OUHT emergency department attendances and emergency admissions 2008/9 to 2012/13

Interim Report describing OUHT data

August, 2013

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Executive Summary

Introduction

This is an interim report of an investigation into the reported increase in emergency department (ED) attendances and in total emergency admissions at Oxford University Hospitals NHS Trust (OUHT) between 2008/09 and 2012/13.

Key findings

Emergency department attendances

- The total number of OUHT ED attendances increased by 10.8% from 105,839 in 2008/9 to 117,261 in 2012/13. The increase in attendance was much greater at the JRH (14.6%) than the Horton (2.3%).

- One-third (32.6%) of the rise in ED attendances is predicted by changes in the age-structure of the Oxfordshire population.

- The increase in the number of people being brought to the ED by ambulance, particularly the very young and the elderly, is equivalent to 73.4% of the overall increase in attendances.

- The direct impact of GP referral on the increase in ED attendance is small but it is not possible to quantify the potential impact of GP access issues (e.g. ease of getting appointments, out-of-hours access etc) from the available data.

- Although there is a predictable pattern of variation in ED attendances by time of day (the day time is nearly five times busier than the night), there is a fluctuation in numbers attending on any given day of up to two-fold which is unlikely to be predictable much in advance.

- The proportion of patients in the department who breach the four hour wait is highest at night when ED attendance is lowest.

Emergency admissions

- Across the same five year period, emergency admissions have increased from 53,010 in 2008/9 to 61,802 in 2012/13 (16.6 %; underlying linear trend 3.8% increase per year).

- Again, about one-third (36.3%) of the increase in admissions can be explained by changes in the age-structure of the Oxfordshire population.

- The increase in admissions above that predicted by population change is greatest in patients aged 40-59 years.

- There has been no change in emergency admissions referred directly by GPs, and there has been an increase in the number of admissions through direct-access clinics for patients already receiving hospital treatment.

- Over half those initially admitted to the Emergency Assessment Unit or the Surgical Emergency Unit are discharged in under 48 hours.

- Over half those aged over 60 years admitted as emergencies stay for three or more days, a quarter for more than a week.

Interpretation

ED Attendances

The increase in ED attendance is not explained by population change nor by patients self-presenting using their own transport.

The increase in the number of attendees brought by ambulance is striking, particularly at the extremes of age, and this may be the biggest single contributor to the rise in attendances.

The high and increasing proportion of patients discharged from ED either into hospital or back to their usual place of residence in the 10 minutes before the 4-hour wait target suggests less than optimal management and clinical care.

Possible explanations for the fact that that patients are more likely to breach the 4 hour wait target at night, when fewer patients are attending, include inadequate night or late evening ED staffing numbers (failure to deal with the late evening workload can lead to knock-on effects later), an increase in the ratio of junior to senior medical staff, an increase in the proportion of locum staff grade doctors compared to ED specialty trainee doctors, or difficulty in accessing other (hospital or community) services overnight.

The substantial and unpredictable variation in the number of patients attending ED on a given day requires the capacity to rapidly increase or decrease staffing levels in response to changing demand in order to preserve care quality cost-effectively.

Emergency Admissions

The increase in emergency admissions since 2008/9 is only partly explained by demographic changes in Oxfordshire's population. The impact on admissions of the increasing number of patients attending ED by ambulance merits further investigation.

The trend emergency admission data and the 2012-13 cross-sectional emergency admission data raise two questions about the management of emergency admissions:

1. Is it possible to manage those patients aged 40-59 years who are admitted for <48 hours without admitting them to hospital?

2. Is it possible to avoid admission, or achieve an earlier discharge, of those patients aged over 60 years who are admitted for over 7 days?

The resource impact of the increase in emergency admissions has not been offset by any decrease in the length of stay of those admitted.

In the context of increasing admissions through direct access clinics and through ED, there has been no change in GP mediated admissions. This may be because patients are choosing to bypass primary care to be admitted (either intentionally or due to difficulty in accessing primary care services), or because primary care are seeing more patients but reducing the proportion who are admitted.

Initial recommendations

1. To reduce the risk of 4 hour wait breaches, staffing and support to the ED should be investigated to identify:
   (i) how the department can better adjust to unpredictable variation in hour-by-hour and day-by-day workload;

   (ii) how predicable patterns in patients breaching, such as breaching overnight, can be tackled.

   In addition, a strategy must be developed to halt the increase in (and then substantially reduce) the number of ED attenders being discharged either into hospital or back to their usual place of residence between 3 hrs 50 mins and 3 hrs 59 mins after arrival.

2. To reduce the number of emergency admissions, the management of patients aged 40-59 years who are admitted for <48 hours should be audited to identify the proportion who could have been managed effectively without admission.

   Patients aged over 60 years who are admitted for over 7 days should also be investigated, but as a lesser priority.

3. To reduce the number of emergency admissions and ED attendances, the reasons for the substantial unexplained increase in ambulance arrivals need to be investigated urgently through auditing JRH ED patient notes and South Central Ambulance Service notes in liaison with the South Central Ambulance Service. Strategies to reduce the number of inappropriate arrivals should be identified.

4. To facilitate the on-going rational management of the emergency admission problem by OUHT and the CCG:
   (i) a complete linked data set (linking ED attendance and admission data by NHS number) needs to be constructed for 2012/13 to allow more precise estimation of length of stay, the frequency of recurrent events, and further investigation of the relationship between mode of arrival and admission;

   (ii) the quality and extent of the data routinely collected on ED attendance and emergency admissions needs to be reviewed to ensure it is reliable and fit for purpose.

1. Introduction

The past 10 years has seen an increase in emergency department (ED) attendances and emergency admissions across both the South Central Region and England as a whole.[1] [2] [3]

The impact of the increased attendances has been felt not only by ED staff at the Horton and John Radcliffe Hospitals but by all the acute services supporting ED across the Oxford University Hospital Trust (OUHT). Since the third quarter of 2011/12, the Trust has on a number of occasions failed to meet its 4 hour wait target in ED, a key performance indicator for the Oxfordshire Clinical Commissioning Group (CCG) and a criterion for achieving FT status.

In parallel with this increase in ED attendance, the OUHT has also experienced a substantial increase in emergency (non-elective) admissions. Again this has led to increasing pressure on the acute services at all four Trust hospitals. The number of emergency admissions is now significantly greater than planned, leading to unsustainable financial pressures on the local health economy.

In response, OUHT and the Oxfordshire CCG has set up a joint working group, chaired by a University representative, to:

1. quantify the extent of the increase in ED attendance and emergency admissions;
2. investigate what may be driving the increase;
3. make recommendations, on the basis of the investigation, on what actions might be taken to reduce the number of ED attendances and emergency admissions.

This is an interim report of the first phase of this investigation, an analysis of the local data on ED attendances and emergency admissions, Q1 2008/09 to Q4 2012/13 (for a discussion of the data available and its limitations, see appendix).

Although it is possible to make some immediate recommendations for action on the basis of this preliminary analysis, the report also identifies the limitations of the available routine data. It therefore proposes two areas of more in-depth investigation (planned to be undertaken urgently in phase 2) which will provide essential additional evidence to guide policy decisions.

