



Cite as: KURNIK, Michał, GRZYB, Weronika, GRZYBOWSKA, Dominika, RZESZUTEK, Jakub, NIDERLA, Natalia, KUBICKI, Adrian, RACHWAŁ, Natalia, JAŚLIKOWSKA, Adrianna and IDZIK, Kamil. Emergency Department Utilization According to Patient Age and Type of Presenting Complaints: A Narrative Review. *Quality in Sport*. 2026;60:72899. <https://doi.org/10.12775/QS.2026.60.72899>

ARTICLE TIMELINE

Received: 31.05.2026. Revised: 20.06.2026. Accepted: 20.06.2026. Published: 26.06.2026.

The journal has been awarded 20 points in the parametric evaluation by the Polish Ministry of Higher Education and Science (Annex to the announcement of 05.01.2024, No. 32553). Unique Journal Identifier: 201398. Scientific disciplines: Medical Sciences; Health Sciences.

Punkty Ministerialne z 2019 – aktualny rok 20 punktów. Załącznik do komunikatu Ministra Szkolnictwa Wyższego i Nauki z dnia 05.01.2024 Lp. 32553. Posiada Unikatowy Identyfikator Czasopisma: 201398. Przypisane dyscypliny naukowe: Nauki medyczne; Nauki o zdrowiu. © The Authors 2026.

OPEN ACCESS · CC BY-NC-SA 4.0 This article is published with open access under the License Open Journal Systems of Nicolaus Copernicus University in Toruń, Poland, and is distributed under the terms of the Creative Commons Attribution Non-commercial Share Alike License (<http://creativecommons.org/licenses/by-nc-sa/4.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the work is properly cited. The authors declare no conflict of interest regarding the publication of this paper.

Emergency Department Utilization According to Patient Age and Type of Presenting Complaints: A Narrative Review

Michał Kurnik¹, ORCID <https://orcid.org/0009-0008-4791-0630>

E-mail: michalkurnik95@gmail.com

¹Wojewódzki Szpital Wielospecjalistyczny Megrez Sp. z o.o., 43-100 Tychy, Poland

Weronika Grzyb¹, ORCID <https://orcid.org/0009-0001-7622-281X>

E-mail: wgrzyb@gmail.com

¹Wojewódzki Szpital Wielospecjalistyczny Megrez Sp. z o.o., 43-100 Tychy, Poland

Dominika Grzybowska², ORCID <https://orcid.org/0009-0002-0599-8896>

E-mail: dominikagrzybowska996@gmail.com

²Szpital Wojewódzki im. Św. Łukasza w Tarnowie, 33-100 Tarnów, Poland

Jakub Rzeszutek², ORCID <https://orcid.org/0009-0007-7105-1031>

E-mail: jakub.rzeszutek11@gmail.com

²Szpital Wojewódzki im. Św. Łukasza w Tarnowie, 33-100 Tarnów, Poland

Natalia Niderla³, ORCID <https://orcid.org/0009-0001-5041-7846>

E-mail: natalia.niderla@yahoo.pl

³Szpital Czerniakowski w Warszawie, 00-739 Warszawa, Poland

Adrian Kubicki³, ORCID

<https://orcid.org/0009-0007-7792-3590>

E-mail: kubickiadr@gmail.com

³Szpital Czerniakowski Sp. z o. o. w Warszawie, 00-739 Warszawa, Poland

Natalia Rachwał⁴, ORCID <https://orcid.org/0000-0003-4224-4794>

E-mail: nrachwal03@gmail.com

⁴Wojewódzki Szpital Specjalistyczny im. Stefana Kardynała Wyszyńskiego SPZOZ w Lublinie, 20-718 Lublin, Poland

Adrianna Jaślikowska⁵, ORCID <https://orcid.org/0009-0003-1885-2711>

E-mail: adriannajaslikowska@gmail.com

⁵Wojskowy Szpital Kliniczny z Polikliniką SPZOZ w Lublinie, 20-049 Lublin, Poland

Kamil Idzik⁶, ORCID <https://orcid.org/0009-0000-7532-9255>

E-mail: kamilidzik99@gmail.com

⁶Szpital Murcki Sp. z o.o., 40-749 Katowice, Poland

Corresponding Author

Michał Kurnik, E-Mail: michalkurnik95@gmail.com

Abstract

Background: The number of patients presenting to hospital emergency departments (EDs) has been consistently increasing. Patients present with a wide spectrum of complaints, from specific symptoms directing diagnostic evaluation to entirely non-specific ones, and their clinical relevance varies with age.

Aim: To summarize and compare presenting complaints reported by ED patients across age groups and to discuss their association with clinical outcomes.

Material and methods: A literature search was performed in PubMed (MEDLINE) to identify publications on presenting complaints in ED patients. Case reports, case series, letters, editorials, and commentaries were excluded. Only English-language full-text studies were included; no date restrictions were applied.

Results: The spectrum of presenting complaints is broadly similar across age groups, whereas their frequency differs substantially with age. ED utilization is highest at the extremes of age. In children, infectious complaints (fever, respiratory and gastrointestinal symptoms) and injuries dominate, and hospitalization rates are low. In adults, the spectrum is more heterogeneous, and many patients are discharged with a symptom-based rather than definitive diagnosis. In older adults, non-specific complaints such as fatigue, weakness, and confusion become one of the most common reasons for presentation; their proportion rises with age and they are associated with higher hospitalization and mortality rates than complaints traditionally regarded as more urgent. The same complaint may carry a markedly different prognosis depending on age.

Conclusions: Both the frequency of presenting complaints and their clinical consequences in the ED are strongly age-dependent. The presenting complaint should be interpreted together with patient age, as a complementary component of risk assessment. Older patients with non-specific complaints warrant particular attention as a group at increased risk of adverse outcomes.

Key words: Emergency Department, Age group, Triage, Emergency Medicine, Patient Demographics.

1.1 Introduction

In contemporary healthcare systems, emergency departments (EDs) play a central role in the delivery of acute medical care [1]. Their primary objective is to provide assessment and treatment to patients in life-threatening conditions, as well as to those in situations posing a serious risk to health [1]. Patients in critical condition are most often transferred to EDs by prehospital emergency medical services, including ambulance teams and helicopter emergency medical services (HEMS) [1]. However, a substantial proportion of critically ill patients are transported by family members or present to the ED independently. Additionally, patients are frequently referred from primary healthcare facilities for the exclusion of acute conditions requiring urgent diagnostics or treatment.

Another important function of EDs is the initial assessment and stratification of patients into those requiring further inpatient diagnostics and treatment, and those who can continue evaluation within outpatient healthcare services [2]. For this reason, EDs play an essential role not only in clinical care but also in the overall organization and efficiency of healthcare systems [2].

In recent years, a gradual increase in the number of patients presenting to EDs has been observed worldwide [2,3]. This phenomenon is frequently associated with limited accessibility to primary healthcare services, as many patients perceive that their medical concerns will be addressed more rapidly in the ED than within primary care [5]. In some cases, primary care physicians refer patients to EDs for additional diagnostic testing that is not readily available in the outpatient setting. The growing number of presentations contributes to prolonged waiting times and ED crowding, which in turn may negatively affect patient satisfaction, quality of care, and clinical outcomes [2].

