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Understanding emergency hospital admission of older people

Report

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Centre for
**Health Service Economics
& Organisation**

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Executive Summary

All developed countries face the problem of the affordability of high quality world class health care, in the face of a combination of ageing populations and continuing technological change in medicine, at a time when their economies are experiencing weak, if any, sustained economic growth. In England, following a period of no real terms growth in NHS budgets, commentators have pointed to increasing numbers of hospital admissions to illustrate the healthcare funding challenge.

The aim of this study is to gain an improved understanding of the rise in emergency hospital admissions for older people over the period 2001/02 to 2012/13 and to formulate evidence-based scenarios for possible future trends in older emergency admissions in England. It has extended the scope of the findings of earlier studies through: a focus on older people and especially the oldest old, aged 85 and over; more extensive examination of bed days and lengths of stay as well as admissions; inclusion of more recent trends; a clear distinction between demand, supply and policy drivers of trends; an examination of trends for specific health conditions; an analysis of age, cohort and period effects explaining the increase in admissions; and development of evidence-based scenarios for future trends in older emergency admissions. This provides a lens to consider the pressure on resources.

Trends in older emergency admissions and bed days

Emergency admissions for people aged 65 and above in England have increased year on year since 2001/02. They rose by 45.6% from 1.52 million admissions in 2001/02 to 2.21 million in 2012/13. While the total number of emergency admissions increased only marginally after NHS expenditure was held constant in real terms from 2010/11, the number of emergency admissions of older people has continued to rise to 2012/13. The rate of emergency admissions of older people per thousand older population has increased by almost 26% over this eleven year period 2001/02 to 2012/13 (or by 25% on an age-standardised basis). Rates have increased monotonically with age: while the rate rose by only 10% over the period for the 65 to 69 age group, it rose by 50% for the 90 and over age group.

Neither the increase in emergency admission rates over the past eleven years nor the rate reached in 2012/13 is unusual by international standards. Within the UK, the emergency admission rate per 1,000 population (*all ages*) was 73 in England and 91 in Scotland at the end of the 1990s. By 2009/10 England and Scotland had rates of 100 and 99 respectively. English rates were then similar to Scottish rates, which had risen during the 2000s albeit not as rapidly as English rates. There have been reports of rising emergency admissions from several countries outside the UK (Jones 2011), but international comparisons are complicated by scarcity of comparable trend data. OECD Health Data (OECD 2011) show that the UK had lower rates of *total* hospital admissions involving at least one overnight stay than the OECD average: the UK rate was only 87% of the OECD average.

The total number of bed days following emergency admissions of people aged 65 and over has fallen. This is remarkable viewed from the perspective of a decade ago when the projected rapid rise in numbers of older people suggested a likely rise in need for hospital capacity. The number of bed days *fell* from 22.0 million in 2001/02 to 20.0 million in 2012/13, a decline of 9.1%. It fell by 14.0% by 2007/08 and then rose again by 1.9% between then and 2012/13. Bed days decreased for people aged 65 to 84 but increased for those aged 85 and over. The age-standardised bed day rate per thousand older population fell by 25% over the eleven year period. This fall facilitated the rise in emergency admissions by creating the necessary capacity to admit more patients. The recent news focus on

pressures on capacity from rising admissions should not be viewed without recognition of the reductions in pressure from falling bed days.

There is considerable variation in emergency admission and bed rates among older people between different areas of England. Differences in need for care account for only a small part of this variation (Redding et al 2014). This suggests that there remains scope for further convergence between areas in emergency admissions and bed days of emergency care for older people.

The most dramatic increase has occurred in London, which now has the highest rate of emergency admissions for people aged 65 and above. Had London experienced the same growth in rates as the South and East of the country, there would have been 60,000 *fewer* emergency admissions in 2012/13. This comparatively high growth in London, which is seen for people aged under 65 as well as for people aged 65 and over, cannot be explained by faster increase in the older population of London than of other regions.

The divergence of trends for emergency admissions of older people and bed days associated with these admissions is due to two factors. First, the number of short spells (0 or 1 day) rose far faster than the number of longer spells (2 or more days), 192% in comparison with 20%. Second, the average length of stay of longer spells fell. Lengths of stay have fallen consistently during the period, by 25% in all, with slightly smaller proportionate declines for the younger old: a 19% reduction for 65 to 69 year olds compared to a 29% reduction for those aged 90 and over. This reduction in length of stay of emergency patients appears to have been closely associated with the introduction of case-based, 'Payment-by-results' (PbR) which was introduced in a staged fashion across hospitals between 2003/04 and 2009/10. In addition, the imposition of a 30% marginal PbR tariff for 'excess' emergency admissions above the 2008/09 level may have contributed to bringing the overall growth in emergency admissions to a halt after 2010/11.

Total A&E attendances (*all ages*) have increased over the last decade. They have risen by 32% since the introduction of Walk-in Centres in 2003/04, with almost 70% of the growth occurring in 'minor' (type 2 & 3) units. However, it is major (type 1) units that remain the most important source of emergency admissions, since the proportion of A&E attendances that lead to emergency admission from type 2 and 3 units is small. Strikingly, the number of attendances in type 1 units rose by only 6.4% between 2007/08 and 2012/13. This suggests that the increase in demand at the major units has been relatively modest. The proportion of attendances at these units which have led to an emergency admission has risen but the rise for older people has been small.

The rise in numbers of admissions of older people was accompanied by an increase in the proportion of admissions involving procedures (including diagnostic procedures). The number of older emergency admissions which involved a procedure rose by 47%, from 500,000 to 735,000, between 2007/08 and 2012/13. The number of admissions with no procedure in contrast rose by only 10%. The proportion of admissions which involved a procedure rose from 27% in 2006/07 to 33% in 2012/13.

The numbers of emergency admissions rose between 2001/02 and 2012/13 for almost all the main ICD chapters, with the sole exception (among chapters with over 10,000 admissions) of neoplasms, where the numbers fell by 9%. The majority of ICD chapters, however, saw a fall over this period in numbers of bed days. The exceptions were: rises of less than 50% for diseases of the respiratory system; injury, poisoning etc.; endocrine, nutritional and metabolic diseases; and diseases of the digestive system¹; and rises of over 50% for three chapters: diseases of the genitourinary system; infectious and parasitic

¹ After allowing for coding changes

diseases² ; and diseases of the ear. There were especially large rises for pneumonia and flu and for urinary tract infection, which are among the conditions for which admissions have been classed as potentially avoidable.

Major drivers of trends in older emergency admissions

The underlying demand for emergency inpatient care in old age has been affected by rising numbers of older people and also by changes in the health state of the older population. The rise in numbers explains only around one-third of the rise in emergency admissions of older people. Reductions in the incidence and prevalence of serious illnesses and accidents in successive birth cohorts of the population have reduced the underlying demand for emergency admissions, as discussed below. Changes in attitudes, including arguably rising risk aversion among the public and among health and social care staff may have affected underlying demand. The increased scope for urgent and emergency care to diagnose and treat health conditions, and associated greater awareness of the rising effectiveness and availability of specialist diagnostic services and of urgent and emergency care, may also have put upward pressure on demand.

The rise in the number of older emergency admissions would not have been possible without the fall in average length of stay and the increase in capacity, in particular medical staffing funded by rising NHS budgets. There was an unprecedented increase in real NHS spending in England from 2001/02 to 2009/10. The then Government decided to provide a strong boost to the funding of the NHS, with a view to bringing Britain's health care share of Gross Domestic Product (GDP) up to the European average. Given previous less generous funding of the NHS and the consequent rationing of services and access to available technology, there was ample scope for the population to benefit from an improved quality and quantity of services. Rising real expenditure to 2009/10 allowed the NHS to fund rising numbers of emergency admissions of older people without needing to reduce other services. This period was however followed by three years during which spending remained constant in real terms and payments for additional emergency admissions above the 2008/09 level were reduced to only 30% of the normal tariff rate. During these years, 2010/11 to 2012/13, there was little further increase in 'all ages' emergency admissions, but emergency admissions of older people continued to rise.

To explore the impact on the path of admissions of both an increasingly old population and a possible diminished tendency of successive age cohorts to receive emergency inpatient hospital care, we developed an age, period, cohort (APC) analysis. This analysis divides the increase in emergency admissions between factors associated with the patient's age (age effect), factors associated with the patient's year of birth (cohort effect) and factors associated with the year of the patient's admission (period effect). The period effects could reflect either demand factors such as a change in patients' expectations or supply factors such as adoption of new technologies.

Analysis of age, period and cohort effects provides helpful insights:

- The age effect is as would be expected: admission rates fall with age to about age 30 and then rise monotonically with age from around age 40 upward.
- The cohort effect is perhaps more surprising: each cohort from those born in around 1912 onward have experienced lower emergency admission rates after standardising for age and period effects.

² After allowing for coding changes

- Period effects have been increasing over the period since 1999. They rose especially sharply between around 2002 and 2005 and have continued to rise (although it has not been possible to produce an estimate specifically for the period since 2010 when real NHS expenditure and all ages emergency admissions ceased to rise).

Favourable cohort effects (the more recent the cohort, the lower the admission rate given the age) could represent improvements in health over time, or improved primary care, with healthy life expectancy rising as well as total life expectancy. These cohort effects currently broadly offset the age effect (the older the age group, the higher the admission rate, given the cohort) and the impact of rising numbers of older people. The rate of emergency admissions, averaged across all ages, has been falling for successive cohorts, after controlling for period effects. While the age and cohort effects are likely to reflect demographic and epidemiological change, the period effects capture admissions that could not have been anticipated given evidence from previous years: these would reflect both supply-side and policy innovations as well as any increases to patient demand. These effects are persistently important and include the contribution of increases in staff and other resources funded through the increase in expenditure on the NHS up to 2010, the uptake of new technologies and changes in clinical practice.

Arguably one of the reasons for the substantial increase in NHS expenditure following the NHS Plan was to reduce rationing of access to new and existing technologies. There have over the last decade been improvements in access to relatively new diagnostics, drug therapies and surgical procedures, a rise in the numbers and types of imaging and radio-diagnostic examinations and a rise in the proportion of older emergency admissions involving a procedure. Evidence for the important role of technology is that the numbers of spells involving procedures has risen much more rapidly than the number not involving procedures and that the number of short spells (0-1 day) have risen far faster than the number of longer spells (2 and more days).

Scenarios for the future

We have prepared projections to 2020/21, the end of the next Parliament, of the numbers of older emergency admissions and associated bed days. These are projections on the basis of specified assumptions about changes in emergency admission rates and length of stay and should not be regarded as forecasts.

We examined through several scenarios what rate of change in older emergency admissions and bed days might be required over the period to 2020/21 to meet demand pressures and the impact of technological change without tightening the 'eligibility criteria' threshold for emergency admissions or greatly increasing alternatives to emergency inpatient care.

The projected increase in numbers of older people is clearly one factor, albeit this demographic pressure will be greater after 2020 than in the next few years. The numbers of older people are projected to rise partly because of falling mortality rates and partly because of higher fertility rates in the years following World War II (WWII), i.e. the post-war baby boom. Even if need for emergency inpatient care at a given age (the cohort effect) continues to fall as mortality rates fall, unless the fall is very substantial the baby boom will in due course lead to increased admissions as those born shortly after WWII start to reach late old age. It happens however that in the years to 2020/21 the cohort effect seems likely to continue to offset the demographic effect. This means that whether the number of emergency admissions of older people continues to rise will depend heavily on future period effects.

If period effects remain constant, the number of emergency admissions of older people is projected to rise only slightly, from 2.21 million in 2012/13 to 2.25 million in 2020/21. If period

effects follow trends since 2007/2008, however, the number of emergency admissions is projected to rise from 2.21 million in 2012/13 to 3.01 million in 2020/21. The latter projection is likely to be upward biased because it is based, unavoidably, on a six-year period which includes some years in which NHS expenditure was still growing. However, emergency admissions for older people did not stop growing after 2010/11 when NHS austerity was imposed, and a relatively high projection might capture, appropriately, other, new period effects, such as a greater emphasis on improved care for older people following the implementation of the Equalities Act provisions on age discrimination in public services and the recommendations of the Francis enquiry.

These projections are based on current policy and practice. They implicitly take account of the impact of past measures to reduce the number of potentially avoidable emergency hospital admissions. They do not however take account of the recent policy of NHS England to reduce emergency admissions by 15% by the end of this decade with the help of the *Better Care Fund*.

Average lengths of stay of older emergency admissions are likely to continue to fall, even if not as rapidly as in recent years. If so, it is uncertain whether the number of total bed days will rise or fall but the overall change, whether positive or negative, seems unlikely to be large.

What implications might these projections have for total expenditure on emergency care of older people? The cost of an emergency hospital spell has risen, albeit slowly, in real terms over recent years, despite the continuing reduction in average length of stay. It seems entirely possible that the uptake of new technology will, unless put on hold for some years, exert continuing upward pressure on cost per day bed of emergency inpatient care such that the cost of a spell will continue to rise. This suggests that, if the numbers of admissions continue to rise, even slightly, total expenditure would also need to continue to rise in real terms.

In the period 2010/11 to 2012/13 expansion of admissions for older people has occurred without total admissions noticeably increasing. Our projections above for the older population do not therefore imply similar increases in total admissions, which may be more moderate.

Implications for policy

The implications for policy of our research findings need to be considered against the background of continued constraints on health and social care expenditure. The March 2014 Budget has reaffirmed the Government's plan to continue to reduce public expenditure over the coming years.

We have found a favourable cohort effect in the utilisation of emergency hospital admissions which has offset the age effect and impact of rising numbers of older people. An important implication of our research is that such offsetting seems likely to continue to the end of the decade (but not beyond since the numbers of older people are projected to rise faster in the next decade). This suggests that underlying demand pressures may have been more limited, and may continue to be more limited, than would be expected from consideration of population projections alone.

In contrast with our finding on cohort effects, our projections of period effects are inconsistent with any suggestion that emergency admissions for older people are likely to fall before the end of the decade, although they might remain fairly flat. This suggests that the current policy to reduce emergency admissions by 15% over this period could well face considerable challenges.

A major implication for policy of our findings is therefore that unless robust new measures can be introduced that prove highly cost-effective in constraining the rise in emergency admissions of older people, the number of such admissions is likely to continue to rise or at best remain constant. While the number of bed days of these admissions may well continue to fall, expenditure on older emergency admissions could continue to rise in real terms over the next few years.

Where hospitals are experiencing pressures on beds and operating with high bed occupancy rates, it appears that in general this is due not to exceptional rises in demand for emergency inpatient care, which changed little between 2010/11 and 2012/13, but to past reductions in acute bed capacity. Numbers of general and acute beds fell by about 11% between 2004/05 and 2009/10 and by about 4% between 2010/11 and 2012/13. (There was a break in the series between 2009/10 and 2010/11 which makes the recent picture incomplete.) This is not to say that individual hospitals may not be experiencing surges in demand, for example, where neighbouring hospitals have reduced capacity, but to stress that nationally there has not been a rise, let alone a surge, in numbers of emergency hospital bed days over the period we have studied: the number of emergency hospital bed days has in fact fallen.

The implication of a combination of continuing upward pressure on resources for emergency inpatient care and continuing constraint on real terms growth in expenditure is that it will remain important for the NHS and its partners to seek innovative and cost-effective ways to reduce the demand for emergency inpatient care and increase the efficiency of such care. The difficult question of what policy measures would be effective and cost-effective lies outside the scope of this study, but we offer the following points.

One possibility is that primary and community care services are strengthened and co-ordination between primary, secondary and social care improved, with a view to reducing the numbers of older people requiring emergency admission. Another possibility is that capacity constraints resulting from continuing financial pressure on NHS resources will encourage service providers to adopt more stringent criteria for admitting patients. If tightening effective admissions criteria is not considered acceptable and measures to prevent the need for admissions do not prove progressively more effective, resources may need to be transferred from other health services to fund rising numbers of older emergency admissions.

We have found considerable spatial diversity of admission growth rates, and others have noted the diversity in length of stay. This continuing considerable variation between areas in emergency admission rates and emergency lengths of stay suggests that a uniform national target for reductions in emergency admissions is unlikely to be optimal. Areas with relatively low emergency admission rates but above average lengths of stay may achieve better outcomes by reducing lengths of stay than by reducing admission rates. In some areas pressure to reduce length of stay rather than admissions appears appropriate; in others, such as London, the sharp relative rise in admissions per head deserves careful study and potential policy response.

Overall it appears important that current heightened perceptions of the burden of spiralling admissions, resulting from population aging, be re-considered: there are certainly more older people, but at a given age those born relatively more recently have fewer emergency admissions. This phenomenon of reduced emergency need among later-born cohorts turns out to be of no less importance in driving the number of emergency hospital admissions among older people than the aging of the population. Yet it appears to have escaped attention so far. It is possible that analyses of data for the period from 2013/14 onward will show that the end of real increases in NHS budgets resulted in no further increase in period effects. Continuation of past trends in increases in the number of emergency admissions of older people, even under present policy, is not inevitable.

1. Introduction

Recent years have seen considerable concern and debate about rising numbers of emergency hospital admissions in England. Rising numbers of emergency admissions of older people (aged 65 and over) over the past decade and longer have attracted particular attention, in part because of the projected continuing increases in the numbers of older people. The upward trend in emergency admissions have raised question about why the numbers have increased, and in particular whether the trend is due to inadequate primary and community health services and social services.

The Department of Health (DH) decided against this background to commission the Centre for Health Service Economics and Organisation (CHSEO) at the University of Oxford to conduct a new study of recent trends in emergency hospital admissions of older people, aged 65 and over, and factors associated with these trends. This study is one of two related studies concerning trends in emergency hospital admissions which DH commissioned from CHSEO. The other study is a comparison of inpatient emergency hospital care (all ages) in England and Scotland. Its findings are reported in Chalkley and Aragon (2014).

The aim of this study is to gain an improved understanding of the drivers of these hospital admissions and to formulate evidence-based scenarios for possible future trends in older emergency admissions in England.

The study has focused on the following research questions:

1. What are the trends in numbers of emergency hospital admissions, associated lengths of stay and total bed days of older people by age band, diagnoses and procedure over the last decade?
2. How far is the rise in admissions due to increases in the numbers of older (aged 65 and over) and very elderly (aged 85 and over) people over the last decade?
3. How far do trends in health state among successive generations affect the trend risk of emergency admission in old age?
4. How far do changes in the pattern of diseases at hospital admission help to explain emergency admissions or bed days over the last decade?
5. What supply side factors, such as advances in technology or organisational changes in emergency care, might explain trends in emergency admissions or beds days over this period?
6. What policy changes, such as payment by results or changes in resources for health care, may have impacted on these trends?
7. What would be a plausible range for the number of emergency admissions of older people over the period to 2020/21 based on trends over the last eleven years?

The study has involved analyses of Hospital Episode Statistics (HES) data for the period 2001/02 to 2012/13 and other official data; focussed review of literature on emergency hospital care of older people and on potential drivers of trends in older emergency admissions; consultation with experts, including a workshop and a survey of community geriatricians.

The approach adopted in this study involves careful consideration of and distinction between potential demand, supply and policy drivers of changes in numbers of older emergency hospital admissions. Unless these three factors can be clearly identified and distinguished, it is not possible to produce reasonable explanations of past trends let alone convincing comments on potential future trends. In particular it is important to distinguish factors which are determined or heavily influenced by policy and factors which are external, or exogenous, to policy decisions except perhaps in the very long term. This distinction is crucial if findings are to be valuable for future policy development.

A special feature of emergency hospital admissions is that choice may be rather limited. People experiencing medical emergencies, as opposed to requiring urgent but not emergency care, require prompt health care as soon as possible and may then require hospital admission. A key question is how far the trends can be explained not only by rising numbers of old, and especially very old people, but also by changes in the prevalence of different health conditions in the older population. The prevalence of co-morbidities comprising a combination of long-term conditions, including cognitive impairment as well as physical illness, is likely to be especially important. An expansion of morbidity among older people could in principle be a major part of the explanation for rising emergency admissions.

Also important for the consideration of demand for emergency inpatient care is the availability of services that may substitute for or reduce the need for emergency hospital admission. Such provision is on the supply side of health and social care generally but affects demand for emergency hospital inpatient care. It includes in particular primary health care and community-based health care and adult social services.

On the supply side, there have been significant advances in technology and changes in the organisation and staffing of acute and emergency care over past decade, which have contributed to a very substantial reduction in lengths of stay, increased day case care, reduced waiting times and improved effectiveness in terms of in-hospital case-fatality rates. There have also been changes in the organisation of other services, especially primary care, which may also have impacted both positively and negatively on use of emergency hospital care.

Policy changes which have been suggested as potential drivers of changes in use of emergency hospital inpatient care include changes to the General Practitioner (GP) contract, the introduction of performance management targets, especially the 4 hour waiting target for Accident & Emergency (A&E) care, and the introduction of payment by results (PbR). In addition, and most importantly, the level of resources to be made available to health and social services is a crucial policy variable. It is clearly a major determinant of capacity in terms of staff, hospital beds and equipment.

Chapter 2 presents the policy background to our study and the findings of other recent studies of emergency hospital admissions. Key trends in older emergency admissions over the last decade, lengths of stay and bed days are set out in chapter 3, with detailed analyses by health condition examined in chapter 4. Chapter 5 discusses demand side factors, chapter 6 supply side factors and chapter 7 policy drivers associated with trends in older emergency admissions. Scenarios and implications for the future are discussed in chapter 8. Chapter 9 offers a summary and some conclusions to which the reader seeking an overview is referred.

2. Background

Emergency hospital admissions in England have been rising for at least the last 25 years. The National Beds Inquiry (DH 2000) reported that emergency admissions per head increased by 2.1% per year between 1989 and 1998 for the whole population and by 3.0% per year for the older population (age 65 and over). The Nuffield Trust (Blunt et al 2010) found that emergency admissions among the overall population rose by 2.8% per year between 1998/99 and 2008/09, which implies a rate of around 2.3% per head per year. The next chapter of this report sets out trends for the most recent decade, to 2012/13, in much more detail.

Within the UK, increases in emergency hospital admissions are not peculiar to England. At the end of the 1990s the all ages emergency admission rate per 1,000 population was 73 in England and 91 in Scotland. By 2009/10 England and Scotland had rates of 100 and 99 respectively. Scottish rates had continued to rise but not as rapidly as English rates, which by 2009/10 reached Scottish levels.

Chalkley and Aragon (2014) found that England has experienced faster growth than Scotland in numbers of emergency episodes (all ages) but that differences in case-mix explain some of the difference in growth rates of emergency episodes. After controlling for differences in case-mix the difference in growth rates of emergency episodes is more modest than the raw data appear to suggest. Moreover, after controlling for hospital case-mix, population and policy differences, England has a persistently *lower* rate of emergency episodes and emergency bed days than Scotland.

There have been reports of rising emergency admissions from several countries outside the UK (Jones 2011). This author has also written that "... the unusually high growth in medical admissions has been an enduring international enigma over the past four to five decades" (Jones 2011, page 307). However, international comparisons are complicated by scarcity of comparable trend data. Organisation for Economic Co-operation and Development (OECD) Health Data (OECD 2011) show that the UK had lower rates of total hospital admissions involving at least one overnight stay than the OECD average: the UK rate was only 87% of the OECD average. In the USA the numbers of emergency admissions via emergency departments involving at least one overnight stay rose by 3.2% per year between 1993 and 2006, which implies an average annual rise of some 2.2% in the rate per head (Schuur and Venkatesh 2012). This is broadly in line with the English rate of increase reported by the Nuffield Trust (Blunt et al 2010).

In Melbourne, Australia, the rate per head of emergency admissions via emergency departments for all ages appears to have grown by about 3% per year between 1999/2000 and 2008/09 (Lowthian et al. 2012a). The Australian figures compare with a rise in the corresponding rate of admissions via emergency departments in England during the same period of about 5.6% per year (although total emergency admissions from all sources rose by a more modest 2.5% per year). Only about half of the increase in the all-age rate in Melbourne could be explained by demographic change. (Lowthian et al. 2012a). Meanwhile, the *levels* of the age-specific rates of emergency admission for older people in specific age groups seemed to be similar in Melbourne and in England in 2008/09 (Lowthian et al. 2012 and Blunt et al. 2010).

Urgent and emergency services have been the subject of a wide range of policy discourse and policy decisions over the last year. This has been prompted by a belief that the system is currently facing severe stress, at least in severe winters, and is not delivering the best outcomes. Increasing numbers of emergency hospital admissions and increasing waiting in

emergency departments are mentioned as evidence of systemic problems that require attention.

The House of Commons Health Committee conducted a study of urgent and emergency care and published a report in July 2013 (Health Committee 2013). They commented that 'the problems that have manifested themselves within emergency care cannot be attributed to any one factor or failure within the system'. They further commented that neither reduced hospital bed capacity, nor problems with out of hours care nor failures associated with NHS111 can sufficiently explain why emergency care is operating under such sustained stress.

Changes in the way hospital inpatient care is funded have been suggested as one of the potential drivers of the increase in emergency hospital admissions. The payment by results system of paying providers was introduced in stages with full introduction for emergency admissions across all providers from 2008/09. This gave providers a financial incentive to increase the number of emergency admissions but reduce the length of each spell.

To mitigate this incentive and limit the growth in numbers of emergency admissions, a marginal rate rule was introduced in 2010/11. Under this rule each emergency admission above a baseline set at the number of such admissions in 2008/09 attracts a payment of only 30% of the tariff. Monitor and NHS England have conducted a recent review of this rule and published a report in October 2013 (Monitor and NHS England 2013). They announced that the rule would be updated from 2014/15 to require baseline adjustment in some localities and to ensure that funds retained by commissioners as a result of application of the rule 'are invested transparently and effectively in appropriate demand management and improved discharge schemes'. To facilitate the investment of such funds, the Government indicated that 'Urgent Care Boards' should be set up in local areas to bring together commissioners and providers to develop plans to improve emergency services.

Access to primary care services has also been suggested as a potential driver of the increase in emergency hospital admissions. In particular the change in the general practice contract from 2004, under which GPs can opt out of providing out of hours services, has been raised as a possible contributory factor. The government has recently decided to introduce a new GP contract for April 2016. The new GP contract will secure specific arrangements for all patients aged 75 and over to have an accountable GP and for those who need it to have a comprehensive and coordinated package of care. The NHS England planning guidance for 2014/15 indicates that 'CCGs will be expected to support practices in transforming the care of patients aged 75 or older and reducing avoidable admissions by providing funding for practice plans to do so' (NHS England 2013).

NHS England is conducting a comprehensive review into the organisation of urgent and emergency care services in England. The review was set up in response to concern that A&E departments, hospital departments and ambulance services were under intense, growing and unsustainable pressure. The findings of the first phase of the review were published in November 2013.

The report and covering letter by Professor Sir Bruce Keogh (NHS England 2013) set out a vision of 'highly responsive, effective and personalised services outside of hospital' for people with urgent but non-life threatening needs and for people with more serious or life threatening emergency needs treatment in 'centres with the very best expertise and facilities in order to reduce risk and maximise their chances of survival and a good recovery'.

There have been a number of studies of trends in emergency admissions in England and of geographical variations in emergency admission rates. A study by the Nuffield Trust of trends in emergency admissions during the period 2004-2009 (Blunt et al 2010) found that

the number of emergency admissions (*all ages*) rose by 11.8% over this five-year period. Moreover, while the number of attendances at major Accident & Emergency (A&E) units grew by 1.2%, the proportion admitted from these A&E units as emergencies grew by 14.3%. At most, 40% of the increased number of emergency admissions over the period could be explained by the effects of population aging. The rise in emergency admissions was not found to be associated with any one particular type of illness but to be associated with a large rise in short-stay admissions. Blunt et al argue that this implied that less severe cases were being admitted to hospital, which suggested that the clinical thresholds for acute admission had reduced.

The King's Fund found in their recent study of variations in older emergency admissions (Imison et al 2012) that there is significant variation in the use of hospital beds by people over 65 admitted as an emergency. This resulted almost equally from variation in rate of admission and variation in length of stay. They argued that the drivers of variation are complex, including patient attributes, deprivation, availability of community services, access to hospital services, hospital management, and staff relationship with services. They found that areas with higher proportions of older people have lower rates of emergency bed use and that areas with well-developed, integrated services for older people have lower rates of hospital bed use. Areas with low bed use also delivered a good patient experience and had lower readmission rates.

The National Audit Office (NAO 2013) recently reported that emergency admissions rose by 47% over the previous 15 years, a 124% rise for short stay admissions (<2 days) and a 14% rise for long stay admissions (2+ days). The proportion of patients attending major A&E who were admitted rose from 19% in 2003/04 to 26% in 2012/13. The causes of the increase include, in the NAO's view, a lack of effective alternatives, the four hour waiting target for A&E, changing medical practices, more older people with long-term conditions, increasing pressure on A&E, and payment by results. They commented that hospitals have become more efficient at managing emergency admissions: waiting times in A&E have reduced until the last few years, lengths of emergency stays have reduced, and mortality rates for emergency admissions have fallen.

Our study has added to the findings of these earlier studies through:

- A focus on older people and especially the oldest old, aged 85 and over;
- More extensive examination of bed days and lengths of stay as well as admissions;
- Inclusion of more recent trends;
- A clear distinction between demand, supply and policy drivers of trends;
- An examination of trends for specific health conditions;
- An analysis of age, cohort and period effects in trends in emergency admissions to understand better the demographic pressures; and
- Development of some evidence-based scenarios for future trends in older emergency admissions.

