Research Square

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Trends in Emergency Department Utilization at a Secondary Care Hospital in Bosnia and Herzegovina

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Abstract

Background

Emergency departments (EDs) worldwide are increasingly exposed to overcrowding, excessive patient turnover, prolonged waiting times, and physician burnout. The ED of the General Hospital “Prim dr Abdulah Nakaš” Sarajevo functions as a major referral centre for patients requiring urgent diagnostic evaluation and possible inpatient treatment. This study aimed to retrospectively evaluate trends in emergency department utilization, physician workload, and hospitalization rates between 2015 and 2022.

Materials and Methods

A retrospective observational study was conducted using official annual reports from the ED between January 2015 and December 2022. The variables included the total number of services provided, ED treatments and discharges performed, inpatient admissions, admission rates, and patient-to-physician ratios. Patients treated in the ED were categorized into five clinical groups: surgical, orthopaedic, internal medicine, urology, and neurology. Correlation analysis was used to assess increases or decreases over time. Statistical significance was established at $p < 0.05$.

Results

Over the seven-year study period, the number of ED treatments and discharges increased significantly, as did the total number of services provided. The patient-physician ratio increased 2.5-fold during the study period. A statistically significant increase in the number of patients treated in the ED was observed among the general surgery, orthopaedic and trauma, and neurology patient groups. Hospital admission rates remained relatively stable despite increased ED utilization.

Conclusion

ED utilization increased substantially over the study period without proportional growth in physician staffing. Stable hospitalization rates suggest that many ED visits may represent nonurgent conditions potentially manageable at the primary healthcare level.

Keywords: Emergency department; Burnout; Healthcare utilization; Overcrowding; Bosnia and Herzegovina; Physician workload

Clinical trial registration

Not applicable

1. Introduction

Emergency departments (EDs) represent one of the most dynamic and resource-intensive components of modern healthcare systems. Originally designed to provide rapid stabilization and treatment for acute and life-threatening conditions, EDs have progressively evolved into complex healthcare access points

for a broad spectrum of urgent and nonurgent medical problems [1]. During the past several decades, healthcare systems worldwide have experienced a substantial increase in ED utilization, resulting in overcrowding, prolonged waiting times, delayed treatment, reduced patient satisfaction, increased healthcare costs, and deterioration in physician well-being [2, 3]. ED overcrowding has become a global public health issue affecting both developed and developing countries. The causes are multifactorial and include demographic ageing, an increased prevalence of chronic diseases, insufficient primary healthcare accessibility, shortages of healthcare professionals, reduced inpatient bed availability, and inappropriate use of emergency services for low-acuity conditions [4, 5]. In many countries, EDs are being inceasingly used as substitutes for outpatient clinics and primary care facilities, particularly during evenings, weekends, and periods of reduced accessibility of outpatient facilities [6]. ED overcrowding has significant clinical consequences. Previous studies have demonstrated associations between overcrowding and increased mortality, prolonged hospitalization, delayed administration of critical therapies, and increased rates of medical errors [7, 8]. Furthermore, excessive workload and continuous exposure to high-stress environments contribute significantly to burnout syndrome among emergency medicine physicians [9]. Burnout is characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment [10]. Emergency medicine physicians are particularly vulnerable to burnout because of shift hours, sleep deprivation, high patient turnover, and frequent exposure to critically ill patients [11]. Numerous international studies have shown that physician burnout negatively affects patient safety, healthcare quality, job satisfaction, and physician retention [12]. In transitional healthcare systems such as those of Bosnia and Herzegovina, EDs face additional structural challenges, including fragmented healthcare organization, insufficient workforce capacity, and limited healthcare financing [13]. Despite increasing patient burden, relatively few studies from Southeast Europe have investigated long-term trends in emergency department utilization and physician workload. The ED of General Hospital “Prim dr Abdulah Nakaš” Sarajevo serves as an important secondary healthcare institution receiving referrals from primary healthcare centres across Sarajevo Canton. Institutional data suggest a progressive increase in patient volume over recent years, accompanied by minimal increases in staffing resources. Understanding temporal trends in emergency healthcare utilization is essential for evidence-based healthcare planning, optimization of resource allocation, and development of strategies aimed at reducing overcrowding and improving patient care quality. Therefore, the aim of this study was to retrospectively evaluate emergency department activity, physician workload, and hospitalization trends between 2015 and 2022.

