

Hospital healthcare utilisation among older adults admitted to a university hospital in the last months of life: A retrospective observational study

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ABSTRACT

Introduction: Health needs increase in older age. This translates into higher healthcare utilisation and expenditure compared to any other age group. Much of this is driven by frailty and multimorbidity. Many older people spend their last days in hospital. The aim of this study was to explore the utilisation of healthcare services among older adults admitted to a university hospital in the last 6 months of life.

Materials and methods: Patients aged 70 years and over who died on medical wards of a university hospital in 2019 were included based on a stratified sampling approach using three categories. The categories were which medical ward the patient was admitted under, ICD-10 reported cause of death, and gender. The proportion of patients distributed across all three categories was calculated and 200 patients out of 472 deaths in that year were randomly selected to ensure mirrored proportion distributed across these three categories. Data on demographics and healthcare utilisation were collected. Healthcare utilisation parameters included clinical encounters, radiological investigations, and medical procedures undergone.

Results: The median age was 83 years with more women (51%) than men. Septicaemia was the commonest cause of death (24.5%), followed by pulmonary disease (21.0%), and cardiovascular disease (19.5%). In the last 6 months before death, median inpatient stay was 9 days. The median number of Emergency Department and outpatient attendance was one episode, respectively, and number of radiology was four investigations. Over one-third of patients had multiple hospital admission. During the terminal admission, the median inpatient stay was 6 days. 45% had a nasogastric tube in-situ. Antibiotics used during the last 24 hours of life and polypharmacy (≥ 5 medications) were high at 74.5% and 82.5%, respectively. 7% of patients received cardiopulmonary resuscitation.

Conclusion: This study has provided descriptive evidence of hospital care delivered in the last months of life. The majority had contact with a healthcare team prior to their terminal admission. Many during their terminal admission had healthcare procedures, investigations, antibiotics, and issues of polypharmacy during this time. With an aging population, how care is organised and delivered is important in promoting good care in their later years.

KEYWORDS:

Aged, geriatric, hospital, end of life, palliative

INTRODUCTION

The health condition among older adults deteriorates with increasing age. This was much driven by multimorbidity and frailty.¹⁻³ This is associated with increased healthcare utilization.³⁻⁵ In one study using Norway's public health registries which captures data for much of its entire population, those aged 65 and over utilised almost half of the total cost allocated to healthcare despite only representing 15% of the population.⁵ This indicated that older people in this country accounted for the greatest amount of one country's healthcare costs.

Malaysia is seeing huge growth in its ageing population. The 60 years and over age group has seen the largest growth compared to any other age category.⁶ In 2021, 7.4% of the population was aged 65 years and above, a rise from 7.0% the year before.⁷ By 2040, it is estimated that this proportion will rise to 14.5%.⁸ Additionally, the life expectancy at birth of the population has progressively increased and is now 73.2 years for men and 78.3 years for women.⁹ With greater longevity comes higher morbidity and increasing use of healthcare services, which ultimately increases health expenditure.^{10,11}

Studies have reported that a significant amount of hospital healthcare resources are consumed at the patient's end of life (EOL).¹² In the United States, up to 25% of the healthcare budget was spent on care in the last year of life.¹³ This expenditure was on average at least five times higher than in other years of life.¹⁴ Much of this was associated with care delivered within an acute healthcare setting.¹³⁻¹⁵

Over half of all deaths in Malaysia occur in hospitals.¹⁶ However, how healthcare is utilised in hospital at the latter stage of life among older Malaysians has not been reported. This study aims to report on the utilisation of healthcare in hospital and the preceding 6 months of life among older people admitted to a university hospital in Malaysia.

MATERIALS AND METHODS

The retrospective observational study was conducted at an urban 1600-bedded university hospital. The hospital's

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Table I: Characteristics of patients (n=200)

Characteristics	Number (%)
Age (median, IQR) years	83 (9.0)
Gender	
Male	98 (49.0)
Female	102 (51.0)
Polypharmacy, n (%) ^a	165 (82.5)
Race (count, %)	
Malay	42 (21.0)
Chinese	126 (63.0)
Indian	25 (12.5)
Others	7 (3.5)
Cause of death	
Cerebrovascular accident	11 (5.5)
Cardiovascular disease	39 (19.5)
Pulmonary disease	42 (21.0)
Sepsis	49 (24.5)
Malignancy	39 (19.5)
Gastrointestinal/hepatic disease	7 (3.5)
Others ^b	13 (6.5)

^aPolypharmacy, ≥ 5 medication

^bAdvanced renal failure, advanced dementia/ parkinsonism, abdominal aortic aneurysm rupture.

