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ORIGINAL RESEARCH

Non-specific complaints in patients admitted to emergency departments

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Abstract

Background: To define non-specific complaints (NSCs) and discuss their relevance in the emergency department (ED), particularly focusing on elderly patients. **Methods**: We conducted a retrospective, multicenter study in eight tertiary care hospitals' EDs to assess the distribution and clinical outcomes of NSCs and specific complaints (SCs) among adults. The study included 192,426 adults over 18 years old, including 42,554 individuals aged 65 years and older, who visited the EDs. The primary outcome was the distribution of NSCs and SCs across the two age groups (<65 years *vs.* ≥65 years). Univariable statistics compared the distribution and clinical outcomes between these age groups. **Results**: Young adults showed a 10% incidence of NSC (14,971 out of 148,872), while those aged ≥65 years had an 18% incidence (7667 out of 42,554). NSC patients had a longer ED length of stay (LOS) (younger: 145.0 ± 65.2 *vs.* 127.5 ± 70.1 minutes, $p < 0.001$; older: 183.0 ± 78.7 *vs.* 171.3 ± 87.2 minutes, $p < 0.001$). Hospital admission rates were higher among SC patients (younger: 14.9% *vs.* 11.1%, $p < 0.001$; older: 36.7% *vs.* 24.8%, $p < 0.001$), as were hospital LOS (younger: 4.8 ± 10.5 *vs.* 4.7 ± 10.4 days, $p < 0.001$; older: 7.9 ± 14.0 *vs.* 6.3 ± 12.6 days, $p < 0.001$). Intensive care unit (ICU) admissions were higher for younger NSC patients (19.7% *vs.* 17.5%, $p = 0.027$), but lower for older NSC patients (26.0% *vs.*30.2%, $p < 0.001$). **Conclusions**: Elderly NSC patients show longer ED LOS, lower hospital admission rates, shorter hospital LOS, and lower ICU admission rates when, compared to SC patients. More research and standardized definitions are needed to optimize ED management for adults over 65 years.

Keywords

Emergency department; Geriatric assessment; Geriatrics; Non-specific complaints; Specific complaints

1. Introduction

As the population ages, older patients visit the emergency department (ED) more frequently [1–5]. Compared with their younger counterparts, older patients are more likely to have comorbidities and are prone to developing severe diseases [6, 7]. These factors often result in hospitalization, prolonged stays in the ED and hospital, increased in-hospital mortality, and consequently, a rise in healthcare costs [8, 9]. Another challenge in diagnosing and treating older patients is the presence of nonspecific complaints (NSCs) they exhibit. In a previous study, up to 20 percent of patients aged over 75 presented with NSCs [10].

Most patients who visit the ED present with a primary symptom, such as chest pain, dyspnea or abdominal pain, which is crucial to the physician's diagnosis and treatment plan. However, NSCs, often described as "general weakness" and "feeling tired", complicate the process of differential diagnosis [11, 12]. Notably, the rate of misdiagnosis among general ED patients is about 10%, while for patients with NSCs, it is as high as 53% [13, 14]. Patients with NSCs necessitate more diagnostic tests and expert consultations, leading to adverse outcomes, such as prolonged ED stays [14, 15].

Previous studies have reported on NSCs in older patients, yet they used varying definitions for NSCs [10, 16, 17]. Establishing a clear definition of NSCs has been challenging in many studies. One such study attempted to distinguish between specific complaints (SCs) and NSCs, aiming to establish a clear definition of NSCs. However, the study was limited by an insufficient sample size due to it being a single-institution

study [13]. Consequently, our initial effort was to identify and categorize NSCs based on the complaints articulated by patients at multiple ED, aiming to more effectively differentiate between SCs and NSCs presented by patients.

This study aimed to compare the characteristics of patients with NSCs across different age groups. NSCs and SCs were defined based on the symptoms described by patients upon presentation at the EDs. Furthermore, we investigated whether NSCs among older patients (>65 years old) were associated with poorer prognoses, indicated by longer ED and hospital stays, higher rates of intensive care unit (ICU) admissions and increased in-hospital mortality.

2. Materials and methods

2.1 Study design

This was a multicenter, retrospective cohort study that used the National Emergency Department Information System (NEDIS) database. The NEDIS, developed in 2004 and updated in real time by the National Emergency Medical Center in the Republic of Korea, includes data on patients who present at nationwide EDs. The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Institutional Review Board of Eulji university medical center (IRB No. EMCS 2019-09-010).

