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ORIGINAL RESEARCH

Factors Affecting Return Visits to the Emergency Department within 30 Days

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Abstract

Background and Objectives: The goal of this study is to determine the factors associated with the admission to hospital on a return visit to the ED. The reasons of return visits to the ED are complex and involve such causes as disease progression, medical errors, delayed diagnosis, or misdiagnosis. **Materials and methods:** A retrospective study was conducted in Vilnius University Hospital Santaros Klinikos. All the emergency visits from 1 January 2018 through 20 May 2019 were included. The patients were divided into two groups: the patients who visited the ED only once within a month were attributed to group 1, while those who paid two or more visits to the ED within 30 days belonged to group 2. The demographic data, the triage category, the number of laboratory and radiology tests, specialist consultations, diagnoses and the time spent in the ED were evaluated. The statistical analysis was performed using R statistical software package, non-parametric statistical methods were used. **Results:** 32,215 patients were included in the analysis, 3,243 patients (10.05% of all the initial visits) returned to the ED within 30 days. The number of laboratory tests had a statistically significant impact on admission to the ward both the first and the return visits. The triage category was associated with the admission on the return visit to the ED. Age, gender, number of consultations and radiology tests had no medium or large impact. Among the diagnoses, cardiovascular, gastrointestinal and renal diseases were related to the admission on return visit. **Conclusions:** Patients with cardiovascular, gastrointestinal and renal system diseases in all age groups, patients with medical conditions and advanced investigation (the increased number of laboratory testing and the time spent in the ED) have an increased risk for a return visit over a 30-day time frame and an increased rate of hospital admissions.

Keywords

Return visits, Hospital admission, Emergency department

1. Introduction

Patients visiting the emergency department (ED) usually have acute or exacerbated chronic conditions that require a prompt diagnosis and treatment. Return visits defined as a return of the patient to the ED is an undesirable event both for a patient and a healthcare provider, it increases healthcare costs, lengthens the waiting time in the ED and reduces patient satisfaction [1]. Sometimes it may even worsen the outcomes of the patient [1, 2]. However, there is no equivocal time frame set to monitor the returning patients. 72 hours, 7 days, 30 days are used in most recent scientific papers. Not only the readmission rate is an indicator of the ED performance and efficacy, but it also reveals certain administrative, communication or organizational pitfalls. Many factors, both patient and healthcare related, have been proved to affect the rate of returns [1–3]. The identification and analysis of these factors may lead to a significant improvement of the ED performance, higher quality of healthcare and patient satisfaction. Therefore, our study aims to determine the factors which can predict return visit during the first visit to ED and can be included into the predictive model of unsheduled return visits over a 30-day frame to our hospital.

2. Materials and methods

A retrospective study included all patients visiting Emergency Dapartment of Vilnius University Hospital Santaros Klinikos, Vilnius, Lithuania, between 1 January 2018 and 20 May 2019 (permission of regional Bioethics committee, No: 158200-17-439). Readmission was defined as an unplanned return visit within a time frame of 30 days after initial visit. Medical records were obtained using computerized electronic health records (ELI Web). The exclusion criteria were as follows: age