Because of differences in age, disease prevalence, and the severity of clinical symptoms among presenting patients, triage systems are widely used to prioritize care in EDs [4]. Depending on the specific model applied, patients are assigned to a priority category based on clinical parameters, presenting complaints, and overall condition, with each category corresponding to a recommended maximum waiting time for medical evaluation [4]. Although age alone does not directly determine triage priority, organizational differences between hospitals may result in paediatric patients being assessed separately by paediatric emergency physicians, creating independent patient pathways within the ED.

Patient-reported symptoms, clinical condition, and vital sign measurements are the key factors used to assign a triage category [4]. Although the spectrum of symptoms is broadly similar across age groups, their frequency and clinical significance vary substantially with patient age [5]. Moreover, the severity of a given symptom does not always correlate with the need for hospitalization. Many presenting complaints may initially suggest acute, life-

threatening conditions; however, following diagnostic evaluation and exclusion of serious pathology, a considerable proportion of such patients are discharged from the ED.

The rates of hospitalization and mortality among ED patients increase with age [5]. At the same time, the reason for presentation in older patients is not always specific. Alongside common causes of ED visits such as injuries, older adults frequently present with non-specific complaints such as "malaise" or "weakness," which often require extended diagnostic evaluation to determine whether an actual life-threatening or health-threatening condition is present [5]. Such non-specific presentations have been associated with higher rates of hospital admission and adverse outcomes in older populations [5].

As noted above, the spectrum of presenting complaints is broadly similar across age groups, but their frequency differs substantially between populations [5]. Presenting complaints can be further divided into specific complaints, which relatively narrow the differential diagnosis and guide further evaluation (e.g., chest pain), and non-specific complaints, which considerably broaden the differential diagnostic spectrum (e.g., "feeling unwell" or generalized weakness) [6,7]. In the literature, emergency department (ED) patients are most commonly stratified into three age categories: paediatric (0–18 years), adult (18–64 years), and geriatric (≥ 65 years) [5,8]. Some studies further divide the geriatric population into subgroups of 65–80 and ≥ 80 years [8]. This general stratification reflects both legal definitions of adulthood and the organization of medical specialties, which differ depending on the age-related prevalence of disease. The additional subdivision within the geriatric group is justified by differences in clinical outcomes and mortality observed for the same conditions between these two subgroups [8,9].

Among paediatric patients, the most frequently reported complaints include fever, upper respiratory tract infections, nausea and vomiting, and diarrhoea [10,11]. Trauma-related presentations, broadly defined, also represent a substantial proportion of paediatric ED visits, with musculoskeletal injuries being particularly common and their frequency increasing with age [12].

Among geriatric patients, the most common reasons for ED presentation include non-specific complaints such as malaise, fatigue, generalized weakness, and confusion [6,7,13]. These are followed by symptoms related to cardiovascular disease, particularly chest pain and dyspnoea, which are associated with high hospitalization and mortality rates in this age group [9,13].

The adult population is the most challenging to analyse, owing to its broad age range and the resulting heterogeneity of presenting complaints, which may differ substantially between young adults and those approaching 65 years of age [5,8]. In younger adults, chest pain and abdominal pain are common but are infrequently associated with serious adverse cardiac events [14], whereas in older adults the same complaints carry a markedly higher risk of hospitalization and mortality [5,8,9].

Despite numerous studies evaluating ED utilization and presenting complaints in selected populations, comprehensive analyses focusing on age-related differences in ED presentations remain limited. Therefore, the aim of this narrative review is to summarize the most common presenting complaints among ED patients across paediatric, adult, and older adult age groups, and to discuss their association with hospitalization rates and clinical outcomes, including mortality.

1.2.1 Research Objective:

The aim of this narrative review is to summarize the most common presenting complaints among emergency department patients across paediatric, adult, and geriatric age groups, and to discuss their association with hospitalization rates and clinical outcomes, including mortality.

1.2.2 Research Problems:

The present review addresses the following research questions:

What are the most frequent presenting complaints among emergency department patients in the paediatric, adult, and geriatric age groups?

How does the frequency of specific presenting complaints differ across age categories?

What is the relationship between presenting complaints and short-term clinical outcomes, including in-hospital mortality, across age categories?

Materials and methods

Search strategy

A literature search was performed in the PubMed (MEDLINE) database to identify studies relevant to the topic of emergency department (ED) utilization and presenting complaints across different age groups. No restrictions on publication date were applied, in order to capture both foundational and contemporary studies on the topic.

The following search terms and combinations were used: ("emergency department" OR "emergency room") AND ("presenting complaint*" OR "chief complaint*" OR "reason for visit") AND ("age" OR "elderly" OR "geriatric" OR "older adults" OR "pediatric" OR "paediatric" OR "adult"). Additional searches were performed for specific

presenting complaints frequently associated with age-related differences in hospitalization and outcomes, including "chest pain", "abdominal pain", "dyspnoea", "non-specific complaints", "weakness", "falls", and "trauma", combined with terms related to ED presentation and patient age.

Reference lists of selected articles were additionally screened to identify further relevant publications not retrieved through the initial database search.

Inclusion and exclusion criteria

Studies were considered eligible for inclusion if they met the following criteria: original research articles, systematic reviews, meta-analyses, or narrative reviews,

conducted in the setting of an emergency department or acute admission unit,

reporting data on presenting complaints, hospitalization rates, or clinical outcomes (including mortality) in relation to patient age, published in the English language, full text available.

The following types of publications were excluded: case reports and case series,

letters to the editor, editorials, and commentaries, studies focused exclusively on highly specialized patient populations without reference to general ED presentations (e.g., dedicated oncology or transplant cohorts), publications not available in full text in English.

2.3. Selection process

Titles and abstracts of the retrieved records were screened for relevance to the aim of the review. Articles considered potentially relevant were subsequently evaluated in full text. The selection of studies was purposive and aimed at providing a comprehensive overview of presenting complaints and clinical outcomes across paediatric, adult, and geriatric ED populations, rather than at performing an exhaustive systematic search. As this is a narrative review, no formal protocol (such as PRISMA) was applied, and no quantitative synthesis of results was undertaken.

Research results

Emergency department (ED) utilization differs substantially across age groups, both in terms of the frequency of visits and in clinical characteristics of the patients presenting for care. Understanding these age-related differences is essential for resource allocation, triage planning, and the interpretation of clinical outcomes [5,8].

3.1 Overall trends in ED utilization

ED visit rates show a characteristic distribution across the life course. Visit rates are highest at the extremes of age — infancy and very old age — and lower in young and middle-aged adults [6,13]. In a nationwide Italian study including over 20 million ED visits, the rate of presentations increased with age, reaching more than 650 visits per 1000 inhabitants in patients aged 90 years and older [13]. In the United States, older adults aged ≥ 65 years account for approximately 50 ED visits per year per 100 inhabitants, and the proportion of geriatric ED presentations is projected to increase further with population aging [15]. The appropriateness of ED visits also differs significantly with age. In the same Italian nationwide study, the proportion of visits classified as appropriate increased from 6.3% in the 5–9 years age group to 44.2% in the 95–99 years age group [13]. This finding reflects the clinical complexity of older patients, who more often present with conditions that genuinely require emergency assessment.