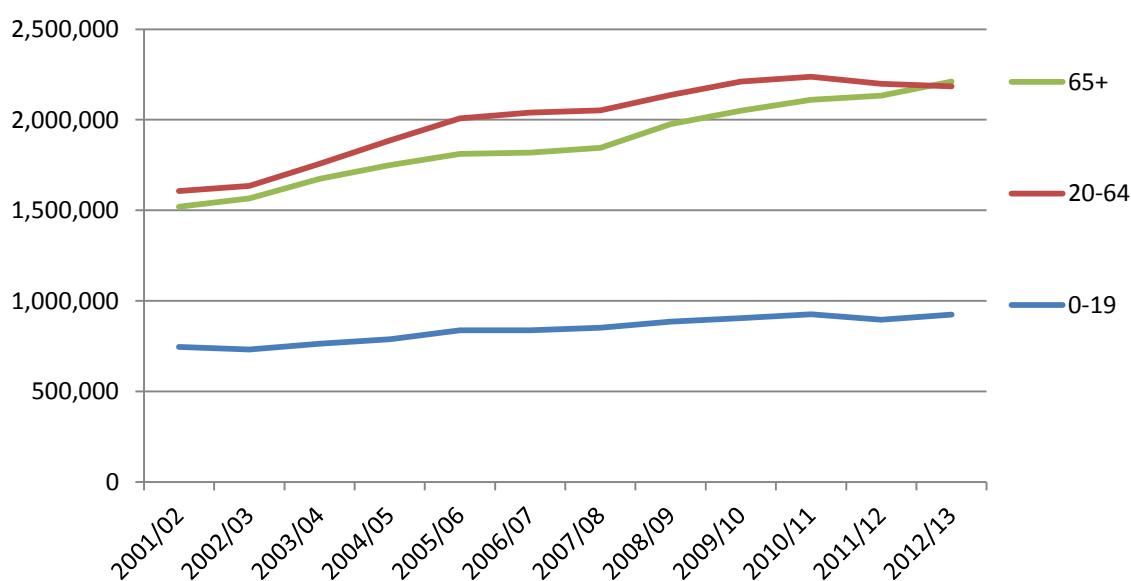
3. Key trends

This chapter outlines the key trends in emergency hospital admissions and bed days over the eleven year period 2001/02 to 2012/13. It paves the way for more detailed analyses of trends (and examination of factors associated with them) in subsequent chapters and sets the trends in emergency admissions of older people in the context of trends for all age groups and in the context of trends in elective admissions. It also considers trends in lengths of stay and in sources of admission, trends by region and trends in A&E attendances. The data source for the analyses is Hospital Episode Statistics (HES), except where otherwise stated.

3.1. Emergency hospital admissions

Total emergency hospital admissions for all ages have increased in all but one year since 2001/02, rising by 37.4% from 3.87 million in 2001/02 to 5.32 million admissions in 2012/13. This increase reflects both growth in the population of England and rises in emergency admission rates. The greatest increase, 45.6%, was seen for those aged 65 and over, and similar but less pronounced increases were also observed for working age adults (aged 20 to 64) and younger people (aged 0 to 19), with growths of 36.0% and 24.0% respectively (Figure 3.1). Whilst there are additional pressures acting on the older age group, a significant proportion of underlying growth appears to be common to the entire population.

Figure 3.1: Emergency hospital admissions by broad age band, England, 2001/02 to 2012/13



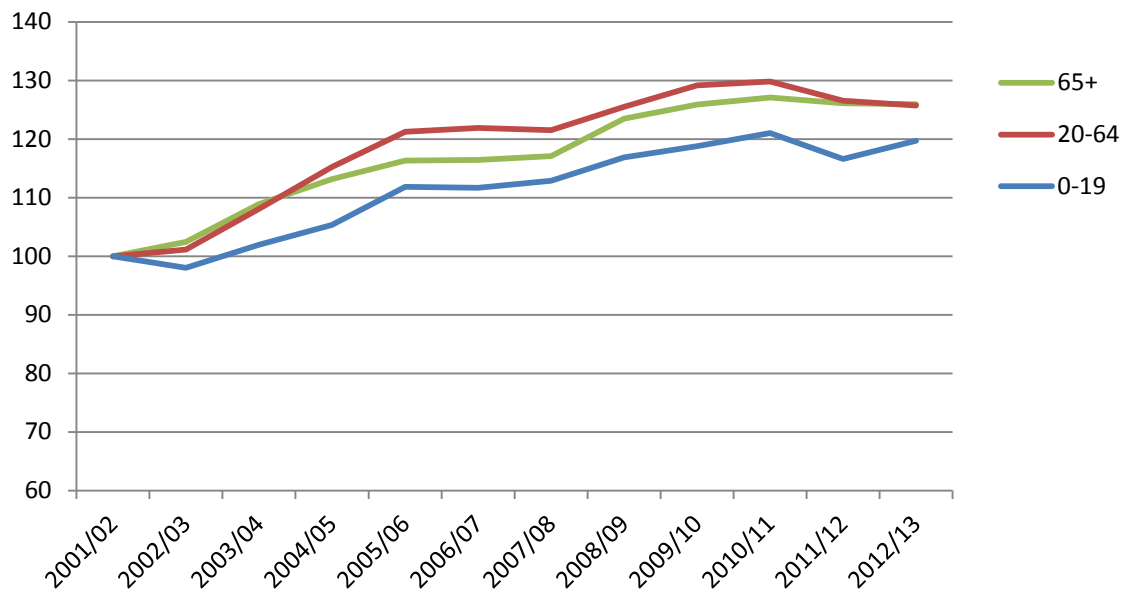
Annual fluctuations in the number of admissions are highly correlated across age bands, which further support the idea that important common factors drive the rise in admissions for all age groups. All age groups experienced faster growth from 2002/03 to 2005/06, and later from 2007/08 to 2010/11, with relatively limited or even negative growth outside of these periods. Possible reasons for this variability are discussed in later chapters of this report.

3.2. Emergency admission rates

This co-movement across age bands becomes more apparent when admission rates per 1,000 population for broad age bands are considered. A simple bivariate regression of the annual percentage changes in emergency admission rates for 20 to 64 year olds against those for people aged 65 and over results in an R^2 of 0.74, suggesting that the majority of the trend in older admission rates is explained by factors also affecting younger adults. Figure 3.2 shows this relationship by plotting admission rates indexed to 2001/02. It is apparent that the growth rates of working age and older adult emergency admissions are virtually identical when the period is taken as a whole, and track each other closely throughout.

The rate of emergency admissions for all age groups peaked in 2010/11, with both the 20 to 64 and 65 and over age groups experiencing decline since 2010/11. There has been noticeably slower growth in the admission rate for young people over the period as a whole, who have nevertheless experienced a similar pattern of growth (Figure 3.2).

Figure 3.2: Emergency hospital admission rates, Index 2001/02 = 100

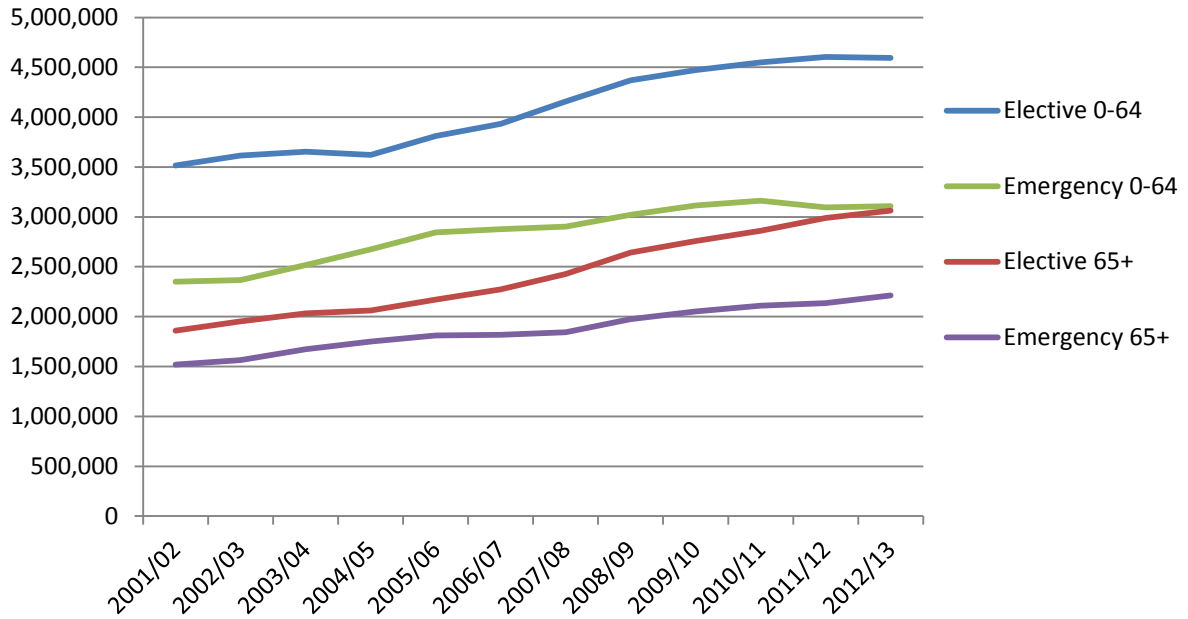


3.3. Comparison of emergency and elective admission rates

Alongside this increase in emergency hospital admissions, there have also been consistent increases in the number of elective inpatient admissions (Figure 3.3). Elective admissions for people aged 0 to 64 have increased by 30.2% since 2001/02, slightly less than the corresponding figure for emergencies, but elective admissions for those aged 65 and over have increased by 64.6%, a substantially higher figure. This growth has been driven by day case activity, with the number of longer stay elective admissions actually falling.

Similar to emergency admissions, the annual fluctuations in elective admissions for those aged 65 and over are highly correlated with those for people aged 0 to 64. However, there is little apparent correlation between changes in electives and changes in emergencies, with each experiencing rates of faster and slower growth at different times.

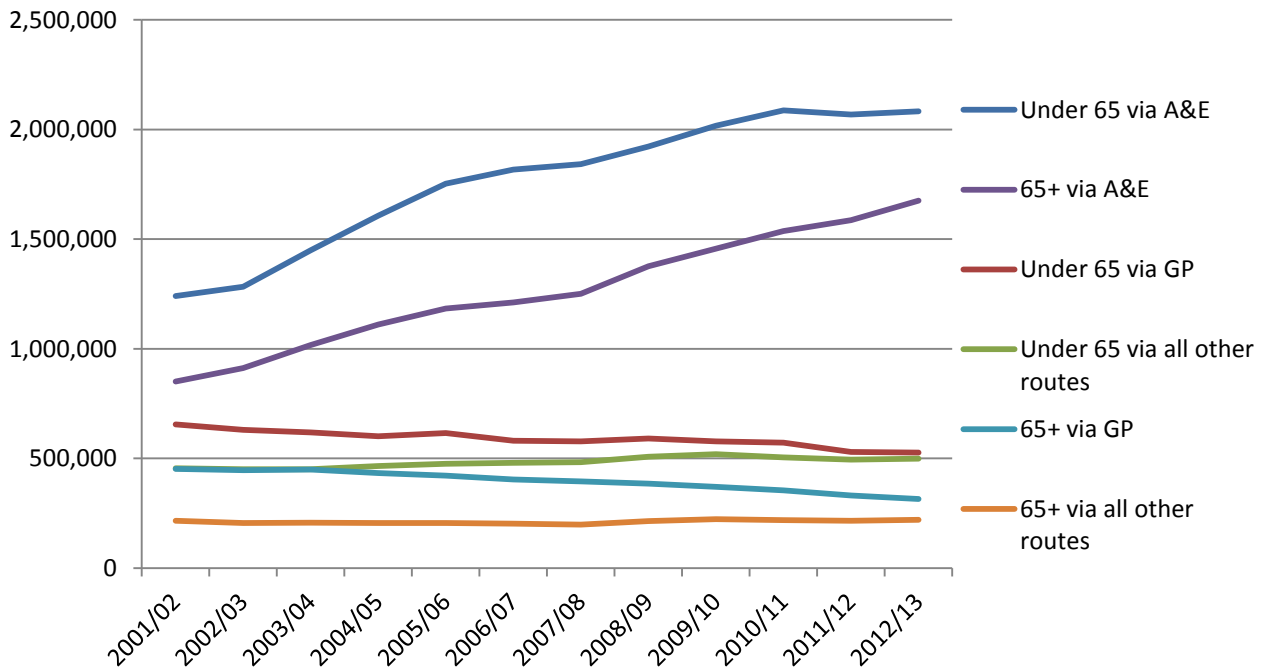
Figure 3.3: Hospital admissions by broad age band and admission method



3.4. Source of emergency admissions

There has been a well-documented shift in the source of emergency hospital admissions from GP referrals to Accident & Emergency attendances. As Figure 3.4 illustrates, this transition is common to both older and younger patients. However, the proportionate change is *larger for the 65 and over group*, with a 97% rise in admissions via A&E and a 30% fall in admissions via GP referral, compared to a 68% rise and a 20% fall for those aged 0 to 64. This decline in admissions via GP may reflect problems with access to primary care. However, it may also reflect that people are getting better at selecting which healthcare provider to present to in case of illness.

Figure 3.4: Emergency hospital admissions by admission method

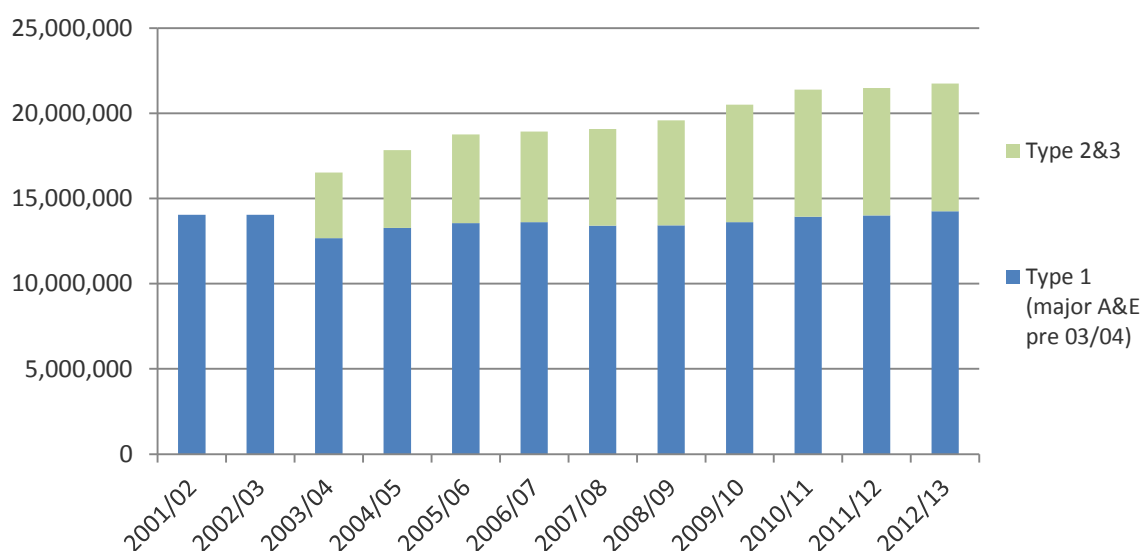


3.5. Accident & Emergency attendances

As shown in Figure 3.4, Accident & Emergency units appear to be playing an increasingly important role as the source of most emergency hospital admissions. To understand the trends in hospital admissions, it is therefore important to look in more detail at A&E attendances.

Total A&E attendances (all ages) have increased by 31.6% since the introduction of Walk-in Centres in 2003/04, with 69.6% of the growth occurring in type 2 & 3 units (Figure 3.5). However, it is type 1 units that remain the most important source of emergency admissions, since the proportion of A&E attendances that lead to emergency admission, known as the conversion ratio, from type 3 units is small. The rise in the type 1 conversion ratio over the last decade is well documented, but using experimental HES data on A&E attendances allows us to examine why this has occurred.

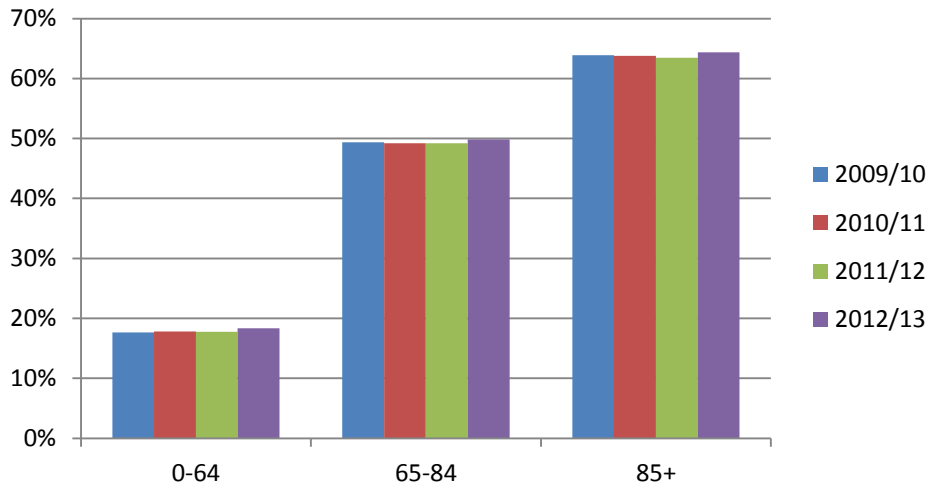
Figure 3.5: A&E attendances by unit type



HES data on Accident & Emergency attendances are available from 2007/08, but with only very limited coverage for the early years. As such, we use HES data from 2009/10 to 2012/13 to provide a more detailed examination of the older age group. As type 1 units are both the largest source of emergency admissions, and have much greater data coverage than type 2 and 3 units, we only use data from these major A&E units.

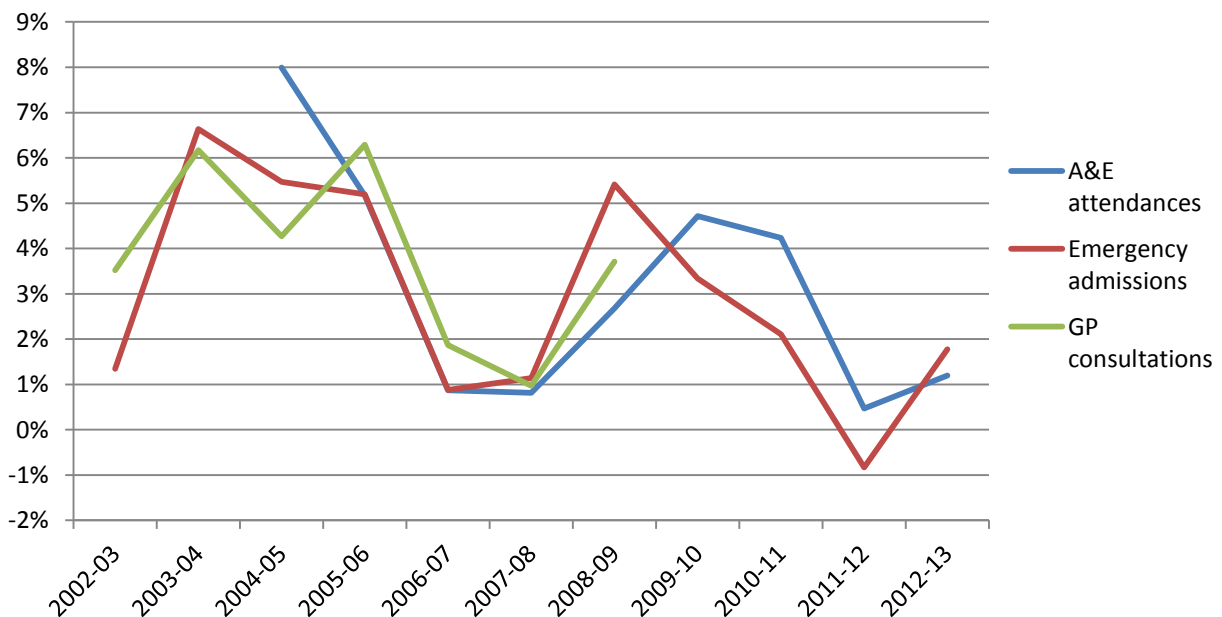
The conversion rate from A&E attendance to hospital admission is highly dependent on age, with A&E attendances for the oldest old (aged 85 and over) being 3.5 times as likely to result in admission as attendances for 0 to 64 year olds (Figure 3.6). As demographic pressures result in a growing proportion of older A&E attendees, we would naturally expect the overall conversion rate to increase. The rise in the all age conversion ratio from 24.4% in 2009/10 to 25.9% in 2012/13 was driven mainly by two factors: a faster increasing conversion ratio amongst 0 to 64 year olds, and a shift towards older patients. While 0 to 64 year olds comprised 81.0% of type 1 attendances in 2009/10, they made up only 78.7% in 2012/13. The corresponding share for those aged 85 and over rose from 4.8% to 5.7%. This age effect alone is responsible for 56% of the increase seen between 2009/10 and 2012/13. Although age specific conversion rates did increase over this 3 year period, the increases for older people were small.

Figure 3.6: Percentage of Type 1 Accident & Emergency attendances resulting in an emergency admission, by age



It is interesting to note that the trends in A&E attendances displayed in Figure 3.5 appear to align with those seen for emergency admissions. If we plot the changes in A&E attendances, emergency admissions and GP consultations³ on the same graph, we see a high level of correlation not only between the first two variables, but also with GP consultations (Figure 3.7). This seems to indicate that the increases in emergency activity were not due to a substitution away from primary care, but because of a wider range of factors affecting various forms of healthcare utilisation. In contrast, both elective inpatient admissions and outpatient appointments display different trends (not shown in Figure 3.7) with limited correlation in terms of annual percentage changes.

Figure 3.7: Percentage change from previous year's activity, all-ages

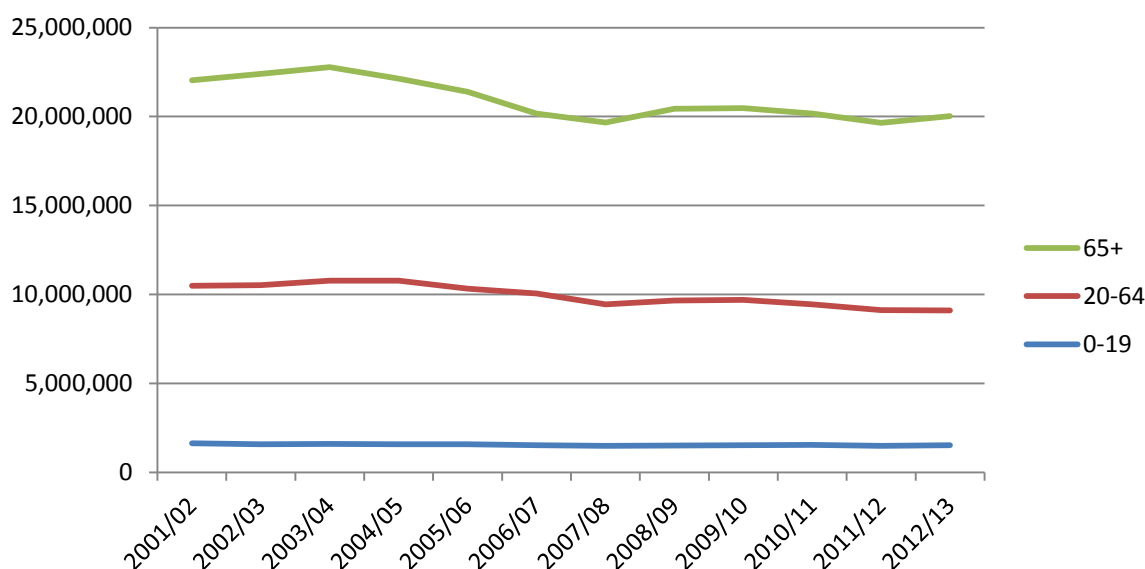


³ Trends in Consultation Rates in General Practice - 1995-2009, QResearch

3.6. Bed days of emergency admissions

When considering the pressure that additional activity places on the NHS, it is important to study the number of bed days associated with hospital admissions, rather than just the number of admissions themselves. Despite rising admissions, *the total number of emergency bed days*⁴ fell by 10.3%, from approximately 34.2 million in 2001/02 to 30.7 million in 2012/13. The proportionate fall in bed day use was greatest for the 20 to 64 age group, with 13.2% fewer bed days in 2012/13 than 2001/02, with the majority of this decrease occurring between 2004/05 and 2007/08. For people aged 65 and over, there was a sustained fall in bed days for much of the period until 2007/08, since when they have remained reasonably constant (Figure 3.8). The 65 and over share of all emergency hospital bed days has increased slightly, from 64.5% in 2001/02 to 65.3% in 2012/13. Whilst the 65 and over group does account for the majority of bed days, when considering how pressures have changed over the past decade, the experience for older people is not unique: there appears to be a similar evolution in trends for older and younger patients.

Figure 3.8: Emergency hospital bed days by broad age band



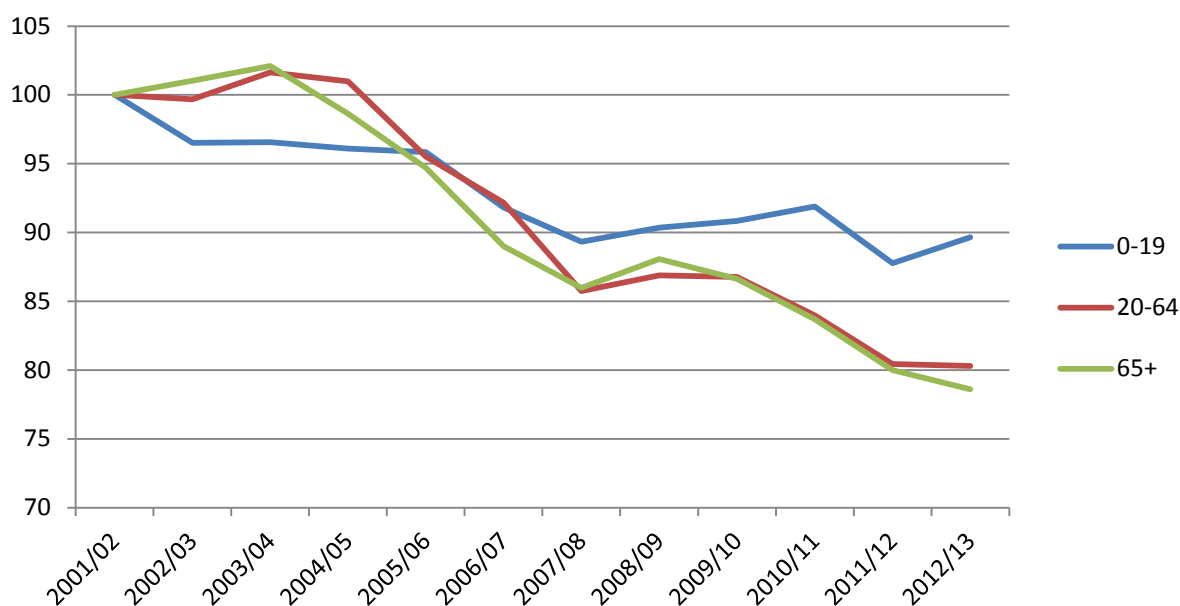
3.7. Rates of bed days of emergency spells

Rates of emergency bed day use again show similar trends for older and younger adults (Figure 3.9). It is only for the 0 to 19 age group that a substantially different trend is seen, with more limited reductions in bed day use. Given the smaller increase in admissions for this group, it is clear that the length of stay reductions achieved for adults have not occurred to the same extent for younger people.

Whilst rates of bed day use for adults ceased to fall in 2007/08, from 2009/10 onwards the previous trend resumed, although at a slower pace than before. For the 20 to 64 age group, these reductions appear to have again ceased by 2012/13.

⁴ For these analyses, spells with lengths of stay of over 1 year have been excluded.

Figure 3.9: Emergency hospital bed day rates, Index 2001/02 = 100



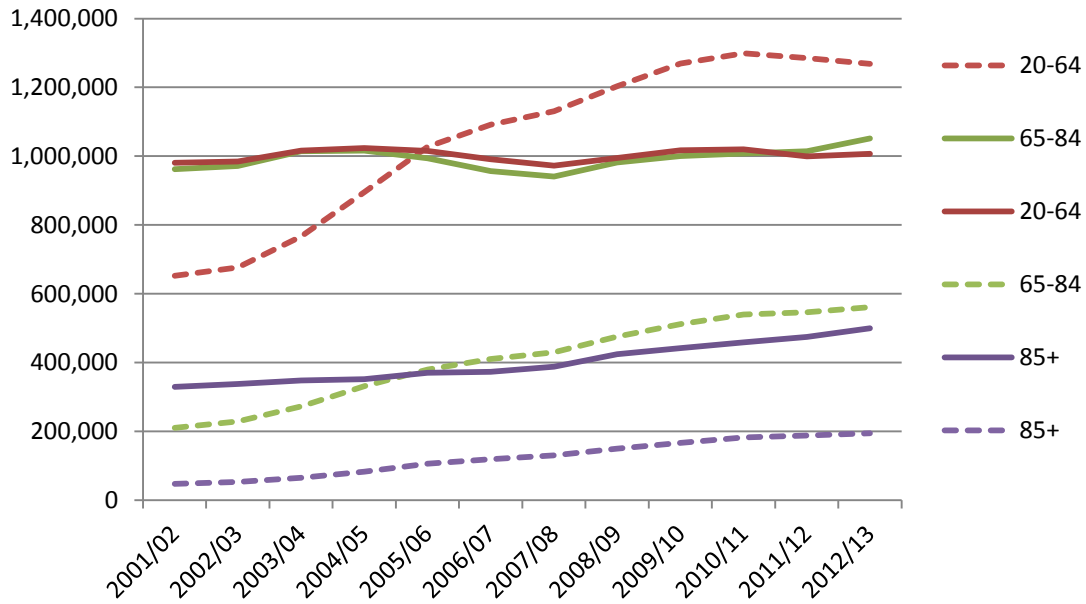
3.8. Emergency spells by length of stay

These aggregate level trends mask underlying differences between the changing pattern of older and younger emergency admissions. Changes in average lengths of stay are determined not only by efficiency gains allowing more rapid treatment of patients, but also by the proportion of very short-stay cases. Since work by the National Audit Office (NAO) has shown that much of the distinction between 0 and 1 day stays are caused by time of arrival; we group these cases together as 'short stays'. Comparison of trends in these short stays with longer stays of 2 or more days shows key differences arising for the oldest old (aged 85 and over).