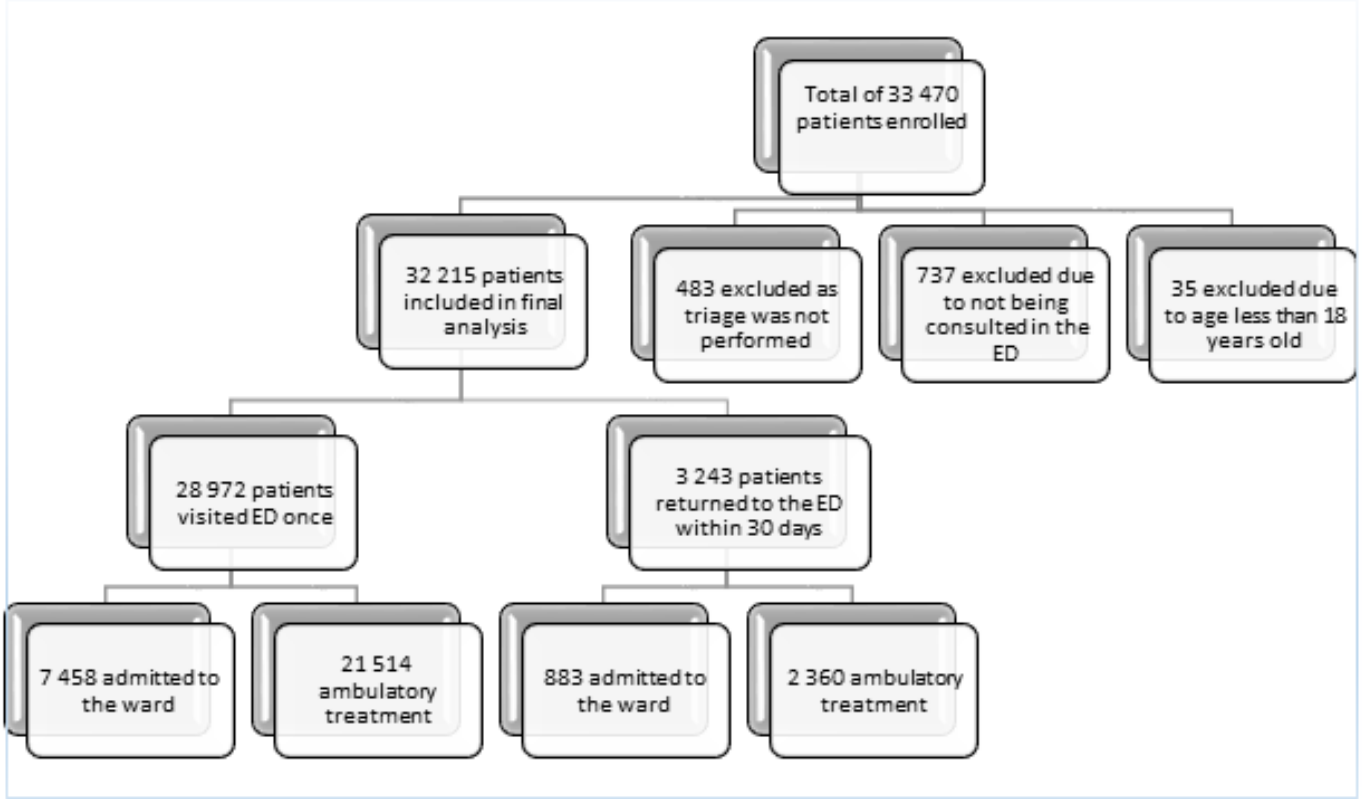

FIGURE 1. Flowchart demonstrating the enrolment of study subjects.

less than 18 years old, no consultations or triage performed.

The patients were divided into two groups: the patients who visited the ED only once in a time frame of 30 days were attributed to group 1, while the group 2 comprised the patients who paid 2 or more visits to the ED in a time frame of 30 days.. The effect of treatment (admission to the hospital or discharge) was compared between the groups. The study evaluated the demographic data (age, gender), the triage category (ranging as follows: level 1 - resuscitation, level 2 - emergency, level 3 - urgent, level 4 - less urgent, level 5 - non-urgent), the number of laboratory and radiology (computed tomography and ultrasound scan, X-ray) tests, specialist consultations, the diagnoses and the time spent in the ED. Every patient's chief diagnosis was categorized and grouped according to the International Classification of Diseases (ICD) system.

Statistical analysis was performed using the following software: R statistical software package V 3.6.2 (© The R Foundation for Statistical Computing), Rstudio Version 1.2.5033 © 2009-2019 RStudio, Inc., IBM SPSS Statistics V.23, G*Power V. 3.1.9.4 Universität Düsseldorf, Germany.