2.2 Source of participants

The study population comprised patients who visited any of eight tertiary-care university hospitals, each receiving between 36,000 and 70,000 annual emergency visits, from January 2017 to January 2018. The inclusion criteria encompassed individuals aged 18 years or older who visited the ED during the study period. We excluded: (1) patients who visited the ED for nonmedical purposes, (2) patients who discharged themselves against medical advice, and (3) patients who were transferred to another facility. For data analysis, we categorized patients into two age groups: (1) the young adult group, aged 18 to 64 years, and (2) the older group, aged 65 years and older. We further divided each age group into subsets of patients presenting with NSCs and SCs.

2.3 Variables

The collected data included each patient's presented chief complaint, demographic data (age, sex), method of transport to the ED (ambulance, self-transport, other), and initial vital signs in the ED (systolic blood pressure, diastolic blood pressure, pulse rate, respiratory rate, body temperature and mental status). Other data points were the primary diagnosis, time variables (time of ED visit, ED discharge, hospital admission and hospital discharge), final diagnosis, and the results of ED treatment (discharge, hospital admission to ICU or general ward, transfer and death). Additionally, we used the Korean Triage and Acuity Scale (KTAS), which was developed in Korea in 2012, modified from the Canadian Triage and Acuity Scale, to facilitate the triage of patients presenting to the ED [18, 19].

The length of stay (LOS) in the ED was defined as the time (in minutes) between patient arrival and either ED discharge or hospital admission. Following the definition by Brouns *et al.* [20], a prolonged ED LOS was considered to be any LOS equal to or exceeding the 75th percentile of LOS in the ED. This metric incorporated the time delay in the emergency room due to waiting for admission because of unavailable units. To minimize measurement bias, we calculated the ED LOS after excluding values equal to or exceeding the 75th percentile. The hospital LOS was defined as the time (in days) between hospital admission and either discharge or death. A revisit was defined as any patient who returned to the ED within 30 days of discharge.

2.4 Determination and classification process for NSCs

NSCs were defined through a series of discussions among two emergency medicine professionals, each with over 20 years of experience and two emergency medicine professionals, each with over 8 years of experience in a university hospital ED. Initially, we reorganized the NEDIS database to generate a list of chief complaints, screening out all duplicates and identical linguistic expressions. Subsequently, we identified NSCs based on the medical experience and intuitive judgment of four emergency medicine specialists, following two rounds of discussions according to the KTAS. The KTAS classifies conditions into five levels: Level I (resuscitation), Level II (emergency), Level III (urgent), Level IV (less urgent), and Level V (nonurgent) [18]. It assesses patients based on their statements at the ED, general impression, identification of infection and primary and secondary considerations. The final step involved classifying the agreed-upon nonspecific symptoms into NSC categories with homogeneous characteristics.

2.5 Outcome measures based on defined NSCs

The primary outcome was the distribution differences between NSCs and SCs according to age group. The secondary outcome involved comparing age-specific characteristics between NSCs and SCs, including factors, such as ED LOS, hospitalization, distribution of triage level, hospital LOS and in-hospital mortality, and any additionally sought information to identify the impact on patient outcomes, such as hospitalization and mortality.

2.6 Statistical analysis

Continuous variables are represented as mean $\pm$ standard deviation (SD), and categorical variables are expressed as count (percentage). Differences in baseline demographic and clinical characteristics between groups were assessed using the independent *t*-test for continuous variables and Pearson's chi-square test for categorical variables. For continuous variables that did not exhibit normal distributions, such as hospital LOS, the Wilcoxon-Mann-Whitney U-test was employed. These variables were described using the median and interquartile range (IQR). To determine the independent prognostic factors for each patient group, we conducted a multivariable logistic regression analysis on the statistically significant variables

identified through the univariable logistic regression analysis. Additionally, we calculated the adjusted odds ratios and 95% confidence intervals (CI) from the multivariable model. All statistical analyses were conducted using SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, NY, USA), with a significance level set at a p-value < 0.05.

3. Results

3.1 Determination of NSCs

During the study period, there were 504,113 patient visits to the EDs of the eight participating tertiary university hospitals. We excluded 19,156 ED visits that were either not for treatment or for which the visit reason was unknown. Upon enumerating the chief complaints of these patients, we eliminated 484,958 duplicates, yielding 5372 unique chief complaints. After careful deliberation, we selected 264 NSCs (**Supplementary Fig. 1**). We excluded cases featuring localized symptoms, cases where a specific diagnosis could be determined, cases where symptoms could explain the disease state, and cases that were clearly determined by the main KTAS categories and subcategories. The identified NSCs were then grouped into 24 clusters based on similarities in linguistic expressions and KTAS categories.

3.2 Comparison of characteristics among SC- and NSC-patients by age groups

The study included a total of 191,426 patients, of which 148,872 were in the younger group and 42,554 in the older group. Applying the previously defined NSCs to distinguish between SCs and NSCs by patient age group, we found that 14,971 (10.1%) of the younger adults and 7667 (18.0%) of the older patients presented with NSCs (Fig. 1).