2. Materials and Methods

2.1 Study Design

In this retrospective observational study, aggregated annual institutional data obtained from the ED of General Hospital ‘Prim. dr Abdulah Nakaš’ Sarajevo between January 2015 and December 2022 was analysed. All recorded ED treatments and discharges and related hospital admissions during the study

period were included. Data were analysed at the institutional level rather than at the individual patient level.

2.2 Study Setting

The ED provides secondary healthcare services for patients referred from primary healthcare institutions for further diagnostic evaluation, observation in dedicated observation units, emergency treatment, and, when necessary, subsequent inpatient hospitalization. Patients were categorized according to the primary clinical presentation determined during triage and initial ED physician assessment into the following categories: general surgery, orthopaedics, and trauma, internal medicine, urology and neurology patients.

2.3. Data Collection

The following variables were extracted from annual institutional reports: total number of services provided, total number of ED treatments and discharges performed, number of inpatient admissions, admission rates relative to ED treatments, trends in patient ED treatments and discharges by clinical category, percentage distribution of ED treatments and discharges across clinical categories, number of emergency medicine physicians, and number of patients per physician.

2.4. Statistical Analysis

Descriptive statistical methods were used to summarize annual trends. Correlation analyses were performed using Spearman correlation coefficients (r_s) to assess increases or decreases over time. Temporal trends were evaluated using Spearman correlation coefficients because of the limited number of annual observations. For workload analysis, comparisons between patient-to-physician ratios in 2015 and 2022 were performed by calculating patient-to- doctor ratios. Statistical significance was established at the 95% confidence level or when $p < 0.05$. Statistical analyses were performed using SPSS software v25.0. (IBM Corp., Armonk, NY, USA).

2.5. Ethical approval and accordance

The protocol was approved by the General Hospital “Prim. dr. Abdulah Nakaš” Ethics Committee (Ref. No. 26–143/26) in accordance with relevant institutional guidelines and regulations. The research was carried out following the guidelines of the General Hospital “Prim. Dr. Abdulah Nakas” Ethics Committee and the ethical principles of the Declaration of Helsinki.

3. Results

3.1 Overall Emergency Department Activity

Between 2015 and 2022, healthcare utilization in the ED increased substantially, as summarized in Table 1.

Table 1
Overall emergency department activity, 2015–2022

Year	Services	ED treatments and discharges	Admissions	Admission rate %
2015	72,738	11,970	1,007	8.41
2016	100,745	19,329	1,625	8.40
2017	119,999	23,342	1,892	8.11
2018	114,173	23,859	1,705	7.15
2019	108,688	23,103	1,478	6.40
2020	70,252	14,202	1,134	7.98
2021	168,820	32,347	1,636	5.06
022	177,915	33,759	2,389	7.08

As shown in Fig. 1, the number of services provided increased from 72,738 in 2015 to 177,915 in 2022, representing a 144.6% increase during the study period. Correlation analysis revealed a statistically significant linear increase ($r = 0.682$, $p = 0.033$).

Despite the increased patient volume, the percentage of patients requiring inpatient hospitalization remained relatively stable throughout the observation period, and showed no statistically significant increase (Fig. 3).

A temporary decline in healthcare utilization occurred during 2020, corresponding with the COVID-19 pandemic and the implementation of public health restrictions.

3.2 Physician Workload

The number of emergency medicine physicians increased only minimally, from 8 physicians in 2015 to 9 physicians in 2022. However, the annual number of ED treatments and discharges per physician increased substantially from 1,496 to 3,751 patients per physician annually. This represented a 2.5-fold increase in physician workload. Data regarding a significant increase in physicians' workload are presented in Table 2.

Table 2
Patient-to-physician ratio during the 2015–2022 study period

Variables	2015	2022
Number of examinations	11,970	33,759
Number of physicians	8	9
Number of patients per physician	1,496	3,751
Increase ratio 2015:2022	1: 2,5	