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[1] Appelby J. 2013. Are accident and emergency attendances increasing? The King's Fund. http://www.kingsfund.org.uk/blog/2013/04/are-accident-and-emergency-attendances-increasing

[2] Blunt I, Bardsley M, Dixon J. 2010. Trends in emergency admissions in England 2004–2009. The Nuffield Trust

[3] The King's Fund. 2013. Urgent and Emergency Care. A review for NHS South of England. The King's Fund

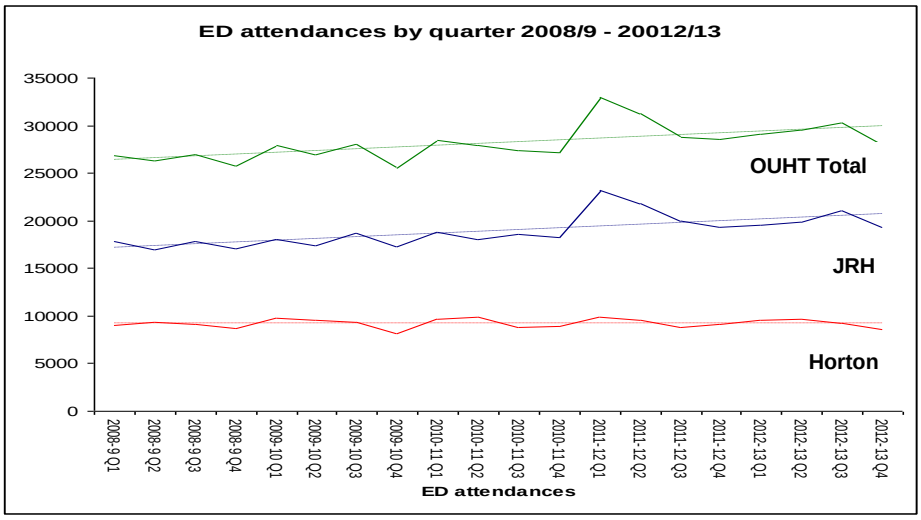
2. Emergency Department attendances between 2008/09 and 2012/13

2.1 Trend in number of attendances

Figure 1 shows the trend in ED attendances at OUHT between 2008/9 and 2012/13. Attendances increased by 10.8%, from 105,839 in 2008/9 to 117,261 in 2012/13. The increase was greater at the JRH (14.6%) rather than the Horton (2.3%).

The linear regression line estimates the underlying upward trend in the OUHT ED attendance rate as 3.5% per year (5.0% at JRH).

Figure 1



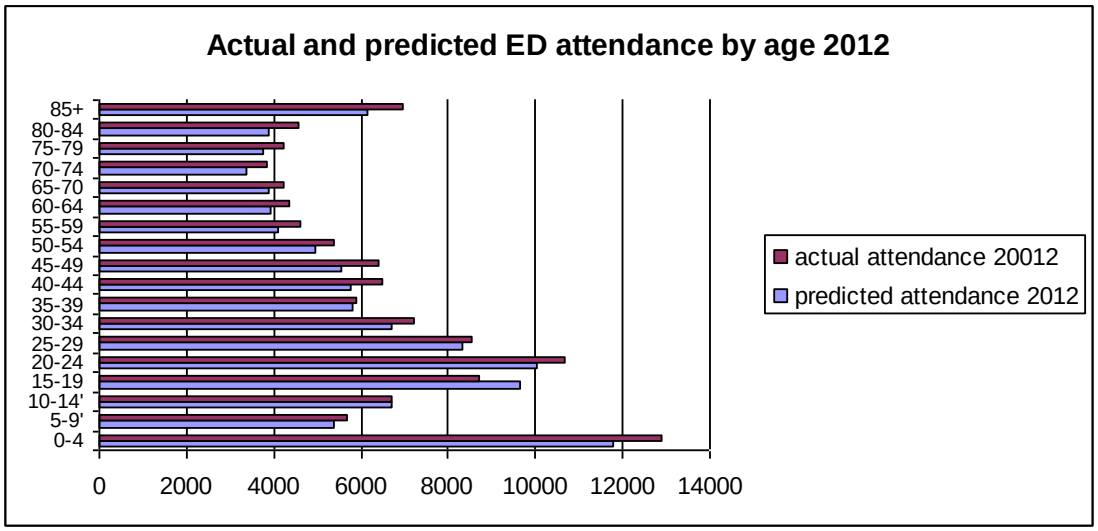
We have not explained the peak in admissions recorded in Quarter1 2011-12.

2.2 Effect of demographic change on ED attendance

Only 32.6% of the actual increase in ED attendance can be explained by changes in the age structure of the Oxfordshire population; applying the 2008/9 age-specific attendance rates (in 5-year age bands) to the 2012 population predicts an increase in attendance of 3,728 (compared to the observed increase of 11,422 attendances).

Figure 2 shows the actual and predicted number of attendances generated by each age group in 2012/13; although children under 5 generate most ED attendances, the highest age-specific attendance rate is in those aged 85+ (398/1000).

Figure 2



Local data suggest large increases in the numbers of people in Oxford City born outside of the UK over the last ten years.[4] Hospital data are not collected on ethnicity or country of birth and it is therefore not possible to determine whether different ethnic groups have different health behaviours and hence whether trends in changes to the ethnic mix of Oxford City are contributing towards the increasing demand on emergency services. However, National data suggest this is unlikely to be the case.[5]

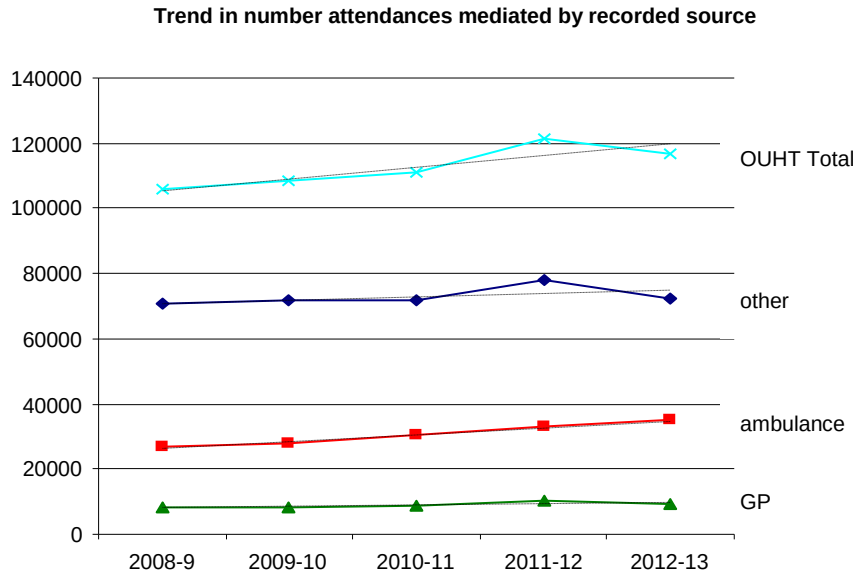
2.3 Changes in recorded source of attendance

Figure 3 shows the recorded "source" of attendance. The coding of "source" needs to be improved as there is substantial variation over time in the codes contributing to the "other" category and 0.8% of attendances were not coded. However, the overall increase in "others" estimated from the regression is 1.4% per year - providing little evidence of an important change in patients self-presenting using their own transport.

[4] Oxford City Council. Growth in Oxford's International Diversity. 2013. http://www.oxford.gov.uk/Library/Documents/Statistics/Jan2013.pdf

[5] Steventon A, Bardsley M. Use of secondary care in England by international immigrants. J Health Serv Res Policy. 2011;16: 90-4.