A comparative analysis of baseline characteristics of patients presenting with SCs and NSCs, segmented by age group, is shown in Table 1. The proportion of patients with NSCs was higher in the older group (10.1% *vs.* 18.0%, $p < 0.001$), and among patients aged 18–64 years, those with NSCs were older than those with SCs (45.6 ± 12.8 *vs.* 40.0 ± 13.0, $p < 0.001$). In contrast, among patients aged 65 years and older, those with NSCs were slightly younger than those with SCs (75.6 ± 7.1 *vs.* 76.0 ± 7.4, $p < 0.001$).

3.3 Distribution of each NSC cluster by age group

The distribution for each NSC cluster by age group is illustrated in Fig. 2. The cluster for dizziness had the highest frequency in both the younger and older groups (59.5%, 53.0%). The second most frequent cluster was discomfort sensation in the younger group (11.2%) and general weakness in the older group (25.6%). While other clusters had similar rankings, thermal change feeling, speech problems and eye problems were ranked lower in frequency in the older group compared with the younger group. When compared to the younger group, the clusters for general weakness, poor oral intake, and drowsiness were more prominent in the older group.

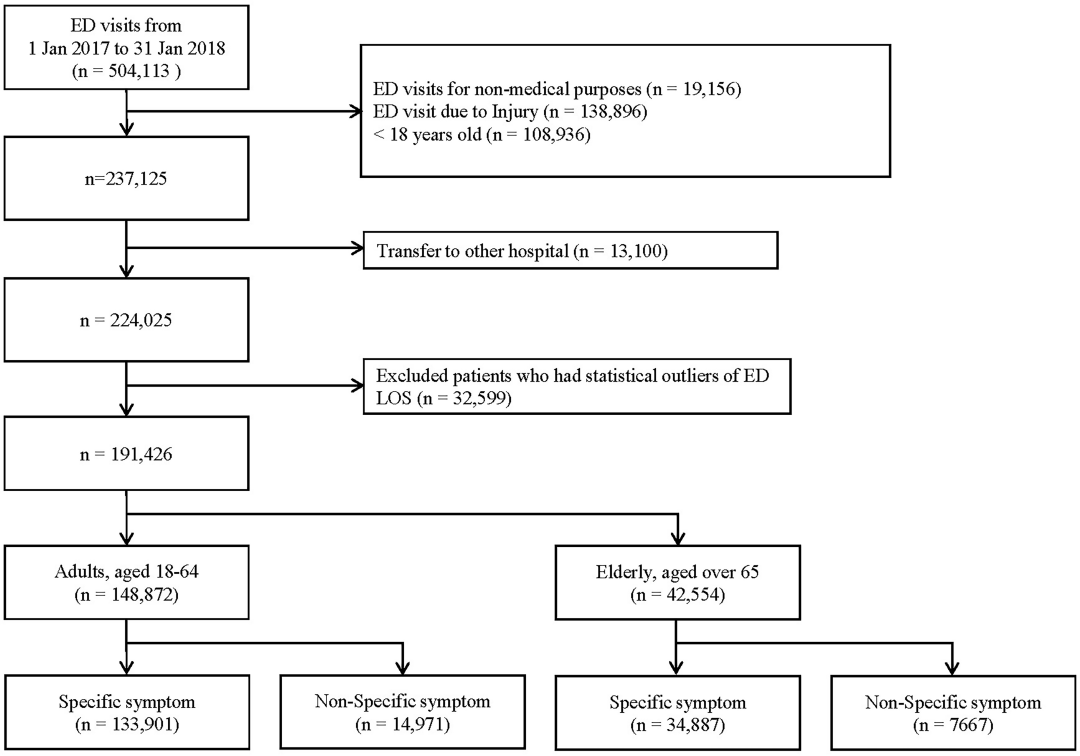

FIGURE 1. Flow chart for participant selection. ED: emergency department; LOS: length of stay.

TABLE 1. The characteristics of the SC- and NSC-patients by age groups.