3.3 Trends in Patient Distribution by Clinical Evaluation

According to medical history, clinical examination, and radiological and laboratory assessments, patients in the ED were classified into five clinical groups: general surgery, orthopaedic and trauma, internal medicine, urology, and neurology. The number of general surgery patients treated and discharged from the ED increased from 2,776 in 2015 to 9,489 in 2022, a more than threefold increase during the study period, with a statistically significant positive monotonic trend ($r_s = 0.743$, $p = 0.036$). Although the examination volume increased substantially, the percentage of inpatient admissions relative to the number of patients evaluated and treated in the ED decreased from 11.13% to 7.87%, suggesting that a growing proportion of patients presented with conditions not requiring inpatient surgical treatment. Throughout the study period, general surgery patients represented approximately 23–31% of all patients evaluated, treated and discharged in the ED, emphasizing their major contribution to the total ED workload. Patient visits related to orthopaedics and trauma constituted a substantial proportion of patient visits and were among the most frequently encountered clinical disciplines in the analysed cohort. The number of orthopaedic and trauma patients treated and discharged from the ED increased from 4,219 in 2015 to 11,466 in 2022, with a statistically significant positive linear trend over the study period ($r_s = 0.714$, $p = 0.047$). Cases related to orthopaedics and trauma consistently represented nearly one-third of all ED patient encounters, comprising 28.80% to 35.69% of the examined, treated and discharged patients. Despite substantial increases in number of patients, admission rates remained low and stable (approximately 3–4%), suggesting that many orthopaedic and trauma patients were managed conservatively at the ED without hospitalization. The number of internal medicine patients with signs and symptoms suggestive of pulmonologic and cardiologic conditions gradually increased during the study period; nevertheless, the correlation analysis failed to demonstrate statistical significance ($r_s = 0.548$, $p = 0.160$). The number of internal medicine patients with clinical manifestations of gastroenterological conditions gradually increased throughout the study period, with the number of cases increasing from 967 in 2015 to 3,023 in 2022 ($r_s = 0.690$, $p = 0.058$). Although the increase approached statistical significance, the relatively small sample size may have limited statistical power. Admission rates increased modestly over time, reaching 8.44% in 2022. A moderate increase was observed in the number of urologic patients treated and discharged from the ED, rising from 562 in 2015 to 1,517 in 2022. However, the observed trend did not reach statistical significance ($r = 0.548$; $p = 0.160$). Admission rates

fluctuated considerably during the study period, ranging between 4.56% and 13.37%. Patients who exhibited neurological manifestations demonstrated one of the most significant increases in patient volume among all analysed departments (r = 0.738; p = 0.037). The number of neurology patients treated and discharged from the ED increased nearly fourfold, from 975 in 2015 to 3,740 in 2022. Neurology patients treated and discharged from the ED accounted for approximately 8%–11% of all ED visits throughout the study period.

4. Discussion

Over the seven-year study period, this retrospective analysis revealed a substantial increase in ED utilization at a secondary healthcare institution in Bosnia and Herzegovina. The number of patient examinations increased nearly threefold, accompanied by a more than twofold increase in healthcare services provided. However, these increases occurred in the absence of a proportional expansion in physician staffing, resulting in a statistically significant 2.5-fold increase in physician workload. The findings of this study are consistent with global trends reported in the emergency medicine literature demonstrating progressive increases in ED overcrowding and physician burden [14–16]. Emergency department overcrowding has emerged as a major healthcare challenge worldwide. Studies from the United States, Canada, the United Kingdom, Australia, and European Union countries have consistently reported increasing ED attendance rates in recent decades [17–19]. Several mechanisms contribute to ED overcrowding, such as population ageing, increased chronic disease burden, limited access to primary healthcare, delayed inpatient admissions, workforce shortages, increased patient expectations, and inappropriate use of ED services for nonurgent conditions. The observed trends in Sarajevo align with evidence from other transitional healthcare systems, where inconsistent primary healthcare accessibility and limited service capacity have been linked to uneven implementation of health reforms and persistent resource constraints [20–22]. One of the most important findings of this study was the dramatic increase in the patient-to-physician ratio from 1,496 to 3,751 patients per physician annually. Emergency medicine physicians are particularly vulnerable to occupational burnout because of shift hours, sleep disruption, emotional stress, high patient turnover, time pressure, administrative burden, and exposure to traumatic events. Burnout syndrome has become increasingly recognized as a critical healthcare issue. According to Shanafelt et al., among those in all medical specialities, physicians working in emergency medicine have among the highest burnout rates [23]. Burnout has important clinical consequences, including increased medical errors, reduced patient satisfaction, lower healthcare quality, depression and anxiety, higher physician turnover and reduced productivity. Several studies have demonstrated that overcrowded ED environments are associated with delayed diagnosis, delayed analgesia, prolonged treatment times, and increased mortality [24–26]. According to the study results, the significant increase in the number of general surgery patients was approximately one-quarter to one-third of all patients evaluated and treated in the ED, highlighting the significant impact of these patients on total ED workload. Despite a threefold increase in the number of general surgery patients over the study period, the admission-to-evaluation ratio decreased from 11.13% to 7.87%, suggesting that an increasing proportion of patients presented with conditions that could be managed by ED specialists

