

Is secondary preventive care improving? Observational study of 10-year trends in emergency admissions for conditions amenable to ambulatory care

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ABSTRACT

Objective: To identify trends in emergency admissions for patients with clinical conditions classed as ‘ambulatory care sensitive’ (ACS) and assess if reductions might be due to improvements in preventive care.

Design: Observational study of routinely collected hospital admission data from March 2001 to April 2011. Admission rates were calculated at the population level using national population estimates for area of residence.

Participants: All emergency admissions to National Health Service (NHS) hospitals in England from April 2001 to March 2011 for people residents in England.

Main outcome measures: Age-standardised emergency admissions rates for each of 27 specific ACS conditions (ICD-10 codes recorded as primary or secondary diagnoses).

Results: Between April 2001 and March 2011 the number of admissions for ACS conditions increased by 40%. When ACS conditions were defined solely on primary diagnosis, the increase was less at 35% and similar to the increase in emergency admissions for non-ACS conditions. Age-standardised rates of emergency admission for ACS conditions had increased by 25%, and there were notable variations by age group and by individual condition. Overall, the greatest increases were for urinary tract infection, pyelonephritis, pneumonia, gastroenteritis and chronic obstructive pulmonary disease. There were significant reductions in emergency admission rates for angina, perforated ulcers and pelvic inflammatory diseases but the scale of these successes was relatively small.

Conclusions: Increases in rates of emergency admissions suggest that efforts to improve the preventive management of certain clinical conditions have failed to reduce the demand for emergency care. Tackling the demand for hospital care needs more radical approaches than those adopted hitherto if reductions in emergency admission rates for ACS conditions overall are to be seen as a positive outcome of for NHS.

INTRODUCTION

Internationally, many health systems are facing the challenge of rising prevalence of

ARTICLE SUMMARY

Article focus

- Unplanned hospital admissions for ambulatory care sensitive (ACS) conditions are an established marker of quality and access to primary care.
- Many policy initiatives have been targeted at reducing ACS admissions, particularly those for long-term conditions, yet little is known about the cumulative impact of these initiatives over time.
- The study presents trends in admissions for a range of ACS conditions in England over 10 years.

Key messages

- Trends are mixed by condition—some fell over time, many more rose.
- Increases in rates of emergency admissions suggest that efforts to improve the preventive management of certain clinical conditions have failed to reduce the demand for emergency care.

Strengths and limitations of this study

- The main strengths of this study are that it analysed every admission to a National Health Service hospital in England over a period of 10 years—nearly 140 million admissions.
- It applied a systematic framework to identify an ACS admission.
- Potential limitations are the assumption that emergency admissions for ACS conditions are a reasonable indicator of the performance of ambulatory care (it may also be linked to availability and quality of social care).
- Any study of changes over time is susceptible to artefacts caused by the way information is collected or recorded.

chronic health problems and increasing numbers of frail older people needing care. Many countries are actively developing strategies of preventive care for affected population groups¹ to improve health and reduce avoidable costs particularly of hospital care.

The UK has been no exception and over the past decade there have been a plethora of policy initiatives. For example, national

guidance was been developed on best practice for the treatment of common chronic conditions² and financial incentives have helped to boost chronic disease management in primary care.³ Risk stratification has been encouraged^{4 5 6} to identify which individuals may be at high risk of emergency admission in future. A growing range of preventive initiatives have been designed to reduce that risk, including case management by community matrons,⁷ telephone coaching, telehealth, virtual wards⁸ or integrated care.⁹ At the same time there have been a range of developments in primary care with the increasing numbers of general physicians (GPs) practising with enhanced clinical skills in specific specialities (GPs with special interests) and changes in the arrangements for out-of-hours primary care.¹⁰

Some of these individual initiatives have been, and are being, evaluated. But there has been less work measuring the impact of the combination of these mostly community-based initiatives over time. One relatively simple approach is to use admissions for 'ambulatory care sensitive' (ACS) conditions—defined in the early 1990s¹¹—as an overall indicator. ACS conditions are defined as clinical conditions for which the risk of emergency hospital admission can be reduced by timely and effective ambulatory care.¹² Ambulatory care here mainly means primary care, community services and outpatient care. Higher rates of emergency admission could indicate suboptimal ambulatory care because the health of the individual had deteriorated to the extent that hospitalisation was necessary.

