CHARACTERISTICS OF MULTIMORBIDITY IN HOSPITALIZED ELDERLY PATIENTS

Tran Ngoc Tuan[1], Do Dinh Tung[2], Nguyen Van Luyen[3]
Nguyen Van Thuan[3], Nguyen Thi Hanh[3], Nguyen Thanh Xuan[3]*

Abstract

Objectives: To evaluate the characteristics of multimorbidity in hospitalized elderly patients and identify factors associated with the length of stay and the number of comorbidities. ***Methods:*** A retrospective, cross-sectional study was conducted using 507 medical records of patients aged > 60 years. Descriptive statistics, one-way ANOVA, Pearson correlation analysis, and multiple regression analysis were used to evaluate the associations between age, sex, number of comorbidities, and length of stay. ***Results:*** The median age of patients was 73 years, and the sex distribution was relatively balanced (49.3% male, 50.7% female). The median length of stay was 9 days, and the median number of comorbidities was 3. Hypertension was the most common comorbidity (61.9%), followed by chronic lung disease (30.4%) and diabetes (26.4%). Older age and number of comorbidities were associated with longer length of stay. The number of comorbidities was an independent factor affecting the length of hospital stay (OR = 1.63; 95%CI = 1.41 - 1.89). ***Conclusion:*** Multimorbidity is common in hospitalized elderly patients, and factors such as advanced age and the number of comorbidities increase the length of hospital stay. Management and medical care should be strengthened to meet the needs of this group of patients.

Keywords: Elderly patients; Multimorbidity; Length of hospital stay; Chronic diseases.

[1]Vietnam Military Medical University
[2]Saint Paul General Hospital
[3]Military Hospital 103, Vietnam Military Medical University
[*]Corresponding author: Nguyen Thanh Xuan (bsxuanhatay@gmail.com)
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INTRODUCTION

Multimorbidity is the simultaneous occurrence of multiple chronic diseases in the same patient, especially in the elderly [1, 2]. The biological mechanism may be due to aging and the development of different diseases, the impact of which can lead to complex developments [2]. Elderly people often have complex health problems due to the combination of chronic diseases such as hypertension, diabetes, cardiovascular disease, and other disorders [3]. This increases the risk of prolonged hospitalization, affects quality of life, and places a great burden on the health system.

There have been many studies on factors related to multimorbidity in elderly people worldwide. The factors included age, sex, number of comorbidities, living conditions of the elderly individuals, number of visits, number of hospitalizations, length of stay, and treatment costs. These studies have helped to improve the understanding of the need for integrated disease management and the development of effective treatment strategies to reduce hospital stays and improve treatment outcomes [2, 4].

However, in Vietnam, studies related to multimorbidity in the elderly population are still limited. Although there are some small studies on individual chronic diseases, such as hypertension or diabetes, comprehensive studies on combined multimorbidity and factors related to hospital stays have not been widely conducted. This study analyzed the characteristics of combined multimorbidity in elderly patients hospitalized at a large hospital in Vietnam. This paper aims to: *Identify factors associated with length of stay and number of comorbidities, and provide data to support the development of appropriate health strategies.*

MATERIALS AND METHODS

1. Subjects

Including 507 medical records of patients aged > 60 years who were admitted and discharged from the Senior Officer Department, Military Hospital 103, between December 2022 and October 2024.

* *Exclusion criterion:* Medical records of patients who were not admitted or discharged from the research department.

2. Methods

* *Study design:* A retrospective, cross-sectional study based on data collected from inpatient medical records.

* *Protocol:*

Medical records were collected by selecting and coding medical records that met the criteria for the study.

Recording information: Data, including admission and discharge times, year of birth, sex, and disease status, were collected from medical records and coded according to the International Classification of Diseases-10.

Data entry and processing: After the data were collected, the data were entered into Excel software and checked again before analysis with SPSS 26.0.