As Figure 3.10 shows, all age groups have seen considerable increases in short stay cases, from 41.5% amongst 0 to 19 year olds to 309.2% for those aged 85 and above. When looking at emergency hospital spells of at least 2 days, we see a reasonably flat picture for people aged 20 to 84, and even see falls for the youngest age group. It is only amongst people aged 85 and over that we see a substantial increase of 51.5%.

Short and long stay admissions also display different trends over time. Perhaps most importantly, whilst the number of short stay admissions fell or grew at a slower rate since 2010/11, this does not appear to be the case for longer stays among the 85 and over age group.

Figure 3.10: Emergency hospital discharges⁵, by 0-1 (dashed) and 2-365 (solid) day length of stay



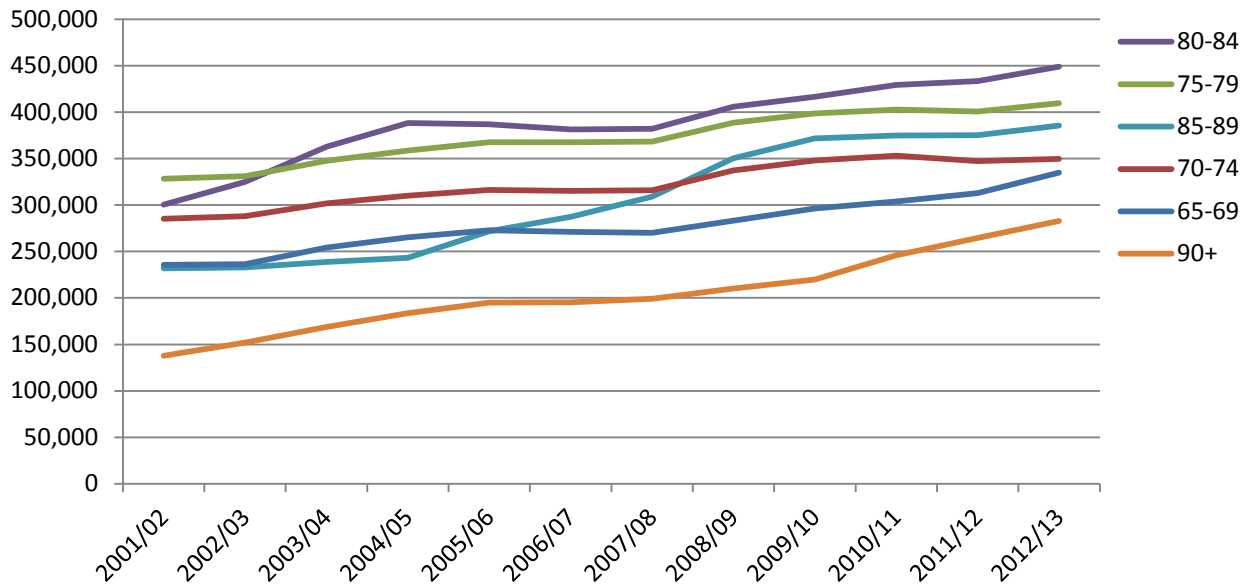
It is ultimately the absolute number of admissions and bed days that is most important in determining pressure on the NHS, and it is the older age group where these changes have been the largest. We present more detailed analysis of this older age group below.

3.9. Emergency hospital admissions of older people

Emergency hospital admissions for people aged 65 and above have increased year on year since 2001/02, rising by 45.6% from 1.52 million admissions in 2001/02 to 2.21 million in 2012/13. This increase has been seen for all quinary age bands, with the proportionate change generally rising with age (Figure 3.11). The only exception to this is the 65 to 69 age group, which has seen larger population growth due to the baby boom, and as such has experienced a larger increase in admissions than the 70 to 74 and 75 to 79 groups.

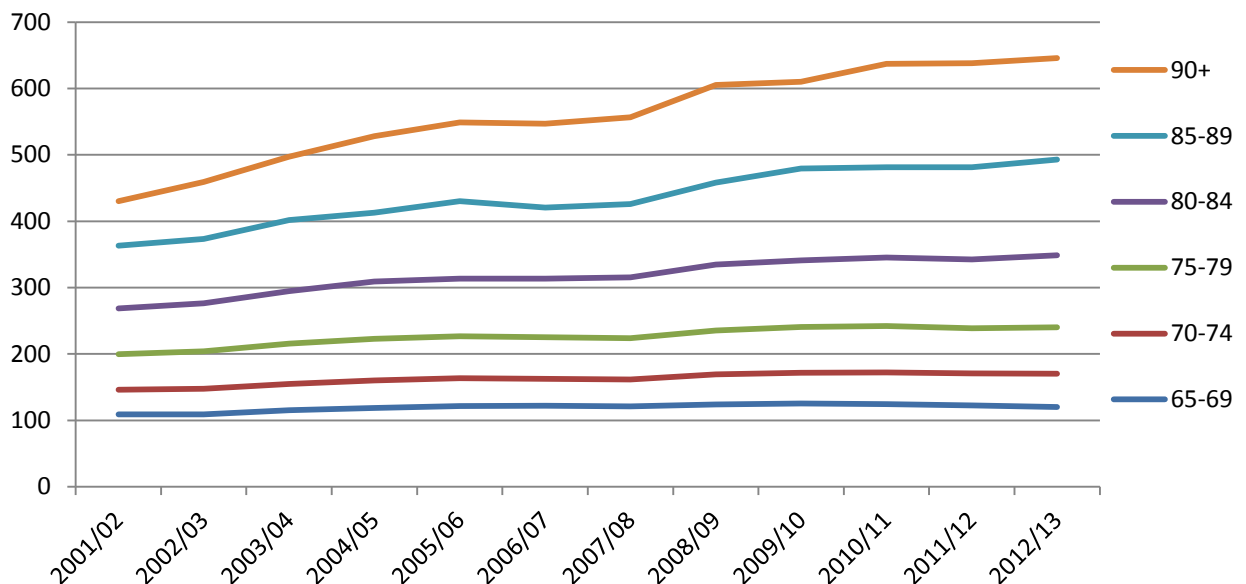
⁵ Discharges have been used rather than admissions as spell duration is only recorded against the discharge episode in HES. Whilst episodes can be linked to allow disaggregation of admissions by length of stay, using the raw discharge data avoids any potential issues arising from data linkage.

Figure 3.11: Older emergency hospital admissions by age band



As Figure 3.12 shows, once population growth is taken into account, the proportionate changes in admission rates among older people increase monotonically with age. Growth is relatively limited for the younger age bands, with only a 9.9% increase in the 65 to 69 rate of admissions, but growth of 50.2% is observed for the oldest 90 and over age group. These results highlight the considerable differences between the younger old and the oldest old. Rates for people aged 65 to 79 actually increased more slowly than for 0 to 64 year olds.

Figure 3.12: Older emergency hospital admission rates per 1000 population by age band



The number of bed days associated with these emergency admissions fell for all age groups except the oldest old (90 and over). That group, despite experiencing some decline towards the middle of our period, used 21.6% more bed days in 2012/13 than in 2001/02 (Figure

3.13). Amongst the other age bands, much of the reduction was seen during the earlier half of the period, with less of a reduction since 2007/08. This overall reduction in bed days nevertheless represents a noteworthy development in the face of demographic pressures and rising admission rates.

Figure 3.13: Older emergency hospital bed days by age band

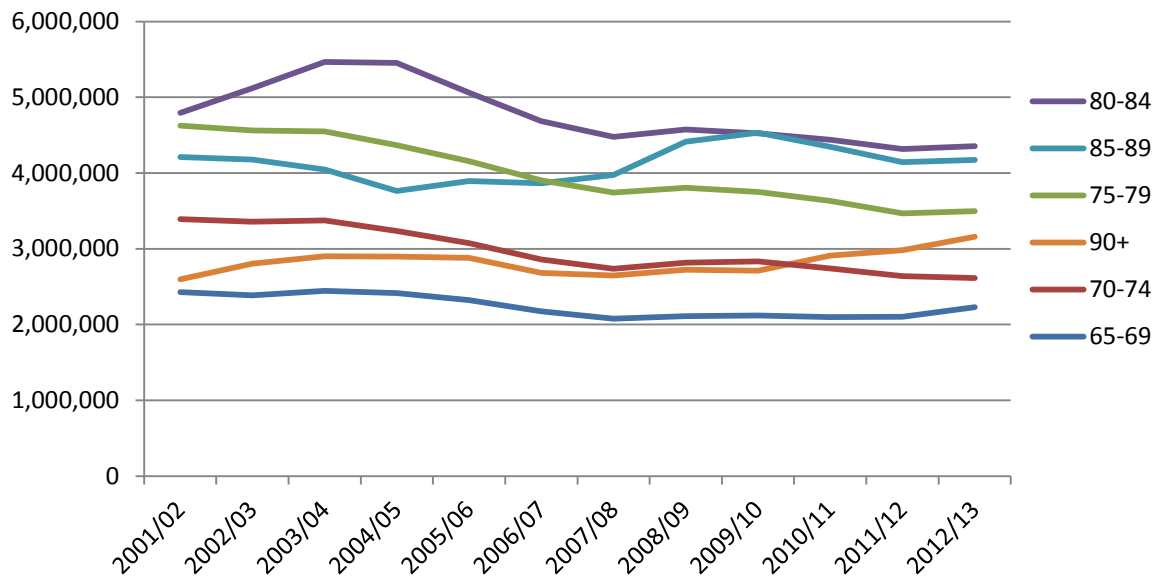
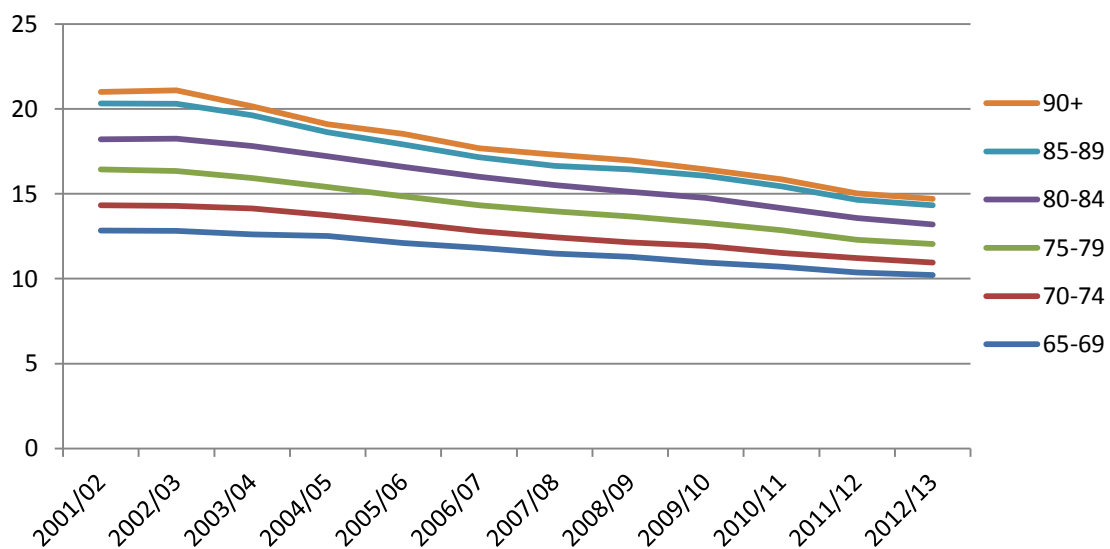


Figure 3.14 displays the average length of stay, by age band, for spells that were at least 2 days long. Lengths of stay have fallen consistently during the period, with slightly smaller proportionate declines for the younger old: a 20% reduction for 65 to 69 year olds compared to a 30% reduction for those aged 90 and over.

Figure 3.14: Mean length of stay for emergency spells lasting 2-365 days, by age band



3.10. Variation in emergency admission rates

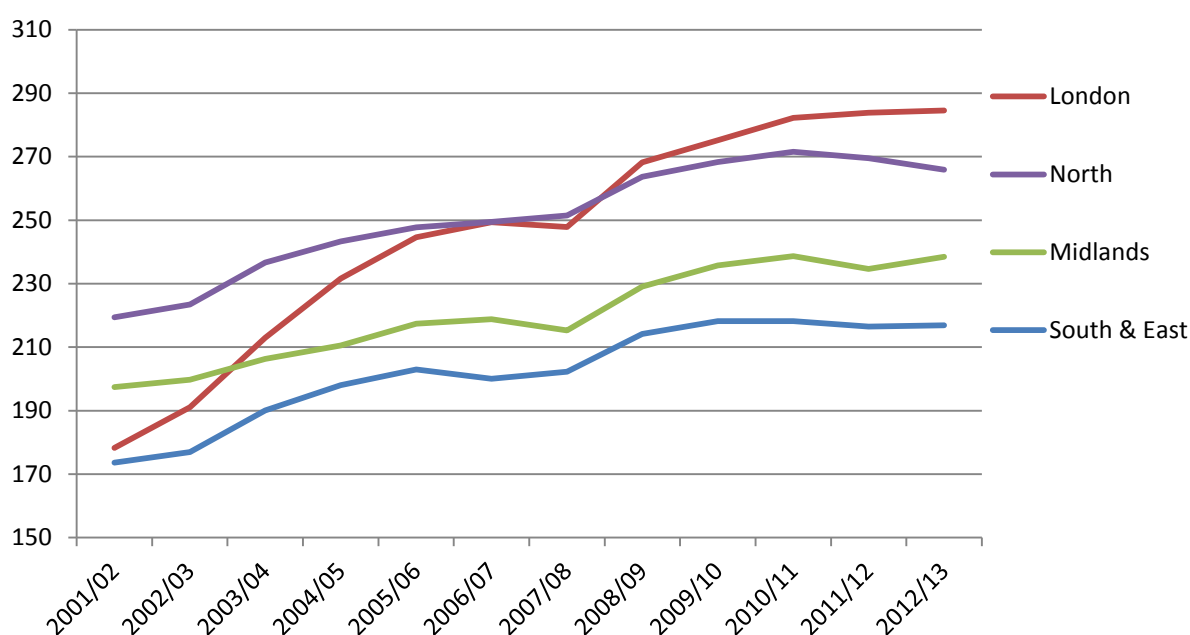
Whilst local variation in admissions is a highly important issue in its own right, changes in variation across former Primary Care Trust (PCT) areas do not appear to be a major cause of rising emergency admissions at a national level. Although there is substantial variation in admission rates by PCT, growth rates do not appear to be systematically correlated with the current magnitude of admission rates. More detailed analysis of local variations may uncover impacts on hospital use, but this is beyond the scope of this paper.

At a more aggregated regional level, we see that emergency hospital admission rates remain higher in the North of the country than in the South and East. However, the most dramatic increase has occurred in London, which now has the highest rate of emergency admission for people aged 65 and above. Nearly two-thirds of the increase in London's rate of emergency admissions occurred prior to 2005/06. Had London experienced the same growth in rates as the South and East of the country, there would have been 60,000 fewer emergency admissions in 2012/13. The additional admissions in London are largely similar to those in the rest of the country, in terms of distribution of conditions and proportion of 0-1 day stays.

This additional increase in London does not appear to be due to demographic factors. The population share of the oldest old in London has evolved in a manner similar to that seen in the rest of the country; and London also experienced the greatest increase in emergency admission rates for those aged 0 to 64. Immigration is often seen as a potential cause of increased emergency hospital activity, but it seems unlikely that this would be a major factor amongst the older population.

It is possible that this additional increase in London reflects factors that have occurred nationwide, but to a greater extent in the capital. These may be supply side changes such as the adoption of new technology or organisational change. More detailed analysis of changes to healthcare in London, especially during the early part of the decade, may therefore help to explain much of the increase that was occurring nationwide.

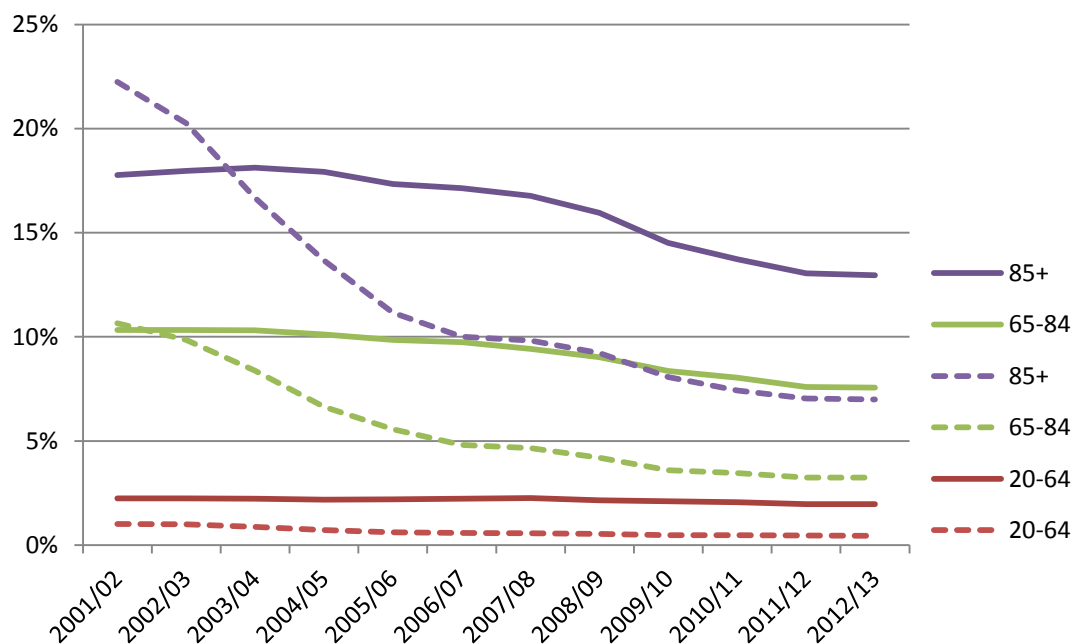
Figure 3.15: Older emergency hospital admission rates per 1000 population by region



3.11. Performance

Rising numbers of emergency admissions represent a more significant problem if they are associated with a decline in quality. One metric that provides a snapshot of performance is mortality. In-hospital mortality fell for patients of all ages from 2001/02 to 2012/13. This could reflect various factors including improved quality of care and reduced admission thresholds. In an attempt to partially control for this, we calculate mortality rates for broad age groups, separately for short and long stay admissions. It is clear that much of the reduction in mortality seen during the first half of the period is associated with 0-1 day stays, after which mortality declines gently for both short and long stay older patients (Figure 3.16).

Figure 3.16: In-hospital mortality, by 0-1 (dashed) and 2-365 (solid) day length of stay and broad age band



The frequency of emergency readmissions to hospital is often seen as a measure of performance, to the extent that readmissions may be associated with the premature discharge of patients. The rate of emergency readmissions to hospital has increased for all age groups since 2001/02, with the fastest growth observed for older people (aged 75 and over). A pause in rising readmission rates, most clearly visible for older patients from 2005/06 to 2007/08, corresponds with the pause in rising numbers of overall admissions. Emergency readmissions account for a small but measurable proportion of the overall increase in emergency hospital activity.

3.12. Summary

The basic findings from these analyses of HES data can be summarised as follows:

- Emergency admissions of older people rose by 46% and the age-standardised rate by 25%. The increase in the rate for those aged 65 to 84 was lower than for younger adults, but the increase in rate was highest for those aged 85 and over.
- Elective admissions of older people also rose rapidly, by 65%, which is more rapidly than emergency admissions. This increase was driven entirely by day case activity.
- The number of short stay older emergency admissions rose more rapidly than long stays, by 193% as against 20%.
- Average length of stay for older people fell by 25%, equivalent to 4 fewer days per hospital spell.
- The number of emergency bed days among older people fell by 9%, as the decline in average length of stay outweighed the increase in admissions, and the rate of emergency bed day use fell by 25%.
- Total A&E attendances (all ages) increased by 32% since the introduction of Walk-in Centres in 2003/04, with 70% of the growth occurring in type 2 and 3 units but it is type 1 units that remain the most important source of emergency admissions.

In addition to these basic findings, a number of trends that warrant further investigation or shed new light on the changes in emergency hospital admissions are presented below:

- There is a high correlation ($R^2 = 0.74$) between annual changes in older and younger adult emergency admissions.
- The emergency admission rate of older people rose much more rapidly in London, by 60%, compared to 22% in the rest of England.
- 56% of the increase in the conversion ratio from type 1 A&E attendance to emergency hospital admission between 2009/10 and 2012/13 is due purely to changes in the demographic mix of A&E attendees.

These findings will be considered in later chapters, where we examine hypotheses for factors associated with the rise in emergency admissions.

4. Trends by health condition

Past studies have tended to concentrate on overall trends in emergency admissions across *all health conditions* and not to examine in any detail trends by *individual health condition*. It seems important in the context of the aims of this study to consider trends for different health conditions. This is for three main reasons.

First, a report of overall trends without any breakdown by health condition may hide important variations by condition which are important for understanding the underlying factors associated with these trends. Emergency admissions of older people can be due to a variety of causes including accidents, infectious diseases, non-infectious physical illnesses, mental health problems or signs and symptoms that require investigation. A detailed exposition of past trends would be incomplete if it did not include separate information on trends for these disparate categories.

Second, the factors which are associated with trends in admissions and their lengths of stay may vary by health condition. Some conditions may be more heavily concentrated on the very old than others, which means that admissions for those conditions would be more greatly affected by demographic change. Some conditions may have experienced greater changes in prevalence among the older population, by age band, than others. Diagnosis and treatment for some conditions may have benefited more from technological advances than others.

Third, future trends may vary by health condition. This could arise if the incidence and prevalence of specific conditions is expected to rise or fall or if the scope for treating some conditions improves as a result of technology. If the factors associated with past trends vary by condition, it is possible, if not likely, that future trends could also vary by condition.

We have supplemented our analysis of trends by health condition with an analysis of trends by procedure (that is, surgical procedure, diagnostic tests etc.) The reasons are to examine trends in diagnostic procedures and to add more detail to the analysis of trends by health condition, especially for those health conditions where surgical procedures might be conducted.

Our strategy has been to:

- Examine trends by specific procedure to ascertain which have had the greatest increases or declines in admissions, discharges or bed days;
- Examine trends in admissions and bed days by International Classification of Diseases (ICD) chapter over the period 2001/02 to 2012/13;
- Examine trends by specific health condition to ascertain which have had the greatest increases or declines in admissions, discharges or bed days;
- Investigate in more detail the trends, and factors potentially associated with them, for those conditions which have experienced the greatest changes over the period 2001/02 to 2012/13.

4.1. Trends by OPCS main procedure

The number of older emergency admissions (first episodes) which involved a procedure rose by 47.0%, from 500,000 to 735,000, between 2007/08 and 2012/13. This rise was faster for

the oldest old, 62% for those aged 85 and over compared with 42% for those aged 65 to 84. The number of admissions with no procedure rose by only 9.9%. The proportion of admissions which involved a procedure rose from 27.1% in 2006/07 to 33.3% in 2012/13.

Data showing the change in discharges by OPCS procedure chapter, for those chapters with at least 500 discharges in 2012/13, are summarised in Table 1. The key points are:

- There was an increase of 108% in discharges for diagnostic imaging, testing and rehabilitation; within the total, there was an increase of 83% for diagnostic imaging of the central nervous system; 416% increase for diagnostic imaging procedures; and 383% increase for diagnostic echocardiography.
- There were increases of less than 100% but over 50% in discharges relating to heart (74%); ear (57%); and respiratory tract (52%); within the heart group there was an increase of 176% for angioplasty and insertion of stent; within respiratory tract there was an increase of 105% for ventilation support.
- There were increases of between 25% and 50% in discharges for nervous system (48%); urinary (44%); and bones and joints (32%).
- There were only seven groups for which there were decreases in discharges, of which four had decreases of 10% or more: upper female genital tract (-33%); eye (-19%); upper digestive system (-12%); and lower digestive system (-10%).

The (more than) doubling of diagnostic testing and imaging, which accounted in 2012/13 for some 16% of all older emergency admissions and for around half of those involving a procedure, is of particular interest. It seems consistent with the finding that the increase in emergency admissions has related mainly to 0 day and 1 day admissions. It is also consistent with the view that part of the increase in emergency admissions can be explained by technological advances which have increased the scope for diagnostic testing and adoption of new diagnostic procedures. It is important to note however that, since procedure codes for diagnostic testing and imaging were first introduced in 2007/08, the increase might be in part an artefact if diagnostic testing was still in some cases recorded as no procedure in 2007/08.

Also of interest is that the increases both for diagnostic testing and for all the other procedure groups with increases exceeding 25% were greater among people aged 85 and over than among people aged 65 to 84. This is likely to reflect the rapid rise in numbers of people aged 85 and over but possibly also technological advances which have increased the scope for conducting procedures safely and effectively in late old age.

This analysis of trends in older emergency admissions by procedure has highlighted two points of particular importance in the context of an examination of factors associated with the rise in admissions and fall in bed days. First, there were some 235,000 additional admissions involving procedures in 2012/13 compared with 2007/08, which amounts to 64% of the overall increase in older emergency admissions of 367,000 over this period. Second, this increase in admissions with procedures relates mainly to diagnostic testing, angioplasty with insertion of stents and ventilation support which are likely to reflect technological advances in recent years. There may be an association between the increase in diagnostic procedures and the decline in spells recorded at discharge as due to signs and symptoms, implying no specific diagnosis.

4.2. Trends by ICD chapter: Overview

Admissions

The number of emergency admissions of older people rose between 2001/02 and 2012/13 for almost all the main ICD chapters. The only exception among chapters with over 10,000 admissions is neoplasms, where the numbers fell by 9%. The numbers of discharges following emergency admissions of older people rose for all the main ICD chapters between 2001/02 and 2012/13, without any exception, among chapters with more than 10,000 discharges in 2012/13.

There were especially large rises, that is rises exceeding 100%, between 2001/02 and 2012/13 in admissions and discharges for three chapters: certain infectious and parasitic diseases (304% rise in discharges); diseases of the ear and mastoid process (131% rise in discharges); and diseases of the genitourinary system (171% rise in discharges). The very large rise for certain infectious and parasitic diseases is partly due to coding changes in 2012/13, but the rise in discharges for this chapter was already over 100% between 2001/02 and 2011/12, before the coding changes occurred.

The number of discharges exceeded the number of admissions in 2012/13 for most chapters and rose more rapidly between 2001/02 and 2012/13 for most conditions. The main exception is symptoms, signs and abnormal clinical and laboratory tests, for which admissions exceeded discharges by 17.5% in 2012/13. Around 70,000 admissions which were recorded under symptoms, signs etc. at admission were recorded under conditions in other ICD chapters at discharge. These account for some 15% of all admissions with symptoms, signs etc. This is an important point since it indicates that data on admissions for which signs and symptoms are recorded as the primary diagnosis overstate the number of hospital spells for which no specific condition is determined.

Bed Days

The pattern of changes for bed days of older emergency admissions over the period 2001/02 to 2012/13 is more complex. The overall number of bed days of emergency admissions fell from 22.0 million in 2001/02 to 20.0 million in 2012/13, a fall of 9.1%. The number of bed days fell by 13.7% by 2007/08 and then rose by 1.5% between then and 2012/13.

The majority of ICD chapters saw a fall over the full eleven year period. Exceptions were: rises of less than 50% for: diseases of the respiratory system; injury, poisoning etc.; endocrine, nutritional and metabolic diseases; and, after allowing for coding change, diseases of the digestive system; and rises of over 50% for: diseases of the genitourinary system; infectious and parasitic diseases (even after allowing for coding change); and diseases of the ear.

The increases and decreases in bed days for different conditions mean that there has been a considerable change over the eleven year period 2001/02 to 2012/13 in the pattern of health conditions (primary diagnoses) responsible for older emergency hospital utilisation. The four categories with increases in bed days of over 10% accounted for over 29% of all older emergency bed days in 2012/13, with respiratory diseases alone accounting for some 17% of bed days. The eight categories with decreases in bed days of over 10% accounted for over 42% of all older emergency bed days in 2012/13, with diseases of the circulatory system alone accounting for some 18% of bed days.

More detail about trends in admissions by ICD chapter is set out in Annex 4.1 and Table 2.

4.3. Ambulatory care-sensitive conditions

There has been considerable interest in the topic of avoidable emergency hospital admissions. This has sometimes concentrated specifically on admissions relating to ambulatory care sensitive conditions and sometimes looked more widely at any admission that could be potentially avoidable. Purdy (2010) defines ambulatory or primary care sensitive conditions (ACSCs) as those 'for which hospital admission could be prevented by interventions in primary care'. She points out that at present different sets of ACSCs are used in different situations. Tian, Dixon and Cao (2012) define them as 'conditions for which effective management and treatment should prevent admission to hospital'. Their analysis covers 19 such conditions in three categories: vaccine preventable (including influenza and pneumonia); chronic (including congestive heart failure, diabetes complications); acute (including dehydration, ear, nose and throat infections). They found that ASCSs accounted in 2009/10 for one in every six emergency admissions (all ages) in England. The rate of these conditions is higher than average for older people and for people living in deprived areas. They estimate that emergency admissions for these conditions could be reduced by between 8% and 18%.