This approach has been developed and tested in a number of studies internationally including the UK.^{13 14 15 16} Perhaps unsurprisingly, strong relationships have been observed between ACS admissions and levels of deprivation^{16 17 18} or ethnicity.^{19 20} Recent analysis in England suggests that better management of ambulatory care could achieve savings of over £1.42 billion.²¹ Analyses of admissions for ACS conditions are currently being made available by commercial information vendors as a tool to improve local commissioning.²² Most recently, ACS conditions have been proposed as part of a national outcomes Framework for the National Health Service (NHS) in England²³ which will be used by government to ensure the delivery of strategic goals for the service.

To date there has been little work in the UK examining trends in admissions for ACS conditions over time. This is important to do because new preventive care initiatives in the NHS are often grafted onto a range of old ones and develop over time, and evaluations of individual initiatives may not be long enough or take an account of synergies between different policies and initiatives. Given all the combined national and local policies outlined above designed to reduce avoidable ill health, plus other initiatives, what has been the overall impact over the last decade?

One huge benefit of having a single payer of health-care in the UK—the NHS—with universal coverage of the population and comprehensive cover of healthcare

is that several years of inpatient data are available for the whole population that can be used in time series analyses to answer this broad question.²⁴ This study examines the pattern of admissions across England for people with ACS conditions over a decade.

METHODS

The analysis was based on anonymised person-level records extracted from national hospital episode statistics for the period April 2001–March 2011. These records captured episodes of care for all NHS hospitals in England, totalling more than 150 million finished consultant episodes (FCEs) across the 10 years. Data were supplied by the Information Centre for Health and Social Care.²⁵ Records from residents of Wales and Scotland were excluded, as were records with invalid age or sex fields.

This study focused on the first finished consultant episode (FCE) in each hospital spell (defined where field EPIORDER=1) for emergency inpatient admissions (ADMIMETH between 21 and 29). By taking only the first episodes of spells we aimed to focus on the reason for admission, rather than a condition that developed later in the spell.

There have been a number of different definitions used for ACS conditions (summarised in table 1). This analysis used a set identified by Victoria State Health Department,²⁹ which was also the basis of common NHS subset of ACS conditions identified by Purdy.³¹ In addition, we included a condition based on tuberculosis that had been part of the original set by Billings (Billings J, *fv* personal communication, 2010) (detailed definitions are in appendix). The 27 ACS clinical conditions were split into three groups: acute; chronic; and 'vaccine preventable' categories as described by Billings¹¹ and Ansari.³²

Emergency admissions were linked to a specific ACS condition on the basis of primary diagnosis for most categories. In addition, four categories were also defined in terms of codes present as secondary diagnoses—these were 'gangrene', 'diabetes complications', 'pneumonia' and 'other vaccine preventable conditions'.

Age-specific admission rates were calculated for England using national population estimates³³ for the relevant year and aggregated across ages using the European Standard Population.³⁴ This was to allow the rate of admission to be compared over time despite changing age structure of the population. Trends over time were analysed using the slope derived from a linear regression on quarterly observations.

As well as identifying emergency admissions for ACS conditions, we also identified emergency admissions for appendicitis (ICD-10 codes K35-K37)—a condition where admission rates are generally constant at a population level and relatively insensitive to the quality of ambulatory care. This category provided a check on whether trends could be linked with changes in the changes in the accuracy and completeness of diagnostic coding and recording.

Table 1 Ambulatory care sensitive (ACS) conditions as defined by various key works and the NHS outcomes framework 2012/2013