Diagnostic criteria: (1) Hypertension: According to the Vietnam Heart Association and ESC/ESH 2018: Systolic blood pressure (SBP) ≥ 140 mmHg and/or diastolic blood pressure (DBP) ≥ 90 mmHg measured in a clinical setting; or the patient is on antihypertensive medication. (2) Diabetes mellitus: According to the American Diabetes Association (ADA 2023): Fasting plasma glucose (FPG) ≥ 126 mg/dL (7 mmol/L) after fasting for at least 8 hours; HbA1c ≥ 6.5% (48 mmol/mol); plasma glucose ≥ 200 mg/dL (11.1 mmol/L) 2 hours after a 75-gram oral glucose tolerance test (OGTT); or random plasma glucose ≥ 200 mg/dL (11.1 mmol/L) with symptoms of hyperglycemia; or the patient is on glucose-lowering medication. (3) Arrhythmias: According to the Vietnam Heart Association and ESC 2020: Diagnosed by electrocardiogram (ECG) with the following findings: Atrial fibrillation; premature atrial or ventricular contractions; right or left bundle branch block; atrioventricular block (grade I, II, or III). (4) Heart failure: According to ESC 2021: Clinical symptoms: Dyspnea, fatigue, or leg edema (NYHA class II-IV); echocardiographic findings: Heart failure with reduced ejection fraction (HFrEF): Left ventricular ejection fraction (LVEF) ≤ 40%; heart failure with preserved ejection fraction (HFpEF): LVEF ≥ 50% with signs of heart failure. (5) Dyslipidemia: According to the Vietnam Endocrine Society and ESC/EAS 2019: Total cholesterol (TC) ≥ 5.2 mmol/L (200 mg/dL); LDL cholesterol ≥ 2.6 mmol/L (100 mg/dL); HDL cholesterol < 1.0 mmol/L (40 mg/dL) in men or < 1.2 mmol/L (50 mg/dL) in women; triglycerides (TG) ≥ 1.7 mmol/L (150 mg/dL); or the patient is on lipid-lowering therapy. (6) Chronic kidney disease (CKD): According to KDIGO 2012: Glomerular filtration rate (GFR) < 60 mL/min/1.73m² for ≥ 3 months; or structural or functional kidney abnormalities for ≥ 3 months, evidenced by: Albuminuria ≥ 30 mg/24h; persistent urinary abnormalities (e.g., hematuria, leukocyturia); imaging findings indicating kidney abnormalities. (7) Old stroke: According to the Vietnam Ministry of Health: History of ischemic or hemorrhagic stroke that is no longer in

the acute phase; or imaging evidence (MRI or CT) of previous stroke lesions. (8) Gout: According to ACR/EULAR 2015: Serum uric acid level > 6.8 mg/dL (408 μmol/L); history of recurrent acute arthritis, particularly involving the first metatarsophalangeal joint; identification of urate crystals in synovial fluid or tophi. (9) Musculoskeletal diseases: According to the Vietnam Ministry of Health: Rheumatoid arthritis: Diagnosed according to ACR/EULAR 2010 criteria. Osteoarthritis: Identified by clinical features and X-ray findings (Kellgren-Lawrence criteria). Osteoporosis: Diagnosed by a T-score ≤ -2.5 using a DXA scan. (10) Neurological diseases: According to the Vietnam Ministry of Health and international guidelines; Alzheimer's disease: Diagnosed per DSM-5 or NIA-AA criteria; herniated disc: Confirmed by MRI showing nerve root compression; peripheral neuropathy: Diagnosed through clinical features and electromyography (EMG). (11) Cachexia: According to the International Association of Gerontology: Loss of skeletal muscle mass ≥ 5% within 12 months; body mass index (BMI) < 18.5 kg/m^2; reduced muscle strength assessed by clinical tests (e.g., handgrip strength). (12) Chronic lung disease: According to GOLD 2023 and the Vietnam Ministry of Health: COPD: Post-bronchodilator FEV1/FVC < 0.7; asthma: Diagnosed based on clinical history and spirometry results. Chronic bronchitis: Persistent cough and sputum production for ≥ 3 months over 2 consecutive years. (13) Chronic diseases: According to WHO: Non-communicable diseases (NCDs), including cardiovascular diseases, cancer, diabetes, chronic respiratory diseases, musculoskeletal diseases, and neurological disorders; duration of ≥ 6 months, requiring long-term monitoring and management.