Figure 3

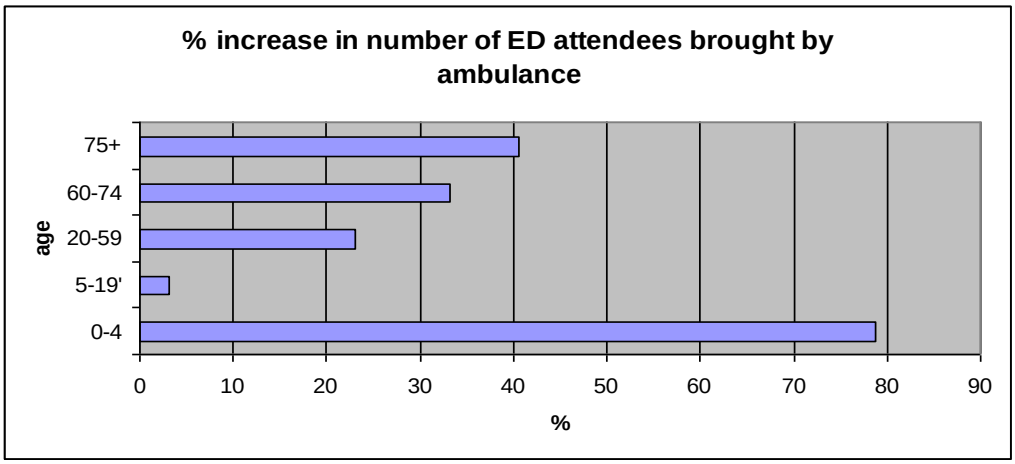


In contrast, there is a substantial increase in the number of attendees brought by the ambulance service (increase estimated by linear regression as 8.6% per year). The increase in number of attendees arriving by ambulance was 73.4% (8,087/11,010) of the overall increase in attendances. It is unclear from the data who is phoning to request an ambulance, be it the patient, a relative, a care home, or a GP.

The regression estimated underlying increase in GP mediated attendances was also substantially greater that would be expected as a result demographic change at 5.3% per year, although their relative impact was small (equal to 9.8% of the overall increase).

Figure 4 shows the marked difference in the increase in attendees brought by ambulance according to their age.

Figure 4



2.4 Variation in ED attendance

At the trust level, Saturday to Monday is about 10% busier than Tuesday to Friday, with Sunday usually being the busiest day (mean attendance 342 in 2012/13) and Wednesday the least busy (mean attendance 293). However, Table 1 below shows that in 2012/13 there was substantial variation in the numbers attending on any given day, with slightly more variation at the Horton than the JRH.

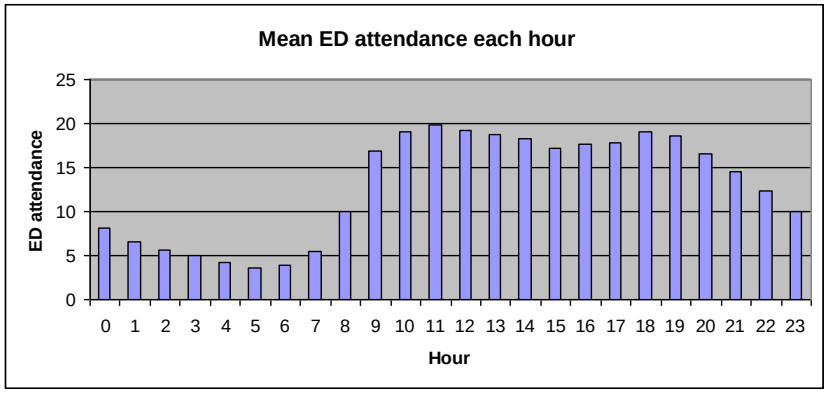
Table 1 Variation in numbers attending ED by day of week

	SUNDAYS				**WEDNESDAYS**			
	Lowest	*Highest*	*Difference*	*%max>min*	*Lowest*	*Highest*	*Difference*	*%max>min*
JRH	195	300	105	35%	179	244	65	36%
Horton	83	126	43	52%	81	119	38	47%

There is less seasonal variation in attendance than might be anticipated, with an overall difference of only 14% between the highest and lowest mean attendance in each calendar month in the 5 years from 2008/9 to 2012/13. However, the day to day variability in daily attendance is high, particularly between December and March. For example, in February 2013, the ED attendance was 213 patients on Feb 15th and 396 on Feb 17th.

The most predictable variation in attendance is by time of day, with, on average, five times as many attendances each hour between 8am and 8pm than between midnight and 8am. Figure 4 shows the mean number of ED attendance each hour for JRH and Horton combined.

Figure 5



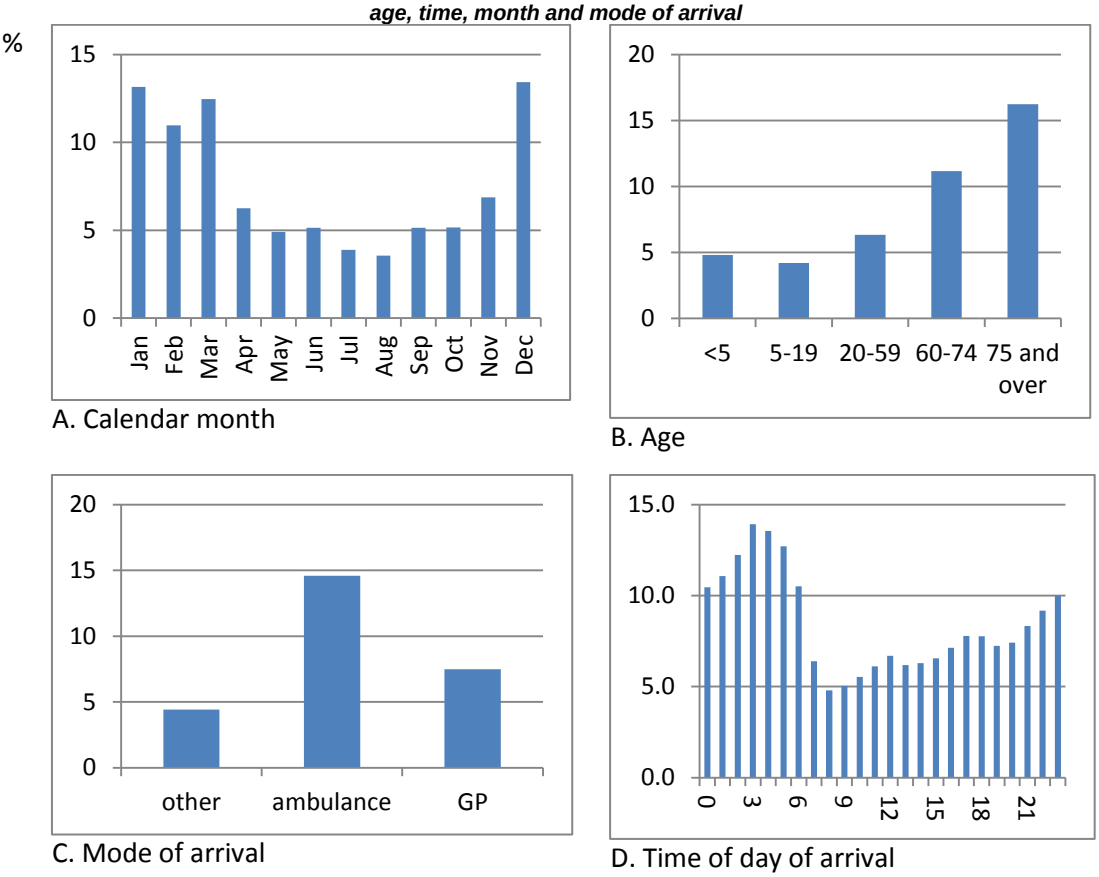
2.5 Breaches of 4 hour wait target

OUHT has missed its quarterly 4 hour-wait target in both Q1 and Q4 of 2012/2013. There is no simple correlation with the total number of ED attendances based on analysis of the unlinked data currently available but the likelihood of breach is predicted strongly by the four variables shown in Figure 6 below – older age, arriving between December and March, arriving by

ambulance and arriving during the night – and whether the patient arrives at JRH or the Horton.

