay = 0. The total length of hospital stay in the year prior to death varies widely between individuals ranging from 0 to 313 with a standard deviation of 27.9 days.

Table 4. Statistical analyses of the total length of hospital stays in the last year of life of people who died in 2008

Length of hospital stay analyses	
Number of people	1835
Mean	20.6
Standard Error	0.7
Median	13.0
Standard Deviation	27.9
Minimum	0
Maximum	313

Outpatients, pharmaceutical and laboratory service utilisation—The number of people who utilised the service and the volume of service utilised are shown in Table 5. For those people who attended an outpatient clinic, the average number of clinics attended in the last year of life was 12.9.

Table 5. Outpatients, pharmaceutical and laboratory service utilisation in the last year of life

Type of service	Number of people who utilised the service (% out of total 2290 people in study)	Volumes of service used	Average number of service per patient in the last year of life
Outpatients	1935 (84%)	24,866 clinics	12.9 clinics
Pharmaceutical	2092 (91%)	177,102 prescription items dispensed	84.7 prescription items dispensed
Laboratory	1967 (86%)	85,257 individual lab tests	43.3 individual lab tests

Healthcare cost in the last year of life—CMDHB spent a total of \$51.2 million on health care for the 2290 people who died in 2008 during their last year of life. This consisted of \$38.8 million on inpatient hospitalisations, \$7.8 million on outpatients, \$4 million on community-dispensed pharmaceuticals and \$680,000 on community laboratory tests.

While the average health care cost per person in the last year of life was \$22,376 per person, the range of health care costs spent varied widely (Table 6). There were 69 people who did not access any of health care services recorded by the study in their last year of life. On the other hand, there were 61 people (2.7%) who had health care

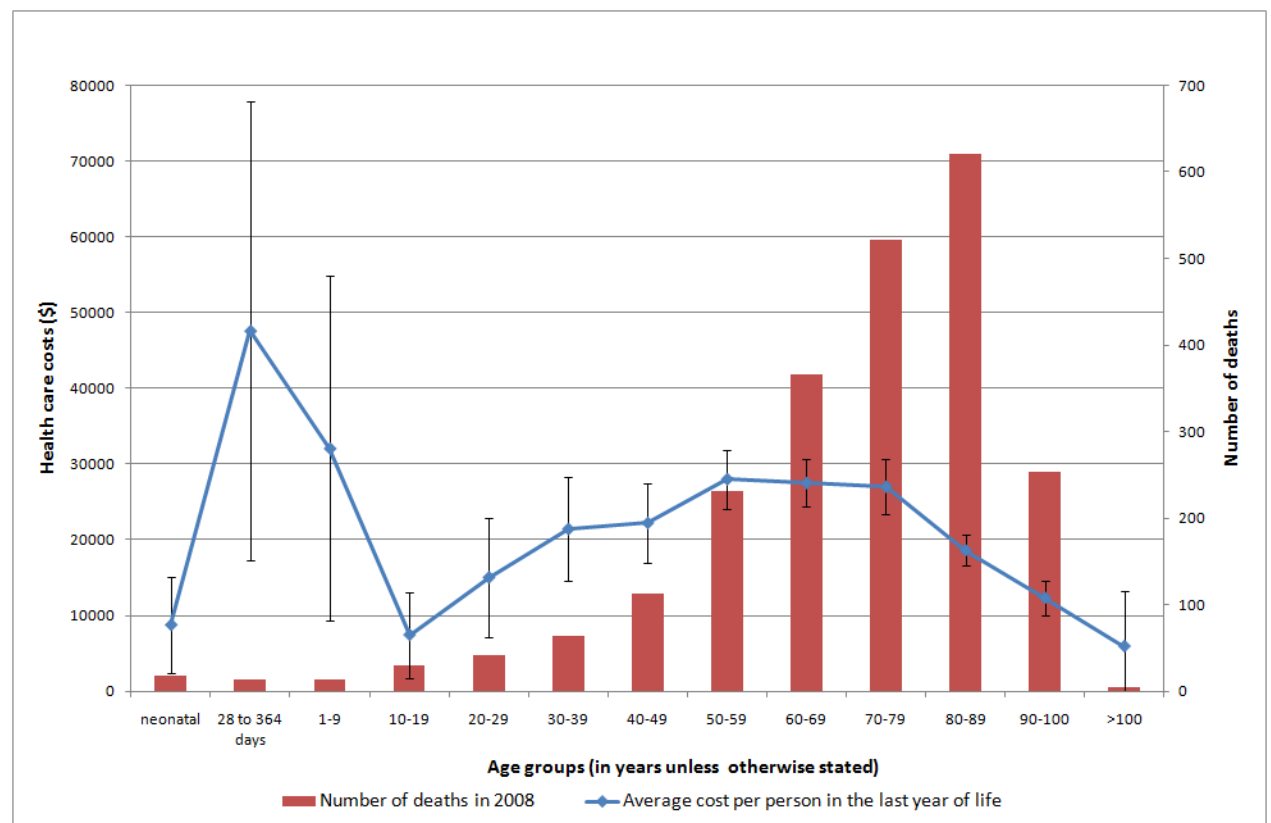
costs greater than \$100,000 in the last year of life, accounting for a total of 8.7 million (17% of the total cost).