Variable	Adults 18–64 years old			Elderly ≥65 years old		
	Total (148,872) n (%)	SC (133,901) n (%)	NSC (14,971) n (%)	Total (42,554) n (%)	SC (34,887) n (%)	NSC (7667) n (%)
Age (yr, mean ± SD)	40.6 ± 13.1	40.0 ± 13.0*	45.6 ± 12.8*	75.9 ± 7.4	76.0 ± 7.4*	75.6 ± 7.1*
Sex						
Male	62,271 (41.8)	56,377 (42.1)*	58,940 (39.4)*	18,916 (44.5)	15,929 (45.7)*	2987 (39.0)*
Female	86,601 (58.2)	77,524 (57.9)*	9077 (60.6)*	26,638 (55.5)	18,958 (54.3)*	4680 (61.0)*
Vital sign						
Systolic blood pressure (mmHg)	129.6 ± 23.9	129.0 ± 23.9*	134.3 ± 24.1*	134.6 ± 36.5	133.2 ± 38.0*	141.2 ± 28.2*
Diastolic blood pressure (mmHg)	79.0 ± 15.5	78.8 ± 15.5*	81.1 ± 14.9*	75.2 ± 21.2	74.6 ± 22.2*	78.1 ± 16.0*
Pulse rate (beats/min)	86.5 ± 18.6	87.0 ± 18.9*	81.7 ± 15.9*	83.0 ± 24.5	83.5 ± 25.8*	80.6 ± 17.3*
Respiratory rate (breath/min)	19.4 ± 3.0	19.4 ± 3.1*	19.4 ± 2.1*	19.4 ± 6.8	19.4 ± 7.4	19.5 ± 2.4
Body temperature (°C)	36.6 ± 3.3	36.6 ± 3.4*	36.5 ± 1.6*	35.6 ± 6.5	35.5 ± 7.1*	36.5 ± 1.7*
Mental status						
Alert	146,999 (98.7)	132,152 (98.7)*	14,847 (99.2)*	39,129 (92.0)	31,662 (90.8)*	7467 (97.4)*
Verbal response	682 (0.5)	594 (0.4)*	88 (0.6)*	1,083 (2.5)	920 (2.6)*	163 (2.1)*
Painful response	648 (0.4)	615 (0.5)*	33 (0.2)*	871 (2.0)	838 (2.4)*	33 (0.4)*
Unresponsive	543 (0.4)	540 (0.4)*	3 (0.0)*	1471 (3.5)	1467 (4.2)*	4 (0.1)*
Triage category						
Level 1-Resuscitation	987 (0.7)	962 (0.7)*	25 (0.2)*	2145 (5.0)	2107 (6.0)*	38 (0.5)*
Level 2-Emergent	7467 (5.0)	6394 (4.8)*	1073 (7.2)*	5388 (12.7)	4595 (13.2)*	793 (10.3)*
Level 3-Urgent	74,859 (50.3)	64,463 (48.1)*	10,396 (69.4)*	23,563 (55.4)	17,853 (51.2)*	5710 (74.5)*
Level 4-Less urgent	50,238 (33.7)	47,550 (35.5)*	2688 (18.0)*	8949 (21.0)	8043 (23.1)*	906 (11.8)*
Level 5-Non urgent	15,321 (10.3)	14,532 (10.9)*	789 (5.3)*	2509 (5.9)	2289 (6.6)*	220 (2.9)*

SC: specific complaints; NSC: non-specific complaints; SD: standard deviation.
Asterisk (*) indicates statistical significance ($p < 0.05$).