3.2 Hospitalization rates across age groups

The likelihood of hospital admission following ED evaluation rises markedly with patient age [5,8]. Ginsburg et al. demonstrated that older adults with the same chief complaint and the same triage acuity (Emergency Severity Index, ESI) as younger adults had significantly higher rates of hospital admission, greater ED resource utilization, and higher in-hospital and short-term mortality [8]. This effect was observed across all three age categories analysed (40–64, 65–79, and ≥ 80 years), with the highest rates in the oldest group [8]. In the Dutch multicenter cohort by Raven et al., hospitalization rates increased progressively across five age strata (0–18, 19–50, 51–65, 66–80, and > 80 years), with the steepest increase observed between middle-aged and older adults [5]. Similar patterns have been confirmed in nationwide registry data, where clinical severity/hospitalization mismatching — the discrepancy between symptom severity and need for admission — decreased steadily with age, from 62.9% in patients aged 30–34 years to 27.7% in those aged 95–99 years [13].

3.3 Mortality and adverse outcomes

In-hospital and short-term mortality among ED patients also rise sharply with age [5,6,8]. Safwenberg et al., in an observational study of nearly 13 000 non-surgical ED admissions, identified patient age as the most powerful predictor of in-hospital mortality, with the presenting complaint itself contributing additional prognostic information [6]. Their findings emphasize that the combination of age and presenting complaint provides clinically meaningful risk stratification at the point of ED triage. Older adults are also at increased risk of adverse outcomes after ED discharge. In the Italian nationwide cohort, 11.4% of patients aged ≥ 75 years died during hospitalization and an additional 8.8% were discharged to long-term care facilities [13]. A systematic review by Aminzadeh and

Dalziel concluded that older adults attending the ED are at high risk of functional decline, repeated ED presentations, and unplanned hospital admissions following the index visit [15].

3.4 Implications for ED organization

The distinct clinical profile of paediatric and geriatric ED patients has led many hospitals to develop dedicated care pathways. Paediatric patients are frequently assessed by paediatric emergency physicians within separate organizational structures [4,11]. In parallel, the growing recognition of the complexity of geriatric ED presentations has prompted the development of geriatric emergency departments and the implementation of geriatric assessment tools for risk stratification in this population [15]. Together, these adaptations reflect the awareness that age strongly influences not only the spectrum of presenting complaints but also the appropriate organization of care.

3.5 Paediatric patients (0-17)

The paediatric population (0–17 years) presenting to the emergency department (ED) is highly heterogeneous with respect to age distribution. The majority of paediatric ED visits involve children younger than 5 years of age, with infants and toddlers accounting for the largest proportion of presentations [10,11]. Massin MM et al. reported that 52.7% of paediatric ED visits were made by children below the age of 3 years, while only 9.5% involved adolescents [10]. Similarly, in the multicenter analysis of the Pediatric Emergency Care Applied Research Network (PECARN), which evaluated paediatric ED visits across multiple US tertiary care centers, the mean patient age was 6.2 years, with infants representing the single largest age subgroup [11]. Adolescent patients (12–17 years) constitute the smallest proportion of paediatric ED visits and are most frequently represented by individuals with previously diagnosed chronic conditions [10].

With regard to presenting complaints, fever is the most frequently reported symptom, accounting for more than 20% of all paediatric ED visits [10]. The next most common complaints are upper respiratory tract infections (URTIs) and diarrhoea, which together with fever constitute close to 50% of all chief complaints reported in paediatric EDs [10]. In terms of final diagnoses, upper respiratory tract infections dominate (26.7%), followed by viral syndrome (13.1%) and acute gastroenteritis (10.7%) [10]. Notably, infection-related conditions account for nearly two-thirds (63.9%) of paediatric ED presentations [10]. The PECARN data confirm this pattern: approximately 27% of paediatric ED visits in the network were attributable to infection-related diagnoses, and respiratory and gastrointestinal complaints remained among the most frequent reasons for evaluation across participating centers [11].

A noteworthy finding from the available data is that the majority of paediatric patients present to the ED during daytime hours, when primary healthcare services are normally available [10]. Massin MM et al. demonstrated that 55.1% of visits occurred during the day shift, while only 12.4% took place during the night shift [10]. This observation is particularly relevant from the perspective of healthcare organization, as it suggests that a substantial proportion of paediatric ED presentations could potentially be managed within primary care, in line with the broader phenomenon of ED utilization for non-urgent complaints discussed in the introduction. Hospitalization rates also varied by shift: 28.6% of children seen on the evening shift were admitted, compared with 22.1% during the day and 25.2% at night [10].

The epidemiology of paediatric ED visits also shows a clear seasonal pattern, with a higher number of presentations observed during winter and spring months, reflecting the seasonality of respiratory and gastrointestinal infections [10]. The PECARN dataset further demonstrated that paediatric ED visits are associated with characteristic demographic patterns, with male sex and younger age being independently associated with higher likelihood of hospital admission [11].

Among paediatric ED presentations, infections of the upper respiratory tract represent the most frequent infectious cause of attendance. In the European multicentre PERFORM study evaluating febrile children, upper respiratory tract infections (URTIs) accounted for 52.3% of all cases [16]. The majority of these infections are of viral origin (56%), while a bacterial aetiology is suspected in approximately one quarter of patients [17]. Despite the high prevalence of these conditions, the proportion of children requiring intensive care is low — only around 0.4% of the study population required admission to the paediatric intensive care unit (PICU), and fewer than 25% of children evaluated for respiratory or febrile complaints required hospitalization in a paediatric ward [17].

Fever was consistently the most common presenting symptom across all paediatric age groups, with reported frequencies ranging from 36% to 54% depending on the age subgroup analysed [17]. Other frequently observed symptoms included dyspnoea (17–34%), cough (9.2–15.5%), and vomiting (9.1–13.7%) [17]. Additional non-respiratory complaints accompanying infectious presentations included abdominal pain, oedema, and skin rash [17].

The PERFORM study also revealed considerable variability in hospital admission rates between European centres, with adjusted standardized admission rates ranging from 0.6 to 1.5 [16]. The variability was largest for short-stay admissions, paediatric intensive care admissions, and admissions for fever without an identifiable focus, suggesting that clinical decision-making in this group remains heterogeneous despite available guidelines [16]. By contrast,

admission rates for sepsis and meningitis showed minimal variation across centres (0.9–1.1), reflecting the consensus regarding the management of these critical presentations [16].

Gastrointestinal complaints represent one of the most common reasons for paediatric ED presentations. In the study by Massin MM et al., diarrhoea was the third most frequent chief complaint among paediatric patients, accounting for 10% of all visits, while acute gastroenteritis (AGE) ranked as the third most common final diagnosis (10.7%) [10]. Vomiting was reported as a co-occurring symptom in 9.1–13.7% of children presenting with infectious complaints [17].

The majority of paediatric AGE cases are of viral aetiology. Historically, rotavirus was the predominant pathogen; however, following the introduction of routine rotavirus vaccination in the United States in 2006, a marked decline in ED visits and hospitalizations related to paediatric AGE has been observed [21,22]. Subsequently, norovirus has become the leading cause of medically attended AGE in children younger than 5 years of age. In a large prospective surveillance study, Payne et al. detected norovirus in 21% of children below 5 years of age seeking medical attention for AGE [21]. Extrapolated to the US population, norovirus accounts for approximately 24,000 hospitalizations, 132,000 ED visits, and 925,000 outpatient visits annually among children younger than 5 years of age [21].