	Weissman <i>et al</i> 1992 ²⁶	Billings <i>et al</i> 1993 ¹¹	Bindman <i>et al</i> 1995 ²⁷	Sanderson <i>et al</i> 2000 ¹²	AHRQ <i>et al</i> 2001 ¹⁵	De Lia <i>et al</i> 2003 ²⁸	Victoria <i>et al</i> 2004 ²⁹	Caminal <i>et al</i> 2004 ¹³	Bindman <i>et al</i> 2005 ¹⁴	Dr Foster <i>et al</i> 2006 ²²	Ling <i>et al</i> 2010 ³⁰	NHS outcomes framework 2012/2013 (chronic) ²³	NHS outcomes framework 2012/2013 (acute) ²³
Asthma	•	•	•	•	•	•	•	•	•	•	•	•	
Hypertension	•	•	•		•	•	•	•	•	•	•	•	
Chronic obstructive pulmonary disease		•	•		•	•	•	•	•	•	•	•	
Congestive heart failure	•	•	•		•	•	•	•	•	•	•	•	
Diabetes	•	•	•	•		•		•	•			•	
Diabetes complications		•		•	•	•		•	•	•		•	
Convulsions and epilepsy		•		•		•	•	•	•	•	•	•	•
Ear, nose and throat infections							•			•	•		•
Severe ENT infections		•				•			•				•
Tuberculosis		•				•		•	•		•		
Immunisation preventable conditions	•	•				•	•	•	•	•	•	•	•
Pneumonia	•	•			•	•	•	•	•	•	•		•
Influenza													•
Congenital syphilis		•				•		•	•				•
Angina		•			•	•	•		•	•	•	•	
Cellulitis	•	•		•		•	•	•	•	•	•		•
Kidney/urinary infection		•			•	•		•	•		•		•
Pyelonephritis	•					•			•	•			•
Gastroenteritis		•				•	•	•	•	•	•		•
Dehydration		•			•	•			•				•
Iron deficiency anemia		•		•		•	•	•	•	•	•	•	
Nutritional deficiency		•				•	•		•	•	•		
		•				•	•	•	•	•	•		

Continued

Table 1 Continued

	Weissman <i>et al</i> 1992 ²⁶	Billings <i>et al</i> 1993 ¹¹	Bindman <i>et al</i> 1995 ²⁷	Sanderson <i>et al</i> 2000 ¹²	AHRQ <i>et al</i> 2001 ¹⁵	De Lia <i>et al</i> 2003 ²⁸	Victoria <i>et al</i> 2004 ²⁹	Caminal <i>et al</i> 2004 ¹³	Bindman <i>et al</i> 2005 ¹⁴	Dr Foster <i>et al</i> 2006 ²²	Ling <i>et al</i> 2010 ³⁰	NHS outcomes framework 2012/2013 (chronic) ²³	NHS outcomes framework 2012/2013 (acute) ²³
Pelvic inflammatory disease													
Dental Conditions		•				•	•		•	•			•
Appendicitis with complication	•				•			•	•		•		
Perforated or bleeding ulcer	•			•			•	•		•	•		•
Hypokalaemia	•										•		
Gangrene	•						•			•	•		
Constipation				•							•		
Dyspepsia and other stomach function disorders				•							•		•
Dementia											•	•	
Atrial fibrillation and flutter											•	•	

Conditions only included in one study: Roland 2010 (alcohol-related disease; Fractured proximal femur; Migraine/acute headache; Peripheral vascular disease); SandersonDixon 2000 (dysplasia, mucous polyp, erosion of cervix; Fracture of radius and ulna (lower, closed); In growing toenail; Lower limb ulcer except for decubitus; Sebaceous cyst; Viral infection unsec); Caminal 2004 (disorders of hydro-electrolyte metabolism) and AHRQ 2000 (low birth weight).

The costs of emergency admissions for ACS conditions to commissioners were estimated for the year 2010/2011 from HES data using Payment by Results (PbR) tariffs.³⁵ Activity not covered by the national tariffs was costed using the national reference costs (NRC)³⁶ and adjusted to ensure they were directly comparable with 2010/2011 tariffs. If neither tariff nor NRC were available, the activity was costed as the average tariff for the specialty under which it was delivered, using a method developed for a national study of resource allocation.^{37 38}

RESULTS

In total, 138 million admissions to hospital were recorded as taking place in England between 1 April 2001 and 31 March 2011, of which 46 million were classified as emergency admissions. Less than 2% of emergency admissions (794 369) were excluded due to invalid age or gender codes, or were for people resident outside England. Of the remaining valid emergency admissions, 8.3 million (18.5%) were recorded as falling within 1 of the 27 conditions defined as ACS. The estimated cost to commissioners for these admissions in 2010/2011 was £1.9 billion. The mean age of patients admitted as an emergency with an ACS condition was 53 years and 49% were male.

