Adolescent Presentations to Adult Hospital Emergency Departments: Systematic Review

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Abstract

Background: Adolescents access either paediatric or adult emergency departments (EDs) for acute care and other health needs. Anecdotally adolescent management is perceived as burdensome in adult EDs, with complex chronic illness cited as a specific issue. This systematic review aimed to describe what is known of adolescent presentations made to adult hospital EDs.

Methods: The systematic review was conducted according to PRISMA Guidelines. OVID-MEDLINE, EMBASE, WEB OF SCIENCE and CINAHL was searched from the beginning of the databases up to January 2016 for peer-reviewed journal articles reporting on 10-19 year-old presentations made to adult hospital EDs. It was not always possible within a dataset to isolate the 10-19 year-old data. Endpoints pertaining to demographic, diagnostic and other characteristics were examined.

Results: Four manuscripts of single and multi-site studies were included, all of North-American origin with a total participant sample of 8,415,366 adolescents. Physical injury was the most common cause of presentation, accounting for nearly 50% of presentations. The prevalence of chronic illness represented 35.2% of the sample in one study. Another study reported 22% of their sample was triaged as non-urgent and 52.2% of all visits occurred at night.

Conclusion: The limited findings are consistent with global adolescent morbidity data. Characterisation of adolescent-specific presentations to adult-specific emergency care settings is limited by inability to separate datasets into the specific age group. We were not able to confirm on data available that acute presentations on the background of chronic illness made up a significant management load.

Keywords: Adolescent; Emergency Department; Adult Hospital; General Hospital

Abbreviations
ED: Emergency Department;
WHO: World Health Organisation

Author’s Contributions
ON contributed to the design of the study, acquired, analysed and interpreted the data, drafted the initial manuscript, and revised the manuscript. AS contributed to the design of the study and critically reviewed the manuscript. KS conceptualised and designed the study, supervised data collection and analysis and critically reviewed the manuscript. All authors agreed to be accountable for all aspects of the work and have ensured that questions related to the accuracy or integrity of any part of the work have been appropriately investigated and resolved.
Introduction

Adolescence bridges childhood and young adulthood. The World Health Organisation (WHO) defines adolescence as the second decade of life (10-19 years old) [1]. Adolescents experience complex biopsychosocial development during this decade, with cognitive development continuing into the mid-twenties [2]. A conventional view is that adolescents experience robust health, and certainly globally they exhibit healthier conditions than previous generations [3]. However improvements in adolescent health have been static relative to younger age groups [4]. The 2014 WHO report identified adolescents as an under-researched group with empirical evidence on many aspects of their health and wellbeing lacking [4].

According to literature, adolescents represent 15-20% of all emergency department (ED) visits to both paediatric [5] and general (mix of adults and paediatrics) hospitals [6-8]. An Australian-wide survey of ED use during 2013-14 revealed 5-14 year olds and 15-24 year olds accounted for 10.0% and 14.4% of all ED presentations respectively [9]. Adolescents seek adult emergency services mostly for injury-related presentations [7, 10], which account for more than 45% of all adolescent presentations [7, 11], followed by presentations for respiratory and digestive system disorders [7, 11, 12]. One study found almost a quarter of adolescent complaints relate to interpersonal violence [5].

While adolescents have been reported as the lowest users of primary health care services even when access is free [13, 14], as it is in Australia, their use of acute care and emergency services is relatively high [5, 11, 15, 16], a pattern continued into early adulthood. Around one-third of 15-24 year-old Australians agreed that they could have sought advice from a general practitioner instead of accessing an ED [17]. It is desirable in any health care system that presentations for any type of health care are made to the correct level of the health care system in terms of cost, expertise of the health care provider and the ultimate outcome for the patient.

Adolescents access both pediatric and adult acute health care services, primarily related to institutional age limitations to access. Ideally, staff in both paediatric and adult EDs should have the knowledge, skills and resources to deal with adolescents and their unique health and developmental needs [18, 19]. Adolescents are seen as challenging patients in both paediatric and adult services [20-22]. The unplanned, ED admission of adolescents with an acute exacerbation of a chronic childhood illness is a specific example of where management difficulties may arise [23], but data on such events appear limited and anecdotal. The challenge is to identify ED studies where age brackets or ranges for data collection [24, 25] are available, in order to obtain adolescent specific data. Thus the aim of this systematic review is to identify what is known about adolescent presentations to EDs in general or adult only hospitals in the peer reviewed literature.

Methods

Search Strategy

The research question was identical to the aim, namely what is known about adolescent presentations to adult emergency departments. The search strategy was deliberately kept broad as is shown in Figure 1. Boolean operators, Medical Subject Headings and text word search functions were utilised, where appropriate, to explore four databases from the beginning of the databases to 30 July 2016: OVID-MEDLINE, EMBASE, WEB OF SCIENCE and CINAHL, with modifications to search strategy as required. The search strategy for OVID-MEDLINE is shown in Figure 1. Database alerts ensured the search was automatically repeated weekly to identify newly published articles. No restrictions were applied regarding language, geographical regions or publication date. Missed citations were manually extracted using reference lists of highly pertinent articles. The PRISMA Statement for reporting systematic reviews was followed, inclusive of both the search flowchart and systematic review checklist [26].