When analyzing the returning patients, their data obtained on the initial visit were compared with the patients' data of a single visit group. The interval and ratio variables were described by medians, first quartiles (Q1) and third quartiles (Q3) and interquartile range (IQR 75 %). Shapiro - Wilk and Kolmogorov - Smirnov (K – S) tests were used to check the data for normality. The nominal and ordinal variables were characterized by frequencies and percentages across the corresponding subset of the sample.

In order to assess a statistically significant relationship between the nominal and ordinal variables, the Chi-Square Test of Independence was used. To measure the strength of association between the nominal and ordinal variables, for 2×2 cross tabulation tables we used the Phi effect size. For larger than 2×2 cross tabulation tables, the Cramer's V effect size was used to measure the strength of the association between a continuous-level variable (ratio or interval data) and a binary variable.

The magnitude of the effect size was evaluated as follows: 0.1 - 0.25: small effect size (explains about 1% of the total variance), 0.25 - 0.5: medium effect size (explains about 9% of the total variance), $>$ 0.5: large effect size (explains about 25% of the total variance). The corresponding p-values were also calculated. The Mann Whitney U test was used to estimate a statistically significant relationship between the groups of variables. For the graphical comparison of data, box plots were used. The relationships between the variables were evaluated as statistically significant when p-value was less than 0.05 ($p < 0.05$) and a statistical test power of 1-ß was equal 0.95 (1-ß = 0.95).

3. Results

Overall, 32,215 patients were included in the final analysis, of them, 7,458 (23.15%) patients were admitted to the ward on the initial visit, while the rest were discharged with recommendations for ambulatory treatment, 3 243 patients (10.05% of all initial visits) returned to the ED within 30 days, 883 patients (27.22% of return visits) were admitted on the 2^{nd} visit (Fig. 1).

Relationship between gender and triage category were evaluated. (Table 1).

TABLE 1. Relationship by gender and the Triage category.

Feature	Single ED admissions				Returning patients			
	Admitted on 1^{nd} visit	Discharged on 1^{nd} visit	Total on 1^{nd} visit	Effect size (regarding admission)	Admitted on 2^{nd} visit	Discharged on 2^{nd} visit	Total on 2^{nd} visit	Effect size (regarding admission)
Female	3 646 (48.9%)	11 964 (55.6%)	15 610 (53.9%)	Phi = 0.0652 $p < 0.05$	434 (49.2%)	1332 (56.4%)	1766 (54.4%)	Phi = 0.0590 $p < 0.05$
Male	3 812 (51.1%)	9 550 (44.4%)	13 362 (46.1%)		449 (50.8%)	1028 (43.6%)	1477 (45.5%)	
Triage category 1	675 (9.1%)	230 (1.1%)	905 (3.1%)	Cramer's V = 0.0692 $p < 0.05$	12 (1.4%)	29 (1.2%)	41 (1.3%)	Cramer's V = 0.2820 $p < 0.05$
Triage category 2	236 (3.2%)	163 (0.8%)	399 (1.4%)		26 (1.1%)	26 (1.1%)	41 (1.3%)	
Triage category 3	2 853 (38.3%)	5 096 (23.7%)	7 949 (27.4%)		304 (34.4%)	701 (29.7%)	1 005 (31.0%)	
Triage category 4	1 900 (25.5%)	8 677 (40.3%)	10 577 (36.5%)		287 (32.5%)	933 (39.5%)	1 220 (37.6%)	
Triage category 5	1794 (24.1%)	7348 (34.2%)	9142 (31.6%)		265 (30.0%)	671 (28.4%)	936 (28.9%)	

We have found a statistically significant but very weak relationship between gender and inpatient (outpatient) treatment for both the single ED admissions and the returning patients. In terms of the triage category, there was a very weak statistically significant association with hospitalization in single ED admissions (Cramer's V = 0.0692, $p < 0.05$), while in returning patients - a statistically significant, medium association was observed (Cramer's V = 0.2820, $p < 0.05$). Gender was unrelated to hospitalization on the return visit, though triage category during the first admission to ED was related.

