

ORIGINAL ARTICLE

UTILIZATION OF HIGH DEPENDENCY CARE BY GERIATRIC POPULATION IN A PRIVATE HOSPITAL IN MALAYSIA.

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Abstract

Background: The growth of aging population contributes to an increase utilization and burden on healthcare resources. Clinical assessment of geriatric patients admitted to High Dependency Unit (HDU) is essential to evaluate the level of care for benchmark setting of HDU admission criteria. The aim of the study was to assess the utilization of high dependency care by geriatric population in a private hospital in Malaysia. **Methods:** Every consecutive medical records of patients admitted to HDU of Ipoh Specialist Hospital (ISH) from 1st January 2016 to 30th June 2016 were collected from the Health Information Management System Services (HIMSS) and were recorded. The study variables were age, gender, ethnicity, length of stay, reasons for admission, sources of admission and co-morbidities. Bed occupancy rate and mortality rate at HDU were also calculated. **Results:** Total hospital admission to ISH in the first six months of 2016 was 12744, which included 572 admissions to a 13-bedded HDU. More than half (56.67%) of HDU admission within this period was contributed by geriatric population, out of which 56.04% were males. The bed occupancy rate of geriatric patients was 57.31%, which was consistently higher than the younger age group (39.86%) and the mean duration of HDU stay was 4.34 days (95% CI: 3.87-4.81). Admissions from the Accident and Emergency (A&E) department ($p = 0.022$) and medical causes ($p = 0.000$) were significantly higher in the geriatric age groups compared to the younger age group. Geriatric patients had significantly higher co-morbidities of ≥ 4 ($p = 0.000$). **Conclusion:** The HDU is most commonly utilized by geriatric population with multiple medical co-morbidities. The set up and the delivery of care in the HDU should be tailored towards the specific needs of elderly. **Keywords:** *geriatric admission, high dependency unit*

Introduction

Aging nation is defined by World Health Organization (WHO) as the population aged 65 years and above reaches 7% or more of the total population in a region or country.¹ In Malaysia, the elderly or senior citizens are those aged 60 years and above, as outlined by the National Policy On Senior Citizens.² The WHO also further classified the elderly into four groups that is young old (60-74 years), middle old (75-84 years), old old (85 years and above) and centenarians (100 years and above).¹

According to WHO Global Health and Aging publication, the number of people aged 65 and above has an estimated growth from 524 million in 2010 to approximately 1.5 billion in 2050, with most expected increase in developing countries.³ In Malaysia, the National Statistics Department has also projected that by the year 2035, 15% or 5.6 million of its population will constitute of senior citizens. As of year 2016, 6% of total Malaysian population was senior citizens.⁴

The growth of aging population contributes to an increase utilization and burden on healthcare resources. This is especially so in intensive care medicine.⁵ It is an extremely challenging task for healthcare professionals to provide quality care for this population with limited resources⁶.

According to National Health Service (NHS), United Kingdom, there are 3 levels of care in a hospital setting. Level one involves ward-based care where patients do not require organ support. The HDU is at level two where patients require single organ support and one nurse is responsible for every two patients. On the other hand, intensive care unit (ICU) is one level higher than HDU where patients require two or more organs support (or need mechanical ventilation alone). In ICU, as the name implies, has one nurse to one patient with the presence of intensivist round the clock.⁷ However, in Malaysia, there are no clear guidelines for HDU admission, compromising the needs of geriatric patients with pre-existing comorbidities. This study correlated HDU

admission of geriatric age groups with gender, ethnicity, sources and causes of admission, comorbidities, length of HDU stay as well as bed occupancy rate in the hope of providing a better insight into the needs for high dependency services and care for the geriatric population.

Methods

Study Design

The study was a cross sectional descriptive study conducted in ISH based on medical records from 1st January 2016 to 30th June 2016 obtained from HIMSS and HDU admission records.

Study Population

The reference population was total geriatric hospitalization in ISH and sample population was geriatric patients (≥ 60 years old) admitted to HDU.