without need for inpatient surgical intervention. Our findings are consistent with those of Matevish et al., who demonstrated that the majority of patients who present to the ED with general surgical complaints do not require surgical intervention and can be effectively managed by emergency department clinicians [27]. Harpole et al. demonstrated a high level of concordance between ED and definitive surgical diagnoses, suggesting that consultations requested by ED clinicians for injuries potentially requiring surgery are generally clinically appropriate and supported by accurate initial assessment [28]. These findings provide reassurance that requests for surgical consultation initiated by ED clinicians are generally warranted and reflect accurate identification of patients requiring surgical evaluation and intervention. The results of this study revealed that approximately one-third of all patients who were examined and treated in the emergency department were orthopaedic and trauma patients. These findings are consistent with previous international studies reporting increasing ED utilization for musculoskeletal injuries and low-acuity trauma conditions [29, 30]. Although a gradual increase in the number of internal medicine patients entering the ED was observed over the study period, more than 90% of patients were managed by ED physicians and discharged to home. Our findings are consistent with those of previous studies reporting an increasing number of internal medicine patients presenting to the emergency department, alongside declining inpatient admission rates and a growing proportion of patients being treated and discharged directly from the ED [31, 32]. Our results revealed an increase in the number of urology patient examinations and the management of patients over time in the ED, but the difference was not statistically significant, as the patient hospitalization rate did not increase. The results of our study are in agreement with those of earlier reports indicating an increase in ED visits among urology patients [33, 34]. Nevertheless, in the study of Matta et al., a significant increase in the annual rate of patients visiting the ED with primary urologic disease diagnoses was accompanied by increasing hospital admission rates [33]. Additionally, the findings of the present study demonstrated a substantial increase in the number of neurological examinations during the study period, with the number of examinations increasing nearly fourfold over time. These findings may be associated with changing patterns of emergency neurological presentations. Globally, the number of emergency neurology visits has increased significantly over the past decades because of population ageing, increasing prevalence of cerebrovascular and neurodegenerative diseases, improved recognition of acute neurologic conditions, increased availability of neuroimaging diagnostics, and increasing incidence of stress-related and post–COVID-19 neurologic manifestations [35–38]. Our results were most consistent with those reported by Liberman et al., who reported that over a three-year period, 8.4% of all ED visits involved patients who presented with neurological complaints [39]. Despite substantial increases in the number of patients examined and treated in the ED, hospitalization rates remained relatively stable throughout the study period. This observation may indicate that a substantial proportion of patients who present to the ED suffer from low-acuity conditions that are potentially manageable within primary healthcare settings. Similar findings were reported in other studies, where significant percentages of ED visits were classified as nonurgent [6, 40, 41]. Several factors may contribute to this pattern, including limited access to primary care, prolonged waiting times for outpatient consultations, patient preference for ED assessment, and the availability of more timely diagnostic testing within the ED. Consequently, strengthening primary care and family medicine services may represent a key strategy