Selection Criteria

The WHO definition of adolescence as 10.0-19.9 years was used [1]. Any retrieved articles which examined broader age groups were included if there were data exclusive to the adolescent age group. Thus data provided for example in 15-24 year olds or 17-21 year olds could not be used. The full set of inclusion and exclusion criteria used for variables relating to study design and type, population, setting, and outcome is provided in Table 1.

![Table 1. Inclusion and exclusion criteria employed during the systematic search of literature for the review.](image-url)
Data Extraction

Two authors, ON and KS, independently extracted data from each article across the following categories: population, study design, diagnostic tools and procedures, presenting reason and statistical analysis. The presenting reason at triage and the physician’s final diagnosis were recorded for all data sets mainly, except for one, which lacked final diagnosis data [12]. Numerical data extraction involved both listed quantitative values and estimation via figure interpolation. When there was disagreement between the two reviewers, there was a discussion and consensus reached.

Statistics

A meta-analysis of data sourced from each article was not possible. Neither were any other statistical tests between results valid for this review, due to variability in end points and age definitions.

Results

The results of the database searches and the selection of articles for review are shown in the PRISMA diagram (Figure 2). There were 206 exclusions after reading the full manuscripts. Four manuscripts fulfilled the search criteria for the study.

The years of publication were 2009 [12], 1998 [7], 1994 [11] and 1967 [27] and all were North American in setting. Three manuscripts were single-site studies [11, 12, 27] and the fourth a nationwide representative sample [7]. The institutions where the data collection took place and other participant characteristics are shown in Table 2.

The total number of participants across the four manuscripts was 8,415,366 adolescent patients; n=219 [12], n= 4932 [11], 6215 [27] and 8,404,000 [7]. In one study the numbers were estimated visually from a figure [27]. The mean age of sample was 18.1 years in one study [12]. Age ranges for all studies were within 10-18 years, with specific ranges for each study presented in Table 1. One study reported on triage status with 22.0% of the sample triaged as non-urgent. The same study identified that 52.2% of all adolescent visits occurred between mid-afternoon and midnight [12].

Three studies reported specifically on the presenting complaint [7, 11, 12]. Injury was the most frequent presenting complain in two studies, accounting for 31.9% [7] and...
<table>
<thead>
<tr>
<th>Article</th>
<th>Setting</th>
<th>Study period</th>
<th>Study defined groups</th>
<th>Male:Female ratio</th>
<th>Age distribution (percentage)</th>
<th>Sampling strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marsh et al (2009) [12]</td>
<td>General university ED</td>
<td>1st July 2002 – 30th June 2003</td>
<td>15-19 year olds (n=219)</td>
<td>0.4</td>
<td>-</td>
<td>Eligible participants must have completed a medical record, and lived in a zip code surrounding the hospital. From this eligible pool, a random sample was picked using an online random number generator, such that the final sample accounted for 10% of all presentations made by adolescents.</td>
</tr>
<tr>
<td>Ziv et al (1998) [7]</td>
<td>Four hundred and eighteen US EDs of the 1994 National Hospital Ambulatory Medical Care Survey (NHAMCS)</td>
<td>1994</td>
<td>11-17 year olds (n= 8 404 000)</td>
<td>11-14 year olds (1.1) 15-17 year olds (1.0) 11-14 year olds (51%) 15-17 year olds (49%)</td>
<td>Sample weights were utilized and a simple approximation to account for the effects of the sample design on the variance of the calculated estimates. Relevant data from the final sample were collected from patient record forms.</td>
<td></td>
</tr>
<tr>
<td>Lehmann et al (1994) [11]</td>
<td>Cabell Huntington Hospital, West Virginia, USA</td>
<td>1989</td>
<td>12-18 year olds (n=4932), women with pregnancies were excluded</td>
<td>12-18 year olds (0.8) 12 year olds (1.2) 13 year olds (1) 14 year olds (0.8) 15 year olds (0.8) 16 year olds (0.8) 17 year olds (0.8) 18 year olds (0.6) 12 year olds (9.3%) 13 year olds (12.2%) 14 year olds (12.1%) 15 year olds (13.7%) 16 year olds (14.2%) 17 year olds (17.2%) 18 year olds (21.3%)</td>
<td>All ED visits over a one year period were retrospectively collected and organized into a specially designed questionnaire</td>
<td></td>
</tr>
<tr>
<td>*Robinson and Klonoff (1967) [27]</td>
<td>The Vancouver General Hospital, Vancouver, Canada</td>
<td>1st July 1965 – 30th June 1966</td>
<td>*10-19 year olds (n=6215)</td>
<td>1.7</td>
<td>10-13 year olds (28%) 14-17 year olds (38%) 18-19 year olds (34%)</td>
<td>All ED visits over a 1 year period were retrospectively collected.</td>
</tr>
</tbody>
</table>

*Estimation based on figure interpolation of 19-0 year-old data.