Data Collection

Total geriatric hospitalization (≥ 65 years old) was obtained from the hospital database and the total admission to HDU was obtained from the HDU admission book. Detailed medical records of every consecutive patient admitted to HDU were recorded according to the variables (age, gender, ethnicity, length of stay, reasons for admission, sources of admission and comorbidities). Subsequently, the bed occupancy rate and mortality rate of the geriatric population at the HDU were calculated. The hospital software adopted 65 years and above for all geriatric hospitalization based on international geriatric age group stratification. However, the age limit of the HDU geriatric patients was 60 years and above according to national guidelines of Malaysia, which is also the retirement age. The geriatric cohort in HDU was further subjected to sub-analysis based on young old (60-74 years), middle old (75-84 years) and old old (85 years & above). Ethical and administrative approval was obtained from the authorities of ISH.

Statistical Analysis

Descriptive data was summarized using frequency tables and presented in graphs as appropriate. Analytical data was analyzed using the Statistical Package for Social Sciences version 17.0 (SPSS Inc, Chicago, USA). All data obtained was stratified by demographic variables. Categorical variables were tested using Pearson Chi-Square test. Parametric model assumptions were assessed using normality plot or Shapiro-Wilk statistic for verification of normality. Non-parametric analysis methods were used throughout the analysis since parametric assumptions could not be satisfied (Shapiro-Wilk statistic $p < 0.05$). Correlation between categorical data and continuous data was tested using Mann Whitney U-test. Kruskal Wallis test was utilized to assess the relationship between more than 2 categorical variables. $p < 0.05$ was considered as statistically significant.

Results

The total hospital admission in the first half of 2016 showed that majority of the hospital beds were occupied by the younger patients who were < 65 years of age (86.24%). However, in HDU, more than half (56.57%) of its admission was by the geriatric patients. The flowchart of data collection on study population and analysis process is outlined in **Figure 1**. Males were dominating in both the younger and geriatric age groups in all HDU admission. The main source of admission into HDU was from A&E (55.17%). Both the younger age group < 60 years old (61.7%) and geriatric age group ≥ 60 years old age (75.85%) were admitted mainly due to medical-related conditions. The number of co-morbidities for both the age groups is listed in **Table 1**. Most of the geriatric patients were suffering from hypertension (64.71%), diabetes mellitus (43.96%) and cardiac-related problems (37.77%) (**Figure 2**). The total length of stay for geriatric patients was more than the younger age group but

this difference was not statistically significant ($p = 0.107$) (**Table 1**). The bed occupancy rate of HDU was calculated for both the age groups, with the younger occupying 39.86% and the geriatric utilizing 58.62% of HDU beds (**Table 1**). More than half (52.63%) of the geriatric admission was by the young old group (**Table 2**). Both cardiovascular (18.89%) and central nervous system-related problems (18.89%) were the main reasons for medically-related admission, followed by respiratory related problems (17.34%). Gastrointestinal problems (4.33%) were the most common surgically related admissions (**Table 3**).

Discussion

In our study, we found that more than half (56.67%) of the HDU admission was by the geriatric population in the first six months of the year 2016. Similar findings have been published in a retrospective audit conducted on a nurse-led HDU (Nurse Specials Unit) in Perth Western Australia by Alan Tulloch et al. 8 We observed that young old group (60-74 years old) had more HDU admission which was consistent with a study done in an ICU setting in Bangladesh. 9 On the contrary, study done in United States of America showed that the highest admission rate among the geriatric population into ICU was in the age group of 75-84 years (41.3%). 10 Overall, there is scanty report addressing the issues related to geriatric population in HDU settings.

In our study, HDU being taken as a step-up or step-down facility caters for a heterogeneous group of patients from various sources. Majority of HDU admission were from the A&E department. This finding was similar to that by Junker et al. (37.6%) 11 and L. Weiss et al. (54%) 12 where HDU admission was mainly from the emergency department but was in contrast to the findings by Alan Tulloch et al. 8 and Prin et al., 13 where wards (33%) and ICU (22.4%) were the main source of HDU admissions respectively.

Table 1: Comparison of clinical variables between the young (< 60 years old) and geriatric (≥ 60 years old) groups.