Relationship between the pre-set features and admission to the ward were evaluated. (Table 2).

A statistically significance and weak association between the number of consultations and admissions for a single ED visit was also have found, while a very weak and statistically significant association was observed between the returning patients and the number of consultations.

The analysis of the number of radiology tests has revealed a statistically significant, but weak association in both the single ED visits and the returning patients' groups.

The statistically significant and medium association exist between the time spent in ED and admissions for a single ED visit, while a strong, and statistically significant association was observed between the returning patients and the time spent in ED.

The analysis of the laboratory tests and time spent in the ED revealed a statistically significant impact on admission to the ward both the first and the return visits. In contrast, no tangible impact was observed on the age, the number of consultations and the radiology tests.

Cardiovascular, gastrointestinal and renal diseases were related to admission on returning visits (Table 3).

The statistically significant and medium association exist between these diseases and admission to ward. Regarding the effect size to hospitalization on first and return visits respectively were as follows: Cramer's V = 0.2361, $p < 0.05$ and Cramer's V = 0.3685, $p < 0.05$.

4. Discussion

The rate of attendance at the Emergency Department (ED) is annually increasing worldwide. Return visits constitute 5% of all visits to the ED. When discussing the underlying causes of the unplanned returns to the ED, related factors are the following - patient-related, illness-related, organization-related and clinician-related. In our study, the rate of return visits was found to be similar to that reported by other studies where the overall rate of return visits was 10.05% [4]. Although several variables based on the departmental quality data over the same period have been identified as significantly associated with return visits, the overall prognostic value was poor.

A strength of our study was its use of a large data set extracted from ELI web.

The clarification of time frame used in our study should be done. Return visits were defined miscellaneous in other studies of these patient groups. An unforeseen postpone of up to 72 hours was operated by most studies, but others used a time frame of 7 or 30 days between two visits [5–9]. Our study used a 30-day time frame. Only patients who had ED for the same reason were considered in some studies, either patients who initial conditions were not improved (missed diagnosis included), while majority of the studies did not any limits for the definition of return visits in that regard [10]. Our study involved the patients which delay was long between first and second visit (till 30 days) and presumably covered the patients with acute diseases and those with comorbidities. Patients returning after follow-up programs may be not applied in our results. Unscheduled return visits rate is similar in current study (10.05%) and previously reported results (0.07% to 33%) [3].

This study shows that patients returning to the ED do not

TABLE 2. Relationship between the pre-set features and admission to the ward.

Feature	Single ED visits				Returning patients			
	Admitted on 1*nd* visit	Discharged on 1*nd* visit	Total on 1*nd* visit	Effect size (regarding admission)	Admitted on 2*nd* visit	Discharged on 1*nd* visit	Total on 2*nd* visit	Effect size (regarding admission)
	Median	Median	Median	Cramer's V (φ_*c*)	Median	Median	Median	Cramer's V (φ_*c*)
	[Q1-Q3]	[Q1-Q3]	[Q1-Q3]	p-value	[Q1-Q3]	[Q1-Q3]	[Q1-Q3]	p-value
	IQR 75%	IQR 75%	IQR 75%		IQR 75%	IQR 75%	IQR 75%	
Age	66	53	57	0.2435	64	64	64	0.1878
	[52.0, 77.0]	[33.0, 70.0]	[36.0, 72.0]	< 0.05	[48.5, 76.0]	[45.0, 76.0]	[47.0, 76.0]	< 0.05
	25	37	36		27.5	31	29	
Number of consultations	1	1	1	0.1636	1	1	1	0.0263 < 0.05
	[1.00, 2.00]	[1.00, 2.00]	[1.00, 2.00]	< 0.05	[1.00, 2.00]	[1.00, 2.00]	[1.00, 2.00]	
	1	1	1		1	1	1	
Number of lab tests	3	2	2	0.3611	3	2	2	0.1296
	[2.00, 4.00]	[0.00, 3.00]	[0.00, 3.00]	< 0.05	[2.00, 4.00]	[1.00, 3.00]	[1.00, 3.00]	< 0.05
	2	3	3		2	2	2	
Number of radiology tests	1	1	1	0.2115	1	1	1	0.0824 < 0.05
	[0.00, 2.00]	[0.00, 1.00]	[0.00, 1.00]	< 0.05	[0.00, 1.00]	[0.00, 1.00]	[0.00, 1.00]	
	2	1	1		1	1	1	
Time spent in the ED (min)	3.2	2.57	2.75	0.2755	3.17	3.17	3.17	0.4971
	[2.03, 4.97]	[1.33, 3.97]	[1.50, 4.23]	< 0.05	[2.13, 4.77]	[1.83, 5.27]	[1.92, 5.17]	< 0.05
	2.93	2.63	2.73		2.63	3.43	3.25	