** Research variables:*

Independent variable: Number of diseases (calculated according to the ICD-10 diagnosis list). Diseases are coded in binary form (0 - 1), with 1 being the presence of the disease and 0 being the absence of the disease.

Dependent variables: Patients were divided into 4 age groups: 60 - 69, 70 - 79, 80 - 89, ≥ 90; sex (male/female); total number of diseases: The patients were grouped into 1 disease, 2 diseases, 3 diseases, 4 diseases, 5 diseases, and 6 diseases or more; duration of hospital stay (classified by median: Short and medium, or long).

** Data processing:*

Descriptive analysis: Frequencies and proportions were calculated to describe the characteristics of the study sample (age, sex, number of combined diseases, and length of hospital stay).

Comparative analysis: One-way ANOVA and two-way ANOVA were used to compare age group, sex, number of combined diseases, and length of hospital stay. Correlation analysis: The Pearson correlation test was used to evaluate the associations between age, length of hospital stay, and number of combined diseases. Multivariate regression analysis: Factors associated with length of hospital stay were evaluated using odds ratios (ORs) and 95% confidence intervals (CIs).

3. Ethics

The study was conducted in compliance with the Declaration of Helsinki of the World Medical Association. The study data were anonymized without containing specific personal information about the patients to ensure confidentiality and privacy. The Department of Senior Staff, Military Hospital 103 granted permission for the use and publication of the research data. The authors declare to have no conflicts of interest in the study.

RESULTS

The study showed a fairly even distribution of male and female patients, with a median age of 73 years. The median length of stay was 9 days, reflecting the severity of the disease. The median number of comorbidities was 3. Patients with 2 or 3 comorbidities predominated (23.7% and 24.3%, respectively). Hypertension was the most common disease (61.9%), followed by chronic lung disease (30.4%) and diabetes mellitus (26.4%) (*Table 1*).

Table 1. Age, sex, number of days in hospital, and disease status of elderly patients (n = 507).

Characteristics	Total, n (%)
Age (years)	
Median (Interquartile Range)	73 (65.80)
Sex	
Male	250 (49.3)
Female	257 (50.7)
Number of days in hospital (days)	
Short and medium length of hospital stay	232 (45.8)
Long length of hospital stay	275 (54.2)

Characteristics	Total, n (%)
Proportion distribution of chronic diseases	
Hypertension	314 (61.9)
Diabetes mellitus	134 (26.4)
Arrhythmias	35 (6.9)
Heart failure	32 (6.1)
Other cardiovascular diseases	15 (3.0)
Dyslipidemia	40 (7.9)
Chronic kidney disease	46 (9.1)
Old stroke	83 (16.4)
Gout	20 (3.9)
Musculoskeletal diseases	18 (3.6)
Neurological diseases	112 (22.1)
Cachexia	52 (10.3)
Chronic lung disease	154 (30.4)

The length of hospital stay and number of comorbidities increased with age ($p < 0.05$) (*Table 2*).

Table 2. The association between age groups and length of hospital stay.

Age group	n	Mean	SD	p
60 - 69	203	3.84	1.477	< 0.05
70 - 79	159	4.45	1.504	
80 - 89	105	5.24	1.929	
≥ 90	40	5.03	1.790	
Total	507	4.41	1.700	

(SD: Standard deviation; n: Number of patients)

The number of comorbidities and length of hospital stay increased with age, particularly in the 80 - 89 and ≥ 90 age groups. (*Figure 1*).