for reducing ED utilization. In parallel, observation medicine has assumed an increasingly important role in emergency care. Observation units and clinical decision units provide a structured setting for further evaluation and management of selected patients, helping to optimize disposition decisions and reduce unnecessary inpatient admissions while maintaining patient safety [42]. A noticeable decline in ED utilization occurred during 2020, corresponding with the COVID-19 pandemic. The temporary decline in emergency department utilization observed in 2020 likely reflected the impact of the COVID-19 pandemic and associated public health restrictions, during which reduced healthcare-seeking behaviour was widely reported because of concerns regarding infection transmission. These findings are consistent with those of international studies demonstrating substantial reductions in emergency department visits during the pandemic period [43–45]. These trends may be attributable to multiple factors, including apprehension related to nosocomial COVID-19 transmission, restrictive governmental containment measures, reduced trauma exposure during lockdowns, and delays in visiting the ED for medical evaluation and treatment. After 2020, patient volumes rapidly recovered, with marked increases in the number of cardiovascular and pulmonary patients visiting ED, underscoring the continued demand for emergency care services. Concurrent increases in the number of patients with gastrointestinal and metabolic presentations who visit the ED may reflect the growing burden of chronic conditions requiring urgent evaluation. The rapid increase in patient volume following the initial pandemic phase likely reflects the accumulation of previously deferred healthcare needs, particularly among internal medicine patients, during periods of lockdown and limited healthcare accessibility. Despite a modest reduction in patient satisfaction during the COVID-19 pandemic period, an overall upwards trend in satisfaction with healthcare services and the number of visits has been observed in Bosnia and Herzegovina in recent years [46, 47]. Despite the substantial increase in ED utilization, hospitalization rates remained relatively stable throughout the study period. These findings suggest that a considerable proportion of ED visits involved lower-acuity conditions that may have been amenable to management within primary healthcare settings. These observations are consistent with international evidence identifying ED overcrowding as a major global healthcare challenge associated with prolonged waiting times, reduced operational efficiency, and increased risk of clinician burnout. The temporary reduction in ED attendance observed during the COVID-19 pandemic was followed by a rapid rebound in patient volume, highlighting the persistent and growing demand for emergency care services. Moreover, the increasing emphasis on reducing hospital admissions from the ED has shifted attention from concerns regarding inappropriate admissions to the potential risks associated with inappropriate discharges, increasing patient safety and quality-of-care considerations. Importantly, ED overcrowding should not be regarded solely as a hospital-level phenomenon. Rather, it reflects broader system-wide pressures across the continuum of care. Limitations in primary healthcare access, community-based services, and postacute care capacity—including rehabilitation facilities, aged-care services, nursing home placement, and postacute beds—may contribute substantially to patient flow disruptions and reduce the effectiveness of overcrowding mitigation strategies. Addressing these challenges will require coordinated interventions across healthcare sectors to improve care transitions, optimize resource utilization, and strengthen the overall resilience of emergency care systems.

4.1. Strengths and Limitations of the Study

The major strengths of this study include its long-term observational design (2015–2022), the utilization of real-world clinical data, comprehensive analyses of patient distribution across clinical disciplines, assessment of physician workload, and evaluation encompassing both the prepandemic and COVID-19 pandemic periods. The present study is subject to several limitations. These include the retrospective study design, single-centre data collection, limited availability of patient-specific clinical information, absence of triage category evaluation, and lack of mortality and emergency department waiting-time analyses. Moreover, changes in healthcare system organization and policy during the observation period may have influenced the study results.

4.2. Further Directions for Research and Healthcare Policy

Future multicentre studies across Bosnia and Herzegovina are needed to better characterize national trends in emergency department utilization, patient distribution, and physician workload. Prospective studies that include assessments of triage severity, patient-level clinical data, waiting times, hospitalization outcomes, and mortality would provide more comprehensive insights into emergency healthcare demands. The findings of this study have important implications for healthcare planning and policy development. The observed increase in emergency department utilization and physician workload highlights the need for systemic interventions aimed at reducing emergency department overcrowding and improving healthcare accessibility. Potential strategies include strengthening primary healthcare systems, increasing emergency medicine staffing, developing urgent outpatient services, implementing improved triage systems, enhancing digital referral coordination, and establishing fast-track units for low-acuity patients. Healthcare policymakers should recognize emergency department overcrowding as a major clinical and organizational healthcare challenge requiring coordinated systemic intervention and long-term healthcare planning. Future research should focus on the systematic evaluation of interventions to strengthen the evidence base for policy and practice. A systems-level approach is needed to identify and implement strategies that improve the efficiency, coordination, and overall performance of the emergency healthcare system.

5. Conclusion

The present retrospective study demonstrated a substantial increase in emergency department utilization at General Hospital “Prim dr Abdulah Nakaš” Sarajevo between 2015 and 2022. During the study period, the number of examinations nearly tripled, while the number of emergency medicine physicians remained relatively unchanged, resulting in a significant increase in physician workload and the patient-to-physician ratio. Analyses of patient distribution by clinical category revealed marked increases in examinations of general surgery, orthopaedic and trauma, and neurology patients, indicating the expansion of emergency healthcare demand across these clinical fields. These findings highlight the need for healthcare system reforms focused on strengthening primary healthcare accessibility, improving referral coordination, increasing emergency medicine workforce capacity and developing

alternative pathways for nonurgent patient care. Future multicentre studies involving institutions across Bosnia and Herzegovina and Southeast Europe are warranted to more comprehensively characterize regional patterns of emergency healthcare utilization and to inform evidence-based, sustainable healthcare system planning.

Declarations

Contributions

ED: Conceptualization, methodology, investigation, writing-original draft, project administration. MS: Conceptualization, clinical services, formal analysis, writing-review and editing. ZH: Methodology, formal analysis, investigation, resources. MD: Methodology, formal analysis, resources, clinical services. BB: Investigation, resources, project administration. KD: Conceptualization, methodology, writing-original draft, writing-review and editing.