The epidemiology of ED visits for gastrointestinal complaints shows a distinct seasonal pattern. Diarrhoea-related visits peak during winter months, corresponding to norovirus activity in the general population, whereas rotavirus historically contributed substantially to ED visits among children younger than 5 years of age [23]. Data from the US BioSense surveillance system support the use of ED chief complaint analysis as a near real-time indicator of norovirus activity in the population [23].

From a clinical standpoint, the majority of children with AGE are managed in the outpatient setting with oral rehydration therapy, while hospitalization is generally reserved for patients with severe dehydration or complications [20]. Mortality associated with AGE in developed countries is low; nevertheless, on a global scale, acute diarrhoeal diseases remain among the leading causes of death in children under 5 years of age, particularly in low-income settings [21].

Trauma represents one of the leading reasons for paediatric ED presentations, and its frequency has been steadily increasing in recent decades. In a ten-year analysis of 33 US children's hospitals, Lee LK et al. demonstrated that the proportion of trauma-related ED visits rose from 16.3% in 2010 to 18.1% in 2019 [19]. Notably, during the same period a decline in hospitalization rates following paediatric trauma was observed, despite an increase in the use of advanced imaging modalities such as computed tomography [19].

The patterns of paediatric trauma are closely related to patient age. In a retrospective analysis of 12,508 paediatric trauma patients, Cintean R et al. stratified the cohort into five age groups: infants under 1 year of age (8.8%), toddlers aged 1–3 years (16.8%), preschool children aged 4–6 years (19.3%), young school-aged children aged 7–10 years (27.1%), and young adolescents aged 11–14 years (27.9%) [18]. Male sex predominated across all age groups [18]. The location and mechanism of injury also varied with age: head injuries were most frequent in the youngest children, reflecting the disproportionately large head size in this age group, while fractures of the long bones predominated in school-aged children [18].

Musculoskeletal pain as a distinct chief complaint also shows a clear age-related distribution. In the study by de Inocencio et al. involving children aged 3–14 years, the frequency of ED visits due to musculoskeletal pain increased with age [12]. The most common pain locations were the wrist (19%), ankle (19%), and finger (15%), which together accounted for approximately 50% of all presentations in this category [12]. The predominant aetiology was trauma (88.4%), including contusions (38%), fractures (21%), and sprains (18%) [12]. Fractures occurred significantly more frequently in boys than in girls (64% vs 36%) [12].

From a clinical perspective, the majority of paediatric trauma cases are of mild to moderate severity and do not require hospital admission. The trend observed by Lee LK et al., showing an increase in trauma-related ED visits accompanied by a decrease in hospitalization rates, suggests that a substantial proportion of trauma presentations could potentially be managed outside the emergency care setting — a relevant observation in the context of the growing problem of ED overcrowding [19].

3.6 Adult patients (18-64)

The adult patient population (18–64 years) represents the most heterogeneous group among emergency department (ED) attendees, both demographically and clinically. The spectrum of presenting complaints and the risk of adverse outcomes vary substantially with age within this group, which makes it difficult to characterize a single "typical" adult ED patient.

In a multicentre population-based study by Bjørnsen et al. of adult non-trauma ED presentations, the frequency of chief complaints was as follows: non-specific symptoms 19%, abdominal pain 16%, dyspnoea 12%, fever 8%, chest pain 8%, and neurological complaints 7% [24]. The overall 30-day mortality in this population was 3.5%, with 1.7% of patients dying within the first 7 days and 1.8% between days 8 and 30 [24]. The presenting complaint was significantly associated with early mortality (0–7 days) but not with later mortality — dyspnoea was associated

with a 2.4-fold higher risk of death within the first week, while the highest mortality was observed in patients aged ≥ 80 years and in those with substantial comorbidities [24].

Chest pain and abdominal pain are reported as the most frequent reasons for ED visits among persons aged 15 years and older [25]. In a national US analysis by Bhuiya et al. covering a ten-year period (1999–2008), the proportion of chest pain visits that resulted in a diagnosis of acute coronary syndrome (ACS) decreased by 44.9% [25]. This change reflects both advances in risk stratification and a growing tendency for patients with low-risk chest pain to seek emergency evaluation [25]. In a large cohort of 77,652 adult chest pain patients in whom acute myocardial infarction was not diagnosed at the ED, the overall hospitalization rate was 14.2%, and 30-day mortality or acute myocardial infarction occurred in only 0.4% of patients [26]. Importantly, clinical characteristics and prognosis differ markedly between younger and older adults: in a prospective study by Walker et al. of patients younger than 40 years with chest pain, although 32% were hospitalized, the rate of major adverse cardiovascular events within 30 days was low [14].

Abdominal pain, alongside chest pain, is among the most common chief complaints in adults. In a retrospective analysis by Cervellin et al. of 5,340 cases of acute abdominal pain in adults, this complaint accounted for 7–10% of all ED visits [27]. Despite a broad differential diagnosis and the frequent use of active clinical observation (52% of patients), the proportion of diagnostic changes at re-presentation was negligible, suggesting good stability of initial ED evaluation [27].

A noteworthy issue concerning adult ED patients is that a substantial proportion are discharged without a pathological diagnosis, receiving only a symptomatic one. In a nationally representative analysis by Wilper et al. of 164 million adult ED visits in the US, the proportion of patients discharged with a pathological diagnosis was 55% for chest pain, 71% for abdominal pain, and 70% for headache [28]. This means that nearly half of adults presenting with chest pain are discharged with a symptomatic diagnosis, reflecting both diagnostic difficulty and the precautionary nature of ED evaluation [28]. Moreover, the authors observed that between 1993 and 2009 the proportion of pathological diagnoses in these patients decreased from 72% to 63%, possibly reflecting a changing threshold for ED attendance and a growing share of patients with less specific complaints [28].

The heterogeneity of the adult group is further complicated by presentation patterns characteristic of younger adults. In this subgroup, alcohol-related visits, injuries, and mental health problems constitute a notable proportion of ED attendances, whereas in older adult subgroups the proportion of such presentations is considerably lower. These differences between young adults and those approaching 65 years of age limit the clinical utility of a single characterization of "the adult ED patient" and reinforce the rationale for subdividing this population in epidemiological analyses.

3.7 Geriatric patients (≥ 65)

Geriatric patients (≥ 65 years) constitute the fastest-growing population among emergency department (ED) attendees. According to Aminzadeh and Dalziel, older adults account for up to 25% of all ED visits, and their share continues to increase in parallel with the ageing of the general population [15]. Geriatric patients differ from younger adults not only in the frequency of presenting complaints, but also in their greater burden of multimorbidity, increased susceptibility to adverse clinical outcomes, and a higher prevalence of atypical clinical presentations [15]. For these reasons, several analyses further stratify the geriatric population into 65–79 and ≥ 80 year subgroups, since the risks of hospitalization and death change substantially between these subgroups [8].

One of the most distinctive features of geriatric ED presentations is the prominence of non-specific complaints (NSC). These most commonly include fatigue, generalized weakness, confusion, risk of falling, and "feeling unwell" [7,9]. In a nationwide Italian analysis, Vanzetto et al. demonstrated that NSC accounted for as much as 21.6% of all ED presentations in patients ≥ 75 years of age [13]. In the study by Erwander et al. of 4,927 older ED patients, 11% presented with NSC as their chief complaint, and these patients had the highest mean age in the entire cohort [9].