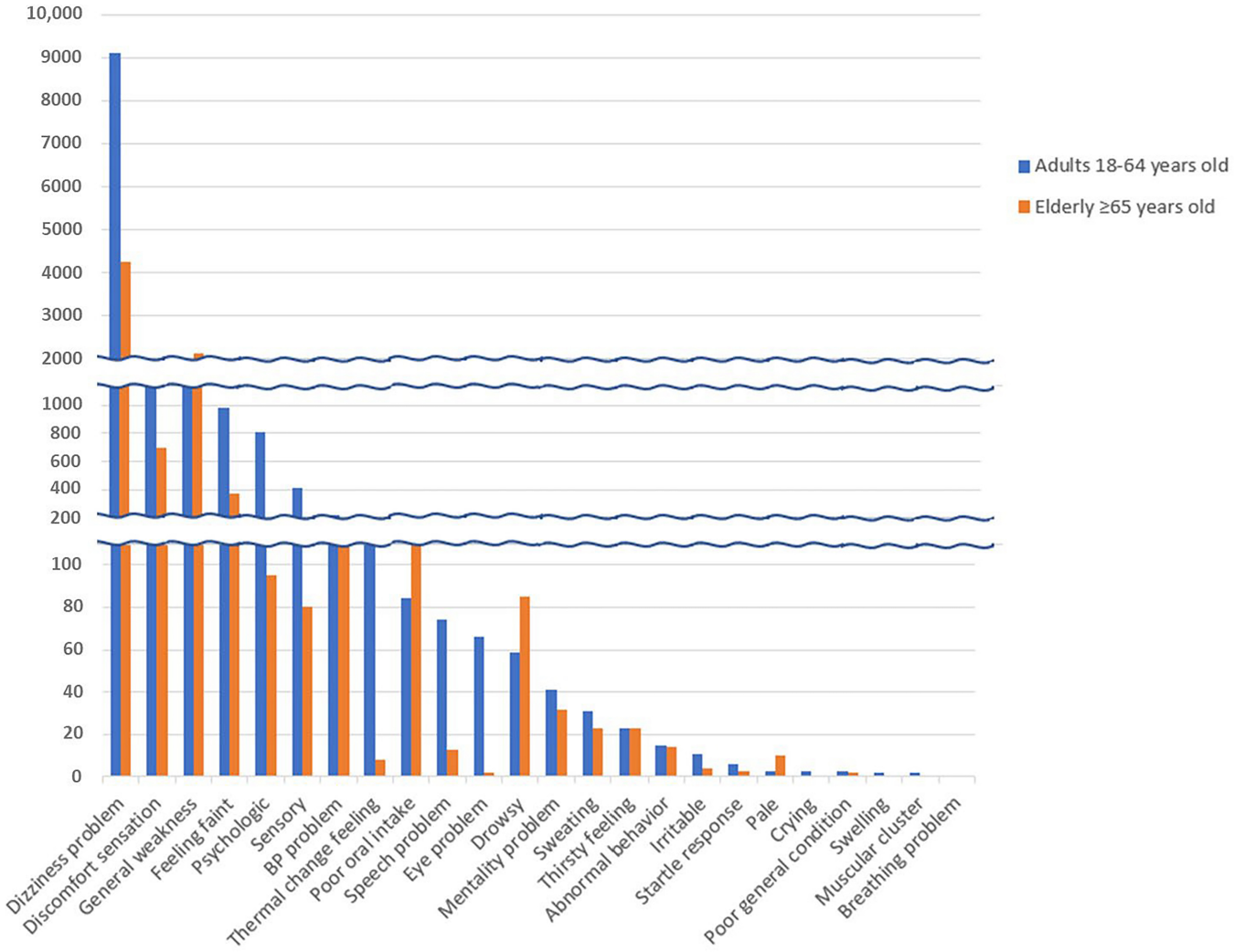

FIGURE 2. The distribution for each NSC cluster by age group. BP: Blood pressure.

3.4 Clinical characteristics of patients with SCs and NSCs in the ED by age group

Table 2 compared the characteristics of ED patients with SC and NSC based on age groups. The LOS in the ED, measured from presentation to discharge or admission, was longer for patients with NSCs in both age groups (127.5 ± 70.1 *vs.* 145.0 ± 65.2, $p < 0.001$; 171.3 ± 87.2 *vs.* 183.0 ± 78.7, $p < 0.001$). SC patients had higher rates of hospital admissions from the ED in both age groups (14.9% *vs.* 11.1%, $p < 0.001$; 36.7% *vs.* 24.8%, $p < 0.001$), and their LOS in the hospital was also longer (4.8 ± 10.5 *vs.* 4.7 ± 10.4, $p < 0.001$; 7.9 ± 14.0 *vs.* 6.3 ± 12.6, $p < 0.001$). The proportion of ICU admissions differed between the two age groups. In the younger group, patients with NSC had a higher proportion of ICU admissions (17.5% *vs.* 19.7%, $p = 0.027$), whereas in the older group, SC patients had a higher proportion (30.2% *vs.* 26.0%, $p < 0.001$). This trend was similarly observed for in-hospital mortality, although it was not statistically significant in the older group. There were no statistically significant differences between SC and NSC patients in both age groups in terms of revisits to the ED within 30 days.

3.5 Predicting factors for hospital admission and mortality among patients with SCs and NSCs stratified by age

Results of multivariable logistic regression analysis of hospital admission by age group are detailed in Table 3. Among adult patients, the predictors included age, male; sex, altered mental status, systolic blood pressure, diastolic blood pressure, pulse rate, respiratory rate, NSC, KTAS triage category ≤3, and ED LOS. Among elderly patients, the independent predictors of hospital admission were age, male; sex, altered mental status, systolic blood pressure, pulse rate, respiratory rate, body temperature, NSC, KTAS triage category ≤3, and ED LOS. Results of multivariable analysis of factors associated with in-hospital mortality stratified by age group are presented in Table 4. Among adult patients, the predictors included age, male; sex, altered mental status, systolic blood pressure, pulse rate, body temperature, KTAS triage category ≤3, and ED LOS. Among elderly patients, the independent predictors of in-hospital mortality were age, male; sex, altered mental status, systolic blood pressure, pulse rate, body temperature, NSC and KTAS triage category ≤3.

TABLE 2. The emergency department characteristics of the SC- and NSC-patients by age groups.