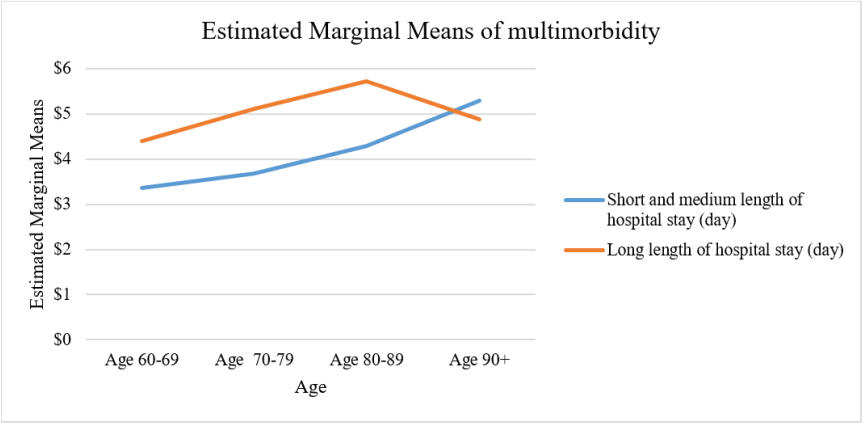

Figure 1. The association between the number of comorbidities and length of hospital stay by age group.

The results showed that age was positively related to the length of hospital stay (|r| = 0.137; p < 0.01) and the number of comorbidities (|r| = 0.325; p < 0.01). The greater the number of comorbidities, the longer the hospital stay (|r| = 0.446; p < 0.01) (*Table 3*).

Table 3. The correlation between age, length of hospital stay, and number of comorbidities (n = 507).

Factors	Pearson correlation	Length of stay	Number of comorbidities
Age	r (p)	0.137 (0.002)	0.325 (0.000)
Length of stay	r (p)		0.446 (0.000)

(r: Pearson correlation)

The number of comorbidities was an independent factor that significantly affected the length of hospital stay (OR = 1.63; 95%CI = 0.000) (*Table 4*).

Table 4. Multivariate regression analysis between length of hospital stay and age, sex, and the number of comorbidities and chronic diseases (n = 507).

Factors	OR	95%CI	p
Age	1.01	0.99 - 1.04	0.18
Gender	0.71	0.49 - 1.05	0.08
Comorbidity	1.63	1.41 - 1.89	0.00*
Chronic diseases	1.41	0.96 - 2.09	0.08

*(OR: Odds ratio; CI: Confidence interval; *: p = 0.000)*

DISCUSSION

The study showed a fairly even distribution of men and women. There was a long hospital stay, a high number of comorbidities, and mainly chronic diseases reflecting the severity of the disease as well as the prevalence of multimorbidity in the elderly patient group, Like other studies showing that multimorbidity is common and a factor that increases the risk of hospitalization, patients with chronic cardiovascular disease and diabetes were identified as complex elderly people [2, 3]. Recognizing age and sex characteristics and the number of comorbidities could identify specific care needs and design personalized treatment intervention programs for elderly people, thereby improving the quality of care and the effectiveness of chronic disease management.

Hypertension was the most common disease, followed by chronic lung disease and diabetes. Jobe, Modou [3] et al. showed that people > 75 years had a prevalence of hypertension of approximately 75%, and that of diabetes was 13%. Xiao Li et al. [5], studying patients aged > 60 years in rural areas in China, reported that the prevalence of hypertension was 50.6%, and that of diabetes, stroke, and COPD were 10.2%, 6.4%, and 5.4%, respectively. Gao S et al. [6], performing an epidemiological study on 210,169 hospitalized elderly patients, showed that hypertension, diabetes, and ischemic heart disease were the leading diseases. Comorbidities are a major problem in hospitalized elderly patients due to an increase in the number of hospitalizations, length of hospital stay, and risk of mortality, which greatly affect the aging process and increase the burden on families and society. Management requires a multidisciplinary approach that includes healthcare staff, geriatric specialists, pharmacists, and the community [6, 7].