Between April 2001 and March 2011 the number of emergency admissions per year for ACS conditions increased by 40% rising from 701 995 to 982 482—an increase of 280 487 admissions per year (figure 1). However, throughout this period ACS conditions remained largely constant as a proportion of all emergency admission (range from 18.2% to 19.1%). Over the

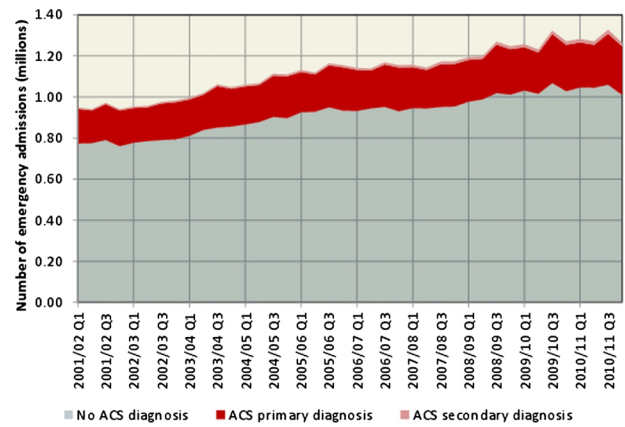


Figure 1 Number of emergency admissions by quarter 2001–2011.

same time period, emergency admissions for all other (ie, non-ACS) conditions increased by a similar 34%.

Further analysis revealed that there was a threefold growth in the four ACS conditions defined by their secondary diagnoses and that this accounted for most of the additional growth in ACS over non-ACS admissions (ie, 40% vs 34%). This appears to be part of a general trend for more complete recording of diagnoses and comorbidities in hospital data during this decade.³⁹ ACS emergency admissions defined by primary diagnosis increased by 35% between 2001/2002 and 2010/2011.

Emergency admissions for ACS conditions were more common among the oldest and youngest age groups (table 2) with children under 1 year and adults over 70 more than twice as likely to receive an emergency admission for an ACS condition as the general population. Likewise, the change in rates of ACS emergency

Table 2 Numbers and rates of emergency admissions in 2001/2002 and 2010/2011 by age band

Age band (years)	2001/2002		2010/2011		Change from 2001/2002 Change in rate per 100k—number (%)
	Observed number	Rate per 100k	Observed number	Rate per 100k	
0	31 739	5693	37 620	5570	-123 (-2.2)
01–04	74 701	3157	84 751	3270	113 (3.6)
05–09	24 381	781	29 214	1006	225 (28.8)
10–14	15 657	484	18 151	609	125 (25.9)
15–19	16 210	532	25 071	768	235 (44.2)
20–24	15 614	523	28 012	777	254 (48.6)
25–29	15 449	465	25 202	702	237 (50.9)
30–34	18 012	468	23 064	698	230 (49.2)
35–39	19 200	490	25 948	728	238 (48.6)
40–44	19 258	552	31 690	811	259 (47)
45–49	21 560	689	37 133	972	283 (41.1)
50–54	27 900	829	39 374	1190	361 (43.6)
55–59	32 748	1156	43 943	1479	323 (28)
60–64	40 535	1692	59 379	1891	199 (11.7)
65–69	50 921	2357	64 500	2649	292 (12.4)
70–74	64 906	3324	79 262	3862	539 (16.2)
75–79	73 833	4489	91 085	5460	970 (21.6)
80–84	64 710	5783	98 352	7848	2065 (35.7)
85+	74 661	7787	140 731	11 749	3962 (50.9)

admissions was not uniform across age bands. Under age 5 the rates of ACS emergency admissions changed much less than in other age groups over the decade. For the remaining age bands the rate of increase was lowest in ages from 60 to 79, rising by between 10% and 20%. Many age bands (including age 85+) increased by over 40%.

When the age-standardised rates of emergency admissions for ACS conditions were compared, the overall increase between 2001/2002 and 2010/2011 was 25% (when considering primary diagnoses only the age-standardised increase was 21%) indicating that some, but not all, of the change in crude admission rates could have to be due to the changing demographic structure of the population. On the basis of the change in age-standardised admission rate, we estimate the increase in ACS admissions above 2001/2002 levels would cost an additional £477 million per year in 2010/2011.

