



EFFECT OF THE INTRODUCTION OF EMERGENCY MEDICINE SPECIALISTS ON THE EMERGENCY DEPARTMENT PERFORMANCE INDICATORS: A RETROSPECTIVE DATA ANALYSIS

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SUMMARY – Patient management in the emergency department (ED) is evaluated by performance indicators, such as wait times (time to be seen by a physician), length of stay (LOS) and the number of diagnostic tests per patient. To improve the quality of care, dedicated emergency medicine (EM) specialists are employed to work in the ED. The aim of this study is to evaluate three performance indicators of patient management in the ED compared by specialty, internal medicine (IM) versus EM. Research was conducted in the ED of a large tertiary teaching hospital. A retrospective data analysis of the hospital information system was conducted for the period when only IM specialists were working as attendants, versus a period when two EM specialists joined the ED team. We calculated the percentage of patients seen within the recommended time per Australasian Triage system (AST) category and compared the average LOS and the average number of tests per patient, using data from June 2017 to January 2020. Means, standard deviation, standard error, 95% confidence interval were calculated, and the independent t-test was used to compare means. With the introduction of the EM specialists, the percentage of patients examined within the recommended time frame per AST category was higher. There was a significant reduction in LOS in the ED when comparing only IM specialists to IM specialists with two EM specialists ($p < 0.001$). The IM physicians on average do more tests than EM specialists, which was statistically significant ($p < 0.05$). There was a significant improvement in efficiency in the ED with the introduction of EM specialists which was manifested by shorter patient wait times and shorter length of stay in the Emergency Department and fewer diagnostic test orders.

Key words: *Quality Indicators, Healthcare; Emergency Service, Hospital; Attending Physicians, Hospital; Triage; Length of Stay; Time Management.*

Introduction

With an increase in patients in the emergency departments each year, overcrowding has become a serious problem worldwide in the last few decades that adversely influences patients' outcomes and the availability of care¹. Emergency Department (ED) crowding is a serious problem faced by most emergency departments all

around the world. It is defined as "a situation in which the identified need for the emergency service exceeds the available resources for patient care in the ED, hospital, or both."²⁻⁴ It represents a major problem considering that prolonged stay in the emergency department is associated with poor health outcomes.⁵

To improve the quality of care, patient management in the ED is evaluated by appropriate performance indicators, such as length of stay (LOS), time from arrival to triage, time to be seen by a physician, percentage of patients who left without being seen, and many more.^{3,4}

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According to the Australasian Triage system (ATS)⁶, patients in the first category must be treated immediately, category 2 patients should be treated within 10 minutes, category 3 within 30 minutes, category 4 patients within 60 minutes, and triage category 5 patients should be treated within 120 minutes of arrival at the ED.⁶ Performance indicators describe the minimum percentage of patients treated in the recommended time, depending on the ATS category, which is 100% for category 1, 80% for category 2, 75% category 3 and 70% for categories 4 and 5⁷.

As a part of a state-wide restructuring of the emergency medical services, our hospital started a five-year emergency medicine specialty residency program in 2012. Consequently, the first two specialists joined the team of 18 internal medicine (IM) specialists in June 2019, rotating in shifts in the ED of a busy urban teaching tertiary level hospital with about 22,000 patient visits in 2019.

The aim of this study was to evaluate three performance indicators of patient management in the ED compared by specialty: internal medicine vs emergency medicine.

Methods

Study design and setting

A retrospective data analysis using the hospital's information system was performed for the period when there were only Internal Medicine specialists working as attendings (from June 2017 to August 2018), compared to June 2019 – January 2020 when two EM specialists started working as attending physicians. In February 2020, due to the Covid-19 pandemic, there were major organizational changes implemented in the ED, therefore, that later period was not eligible for comparison. A prospective survey was carried out on a convenience sample of on-call residents and nurses who worked in the emergency department of an urban teaching hospital and gave their informed consent. Permission to conduct this research was obtained from the ethics committee of the University Hospital Dubrava and the Medical School of the University of Zagreb. The percentage of patients seen within the recommended time per ATS category (efficiency), for each period was calculated. The average length of stay (LOS) for patients in the ED and the

average number of tests per patient seen in the ED per physician were compared.

Data analysis

Means, standard deviation (SD), standard error (SE), 95% confidence interval (CI) were calculated. Student's t-test was used to compare means between groups since the distribution was normal. The p-value <0.05 was considered significant. To compare mean number of tests per physician the Student's t-test was used.

