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Adolescent inpatient activity 1999–2010: analysis of English Hospital Episode Statistics data

Dougal S Hargreaves,1,2 Russell M Viner1

ABSTRACT
Objective To investigate patterns and trends of adolescent (10–19 years) inpatient activity in England by sex, disease category, and admitting specialty.


Analyses Age trends by sex and major International Classification of Disease 10 (ICD10) chapter; differences in activity rates by age and sex; inpatient activity trends over the past decade, disaggregated by sex, admitting specialty and ICD10 chapter.

Results Adolescent female patients account for more activity than girls aged 1–9 (139.4 vs 107.2 FCEs/1000). Female inpatient activity increases significantly between age 10 (70.9 FCEs/1000) and 19 (281.7 FCEs/1000), of which non-obstetric care accounts for 155.9 FCEs/1000). Male activity increases much less during adolescence, with lower overall rates among adolescents than younger children (93.7 vs 142.9 FCEs/1000). Between 1999 and 2010, total adolescent inpatient activity increased faster among adolescents (10–19 years) (+14.2%) than younger children (1–9 years) (+11.0%). Adolescent FCEs/1000 increased by 12.8%, including higher rates admitted under Paediatrics (+47.5%) and Paediatric Surgery (+23.2%). Adolescents were admitted across a range of specialties.

Conclusions These data challenge the belief that adolescents are a healthy group who rarely use inpatient services. In England, use of inpatient services is higher among female patients aged 10–19 years than those aged 1–9 years, while adolescent activity has increased faster than for younger children over the past 11 years. Improving service quality for adolescents will require engagement of the many different teams that care for them.

BACKGROUND
Adolescent mortality (10–19 years) has overtaken deaths in any other period of childhood outside infancy in high, middle and some low income countries, and WHO has identified adolescent health as a global health priority. In high and low income countries, health services frequently fail to meet the distinct needs of adolescents, resulting in avoidable short and long term ill health. However, strategies to improve the quality of these services have often been limited by data availability, especially for healthcare activity. In a recent survey, Patton et al. found that health service utilisation was one of only two adolescent health indicators for which no national data were readily available for any country.

In England, the Chief Medical Officer’s (CMO) Annual Report 2012 reported ongoing, outdated assumptions that adolescence is a healthy period of life, with little utilisation of health services. Analysis of health service use among adolescents was identified as an important research gap to challenge these assumptions and guide service planning and quality improvement. For example, young people aged 16–24 report the poorest NHS experience of any age group, and concerns have been raised about the quality and age appropriateness of many aspects of care for this group. In response, extensive policy recommendations have been made in recent years by a previous CMO annual report, and influential reports by Kennedy and the Children and Young People’s Health Outcomes Forum (2012). Lack of data has consistently been identified as a key factor limiting service improvement and policy development in adolescent health.

We aim to address this lack of data by examining national adolescent inpatient activity from 1999 to 2010 in the English NHS. In this study, we investigate

1. age trends in inpatient activity, disaggregated by sex and disease category
2. the proportion of hospital activity accounted for by each specialty
3. time trends in activity by speciality and disease category.
METHODS

Data
Anonymised, aggregated Hospital Episode Statistics (HES) data for England were supplied for the years 1999/2000 to 2010/2011 by Northgate Information Solutions (http://www.northgate-is.com/). Finished Consultant Episodes (FCEs), the standard HES unit of inpatient activity, were used throughout. This is defined as a ‘continuous period of admitted patient care under one consultant within one healthcare provider’ and is considered to provide the best overall measure of consultant workload and wider resource use.

FCEs were analysed by single year of age, sex, International Classification of Disease 10 (ICD10) chapter and by admitting specialty. Patients with incomplete data were excluded. A total of 9,632,844 FCEs were analysed.

We limited our analyses to age 1–19 years, with 19 being the upper limit of the WHO definition of adolescence 10–19 and the National Service Framework for Children and Young People in England. Data from infants were excluded due to problems excluding birth episodes in HES data for infants, and for consistency with other comparisons of child and adolescent health.

Analysis
We calculated the number of inpatient episodes per thousand age-specific population by age and sex, using mid-year population estimates for the years 1999–2010 from the Office of National Statistics (http://www.ons.gov.uk). We also compared overall activity levels in adolescence (10–19 years) versus earlier childhood (1–9 years).

We then disaggregated activity into seven major ICD10 categories. Five common ICD10 chapters were used that account for a large proportion of activity (Infection, Respiratory, Digestive Pregnancy/Childbirth-related, Injury/Poisoning). Chapter XVIII (Symptoms, Signs and Abnormal Clinical and Laboratory Findings) and Chapter XXI (Factors Influencing Health Status and Contact with Health Services) were combined into a category labelled ‘Non-specific’. All other activity was labelled as ‘Other’.