Importantly, although NSC are by definition non-specific, their prognosis in older adults is worse than that of many complaints traditionally regarded as more "alarming". In the cohort of 1,784 older patients studied by Wachelder et al., patients with NSC were hospitalized significantly more frequently than those with specific complaints (84.0% vs 71.1%; $p < 0.001$), had a longer hospital length of stay (median 9 vs 6 days), and a higher 30-day mortality (20.1% vs 11.0%) [7]. Similar findings were reported by Erwander et al.: patients with NSC and dyspnoea had the highest hospital admission rates (70% and 79%, respectively) compared with chest pain (63%) and abdominal pain (61%), and NSC together with dyspnoea were associated with the highest 30-day mortality [9].

Chest pain and dyspnoea represent, alongside NSC, the most common "classic" reasons for older patients to attend the ED. In the Erwander et al. cohort, chest pain accounted for 32%, dyspnoea for 27%, and abdominal pain for 30% of all presentations among older adults [9]. However, it must be emphasised that the same complaint in an older patient carries a markedly higher risk of hospitalization than in a younger adult. In a retrospective study of older patients (> 75 years) presenting with chest pain, the hospitalization rate was 83.5%, with a 1-year mortality of 12% [32]. This stands in sharp contrast to data for younger adults with the same chief complaint, in whom hospitalization rates rarely exceed 30% and 30-day mortality is below 1% [14,26].

Dyspnoea in geriatric patients deserves particular attention. In a Swedish cohort of 29,291 patients presenting with dyspnoea or chest pain, dyspnoea patients were significantly older (median 64 vs 56 years), had greater comorbidity, a higher hospitalization rate (48% vs 30%), and a five-fold higher long-term mortality compared with chest pain patients [29]. Similarly, in the geriatric cohort analysed by Erwander et al., dyspnoea and NSC were associated with the highest 30-day mortality across the entire study population [9].

Falls represent a distinct and clinically important category of ED presentations in older adults. They constitute a leading cause of injury and injury-related hospitalization in the geriatric population and generate a substantial economic burden for healthcare systems [31]. In the study by Choi et al. of 1,840 individuals aged ≥ 60 years receiving medical attention for fall-related injuries, approximately one third used ambulance services, more than a third had an ED visit without hospitalization, and nearly one fifth required an overnight hospital stay [30]. Factors associated with hospitalization included hip and head injuries, facial injuries, fractures, falls occurring at home, and living alone [30].

Geriatric patients consistently demonstrate higher rates of hospitalization and mortality than other age groups, regardless of the presenting complaint. In the analysis by Ginsburg et al., older adults with the same chief complaint and the same triage acuity level as younger patients had significantly higher rates of hospital admission, greater ED resource utilization, and higher short-term mortality, with the highest values observed in the ≥ 80 year subgroup [8]. These differences justify the further subdivision of the geriatric group into 65–79 and ≥ 80 year subgroups. The Raven et al. study supports this pattern, demonstrating that case-mix adjusted odds of hospitalization and mortality increase with age for most presenting complaints [5].

These observations have important consequences for the organization of emergency care for older adults. Patients with NSC, although clinically appearing less "alarming", are often assigned lower triage priority, which stands in contrast to their actual prognosis [7,9]. For this reason, increasing emphasis is being placed in the literature on the use of dedicated geriatric assessment tools and on the integration of frailty assessment into ED triage processes [15]. The recognition that non-specific complaints in older adults may represent an early signal of serious, life-threatening pathology constitutes one of the central messages of contemporary geriatric emergency medicine.

3.8 Specific vs. non-specific complaints and clinical outcomes

One theme recurring across all analysed age groups is the distinction between specific and non-specific presenting complaints. Specific complaints, such as chest pain, dyspnoea, or abdominal pain, relatively narrow the differential diagnosis and guide further management. Non-specific complaints (NSC) — including fatigue, generalized weakness, confusion, risk of falling, and "feeling unwell" — considerably broaden the range of possible diagnoses and complicate initial clinical assessment [7,9]. This distinction is of importance not only diagnostically, but also prognostically and organizationally.

The frequency of NSC as a chief complaint clearly increases with patient age. In the paediatric population, presenting complaints are mostly relatively specific and linked to defined clinical conditions, primarily infectious and traumatic [10,11]. In the adult non-trauma population, NSC already constitute a substantial proportion of presentations — in the multicentre study by Bjørnsen et al., they were the most frequent category of chief complaint, accounting for 19% of all presentations [24]. In the geriatric population, this phenomenon is even more pronounced: in a nationwide Italian analysis, NSC accounted for 21.6% of all presentations among patients ≥ 75 years of age [13]. This pattern reflects both the greater burden of multimorbidity and the higher prevalence of atypical clinical presentations in older adults, in whom serious conditions may manifest with non-specific symptoms [9,15].

A key observation emerging from the reviewed literature is that NSC — although clinically appearing less "alarming" — are associated with a worse prognosis than many complaints regarded as more specific. In the study by Wachelder et al., older patients with NSC were hospitalized more frequently (84.0% vs 71.1%) and had an almost two-fold higher 30-day mortality (20.1% vs 11.0%) compared with patients presenting with specific complaints [7]. Similarly, Erwander et al. demonstrated that NSC and dyspnoea were associated with the highest hospitalization rates and the highest 30-day mortality among all analysed chief complaints in older adults [9].

This phenomenon contrasts with the prognosis of certain complaints traditionally classified as urgent. Chest pain, usually assigned to high triage categories, is in many cases associated with a relatively low risk of hospitalization and death, particularly in younger patients [5,26]. Raven et al. noted that chest pain and palpitations, although often triaged as "very urgent", carry a low risk of hospitalization and mortality [5]. It follows that triage priority assigned on the basis of the presenting complaint alone does not always reflect the patient's actual prognosis.

The analysis of individual age groups indicates that the same presenting complaint carries a different risk depending on patient age. Chest pain in a younger adult is associated with a hospitalization rate that rarely exceeds 30% and very low mortality [14,26], whereas in older patients the same complaint may lead to hospitalization in more than 80% of cases [32]. Similarly, the risk associated with abdominal pain and dyspnoea increases with age [5,29]. Raven et al. demonstrated that, for most presenting complaints, the case-mix adjusted odds of hospitalization and mortality increase with each successive age category [5].

This observation provides the principal rationale for analysing presenting complaints together with patient age rather than in isolation. The combined interpretation of the presenting complaint and patient age as complementary components of initial risk assessment, and its implications for clinical practice, are discussed in more detail below.

4. Discussion

The analysis of studies conducted by numerous authors across different countries — including Europe, the United States, and the Middle East — consistently demonstrates an upward trend in the number of patients presenting to emergency departments (EDs) [2,3]. The reviewed literature further indicates that, although the spectrum of presenting complaints is broadly similar across age groups, the frequency of individual complaints differs substantially between age categories, and in some cases differences can also be observed between subgroups within the same age category [5]. Moreover, the clinical consequences of a given presenting complaint vary considerably between age groups, influencing the risk of hospitalization, length of hospital stay, and mortality [5,8]. A growing challenge identified throughout the reviewed literature is the increasing proportion of non-specific complaints. Whereas specific complaints narrow the diagnostic possibilities and direct the diagnostic process, non-specific complaints require a broad diagnostic evaluation and frequently result in discharge with a symptom-based rather than a definitive diagnosis [7,28]. Trauma patients constitute a separate category, in which the concept of non-specific complaints is less applicable, although the pattern of injuries also differs across age groups [12,18].