Mytton et al (2012), in contrast, define an avoidable admission as 'any admission that would have been avoided in an ideal system that may be due to medical factors, social factors or a combination of both'. They undertook an observational study of a series of acutely admitted patients identified on the consultant geriatrician ward rounds of the medical assessment unit at the Royal Berkshire Hospital in early 2011. They found that around one fifth to one third of admissions to the elderly care team in this hospital (in an area with below average admission rates) were potentially avoidable. They concluded that avoiding admissions in this group of older people depended on high quality decision making around the time of admission and on sufficient appropriate capacity in alternative community services (notably intermediate care).

Emergency admissions for *chronic* ambulatory care-sensitive conditions (NHS Outcomes Framework Indicator 2.3.i definition⁶) fell from 16% of admissions of people aged 65 and over in 2003/04 to 11.6% of these admissions in 2011/12. There were falls for all older 5 year age bands except for those aged 85 and over. Emergency admissions for *acute* ambulatory care-sensitive conditions that should not usually require hospital admission (NHS Outcomes Framework Indicator 3a definition⁷) increased from 7.7% of admissions of people aged 65 and over in 2003/04 to 11.5% of such admissions in 2011/12. This increase was largely driven by rising numbers of emergency admissions for pneumonia and urinary tract infections.

4.4. Trends for specific conditions

The number of emergency admissions of older people with a primary diagnosis of pneumonia increased by over 82,000 (a rise of 172%) between 2001/02 and 2012/13, which is a larger increase (in absolute terms) than for any other group of conditions. The number of bed days relating to these conditions rose more slowly, by 117%, during this period, with mean length of stay falling from 15.5 days in 2001/02 to 11.8 days in 2012/13.

⁶ This indicator measures how many people with specific long-term conditions, which should not normally require hospitalisation, are admitted to hospital in an emergency. These conditions include, for example, diabetes, convulsions and epilepsy, and high blood pressure. Full definition and list of included conditions available at: https://indicators.ic.nhs.uk/download/Outcomes%20Framework/Specification/NHSOF_Domain_2_S_V1.pdf

⁷ This indicator measures the number of emergency admissions to hospital in England for acute conditions such as ear/nose/throat infections, kidney/urinary tract infections and heart failure, among others, that could potentially have been avoided if the patient had been better managed in primary care. Full definition and list of included conditions available at: https://indicators.ic.nhs.uk/download/Outcomes%20Framework/Specification/NHSOF_Domain_3_S_V1.pdf

The number of emergency admissions of older people with a primary diagnosis of urinary tract infection (UTI) rose from 35,800 in 2001/02 to 107,300 in 2012/13, an increase of 200%. This is the second highest increase (in absolute terms) among groups of conditions. The number of bed days relating to these admissions rose more slowly, by 104%, with mean length of stay falling from 16.0 days in 2001/02 to 10.3 days in 2012/13. This increase in bed days is the second highest increase (in absolute terms) among groups of conditions.

The number of emergency admissions of older people with a primary diagnosis of injuries to the head rose from 17,600 in 2001/02 to 61,100 in 2012/13, an increase of 246%. This is the third highest increase (in absolute terms) among groups of conditions. The number of bed days relating to these admissions rose more slowly, by 70%, with mean length of stay falling from 8.0 days in 2001/02 to 4.1 days in 2012/13.

The number of emergency admissions of older people with a primary diagnosis of ischaemic heart disease fell from 114,700 in 2001/02 to 89,300 in 2012/13, a decrease of 22% over this period. This decrease of 25,400 was the largest (in absolute numbers) of any group of conditions. The number of bed days relating to these admissions fell by 35% during this period, with mean length of stay falling from 8.2 days in 2001/02 to 6.3 days in 2012/13.

The number of emergency admissions of older people with a primary diagnosis of cerebrovascular disease rose from 63,600 in 2001/02 to 67,400 in 2012/13, an increase of 6% over this period. The number of bed days relating to these admissions fell by 32% during this period, with mean length of stay falling from 27.1 days in 2001/02 to 15.9 days in 2012/13. This decrease of over 575,000 bed days was the largest (in absolute numbers) of any group of conditions.

The number of older emergency admissions with a diagnosis of signs, symptoms etc. (R-codes) rose by 46% between 2001/02 and 2012/13, but bed days fell by 46%. There were different trends for different groups within this chapter, partly due to a coding change: some conditions which were coded as general symptoms and signs until 2011/12 were coded as signs and symptoms involving the nervous and musculoskeletal systems from 2012/13.

Admissions for signs and symptoms involving the circulatory and respiratory systems rose by 49%, from 79,200 in 2001/02 to 118,000 in 2012/13. This was the third largest rise in absolute numbers of admissions for any group of conditions. Bed days for this condition nevertheless fell by 38% over the eleven year period.

More detail about trends in admissions for specific conditions is set out in Annex 4.2 and Table 3.

4.5. Summary

The number of older emergency admissions (first episodes) which involved a procedure rose by 47.0%, from 500,000 to 735,000, between 2007/08 and 2012/13, while the number of admissions with no procedure rose by only 9.9%.

The number of emergency admissions of older people rose between 2001/02 and 2012/13 for almost all the main ICD chapters. The only exception among chapters with over 10,000 admissions is neoplasms, where the numbers fell by 9%.

Emergency admissions for *chronic* ambulatory care-sensitive conditions fell from 16% of admissions of people aged 65 and over in 2003/04 to 11.6% of these admissions in 2011/12.

Emergency admissions for *acute* ambulatory care-sensitive conditions that should not usually require hospital admission however increased from 7.7% of admissions of people

aged 65 and over in 2003/04 to 11.5% of such admissions in 2011/12. This increase was largely driven by rising numbers of emergency admissions for pneumonia and urinary tract infections.

There have been rises in the numbers of short (0 or 1 day) spells for all ICD chapters except neoplasms, diseases of the eye and factors influencing health status. A question for the future is whether the numbers of short spells will continue to rise as rapidly as over the last eleven years.

There have been rises in the numbers of longer (2 or more day) spells for diseases of the respiratory system, diseases of the genitourinary system, endocrine, nutritional and metabolic diseases, diseases of the digestive system and certain infectious and parasitical diseases. A question for the future is whether the numbers of longer spells will continue to rise as rapidly as over the last eleven years for these chapters, especially for diseases of the respiratory system which account for almost 17% of all older emergency bed days.

Average lengths of older emergency stays have fallen for neoplasms, mental and behavioural disorders, diseases of the circulatory system, diseases of respiratory system, diseases of the digestive system, diseases of the genitourinary system, symptoms and signs, and injury and poisoning. A question for the future is whether average lengths of stay will continue to fall as rapidly as over the last eleven years for these chapters, especially for diseases of the circulatory system and diseases of the respiratory system which account respectively for almost 18% and almost 17% of all older emergency bed days.

Annex 4.1: Trends by individual ICD chapter

Certain infectious and parasitic diseases

Admissions for this chapter rose by 335% over the eleven year period 2001/02 to 2012/13, but the rise over the ten years to 2011/12 was 111%. This is due to a coding change: some conditions which were coded as non-infective enteritis and colitis until 2011/12 were coded as infectious intestinal diseases from 2012/13. The number of bed days for this chapter rose by 138% over the whole eleven year period to 2012/13, with length of stay falling by 41% over the period, which is typical of the fall in average length of stay across all emergency admissions of older people.

Neoplasms

Admissions for neoplasms fell by 9% over the period 2001/02 to 2012/13, but discharges rose by 5% over the period. In 2012/13 there were 31% more discharges with neoplasm recorded as the primary diagnosis than admissions. This suggests that around one quarter of older people discharged from an emergency stay with a diagnosis of neoplasm were admitted with another primary diagnosis. The decline in admissions was concentrated among people aged 65 to 84, with the number remaining constant for the 85 and over group. The rise in discharges was heavily concentrated in 0 to 1 day spells with a slight fall in spells of 2 or more days. Bed days for neoplasms fell by 18% over the eleven year period with average length of stay falling by only 22%. It should be noted that this chapter accounted for 6.6% of older emergency hospital bed days in 2012/13.

Diseases of the blood and blood-forming organs

Admissions for diseases of the blood rose by 27% over the eleven year period 2001/02 to 2012/13, but bed days for this chapter fell by 32%, with average length of stay falling by 50%. The increase in spells was virtually entirely an increase in 0 and 1 day spells, which rose by 217%, with spells of 2 or more days rising by less than 1%.

Endocrine, nutritional and metabolic diseases

Admissions for this chapter rose by 95% over the eleven year period 2001/02 to 2012/13 and bed days rose by 6% despite a fall in average length of stay of 46%. This is one of the largest rises across all ICD chapters. The rise was heavily concentrated on 0 to 1 day spells. Within this chapter, admissions for diabetes mellitus rose by only 4% but admissions for metabolic disorders rose by 185% and in 2012/13 account for over half the admissions under this chapter. Similarly, bed days for diabetes fell by 38% but for metabolic disorders rose by 60%.

Mental and behavioural disorders

Admissions for mental and behavioural disorders rose by 9% over the eleven year period 2001/02 to 2012/13 and discharges by 22%. Bed days however fell by 31% as average length of stay fell by 44%, from 47 days in 2001/02 to 26 days in 2012/13. The increase was heavily concentrated among spells of 0 and 1 days, with spells of 2 or more days rising by only 2%, and heavily concentrated on the 85+ group, with admissions for the 65 to 84 group falling by 1%. This chapter accounted for 5% of all older emergency bed days but only 1.5% of admissions in 2012/13.

Diseases of the nervous system

Admissions for diseases of the nervous system rose by 30% over the period 2001/02 to 2012/13, but bed days fell by 31% as average length of stay fell by 50%, from 23 days in 2001/02 to 11 days in 2012/13. The increase was heavily concentrated among spells of 0 and 1 days, with spells of 2 or more days rising by only 2%.

Diseases of the eye and adnexa, diseases of the ear and mastoid

Admissions for diseases of the eye and adnexa fell by 3% over the period 2001/02 to 2012/13 and bed days by 36%. This comprises an increase of 42% in spells of 0 and 1 days and a fall of 37% in spells of 2 or more days. Admissions for diseases of the ear and mastoid rose by 110% over the period 2001/02 to 2012/13 and bed days by 62%. The increase was concentrated among 0 to 1 day spells and among the 85+ age group. Each of these chapters accounts for only 0.1% of older emergency bed days in 2012/13.

Diseases of the circulatory system

Admissions for diseases of the circulatory system rose by just 2% over the eleven year period 2001/02 to 2012/13 and discharges by 12%. Bed days for this chapter fell by 25%. The increase was heavily concentrated among spells of 0 and 1 days, with spells of 2 or more days falling by 4%, and heavily concentrated on the 85+ group, with admissions for the 65 to 84 group falling by 6%. Bed days for ischaemic heart disease fell by 35% over the period but rose by 31% for pulmonary heart disease. Bed days for other forms of heart disease fell by 17% and for cerebrovascular disease by 33%. This chapter as a whole accounted for over 18% of all older emergency bed days in 2012/13.

Diseases of the respiratory system

Admissions for diseases of the respiratory system rose by 72% over the period 2001/02 to 2012/13, with a substantial proportion of this rise occurring in the final year of this eleven year period. Bed days for this chapter rose by 35%, with average length of stay falling by only 26%. The increase was heavily concentrated on the 85+ group. Bed days for influenza and pneumonia rose by 112% over the eleven years (and admissions by 172%) and accounted in 2012/13 for slightly over half of all bed days in this chapter. This is discussed further below. This chapter as a whole accounted for over 17% of all older emergency bed days in 2012/13.

Diseases of the digestive system

Admissions for this chapter rose by 30% over the eleven year period 2001/02 to 2012/13, but the rise over the ten years to 2011/12 was 45%. The decline between 2011/12 and 2012/13 is due to a coding change: as indicated above, some conditions which were coded as non-infective enteritis and colitis until 2011/12 were coded as infectious intestinal diseases from 2012/13. Bed days for this chapter fell by 3% over the whole eleven year period, with average length of stay falling by 29%. The increase was in spells was heavily concentrated on 0 to 1 day spells. This chapter accounted for 7.6% of all older emergency bed days in 2012/13.

Diseases of the skin and subcutaneous tissue, diseases of the musculoskeletal system

Admissions for diseases of the skin rose by 48% over the period 2001/02 to 2012/13. Bed days for this chapter fell by 5% over this period, with average length of stay falling by 37%. Admissions for diseases of the musculoskeletal system rose by 81% over the period

2001/02 to 2012/13. Bed days for these conditions fell by just 1%, with average length of stay falling by 46%. The increase was again concentrated on 0 to 1 day spells.

Diseases of the genitourinary system

Admissions for diseases of the genitourinary system rose by 163% over the period 2001/02 to 2012/13, with a substantial proportion of this rise occurring in the final year of this eleven year period. Bed days for these conditions rose by 87%, despite average length of stay falling by 31%. Conditions within this chapter are dominated by renal failure and other urinary conditions which includes urinary tract infection. Bed days for the latter doubled over the eleven year period and accounted in 2012/13 for 70% of all bed days for this chapter. This is discussed further below. This chapter as a whole accounted for almost 9% of all older emergency bed days in 2012/13.

Signs, symptoms and abnormal clinical and laboratory findings not elsewhere classified

Admissions for signs, symptoms etc. rose by 46% over the period 2001/02 to 2012/13, but discharges by only 38%. In 2012/13 there were still 15% fewer discharges than admissions with signs, symptoms etc. recorded as the primary diagnosis, implying that around 15% of older people admitted with a primary diagnosis of signs and symptoms were discharges with another primary diagnosis. Bed days for this chapter fell by 46%, with average length of stay falling by 61%. The increase in spells was heavily concentrated on 0 to 1 day spells, with 2+ day spells falling by 21%. This chapter accounted for over 8% of all older emergency bed days in 2012/13. The chapter is discussed further below.

Injury, poisoning and certain other consequences of external causes

Admissions for injury poisoning etc. rose by 79% over the period 2001/02 to 2012/13. Bed days for this chapter rose by 9% over this period, with average length of stay falling by 39%. The largest groups of conditions in this chapter in terms of bed days are injuries to the hip and thigh, injuries to the knee and lower leg and injuries to the head. While the numbers of bed days for the former two types of injury did not change greatly over the eleven year period, bed days for injuries of the head rose by 68% (and admissions by 247%) over the period. This chapter as a whole accounted for over 13% of all older emergency bed days in 2012/13.

Factors influencing health status and contact with health services

Admissions for this chapter fell by 45% and discharges fell by 58% over the period 2001/02 to 2012/13. While in 2001/02 there were around one-third more discharges with factors influencing health status recorded as the primary diagnosis than admissions, by 2012/13 this had fallen to less than 2% more. While admissions fell slightly during in the first year of the period (2001/02 to 2002/03), discharges fell by almost one-quarter over this year. This suggests the possibility that this chapter is affected by changes in coding practice. Bed days for this chapter fell by 94% over this period, with average length of stay falling by 85%. This chapter however accounted for only 0.2% of all older emergency bed days in 2012/13.

Annex 4.2: Trends for specific conditions

Pneumonia and flu

The number of emergency admissions of older people with a primary diagnosis of pneumonia increased by over 82,000 between 2001/02 and 2012/13, which is a larger increase (in absolute terms) than for any other group of conditions. It rose from 47,800 in 2001/02 to 129,900 in 2012/13 an increase of 172% over this period. The number of discharges with this condition was 18% higher, at 152,900 in 2012/13, and rose more rapidly, by 185%. While the number of discharges from spells 2 or more days rose by 179% to 134,500 in 2012/13, the number of discharges from spells of 0 or 1 days rose by 242% to 18,400 in 2012/13. The number of bed days relating to these conditions rose more slowly, by 117%, during this period, with mean length of stay falling from 15.5 days in 2001/02 to 11.8 days in 2012/13. This was nevertheless a larger increase than for any other group of conditions.

The rise in emergency admissions for pneumonia could be due to range of factors including population change, coding practices and changes to hospital organisation (Trotter et al 2008). The rise in England is unlikely to be just a HES coding issue since other countries have also experienced rises (van Gageldonk-Lafeber 2009 for Netherlands). The trend of rising emergency admissions for pneumonia could continue (Fry et al 2005).

Urinary tract infections

The number of emergency admissions of older people with a primary diagnosis of UTI rose from 35,800 in 2001/02 to 107,300 in 2012/13, an increase of 200%. This is the second highest increase (in absolute terms) among groups of conditions. The number of discharges with this condition was 11% higher, at 119,600 in 2012/13, and rose more rapidly, by 214% over this period. While the number of discharges from spells of 2 or more days rose by 173% to 93,900 in 2012/13, the number of discharges from spells of 0 or 1 days rose by 614% to 25,700 in 2012/13.

The number of bed days relating to these admissions rose more slowly, by 104%, with mean length of stay falling from 16.0 days in 2001/02 to 10.3 days in 2012/13. The increase in bed days is the second highest increase (in absolute terms) among groups of conditions. UTI is believed to be greatly over-coded, and the extent of over-coding is considered to have risen in recent years. Part, if not most, of the increase may be due to changes in coding practice. Another possible explanation is antibiotic resistance.

Injuries to the head

The number of emergency admissions of older people with a primary diagnosis of injuries to the head rose from 17,600 in 2001/02 to 61,100 in 2012/13, an increase of 246%. This is the third highest increase (in absolute terms) among groups of conditions. The number of discharges with this condition was 10% lower, at 55,100 in 2012/13, and rose less rapidly, by 231% over this period. While the number of discharges from spells of 2 or more days rose by 106% to 19,100 in 2012/13, the number of discharges from spells of 0 or 1 days rose by 388% to 36,000 in 2012/13. The number of bed days relating to these admissions rose more slowly, by 70%, with mean length of stay falling from 8.0 days in 2001/02 to 4.1 days in 2012/13. The large increases for head injuries may be due to NICE guidance on their treatment.

Ischaemic heart disease

The number of emergency admissions of older people with a primary diagnosis of ischaemic heart disease fell from 114,700 in 2001/02 to 89,300 in 2012/13, a decrease of 22% over this period. This decrease of 25,400 was the largest (in absolute numbers) of any group of conditions. The number of discharges with this condition was 15% higher, at 103,000 in 2012/13, and fell more slowly, by 15% over this period. While the number of discharges from spells of 2 or more days fell by 27% to 74,800 in 2012/13, the number of discharges from spells of 0 or 1 days rose by 43% to 28,100 in 2012/13. The number of bed days relating to these admissions fell by 35%, during this period, with mean length of stay falling from 8.2 days in 2001/02 to 6.3 days in 2012/13.

The decline in numbers of admissions for this condition seems likely to be linked with the decline in its prevalence in the general population. The prevalence of IHD among older people aged 65-74 fell from 16.1% in 1998 to 11.1% in 2011 (HSE). The prevalence of IHD among older people aged 75+ rose from 20.3% in 1998 to 22.8% in 2006 and then fell to 20.8% in 2011 (HSE).

Stroke

The number of emergency admissions of older people with a primary diagnosis of cerebrovascular disease rose from 63,600 in 2001/02 to 67,400 in 2012/13, an increase of 6% over this period. The number of discharges with this condition was 15% higher, at 77,500 in 2012/13, and rose more rapidly, by 16% over this period. While the number of discharges from spells of 2 or more days rose by 88% to 11,200 in 2012/13, the number of discharges from spells of 0 or 1 days rose by just 9% to 66,300 in 2012/13. The number of bed days relating to these admissions fell by 32% during this period, with mean length of stay falling from 27.1 days in 2001/02 to 15.9 days in 2012/13. This decrease of over 575,000 bed days was the largest (in absolute numbers) of any group of conditions.

The decline in numbers of bed days for this condition seems not to be linked with changes in its prevalence in the general population but rather with changes in its treatment responsible for the large fall in average length of stay. The prevalence of stroke among older people aged 65-74 rose from 5.5% in 1998 to 6.4% in 2003 and fell to 5.7% in 2011 (HSE). The prevalence of stroke among older people aged 75+ rose from 9.4% in 1998 to 11.6% in 2006 and then fell to 10.6% in 2011 (HSE).

Signs and symptoms: R-codes

The number of older emergency admissions with a diagnosis of signs, symptoms etc. (R-codes) rose by 46% between 2001/02 and 2012/13, but bed days fell by 46%. There were different trends for different groups within this chapter, partly due to a coding change: some conditions which were coded as general symptoms and signs until 2011/12 were coded as symptoms and signs involving the nervous and musculoskeletal systems from 2012/13.

Admissions for signs and symptoms involving the circulatory and respiratory systems rose by 49%, from 79,200 in 2001/02 to 118,000 in 2012/13. This was the third largest rise in absolute numbers of admissions for any group of conditions. Bed days for this condition nevertheless fell by 38% over the eleven year period.

A study of unplanned admissions of older people in one hospital (Walsh et al 2011) found that:

- Patient characteristics – age, gender and comorbidities – were not associated with R-codes.

- Organisational features – admission via A&E and attendance outside usual GP hours – were associated with a higher likelihood of R-codes.
- R-code admissions were shorter than average, and had lower than average mortality rates but broadly average readmission rates.

Table 4.1: Discharges by procedure, change 2007/08 to 2012/13

	Procedure	Procedure numbers 2012/13	Percent of total 2012/13	Change 2006/07 to 2012/13		
				65+	65-84	85+
Q	Upper female genital tract	900	0%	-33%	-11%	-54%
C	Eye	4,663	0%	-19%	-19%	-23%
G	Upper digestive system	20,942	1%	-12%	-12%	-11%
H	Lower digestive system	17,467	1%	-10%	-9%	-11%
P	Lower female genital tract	717	0%	-5%	-1%	-18%
L	Arteries and veins	16,568	1%	-2%	-3%	3%
X	Miscellaneous operations	43,836	2%	-1%	0%	-5%
B	Endocrine system and breast	652	0%	4%	6%	-4%
T	Soft tissue	28,193	1%	6%	7%	3%
W	Other bones and joints	85,385	4%	6%	2%	14%
J	Other abdominal organs	8,054	0%	11%	11%	9%
N	Male genital organs	791	0%	16%	7%	61%
S	Skin	18,649	1%	23%	20%	31%
F	Mouth	1,243	0%	25%	22%	45%
V	Bones and joints of skull & spine	1,589	0%	32%	31%	40%
M	Urinary	51,372	2%	44%	35%	68%
A	Nervous system	6,883	0%	48%	45%	66%
E	Respiratory tract	36,266	2%	52%	49%	66%
D	Ear	652	0%	57%	57%	58%
K	Heart	27,586	1%	74%	71%	93%
U	Diagnostic imaging, testing etc.	362,043	16%	108%	98%	136%
O	Overflow codes	794	0%	451%	410%	1257%
	Total with procedure	735,250	33%	47%	42%	62%
	No procedure	1,475,917	67%	10%	5%	22%
	GRAND TOTAL	2,211,167	100%	20%	15%	32%

Table 4.2: Admissions by ICD chapter

Conditions: ICD Chapter	Admissions in 2012/13		Change 2001/02-2012/13	
	Number (000s)	Percent of total	Number (000s)	Percent
Certain Infectious and parasitic diseases	65.3	3.0%	50.3	335%
Neoplasms	82.6	3.7%	-8.2	-9%
Diseases of the blood	28.9	1.3%	6.2	27%
Endocrine, nutritional and metabolic diseases	47.5	2.1%	23.1	95%
Mental and behavioural disorders	32.6	1.5%	2.8	9%
Diseases of the nervous system	45.4	2.1%	10.5	30%
Diseases of the eye and adnexa	8.3	0.4%	-0.3	-3%
Diseases of the ear and mastoid process	4.8	0.2%	2.5	110%
Diseases of the circulatory system	339.5	15.4%	7.7	2%
Diseases of the respiratory system	322.7	14.6%	135.5	72%
Diseases of the digestive system	171.6	7.8%	39.2	30%
Diseases of the skin and subcutaneous tissue	45.2	2.0%	14.6	48%
Diseases of the musculoskeletal system	93.8	4.2%	42.1	81%
Diseases of the genitourinary system	160.9	7.3%	99.7	163%
Symptoms, signs etc.	469.6	21.2%	147.4	46%
Injury, poisoning etc.	283.0	12.8%	125.1	79%
Factors influencing health status	8.5	0.4%	-7.0	-45%
TOTAL	2,211.0	100.0%	692.0	46%

Table 4.3: Bed Days by ICD Chapter

Conditions: ICD Chapter	Bed days in 2012/13		Change 2001/02 to 2012/13	
	Number (000s)	Percent of total	Number (000s)	Percent
Certain Infectious and parasitic diseases	656	3.3%	380	138%
Neoplasms	1,320	6.6%	-299	-18%
Diseases of the blood	169	0.8%	-81	-32%
Endocrine, nutritional and metabolic diseases	407	2.0%	24	6%
Mental and behavioural disorders	993	5.0%	-455	-31%
Diseases of the nervous system	600	3.0%	-269	-31%
Diseases of the eye and adnexa	24	0.1%	-14	-36%
Diseases of the ear and mastoid process	24	0.1%	9	62%
Diseases of the circulatory system	3,643	18.2%	-1,183	-25%
Diseases of the respiratory system	3,440	17.2%	893	35%
Diseases of the digestive system	1,522	7.6%	-53	-3%
Diseases of the skin and subcutaneous tissue	469	2.3%	-24	-5%
Diseases of the musculoskeletal system	622	3.1%	-4	-1%
Diseases of the genitourinary system	1,754	8.8%	817	87%
Symptoms, signs etc.	1,669	8.3%	-1,397	-46%
Injury, poisoning etc.	2,674	13.4%	210	9%
Factors influencing health status	39	0.2%	-571	-94%
TOTAL	20,031	100.0%	-2,017	-9%

5. Demand factors

Demand for emergency hospital inpatient care arises from patients' needs mediated by clinicians. Emergency admissions (including zero day cases) are preceded by an A&E attendance, a call for an emergency ambulance, or emergency referral to hospital by a clinician, usually a GP but possibly a hospital doctor. Admission then involves a combined decision by a clinician and the patient, where the clinician acts both as agent for the patient and as gatekeeper to day and inpatient care.

5.1. Underlying demand for emergency hospital inpatient care

Underlying demand for urgent and emergency care arises from an illness, accident or condition requiring urgent attention. A decision to consult a health care service urgently depends in principle on the person's or their family's degree of concern about their condition, their expectations and the costs to them of the consultation. Their expectations and preferences are in turn likely to be affected by age, gender, education and other individual characteristics.

A person considering that they need urgent health care may have, depending on the detailed circumstances, several options. These may range from phoning the 111 service, going to a walk-in centre, seeking an urgent appointment with their GP, phoning the emergency 999 service, to going direct to a major (type 1) A&E department. Some of those opting for options other than A&E may of course be referred there by the other services or taken there by the ambulance service.

Choices between these options are likely to be influenced not only by the degree of severity of the patient's condition but also by the availability of, access to and cost of the different options. Although there is no direct cost to the patient, since NHS care is free at point of use, patients may face travel costs and costs of their time. More importantly, if they find or believe that they cannot readily access alternatives they may go to A&E even if their condition is not an emergency.

Health care commissioners, mainly Clinical Commissioning Groups (CCGs), while not directly controlling individual use of emergency hospital care, have an indirect influence over patient choices. They decide for example on the arrangements for out-of-hours primary care and on commissioning of walk-in services. Moreover, their policies are likely to impact on the criteria used by clinicians to decide whether to admit patients for inpatient emergency care.

Demand for health care in old age depends at the individual level on perceived need for care and willingness to act on the perceived need through contacting health care services. At the population level demand depends on the numbers of older people and their morbidity, living arrangements and social attitudes. Demand, unlike need, also depends on the costs of care to patients and their ability and willingness to meet the costs.

5.2. Demographic change

The number of people aged 65 and over rose from 7.8 million in 2001 to 9.1 million in 2012. The numbers aged 65 to 69 have risen especially rapidly in the most recent years as the cohort born shortly after the end of WWII start to reach age 65. The numbers aged 85 and over, who are most likely to need health care also rose rapidly, from 0.96 million to 1.22 million (Figure 5.1).

There has been an increase of 25% in the age standardised rate of emergency admissions among people aged 65 and over between 2001/02 and 2012/13. At the same time, there has

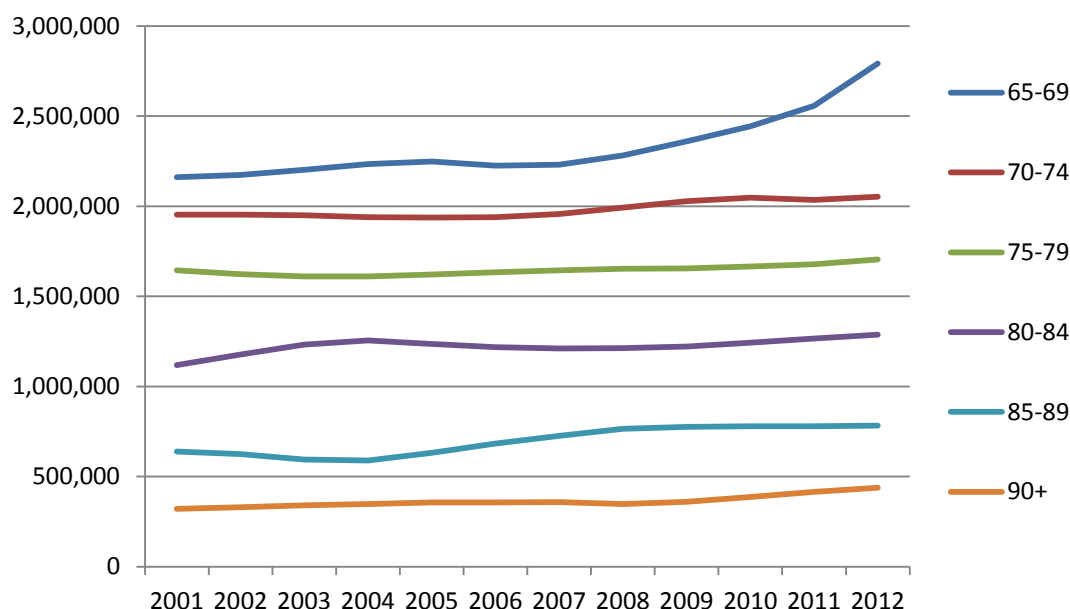
been a fall of 25% in the age standardised emergency bed day rate over this period (Figure 5.2). Total bed days decreased for people aged 65 to 84 but increased for those aged 85 and over, despite the fall in the bed day rate, because of the large population increase for that oldest old group. The numbers of older people are projected to continue to rise rapidly as discussed in chapter 8.