have a higher chance of harboring a more difficult condition meanwhile the return visits, supposing that condition manifestation was not obvious during the initial visit. This was approved by the circumstance that the ratio of all unscheduled return visit patients admitted to the hospital percentage (27.23%) was nearly equivalent to the patients hospitalized at the time of the first ED visit (25.7%). Thus, return visits may be considered to be unavoidable to some degree.

To establish the severity of the patient's disease and to identify the patients who were requiring immediate medical examination the triage score was obtained. However, this variable was not confirmed to predict the admission requirement on the initial visit in our study.

Our study has revealed three independent risk factors—medical condition, previous concerns found on our inner database that require laboratory analysis, and time spent in ED during the first ED visit —to be related with unscheduled visits. Early return to ED includes the patients characterized as high-risk populations, encouraging attempts to reduce return visits, although most return visits come from illness and patients, not medical errors [5]. Diagnosis categories like migraine, also symptom-based diagnosis (e.g., abdominal pain, chest pain and genitourinary system disorders are the most common diagnoses within the highest-risk of rebound [3]. The most common complaints or diagnoses in our study, were cardiovascular disease (34.4%), gastrointestinal disease (9.8%) and kidney disease (7.2%). Patients who were not scheduled for a repeat visit within 30 days of the initial ED visit were defined as these cases. . Factors that were mentioned can be used to predict the ED patients who are at a higher risk of an unexpected revisit, and to indicate the overall need to improve discharge instructions, to improve communication with a system to arrange medical follow-up and primary care practitioners [2, 11].

Patients which required more laboratory analysis were more likely to return. We found that, compared to the first ED visit,

TABLE 3. Distribution of diagnoses according to ICD-10.