Table II: Healthcare utilisation during the terminal admission

	Total (n = 200)
Inpatient bed days, median (IQR)	6 (8.0)
Radiological studies during admission, median (IQR) ^a	3 (2.0)
Procedures during terminal admission, n (%)	
Nasogastric tube	91 (45.5)
Central venous catheter	9 (4.5)
Intercostal drain insertion	3 (1.5)
Non-invasive ventilation	44 (22.0)
Invasive mechanical ventilation	12 (6.0)
Antibiotics in the last 24 hours, n (%)	149 (74.5)
Specialist palliative care consultations (n, %)	43 (21.5)
Cardiopulmonary resuscitation, n (%)	14 (7.0%)

^aPlain radiographs, ultrasound, computerised tomography, magnetic resonance imaging, dual energy x-ray absorptiometry, or positron emission tomography

medical records department provided a list of all deceased inpatients aged 70 years and over from 1 January 2019 to 31 December 2019 who died in any medical ward.

Data on patient demographics and healthcare utilisation were collected during the terminal hospital admission as well as the preceding 6 months using hospital electronic health records. Healthcare utilisation parameters included clinical encounters (inpatient bed days, emergency department (ED) attendances, and outpatient visits), radiological investigations (plain radiographs, ultrasound, computerised tomography, magnetic resonance imaging, dual energy X-ray absorptiometry and positron emission tomography), and medical procedures underwent (nasogastric tube, central venous catheter, chest tube insertion, non-invasive, and invasive mechanical ventilation). Data on EOL care delivered (deprescribing, antibiotic use, symptom-relieving medication, and specialist palliative consultation) were also collected. Polypharmacy was defined as ≥ 5 medications.¹⁷ Non-beneficial medication use that should be considered for deprescribing was based on previously reported research studies.¹⁸⁻²¹ These medications included statins,^{18,20} vitamins, and mineral supplements.²¹ Cause of death was based on the ICD-10 recorded cause by the Medical Records Department.

Over the study period, 472 patients passed away on the medical wards. A sample of 200 patients, representing 42.4% of total deaths provided a 95% confidence interval for a proportion of $\pm 8.9\%$, a value deemed acceptable to meet the aim of this study with the resource available. The sample was selected via a two-step process. Firstly, the study population was stratified into three categories based on the medical wards the patient was admitted under (clinical team overseeing care), ICD-10 reported cause of death, and gender. The proportion of patients distributed across all three categories was calculated. Next, 200 participants were then selected randomly using Microsoft Excel RAND function to ensure equal proportion distributed based on what was calculated in the previous step. This process would have minimised selection bias for the patients included in this study. For example, if out of all the 472 deaths consisted of 10% of patients who were male that died due to sepsis on the geriatric medicine ward, then of the 200 participants in this study's cohort, 10% (20 patients selected at random) would mirror this criteria. Data were also collected by a single researcher using an agreed data collection tool which would have minimised any data extraction bias during this stage.

Findings were presented as numbers and percentages for categorical data and either median with interquartile range (IQR) or mean with standard deviation (SD) based on the parametric distribution of the data using Kolmogorov-Smirnov test. Missing values will be regarded as missing, and analysis will be performed on available data. All analyses were performed using SPSS version 26. This study received ethics approval from local Medical Research Ethics Committee (reference number: 2020525-8673).

RESULTS

Among the 200 patients, the majority were female and of Chinese ethnicity, and participants had a median (IQR) age of 83 (9) years (Table I).

During the terminal hospital admission, the median (IQR) number of hospital bed days was 6 (8) days. During the last 24 hours, patients were still on a median (IQR) of 8 (5) drugs. Many remained on vitamin and mineral supplementation (97/200 patients, 48.5%) and lipid-lowering therapy (70/200 patients, 35.0%). Table II summarises the key aspects of healthcare utilisation during the terminal admission.

In the preceding 6 months, the median (IQR) number of emergency department presentation and outpatient visits was 1 (1.0) episode, respectively. 72/200 patients (36%) had another hospital admission in the preceding 6 months, spending a median (IQR) of 9 (11) days. Five patients received specialist palliative input prior to their terminal admission.

DISCUSSION

This study has reported on the pattern of hospital healthcare utilisation by those aged over 70 who died in a Malaysian university hospital. More than half of the deceased spent at least 9 days in hospital and had either one emergency or outpatient visit in the preceding 6 months. Over one-third had also been admitted previously, spending almost 2 weeks in hospital. Most of them required radiological investigations, invasive procedures, antibiotics and had multiple medications that were continued up till the time of their death, some of which were non-beneficial.

This is the first study looking into healthcare utilisation among older adults in the last 6 months of life in the Malaysian hospital setting. The data reported represent those who passed away in the Department of Medicine, as participants were recruited across the different medical subspecialties. The stratified sampling method was followed by a randomised selection and minimised possible selection bias. The sample was also as representative as possible of all those aged 70 years and above that passed away in 2019. By extrapolating this study's sample to the total 472 patients that died in that year, it is possible to estimate that the overall healthcare utilisation by this older group of patients would be over 4200 inpatient bed days, 470 outpatient visits, 1800 radiological tests, and 210 nasogastric tube insertions.