Figure 6

Likelihood of breaching 4 hour wait (% of attendees) according to age, time, month and mode of arrival



The results of a logistic regression analysis to estimate the independent effect of these 5 variables is shown in Table 2 below.

Table 2 Relative likelihood (adjusted odds) showing the independent effect of different variables of breaching the 4-hour wait limit

	Adjusted odds ratio	***95% CIs***	
John Radcliffe Hospital	1.44	1.41	1.48
Brought by ambulance	2.59	2.53	2.65
Arrive Dec-Mar	2.62	2.57	2.67
Age over 70 years	1.87	1.83	1.92
Arrive 2000 to 0800	1.26	1.23	1.28

Although the time of arrival is the weakest predictor of breach on this multivariate analysis (presumably because it is strongly correlated with the

other predictive factors) Figure 7 shows that there is a striking inverse correlation between the time when breach is most likely and the number of people arriving in ED. Breaches are most likely at night when there are fewest patients arriving in the department. This may reflect levels of night staffing, the shut-down at night of other services (within or external to OUHT) necessary to admit or discharge the patient within 4 hours, or changes to the proportion of senior staff or non-locum staff available.

Figure 7

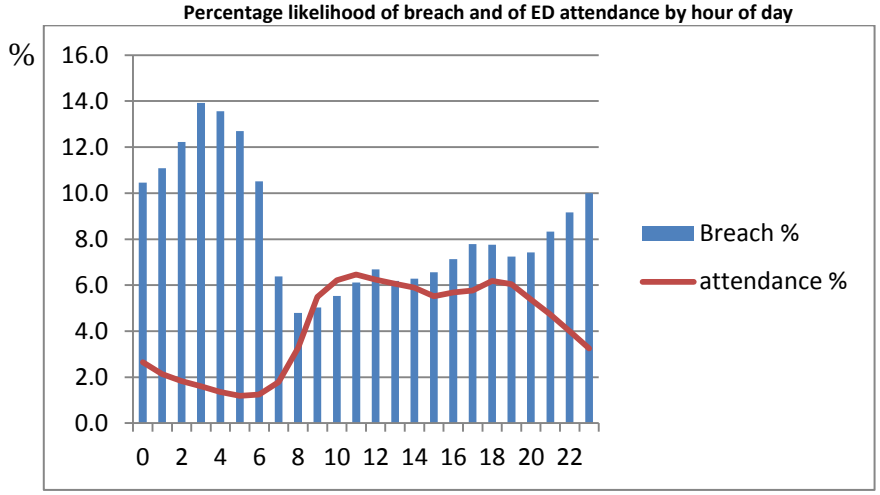
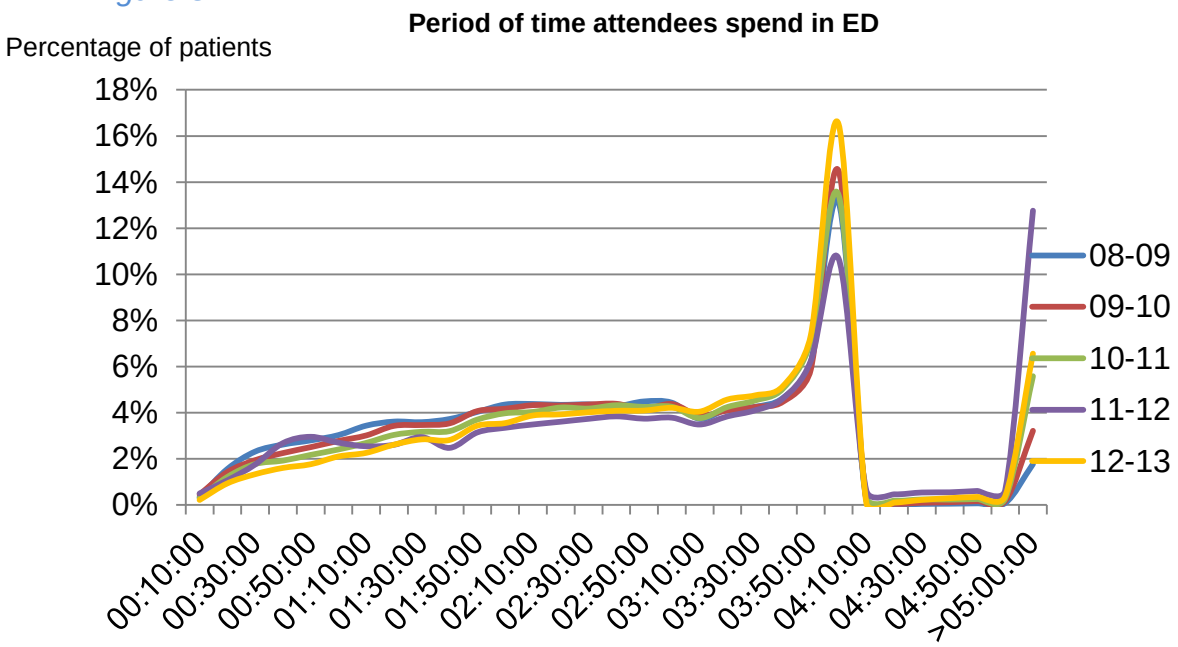


Figure 8 highlights the impact that the four hour target has on the time spent in the ED. There has been minimal change (either upwards or downwards) in the time spent in ED although the proportion being discharged within 10 minutes of the deadline is higher in 2012/13 than in previous years. The "cliff" effect is also evident – very few patients are discharged between 4 and 5 hours after arrival.