Results

We found that with the introduction of EM specialists, patients were seen more quickly, since the percentage of patients examined within the recommended time frame per ATS category was higher (Figure 1). For the second ATS category, there were 38.27% of patients seen within the recommended 15-minute time frame with only IM attending physicians working in the ED, whereas when compared with two EM attendings in the team, it was 52.58%. In the third ATS category, there were 66.06% patients seen on time with two EM specialists working, compared to only half of patients (51.27%) with only IM attendings in the ED. Both second and third categories fail to meet the advised minimal percentage of patients seen within the recommended time frame. A similar rise in the efficiency is seen in the fourth and fifth ATS categories.

When comparing the average length of stay in the ED (Table 1) there is a significant difference between groups ($p < 0.001$).

When comparing LOS for only IM specialists to IM with 2 EM specialist, there is a significant decrease in LOS ($p < 0.001$). Considering the number of tests per patient (Table 2), we found that IM physicians on average do more diagnostic and laboratory tests than EM specialists, ($p < 0.05$).

The average number of tests per patient for all IM specialists is 6.34, while for EM specialists 6.07 tests per patient, ranging from 5.96 to 6.63 tests per patient for 18 IM specialists, and 6.02 and 6.12 for EM specialists. The comparison was made with only 2 EM physicians vs 18 IM physicians as these two EM physicians attended to 33% of all patients seen in the examined period.

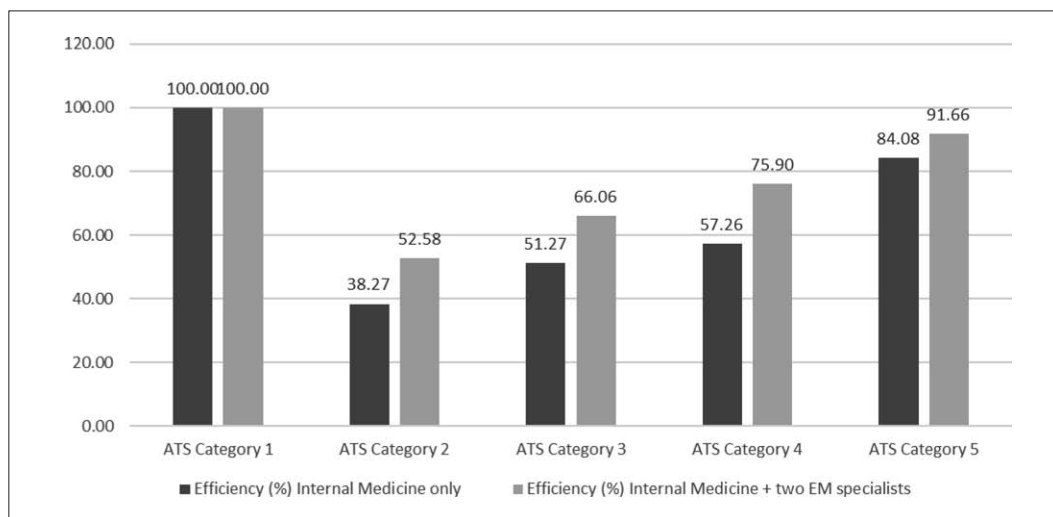


Figure 1 Efficiency in the ED by ATS Category and specialty of the attending physician.

Table 1 Student's *t*-test comparing mean length of stay for patients in the Emergency department depending on the attending physician.

		N	Mean	Std. Deviation	95% Confidence Interval		p
Length of stay	Only Internal Medicine	31135	4,05	2,59	0,29	0,36	<0.001
	Internal Medicine + Emergency Medicine	14841	3,32	2,37			

Table 2 Results of the Student's *t*-test comparing the average number of tests per patient per physician Internal Medicine Specialists vs Emergency Medicine Specialists.

		Mean	Std. Deviation	95% Confidence Interval		p
Average number of tests per patient per physician	Internal Medicine Specialists	6,341	0,168	0,015	0,529	0,04
	Emergency Medicine Specialists	6,069	0,072			

Discussion

The efficiency of the ED by ATS Category, the average length of stay and the average number of diagnostic tests per patient in the ED was evaluated by specialty. The wait time to be seen by a physician was shorter in every ATS category of patients with the introduction of EM specialists. This is supported by other studies that found that emergency clinicians rapidly process large numbers of high-need patients⁸. When comparing the work of internal medicine specialists to a combination with emergency medicine specialists, there was a significant shortening of LOS when two EM specialists worked together on a daily basis in the ED. Traditionally, internal medicine pa-

tients often exceed the four-hour stay in the ED,⁹ which was also supported by our data. Driesen et al. have shown that 76- percent of LOS prolongation is organizational and only 22 percent is patient or disease-related, with 94 percent of the organizational factors outside the influence of the ED.¹⁰ The above facts indicate a greater need for EM specialists since it has been shown that they can reduce LOS to an optimal four-hour target, that has been recommended by health authorities to decrease the LOS in ED.¹¹ Therefore, a significant factor in the ED that can be addressed is the introduction of EM specialists.