We calculated trends in overall activity between 1999/2000 and 2010/2011 using these major categories, and also using single ICD10 chapters. Similarly, we disaggregated inpatient activity by admitting specialty and calculated the change between 1999/2000 and 2010/2011.

RESULTS

Figure 1 shows age trends for England in 2010/2011 for overall inpatient activity and activity by major ICD10 chapters in male and female patients. FCEs per thousand population are higher in male than female patients. Over the last decade, adolescent activity in England has increased faster than activity for younger children. Adolescent activity increases significantly over the second decade of life, particularly for female patients, whose standardised activity rates are almost four times higher aged 19 than aged 10. Although much of this increase is accounted for by obstetric care, inpatient episodes for digestive and respiratory disorders also approximately double over this period.

The observation that female inpatient activity is higher in adolescence than earlier childhood (1–9 years), while the reverse is true for male patients. Over the last decade, adolescent activity in England has increased faster than activity for younger children. Adolescent activity increases significantly over the second decade of life, particularly for female patients, whose standardised activity rates are almost four times higher aged 19 than aged 10. Although much of this increase is accounted for by obstetric care, inpatient episodes for digestive and respiratory disorders also approximately double over this period.

DISCUSSION

Use of inpatient services by female patients is higher in adolescence than earlier childhood (1–9 years), while the reverse is true for male patients. Over the last decade, adolescent activity in England has increased faster than activity for younger children. Adolescent activity increases significantly over the second decade of life, particularly for female patients, whose standardised activity rates are almost four times higher aged 19 than aged 10. Although much of this increase is accounted for by obstetric care, inpatient episodes for digestive and respiratory disorders also approximately double over this period.

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Strengths and limitations

A strength of this study is the use of comprehensive, national-level data, collected in a consistent way over several years. The data include all inpatient care (including psychiatric care) that is delivered in NHS hospitals or commissioned by the NHS from...
the private sector, although the small amount of privately funded care in non-NHS hospitals is excluded.\textsuperscript{13}

The quality of HES data is a potential weakness, with previous authors reporting that diagnostic coding is sometimes inconsistent or inaccurate.\textsuperscript{15} We have mitigated these concerns when possible: inpatient data are known to be more reliable than other sources, such as Emergency Department data,\textsuperscript{15} and ICD10 chapter is likely to be more reliable than exact diagnosis.

A further limitation is that we restricted analyses to FCEs and to the WHO definition of adolescence as 10–19 years. Analysis of bed days, length of stay and total discharges would give a more complete picture of adolescent inpatient activity, and would be needed to investigate cost trends. However, inpatient length of stay is known to be higher among adolescents than in childhood after infancy,\textsuperscript{10} so analysis of these indicators would probably find an even greater proportion of care accounted for by adolescents. Similarly, some authors have used the broader age range of 10–24 to encompass adolescence and young adulthood.\textsuperscript{18} These merit further research but were beyond the scope of the current study.

Implications
Although inpatient care represents a small proportion of health-care delivered to adolescents, avoiding unnecessary hospital admission has been identified as a key health priority by young people themselves,\textsuperscript{16} and high-quality inpatient care is critical to

Figure 1  Inpatient activity by age and sex, England, 2010/2011. (A) Age standardised inpatient activity by age and sex. (B) Male inpatient activity by age and disease category. (C) Female inpatient activity by age and disease category.

improving global outcomes from many key causes of adolescent mortality and morbidity, including trauma, obstetric and psychiatric emergencies.\textsuperscript{17, 18}

Influential reports have consistently identified two key barriers to improving health services for young people: first, lack of understanding of adolescent health needs, including outdated perceptions that adolescence is a healthy time of life with little use of health services; second, lack of age-specific data to inform service planning, quality improvement and economic evaluation.\textsuperscript{5, 7–10, 12} Currently, many existing datasets, in England and internationally, report healthcare utilisation only in broad age bands (eg, 5–14, 15–44), preventing service leaders or national policy makers from seeing what proportion of their adolescent services, as advocated in the CMO 2012 report.\textsuperscript{10}

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Figure 3 Adolescent inpatient activity by admitting specialty, England, 2010/2011. CAMHS/LD, Child and Adolescent Mental Health Services/Learning Disability.

Lastly, while previous efforts to improve adolescent services have often been initiated by staff working in paediatrics, adult medicine or another single specialty,\textsuperscript{8, 21, 22} our data highlight the large number of specialties responsible for delivering adolescent care. Future work to improve the quality of adolescent inpatient services should emphasise cooperation and team working between all relevant specialties, under the leadership of an adolescent physician or other individual with responsibility for all adolescent health issues within an organisation.

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