Table 6. The health care cost per person in the last year of life

Total health care cost per person	
Mean	\$22,376
Standard Error	\$666
Median	\$13,412
Standard Deviation	\$31,859
Range	\$782,111
Sum	\$51,200,000
Number of people	2,290

The total health care cost by age groups—The average health care cost per person in the last year of life varies by age (Figure 2). Children from 28 days to 9 years, and adults between the ages 50 and 79 years are associated with the highest health care cost (blue line in Figure 2). The health care cost in the last year of life progressively falls after 80 years of age.

Figure 2. The number of deaths in CMDHB in 2008 and the average health care cost per person in the last year of life stratified by age category (error bars: 95% confidence interval)



Hospitalisation cost—There were 1835 people (80%) who received inpatient care in the last year of life in 2007/08. CMDHB spent just under \$38.8 million on inpatient hospitalisations for this group. Inpatient care related to cancer was associated with the highest average inpatient cost in the last year of life. Note that the overall average cost (\$21,100) per patient who utilised inpatient services was higher than the average cost per patient associated with any of specific diagnostic category because one person can have multiple hospitalisations with different diagnoses (Table 7).

Table 7. The hospitalisation costs related to last year of life by disease category

Diagnostic category	Average cost per hospital admission (\$)	Cost over the last year of life per patient who had utilised inpatient services (\$)	Number of patients	Total cost by disease category (\$)
Cardiovascular disease	8242	15,300	818	12,520,000
Malignant cancer	5367	18,200	640	11,636,000
Chronic respiratory disease	5026	10,400	149	1,548,000
Chronic liver disease	7599	14,500	33	479,000
Chronic renal failure	8284	14,600	213	3,106,000
All other causes	5093	10,000	945	9,488,000
Overall (people who had hospitalisation)	6159	21,100	1,835	38,777,000

Outpatient, pharmaceutical and laboratory costs in the last year of life—There were 1935 people who had utilised outpatient services in the last year of life. The average cost per patient over the year was about \$4000.

Table 8. The average outpatient, pharmaceutical and laboratory costs per patient in the last year of life

Type of service	Number of people who utilised the service	Total cost of service (\$)	Average cost per patient who utilised the service (\$)
Outpatients	1935	7,785,000	4023
Pharmaceutical	2092	3,999,000	1911
Laboratory	1967	681,000	346

Outpatients, pharmaceutical or laboratory databases do not have formal diagnosis coding. The diagnostic category in Table 9 refers to the discharge diagnosis of people who had at least one inpatient hospitalisation event within the last year of life; linkage was then made by encrypted NHI to their outpatient, pharmaceutical and laboratory costs. For example, there were 818 patients who had an inpatient event with a diagnosis of cardiovascular disease, and the average outpatient, pharmaceutical and laboratory costs for these patients were \$4700, \$2000, and \$340 respectively. People

with chronic renal failure had the highest outpatient, pharmaceutical and laboratory costs.