As already demonstrated, better coordination of care and faster decision making after completion of all diagnostics greatly decrease LOS^{9,12,13} which may be

the advantage of EM specialists compared to other physicians.

Furthermore, we found that a statistically significant difference in the number of tests ordered by internal medicine or ED physicians, suggesting a more rational approach by the EM physicians. Unnecessary testing is time and labor consuming, involves pain and discomfort for the patient, possible adverse effects and unreasonable exposure to radiation, prolongs LOS, increases costs, which is why a rational goal-directed approach to testing is preferred in the ED¹⁴.

Quality of the medical treatment, as well as LOS in triaged patients, is influenced by many factors such as the number of procedural formalities until the examination, the availability of acute hospital and ED beds and connection with other diagnostic points in the hospital, the complexity of certain conditions and other comorbidities of patients presented in the ED. Therefore, it is recommended to have as simple an approach in the treatment of emergency patients as possible, with a focus on the acute health problem. Overall, the results emphasize the need for specialist training in emergency medicine as well as the need for an adequate number of professional and skilled physicians in the ED.

Limitations

The main drawback of this study is the lack of evidence of treatment outcome. Another limitation, and a feature which had an impact on the results, is the timing of the implementation of high-sensitive Troponin in the ED which is the same as the introduction of EM specialists. Therefore, the shortened LOS can partially be attributed to that.

With the introduction of EM specialists there was a significant reduction in LOS for patients in the ED, significant reduction in wait times to be seen by a physician and fewer diagnostic test were ordered. Further improvements are necessary since urgent patients still do not meet the triage target time. Drawing on the results, we suggest implementing more EM specialists in the ED.

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Sažetak

UTJECAJ UVOĐENJA SPECIJALISTA HITNE MEDICINE NA POKAZATELJE
UČINKOVITOSTI BOLNIČKE HITNE SLUŽBE – RETROSPEKTIVNA ANALIZA*Maša Sorić, Diana Špoljar i Mia Golubić*

Zbrinjavanje bolesnika u bolničkoj hitnoj službi (BHS) ocjenjuje se pokazateljima učinkovitosti kao što su vrijeme čekanja (vrijeme čekanja na pregled liječnika), duljina boravka i prosječan broj dijagnostičkih pretraga po pacijentu. Kako bi se poboljšala kvaliteta skrbi, u BHS se specifično zapošljavaju specijalisti hitne medicine (HM). Cilj ove studije je ocijeniti tri pokazatelja učinkovitosti zbrinjavanja pacijenata u BHS u usporedbi prema specijalnosti, interna medicina (IM) u odnosu na HM. Istraživanje je provedeno u hitnoj internističkoj službi tercijarne nastavne bolnice. Provedena je retrospektivna analiza podataka bolničkog informacijskog sustava za razdoblje kada su kao liječnici radili samo specijalisti IM u odnosu na razdoblje kada su se pridružila dva specijalista hitne medicine. Izračunali smo postotak pacijenata pregledanih unutar preporučenog vremena po kategoriji australoazijskog trijažnog sustava (ATS), usporedili prosječnu duljinu boravka i prosječan broj testova po pacijentu, koristeći podatke od lipnja 2017. do siječnja 2020. godine. Izračunate su aritmetička sredina, standardna devijacija, standardna pogreška te 95% interval pouzdanosti, a za usporedbu srednjih vrijednosti korišten je nezavisni t-test. Uvođenjem specijalista HM postotak pregledanih pacijenata u preporučenom vremenskom okviru po ATS kategoriji bio je veći. Došlo je do značajnog smanjenja duljine boravka bolesnika u BHS kada se uspoređuju samo specijalisti IM sa IM specijalistima s dva HM specijalista ($p < 0,001$). Liječnici IM u prosjeku rade više pretraga od specijalista EM, što je statistički značajno ($p < 0,05$). Došlo je do značajnog poboljšanja učinkovitosti u BHS uvođenjem specijalista HM što se očitovalo kraćim čekanjem pacijenata i kraćim trajanjem boravka u bolničkoj hitnoj službi te manjim brojem narudžbi za dijagnostičke pretrage.

Ključne riječi: *pokazatelji kvalitete; hitna služba, trijaža; duljina boravka; specijalisti hitne medicine.*