Figure 8

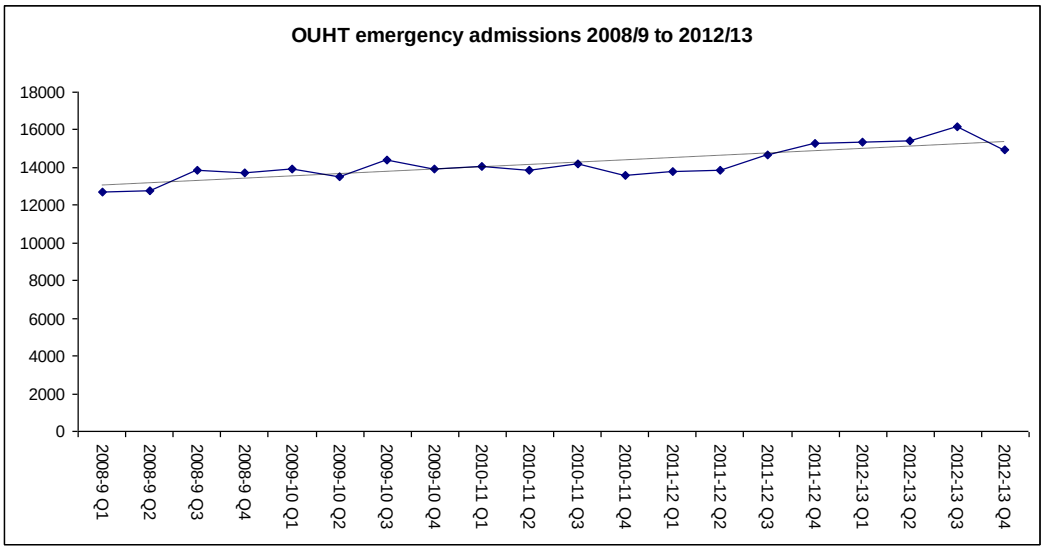


3. Change in emergency admissions between 2008/09 and 2012/13

3.1 Total emergency admissions

The trend in emergency admissions to all four OUHT acute hospitals (Horton, JRH, Churchill and NOC) is shown in Figure 9. The number of emergency admissions increased from 53,010 in 2008/9 to 61,802 in 2012/13 (16.6 %; underlying linear trend 3.8% increase per year).

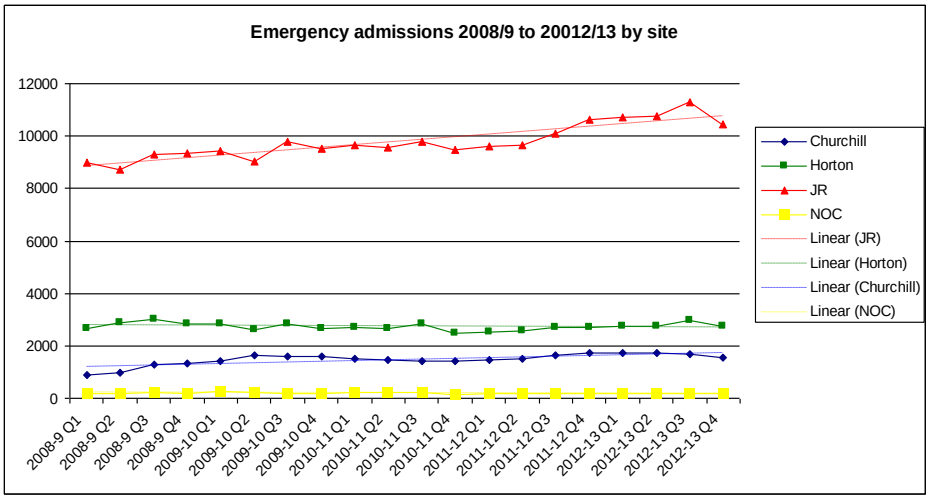
Figure 9



3.2 Emergency admissions by hospital site

Figure 10 below shows the trend in the number of emergency admissions to the different OUHT sites. Two-thirds of emergency admissions continue to be the JRH. The underlying change estimated from the linear regression was an annual increase of 9.7% at the Churchill and 4.6% at JRH; in contrast the underlying trend in emergency admissions at both the NOC and Horton is an annual decrease of 4% and 5% respectively. It should be noted that acute services have become more centralised at the JRH over the past five years with acute cardiac and stroke pathways being introduced in 2009 and 2010, respectively, and the progressive centralisation of trauma care and emergency surgery. This may explain part of the reduction in emergency admissions observed at the Horton.

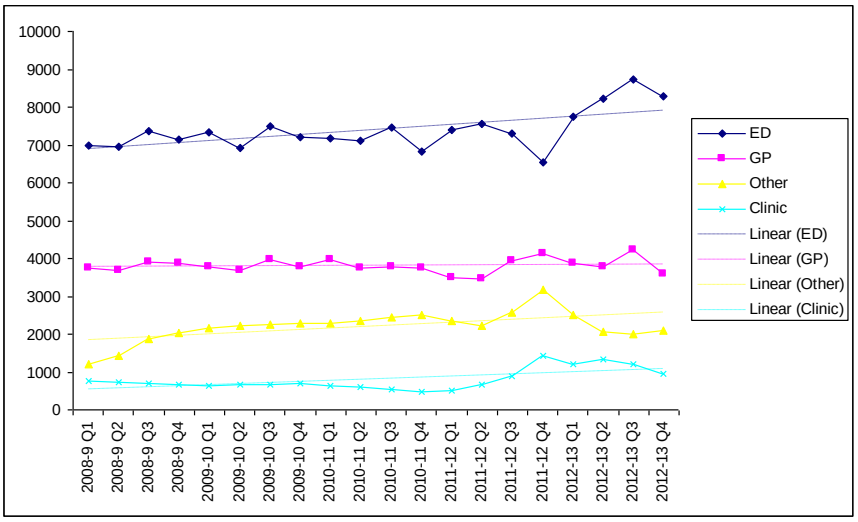
Figure 10



3.3 Emergency admissions by recorded source

As with the attendance data, the unexplained fluctuations in the recorded "source" of emergency admission and the variability of coding contributing to the "other" category almost certainly reflect inconsistent coding practice. It is therefore important to be cautious in interpreting trends, although Figure 11 gives no suggestion of an increase in emergency admissions direct from general practitioners, despite demographic change predicting a 6% increase (see section 3.4).

Figure 11



In contrast, emergency admissions from hospital sources do appear to be increasing, through ED and outpatient clinics at OUHT and through urgent tertiary referrals from other hospitals (which form the bulk of the "other" category). The increase in admissions from OUHT clinics may reflect increasing numbers of patients under hospital care offered the option of

making direct contact with specialist nurses for advice (e.g. to expedite urgent triage of patients taking immune-suppressants with unexplained fevers).

3.4 Effect of age and population change

The predicted increase in emergency admissions in 2012/13, by applying the 2008/9 age-specific admission rates, is 3,199 (a 6% increase, and 36% of the actual difference of 8,792). The actual and predicted number of emergency admissions by 5 year age group is shown in Figure 12. Figure 13 shows the extent to which the increase in admissions for each 20 year age group exceeds that predicted.