Group of diagnoses	Single ED admissions			Returning patients		
	Admitted	Discharged	Total	Admitted	Discharged	Total
A **Infectious and parasitic diseases**	448 (6.0%)	418 (1.9%)	866 (3.0%)	40 (4.5%)	47 (2.0%)	87 (2.7%)
B **Infectious and parasitic diseases**	36 (0.5%)	98 (0.5%)	134 (0.5%)	6 (0.7%)	4 (0.2%)	10 (0.3%)
C **Neoplasms**	174 (2.3%)	267 (1.2%)	441 (1.5%)	35 (4.0%)	42 (1.8%)	77 (2.4%)
D **Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism**	242 (3.2%)	229 (1.1%)	471 (1.6%)	19 (2.2%)	28 (1.2%)	47 (1.4%)
E **Endocrine, nutritional and metabolic diseases**	212 (2.8%)	417 (1.9%)	629 (2.2%)	24 (2.7%)	53 (2.2%)	77 (2.4%)
F **Mental and behavioural disorders**	6 (0.1%)	132 (0.6%)	138 (0.5%)	1 (0.1%)	8 (0.3%)	9 (0.3%)
G **Diseases of the nervous system**	301 (4.0%)	709 (3.3%)	1 010 (3.5%)	24 (2.7%)	70 (3.0%)	94 (2.9%)
H **Diseases of the eye and adnexa/ Diseases of the ear and mastoid process**	243 (3.3%)	1 453 (6.8%)	1 696 (5.9%)	27 (3.1%)	90 (3.8%)	117 (3.6%)
I **Diseases of the circulatory system**	2 649 (35.5%)	5 002 (23.2%)	7 651 (26.4%)	195 (22.1%)	920 (39.0%)	1115 (34.4%)
J **Diseases of the respiratory system**	406 (5.4%)	1 480 (6.9%)	1 886 (6.5%)	45 (5.1%)	102 (4.3%)	147 (4.5%)
K **Diseases of the digestive system**	1 338 (17.9%)	1 510 (7.0%)	2 848 (9.8%)	137 (15.5%)	182 (7.7%)	319 (9.8%)
L **Diseases of the skin and subcutaneous tissue**	63 (0.8%)	350 (1.6%)	413 (1.4%)	5 (0.6%)	41 (1.7%)	46 (1.4%)
M **Diseases of the musculoskeletal system and connective tissue**	96 (1.3%)	1 360 (6.3%)	1 456 (5.0%)	40 (4.5%)	88 (3.7%)	128 (3.9%)
N **Diseases of the genitourinary system**	421 (5.6%)	1 056 (4.9%)	1 477 (5.1%)	97 (11.0%)	135 (5.7%)	232 (7.2%)
O **Pregnancy, childbirth and the puerperium**	38 (0.5%)	171 (0.8%)	209 (0.7%)	3 (0.3%)	22 (0.9%)	25 (0.8%)
Q **Congenital malformations, deformations and chromosomal abnormalities**	1 (0.0%)	8 (0.0%)	9 (0.0%)	0 (0%)	1 (0.0%)	1 (0.0%)
R **Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified**	309 (4.1%)	2 365 (11.0%)	2 674 (9.2%)	89 (10.1%)	264 (11.2%)	353 (10.9%)
S **Injury, poisoning and certain other consequences of external causes**	18 (0.2%)	35 (0.2%)	53 (0.2%)	3 (0.3%)	3 (0.1%)	6 (0.2%)
T **Injury, poisoning and certain other consequences of external causes**	55 (0.7%)	273 (1.3%)	328 (1.1%)	8 (0.9%)	10 (0.4%)	18 (0.6%)
W **External causes of morbidity and mortality**	0 (0%)	15 (0.1%)	15 (0.1%)			
X **External causes of morbidity and mortality**	0 (0%)	5 (0.0%)	5 (0.0%)			
Y **External causes of morbidity and mortality**	373 (5.0%)	3 719 (17.3%)	4 092 (14.1%)	65 (7.4%)	209 (8.9%)	274 (8.4%)
Z **Factors influencing health status and contact with health services**	29 (0.4%)	441 (2.0%)	470 (1.6%)	19 (2.2%)	40 (1.7%)	59 (1.8%)

the number of accomplished laboratory tests was statistically significantly higher in patients admitted to the hospital. Similar data appearance in the medical literature is modest. Based on this finding, it could be considered as an indicator of the disease process intensity which shows the requirement of a wider examination of the patient and influence on a further decision of the clinician.

The length of stay in the ED during the first visit was identified as another influencing though weak factor for return visits. The difference between the groups was only a few minutes, so this fact should not be taken into consideration. Therefore, Li et al study showed that laboratory testing could directly affect patients' time spent in the ED [12]. This explains these findings causality as a relationship of directly proportional sizes.