Table 9. The average outpatient, pharmaceutical, and laboratory cost in the last year of life by disease category

Diagnostic category	Number of patients	Average cost per patient (\$)		
		Outpatients	Pharmaceutical	Laboratory
Cardiovascular disease	818	4700	2000	340
Malignant cancer	640	5400	2200	420
Chronic respiratory disease	149	7600	2500	290
Chronic liver disease	33	700	1300	360
Chronic renal failure	213	13,900	3900	620
All other causes	945	2900	1900	330
People who had inpatient hospitalisation	1835	4100	2000	330
Overall (total cohort)	2290	3400	1700	300

Discussion

People in their last year of life had a high level of health service utilisation in 2007/08. Just over 80% of people had at least one publicly funded inpatient hospital stay in the last year of life. Forty percent of all deaths in 2008 in CMDHB occurred in a publicly funded hospital. More than 75% of the health care costs in the last year of life were related to inpatient hospitalisations.

The average cumulative length of inpatient stay over the year was 20.6 days. Outpatient, pharmaceutical, and laboratory services were received by 84%, 91%, and 86% of people respectively in their last year of life. There were 69 people (3%) who did not attend any of the services examined in the study in the last year of life. This observation is likely to be related to people who had sudden deaths (e.g. car accidents), and/or people who did not engage with the health system at all.

The average health care cost per person in last year of life is high in CMDHB. A CMDHB report suggested that the age standardised health care cost in the last year of life may be seven or more times higher than the average annual health cost in people not in the last year of life.¹¹ The proportion of all deaths that occurred in hospital (40%) in CMDHB is roughly similar to the other developed countries: 36.6% in the US and 50.3% in the UK.¹²

As shown in Figure 2 and Table 7, the health care costs in the last year of life varied widely between individuals, disease categories and age ranges. People who had hospitalisations related to cancer had the highest average hospitalisation cost per person (\$18,200). People who had hospitalisations with chronic renal failure had the highest outpatient costs, presumably related to outpatient dialysis. Overall in 2008 Counties Manukau District Health Board spent at least \$51m on its residents in their last year of life – around 5% of its overall budget.

In the subgroup analyses by age range, the average health care costs in last year of life were highest in young children between 28 days and 9 years and adults in the 50–79

years age group, and the health care costs subsequently dropped with advancing age from 80 year old onwards. The common causes of death in young children in CMDHB include extreme prematurity, congenital anomalies, cancer, sudden unexplained death in infants (SUDI, formerly known as SIDS) and injury and poisoning.¹³

The high end of life costs of the young children may be related to the former three conditions. The observed gradual fall in health care costs with advancing age is consistent with other international studies.^{5,14,15}

Reasons for this are likely to include:

- Age is a good proxy for prognosis.¹⁴ The balance between potential benefit and likely morbidity from an intervention is often less favourable in people who are older or have a poor prognosis.
- Individuals and their families being less likely to want significant interventions the later they are in life (“I’ve had a fair innings”).

If a simple cost utility analysis was undertaken, the results could be somewhat alarming. At a time when the quality of life is often far from perfect, a small proportion of people (2.7% of the cohort) who had health care cost greater than \$100,000 accounted for significant proportion (17%) of the total cost of people in the last year of life. However, results from such cost utility analysis should not be taken on face value only, because the clinical decisions relating to any health service provision (including end of life care) are always made in a prospective manner.

Predicting prognosis and benefits from interventions is often uncertain and the decision to provide high cost health services might be appropriate when the decision was made given the available information at the time. Therefore, it would be inappropriate to use a retrospective analysis after the fact of death to solely determine whether the health care services provided were appropriate or not.