4.1 ED utilization is concentrated at the extremes of age

The reviewed literature indicates that overall ED utilization is highest at the extremes of age — in the paediatric and geriatric populations [5,13]. Although these two groups reach the ED through different pathways, both patterns may be linked to patient autonomy and the legal framework of access to medical care. In minors, responsibility for health-related decisions rests with parents and guardians, who may more readily decide to attend an ED, where diagnostic capabilities are broader than in primary care. Notably, the leading paediatric reasons for presentation — fever, diarrhoea, and upper respiratory tract infections — are conditions that can, in principle, be managed within primary care [10]. The preference for ED attendance may therefore reflect broader diagnostic availability and parental concern that primary care evaluation may be insufficient, rather than true clinical urgency. Older adults, in turn, may preferentially attend EDs because of reduced mobility, the broader diagnostic and therapeutic options available there, and the possibility that age-related changes intensify the perceived severity of symptoms.

This convergence of high-utilizing groups at both ends of the age spectrum has important system-level implications. Given the ageing of the population in most countries, the number of older patients is likely to continue increasing, which may strain the capacity of emergency care systems [13,15]. As discussed below, this concern is amplified by the fact that older patients not only attend EDs more frequently but also experience worse outcomes once they do.

4.2 The same presenting complaint carries different risk depending on age

A central observation emerging from the reviewed literature is that the prognostic meaning of a presenting complaint cannot be interpreted independently of patient age. The likelihood of subsequent hospitalization in other hospital departments following ED evaluation increases with age, as does mortality [5,8]. This pattern is most clearly illustrated by individual complaints whose aetiology shifts across the lifespan.

Chest pain is a representative example. In the paediatric population it is most frequently of musculoskeletal origin, whereas in adults it may be associated with acute coronary syndromes [14,25]. The prognostic consequences differ accordingly: chest pain in adults far less frequently results in hospitalization and death than in the geriatric population, in which this complaint is associated with a 1-year mortality of 12% [32]. This gradient reflects increasing multimorbidity and the higher likelihood of acute coronary syndrome or pulmonary embolism in older patients [32]. Dyspnoea follows a similar logic: whereas in children it is most often of infectious origin, in adults it may signal acute conditions such as pulmonary embolism, and when reported as a presenting complaint it is associated with increased mortality, particularly in the presence of comorbidities [24,29]. Abdominal pain likewise requires a broad diagnostic evaluation that varies in yield across age groups [27].

Taken together, these observations indicate that the presenting complaint and patient age function as complementary components of risk stratification. The same symptom label may correspond to a benign musculoskeletal condition in a young patient and to a life-threatening cardiovascular event in an older one. This has direct consequences for triage, since a complaint-based priority that does not account for age may misrepresent the actual risk of an individual patient.

4.3 The rising burden of non-specific complaints

A further challenge identified throughout the reviewed literature is the increasing proportion of non-specific complaints, and the fact that this proportion rises with age. In the paediatric population, presenting complaints are mostly relatively specific and linked to defined clinical conditions, predominantly infectious and traumatic; even the less specific paediatric symptoms, such as cough or vomiting, differ from the spectrum observed in older populations [10,17]. In adults, the share of non-specific complaints increases, and in the geriatric population such complaints — most often fatigue and generalized weakness — become one of the dominant reasons for presentation [7,9,24].

The central interpretive point is that this rising burden is not merely a diagnostic inconvenience but a prognostic concern. Whereas specific complaints narrow the diagnostic possibilities and direct the diagnostic process, non-specific complaints require a broad evaluation and frequently result in discharge with a symptom-based rather than a definitive diagnosis [7,28]. In the adult population this diagnostic uncertainty is particularly visible, as a substantial proportion of patients are discharged with a symptom-based diagnosis [28]. This outcome is, however, consistent with the function of the ED, whose purpose is to identify and manage conditions threatening life and health; once such conditions have been excluded, the patient should be referred for further outpatient diagnosis [28].

In older patients, by contrast, non-specific complaints carry implications that go beyond diagnostic uncertainty. Such complaints often have a worse prognosis than specific ones [7,9]. This may be related to their underestimation during triage, and to the fact that acute life-threatening conditions in this age group need not manifest with acute symptoms — infections leading to sepsis need not present with fever, and confusion may not be readily apparent against the background of the patient's baseline status [9]. The combination of diminished physiological reserve, multimorbidity, and frailty means that, in the oldest patients, the threat arises not only from the disease itself but also from its treatment, which may constitute an excessive burden without necessarily improving the patient's condition [8,15]. This is reflected in the common use of an 80-year cut-off, above which mortality for the same presenting complaint begins to rise sharply [8].

4.4 Trauma as a distinct category

Trauma patients constitute a separate category that does not fit the specific/non-specific distinction, as injuries are by nature specific; nevertheless, their pattern also varies with age. In children, trauma is closely related to body proportions: head injuries predominate in the youngest children owing to the disproportionately large head, whereas extremity injuries become more frequent in school-aged children in association with increasing physical activity [18]. Hospitalization for paediatric trauma is, however, relatively uncommon [12,19].

In older adults, by contrast, trauma is dominated by falls, which again differ from the patterns seen in younger groups. Falls and the associated injuries in this group more frequently require the involvement of emergency medical services and are more often associated with fractures [30]. At this age, fractures constitute a serious threat and are associated with higher short-term mortality than in other age groups [30,31]. Importantly, injuries in older adults are not necessarily caused by high-energy trauma but may result from same-level falls [30]. Trauma therefore reinforces the central theme of this review: although the complaint category itself is constant, its frequency, mechanism, and prognosis are strongly age-dependent.

4.5 Strengths and limitations

This review has several limitations that should be acknowledged. First, the literature search was conducted in a single database (PubMed/MEDLINE). Although PubMed provides broad coverage of the biomedical literature, relevant studies indexed in other databases, such as Scopus, Web of Science, or Embase, may not have been captured. Second, as a narrative review, the study did not follow a formal protocol such as PRISMA, did not include a systematic quality appraisal of the included studies, and did not involve a quantitative synthesis of results; the selection of studies was purposive, which introduces a risk of selection bias. Third, the included studies were highly heterogeneous in design, setting, and definitions. In particular, the age thresholds used to define paediatric, adult, and geriatric populations varied between studies, as did the definitions of non-specific complaints, which limits the direct comparability of reported frequencies and outcomes. Fourth, most of the included studies originated from high-income countries in Europe and North America, which may limit the generalizability of the findings to other healthcare systems. Finally, only articles available in full text in English were included, which may have introduced a language bias.

Despite these limitations, the review also has notable strengths. It synthesizes evidence across the entire age spectrum, from paediatric to geriatric patients, rather than focusing on a single population. It applied no restrictions on publication date, allowing both foundational and contemporary studies to be considered. Furthermore, by consistently examining presenting complaints in conjunction with patient age, the review highlights the recurring theme of non-specific complaints and their prognostic significance, which may be of practical relevance for emergency care.