Some aspects of the study did not show the impact that was expected. At first glance, the findings that seem to be at odds with earlier studies reporting certain characteristics, particularly age and gender, are associated with higher rates of the ED use [13, 14]. Our study showed that neither age nor gender were predictors of repeated admission to the ED. These results illustrate which characteristics may determine the overall pattern of the ED use in all types of patients, and not just in certain subgroups of the patient population.

The triage score was obtained to determine the severity of the patient's disease, and to identify the patients requiring immediate medical examination. However, this variable was not confirmed to predict the admission requirement in our study. Moreover, the data for this study have been collected since the triage system was introduced in the emergency department of VUH SK, which makes it impossible to compare the statistics prevailing in previous years with the current statistics. Although, according to Sauvin et al, the data from the triage grading system may be one of the key variables that should be considered by the ED practitioners when making a decision to admit the patient. It is also suggested to consider adding an additional score to the existing triage assessment if the patient returns unintentionally. Thus, it would ensure the urgency of re-consultation and perform as a red flag for the consulting doctor herewith [15]. The recent findings of our study showed that age was not a predictor of repeated admission to the ED. Other studies, such as Hendin et al., support the conclusion that the percentage of hospitalization, even in the presence of low-acute elderly patients with non-poor prognosis complaints, is significantly higher than the number of younger patients [13, 14].

Due to the increasing number of patients entering the ED, the provision of high-quality healthcare becomes increasingly important in administrating emergency medicine [16–19]. Poor service quality is generally blamed for patients returning to the ED immediately after treatment [20]. It is impossible to ideally measure the rate of return visits as an index.

5. Conclusions

Patients with ardiovascular, gastrointestinal and renal system diseases in all age groups, advanced investigation (the increased number of laboratory testing and the time spent in the ED) have an increased risk for RV in a 30-day time frame and the increased rate of hospital admissions. Diagnosis, time spent in ED and number of laboratory tests could be the components of prognostic tool for unscheduled return visits.

6. Limitations

Our research has certain possible limitations. Firstly, this study had a case control design which relied on a retrospective review and therefore could not provide explanations of causality. In addition, the study was carried out in a single center, which could affect the relevance of our findings. However, VUH SK is one of the largest medical center in Lithuania and receives patients from all over the country. Patients who revisited other ED would not have been captured in our study. We believe that this figure is negligible. Secondly, the data for this study has been collected since the triage system was introduced in the emergency department of VUH SK, which makes it impossible to compare the statistics prevailing in previous years with the current statistics. Also, it has not been investigated whether return visits occurred due to the same medical problem, as it is known that some patients diagnosed with more than one disease may have multiple exacerbations of chronic diseases within 30 days [2]. Thirdly, due to the specificity of the coding of diagnoses, a statistically significant percentage of patients were assigned to the syndrome and circumstance diagnosis groups (Y and R according to ICD-10-AM). However, this group of diagnoses had no statistically significant effect on the recurrence of patients. Finally, pain score was not evaluated in our study, although some literature sources describe this factor as statistically significant.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Conceptualization, Aušra Bilotienė Motiejūnienė and Rimantas Stukas; methodology, Aušra Bilotienė Motiejūnienė and Eugenijus Jasiūnas; software, Eugenijus Jasiūnas; validation, Aušra Bilotienė Motiejūnienė and Eugenijus Jasiūnas; formal analysis, Aušra Bilotienė Motiejūnienė and Eugenijus Jasiūnas; investigation, Aušra Bilotienė Motiejūnienė; resources, Andrius Klimašauskas and Eugenijus Jasiūnas; data curation, Aušra Bilotienė Motiejūnienė, Andrius Klimašauskas and Eglė Kontrimavičiūtė; writing—original draft preparation, Rūta Janulevičienė, Dovilė Majauskytė; writing—review and editing, Andrius Klimašauskas and Eglė Kontrimavičiūtė; visualization, Eugenijus Jasiūnas, Rūta Janulevičienė and Dovilė Majauskytė; supervision, Andrius Klimašauskas and Eglė Kontrimavičiūtė;

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