Only around one third (35%) of the rise in emergency admissions of older people between 2001/02 and 2012/13 – around 243,000 of the 692,000 increase in older emergency admissions - can be explained by the rise in numbers of older people. Around half (50%) of the rise – some 345,000 – can be explained by other factors common to all older people. The remaining 15% of the rise – around 103,000 admissions – can be associated with factors affecting only the oldest old 85 and over group.

This partition of the two-thirds (65%) of the rise not explained by the rise in numbers of older people is based on an analysis of the proportionate rise in the admission rates for those aged 65 to 84 and those aged 85 and over. The figure of 345,000 is the result of applying to the whole 65 and over age group the rise in admission rate for the 65 to 84 age group. The figure of 103,000 is the result of applying to the 85 and over group the extra rise in admission rate for that age group. It should be noted that the rise in admission rate for the 65 to 84 age group was slightly lower than the rise for the 18 to 64 age group as well as substantially lower than the rise for the 85 and over age group.

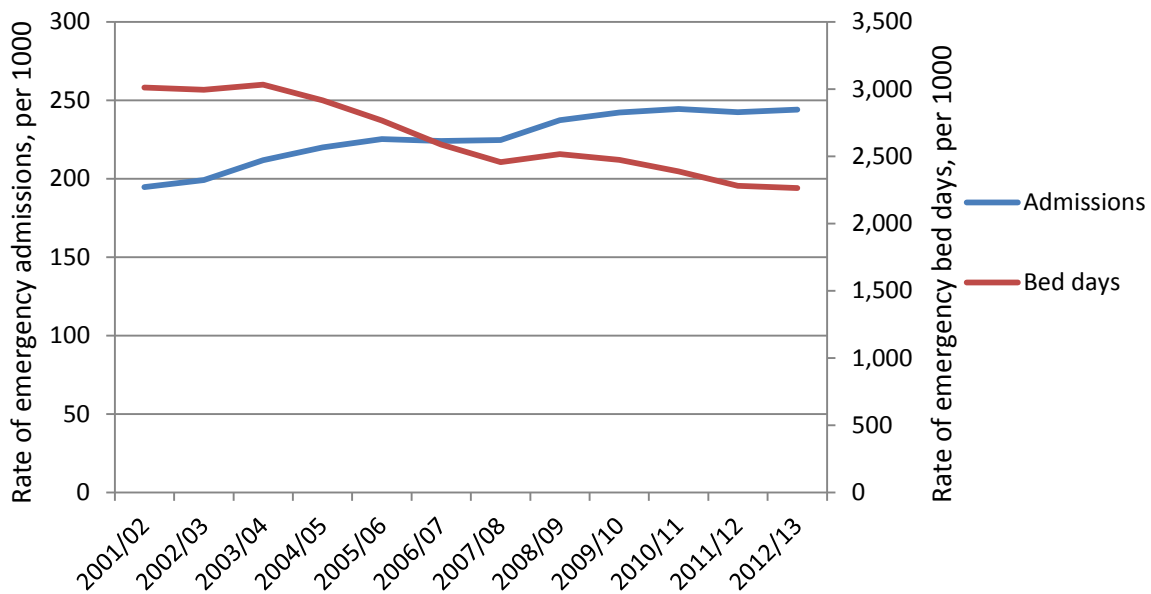
The proportion of older people living in care homes has fallen from around 4.25% in 2001 to around 3.5%, around 325,000 older people, in 2012. This may explain a small proportion of the increase in older emergency admissions, since care home residents are less likely to be admitted to hospital than people of the same age living in private households.

Figure 5.1: Numbers of older people by age band, 2001 to 2012



Source: Office for National Statistics

Figure 5.2: Rates of older emergency admissions and bed days, 2001/02 to 2012/13



Source: Hospital Episode Statistics

5.3. Change in social attitudes

Experts have advised that risk aversion may have arisen among family carers of frail older people and care staff working in home-based and residential care. This could explain some of the increase in A&E attendances. Risk aversion among junior hospital doctors may also have risen, which could explain part of the increase in emergency admissions.

5.4. Epidemiological change

There has been considerable debate about whether increases in life expectancy over past recent years have been accompanied by a compression of morbidity. There has also been related debate about whether (further) compression of morbidity can be expected over future years.

Fries (1980) postulated that increased total life expectancy would be accompanied by a shorter period with morbidity, i.e. a compression of morbidity. He believed that there would be an increase in the age of onset of chronic disease greater than the increase in longevity. Gruenberg (1977) however argued that the decline in mortality rates from chronic diseases would be accompanied by increased prevalence of such diseases. He believed that falling mortality rates would mean higher survival rates for people with health conditions. Manton (1982) suggested that there will be a dynamic equilibrium. He maintained that decreasing mortality rates would be accompanied by increased morbidity rates but that the proportion of life with severe morbidity would not increase.

It is important to recognise that the question about compression or expansion need not have a single answer. There could be different trends for prevalence of self-reported poor health, specific chronic conditions, disability in terms of limiting long-standing illness, or severe disability in terms of conducting personal care tasks. In the context of our study what matters are trends in the incidence and prevalence of conditions likely to require urgent and emergency care services. It is also useful to distinguish between absolute and relative compression or expansion of morbidity. Absolute compression (expansion) occurs when the

number of years with morbidity decreases (increases). Relative compression (expansion) occurs when the proportion of life with morbidity decreases (increases).

There have been changes in the prevalence in old age of various diseases in England over the last 15 years. The prevalence of ischaemic heart disease for example has fallen from 16% in 1998 to 11% in 2011 among people aged 65 to 74 but has risen slightly for people aged 75 and over according to the Health Survey for England (HSE). The prevalence of diabetes in contrast has risen from 7% in 1998 to 13% in 2011 among people aged 65 to 74 and from 7% to 17% for people aged 75 and over.

Rates of overall limiting long-standing illness in England have remained broadly constant over the period since 2001. Trends in limiting long-standing illness since 2001 have been fairly flat for people aged 65 to 74 and for people aged 75 and over with some fluctuation (ONS). Healthy life expectancy at age 65 has risen slightly between 2005-7 and 2008-10, from 57.1% to 57.4% of life expectancy at age 65 for men and from 54.8% to 57.4% for women (ONS).

Jagger et al (2011) have examined the impact of changing patterns of disease on disability and the need for long term care. They show that a combination of constant prevalence of disease and falling mortality rates implies rising rather than constant prevalence of disability. They considered a scenario in which current trend increases in obesity of 1% to 2% annually continue resulting in higher prevalence of arthritis, stroke, coronary heart disease and vascular dementia. Under this scenario the prevalence of severe disability is projected to rise by over 10% among the oldest old between 2010 and 2030. They also examine an improving population health scenario in which a decline in smoking and obesity in the future reduce the prevalence of these diseases. Even under this scenario the prevalence of disability is projected to increase by 2.4% between 2010 and 2030 among those aged 85 and over.

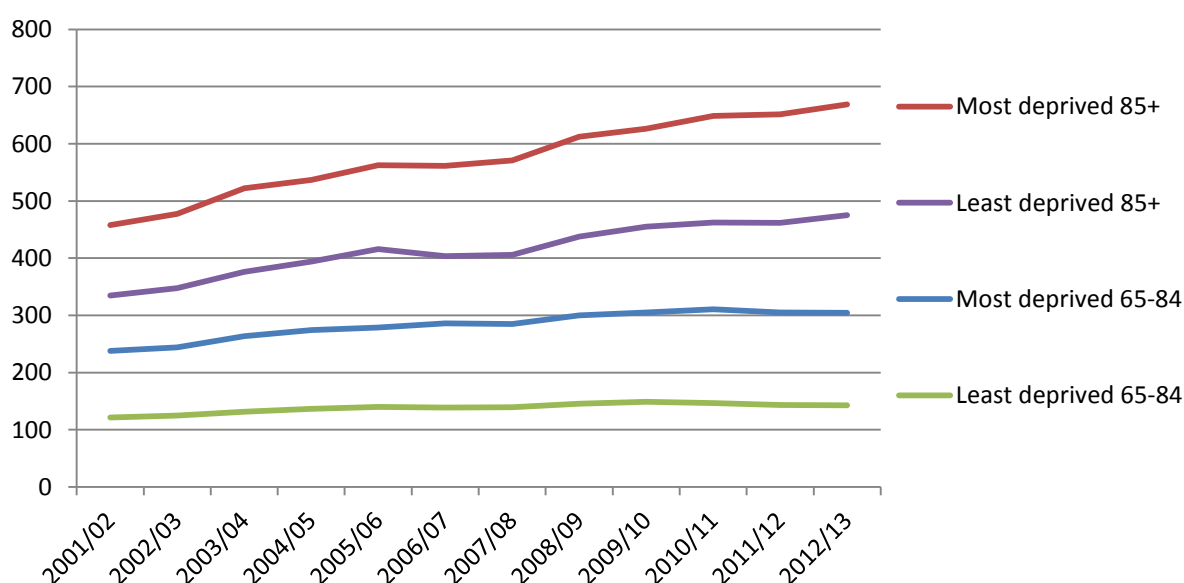
Since the key issue for this study is trends in conditions potentially requiring urgent and emergency care, the growing evidence on the association between health care costs and proximity to death seems pertinent. Various studies in different countries have shown that expenditure on acute health care rises with proximity to death rather than with age, that is it rises in line with time from the end rather than from the start of life. Seshamani and Gray (2004) used longitudinal hospital data for Oxfordshire to explore the influence on health care expenditure of age and proximity to death. They found that, while age may significantly affect quarterly hospital costs, these cost changes are small compared to the tripling of quarterly costs that occurs with approaching death in the last year of life. Werblow, Felder and Zweifel (2007) examined this issue, using Swiss data, for seven different components of health care expenditure. They found weak or no age effects for the components of health care expenditure when controlling for proximity to death but a strong positive relationship between proximity to death and an individual's health care cost. They argue that 'the cost of health care ultimately is driven by medical technology, some of which appears to be lavished on patients with rather limited remaining life expectancy'.

This evidence that health care costs are much more closely associated with proximity to death than with age would suggest that the age-specific rate of emergency hospital admissions may have fallen as age-specific mortality rates in old age have fallen. This interpretation seems consistent with our finding discussed below on cohort effects in old age. An exception might be late old age when most people would be within a few years of death. Clinicians have commented that the number of very elderly people with complex conditions attending accident and emergency departments has risen over recent years.

5.5. Deprivation

A further issue that could explain changes in underlying demand is potential changes in deprivation. There are important differences in older emergency admission rates between the most and least deprived areas of the country (Figure 5.3). The most deprived decile had a 65 to 84 emergency admission rate 113% higher than the least deprived decile in 2012/2013, whilst the corresponding figure for the 85 and over rates was only 41%. This suggests that deprivation has a greater relative effect for the younger old than for the oldest old. While this excess in rates has increased slightly over the period 2001/02 to 2012/13, trends for the most and least deprived are reasonably similar. It does not appear that deprivation has played a major role in increasing the overall number of older emergency hospital admissions.

Figure 5.3: Emergency hospital admission rates for most and least deprived areas, IMD decile



Source: Hospital Episode Statistics

5.6. Changes in the effective demand for emergency admissions

The demand for particular categories of emergency care depends on how services are organised. Minor emergencies can generally be treated in primary care settings. Major emergencies however require specialist care which in the UK is concentrated almost entirely in hospitals and is accessed mainly, but not exclusively, in and through A&E departments.

There has been a long-term trend towards specialisation in major emergency care, as in other branches of medicine (see chapter 6).

It is important to distinguish the underlying demand for emergency care from the effective demand and in particular the effective demand for specific types of care. The former relates to the demand from patients as discussed above. There is likely to be substantial excess underlying demand for NHS services because care is provided free of charge to the patient at the time it is needed. While excess demand may arguably be more likely to arise for planned care, there is also an issue for urgent and emergency care.

Effective demand is demand which backed by ability to pay. Since the NHS in England has a split between purchasers and providers, effective demand relates to demand that has actually been funded (ultimately from general taxation) by the commissioning of services from providers. This is strictly finite and is limited by the budgets available to commissioners and the price at which services can be purchased. These in turn help to determine the resources available to clinical staff at the time patients are treated.

NHS budgets increased by less than 2% per year in real terms during the last half of the 1990s and by 2000 there was a widespread perception among both health care professionals and the public of significant unmet need for major emergency care. NHS budgets then increased strongly between 2000 and 2010 - spending on hospital and community health services rose by nearly 50% in real terms between 2001 and 2011 - before spending increases were halted as a result of the financial crisis. This is discussed further in chapter 7.

The care which can be afforded is offered to patients at the decision of the clinical staff employed by the providers, in accordance with their perceptions of the relative 'need' of patients and the technology and capacity available to them. In other words, patients face pervasive non-price rationing in the NHS. Non-price rationing is managed, mainly by clinicians both in primary and secondary care, through processes such as triage, gate-keeping, waiting/queuing and discharging patients sooner rather than later. It should be noted however that the NHS commissions and providers can in the medium to longer term decide locally how best to allocate resources and capacity between different services. If there is a shortage of urgent and emergency care in an area, resources can at least in principle be re-prioritised, although this may be difficult in practice.

The effective demand for emergency hospital *admissions* is the result of a combination of underlying demand from patients, contracts agreed between commissioners and providers and non-price rationing along different patient pathways. The arrangements agreed between commissioners and providers reflect decisions about the types of care to fund and provide locally. Commissioners may for example fund hospital avoidance schemes, such as hospital at home or intermediate care in nursing homes. The availability of such provision has an effect on clinical decisions on admission to emergency hospital care: supply of alternatives to emergency hospital inpatient care impacts on effective demand for hospital admission.

There is a widespread belief that the rise in emergency admissions was caused partly by weaker GP gate-keeping following the 2004 GP contract which allowed GPs to opt out of providing out-of-hours care. In addition to weaker gate-keeping there may be a perception that out-of-hours primary care is of lower quality than primary care by GPs who know the patient. This is discussed in chapter 7.

Most patients experiencing emergency admissions are admitted to inpatient care via A&E departments although some are admitted directly following requests to specialist departments from GPs, usually over the telephone. Access to A&E is mainly by patient self-referral for younger patients but for older patients self-referral falls to about 50% for the younger elderly (under 85) and to 40% for the older elderly (85 and over) in the case of attendances at major (type 1) A&E departments. Calls to the ambulance service account for about a quarter of attendances at type 1 A&E departments among younger elderly people and about one third among older elderly people – presumably usually following triage by paramedics. GP referrals account for about 9% and 7% of attendances among these sub-groups, respectively. The large numbers of self-referred patients arriving at major A&E departments necessitates triage, with patients presenting with minor conditions often referred to walk-in centres or urgent care clinics, which may be on the same site. Despite this, as few as 15% of younger patients who self-refer to type 1 A&E are subsequently admitted. However, in the case of older people, high proportions of attendees at type 1 A&E

are admitted, ranging from 40% for younger elderly people who self-refer to over 70% for older elderly people brought in by ambulance or referred by a GP.

A&E attendances have risen by about 30% since 2003/04 but almost 70% of the increase was due to attendances at walk-in clinics, minor injuries units and urgent care clinics. As mentioned above, this was almost certainly partly supply-driven. The NHS opened 230 new walk-in centres, offering care mainly by nurses, between 2000 and 2010 with the aim of providing alternative sources of primary care to traditional GP services (Monitor 2013). About a quarter of such clinics were established in hospitals (Monitor 2013). These made access to urgent primary care much easier for patients. Not only were appointments not required but the new 4-hour waiting time target was applied (usually successfully) to such care. This is likely to have represented a lowering of the waiting-time 'price' to patients of urgent primary care compared with traditional A&E departments. Some of these clinics and units have subsequently closed in recent years.

Very few attendances at walk-in centres however lead to emergency hospital admissions. It is attendances at major A&E departments, which account for the great majority of admissions. Such attendances rose by a relatively modest 12.5% between 2003/04 and 2012/13. The total population rose by over 7% over this period and there was presumably an additional rise in demand because of population ageing. This does not suggest that there was huge pressure for admissions coming from additional numbers of major A&E attendees. However, walk-in centres were often co-located with major A&E departments with a view to diverting some demand. If, as a result, triage was tightened at the front door of many major A&E departments, it is possible that there was an increase in the average acuity among those still designated as Type 1 patients. This may have been reinforced by a rise in the numbers of people with complex conditions as a result of population ageing.

What has been rising most in major A&E departments is the conversion ratio of attendances to admissions, which is decided by clinical staff in A&E departments. Blunt et al (2010) report that the proportion of people admitted after attending major A&E departments rose from 21% to 24% between 2003/04 and 2008/09, an increase of about 14%. Later figures show the proportion rising to 25.9% by 2012/13, a rise of nearly a quarter in just under a decade. The conversion rate is higher among older age groups: 49.8% for those 65 to 84 and 64.4% for those 85 and over in 2012/13. However, the conversion rates for each of the two elderly groups have each risen by less than 1% since 2009/10. These figures are consistent with a rise in acuity for the population as a whole over the last nine years but not with a rise in acuity among older people over the last three years.

5.7. Age, cohort and period effects

It is helpful in the context of examining demand and supply factors to be able to partition past trends in older emergency admissions between age, period and cohort effects.

Age effects relate to differences in emergency admissions rates by age after controlling for any differences in the other two factors. They are ascertained by examining admissions rates at each age averaged across each birth cohort (e.g. those born in 1947 to 1949, 1950 to 1952 etc..) and each time period (e.g. 2001 to 2003, 2004 to 2006 etc.). The age effect is likely to reflect the way in which underlying need for emergency inpatient care varies by age. It therefore in all likelihood relates to variations by age group in underlying demand.

Cohort effects relate to differences in emergency admission rates by birth cohort after controlling for any differences in the other two factors. They may be seen as generational differences. They are ascertained by examining the admission rates of each cohort at each age averaged across each time period. The cohort effect is therefore likely to reflect the way in which the underlying need for emergency inpatient care at a given age varies by birth

cohort, possibly in turn reflecting changes over time in the incidence and prevalence of conditions requiring urgent and emergency care. It too therefore likely relates to changes in underlying demand but could also reflect changes in other factors such as clinicians' views about the benefits of hospital admission.

Period effects relate to residual differences over time in emergency admissions rates after controlling for any differences in the other two factors. They are ascertained by examining for each time period the admission rates of each cohort at each age. The period effect is therefore generally likely to reflect not underlying need for emergency inpatient care but other contemporaneous factors. These could include for example advances in technology or changes in capacity over time. An exceptional case where a period effect would reflect underlying need would be a pandemic.

The age, cohort and period effects were estimated by calculating rates of emergency admissions for 3 year cohorts and 3 year periods from 1998 to 2012 and feed these rates into a model designed to estimate the three effects. The method is discussed in more detail in the annex to this chapter. The findings are illustrated in Figures 5.4 to 5.6 which set out the regression coefficients estimated through the modelling.

The age effect is as would be expected: admission rates fall by age to around age 30 and then rise monotonically with age from age 40 upward. The cohort effect is perhaps more surprising: each cohort from those born in around 1912 onward have experienced lower emergency admission rates after standardising for age and period effects. As discussed above, this could represent improvements in health over time. Period effects have been increasing over the period since 1999. They rose especially sharply between around 2002 and 2005 and have continued to rise despite resource constraints in the most recent years. This could reflect a range of factors including advances in technology.

The number of emergency admissions of older people rose from 1.51 million in 1999/2000 to 2.13 million in 2011/12. If admission rates by age band had remained constant at 1999/2000 levels, the overall number of admissions in 2011/12 would have been 1.73 million, an increase of 220,000 rather than 620,000. If the cohort effect is taken into account, the overall number would have been only 1.37 million in 2011/12, a decline of 140,000 instead of the increase of 620,000. The difference is due to the period effect.

The APC results can be used to estimate a counterfactual situation to explore how many emergency admissions would have occurred if the period effects had remained constant. To produce this counterfactual we make an estimate of the probabilities of admission for each age group for each year holding the contemporaneous factors (period effects) influencing emergency admissions at their 1998-2000 level, and taking account of the age effects and cohort effects. Once period effects are held constant, the modelled age-specific rates of emergency admission fall throughout the period 1998-2000 to 2010-2012. These declines are so steep that they more than offset the impact of population aging and growth, such that the estimated total number of older emergency admissions in 2010-2012 is lower in this counterfactual than it actually was in 1998-2000. Much attention has been given to the role of population ageing in determining pressures on the NHS, but these results suggest that this is just a partial view. Successive reductions in the rates of emergency admission for younger cohorts have more than offset the impact of the rising numbers of older people over the period 1998-2000 to 2010-2012.

5.8. Summary

The *underlying* demand for emergency inpatient care in old age has risen due to rising numbers of older people but this explains only around one-third of the rise in emergency admissions of older people over the period 2001/02 to 2011/12. Changes in the incidence

and prevalence of serious illnesses and accidents may also have affected underlying demand, possibly in a downward direction, but the evidence is inconclusive. Changes in social attitudes, including risk aversion among the public and among health and social care staff, may also have affected underlying demand. The *effective* demand for emergency care seems to have risen more rapidly than underlying demand. It may have been influenced by a range of factors including advances in technology and changes in government policy. These issues are discussed in the next two chapters.

Figure 5.4: Age effect coefficients

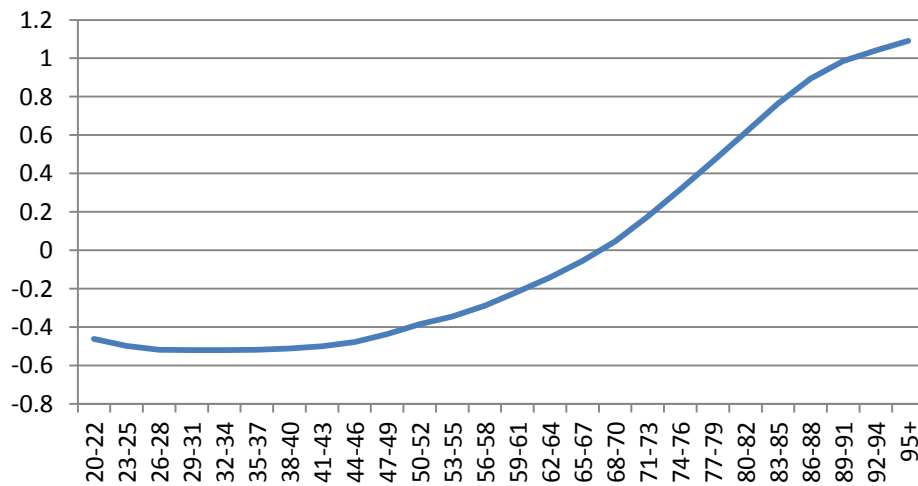


Figure 5.5 Cohort effect coefficients

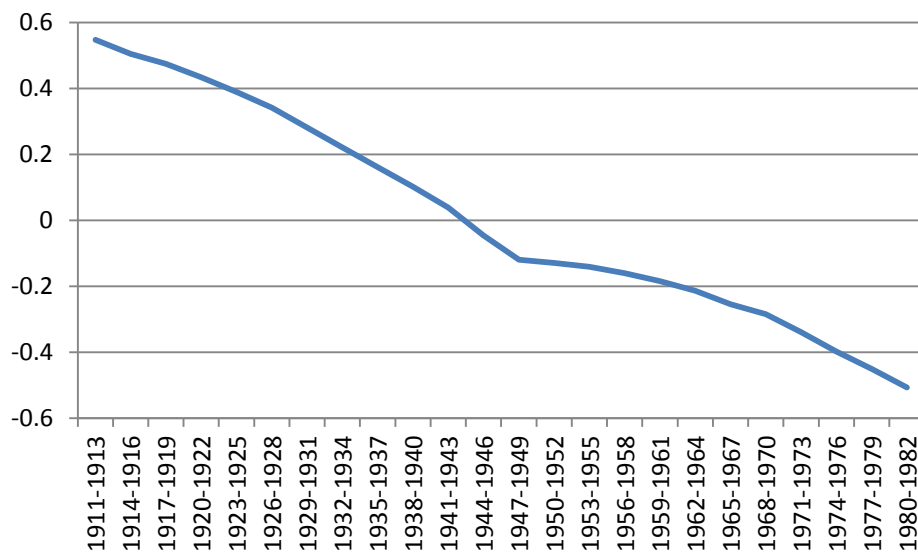
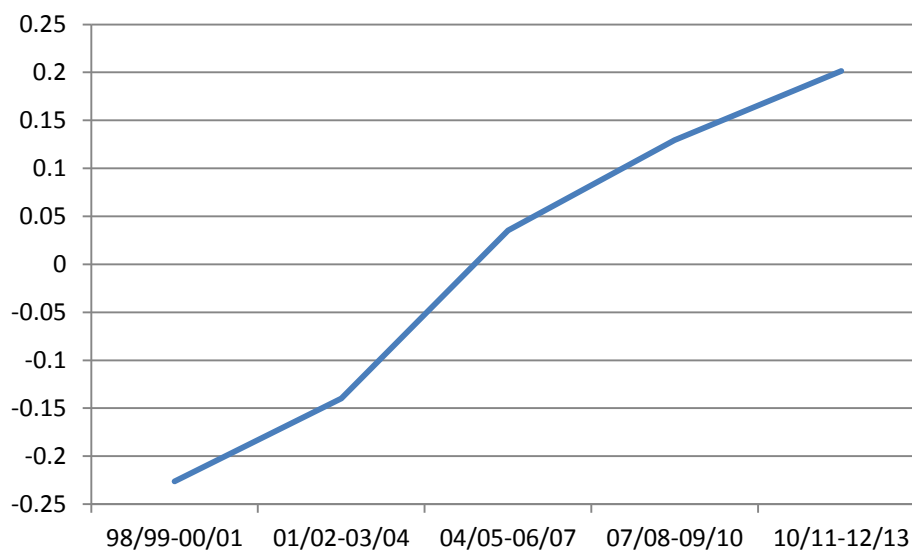


Figure 5.6: Period effect coefficients



Annex 5.1: Age Period Cohort methodology

The Age Period Cohort methodology provides a framework to analyse any sort of count data for a population. It attempts to attribute the changes in an outcome to 3 causal factors:

- Age effects. These show how the age of an individual impacts the likelihood that they will experience an outcome.
- Cohort effects. These show the combined impact of all factors that affected a common birth cohort. They can be seen as a generational effect – capturing differences accrued both at time of birth and during peoples’ formative years.
- Period effects. These show the impact of contemporaneous factors that impact upon all age groups.

A problem arises when attempting to apply the APC method econometrically, in that age, period and cohort are perfectly multi-collinear. In order to obtain consistent coefficient estimates it is necessary to impose constraints on any APC regression. A number of solutions have been proposed to this problem.

One possible solution is to use a Constrained Generalised Linear Model (CGLIM). This involves manually forcing a constraint on two or more coefficients (e.g. $\text{Period}_1 = \text{Period}_2$, $\text{Cohort}_4 = \text{Cohort}_5$). For regression estimates to reflect their ‘true’ values, this constraint needs to accurately reflect something that we can observe in reality. As all APC models are just identified, it is not possible to use conventional model fit criteria to determine the optimal specification. Even with detailed specialist knowledge of an area, creating a suitable constraint can be a major challenge.

Other solutions involve using non-linear transforms of one of the 3 variables, so as to remove the multicollinearity, or to use proxy variables in place of one or more. Both of these have problems: the former removes the flexibility that makes the model appealing, and requires a choice as to the form of the non-linear transform. For the latter, it is highly unlikely that a proxy variable that sufficiently captures the features of one of the variables can be found.

The Intrinsic Estimator (IE) developed by Yang Yang provides a further approach. Rather than imposing a constraint directly on the coefficients, this restricts the impact of the design matrix on the coefficient estimates. In practice, this simply implies that the coefficient estimates are not affected by the number of age and period groups modelled. It has been shown that the Intrinsic Estimator is unbiased, relatively efficient and asymptotically consistent. Simulations comparing IE with CGLIM estimates have also found the former are able to extract valid coefficients from known data generating processes.

Despite the advantages of the Intrinsic Estimator, it suffers from drawbacks common to most of the APC approaches. Age, period and cohort effects are not able to interact, and causal factors are unable to have selective impacts. For example, an increase in the propensity of doctors to admit only older patients could not be appropriately captured by the model. Instead, the effect would appear partly in the relevant period coefficient, partly in the older age and relevant cohort coefficients, and partly in the error term. Cohort effects are also explicitly constrained to imparting the same proportionate effect across all age groups, not allowing cohort effects to adjust to new inputs over time. We have attempted to partially control for this by only modelling admissions for people aged 20 and older, by which point much of the build-up of factors that determine a generation should have occurred.

We have applied the APC IE methodology to emergency hospital admission data from 1998/99 to 2012/13, running the regressions for condition groups separately. These condition groups are generally based around ICD 10 chapters, but focus on more or less specific groups of conditions where appropriate. It is necessary to run the model separately for different conditions in order to accurately reflect the different trends in the three APC variables. The data is aggregated into 3-year periods and age bands in an attempt to capture distinctly different cohorts. As such, the model does not estimate single year values, but 3-year averages. In order to present annual values, linear interpolation is used between the mid points of the modelled periods.