Variables	< 60 years old (n=248)	≥ 60 years old (n=323)	p value *
Gender, n (%)			
Male	157 (63.31%)	181 (56.04%)	0.080 ^a
Female	91 (36.69%)	142 (43.96%)	
Ethnicity, n (%)			
Chinese	110 (44.35%)	236 (73.06%)	0.000 ^a
Malay	86 (34.68%)	62 (19.2%)	
Indian	45 (18.15%)	23 (7.12%)	
Others	7 (2.82%)	2 (0.62%)	
Sources of admission, n (%)			
Accident & Emergency (A & E)	132 (53.23%)	183 (56.66%)	0.022 ^a
Transferred in from other wards	38 (15.32%)	60 (18.57%)	
Outpatient Clinics	17 (6.85%)	11 (3.40%)	
ICU / CCU / CICU	40 (16.13%)	58 (17.96%)	
Lodger / Operation Theatre (OT)	18 (7.26%)	7 (2.17%)	
Diagnostic Centre / Catheterization Laboratory	3 (1.21%)	4 (1.24%)	
Causes of admission, n (%)			
Medicine	153 (61.70%)	245 (75.85%)	0.000 ^a
Surgery	22 (8.87%)	31 (9.60%)	
Neurosurgery	37 (14.92%)	16 (4.95%)	
Orthopedics	20 (8.07%)	21 (6.50%)	
Ear, Nose and Throat (ENT)	3 (1.21%)	7 (2.17%)	
Psychiatry	7 (2.82%)	1 (0.31%)	
Eye	1 (0.40%)	1 (0.31%)	
Plastic Surgery	4 (1.61%)	1 (0.31%)	
Obstetrics & Gynaecology (O & G)	1 (0.40%)	0 (0%)	
Total co-morbidities (n)			
< 4	233 (93.95%)	255 (78.95%)	0.000 ^a
≥ 4	15 (6.05%)	68 (21.05%)	
Total length of stay in HDU (days)	951	1389	0.107 ^b
Mean (95% confidence interval)	3.90 (3.31 - 4.50)	4.34 (3.87 - 4.81)	
Bed Occupancy Rate (%)	39.86%	57.31%	

*p value between age groups and variables, ^a Pearson Chi Square test, ^b Kruskal-Wallis test

Table 2: Sub-analysis of clinical variables between the young old (60-74 years old), middle old (75-84 years old) and old old (85 years old and above).

Variables	60 to 74 years old (n=170)	75 to 84 years old (n=108)	85 years old & above (n=45)	p value *
Gender, n (%)				
Male	110 (64.71%)	49 (45.37%)	22 (48.89%)	0.004 ^a
Female	60 (35.29%)	59 (54.63%)	23 (51.11%)	
Ethnicity, n (%)				
Chinese	112 (65.88%)	85 (78.70%)	39 (86.67%)	0.033 ^a
Malay	38 (22.35%)	18 (16.67%)	6 (13.33%)	
Indian	18 (10.59%)	5 (4.63%)	0 (0%)	
Others	2 (1.18%)	0 (0%)	0 (0%)	
Sources of admission, n (%)				
Accident & Emergency (A & E)	85 (50.00%)	71 (65.74%)	27 (60.00%)	0.078 ^a
Transferred in from other wards	36 (21.18%)	14 (12.96%)	10 (22.22%)	
Outpatient Clinics	8 (4.71%)	3 (2.78%)	0 (0%)	
ICU / CCU / CICU	35 (20.59%)	17 (10.00%)	6 (13.33%)	
Lodger / Operation Theatre (OT)	5 (2.94%)	0 (0%)	2 (4.44%)	
Diagnostic Centre / Catheterization				
Laboratory	1 (0.59%)	3 (2.78%)	0 (0%)	
Causes of admission, n (%)				
Medicine	115 (67.65%)	93 (86.11%)	37 (82.22%)	0.070 ^a
Surgery	23 (13.53%)	7 (6.48%)	1 (2.22%)	
Neurosurgery	13 (7.65%)	1 (0.93%)	2 (4.44%)	
Orthopedics	12 (7.06%)	4 (3.70%)	5 (11.11%)	
Ear, Nose and Throat (ENT)	4 (2.35%)	3 (2.78%)	0 (0%)	
Psychiatry	1 (0.59%)	0 (0%)	0 (0%)	
Eye	1 (0.59%)	0 (0%)	0 (0%)	
Plastic Surgery	1 (0.59%)	0 (0%)	0 (0%)	
Total co-morbidities (n)				
< 4	134 (78.82%)	85 (78.70%)	36 (80.00%)	0.982 ^a
≥ 4	36 (21.18%)	23 (21.30%)	9 (20.00%)	
Total length of stay in HDU (days)				
	696	522	184	0.304 ^b
Mean (95% confidence interval)	4.09 (3.47 - 4.72)	4.83 (3.87 - 5.79)	4.09 (3.32 - 4.85)	
Bed Occupancy Rate (%)				
	29.67%	21.81%	7.78%	