Variable	Adults 18–64 years old			Elderly ≥65 years old		
	Total (148,872) n (%)	SC (133,901) n (%)	NSC (14,971) n (%)	Total (42,554) n (%)	SC (34,887) n (%)	NSC (7667) n (%)
ED LOS (Min, mean ± SD)	129.2 ± 69.8	127.5 ± 70.1*	145.0 ± 65.2*	173.6 ± 85.8	171.3 ± 87.2*	183.0 ± 78.7*
Disposition						
Discharge	127,294 (85.5)	113,987 (85.1)*	13,307 (88.9)*	27,836 (65.4)	22,072 (63.3)*	5764 (75.2)*
Admission	21,578 (14.5)	19,914 (14.9)*	1664 (11.1)*	14,718 (34.6)	12,815 (36.7)*	1903 (24.8)*
Hospital LOS (d)	4.8 ± 10.5	4.8 ± 10.5*	4.7 ± 10.4*	7.6 ± 13.7	7.9 ± 14.0*	6.3 ± 12.6*
ICU admission (%)	3813 (17.7)	3486 (17.5)*	327 (19.7)*	4363 (29.6)	3868 (30.2)*	495 (26.0)*
In-hospital mortality (%)	515 (2.4)	456 (2.3)*	59 (3.5)*	1240 (8.4)	1098 (8.6)	142 (7.5)
Revisit (%)[a]	1261 (0.8)	1145 (0.9)	116 (0.8)	511 (1.2)	433 (1.2)	78 (1.0)

SC: specific complaints; NSC: non-specific complaints; ED LOS: Emergency department Length of stay; SD: standard deviation; Hospital LOS: hospital Length of stay; ICU: Intensive care unit.
[a] This variable is defined as patients who revisited the ED within 30 days.
Asterisk (*) indicates statistical significance ($p < 0.05$).

TABLE 3. Multivariable logistic regression analysis of admission predictors.

Adults 18–64 years old			
Variable	OR	B	*p*-value
Age (yr)	1.020 (1.018–1.021)	0.020	<**0.001**
Sex; Male	0.725 (0.702–0.748)	−0.322	<**0.001**
Altered mental status	6.060 (5.436–6.755)	1.802	<**0.001**
Systolic blood pressure (mmHg)	0.997 (0.996–0.998)	−0.003	<**0.001**
Diastolic blood pressure (mmHg)	0.998 (0.996–0.999)	−0.002	**0.005**
Pulse rate (beats/min)	1.008 (1.007–1.009)	0.008	<**0.001**
Respiratory rate (breath/min)	1.041 (1.036–1.046)	0.040	<**0.001**
Body temperature (°C)	1.005 (0.998–1.012)	0.005	0.129
NSC	0.477 (0.451–0.506)	−0.740	<**0.001**
KTAS triage category ≤3	3.048 (2.933–3.167)	1.115	<**0.001**
ED LOS (min)	1.011 (1.010–1.011)	0.011	<**0.001**
Elderly ≥65 years old			
Variable	OR	B	*p*-value
Age (yr)	1.024 (1.021–1.027)	0.024	<**0.001**
Sex; Male	0.703 (0.672–0.737)	−0.352	<**0.001**
Altered mental status	3.714 (3.339–4.132)	1.312	<**0.001**
Systolic blood pressure (mmHg)	0.992 (0.991–0.993)	−0.008	<**0.001**
Diastolic blood pressure (mmHg)	1.001 (0.999–1.003)	0.001	0.489
Pulse rate (beats/min)	1.008 (1.007–1.010)	0.008	<**0.001**
Respiratory rate (breath/min)	1.072 (1.064–1.081)	0.070	<**0.001**
Body temperature (°C)	1.059 (1.050–1.067)	0.057	<**0.001**
NSC	0.493 (0.463–0.524)	−0.708	<**0.001**
KTAS triage category ≤3	3.532 (3.223–3.755)	1.262	<**0.001**
ED LOS (min)	1.008 (1.008–1.008)	0.008	<**0.001**

OR: odds ratio; B: regression coefficient; NSC: Non-specific complaint; KTAS: Korean triage and acuity scale; ED LOS: Emergency department Length of stay.
Bold values indicate p-values less than 0.05.

TABLE 4. Multivariable logistic regression analysis of in-hospital mortality predictors.