Age period cohort models provide a further benefit in that they allow the formulation of projections. Age and cohort coefficients estimated over the data period can be carried forward, meaning that projections simply require assumptions about changes in the period effect in order to generate future values. If projecting over the entire age range that was modelled, cohort values must be estimated for new cohorts entering the population. However, as we are primarily interested in older people, we simply exclude the youngest ages that would require additional coefficients to be calculated. As such, our forecasts of emergency admissions only cover the 29 and above age group.

6. Supply side factors

It was shown in Chapter 3 that there was an increase of over 45% in the numbers of emergency admissions for older patients (aged 65 and over) in England from 2001/02 to 2012/13. The *rate* of admissions per 1,000 older people also grew strongly, by about 25% over this period, but peaked in 2010/11 with small declines in the subsequent two years.

This expansion and slowdown coincided broadly with changes in the funding of the NHS, which grew rapidly in real terms in most years following 'The NHS Plan' (Secretary of State for Health, 2000) and at a negligible rate after 2009, following the World financial crisis. The changes in the rate of growth of real NHS expenditure, while not affecting the underlying demand for urgent and emergency care, affected both the resources available to NHS purchasers which, until recently, were Primary Care Trusts (PCTs), and the consequent supply of emergency hospital care commissioned from providers.

Meanwhile, emergency bed days fell for older patients until 2007/08 since when they have remained fairly constant. This conceals an almost continuous fall (cumulatively about 20%) in emergency bed day *rates* per 1,000 population for older patients throughout the decade 2001/02 to 2012/13. Falls in average length of stay are likely to have been driven, in part, by advances in technology and organisational change on the supply side. They may also have been driven by policy changes such as the introduction of payment by results for emergency admissions around 2006 to 2008 (Chalkley and Aragon 2014).

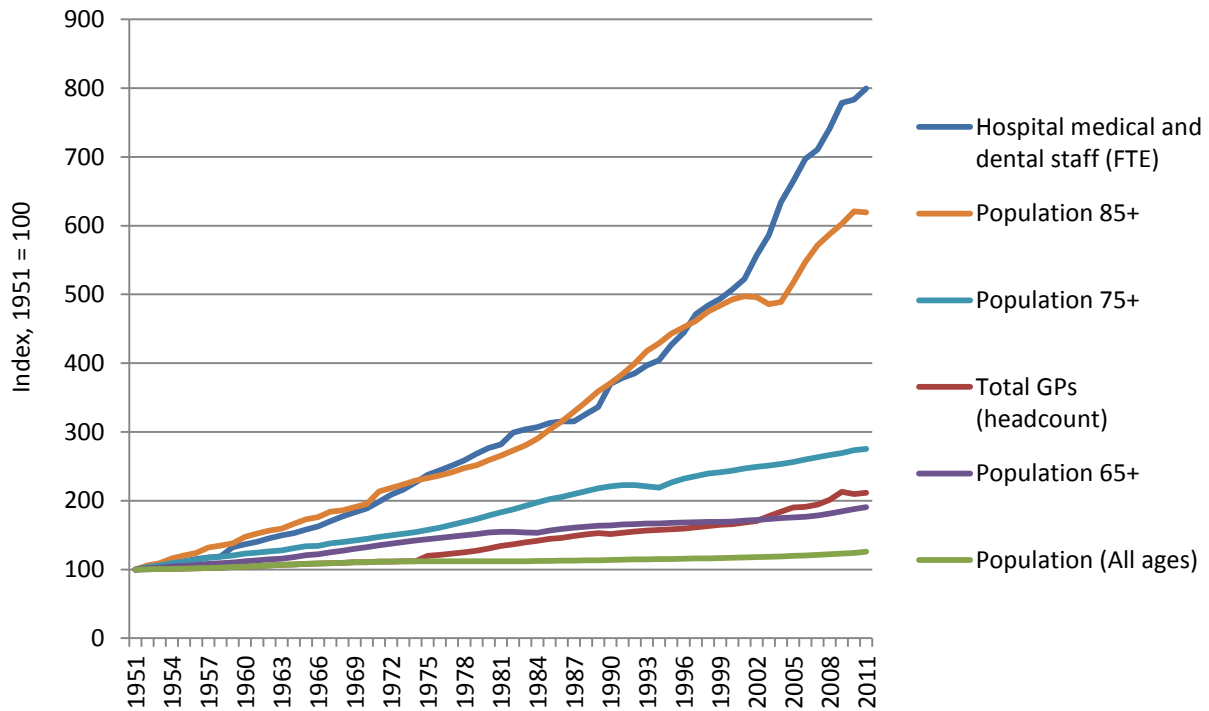
This chapter deals with a number of variables associated with the supply of admissions, such as: the adoption of technological advances; organisational changes in in-patient emergency care; and changes in real unit costs per admission. Changes in these variables (including the rate of adoption of new technology) may have been influenced by changes in funding of the NHS. Funding changes are discussed mainly in the next chapter, on policy.

These factors are likely to be closely related. Technological advance, especially if defined broadly, seems likely to be a driver of medical capability, efficiency gains and costs per admission. Organisational changes may reflect advances in technology which require different systems to implement the improved approaches to diagnosis and treatment.

6.1. Technological advance

It is likely that the most important factor affecting the supply of emergency admissions in the longer term has been the adoption of technological advances which have enhanced medical capability. The growth of medical knowledge has encouraged growing medical specialisation. The number of specialists has grown much faster than the number of GPs and faster than the numbers of older people as a whole since the 1950s. The number of specialists in the UK has even grown faster than the population 85 and over since the mid-1990s (Figure 6.1). In the UK, specialists and specialist equipment are concentrated in hospitals. These facts alone might be expected to be associated with rising hospital admissions.

Figure 6.1: Population and Medical Workforce, UK, 1951 to 2011



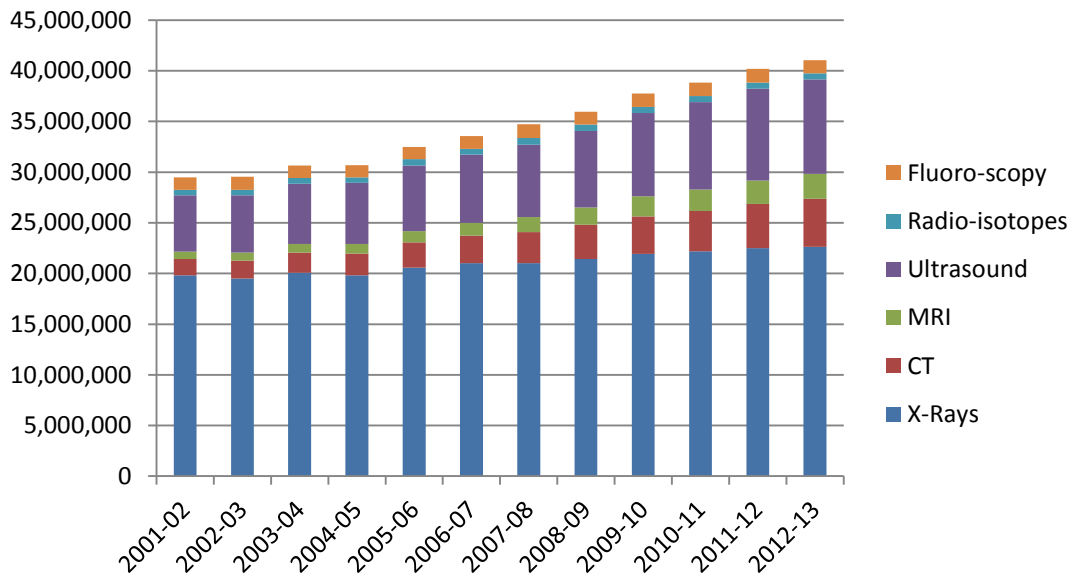
Source: Office of Health Economics (OHE, 2013)

It has been said that technical advances in emergency and critical care have been made in a succession of small steps across many disciplines rather than in any one dramatic leap (Vincent et al. 2006). Nevertheless, the cumulative effect is likely to have been large over the past 50 years or so. New technologies may be cost-reducing or cost-increasing. The rate of adoption of cost-increasing new techniques is likely to be higher in years when expenditure is growing and lower in years when it is not growing.

Many of the step-by-step advances have been in diagnostic technologies and equipment such as: imaging (CT scanning, NMR, ultrasound and endoscopy); pathology testing (haematology and bacteriology); and continuous bedside monitoring of patients' cardiac, haemodynamic and respiratory functions. There have also been advances in drug therapies (such as thrombolytic therapy and aspirin following heart attacks); in non-invasive ventilation of patients with breathing difficulties; and in emergency surgery (such as percutaneous coronary interventions, better anaesthetics and less invasive procedures). Some of these advances – especially the new drugs – have also become available outside hospitals but in the NHS there is a tendency, as has been mentioned above, for many new technologies to be concentrated in hospitals because of their costs, or because specialism is required for their cost-effective use and specialists are located mainly in hospitals.

The growth of emergency admissions of older people involving a procedure, especially for patients aged 85 and over, was discussed in chapter 4, above. Figure 6.2 shows the increase in (all-age) imaging and radio-diagnostic examinations in England between 2001/02 and 2012/13. The chart includes planned as well as emergency investigations. Although the number of total examinations rose at about the same rate as total admissions, this conceals the fact that there was a shift from traditional imaging by x-ray towards more advanced imaging by CT scanning and MRI. Together, numbers of the latter more than trebled over the period.

Figure 6.2: Imaging and radio diagnostic examinations, England, 2001/02 to 2012/13



Note: the data include both emergency and planned imaging tests.

What is the link between growing medical capability and emergency admission rates? Medical advances are often offered first by hospital specialists and are likely to increase the effective demand for specialist services if they enable conditions which hitherto have been untreatable, or inadequately treatable, to be tackled more effectively. However, access to new medical technologies and capabilities is limited in the NHS by the resources made available by the government. These resources were rationed fairly tightly in the years leading up to 2000, judging by the UK's health spending compared with other European countries. There was then a decade of relative plenty until 2010 since when further austerity has been imposed on the NHS.

6.2. Organisational changes in in-patient emergency care

An important response to the rising demand for emergency care and expanding technological opportunities has been the creation in most general hospitals in the past 20 years, or so, of acute medical units (AMUs) (sometimes designated acute assessment units or acute observation units) alongside accident and emergency departments (A&E). Also, a new 'acute medicine' sub-specialty of general internal medicine was created in 2003. Suitable emergency patients are admitted to these units from the A&E (or directly from the community) for rapid assessment and, if indicated, treatment with a view to either early discharge or admission to another speciality for longer term management. It has been reported that 93% of all hospitals in the UK had established AMUs by 2008 (Federation of the Royal Colleges of Physicians 2010).

Acute medical units place senior doctors (who are dedicated to the unit) 'at the front door' for rapid assessment of patients. Ideally, they are backed-up by multidisciplinary teams and there is access to dedicated or privileged diagnostic facilities 24/7. Clinical decisions are guided by appropriate assessment tools and guidelines. Any treatment begins as soon as possible and discharge or transfer plans for patients are formulated as soon as possible. Senior doctors conduct frequent ward rounds with a view to reassessing patients regularly. About three quarters of AMUs had two or more consultant-led ward rounds per day by 2008 (Federation of the Royal Colleges of Physicians 2010). These developments appear to be

consistent with the disproportionate rise in zero- and one-day emergency admissions, noted in chapter 3, above.

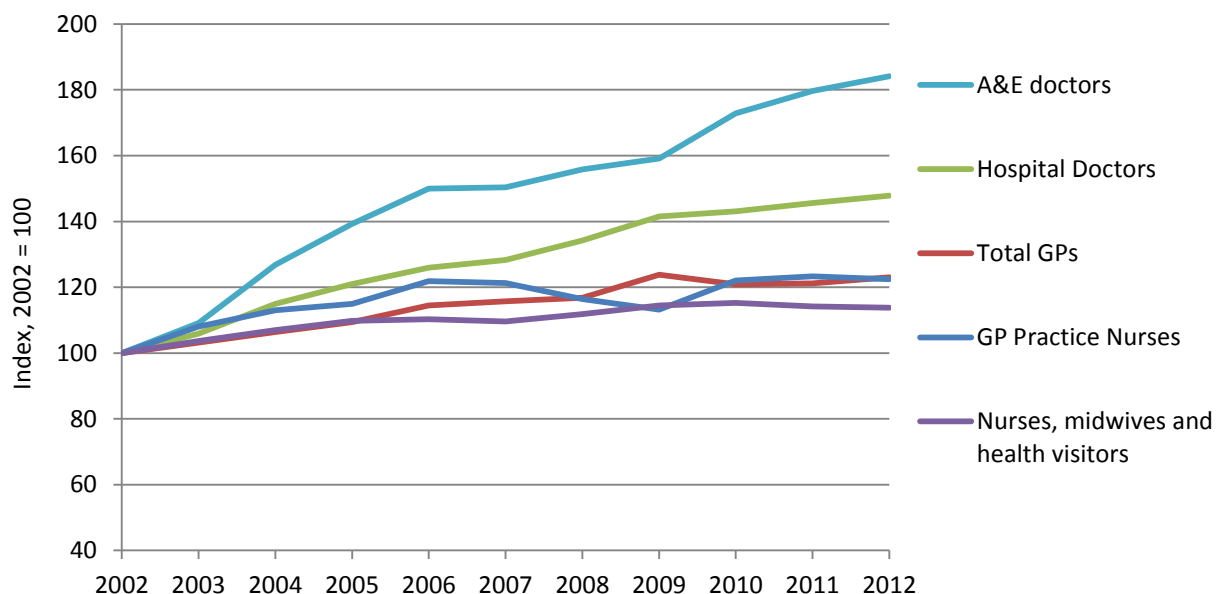
A review of nine, peer-reviewed, before-and-after, uncontrolled studies of the introduction of AMUs in the UK and Ireland (Scott et al. 2009) suggested that they can reduce in-patient mortality and length of stay without increasing readmission rates. They can also reduce waiting for a bed in the emergency department, help to ensure more appropriate placement of patients in other specialties, and improve patient and staff satisfaction. The advantages of a 'short-stay ward' specifically for older people, in terms of reduced stay and better quality of care were reported by Khan et al. (1997).

6.3. Real resource changes in emergency inpatient care

There have been real resource changes in emergency care which have supported the expansion of activity. Plans for a major expansion of capacity in hospital care were set out in *The NHS Plan* (Secretary of State for Health, 2000). Figure 6.3 indicates that there have been significant increases in the staff capacity of NHS hospitals in the past decade. The number of hospital doctors has increased by nearly 50% since 2002, although the number of nurses has increased by less than 20%. This can be compared with numbers of GPs and practice nurses which have increased by about 20%.

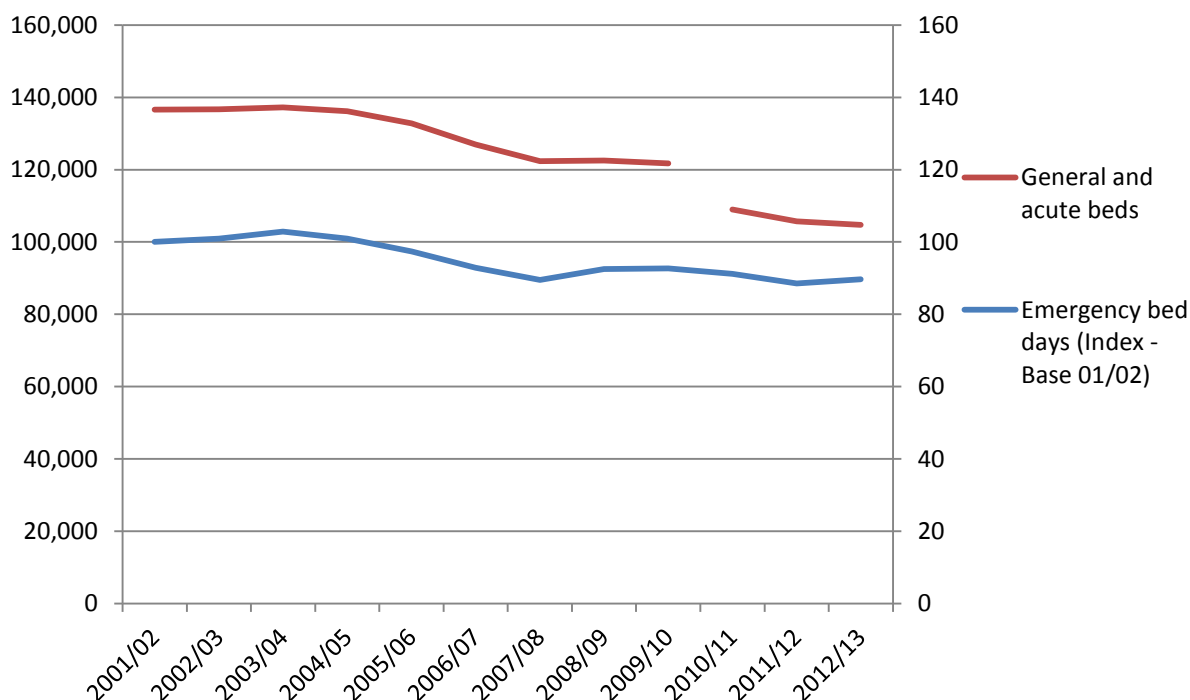
The number of consultants in the new sub-specialty of 'acute medicine and general internal medicine' has increased more than 5-fold in a similar period (2002 to 2010), albeit from a low base. Not surprisingly, the consultants who have been appointed in this new sub-specialty have been disproportionately young doctors in their 30s and 40s (Federation of the Royal Colleges of Physicians 2010). They were presumably 'early adopters' who have helped to diffuse new technologies quickly. Younger doctors tend to shoulder heavier caseloads than older doctors. Moreover, there is some evidence that younger doctors have more up-to-date factual knowledge, are more likely to adhere to appropriate standards and may have better patient outcomes than older doctors (Choudhry et al. 2005). Meanwhile, consultants in other medical specialties continued to contribute to treating acute patients – as they had done traditionally – but at a declining rate (Federation of the Royal Colleges of Physicians 2010).

Figure 6.3: Medical and Nursing Workforce (full-time equivalents), 2002 to 2012



In contrast, capacity in terms of NHS general and acute bed numbers rose fractionally for a couple of years following The NHS Plan (Secretary of State for Health, 2000) before starting to fall (Figure 6.4). Numbers general and acute beds fell by about 11% between 2004/05 and 2009/10 – perhaps led by falls in length of stay – and by about 4% between 2010/11 and 2012/13 – perhaps led by cost-improvement plans. There was a break in the series between 2009/10 and 2010/11 which makes the recent picture incomplete. Bed days seem to have fallen in a fairly similar way, at least until 2009/10.

Figure 6.4: Bed numbers (general and acute) and emergency bed days, England, 2001/02 to 2012/13



Note: there was a change in the method of counting beds between 2009/10 and 2010/11.

6.4. Changes in real costs per admission

The rate of increase of emergency admissions might be affected by changes in the real price (or unit cost) of admissions, depending on the elasticity of demand for admissions. There are likely to have been both upward and downward pressures on real unit costs over time. For example, the adoption of new, cost-increasing technologies will have raised real unit costs, other things being equal. Reductions in length of stay will have lowered real unit costs, other things being equal.

It is possible to estimate a series for real unit costs for non-elective admissions from the Reference Cost Schedules from 2008/09 to 2012/13. Over that period, the estimated real cost per non-elective admission (following adjustment with the HCHS deflator) rose by about 1.5% per year. Presumably, the cost of rising complexity/quality of care outweighed the savings from falling average length of stay for 2+ day stays and the continuing shift towards 0-1 day stay patients. The suggestion of a rise in complexity/quality is consistent with the rise since 2006/07 in emergency admissions with procedures, noted in chapter 4, above. This rise reduces the number of admissions that can be funded from constrained budgets.

We are not aware of recent estimates of elasticity, but in the event of unit elasticity the 1.5% annual rise in real unit costs would reduce admissions by around 1.5% per year.

6.5. Summary

The overall number of hospital doctors has increased by nearly 50% since 2002, although the number of nurses has increased by less than 20%. The number of consultants in the new sub-specialty of 'acute medicine and general internal medicine' has increased more than 5-fold in a similar period (2002 to 2010), albeit from a low base.

A key factor affecting the rise in the number of older emergency admissions is likely to be the adoption of new technologies. There have over the last decade been advances in diagnostics, drug therapies and surgical procedures, a rise in the numbers and types of imaging and radio-diagnostic examinations and a rise in the proportion of older emergency admissions involving a procedure.

There has been growing medical specialisation which is to a large extent concentrated in hospitals. This may be linked to technological advances and may help to explain the rise in emergency admissions among older people during the recent decade when expenditure growth allowed new technologies to be adopted.

Organisational advances, such as the development of Acute Medical Units and the new specialty of acute medicine, may also help to explain such growth during the past decade. Growth in the numbers of very short stay (0 or 1 day) emergency admissions and falls in length of stay for patients staying 2 or more days are likely to be attributable partly to technological and organisation change, as well as the introduction of Payment by Results.

There appears to have been a slight increase in the real cost per non-elective emergency admission since 2008/09. Presumably, growing complexity/quality of care outweighed the savings from shorter average length of stay.

7. Policy drivers

By influencing the underlying demand and supply forces, government policies can have a major effect on the quantities of NHS services provided over time and the efficiency with which they are provided. There were two main themes in government policy towards the NHS in England during the period from 2001/02 to 2012/13. The first was strong growth in real funding of the NHS until 2009/10, some of which was more-or-less earmarked for emergency hospital services. This was followed by a halt to such growth from 2010/11 onwards following the beginning of the world financial crisis. The second was a series of measures aimed at improving the efficiency and quality of NHS care: such as setting performance targets; reforming the employment contracts for staff; restoring the 'internal market' for hospital care (after it was set aside between 1997 and 1999); introducing 'payment by results' for acute hospital services in England (but not in Scotland); and attempting to shift care 'closer to home', especially towards the end of the decade.

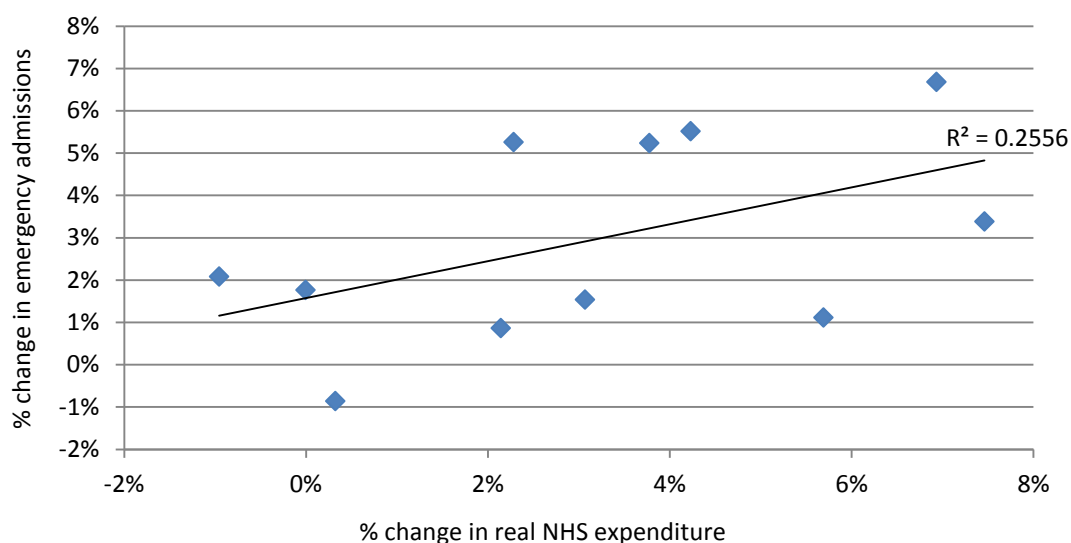
7.1. Expenditure growth

The annual rate of growth of real NHS spending fluctuated quite significantly over the decade. It averaged about 8% per year between 2001/02 and 2004/05, fell back to under 3% in 2005/06, rose again to about 5.5% per year between 2006/07 and 2009/10, and fell back again to little more than zero in the following three years as public spending was reined-in following the economic crisis of 2008 (Appleby et al. 2009). Real spending on Hospital and Community Health Services actually fell after 2009/10 because spending on hospitals was deliberately constrained in relation to the rest of the NHS. Policies aimed at improving efficiency and quality were introduced at various dates during the decade.

The rate of growth of emergency admissions (all ages) in England also fluctuated significantly during the decade. There were surges around 2002 to 2005 and in 2008, separated by a lull in 2006 and 2007. The growth rate tailed off again after 2009/10 (Figure 7.1), although it continued for some groups of older patients. These fluctuations are described in more detail in Annex 7.1. Over the whole period 2001/02 to 2012/13 real NHS expenditure rose by 40% and emergency admissions (all ages) rose by 37%.

There was a positive correlation ($R^2 = 0.26$) between changes in the rate of growth of emergency admissions (all ages) and changes in the rate of growth of real, total NHS spending in England over the period 2001/02 to 2012/13 (Figure 7.1). The correlation for emergency admissions for people 65 and over only, however, was rather lower ($R^2 = 0.10$). A lower correlation for emergency admissions of older people is not surprising since admissions by age group can vary, within the total, in response to changes in relative demand between age groups and policy priorities.

Figure 7.1: Changes in emergency admissions and in real NHS expenditure over time



7.2. The A&E waiting time target

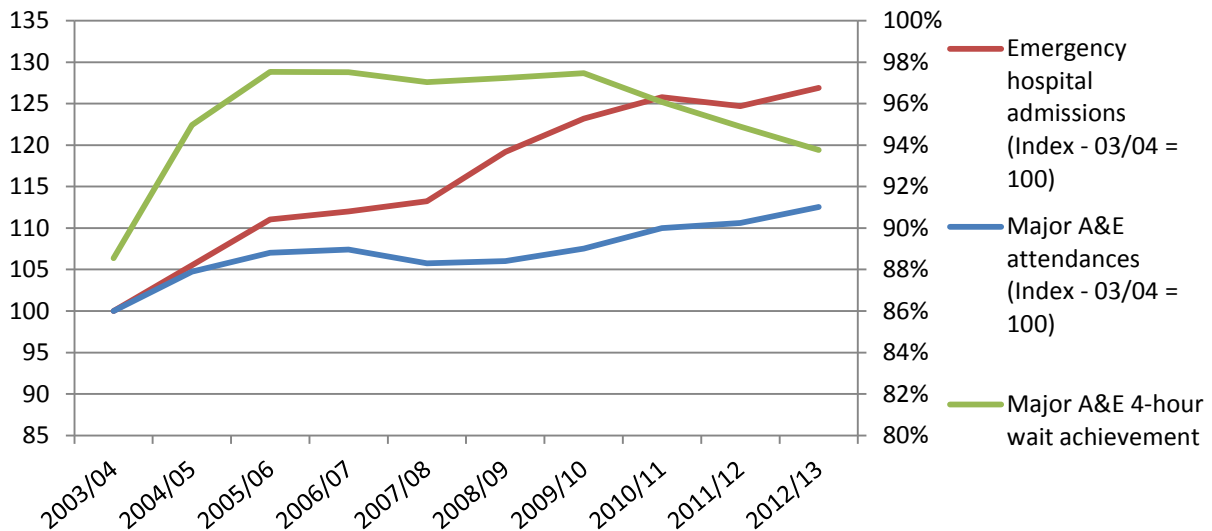
'The NHS Plan' set a number of performance targets aimed at improving the quality and efficiency of services. The target for emergency services was: "By 2004 no-one should be waiting more than four hours in accident and emergency from arrival to admission, transfer or discharge" (Secretary of State for Health, 2000). This target was soon refined to cover 98% of patients attending A&E departments. It was subsequently relaxed in 2010 to cover 95% of patients rather than 98% but plans to scrap it altogether at that time were dropped.

Hospitals were given several years' notice to comply with the 4-hour waiting-time target in A&E departments by 2004. It could be argued that this helped to generate the rapid increase in emergency admissions from 2001 to 2005. This increase was, in turn, associated with dramatic improvements in waiting times in A&E departments even before 2004. Nationally, achievement of the waiting time target rose from 77% in the first quarter of 2002/03 to 94.7% in the first quarter of 2004/05 (Alberti 2004) and subsequently to over 97% in all quarters between the end of 2004/05 and the end of 2008/09 (Blunt et al. 2010). More particularly, in the period between 2002 and 2004 there was a temporal correlation between the rate of rise of zero-day admissions (Jones 2009b) and the rate of rise of achievement of the waiting time target (Alberti 2004). Whereas the announcement of the plan to impose the target may have contributed to the rise in emergency admissions, it was arguably the extra admissions which then helped to bring about the rapid achievement of the target.

However, achievement of the waiting time target was almost certainly helped by other events such as a speeding-up and improvement of treatment in A&E departments, avoiding the need for some admissions. Alberti (2004) noted that the number of A&E consultants increased by 36% between 1999 and 2004 and that the practice of 'see and treat' – where patients are seen quickly by a senior decision maker with a view to their rapid diagnosis, treatment and discharge – had been adopted widely. Moreover, between 2000 and 2004, the NHS had opened a large number of nurse-led, 'walk-in' clinics, sometimes co-located with A&E departments, to treat patients with urgent, minor conditions. This probably took some pressure off major A&E departments (Monitor 2013).

Whereas A&E attendances at major A&E departments (type 1) rose by about 12% over the 9-year period 2003/04 to 2012/13, emergency admissions (all ages) rose by about 25% (Figure 7.2). Achievement of the waiting time target began to fall in 2009/10 slipping to about 94% of patients (of all ages) in 2012/13. Presumably, much of this fall can be attributed to the relaxation of the target to cover only 95% of patients from 2010. There was also the fact that emergency admissions fell slightly between 2010/11 and 2011/12.