However, there were limitations associated with this study. Important factors that could have influenced healthcare utilisation were not analysed, such as frailty, disability

morbidity, and illness severity. This would support targeting attention on factors associated with either high or low healthcare utilisation. Actual healthcare cost was not calculated and should feature in future studies. Additionally, this study's findings were from a single urban hospital which limits its generalisability to other setting. Malaysia's healthcare system consists of both public and privately funded healthcare providers delivered across urban and rural areas at the primary, secondary, and tertiary levels. Additionally, by its retrospective design, data accuracy, and reliability were entirely dependent on clinical notes and records obtained from the hospital electronic health record system. The accuracy of the ICD-10 coded cause of death provided by medical records may not necessarily reflect the true cause of death as these would often be entered by non-clinical coders. Death may also be a result of multiple factors yet only described as a single cause in death certificates and the coding system. Other aspects of healthcare usage such as blood investigations, oxygen tubing, and dressings, for example, were also not captured within this study. This study was also unable to conclude if the healthcare utilised was deemed appropriate or not. Foreseeable deaths due to underlying chronic illnesses and sudden, unexpected deaths will be treated very differently. Moreover, as data were limited to this hospital's electronic medical records, this study was unable to comment on the healthcare utilisation that could have been accessed in other healthcare facilities.

High healthcare utilisation among older people in hospital in the last year of life has previously been reported.¹³ In this study, several medical procedures and treatments contributed to the overall healthcare utilisation. Almost half of the patients had a nasogastric tube in-situ during the terminal admission. This echoes findings from a study done previously in this same hospital.²² Bypassing the swallowing mechanism and delivering food directly into the stomach tends to be the typical approach in people with swallowing difficulties, or with poor oral intake due to either an acute or chronic illness. However, this carries problems such as aspiration pneumonia, diarrhoea, and local trauma.^{23,24} Hence, whether nasogastric tube insertion and feeding should be done requires an individualised approach, an awareness of local cultural context and supported by clinical frameworks.²⁵⁻²⁷ Besides that, 28% of the patients required ventilatory support with either non-invasive or invasive mechanical ventilation during the last 6 months of life. Supported ventilation, similar to nasogastric tube feeding, also requires an individualised decision-making process to balance the goals of care and risk-benefit in the context of one's overall prognosis. Both procedures require trained personnel to initiate and monitor the care delivered.

This study also demonstrated that almost three-quarters of all patients received antibiotics up till the last 24 hours of life. Such high usage has also been described in other cohorts.²⁸ Infection is common and represents the terminal event in chronic conditions, such as dementia and frailty.^{29,30} Antibiotics have been reported to be frequently prescribed empirically in end-of-life care situations based on signs and symptoms without confirmatory imaging studies or laboratory tests.^{31,32} This study only reported whether patients were receiving antibiotics and did not explore the indication

or appropriateness for the treatment. There is a fine balance between active treatment which may still be beneficial for a reversible illness that entails a burden of treatment, against maximising comfort and minimising aggressive interventions for the dying.

Polypharmacy towards the end of life was a significant finding. Many older adults would have chronic illnesses necessitating the need for a number of medications.³³ However, as the chronic disease progresses towards its terminal stages, or when there is an irreversible acute illness, deprescribing needs to be part of the person's care. Guidance on prescribing and deprescribing in older people such as STOPP/START and Beers criteria, as well as those more specific to palliative care to support deprescribing in end of life can support more person-centred prescribing.³⁴⁻³⁷ Prescribing focus towards the end of life should be on anything that relieves distressing symptoms, provide comfort and optimise quality of life.

This study was not meant to determine if the healthcare utilisation was appropriate and beneficial or not. Clinicians work in a challenging environment to ensure that healthcare is delivered in the patient's best interest, i.e. to reverse what is reversible and to provide comfort when it is irreversible. Many of the patients included in this study did have a healthcare contact prior to their terminal hospital admission. Although each healthcare contact could be for very different reasons, it may also be possible that they were for a similar condition to their eventual hospital admission. The high overall healthcare use than could be a sign of chronic disease progression. Thus, each healthcare contact may represent an opportunity to consider how future care should be directed and individualised for the patient in the form of advance care planning (ACP).³⁸ ACP can set clear goals and care plans which could include decisions on artificial hydration and nutrition, preferred place of death, medication appropriateness, ceilings of treatment, and the extent of investigations.

This study has set the scene on what happens towards the end of life among older adults admitted to hospital. Further research to understand how healthcare decisions are made at this stage would provide insight into what clinicians deemed appropriate and how that decision was made. Besides that, risk stratification to determine characteristics and factors associated with high healthcare usage would allow clinician and stakeholders to focus efforts to better support care during this vulnerable period. A better understanding of this would allow better organisation of care and the delivery of high-quality end-of-life care services to address the healthcare needs of an expanding aging population. There is an emerging evidence that within our local context factors such as frailty and care need requirements were associated with higher healthcare utilisation.^{11,39} Further work needs to build on this to provide a clearer picture that is relevant to our local healthcare system.

CONCLUSION

This study has reported on the hospital healthcare utilisation among older adults admitted to hospital in the preceding 6

months before their passing. The majority had contact with a healthcare team prior to their terminal admission. During their terminal admission, many had healthcare procedures, investigations, antibiotics used, and issues of polypharmacy during this time. With an aging population, how care is organised and delivered is important in promoting good care in their later years.

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