Adults 18–64 years old			
Variable	OR	B	*p*-value
Age (yr)	1.069 (1.060–1.077)	0.066	<**0.001**
Sex; Male	0.499 (0.418–0.596)	−0.695	<**0.001**
Altered mental status	27.624 (22.833–33.421)	3.319	<**0.001**
Systolic blood pressure (mmHg)	0.977 (0.974–0.979)	−0.024	<**0.001**
Diastolic blood pressure (mmHg)	0.993 (0.984–1.002)	−0.007	0.127
Pulse rate (beats/min)	1.010 (1.007–1.013)	0.010	<**0.001**
Respiratory rate (breath/min)	0.989 (0.969–1.010)	−0.011	0.304
Body temperature (°C)	0.966 (0.955–0.976)	−0.035	<**0.001**
NSC	0.884 (0.667–1.173)	−0.123	0.394
KTAS triage category ≤3	5.792 (4.180–8.026)	1.757	<**0.001**
ED LOS (min)	1.003 (1.002–1.004)	0.003	<**0.001**
Elderly ≥65 years old			
Variable	OR	B	*p*-value
Age (yr)	1.057 (1.049–1.065)	0.055	<**0.001**
Sex; Male	0.667 (0.595–0.749)	−0.405	<**0.001**
Altered mental status	7.512 (6.598–8.554)	2.017	<**0.001**
Systolic blood pressure (mmHg)	0.976 (0.975–0.978)	−0.024	<**0.001**
Diastolic blood pressure (mmHg)	0.999 (0.993–1.004)	−0.001	0.600
Pulse rate (beats/min)	1.011 (1.009–1.014)	0.011	<**0.001**
Respiratory rate (breath/min)	1.004 (1.000–1.008)	0.004	0.060
Body temperature (°C)	0.942 (0.934–0.951)	−0.059	<**0.001**
NSC	0.606 (0.505–0.727)	−0.501	<**0.001**
KTAS triage category ≤3	6.256 (4.842–8.084)	1.834	<**0.001**
ED LOS (min)	0.999 (0.999–1.000)	−0.001	0.137

OR: odds ratio; B: regression coefficient; NSC: Non-specific complaint; KTAS: Korean triage and acuity scale; ED LOS: Emergency department Length of stay.
Bold values indicate p-values less than 0.05.

4. Discussion

The objective of this study was to examine differences in the distribution of SCs and NSCs among patients presenting to the ED across different age groups and to analyze variations in clinical factors associated with each type of complaint. Patients can be efficiently managed in the ED if clinicians are able to listen to patients' complaints and predict their prognosis. However, there is controversy surrounding prognosis prediction for older patients with NSCs. Quinn *et al.* [10] reported that older patients (aged ≥70 years) with NSCs presenting to the ED did not have an increased risk of life-threatening illness, and most were safely discharged from the ED. Conversely, Sauter found that in adults aged 18 years and older, the NSC group had a longer LOS (NSC *vs.* SC; median = 6.51 (IQR = 5.85) *vs.* 5.22 (5.83) days, $p = 0.025$, $d = 0.2$), but no higher mortality (7.3% *vs.* 3.7%, $p = 0.087$, OR 1.922 (95% CI 0.909–4.065)) [14]. On the other hand, Wachelder observed that the NSC group of patients aged 65 years and older had a longer mean ED LOS (188 *vs.* 178 minutes, $p = 0.004$), hospital LOS (9 *vs.* 6 days, $p < 0.001$), higher admission rates (84.0% *vs.* 71.1%, $p < 0.001$), and reported higher 30-day mortality (20.1% *vs.* 1.0%, hazard ratio (HR) 1.7 95% CI 1.2–2.4) [21]. The inconsistent definition of NSC is believed to be the primary source of controversy. Therefore, we deemed it essential to establish a definition and classification of NSCs prior to predicting prognosis.

The classification of NSCs posed a significant challenge at the onset of this study. There is a lack of consensus regarding some SCs that should be classified as nonspecific. Therefore, previous studies either grouped NSCs together without differentiating them [21] or focused solely on narrow concepts

such as weakness or fatigue when referring to NSCs [16]. In one study, the authors attempted to develop a detailed protocol to define NSCs and highlighted that having an active definition for NSCs would mean creating an almost endless list of possible major complaints and that such a long and complex definition risks excluding certain patients with NSCs [13]. For this reason, protocols in these studies included not only the primary symptoms reported during ED visits but also past medical history, physical examination findings, vital signs, and electrocardiography readings. However, we focused on the chief complaints that patients presented with upon their initial ED visit. To emphasize these primary symptoms and words, we collected data from eight hospitals to capture as many chief complaint terms as possible. We addressed the issues mentioned above by convening multiple meetings involving senior emergency physicians, who categorized the listed complaints into 24 subclusters. This categorization represents the first comprehensive and detailed attempt to classify symptoms associated with NSCs. Considering prior research indicating that older patients with NSCs are more likely to have a serious medical diagnosis [13], we conducted a detailed analysis of NSCs stratified by patient age groups. Several studies have consistently reported a higher proportion of patients presenting with NSCs in the older age group [11, 22, 23]. Within the older group, specific NSCs such as general weakness, poor oral intake, and drowsiness were notably more prevalent compared to the younger group. Interestingly, these NSCs align with those commonly observed in the "frailty population" [24, 25]. This statistical correlation supports the intuitive notion that when providing care for older individuals, it is often challenging to differentiate whether the symptoms they report are attributable to frailty or indicate a serious underlying illness.