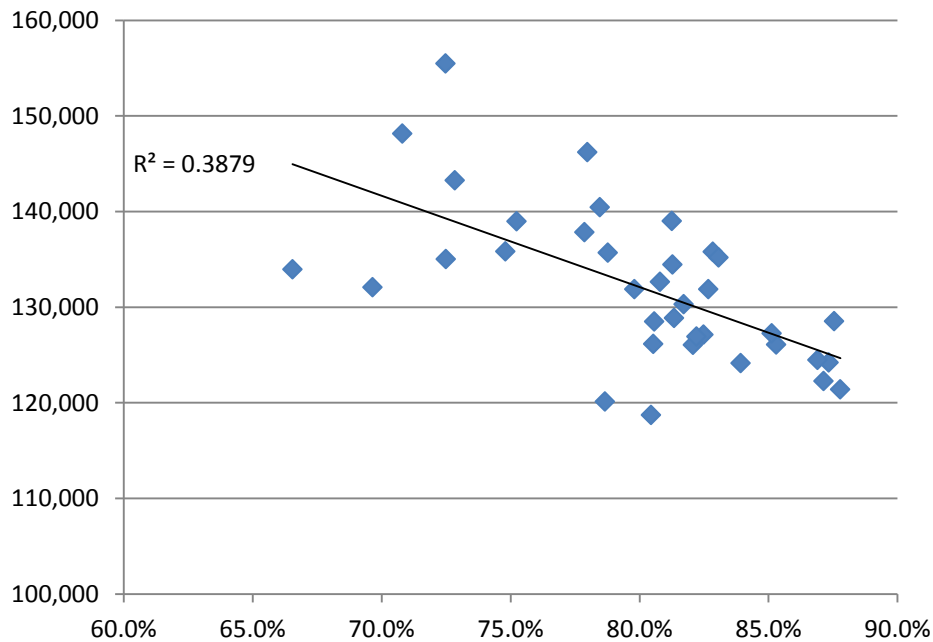
Figure 7.2: A&E attendances, emergency admissions (all ages) and achievement of A&E waiting-time targets



A more detailed examination of monthly data for the three years 2010/11 to 2012/13 reveals a more complex picture for *older* patients, especially for those who needed to be *admitted*, as opposed to discharged or transferred. First, whereas compliance with the target was usually over 90% for older patients *not* admitted, for patients who *were* admitted compliance did not reach 90% at any time during these years, or indeed 80% during winter months, and was on a deteriorating trend towards less than 70% during the harsh winter of 2012/13.

There was an inverse correlation (R-squared = 0.39) between monthly emergency admissions of older patients via A&E and compliance with the waiting time target, as shown in Figure 7.3.

Figure 7.3: 65+ older emergency admissions via A&E and achievement of 4-hour waiting time target for such patients



7.3. The new GP contract

There has been speculation as to whether the new GP contract introduced in 2004 had any effect on the subsequent growth of A&E attendances and emergency admissions. The new contract, by incentivising evidence-based care via the Quality and Outcomes Framework (QOF), encouraged better management of various chronic conditions. It also enabled GPs to opt out of responsibility for out-of-hours care (that is overnight and at weekends) and most GPs decided to do so.

There is evidence that the QOF reduced admissions for some ambulatory care sensitive (ACS) conditions in the early years. Dixon et al. (2011) reported significant inverse relationships between QOF performance and ACS admissions for coronary heart disease, hypertension, congestive heart failure, diabetes and chronic obstructive pulmonary disease. They found no relationship for asthma and stroke. More generally, the reductions in admissions for conditions such as ischaemic heart disease, noted in Chapter 4 above, may have been partly due to appropriate primary care.

There is a view that the new right of GPs to relinquish out-of-hours (OOH) care may have countered such favourable effects on emergency admissions. The responsibility for OOH care was usually transferred to separate co-operative services run by PCTs. It is argued that patients increasingly by-passed these or were increasingly referred by the new OOH providers to A&E departments. Attendances at A&E departments did indeed increase briskly in 2004 and 2005 before flattening off in 2006 and 2007. However the growth at this time was almost entirely in nurse-led walk-in and minor-injury A&E clinics (Monitor 2013) and this is likely to have been partly or mainly supply-driven. Attendances at major A&E departments hardly changed from 2004 to 2007 (Appleby 2013) although there could have been some diversion to minor clinics leading to an increase in average acuity in major clinics. An increase in minor A&E attendances should not have led to rising emergency *admissions*: the conversion rate from minor A&E attendances to admissions is very low.

There were further changes to the GP contract in 2011 aimed directly at avoiding emergency admissions. QOF points could be earned for three new indicators: the practice meeting internally to review data on emergency admissions; the practice meeting externally with other practices to review such data; and the practice co-operating in developing and following 3 care pathways aimed at reducing emergency admissions (BMA and NHS Employers 2011).

7.4. Payment by results

Payment-by-Results (PbR) began to replace funding mainly through fixed budgets with payments by uniform national prices for some hospital activity in 2003/04. However, it did not apply to emergency admissions in most trusts until 2006/07. Even then, the impact of PbR on emergency care was dampened for several years. This was done in two ways. First, from 2006/07 to 2008/09, a differential tariff of 50% of cost was applied to all emergency admissions above a threshold. Second, because there was the potential for local windfall gains and losses for providers and purchasers, gains and losses for providers were limited to 25% in 2005/06, 50% in 2006/07 and 75% in 2007/08 (Department of Health 2012). The dampening of PbR's financial effects on local NHS hospital economies was removed in 2008/09, although the 50% differential rate for excess emergency admissions remained until 2009/10.

Activity-based payment systems such as PbR have been adopted in many countries and there is considerable evidence on their effects. They are usually associated with increases in both productivity and activity in hospitals following the replacement of global budgets (Street et al. 2011). Productivity effects were observed during the stage-by-stage introduction of PbR between 2003/04 and 2005/06 in England (Farrar 2009, Chalkley and Aragon 2014). PbR was introduced in different stages for elective and non-elective admissions and in foundation trusts and non-foundation trusts over this period in England, but not in Scotland.

This offered the opportunity for a quasi-experimental study of a series of treatment and control groups among hospitals which differed in their adoption of PbR over time. Farrar et al. (2009) found that length of stay fell and the proportion of day cases increased in hospitals which adopted PbR – suggestive of improvements in efficiency. It is not so clear that there was an activity effect. Although activity went up in English hospitals which introduced PbR compared with Scottish hospitals, which did not, activity did not go up in English foundation trusts adopting PbR compared with English non-foundation trusts not adopting PbR.

PbR has evolved since it was introduced, especially for emergency admissions. In a specific attempt to control the rate of growth of emergency admissions and encourage the development of care outside hospitals, a marginal-rate tariff of 30% was introduced from 2010/11 for emergency admissions in excess of admission levels set in 2008/09. It was intended that the 70% (of emergency tariff) savings that would be generated by any excess admissions should be retained by local commissioners, with a view to their funding service improvements outside hospitals which would reduce the demand for emergency admissions (Department of Health 2010). This would be done in cooperation with the hospitals concerned. In addition, from 2012/13 providers were not to be paid for readmissions within 30 days of hospital discharge which were judged by a clinically-led panel to have been avoidable.

7.5. Care closer to home

There was one mention of the development of 'care closer to home' in 'The NHS Plan'- it was noted that the responses to the National Beds Inquiry Consultation had given near universal support for such development. The National Plan included plans to invest widely in better services for older people including 5,000 additional intermediate care beds aimed at

reducing unnecessary hospitalisation and aiding early discharge (Secretary of State for Health, 2000). Moreover, a 'whole system' approach was set out in the 'National Service Framework for Older People' issued in 2001 (Department of Health 2001b). However, it is not clear that the whole system approach carried as much weight as the plans focussed on acute hospital services and staff, at least in the early years of 'The NHS Plan'.

Policy shifted towards providing more 'care closer to home' after the start of austerity in 2010/11. The introduction of the 30% marginal tariff in 2010 and the encouragement for any savings to be directed towards avoidance of emergency admissions and management of demand for emergency care outside hospitals has been mentioned above. NHS England has announced that its area offices would set up 'Urgent Care Boards' for each locality with an A&E department. Their aim would be to improve the performance of urgent care services in each locality including demand management for A&E and early discharge processes. Urgent Care Boards would oversee the spending of the 70% savings from the 30% marginal tariff (NHS England 2013a). More recently, NHS England has suggested that emergency admissions might have to fall by around 15% to fund these plans (NHS England 2013b). So far, the introduction of these measures has coincided with a fall in emergency admissions as a whole, but emergency admissions for older people have continued to rise.

7.6. Summary

There was an unprecedented increase in real NHS spending in England from 2001/02 to 2009/10. This was followed by 3 years during which spending remained constant in real terms. Rising real expenditure (to 2009/10) allowed the NHS to fund rising numbers of emergency admissions of older people without needing to reduce other services.

The announcement in the NHS Plan of 2000 of plans to increase NHS spending was accompanied by plans to expand a range of services including hospital emergency services.

Annual changes in emergency admissions (all ages) were correlated with annual changes in real NHS expenditure during this period ($R^2 = 0.26$). The corresponding correlation for older people was weaker ($R^2 = 0.10$), however, presumably because admissions by age group respond to changes in relative demand between age groups and to policy priorities.

A 4-hour waiting time target in A&E departments was announced in 2000 and implemented from 2004. The announcement was followed by a surge in the numbers of emergency admissions and a rapid fall in the proportion of patients not admitted, discharged or transferred in 4 hours.

There is evidence that the new GP contract may have led to some reductions in emergency admissions because of QOF incentives (Dixon et al.) but no evidence that changes to out-of-hours responsibilities for GPs caused a rise in admissions.

The introduction of PbR for emergency admissions between 2006/07 and 2009/10 was associated with a marked fall in bed days per admission, as would be expected from previous experience in other countries (Farrar 2009, Chalkley and Aragon 2014).

The introduction of the 30% marginal tariff in 2010/11 was followed by a fall in all ages emergency admissions but not in emergency admissions for older people.

Annex 7.1: Surges and lulls in the increase in emergency admissions

The extra resources made available from the beginning of the 2000 decade boosted effective demand since most of the money went to commissioners in the first instance. This fed through into supply because, under 'The NHS Plan', government policy at the beginning of the decade was to expand services, including hospital services. Moreover, some of the money went directly to hospitals for capital developments. The expansion of NHS funding stopped at the end of the decade. Also, by the end of the decade the emphasis had switched from expanding hospital care to boosting 'care closer to home' and to managing the demand for hospital services, especially emergency inpatient care, by enhancing alternative forms of care.

The rate of growth of emergency admissions (all ages) in England fluctuated significantly during the decade. There were surges around 2002 to 2005 and in 2008, separated by a lull in 2006 and 2007. The growth rate tailed off again after 2009/10 (Figure 7.1 above), although it continued for some groups of older patients. These fluctuations might be dubbed the first and second 'surges' and the first and second 'lulls' in admissions.

The 'first surge' in admissions, 2001 to 2005

There was a large increase in emergency admissions, during the first 'surge' - by about 20% over three years. The number of zero-day admissions more than doubled over this period (Blunt et al. 2010).

To understand the causes of this surge, it is useful to recall the state of the NHS in England in 2000. By the turn of the 20th Century, the NHS was seen as overstretched, underfunded and old-fashioned. The Executive Summary to the NHS Plan stated, "In part the NHS is failing to deliver because over the years it has been underfunded. In particular there have been too few doctors and nurses and other key staff to carry out all the treatments required. But there have been other underlying problems as well. The NHS is a 1940s system operating in a 21st century world" (Secretary of State for Health, 2000, page 10). The average rate of growth of real NHS spending had fallen below 1% over the period 1996/97 to 1997/98. There had been successive winter crises in many acute hospitals with ambulances turned away from some A&E departments, long 'trolley waits' for some patients and repeated cancellations of planned operations to make room for emergency patients.

Shortages of staff, especially nurses, were an ingredient in this state of affairs. The percentage of emergency patients admitted within four hours of arrival in emergency departments declined from nearly 90% in 1996 to little more than 75% in 2000 (Audit Commission 2002). Meanwhile, waiting lists for planned surgery in England peaked at 1.3 million in 1998/99. Moreover, it became clear about this time that cancer survival was significantly shorter in England than in comparable European countries. Short survival was correlated with low spending on health care (Evans and Pritchard, 2000). The term 'Third-World Medicine' gained currency among some critics as a description of the state of the NHS at this time.

The Government responded in 2000 with its announcement of a sustained increase in real spending on the NHS and the publication of 'The NHS Plan' (Secretary of State for Health, 2000). Among the leading themes in this White Paper were: increased capacity to improve services and bring down waiting times and 'modernisation' of NHS institutions to improve efficiency. There were plans to boost GP services, community services and social services but the main emphasis was on hospital services and it was here that various waiting-time targets were set. In relation to emergency services, the target was: "By 2004 no-one should be waiting more than four hours in accident and emergency from arrival to admission,

transfer or discharge” (Secretary of State for Health, 2000). This target was later refined to cover 98% of patients attending A&E departments.

The proposals in ‘The NHS Plan’ for emergency services were elaborated in a subsequent policy document entitled ‘Reforming Emergency Care’ (Department of Health 2001a). This suggested a number of reforms aimed at achieving the proposed emergency waiting times targets, including: expanding elective capacity in new, private ‘diagnostic and treatment centres’ to release capacity for emergency care in NHS hospitals; providing more 24-hour diagnostic services in A&E departments; and introducing more streaming of A&E patients to separate those with minor illnesses and injuries from those with more serious conditions. Curiously, there was no mention of medical acute units (see Chapter 6) although they had already been adopted in some acute hospitals. However, a report for the Department of Health three years later (Alberti 2004) described developments on the supply-side of emergency medicine which had helped to improve performance. Among other things, Alberti noted that, “The majority of acute trusts now have Assessment Units or Wards, typically run by Acute Physicians, to which patients can be transferred quickly. Acute Physicians are a new and growing group and the Royal College of Physicians has recommended that by 2008 there should be three in every acute trust”. This suggests that the introduction of medical acute units may have been professionally- and locally-led in the early years of ‘The NHS Plan’.

The ‘first lull’ in admissions 2006/07 to 2007/08

The rate of growth of emergency admissions both for older people and for younger people fell back to almost zero in England in 2006/07 and 2007/08. A probable explanation for this is that the NHS suffered a financial crisis in 2005/06, having run-up a deficit exceeding £0.5 billion, partly as a result of over-recruiting staff and under-costing pay awards in previous years. In addition, the rate of increase in NHS spending declined temporarily to under 3% in 2006/07, from 5% to 8% in previous and subsequent years. It was reported that 30% of NHS bodies were in deficit in 2005/06 (House of Commons 2006). Trusts were instructed to restore financial discipline and some were subjected to special ‘turnaround’ measures in the following year or two. The growth of services was reined-in at many trusts and there were staff cuts and bed closures in some. A 13% decline in acute and general beds between 2004/05 and 2007/08 has been noted above.

The ‘second surge’ in admissions, 2008

As mentioned above, there was a second surge in emergency admissions from 2008/09 to 2010/11. The annual rate of increase rose from zero to about 5.5% for older people and from zero to about 3% for younger people in England.

Again, there was an apparent correlation between these changes in the rate of growth of emergency admissions and changes in the rate of growth of NHS spending. The latter rose to over 5% per year in real terms in England in 2007/08 and 2008/09 (House of Commons 2012). The ‘turnaround’ measures following the NHS deficit crisis had been successful and the NHS was able to report a financial surplus in 2007/08.

The ‘second lull’ in admissions, 2009/10 to 2012/13

The rate of increase in *numbers* of all emergency admissions in England tailed off after 2009/10, becoming negative for people under 65 but remaining positive for people aged 65 and over, especially for people 80 and over. After 2010/11 there was a sharp decline in *rates* of emergency admission for people under 65 and a slight decline for people aged 65 and over.

Again, these changes were correlated with changes in real spending on the NHS. NHS expenditure rose by about 6% in real terms in 2009/10 but was then held virtually flat from 2010/11 to 2012/13 as public spending in the UK was reined in following the beginning of the world financial crisis in 2008. It is unlikely that the zero growth in real spending on the NHS from 2010/11 to 2012/13 kept pace with growth in the underlying demand for services because there was continuing population growth, and continuing technological advance.

After 2009/10 there were also cuts to Local Authority budgets which impacted on adult Social Services and may have affected the ability of hospitals to discharge patients.

It is likely that other measures introduced in the NHS from 2010/11 onwards contributed to the decline in the rate of increase in emergency admissions in England. The government indicated, as part of the 'Quality, innovation, productivity and prevention' (QIPP) agenda, that unprecedented productivity improvements were required from the NHS, especially from hospital services, while quality was to be maintained or improved.

In support of QIPP, the annual, across-the-board, PbR tariff uplift was set at 0% in 2010/11, despite expected pay and price increases of 3.5%. In 2011/12, the tariff uplift was set at minus 1.5% at a time when pay and price increases were expected to be 2.5%. Similarly, in 2012/13 the tariff uplift was set at minus 1.8%, with a 4% efficiency requirement offsetting pay and price inflation of 2.2%. It is possible that the reductions in acute bed numbers noted in chapter 6 were due to these general efficiency requirements.

There was a small increase in the share of spending by Primary Care Trusts devoted to community health services, especially in the years 2010/11 and 2011/12 (Jones and Charlesworth 2013). Measures such as these appeared to have given some financial teeth to the policy of 'caring for patients closer to home'. More striking however is the apparent lack of significant change in the shares of primary, secondary and community care in total NHS spending between 2003/04 and 2009/10. Hospital-based services increased their share slightly as did community health services, whereas the share of primary care shrank slightly (Jones and Charlesworth 2013).

In August 2013 the Government announced that £500 million would be made available over the following 2 years to support A&E departments in hospitals where the pressure on services was greatest.

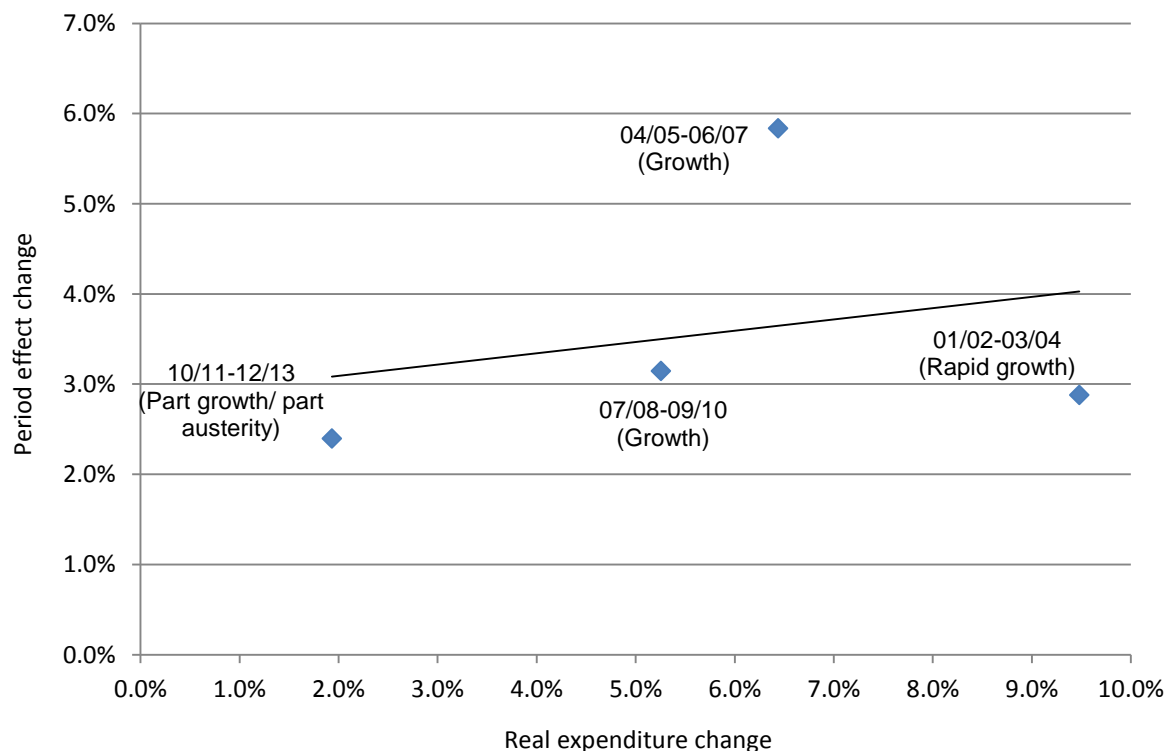
Annex 7.2: Expenditure and the Period effect

Age period cohort analysis can be used to shed further light on the impact of changes in expenditure on rates of emergency admissions. If changes in expenditure impact on emergency admissions, we would expect to see this within the period effect. Since both of these variables have been trending upwards over the period studied, estimating the relationship in levels risks assigning the effect of a common time trend to changes in expenditure. To account for this, we estimate the relationship in differences.

The relationship displayed in Figure 7.4, while weaker than when estimated in levels, still implies a positive correlation between expenditure and emergency admission rates. It suggests that a 1% increase in real NHS expenditure results in a 0.13% increase in emergency admissions. Under a policy of zero real expenditure growth, we would, on the basis of this relationship, expect 2.8% growth per annum in the number of emergency admissions.

These results must be regarded with a high degree of caution given the very limited number of observations. Also, it should be noted that it is not possible to obtain a pure estimate of the effect of austerity (zero real expenditure growth) on the period effect in the model because only 3 years of austerity can be modelled, so far. The estimate for the change in the period effect for 2010/11 to 2012/13 is based on a comparison with the period 2007/08 to 2009/10 when expenditure was still growing. It would require at least two three-year observations of austerity to obtain a pure estimate of its effects. This apart, these results do suggest that real NHS expenditure has an effect on emergency admission rates, but that there may be a baseline level of growth in emergency admission rates that occurs regardless of expenditure change.

Figure 7.4 Change in period effect coefficient against percentage change in real NHS expenditure in England, 1998/99-2012/13



8. Scenarios for future trends

The aim of the study is not only to gain an improved understanding of the drivers of emergency hospital admissions of older people but also to formulate evidence-based scenarios for possible future trends in older emergency admissions in England. In this chapter we discuss scenarios for future trends on the basis of our analysis of factors associated with past trends. We also present some projections of future numbers of older emergency admissions and bed days for the next few years.

It is not our purpose to make forecasts of the future. That would not only be unrealistic but also unhelpful: future trends will be influenced by future policy decisions as well as demand and supply factors. To forecast future policy decisions would not be sensible and would certainly not be useful in informing those decisions. We present not forecasts but rather a series of projections on the basis of specified assumptions about changes in emergency admission rates and length of stay.

We are conscious that resources for health and social care will be constrained for at least the next few years because of the importance of reducing the public sector deficit. Because of the risk of circularity of argument in the context of Spending Reviews, however, we do not limit our scenarios for projections of future expenditure to those which do not require more resources for older emergency inpatient care. Moreover, even while overall resources for health and social care are constrained, the NHS will still be able to re-prioritise resources between different services.

The two principal parameters to consider in developing scenarios arising from our analyses of past trends are future trends in rates of older emergency admissions and future trends in the lengths of stay of those admissions. Our scenarios therefore incorporate assumptions about future trends in those two variables.

Our approach begins by formulating scenarios based on consideration of the likely impact of demand and supply drivers which are, at least over the next few years, not directly influenced by future policy decisions. These include in particular demographic changes in numbers of older people by age band, changes in the prevalence of different health conditions and the adoption of new healthcare technologies. We then formulate scenarios based on age, cohort and period effects. The implications of our scenarios for future numbers of older emergency admissions and bed days can then be compared with likely availability of resources.

This approach aims to address the key question of whether it looks likely that improvements in technology which promote efficiency gains and demand management measures will be sufficient over the next few years to meet the rising demand for older emergency admissions caused by population ageing and any other demand pressures. For those scenarios which imply that emergency hospital bed days for older people are likely to continue to fall, resource constraints may not be a major problem. For those implying rising numbers of emergency bed days for older people, however, our approach draws attention to the potential resourcing problem.

We examine through several scenarios what rate of change in older emergency admissions and bed days would be required over the next few years to meet demand pressures and the impact of technological change on the basis that utilisation in the future is no more constrained by supply factors than now, that is without tightening 'eligibility criteria' for emergency admissions.

Our modelling treats 2012/13 as the base year since this is the most recent year for which Hospital Episode Statistics (HES) data are available. Our final projection year is 2020/21, which extends slightly beyond the end of the next Parliament in 2019/20, but allows for more direct comparison between different projection methodologies.

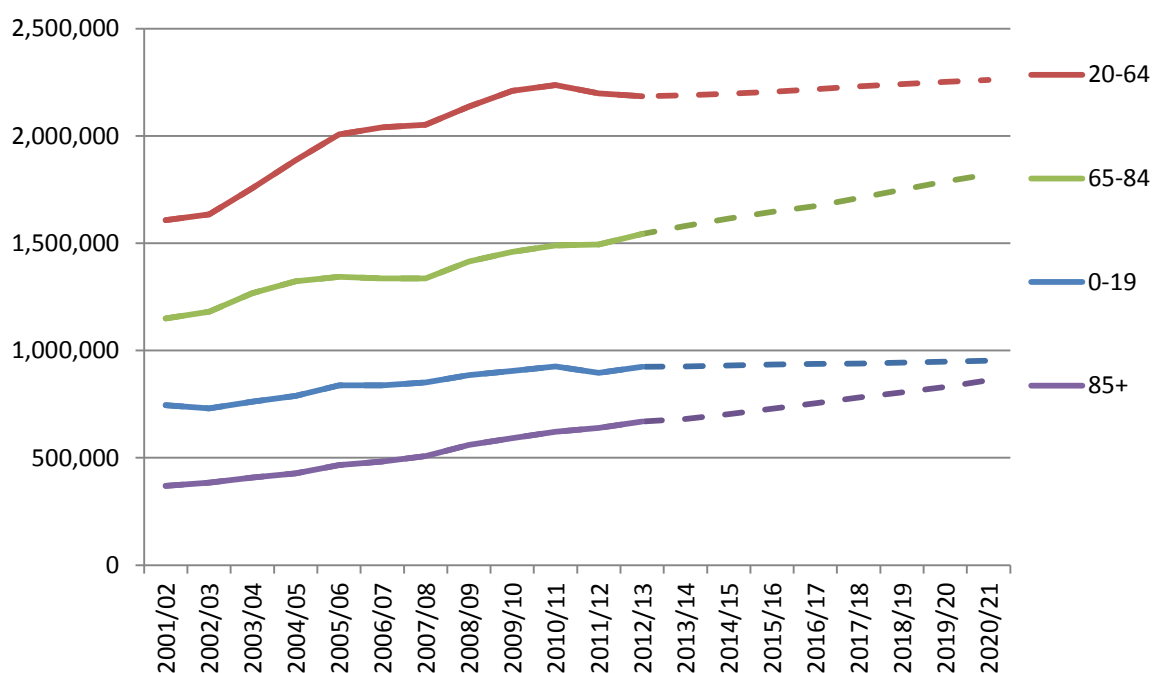
8.1. Projections based solely on changes in numbers of older people

A helpful first scenario is to consider the impact of projected changes in the numbers of older people. For this scenario we hold constant admission rates by age band at 2012/13 rates and allow the numbers of older people to vary in line with Office for National Statistics (ONS) 2012-based principal population projections for England. This scenario implicitly assumes that all other factors, such as prevalence of health conditions and technology, are unchanged. We are not arguing that this scenario is likely to be realised.

These projections show the relative importance of demography in determining past trends in emergency admissions amongst those aged 65 and over. The projections for the 65 to 84 and 85 and over groups approximate linear extrapolations from the previous decade, whilst showing far flatter growth for the younger age groups. The projected growth in numbers of admissions averages 0.4% per year for people aged 0 to 64, 2.1% per year for those aged 65 to 84 and 3.2% per year for the 85 and over group. The number of older admissions is projected to rise under this scenario from 2.21 million in 2012/13 to 2.37 million in 2015/16 and 2.68 million in 2020/21 (Figure 8.1). This would be an average annual growth rate of 2.4% over this period in comparison with the growth rate of 3.5% over the period 2001/02 to 2012/13.

An assumption of constant admission rates may not be warranted.