4.6 Implications and future directions

The findings of this review carry several implications for clinical practice. The observation that the prognostic meaning of a presenting complaint depends strongly on patient age suggests that the presenting complaint and patient age should be interpreted together, as complementary components of initial risk stratification, rather than in isolation. Particular attention is warranted for older patients presenting with non-specific complaints, who, despite an apparently benign clinical picture, represent a group at increased risk of hospitalization and death, while frequently being assigned lower triage priority. Awareness of this discrepancy among ED staff, together with consideration of integrating frailty assessment into the triage process, may contribute to improved early identification of high-risk patients.

Several directions for future research can be identified. There is a need for greater standardization of definitions, particularly the age thresholds used to delineate patient groups and the criteria defining non-specific complaints,

which would improve the comparability of future studies. Further research is also needed to evaluate whether triage instruments that explicitly incorporate patient age and frailty improve the identification of high-risk patients compared with complaint-based triage alone. Finally, studies conducted in a wider range of healthcare systems, including low- and middle-income countries, would help to clarify the extent to which the patterns described in this review can be generalized.

5. Conclusions

This narrative review, synthesizing the available literature, shows that the spectrum of complaints with which patients present to emergency departments is similar regardless of country. Likewise, the spectrum of complaints across individual age groups is similar in terms of the symptoms reported, but differs with respect to their frequency. The proportion of non-specific complaints increases with patient age. Unfortunately, patients presenting with such complaints also have worse clinical outcomes. This demonstrates that the presenting complaint must be interpreted in the context of the patient's age group, rather than in isolation. This is particularly relevant in the context of an ageing population.

Disclosure

Supplementary Materials:

No supplementary materials are available.

Author Contributions:

Conceptualization, [MK, WG, JR]; methodology, [MK, NN, NR]; literature search, [MK, WG, DG, KI, AK]; writing—original draft preparation, [NN, NR, JR, AJ, AK, MK]; writing—review and editing, [MK, WG, KI, DG, AJ]. The authors have read and agreed to the published version of the manuscript.

Funding:

This research received no external funding.

Institutional Review Board Statement:

Not applicable.

Informed Consent Statement:

Not applicable.

Data Availability Statement:

No new data were created or analyzed in this study. Data sharing is not applicable to this article.

Conflicts of Interest:

The authors declare no conflict of interest.

During the preparation of this work, the authors used Claude (Anthropic) for the purpose of language refinement, including translation from Polish to English, correction of grammar and spelling, improvement of academic style and phrasing, and identification of linguistic errors throughout the manuscript. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the substantive content of the publication.

References:

- Peleg K, Pliskin JS. A geographic information system simulation model of EMS: reducing ambulance response time. *Am J Emerg Med.* 2004 May;22(3):164-70. doi: 10.1016/j.ajem.2004.02.003. PMID: 15138950.
- Morley C, Unwin M, Peterson GM, Stankovich J, Kinsman L. Emergency department crowding: A systematic review of causes, consequences and solutions. *PLoS One.* 2018 Aug 30;13(8):e0203316. doi: 10.1371/journal.pone.0203316. PMID: 30161242; PMCID: PMC6117060.
- Ohaiba MM, Anamazobi EG, Okobi OE, Aguda K, Chukwu VU. Trends and Patterns in Emergency Department Visits: A Comprehensive Analysis of Adult Data From the National Center for Health Statistics (NCHS) Database. *Cureus.* 2024 Aug 3;16(8):e66059. doi: 10.7759/cureus.66059. PMID: 39229409; PMCID: PMC11368583.
- Zachariasse JM, van der Hagen V, Seiger N, Mackway-Jones K, van Veen M, Moll HA. Performance of triage systems in emergency care: a systematic review and meta-analysis. *BMJ Open.* 2019 May 28;9(5):e026471. doi: 10.1136/bmjopen-2018-026471. PMID: 31142524; PMCID: PMC6549628.
- Raven W, van den Hoven EMP, Gaakeer MI, Ter Avest E, Sir O, Lameijer H, Hessels RAPA, Reijnen R, van Zwet E, de Jonge E, Nickel CH, de Groot B. The association between presenting complaints and clinical outcomes in emergency department patients of different age categories. *Eur J Emerg Med.* 2022 Feb 1;29(1):33-41. doi: 10.1097/MEJ.0000000000000860. PMID: 34406137.
- Sauter TC, Capaldo G, Hoffmann M, Birrenbach T, Hautz SC, Kämmer JE, Exadaktylos AK, Hautz WE. Non-specific complaints at emergency department presentation result in unclear diagnoses and lengthened

hospitalization: a prospective observational study. *Scand J Trauma Resusc Emerg Med.* 2018 Jul 16;26(1):60. doi: 10.1186/s13049-018-0526-x. PMID: 30012186; PMCID: PMC6048907.

Wachelder JH, Stassen PM, Hubens LPAM, Brouns SHA, Lambooij SLE, Dieleman JP, Haak HR. Elderly emergency patients presenting with non-specific complaints: Characteristics and outcomes. *PLoS One.* 2017 Nov 30;12(11):e0188954. doi: 10.1371/journal.pone.0188954. PMID: 29190706; PMCID: PMC5708794.

Ginsburg AD, Oliveira J E Silva L, Mullan A, Mhayamaguru KM, Bower S, Jeffery MM, Bellolio F. Should age be incorporated into the adult triage algorithm in the emergency department? *Am J Emerg Med.* 2021 Aug;46:508-514. doi: 10.1016/j.ajem.2020.10.075. Epub 2020 Nov 4. PMID: 33191046.

Erwander K, Ivarsson K, Olsson ML, Agvall B. Elderly patients with non-specific complaints at the emergency department have a high risk for admission and 30-days mortality. *BMC Geriatr.* 2024 Jan 3;24(1):5. doi: 10.1186/s12877-023-04621-7. PMID: 38172691; PMCID: PMC10762826.

Massin MM, Montesanti J, Gérard P, Lepage P. Spectrum and frequency of illness presenting to a pediatric emergency department. *Acta Clin Belg.* 2006 Jul-Aug;61(4):161-5. doi: 10.1179/acb.2006.027. PMID: 17091911.

Alpern ER, Stanley RM, Gorelick MH, Donaldson A, Knight S, Teach SJ, Singh T, Mahajan P, Goepf JG, Kuppermann N, Dean JM, Chamberlain JM; Pediatric Emergency Care Applied Research Network. Epidemiology of a pediatric emergency medicine research network: the PECARN Core Data Project. *Pediatr Emerg Care.* 2006 Oct;22(10):689-99. doi: 10.1097/01.pec.0000236830.39194.c0. PMID: 17047467.

de Inocencio J, Carro MÁ, Flores M, Carpio C, Mesa S, Marín M. Epidemiology of musculoskeletal pain in a pediatric emergency department. *Rheumatol Int.* 2016 Jan;36(1):83-9. doi: 10.1007/s00296-015-3335-9. Epub 2015 Aug 11. PMID: 26259985.

Fimognari FL, Lelli D, Landi F, Antonelli Incalzi R. Association of age with emergency department visits and hospital admissions: A nationwide study. *Geriatr Gerontol Int.* 2022 Nov;22(11):917-923. doi: 10.1111/ggi.14481. Epub 2022 Sep 18. PMID: 36116913.

Walker NJ, Sites FD, Shofer FS, Hollander JE. Characteristics and outcomes of young adults who present to the emergency department with chest pain. *Acad Emerg Med.* 2001 Jul;8(7):703-8. doi: https://doi.org/10.1111/j.1553-2712.2001.tb00188.x. PMID: 11435184.