*p value between age groups and variables, ^a Pearson Chi Square test, ^b Kruskal-Wallis test

Table 3: Sub- analysis of the specific causes of HDU admission in the geriatric population.

Variables	60 to 74 years old (n=170)	75 to 84 years old (n=108)	85 years old & above (n=45)	Total (n = 323)	<i>p</i> value *
Specific causes of geriatric admission, n (%)					
Medicine					
Cardiovascular System-related problems	34 (20.00%)	19 (17.59%)	8 (17.78%)	61 (18.89%)	0.106 ^a
Central Nervous System-related problems	29 (17.06%)	25 (23.15%)	7 (15.56%)	61 (18.89%)	
Respiratory-related problems	24 (14.12%)	19 (17.59%)	13 (28.89%)	56 (17.34%)	
Gastrointestinal-related problems	15 (8.82%)	13 (12.04%)	3 (6.68%)	31 (9.60%)	
Renal-related problems	6 (3.53%)	2 (1.85%)	1 (2.22%)	9 (2.78%)	
Endocrine-related problems	3 (1.76%)	3 (2.78%)	1 (2.22%)	7 (2.17%)	
Infection	1 (0.59%)	5 (4.64%)	1 (2.22%)	7 (2.17%)	
Urinary-related problems	0 (0%)	4 (3.70%)	2 (4.44%)	6 (1.86%)	
Electrolyte Imbalance	1 (0.59%)	2 (1.85%)	1 (2.22%)	4 (1.24%)	
Surgery					
Gastrointestinal-related problems	9 (5.30%)	4 (3.70%)	1 (2.22%)	14 (4.33%)	
Cardiovascular System-related problems	4 (2.35%)	2 (1.85%)	0 (0%)	6 (1.86%)	
Respiratory-related problems	6 (3.53%)	0 (0%)	0 (0%)	6 (1.86%)	
Urinary-related problems	3 (1.76%)	1 (0.93%)	0 (0%)	4 (1.24%)	
Renal-related problems	1 (0.59%)	0 (0%)	0 (0%)	1 (0.31%)	
Orthopedics	12 (7.06%)	4 (3.70%)	5 (11.11%)	21 (6.50%)	
Neurosurgery	13 (7.65%)	1 (0.93%)	2 (4.44%)	16 (4.95%)	
Others	9 (5.29%)	4 (3.70%)	0 (0%)	13 (4.01%)	