Figure 12

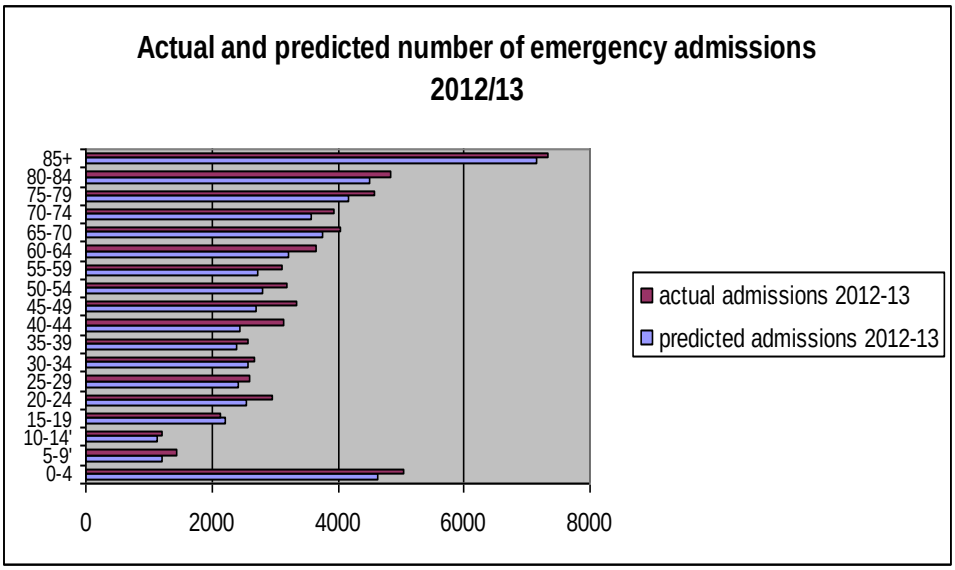
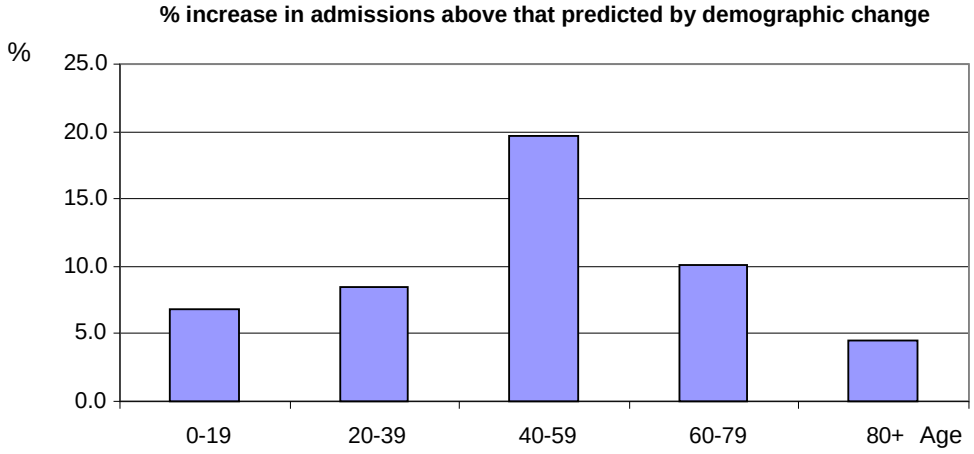


Figure 13



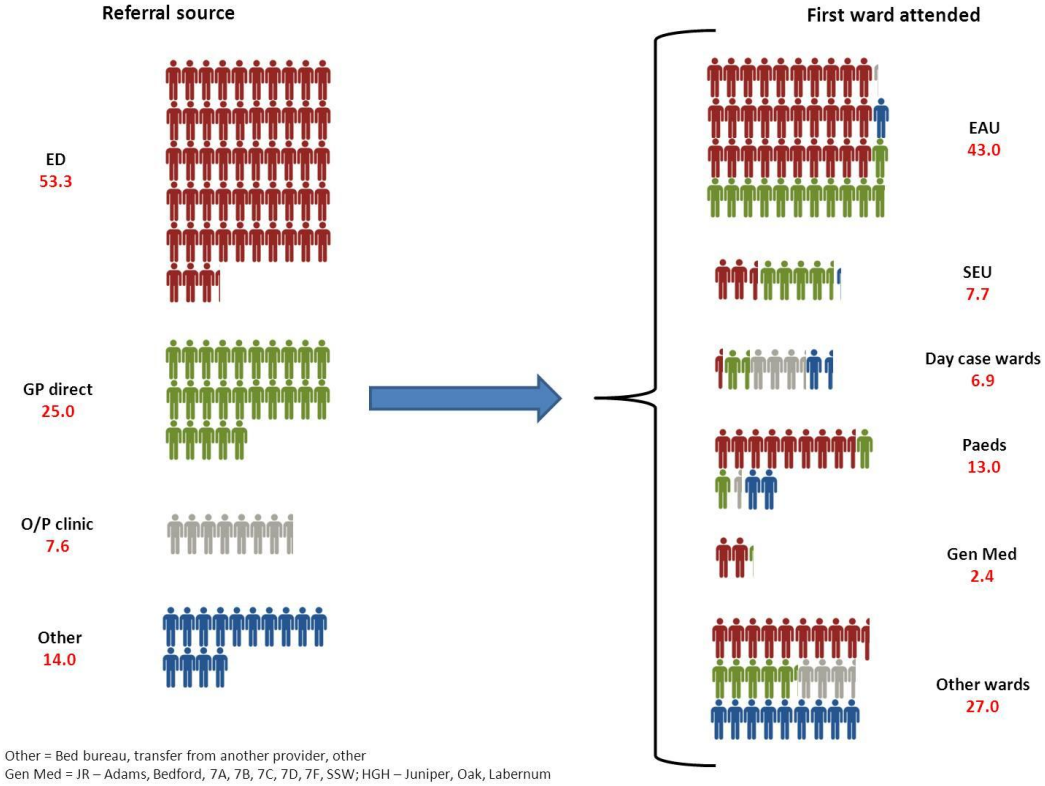
4. Cross-sectional analysis of emergency admission patterns and length of stay in 2012/13

The following figures illustrate the average journey of 100 OUHT emergency admissions and their length of stay in hospital using cross-sectional data for all emergency admissions in 2012/13.

4.1 First destination of admission

Figure 14 shows that the majority of emergency admissions from ED or general practice initially attend a short stay assessment ward (either the Emergency Assessment Unit – EAU, or Surgical Emergency Unit – SEU). In contrast, admissions from out-patient clinics (including direct access clinics) and tertiary referrals go to day-case or other specialist wards.

Figure 14



Other = Bed bureau, transfer from another provider, other
Gen Med = JR – Adams, Bedford, 7A, 7B, 7C, 7D, 7F, SSW; HGH – Juniper, Oak, Labernum

4.2 Length of stay by first ward attended

Figure 15 illustrates the length of stay of patients admitted to each ward. As length of stay is based on the number of days elapsed post admission rather than the exact hour that patients are admitted or discharged, the “24-48 hours” will include patients who stayed less than 24 hours (their stay included two calendar days but was not necessarily greater than 24 hours).

The figure highlights that the majority of patient admitted to short stay wards and to paediatrics are admitted for less than 48 hours. This must often reflect rapid, appropriate, and high-quality diagnosis and stabilisation, but it also raises the question of whether some of these short-stay patients could be managed without admission.

Figure 15

4.3 Effect of age on source, destination, and length of stay

Figure 16 illustrates that source of referral is not much influenced by age but it does affect the destination ward. Those aged over 80 years are disproportionately represented among attendees to EAU.

Figure 17 shows that the majority of patients aged under 60 years have a length of stay of under 48 hours. It seems worth investigating whether a proportion of these patients could have been managed outside of hospital, for example by having diagnostic tests as out-patients without admission.

The pattern is reversed for patients aged over 60 years with the majority staying for over 3 days, a quarter for more than a week. Avoiding admission of these elderly patients when clinically feasible is not only important for them but it is also a key resource issue for the health economy.