Figure 8.1: Projected emergency hospital admissions, by age, demographic change only scenario



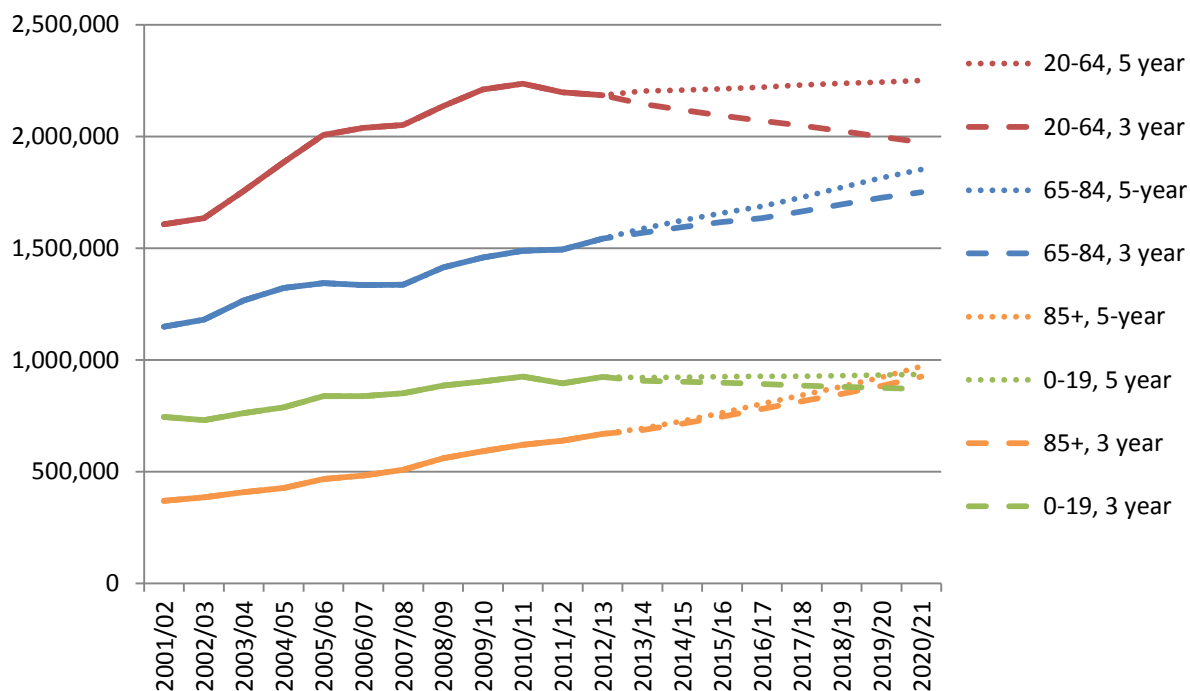
8.2. Projections based on continuation of past trends in admission rates

Another scenario that is interesting to consider is continuation of past trends in admission rates. For this scenario we allow admission rates by age band to rise in line with recent trends and allow the numbers of older people to vary in line with ONS 2012-based principal population projections for England. This scenario implicitly assumes that the combined impact of all factors behind emergency admission rates continues to evolve in the same manner as seen in the past. A key question is whether to use changes in admission rates over the most recent period, where resource constraints have been tight, or over a longer period. Our projection illustrates the impact of looking at trends over the five year period 2007/08 to 2012/13 and the three year period from 2009/10 onwards. (If we had used trends over ten years the projected growth in admissions would have been higher.) We are again not arguing that this scenario is likely to be realised. We are presenting this scenario to illustrate the size of the expected demographic pressure over the next few years as background information to consideration of our more detailed scenarios.

If we continue the trend seen in rates over the past 3 years, admissions for 0 to 64 year olds *fall* by approximately 1.1% per annum. This contrasts to *increases* of 1.6% for the 65 to 84 group and 4.1% for the 85 and over group. The projection for this 3 year trend scenario is very similar to the projection discussed above for the demographic pressures scenario. The number of older admissions would rise to 2.68 million in 2020/21, an average annual increase of 2.4%.

Using trends over a 5 year period, the biggest difference arises for people aged under 65, who now experience an average 0.3% annual growth in admissions. The increase in rates is also higher for older people, at 2.3% for people aged 65 to 84 and 4.8% for the 85 and over group. The number of older admissions is projected to rise under the 5 year trend scenario from 2.21 million in 2012/13 to 2.42 million in 2015/16 and 2.82 million in 2020/21 (Figure 8.2). This is an average annual rate of 3.1%, which is lower than the average of 3.5% experienced over the period 2001/02 to 2012/13.

Figure 8.2: Projected emergency hospital admissions, by age, demography and trended admission rate scenario



8.3. Projections based on analysis of age, cohort and period effects

The purpose of modelling age, cohort and period effects is, as discussed in chapter 5, to investigate how far past trends in older emergency admissions were due to:

- Age effects, which seem likely to reflect age-related differences in incidence and prevalence of health conditions.
- Cohort effects, which might reflect changes in age-specific prevalence of health conditions due to the time-specific environment in which people are born and develop.
- Period effects, which reflect any contemporaneous factors having an impact on all age groups and cohorts in the current period. This could reflect different policies including differences in health care resourcing, technology, or social attitudes and expectations.

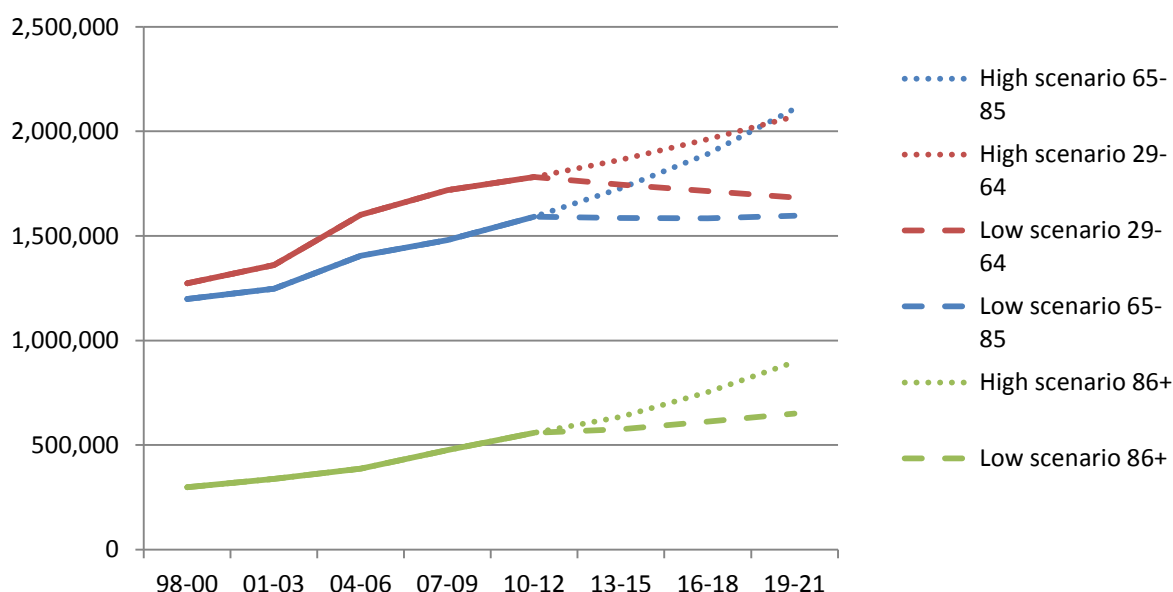
As discussed in chapter 5, the analysis showed that:

- Age effects: the average number of emergency admissions per person year in adulthood falls with age from 20 to 41 and then rises monotonically with age to 90 and over.
- Cohort effects: successive cohorts have had lower numbers of average admissions per year with the average falling from the cohort born in around 1915 to the cohort born in around 1987, but with only a slight fall in the post WWII period (from 1950 until the late 1960s).
- Period effects: after controlling for age and cohort effects there remains an increasing upward pressure from contemporaneous factors on emergency admission rates.

Age and cohort effects are largely determined by past circumstances, such as education, occupation, economic growth, conflict etc. The period effect however reflects contemporaneous circumstances such as current availability of resources. By making alternative assumptions about future period effects, we can create alternative projections.

The two following scenarios are 1) a constant period effect scenario where the period effect held flat at 2011 level, which implies (very) significant progress by the NHS in averting the long run trend of rising emergency admission rates and which may prove challenging and 2) a trend period effect scenario where the period effect trends upwards at the same rate of growth as between 2007/08 to 2009/10 and 2010/11 to 2012/13.

Figure 8.3: Projected number of emergency admissions by age, constant and trend period effect scenarios



Under the constant period effect scenario the number of emergency admissions, although falling for the working age population, would remain roughly stable for those aged 65 to 85, and increase by 1.7% per year for those aged 86 and over. The number of admissions is projected to rise under this scenario from 2.21 million in 2012/13 to 2.17 million in 2015/16 and 2.25 million in 2020/21 (Figure 8.3). This scenario implicitly assumes that policy measures succeed in stemming the trend rise in older admission rates to the extent that age-specific rates decline in line with the trend cohort effect. Increases still occur amongst the oldest groups due to the rapid proportionate increase in population size. This would mean that continuation of the trend for successive cohorts to need less emergency care would roughly offset the impact of rising numbers of older people, such that the overall number of older emergency admissions would remain broadly constant.

Under the trend period effect scenario the number of emergency admissions would continue to rise for both the working age and the older population, by 3.2% per year for those aged 65 to 85 and by 5.4% per year for those aged 86 and over. The number of admissions is projected to rise under this scenario from 2.21 million in 2012/13 to 2.36 million in 2015/16 and 3.01 million in 2020/21 (Figure 8.3). This scenario implicitly assumes that policy measures do not succeed in stemming persistent rise in period effects and associated trend rise in older admission rates.

8.4. Bed days and length of stay

The scenarios discussed so far have not involved any assumptions about trends in average lengths of stay since they relate to admissions and not bed days. Average lengths of stay have been falling in recent years, as discussed in chapter 3. They might reasonably be assumed to continue to fall, but the rate of fall might reduce over time. It seems unlikely that they could fall indefinitely.

The overall decline in average lengths of stay reflects two factors: faster increases in short hospital stays (0 or 1 day) than in longer stays (2+ days); and reductions in the average lengths of longer stays. Both these seem likely to reflect technological advances and efficiency gains [as discussed in earlier chapters]. The two are closely linked: efficiency gains often flow from use of improved technology, especially if 'technology' is interpreted in a wide sense to include not just new or improved clinical procedures but also improvements in the organisation and management of care.

Our scenarios consider, as a base case, continued reductions in average lengths of stay by age band at the rates achieved over the last five years for which data are available, that is 2007/08 to 2012/13. If we had used trends over the last ten years the impact would have been greater or if we had used trends over the last three years it would have been lower. We also consider a variant in which the reduction in average length of stay for each age group falls linearly over the period from the past trend level in 2012/13 to zero from 2020/21⁸. We argue that these two variants, which we refer to as the trend and the tapered variants respectively, represent the two extremes of what could reasonably be expected.

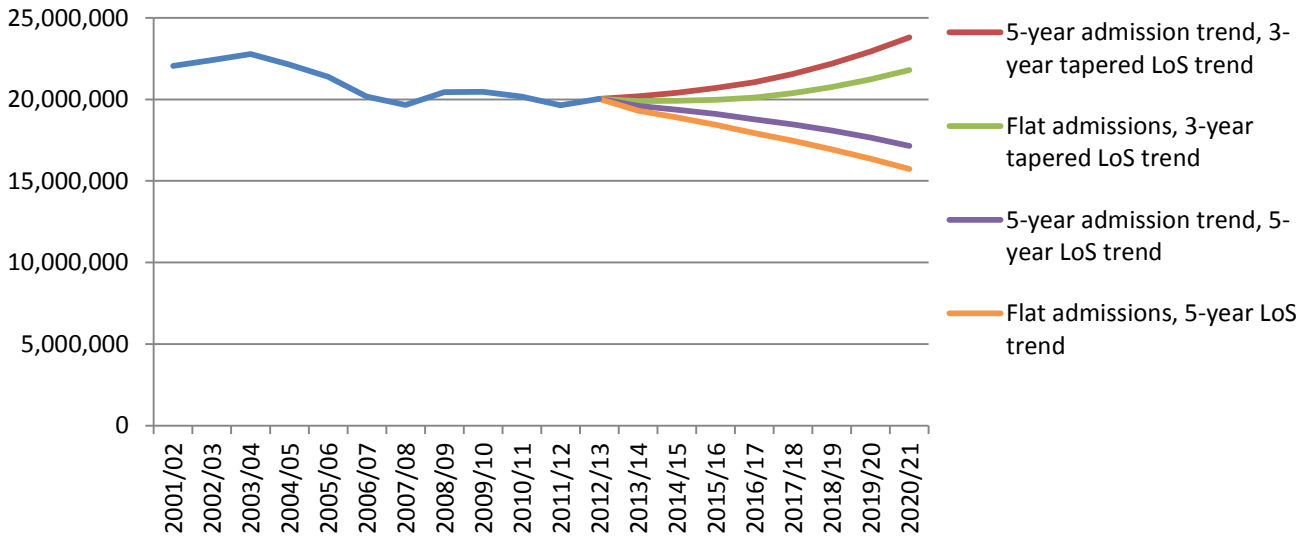
We are not arguing that expenditure will rise or fall in proportion to bed days. The cost of inpatient spells may be front-loaded if patients require more medical and nursing care at the start than at the end of their spell. Moreover, technological advances which reduce average lengths of stay may involve greater intensity of care per inpatient day such that the cost per day rises even if the cost per spell falls. This suggests that the trend in expenditure on older emergency hospital inpatient care is likely to lie between the trend in admissions and the trend in bed days.

Under the assumption of lengths of stay continuing to fall at the rate seen over the past 5 years, i.e. the trend variant, overall emergency hospital bed day use falls regardless of our admission projection scenario. For people aged 65 and over, the number of emergency bed days would fall by 3.0% per annum under constant rates of admission, and 1.9% per annum under the 5-year trend. They would fall from 20.0 million in 2012/13 to 18.5 million in 2015/16 and 15.7 million in 2020/21 under constant rates of admission and to 19.9 million in 2015/16 and 17.2 million in 2020/21 under the 5-year trend (Figure 8.4).

If we taper length of stay reductions, the number of 65 and over emergency bed days increases at a growing rate, averaging 1.1% per annum under constant admission rates and 2.2% per annum under the 5-year trend. They would remain constant at 20.0 million between 2012/13 and 2015/16 and then rise to 21.8 million in 2020/21 under constant rates of admission and rise from 20.0 million in 2012/13 to 20.7 million in 2015/16 and 23.8 million in 2020/21 under the 5-year trend (Figure 8.4).

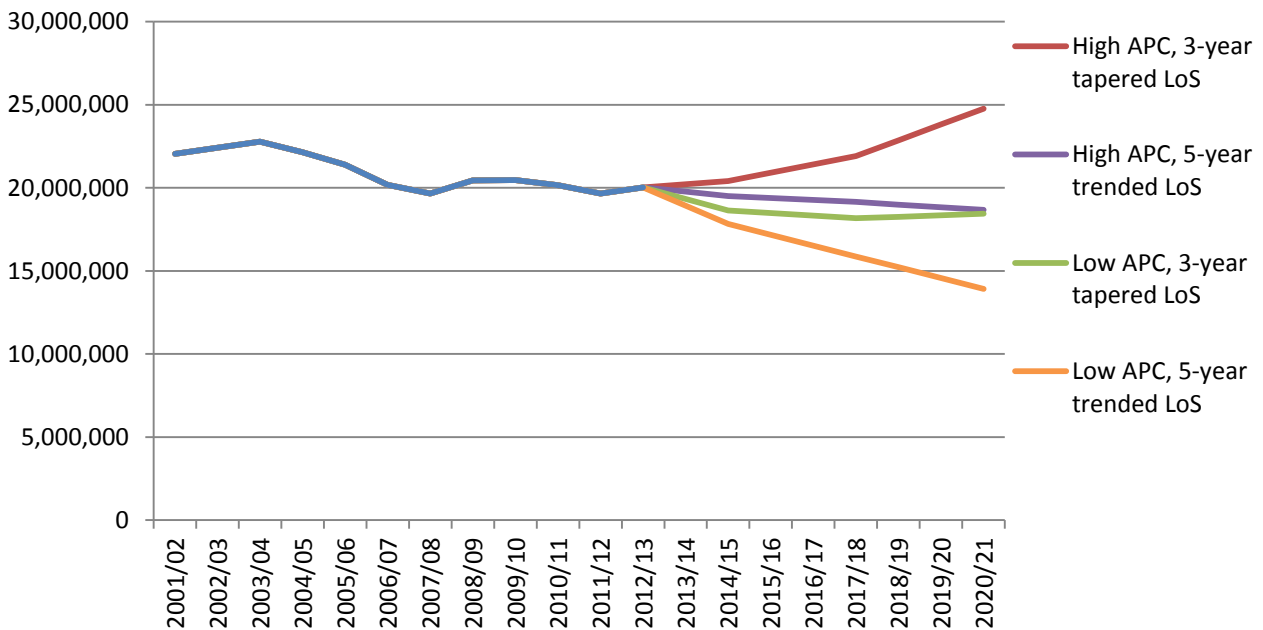
⁸ If for example the annual trend reduction in average length of stay between 2007/08 to 2012/13 for a specific age group was 0.9 days, we assume a reduction in this average to 0.8 days for 2013/14, 0.6 days for 2015/16, 0.4 days for 2017/18 and 0.1 days for 2020/21.

Figure 8.4: Projected number of emergency hospital bed days, people aged 65 and older, by scenario



We have also applied these two variant lengths of stay reductions to each of the constant and trend period effect projections. If lengths of stay continue to fall at the rate seen over the past 5 years, the number of older emergency bed days would fall by 4.4% a year under the constant period effect scenario and 0.9% under the trend period effect scenario. This means that they would fall from 20.0 million in 2012/13 to 17.2 million in 2015/16 and 13.9 million in 2021 under the constant period effect scenario, which produces our lowest projection, or to 19.4 million in 2012/13 and 18.7 million in 2020/21 under the trend period effect scenario (Figure 8.5).

Figure 8.5: Projected number of emergency hospital bed days, people aged 65 and older, by scenario



With tapered reductions in length of stay, bed days would fall by an average of 1% per year under the constant period effect scenario and rise by 2.7% under the trend period effect scenario. This means that they would fall from 20.0 million in 2012/13 to 18.5 million in 2015/16 and 18.4 million in 2021 under the constant period effect scenario or rise to 20.9 million in 2012/13 and 24.8 million in 2020/21, which produces our highest projection, under the trend period effect scenario (Figure 8.5).

8.5. Discussion of scenarios

These scenarios demonstrate the considerable uncertainty surrounding the future path of emergency admissions in England, and the importance of contemporaneous factors in determining them. Since some of these scenarios are substantially more plausible than others, it is possible to present a 'most likely' outturn under different assumptions.

The projection considering only demographic change in numbers of older people shows the conventionally accepted impact of an ageing population, with steady increases in the number of older emergency admissions. While this presents a useful base case, it does not take into account several factors examined in this paper. In particular, it ignores reductions in need for emergency care of successive cohorts at a given age, which are captured in the age period cohort model.

The simple linear projections based on past trends build upon this demographic scenario, but have substantial problems of their own. These atheoretical models may typically be reasonable predictors of short term behaviour, but make no explicit assumptions about changes in causal factors and are unlikely to provide accurate long term predictions. It is possible to view them as representing a continuation in the rate of change of the sum of causal factors over the period in question, but the inability to disentangle these effects makes for an opaque forecasting methodology. We are interested in likely paths of future emergency admissions under various scenarios about trends in drivers of demand and supply, and the real scenarios associated with these linear trends are not clear.

Under the continuation of austerity and associated requirements for efficiency savings, the trend period effect scenario provides a plausible base case for emergency admissions in the absence of further shocks. One of the key findings from the age, period, cohort (APC) analysis is that the impact of declining cohort effect, implying that successive cohort have experienced less need for emergency care at a given age, has been of a similar magnitude to the impact of rising numbers of older people. The balancing of these two opposing trends leaves the fluctuations in emergency admissions largely due to the period effect. Although recent policies appear to have slowed the increase in emergency admissions, the continued increase in period effect reflects the impact, among other things, of technological progress and the associated desirability of hospital treatment. The increase in period effect applied to the coming years under this scenario is still at the lowest rate observed in the modelled period (1998/99 to 2012/13), so it is especially low by historic standards.

This change in period effect does partly capture some of the pre-austerity period due to the 3-year periods used. Growth from 2007/2008 to 2009/2010 means that the average level of expenditure for this period would be lower than for 2010/11 to 2012/2013, even if expenditure had remained entirely flat during the latter period. This means that the 'high' APC scenario will likely give a greater increase than would be expected under austerity. The projection has not been adjusted for this due to the array of factors that are driving the period effect, and the uncertainty around the admission – expenditure relationship.

It is possible for additional, but probably severe, policies aimed at constraining demand for emergency admissions to move us toward the constant period effect outcome. However, to fully hold constant the period effect would require downward pressures capable of counteracting the various factors that have led to a monotonic increase in the period effect over the entire period. Notable amongst these would be a cessation in uptake of cost-raising new technologies that have made emergency hospital treatment more valuable. It is far from clear that this would be a desirable outcome, let alone an achievable one.

NHS England have committed to reducing the number of emergency admissions by 15% by 2020/21 (NHS England 2014) – a target that seems highly challenging in the light of this modelling. All of the scenarios considered resulted in projected growth or at least no decline in emergency admissions by 2020/21. Looked at within the APC framework, this target would require the period effect to be rolled back to the level seen in 2006/07.

In modelling the future number of emergency bed days, lengths of stay have been considered in isolation from trends in the number of emergency admissions. It is unlikely, however, that length of stay changes are exogenous, with shorter lengths of stay freeing up hospital beds and allowing for more admissions, and likewise a greater number of admissions resulting in greater pressure on clinicians to discharge patients more rapidly. When considered in combination with the sustained declines seen in length of stay over the study period, it is plausible to suggest that the recent trend in falling lengths of stay will continue at least in the short term. Under the trend period effect scenario, this results in a 0.9% fall per year in the number of older emergency bed days which is equal to the average rate of reduction seen since 2001/02.

These projections are explicitly presented as possible outcomes under different scenarios, not as forecasts of what will occur. There appears to be a relationship between expenditure and emergency activity, which would cause problems of circularity if these projections are used to inform policies such as the Comprehensive Spending Review. Nevertheless, the APC projections in particular provide a reasonable guide as to what might be expected to occur under different assumptions.

Table 8.1: Projections of older emergency admissions (000s), England, 2012/13 to 2020/21

Scenario	2012/13	2015/16	2020/21
Demographic	2,210	2,370	2,680
3 year trend continued	2,210	2,360	2,680
5 year trend continued	2,210	2,420	2,820
APC low variant	2,210	2,170	2,250
APC high variant	2,210	2,360	3,010

Table 8.2: Projections of older emergency bed days (000s), England, 2012/13 to 2020/21

Scenario		2012/13	2015/16	2020/21
Admissions	Length of stay			
Demographic	Continued trend	20,030	18,450	15,740
Demographic	Tapered	20,030	19,980	21,790
5 year trend continued	Continued trend	20,030	19,110	17,160
5 year trend continued	Tapered	20,030	20,700	23,800
Constant period effect scenario	Continued trend	20,030	17,170	13,920
Constant period effect scenario	Tapered	20,030	18,480	18,440
Trend period effect scenario	Continued trend	20,030	19,380	18,670
Trend period effect scenario	Tapered	20,030	20,910	24,750

9. Conclusions

All developed countries face the problem of the affordability of high quality world class health care, in the face of a combination of ageing populations and continuing technological change in medicine, at a time when their economies are experiencing weak, if any, sustained economic growth. In England, following a period of no real terms growth in NHS budgets, commentators have pointed to increasing numbers of hospital admissions to illustrate the healthcare funding challenge. The aim of this study has been to improve understanding of the increase in emergency hospital admissions of older people in England, 2001/02 to 2012/2013, and thereby to formulate evidence-based scenarios for possible future trends in such admissions.

The number of emergency admissions among older people in England rose by about 3% per year, and admissions per older person by about 2% per year, in the eleven years between 2001/02 and 2012/13. However, in looking forward, it is important to note that within this period there was considerable variation. The increase in admissions per head was higher at the beginning of the period, and fell back after rapid NHS resource growth ended and austerity was imposed from 2010/11. Whilst admissions growth for older people has remained positive for 2010/11 to 2013/14, total emergency admissions were virtually flat for these two years, before increasing in the latter part of 2014. Moreover, despite the rise in annual admissions and an aging population, 2001/02 to 2012/13, total emergency bed days for older people actually declined over the period taken as a whole, and bed days per older person also declined by approximately 2% per year, from 22 million to about 20 million bed days. Robust clinical and managerial leadership, stiffened by the introduction of an activity based tariff, has sharply reduced bed days provided to a larger and older population of people aged 65 and over.

To explore the impact on the path of admissions of both an increasingly old population and a possible diminished tendency of successive age cohorts to receive emergency inpatient hospital care, we developed an age, period, cohort (APC) analysis for 1997/98 to 2012/13. This analysis divides the increase in emergency admissions between factors associated with the patient's age (age effect), factors associated with the patient's year of birth (cohort effect) and factors associated with the year of the patient's admission (period effect). The APC analysis suggests that the upward effect on hospital admissions of the ageing of the population appears to have been almost entirely offset by a favourable downward cohort effect – that is, each cohort from those born in around 1912 onward has experienced lower emergency admission rates after standardising for age and period effects. This could be due to a long-term rise in healthy life expectancy, or improved effectiveness of out of hospital treatments. It suggests that there was little if any net rise in morbidity requiring emergency admissions across the population during the period.

The rise in emergency admissions was almost entirely due to a period effect which increased consistently throughout 2001/02 to 2012/13. This period effect captures that element of the rise in admissions which is due neither to increases in the population nor to changes between birth cohorts in the proportion of people by age experiencing an emergency hospital admission, but rather to sources arising within the years concerned.

Analyses which assume that the probability of emergency hospital admission at a given age has remained constant and which project that population aging will place a large burden on hospital bed capacity without considering a decline over time in the probability of admission at a given age appear to involve an unwarranted assumption. The downward cohort effect shows that in general the probability of emergency admission at a given age has fallen over the years. Among the older population generally this seems consistent with evidence that health care costs are more closely associated with proximity to death than with age from

birth. The position in late old age, at 85 years and over, may be different. There is a high prevalence of multiple chronic conditions among those aged 85 and over; and the emergency admission rate among this group has risen considerably faster than the rate among people aged 65 to 84. This does not however conflict with our general conclusion about a downward cohort effect: people aged 85 and over account for only a minority of the older population.

NHS spending increased by more than 60% in real terms between 2001 and 2009 and then stabilised following the imposition of austerity on the NHS in 2010/11. Much of the spending flowed into hospital emergency services, at least early in the decade, partly because of policies set out in The NHS Plan (2000). The rise in spending enabled a sharp increase in specialist staff and equipment, which in turn enabled more admissions for emergency hospital care. At the same time the improved hospital care was manifest in substantial reductions in average lengths of stay and a rise in the proportion of 'admissions' of emergency patients who did not stay overnight. This was associated with organisational and technological changes on the supply side, such as the advent of acute medical units. The combination of increased resources and shorter lengths of stay allowed hospitals to relax the rationing of access to existing and new emergency technologies, especially for older people.

The reduction in length of stay of emergency patients seems to have been closely associated with the introduction of case-based, 'Payment-by-results' (PbR) which was introduced in a staged fashion across hospitals between 2003/04 and 2009/10. In addition, the imposition of a 30% marginal PbR tariff for 'excess' emergency admissions above the 2008/09 level may have contributed to bringing the overall growth in emergency admissions to a halt after 2010/11. The number of emergency admissions for older people continued to increase whereas those for younger people fell in the two years following 2010/11. However, the admission rates for both groups fell during this period.

We developed scenarios for possible trends in the numbers of emergency admissions of older people to 2019/20. Scenarios based on extrapolating the findings of our APC analysis suggest that a downward cohort effect on admissions will continue to offset an upward age effect, at least until the end of the current decade. The key question for projecting future numbers of emergency admissions of older people is whether the period effect will continue along the lines of recent trends. If the period effect remains constant, on the assumption that it is explained mostly by increased funding and supply capacity, the number of emergency admissions of older people is projected to rise only slightly, from 2.21 million in 2012/13 to 2.25 million in 2020/21. However, if the period effect follows the trend increase since 2007/08, the number of emergency admissions is projected to rise from 2.21 million in 2012/13 to 3.01 million in 2020/21. However, the period 2007/08 to 2012/13, includes two years of substantive real funding growth, and is likely to be an upward biased projection for the years of austerity. Nevertheless, this suggests that to meet the NHS England target of reducing emergency admissions by 15%, and not merely holding them constant, over this period will present considerable policy challenges.

Bed days for emergency admissions of older people would fall until the end of the current decade under both admission scenarios if length of stay were to continue to decline at the rates seen in the last 3 or 5 years. However, bed days would rise under the higher admission scenario if the decline in length of stay were to taper off to zero by 2020/21. Even if bed day numbers do continue to fall, this does not guarantee that expenditure on emergency in-patient care of older people will fall, since the cost per spell has been rising in real terms.

Overall it appears important that current heightened perceptions of the burden of spiralling admissions, resulting from population aging, be re-considered: there are certainly more older people, but at a given age those born relatively more recently have fewer emergency admissions. This phenomenon of reduced emergency need among later-born cohorts turns

out to be of no less importance in driving the number of emergency hospital admissions among older people than the aging of the population. Yet it appears to have escaped attention so far. It is possible that analyses of data for the period from 2013/14 onward will show that the end of real increases in NHS budgets resulted in no further increase in period effects.

We are also sceptical of the view that rising bed occupancy rates, and hospitals under pressure, are primarily due to rising and exceptional demand pressures. The total all-age levels of emergency inpatient admissions changed little between 2010/11 and 2012/13, and the total numbers of emergency bed days continued to fall. Bed numbers, however, fell by about 4% between 2010/11 and 2012/13. The increasing problem of hospitals under pressure, as measured by occupancy rates, appears to be less one of demand than one of falling bed supply. This concern with the supply side may extend from bed capacity in certain areas to the provision of appropriate numbers of emergency care specialists. This is not to say that individual hospitals may not be experiencing surges in demand, for example, where neighbouring hospitals have reduced capacity, and in parts of London, but to stress that nationally there has not been a rise, let alone a surge, in total numbers of emergency hospital bed days over the period 2010/11 to 2012/13.

There are two other findings reported above which, potentially, represent 'good news' in relation to maintaining the affordability of the NHS in the face of an ageing population and continuing technological change. First, under PbR incentives, hospitals appear to have considerably improved their efficiency by reducing average lengths of stay and hence overall bed days for emergency care despite a strong rise in numbers of emergency admissions. Secondly, it appears to have been possible to use a marginal tariff rate under PbR, substantially below average cost per treatment, to discourage the growth of emergency admissions from 2011 to 2013, although there is a lack of evidence on the consequences of this measure for patients' health.

Finally, the much higher growth, for all age groups, of emergency admissions in London than elsewhere deserves investigation. An understanding of why the increase in London has been so much more rapid than the more limited pace of increase in the rest of England could provide helpful information to inform the development of policy and practice and ensure that London's exceptional experience does not introduce a bias to national policy making.

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