The number of comorbidities was an independent factor that increased the length of hospital stay. The older the individual, the higher the risk of multimorbidity and the longer the hospital stay. As in other studies, multimorbidity increased with age from 56% in the 65 - 69 age group to 67% in the 80 - 84 age group [3]. A study by Rodrigues LP et al. [7] showed that multimorbidity was associated with the length of hospital stay, number of hospitalizations, and age. Multimorbidity and long hospital stays are potential risks for polypharmacy and all-cause mortality [8]. Multimorbidity is an independent predictor of long hospital stays and survival [9]. Studies have shown that longer hospital stays are

associated with a number of comorbidities, care services, and caregiver stress. Hospital stays are strongly influenced by health policies and the patient's ability to recover. The extent of the impact of comorbidities may vary from region to region, depending on the quality of health services [7, 8, 9]. Understanding this relationship helps guide appropriate interventions such as increased monitoring and improved hospital care conditions, including the indispensable role of elderly people's healthcare staff. Identifying the relationship between comorbidities and hospital stays is important for health resource planning. Investment in effective chronic disease management programs is needed to reduce hospital stays and improve healthcare quality [10]. The results of this study highlight the importance of effective management and treatment of comorbidities, thereby improving the healthcare quality and reducing its burden. Future studies should extend to multiple hospitals and use a prospective study design to identify effective interventions.

CONCLUSION

The prevalence of comorbidities in hospitalized elderly patients was high, with a median of 3 comorbidities. Hypertension, chronic lung disease, and diabetes were the most prevalent conditions. Older age and the number of comorbidities were associated with the length of hospital stay, with the number of comorbidities identified as an independent factor that increases the length of hospital stay.

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REFERENCES

1. Salive ME. Multimorbidity in older adults. *Epidemiol Rev.* 2013; 35:75-83. DOI: 10.1093/epirev/mxs009.

2. Rodrigues LP. et al. Association between multimorbidity and hospitalization in older adults: Systematic review and meta-analysis. *Age Ageing*. 2022 Jul 1; 51(7):afac155. DOI: 10.1093/aging/afac155.

3. Jobe Modou. et al. Prevalence of hypertension, diabetes, obesity, multimorbidity, and related risk factors among adult Gambians: A cross-sectional nationwide study. *The Lancet Global Health*. January 2024; 12(1):e55 - e65. DOI: 10.1016/S2214-109X(23)00508-9.

4. Baré M. Herranz S. Roso-Llorach A. et al. Multimorbidity patterns of chronic conditions and geriatric syndromes in older patients from the MoPIM multicentre cohort study. *BMJ Open*. 2021; 11:e049334. DOI: 10.1136/bmjopen-2021-049334.

5. Xiao Li. Le Cai. et al. Association of socioeconomic and lifestyle factors with chronic non-communicable diseases and multimorbidity among the elderly in rural southwest China. *Journal of Public Health*. June 2020; 42(2):239-246. https://doi.org/10.1093/pubmed/fdz02.

6. Gao S. Sun S. Sun T. et al. Chronic diseases spectrum and multimorbidity in elderly inpatients based on a 12-year epidemiological survey in China. *BMC Public Health*. 2024; 24:509. https://doi.org/10.1186/s12889-024-18006-x.

7. Rodrigues LP. França DG. Vissoci JRN. et al. Associations of hospitalisation - admission, readmission and length to stay - with multimorbidity patterns by age and sex in adults and older adults: The ELSI-Brazil study. *BMC Geriatr*. 2023; 23:504. https://doi.org/10.1186/s12877-023-04167-8.

8. Zhao Y. Wang J. Zhu X. et al. Multimorbidity and polypharmacy in hospitalized older patients: A cross-sectional study. *BMC Geriatr*. 2023; 23:423. https://doi.org/10.1186/s12877-023-04109-4.

9. Stahl-Toyota S. Nikendei C. Nagy E. Bönsel S. Rollmann I. Unger I. et al. Interaction of mental comorbidity and physical multimorbidity predicts length-of-stay in medical inpatients. *PLoS ONE*. 2023; 18(6):e0287234. https://doi.org/10.1371/journal.pone.0287234.

10. Beil. Michael. et al. The management of multi-morbidity in elderly patients: Ready yet for precision medicine in intensive care?. *Critical Care (London. England).* 10 Sep. 2021; 25(1):330. DOI: 10.1186/s13054-021-03750-y.