Figure 16

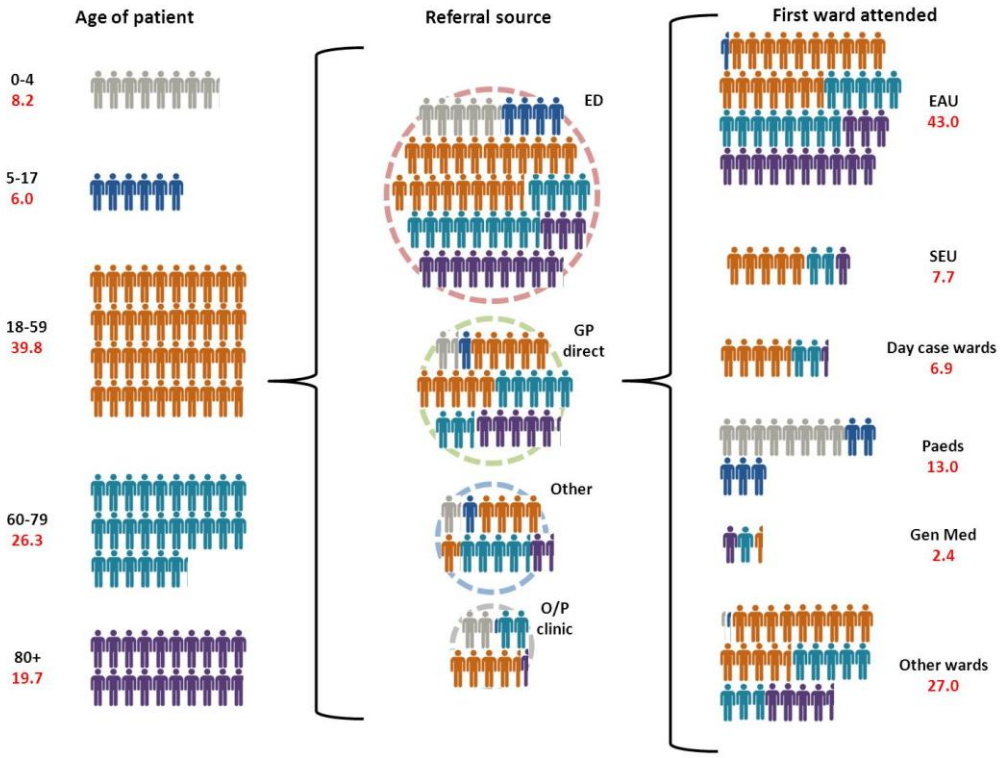
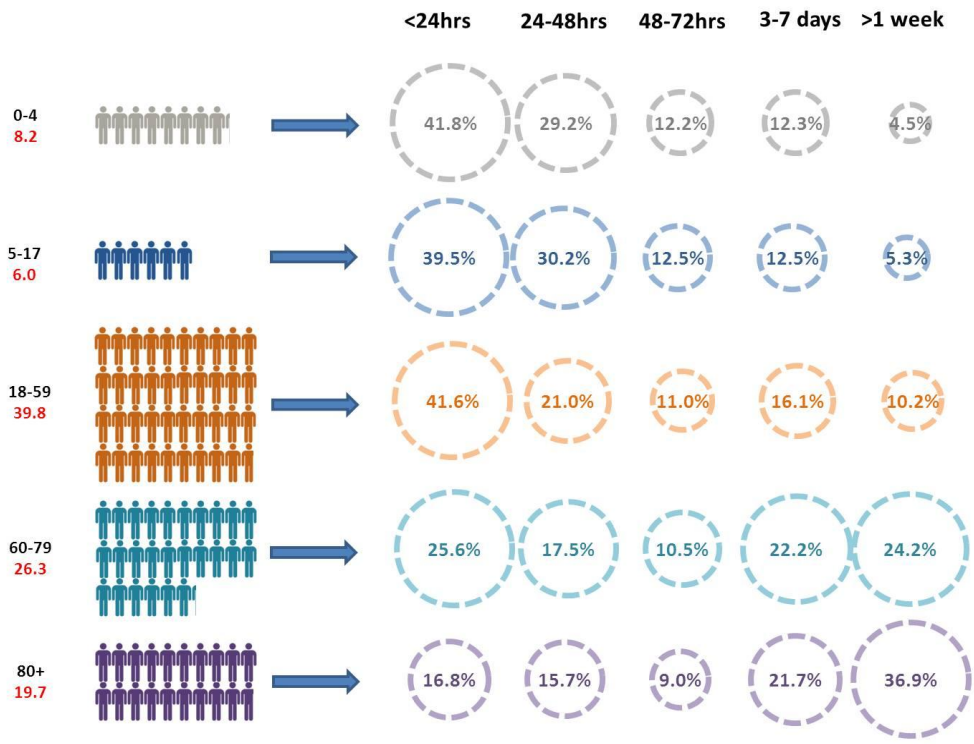


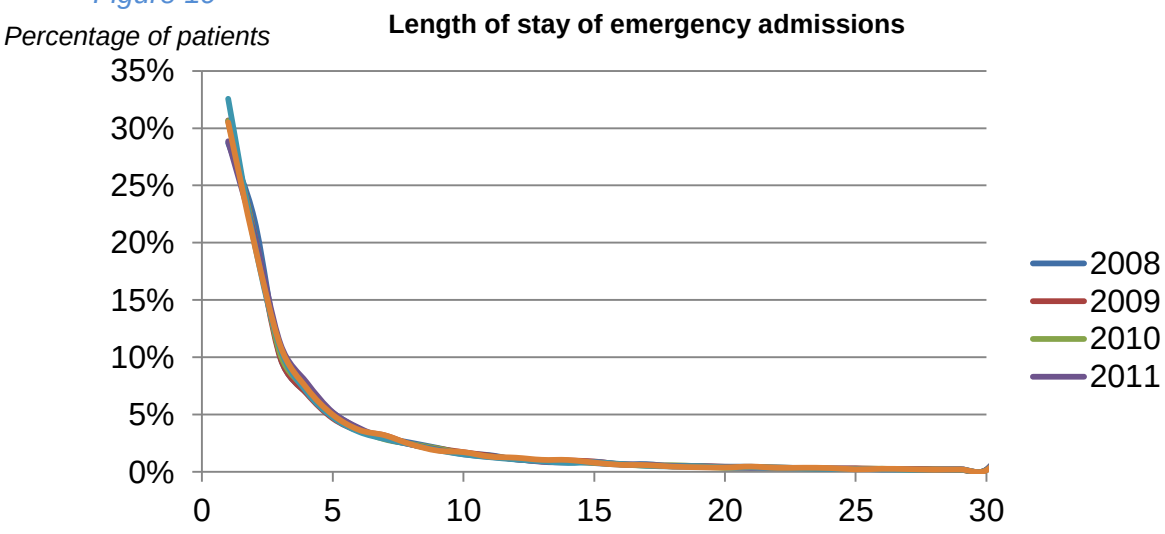
Figure 17



4.4 Trend in length of stay of emergency admissions

Finally, Figure 19 is included to illustrate that the overall length of stay of people admitted as emergencies has changed very little between 2008 and 2013. In other words, the increase in number of admissions has not been matched by any decrease in the length of admission to lessen the resource impact on the health economy.

Figure 19



5. Discussion and next steps

5.1 ED Attendances

Emergency department attendance data highlight that there are substantial increases above that which would be expected by population change alone.

Attendances by ambulance particularly contribute to the excess; the reasons are unknown. For example, the extent to which calling an ambulance is driven by inappropriate 111 algorithms and how this might be addressed needs to be explored urgently with South Central Ambulance Service (SCAS).

There are significant unpredictable variations in the number of patients attending at a given hour of the day or day of the week, it is not clear that ED staffing is sufficiently flexible to respond to this fast changing demand.

Breach data indicate that patients are more likely to breach between 2300 and 0700 when fewer patients are attending. This may reflect a reduction in the numbers of staff available, an increase in the ratio of junior to senior medical staff, an increase in the proportion of locum staff grade doctors compared to ED specialty trainee doctors, or difficulty in accessing other (hospital or community) services overnight.