**p* value between age groups and variables, ^a Pearson Chi Square test, ^b Kruskal-Wallis test

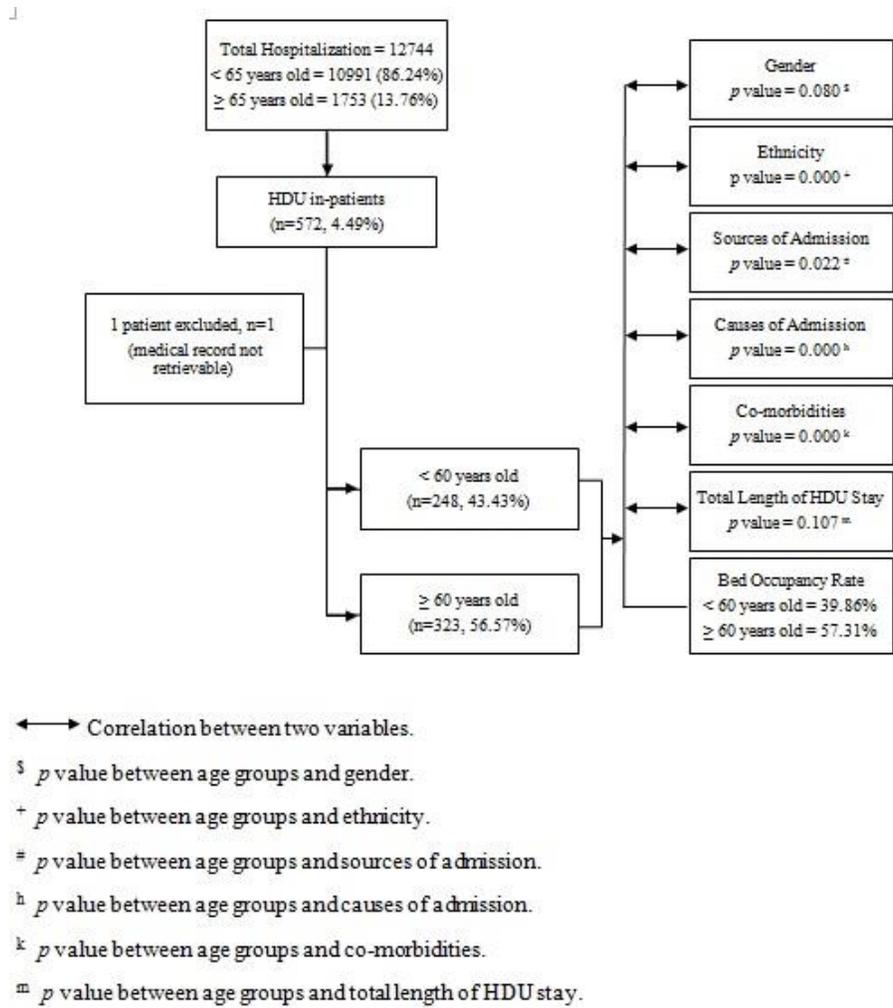


Figure 1: Flowchart of data collection on study population and analysis process.

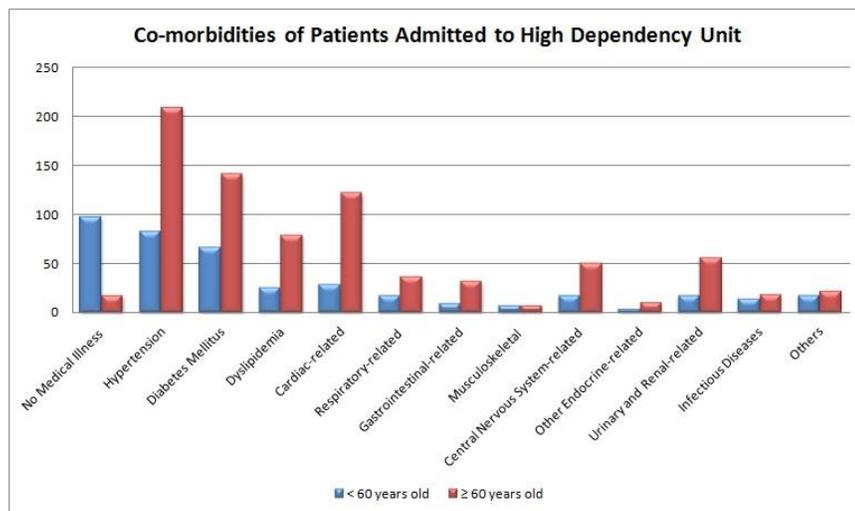


Figure 2: Variety of system-based co-morbidities of patients admitted to HDU.