Aminzadeh F, Dalziel WB. Older adults in the emergency department: a systematic review of patterns of use, adverse outcomes, and effectiveness of interventions. *Ann Emerg Med.* 2002 Mar;39(3):238-47. doi: 10.1067/mem.2002.121523. PMID: 11867975.

Borensztajn DM, Hagedoorn NN, Rivero Calle I, Maconochie IK, von Both U, Carrol ED, Dewez JE, Emonts M, van der Flier M, de Groot R, Herberg J, Kohlmaier B, Lim E, Martinon-Torres F, Nieboer D, Nijman RG, Pokorn M, Strle F, Tsolia M, Vermont C, Yeung S, Zavadzka D, Zenz W, Levin M, Moll HA; PERFORM consortium: Personalised Risk assessment in febrile children to optimise Real-life Management across the European Union. Variation in hospital admission in febrile children evaluated at the Emergency Department (ED) in Europe: PERFORM, a multicentre prospective observational study. *PLoS One.* 2021 Jan 7;16(1):e0244810. doi: 10.1371/journal.pone.0244810. PMID: 33411810; PMCID: PMC7790386.

Khojah IM, Alazhary NW, Alyazidi AS, Alsubaie MA, Alghamdi MK, Jawhari AA. Pediatric respiratory infectious emergencies: clinical profiles and outcomes. *J Med Life.* 2024 Jul;17(7):716-721. doi: 10.25122/jml-2024-0044. PMID: 39440329; PMCID: PMC11493157.

Cintean R, Eickhoff A, Zieger J, Gebhard F, Schütze K. Epidemiology, patterns, and mechanisms of pediatric trauma: a review of 12,508 patients. *Eur J Trauma Emerg Surg.* 2023 Feb;49(1):451-459. doi: 10.1007/s00068-022-02088-6. Epub 2022 Aug 24. PMID: 36001123; PMCID: PMC9925538.

Lee LK, Porter JJ, Mannix R, Rees CA, Schutzman SA, Fleegler EW, Farrell CA. Pediatric Traumatic Injury Emergency Department Visits and Management in US Children's Hospitals From 2010 to 2019. *Ann Emerg Med.* 2022 Mar;79(3):279-287. doi: 10.1016/j.annemergmed.2021.10.008. Epub 2021 Nov 25. PMID: 34839942.

Freedman SB, Hall M, Shah SS, Kharbanda AB, Aronson PL, Florin TA, Mistry RD, Macias CG, Neuman MI. Impact of increasing ondansetron use on clinical outcomes in children with gastroenteritis. *JAMA Pediatr.* 2014 Apr;168(4):321-9. doi: 10.1001/jamapediatrics.2013.4906. PMID: 24566613.

Payne DC, Vinjé J, Szilagyi PG, Edwards KM, Staat MA, Weinberg GA, Hall CB, Chappell J, Bernstein DI, Curns AT, Wikswo M, Shirley SH, Hall AJ, Lopman B, Parashar UD. Norovirus and medically attended gastroenteritis in U.S. children. *N Engl J Med.* 2013 Mar 21;368(12):1121-30. doi: 10.1056/NEJMsa1206589. PMID: 23514289; PMCID: PMC4618551.

Shah MP, Tate JE, Steiner CA, Parashar UD. Decline in Emergency Department Visits for Acute Gastroenteritis Among Children in 10 US States After Implementation of Rotavirus Vaccination, 2003 to 2013. *Pediatr Infect Dis J.* 2016 Jul;35(7):782-6. doi: 10.1097/INF.0000000000001175. PMID: 27088585; PMCID: PMC5113824.

Hall AJ, Wikswo ME, Manikonda K, Roberts VA, Yoder JS, Gould LH. Acute gastroenteritis surveillance through the National Outbreak Reporting System, United States. *Emerg Infect Dis.* 2013 Aug;19(8):1305-9. doi: 10.3201/eid1908.130482. PMID: 23876187; PMCID: PMC3739540.

Arvig MD, Mogensen CB, Skjøt-Arkil H, Johansen IS, Rosenvinge FS, Lassen AT. Chief Complaints, Underlying Diagnoses, and Mortality in Adult, Non-trauma Emergency Department Visits: A Population-based, Multicenter

Cohort Study. *West J Emerg Med.* 2022 Oct 31;23(6):855-863. doi: 10.5811/westjem.2022.9.56332. PMID: 36409936; PMCID: PMC9683768.

Bhuiya FA, Pitts SR, McCaig LF. Emergency department visits for chest pain and abdominal pain: United States, 1999-2008. *NCHS Data Brief.* 2010 Sep;(43):1-8. PMID: 20854746.

Sharp AL, Kawatkar AA, Baecker AS, Redberg RF, Lee MS, Ferencik M, Wu YL, Shen E, Zheng C, Park S, Goodacre S, Thokala P, Sun BC. Does Hospital Admission/Observation for Chest Pain Improve Patient Outcomes after Emergency Department Evaluation for Suspected Acute Coronary Syndrome? *J Gen Intern Med.* 2022 Mar;37(4):745-752. doi: 10.1007/s11606-021-06841-2. Epub 2021 May 14. PMID: 33987795; PMCID: PMC8904710.

Cervellin G, Mora R, Ticinesi A, Meschi T, Comelli I, Catena F, Lippi G. Epidemiology and outcomes of acute abdominal pain in a large urban Emergency Department: retrospective analysis of 5,340 cases. *Ann Transl Med.* 2016 Oct;4(19):362. doi: 10.21037/atm.2016.09.10. PMID: 27826565; PMCID: PMC5075866.

Wen LS, Espinola JA, Kosowsky JM, Camargo CA Jr. Do emergency department patients receive a pathological diagnosis? A nationally-representative sample. *West J Emerg Med.* 2015 Jan;16(1):50-4. doi: 10.5811/westjem.2014.12.23474. Epub 2015 Jan 7. PMID: 25671008; PMCID: PMC4307726.

Jemt E, Ekström M, Ekelund U. Outcomes in Emergency Department Patients with Dyspnea versus Chest Pain: A Retrospective Consecutive Cohort Study. *Emerg Med Int.* 2022 Sep 16;2022:4031684. doi: 10.1155/2022/4031684. PMID: 36158766; PMCID: PMC9507768.

Choi NG, Choi BY, DiNitto DM, Marti CN, Kunik ME. Fall-related emergency department visits and hospitalizations among community-dwelling older adults: examination of health problems and injury characteristics. *BMC Geriatr.* 2019 Nov 11;19(1):303. doi: 10.1186/s12877-019-1329-2. PMID: 31711437; PMCID: PMC6849272.

Burns ER, Stevens JA, Lee R. The direct costs of fatal and non-fatal falls among older adults - United States. *J Safety Res.* 2016 Sep;58:99-103. doi: 10.1016/j.jsr.2016.05.001. Epub 2016 May 28. PMID: 27620939; PMCID: PMC6823838.

Jacob R, Wong ML, Hayhurst C, Watson P, Morrison C. Designing services for frequent attenders to the emergency department: a characterisation of this population to inform service design. *Clin Med (Lond).* 2016 Aug;16(4):325-9. doi: 10.7861/clinmedicine.16-4-325. PMID: 27481374; PMCID: PMC6280207.