5.2 Emergency Admissions

Just 36% of the increase in emergency attendances is explained by demographic changes to Oxfordshire's population.

The excess of the increase in admissions between 2008/2009 and 2012/2013 above that predicted by demographic change is greatest for those aged 40-59 years.

The increase in the number of patients arriving at ED by ambulance may be an important driver for the increase in admissions not explained by demographic change.

The trend emergency admission data and the 2012-13 cross-sectional emergency admission data raise two questions about the management of emergency admissions:

1. Is it possible to manage those patients aged 40-59 years who are admitted for <48 hours without admitting them to hospital?

2. Is it possible to avoid admission, or achieve an earlier discharge, of those patients aged over 60 years who are admitted for over 7 days?

However, it is recognised that the proportion of short-stays in the EAU and SEU may reflect a success story for many patients who are been diagnosed, stabilised, and discharged appropriately and efficiently.

The resource impact of the increase in emergency admissions has not been offset by any decrease in the length of stay of those admitted.

5.3 Next steps

Based on the data presented here, the Working Group is piloting the feasibility two retrospective audits:

1. An in-depth audit of 200 notes of patients admitted to the JRH/Churchill in 2012/13 as emergencies either from the ED or direct to JRH EAU or SEU; notes will be selected from patients aged 40-59 years attending for <48 hours. The audit will aim to identify the patients' presenting needs and the options on how they could be met. Individuals will be selected at random from this patient group. If feasible, the working group will also collect information from the patients (or relatives where more appropriate) and go on to audit patients aged >60 years attending for >7 days.

2. A similar audit of 200 SCAS records and ED notes (and admission records where appropriate) of patients attending the JRH, including discussion of cases with SCAS, to investigate the rise in the number of ED attendances arriving by ambulance.

In addition the Working Group is liaising with the data management teams at OUHT and CCG to facilitate production of a complete linked file for 2012/13 and to develop a strategy to improve data quality so that it can be used to facilitate monitoring and management decisions.

5.4 Initial recommendations

1. To reduce the risk of 4 hour wait breaches, staffing and support to the ED should be investigated to identify:

(i) how the department can better adjust to unpredictable variation in hour-by-hour and day-by-day workload;

(ii) how predicable patterns in patients breaching, such as breaching overnight, can be tackled.

In addition, a strategy must be developed to halt the increase in (and then substantially reduce) the number ED attenders being discharged either into hospital or back to their usual place of residence between 3 hrs 50 mins and 3 hrs 59 mins after arrival.

2. To reduce the number of emergency admissions, the management of patients aged 40-59 years who are admitted for <48 hours should be audited to identify the proportion who could have been managed effectively without admission.

Patients aged over 60 years who are admitted for over 7 days should also be investigated, but as a lesser priority.

3. To reduce the number of emergency admissions and ED attendances, the reasons for the substantial unexplained increase in ambulance arrivals need to be investigated urgently through auditing JRH ED patient notes and South Central Ambulance Service notes in liaison with the South Central Ambulance Service. Strategies to reduce the number of inappropriate arrivals should be identified

4. To facilitate the on-going rational management of the emergency admission problem by OUHT and the CCG:

(i) a complete linked data set (linking ED attendance and admission data) needs to be constructed for 2012/13 to allow more precise estimation of length of stay and further investigation of the relationship between mode of arrival and admission;

(ii) the quality and extent of the data routinely collected on ED attendance and emergency admissions needs to be reviewed to ensure it is reliable and fit for purpose.

Appendix – data source and quality

Data have been retrieved from OUHT FirstNet and Millennium systems (previously PAS); these data are the raw data that feed into the routinely available secondary uses service (SUS) datasets. Small numbers of patients (around 10 per year) will be included in this analysis which will not be found in the SUS datasets due to incomplete local coding of the basic data requirements for SUS. Furthermore, the attendance data include patients seen in ED prior to Q1 2012/13 who were sent straight to GP out of hours care (approx. 3,000-3,500/yr) – these patients will not be found in the SUS database. From Q1 2012/13 onwards, these patients are included in SUS. Finally, there are some patients who were admitted as emergencies in Q4, 2012/13 who will still be in-patients (as of 17th June, 2013) and hence not included in this analysis – this is estimated to be around 10 patients.

The major difficulties surrounding quality of data are an inability to link all emergency admissions from ED to their ED attendance, and problems with coding of source of ED attendance.

OUHT data codes both “arrival mode” (ambulance; other; unknown) and “referral source” (emergency services; general practitioner; other [including self-referral]). As discussed under section 2, coding varies for both arrival mode and referral source. In order to validate the coding, OUHT ED attendance data between 2008/09 and 2012/13 were compared to data from the South Central Ambulance Trust (SCAT) on numbers of patients brought to ED at OUHT over the same time period.

Figure A1 shows that OUHT mode of arrival does not correlate with SCAT data whereas source of referral approximates more closely. Figure A2 shows the correlation between the trend lines for OUHT source of arrival data and SCAT data Assuming SCAT data to be the gold-standard, this correlation is thought to be a good enough to allow conclusions to be made based on the trend in attendances being brought by ambulance coded as “emergency services” in OUHT data. More detailed conclusions would be inappropriate.

Figure A1. ED attendances between 2008/09 and 2012/13 coded as “emergency services” by source of referral and “ambulance” by mode of arrival plotted against SCAT data on numbers of patients brought to the OUHT EDs during the same time period.

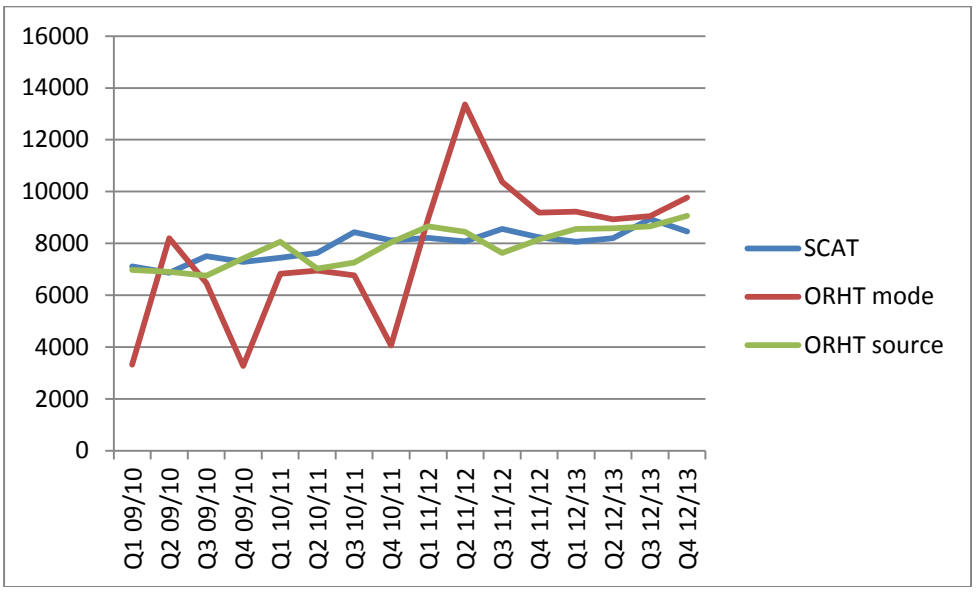


Figure A2. Effect of using SCAT or ORHT source data to estimate linear trend