More than one quarter (28.79%) of the elderly had three co-morbidities. Hypertension, diabetes mellitus and cardiac-related problems were the top three co-morbidities identified in our study. This was reflected in our findings that cardiovascular (18.89%) and central nervous system problems (18.89%) were the most common reasons for admission into HDU. Similar findings have been reported by Junker et al.,¹¹ where cardiovascular diagnoses accounted for 47% of medical Intermediate Care Area admissions. Respiratory conditions were placed second, represented mainly by pneumonia and acute exacerbation of chronic obstructive pulmonary disease (AECOPD), in agreement with study finding by L Weiss et al.¹²

There was significant disparity in reason for orthopedic admission between the young and the old, where trauma was the main cause for the young whilst osteoporotic fractures were the main cause of admission for the old. Fracture neck of femur and inter-trochanteric femur fracture were commonly seen among female geriatric patients.

The length of HDU stay in the geriatric age group ranged from 1 to 36 days, with a mean of 4.34 days (95% CI: 3.87 - 4.81). In a study by Junker et al.,¹¹ the mean length of stay in Intermediate Care Area was 3.9 ± 3.1 days whereas Alan Tulloch et al.⁸ reported duration of stay in the nurse-led HDU (Nurse Specials Unit) in the range of 1-8 days, with a mean of 1.8 days. The HDU bed occupancy rate was calculated based on the total number of in-patient days divided by product of total number of beds and study period and expressed in percentage. This is crucial in the assessment of actual utilization of HDU facility per month. In total, the average HDU bed occupancy rate was 98.46% over 6 months and geriatric patients' bed occupancy rate was at an average of 58.59%. There was scanty literature on the evidence of optimum bed occupancy rate. Leeson-Payne and Aitkenhead predicted that a HDU of seven

beds would be fully occupied 63% of the time, an eight-bed HDU would be occupied to full capacity 50% of the time whereas nine-bedded would be occupied to capacity for only 37% of the time. In the same study with an annual admission of 200; it was recommended that the average occupancy of a HDU not to be less than 60% for viable economic reasons.¹⁴ The recommended standard nurse: patient ratio is 1:2¹⁵ and it is acceptable to have 1:4.^{12,16} In our study setting, nurse: patient ratio is 1:4, depicting limited manpower despite high bed occupancy rate. It was of note that there was no nosocomial infection reported during the study period. The total mortality rate within the study period was 18.65%. However, findings from retrospective cohort studies in the HDUs of United Kingdom and United States, reported a much lower HDU mortality of 5.1%¹³ and 3.1% respectively.¹¹ This could be due to the lack of standard criteria for HDU admission.

The youngest and eldest HDU in-patients within this six months study period were 7 years old and 99 years old respectively. In our study, effort was put to identify survivors, escapers and delayers¹⁷ but inconsistent data rendered this futile. We were able to identify one escaper who was a 90 years old female patient with no known co-morbidities admitted for right neck of femur fracture. There was another 99 years old male survivor with underlying 3 co-morbidities who was admitted for aspiration pneumonia. The main limitation of this study includes ethnic difference among the HDU patients, predominated by Chinese. Age group for the total geriatric hospitalization was taken as ≥ 65 years old whereas a geriatric cut-off age of ≥ 60 years old was taken for our study population in HDU.

Conclusion

High dependency services are predominantly utilized by the geriatric population. This is a growing concern in the light of rapid

demographic transition in Malaysia. Cardiovascular, central nervous system and respiratory-related problems were the most common reasons for geriatric HDU admissions. These problems are rooted from multiple comorbidities, with long-standing metabolic conditions being commonly observed. This is reflected by higher bed occupancy rate and higher mortality rate among the geriatric patients admitted to HDU. Moreover, the HDU admission criteria are not properly spelt out. The hospital authorities need to look into the formulation of HDU admission criteria with reference to the specific needs of geriatric population.

Conflicts of interest

The authors have no conflicts of interest relevant to this article.

Acknowledgements

This study obtained ethical and administrative approval (MDE61/2016 nm) from ISH for utilizing medical records from HIMSS and HDU. The authors would like to extend their appreciation to the Medical Director Dato' Dr. Hj. Fadzli Cheah Abdullah, HDU and HIMSS staffs of ISH.

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