Previous studies indicate that NSC patients have longer ED stays and hospital LOS, and higher admission rates compared to SC patients [17, 26]. Interestingly, when comparing NSC and SC patients within the same age groups, we discovered that both younger and older adults with NSCs exhibited longer ED LOS, shorter hospital LOS, and higher admission rate. Moreover, older patients with NSCs had lower rates of ICU admission. It is worth noting that older individuals may experience delayed symptom recognition or inadequate assessment due to the nonspecific nature of their complaints [27, 28]. Consequently, they often present to the ED when their condition has already deteriorated. However, contrary to expectations, our findings indicate that older patients with NSCs actually had a more favorable prognosis than the SC group. The multivariable logistic regression analysis also demonstrated these trends in the prognostic factors for both patient groups. NSCs significantly predicted hospital admission in both adult and elderly patients. However, the findings suggested that patients presenting with NSCs were less likely to be admitted than patients with SCs. NSCs were not a significant predictor of in-hospital mortality among adult patients but a significant predictor among elderly patients, similar to their role as a predictor of hospital admission. The findings indicated that elderly patients with NSCs had a lower likelihood of mortality than those with SCs.

The better prognosis observed in elderly patients with NSCs compared to those with SCs can be attributed to multiple factors. These results may be due to the increased awareness and thorough evaluation and management by healthcare professionals when dealing with elderly patients presenting with NSCs [17]. Consequently, these patients may have received more comprehensive care. Additionally, the presence of various NSCs could have led to a broader range of diagnostic and therapeutic interventions, ultimately resulting in better overall health management. Furthermore, in Republic of Korea, high healthcare accessibility may have allowed these patients to visit the hospital at a relatively early stage, enabling the detection and treatment of illnesses before they progressed to more severe conditions. These hypotheses need to be further validated through future research.

This study had certain limitations that should be acknowledged. First, as complaints are subjective and can vary depending on the interviewing skills of medical staff, research based on complaints is susceptible to data reliability issues and bias. To mitigate this bias, the study was designed as a multicenter study with a large sample size. Furthermore, since the research is based on actual complaints expressed by patients, with input from clinicians, it can be assumed that major issues with the study are unlikely. Nevertheless, it is important to acknowledge that there may still be objections or criticisms regarding the classification of NSCs. These potential limitations include the inherent subjectivity in determining whether a patient's complaint is non-specific or not, as well as the possibility of variations in how medical staff interpreted and categorized the complaints. Second, this study was conducted using data collected from the ED of university hospitals in South Korea, which may limit the generalizability of the findings to community hospitals or international healthcare settings. Third, the NEDIS database lacks detailed clinical information, and the classification and definition of NSC involve subjective judgments by experts, potentially introducing bias. Finally, a key limitation of this study is the case collection period, which spans from January 2017 to January 2018. While the findings remain applicable to many clinical settings, changes in ED triage practices, diagnostic tools, and population characteristics over time may affect the reproducibility and generalizability of the results. Future studies incorporating more recent datasets would be beneficial in validating and expanding upon these findings.

5. Conclusions

According to the study results, the prevalence of NSC was high in the elderly population, with prominent symptoms including general weakness, poor oral intake, and drowsiness. Additionally, both young and elderly NSC patients stayed longer in the ED and had lower hospital admission rates compared to SC patients, but had shorter hospital stays. Furthermore, unlike younger patients with NSCs, elderly patients with NSCs had lower ICU admission rates compared to SC patients. Despite these findings, the prognosis for elderly patients with NSCs remains controversial, necessitating further research. More research and standardized definitions are particularly needed to optimize ED management strategies for adults aged 65 years and older. These efforts are crucial for enhancing understand-

ing of NSCs and optimizing patient management strategies in the ED, especially for the elderly population.

AVAILABILITY OF DATA AND MATERIALS

The data sets used in this study are available from the corresponding author on reasonable request.

AUTHOR CONTRIBUTIONS

DHK and DHL—designed the research study. SJB—performed the research. KK, CAL, ECK, JYL, SSH and YHC—acquisition and analyzed the data. YC and SJB—wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Institutional Review Board of Eulji university medical center (IRB No. EMCS 2019-09-010), and the requirement for written informed consent was waived.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

SUPPLEMENTARY MATERIAL

Supplementary material associated with this article can be found, in the online version, at https://oss.signavitae.com/mre-signavitae/article/1953698701036666880/attachment/Supplementary%20material.docx.

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