Table 2. Adolescent presentations to adult EDs.

<table>
<thead>
<tr>
<th>Article</th>
<th>Diagnosis Coding</th>
<th>Diagnoses and prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>11-14</td>
</tr>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
</tr>
<tr>
<td>Injury</td>
<td>61.6%</td>
<td>55.4%</td>
</tr>
<tr>
<td>Respiratory</td>
<td>8%</td>
<td>11.6%</td>
</tr>
<tr>
<td>Digestive</td>
<td>3.1%</td>
<td>3.2%</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>-</td>
<td>Not reported</td>
</tr>
</tbody>
</table>

| | Injury (49.1%) | Infection (19.2%) |
| | Other (10.7%) | Non-specific pain (8.6%) |
| | Pulmonary (7.5%) | Obstetrics & Gynaecology (4.9%) |

Robinson and Klonoff (1967) [27] | Author-defined binary grouping with subgroups for each group | Surgical (82%) comprising of head injuries, lacerations, fractures, and other. Medical (18%) comprising of convulsions, poisons, and other. |

Table 3. Final diagnoses or chief presenting complain in adolescent presentations to adult EDs.
47.0% [11] of all presentations and was implicated in 18.8% of all presentations in a third study [12]. An injury presentation was more common in males, with M:F ratios of 1.8 [7] and 1.4 [11] in two studies. Abdominal pain was the most common presenting complaint in the third study, 46.0% of the sample [12]. Musculoskeletal complaints accounted for 17.3% of presentations in Ziv et al., 1998 [7]. Pulmonary system complaints comprised 9.4% [7] and 4.0% [11] of all presentations in two of the studies.

Coping of patient diagnoses varied between studies and is summarised in Table 4. Data on final diagnoses were reported in three of the four studies [7, 11, 27] as shown in Table 3. Three of these studies provided data in a manner that allowed categorisation into specific causes. Nonetheless, injury was the most common final diagnosis in two of these studies, at 49.3% [7] and 49.0% [11] of the sample.

Lehmann et al., 1994 [11] was the only to report on the disposition status of adolescent presentations. Within this group (n=4932), 93.9% were treated in the ED and discharged, 5.9% were admitted and 0.2% departed prior to physician evaluation. Admission rates were highest for those without a clear diagnosis (14.4%) and for those with obstetric and gynecological problems (9.3%).

The three studies from the United States reported on access to insurance and primary health care [7, 11, 12]. Adolescents had varying degrees of insurance, from two thirds to one quarter having coverage.

Discussion

The systematic review revealed a dearth of general information on adolescent presentations to adult EDs, with one study only from the 21st century [12]. It is possible that the conventional portrayal of the adolescent group as relatively healthy may divert research attention away in general, or encourage investigation into specific disorders that characterise adolescent morbidity - namely injury and mental health disorders. Secondly, adolescent emergency care can be provided at both paediatric and adult hospitals, with adult hospitals having a lower percentage of ED presentations and overall admissions among adolescents [28]. Studies of pediatric EDs were specifically excluded from our systematic review. Lastly, age groupings in some studies precluded isolation of adolescent data - studies that may well have contained useful information. One retained study divided participants categorically by age into three groups (early, middle and late adolescence) [7] to potentially account for changes in physiology, psychology and behaviour.

Our systematic review identified injury as the leading cause for presentation. The prevalence of injury among adolescents is well established [7, 10, 25] and according to the Australian Bureau of Statistics’ 2004-05 National Health Survey, hospital data may even under-estimate the true prevalence of injury among adolescents [29]. Injury is often related to the developmental increase in risk-taking behavior [30]. Marsh et al. (2009) was the only study to report on the urgency of presentations and found that 22.0% of all ED visits were non-urgent. Several authors have anecdotally expressed concerns over misuse of the ED [5, 7, 11, 16]. This belief is supported by data from Lehmann et al. (1994) [11] where only 5.9% of presentations led to admission. Reasons for low admission rates include a general under-use of primary care in this age group [13, 31] with concomitant over-use of ED services, and the relative anonymity of ED services especially around confidential issues.

The retrospective nature of most studies reviewed for inclusion, the differences in ED presentation classifications and the varying age ranges all limited the utility of their data. Examples of this include health services where any presentation over the age of twelve is included in adult data [24, 32], a mixed adolescent/youth group as in Australia where ED data are reported for 12-24 year age group [25] or in services which provide paediatric care past the age of 19 years as in some hospitals in the United States [7, 33]. Additionally, many of the studies were more than 15 years old and management approaches change over time. For these reasons we did not present a formal review of quality of individual studies.

Conclusion

There is a paucity of information on adolescents in adult EDs. Key issues raised include physical injury and how adolescents use EDs for non-urgent presentations. These observations feed into more universal concerns about adolescent wellbeing and missed opportunities to alter health trajectories in this unique developmental stage [3, 4]. In turn adolescent engagement with and access to health care services needs to be improved. EDs have a role to play under certain circumstances in screening, brief interventions and perhaps most importantly referral to the correct service. All of these approaches likely require some education and skill provision.

Acknowledgements

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