Ethics Approval

and accordance The protocol was approved by the General Hospital “Prim. dr. Abdulah Nakaš” Ethics Committee (Ref. No. 26–143/26) in accordance with relevant institutional guidelines and regulations. The research was carried out following the guidelines of the General Hospital “Prim. Dr. Abdulah Nakas” Ethics Committee and the ethical principles of the Declaration of Helsinki.

Consent for Publication

Not applicable.

Consent to participate

Not applicable

Competing interests

The authors declare no competing interests.

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Author Contribution

Conceptualization: E.D., M.S., and K.D. Methodology: E.D., Z.H., M.D., and K.D. Investigation: E.D., Z.H., and B.B. Formal analysis: M.S., Z.H., and M.D. Clinical services: M.S.and M.D. Data collection: Z.H., M.D.,

and B.B. Writing of the original draft: E.D and K.D. Writing—review and editing: M.S. and K.D. Project administration: E.D. and B.B. All authors reviewed and approved the final manuscript.

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Data Availability

The datasets analysed during the current study are not publicly available due to personal data protection requirements under applicable data protection legislation in Bosnia and Herzegovina but are available from the corresponding author on reasonable request.

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Figures

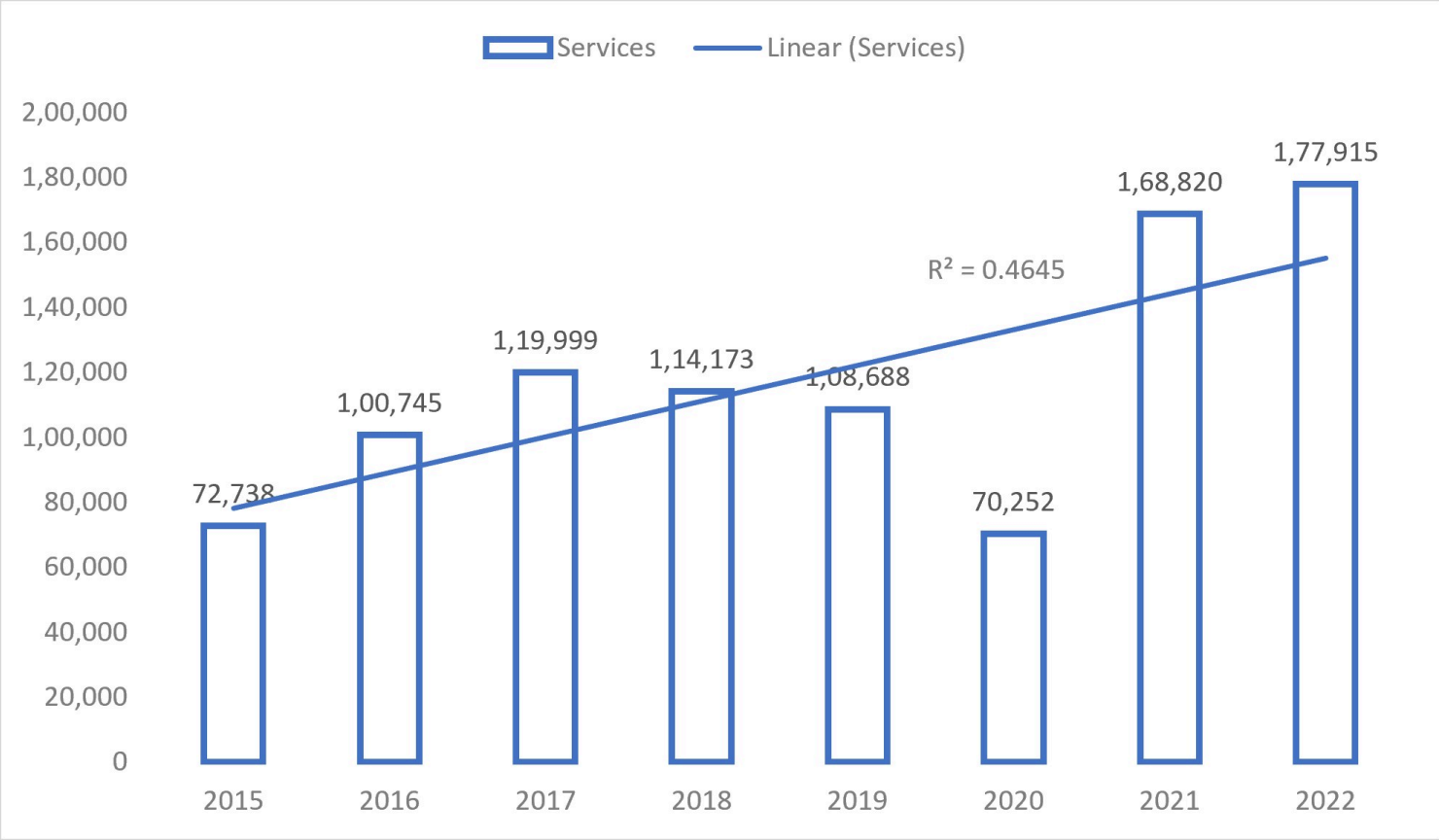


Figure 1

Annual number of services provided in the emergency department between 2015 and 2022

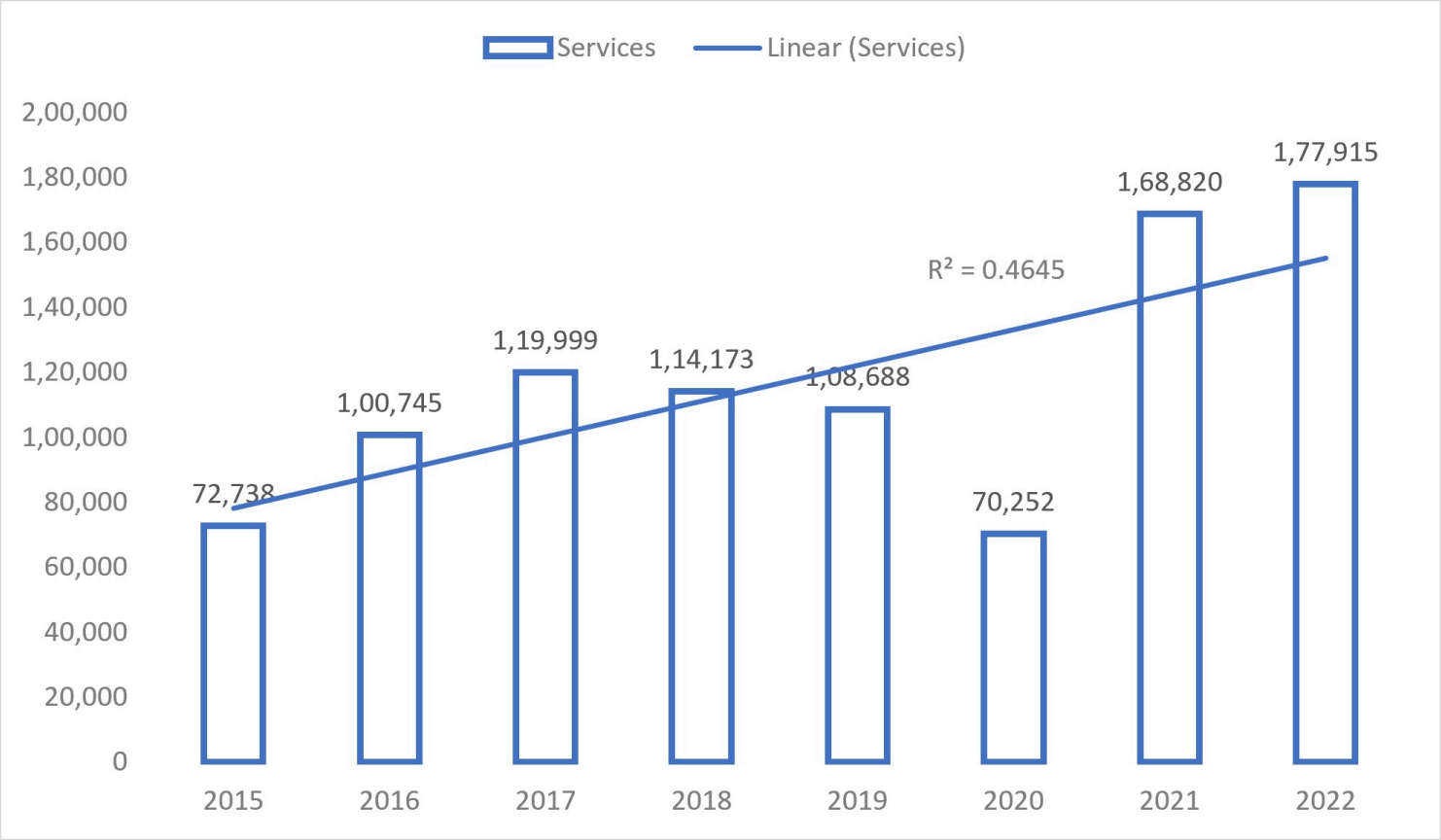


Figure 2

Similarly, the number of ED treatments and discharges significantly increased from 11,970 to 33,759 ($r = 0.717$, $p = 0.015$; $p < 0.05$)