Nevertheless, evidence from overseas studies suggest that the end of life costs in people even with perceived poor prognosis still remained very high, even though the end of life spending is less in people who had a higher estimated risk of death.¹⁶ Furthermore, the amount of health services utilised towards the end of life has been shown to be subject to variations in local clinical practice and/or policy that are not explained by disease prevalence and severity. The Dartmouth Atlas Project demonstrated there are marked variations in the length of stay in inpatient hospitalisations, and intensive care units during the last 6 months of life in the US.⁹

The main reason for the variations in care between 93 integrated academic medical centres is related to the level of ‘supply sensitive’ care that was provided, while severity or prevalence of illness accounted for little of the variation. ‘Supply sensitive’ services refer to services where the availability of a specific resource had a major influence in utilisation rates, e.g. the number of intensive care beds. Disconcertingly, the project found little evidence to suggest the higher volume of services provided had lead to improvement in health outcomes.

In fact, aggressive management in people who have poor prognosis can be associated with more adverse outcomes such as more physical distress, and worse overall quality of death as reported by the caregiver.^{9,17} The provision of an intervention that has

little or remote chance of prognostic benefit may result in unnecessary suffering for the patient in terms of side effects. In some cases, it may be more preferable to redirect the resources of such interventions to provide a better end of life care to the individual.

In the context where the current trends of the health care expenditure increase in New Zealand are not sustainable in the long term,¹⁸ high cost interventions provided towards the end of life should be carefully considered based on clinical factors, patients' expectations and cost utility of interventions. Health care resources are always finite. Every clinical decision is actually also a resource decision. The cost utilities of various available treatments in different patient groups are often not explicitly compared. However, the New Zealand Medical Council expects that as a part of clinical practice, doctors will balance their duty of care to each patient with their duty of care to the population.¹⁹

The decisions to initiate a high cost or invasive treatment in patients with poor prognosis can certainly be challenging. In some circumstances, the decision making process may be assisted by guidelines. However, the decisions to withdraw treatment are phenomenally difficult particularly in patients who would no longer be eligible to have the treatment had the person not started treatment already or the decision to withdraw treatment will lead to death in the immediate future, e.g. the decision to stop dialysis.

As demonstrated by this study, people in their last year of life often have multiple chronic conditions. Clinicians should be supported in taking a more integrated approach in assessing the patients' prognosis based on all the co-morbidities rather than providing a prognosis for a specific condition. A regular forum with contributions from multi-disciplinary and multi-speciality teams to discuss these ethical questions may be appropriate in challenging cases.

The strength of this study is that the data analysed were derived from the routinely collected national datasets in New Zealand. As it is a complete data set, there are no sampling errors or difficulties with generalising to the whole population. The methods can be easily replicable to provide a regional comparison within New Zealand or provide time trends in health care utilisation in the future for monitoring or evaluating purposes. However, a limitation of this study is that it did not include the health care services that are not captured by the routinely collected datasets. The health care costs related to primary health care, inpatient and outpatient hospice care, pharmaceutical co-payments or health services that are funded privately in the last year of life were not included. Furthermore, the significant costs of informal care provided by family and friends were also not included.²⁰

The sub-grouping by clinical condition should be interpreted with caution as it was created in an empirical manner from hospital disease coding rather than a true clinical review. Since one person may be classified into more than one disease category, the non-inpatient hospital costs should be interpreted with caution. For example, not all of the outpatient, pharmaceutical, and laboratory costs for the 818 people discharged with a prioritised diagnosis of cardiovascular disease would be related to cardiovascular disease (Table 9).

Conclusion

Consistent with the international literature, this study found that CMDHB residents in the last year of life have a high level of health service utilisation. People often have multiple chronic diseases in the last year of life. Providing health services for patients in the last year of life is associated with high health care costs. The majority of the health care cost is related to inpatient care. Decisions about the appropriate use of high cost health services in people towards the end of life can be extremely challenging. These decisions are resource allocation decisions as well as clinical decisions and should be based on clinical factors, cost utilities, and patient, family, and society's expectations.

Competing interests: None.

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