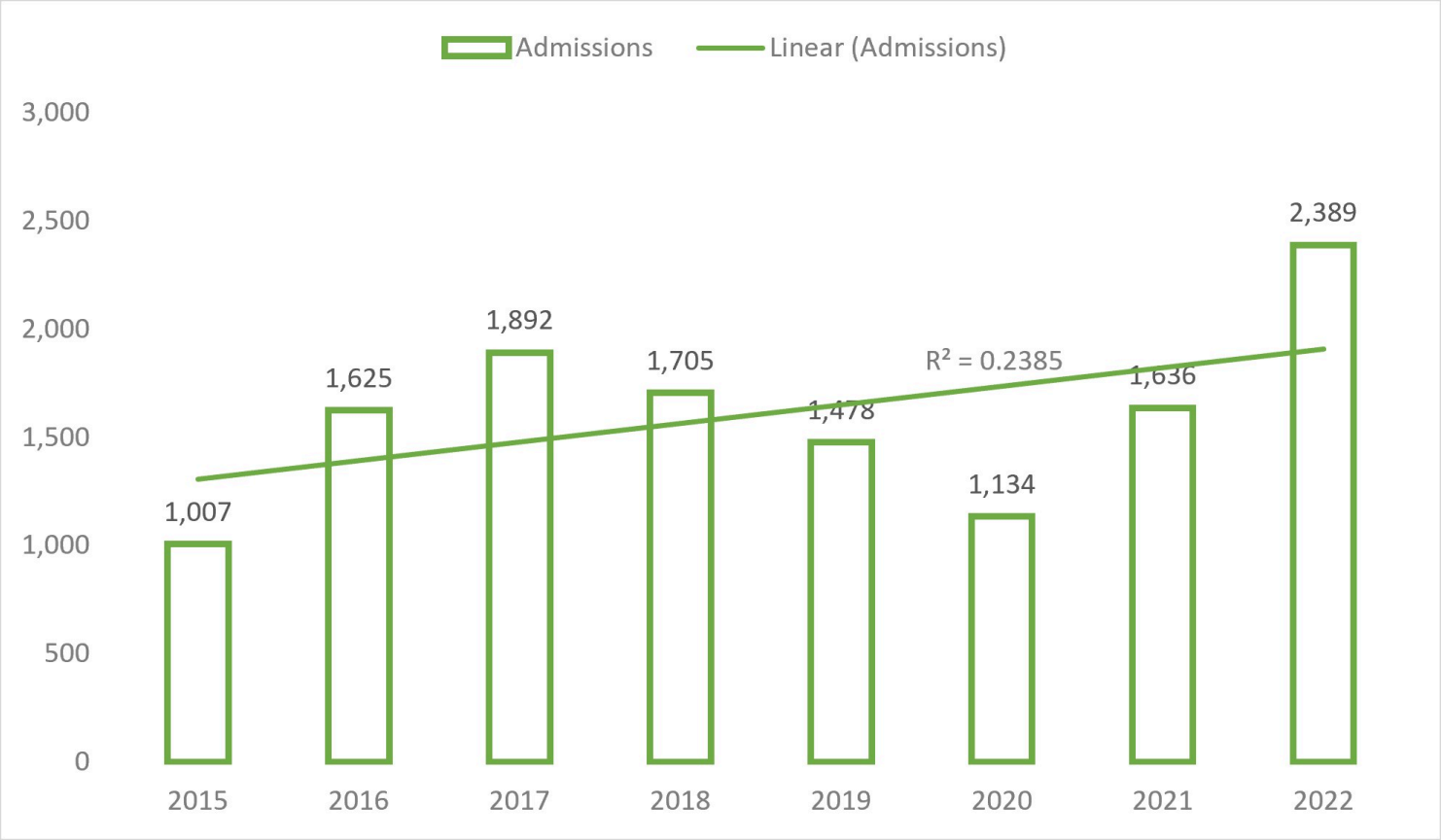


Figure 3

Annual percentage of patients requiring inpatient hospitalization between 2015 and 2022