The change in age-standardised rates of emergency admissions varied between the three broad categories of ACS conditions (acute, chronic and vaccine preventable) as shown in figure 2. For comparison rates of admissions for the ACS-insensitive marker condition (acute appendicitis) are also shown. All the ACS rates show strong seasonal variations in year that are associated with higher admission in the winter months. Figure 2 shows that emergency admission rates for the acute group of ACS conditions increased by 44% over the decade ($p < 0.0001$ based on quarterly trends) while rates for vaccine preventable ACS conditions increased by 136% ($p < 0.0001$), although from a much lower baseline. In contrast, the rate of admissions for chronic ACS conditions decreased by 2%, but this was not statistically significant ($p = 0.5091$). Admission rates for ACS-insensitive conditions showed a small but steady increase of 13% over the decade ($p < 0.0001$). While the HES data do not distinguish between appendicitis and suspected appendicitis, they do record that 90% of appendicitis admissions had their appendixes removed. This proportion did not change notably over time (92% in 2001/2002 vs 89% in 2010/2011).

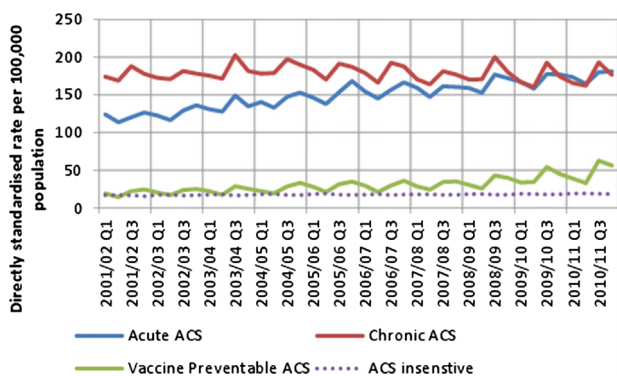


Figure 2 Directly standardised rate of ambulatory care sensitive (ACS)-related emergency admissions in England 2001–2011 by quarter (with one ACS-insensitive marker condition).

Table 3 summarises changes in emergency admissions for individual ACS conditions. The total number of admissions and the directly age-standardised rate per 100 000 population in 2001/2002 and 2010/2011 are shown, as well as the percentage change in the standardised rate, statistical significance of the quarterly rate trend and absolute change in the number of admissions between the 2 years. The trend in rates over time was significantly different from zero in all but three conditions.

There were increased rates of admissions for the majority of the acute ACS conditions. The most extreme were for urinary tract infections (UTIs)/pyelonephritis and gastroenteritis groups, for which the age-standardised rates increased by 102% and 43%, respectively. These changes equated to an additional 113 387 observed admissions in 2010/2011, at an extra cost in that year of £369 million. Admissions for ENT infections and cellulitis had somewhat lower increases of 22% and 29%, but their high volumes meant that they contributed 40 889 extra-admissions.

In contrast, there were significant falls in the rates of admission for perforated/bleeding ulcer (−36%, $p < 0.001$) and pelvic inflammatory disease (−12%, $p < 0.001$). Gangrene as a primary diagnosis also fell (−19%), although gangrene as a secondary diagnosis increased significantly (+154%). These reductions were far less in scale than the increases of other acute conditions, representing just 3080 fewer admissions per year in 2010/2011 than in 2001/2002.

The trends for the chronic group of ACS conditions were more varied. The two conditions with the highest rise in the absolute numbers of admissions were chronic obstructive pulmonary disease (COPD), and convulsions and epilepsy but the rise in age-standardised rates of admission for these conditions was modest and not statistically significant for COPD ($p = 0.246$). The number of admissions for diabetes as a secondary diagnosis grew by 95% and contributed an extra 16 996 admissions with a large and significant rise in age-standardised rates.

The rates of admissions for congestive heart failure and angina showed marked and significant reductions (−41% and −27%). Rates of admissions for asthma—another high-volume condition—remained largely unchanged.

The group of vaccine-preventable conditions showed relatively large increases in admission rates, but still accounted for only about one-eighth of the volume of all ACS admissions in 2010/2011. Of these, 90% were for pneumonia, the rate of which increased by 118% (primary diagnosis) and 208% (secondary) since 2001/2002 resulting in an extra 76 232 admissions. Admissions for pneumonia as a primary diagnosis cost £235 million in 2010/2011. Large increases in influenza (as primary or secondary diagnosis) appeared only from 2009/2010 onwards, and may be linked with the bird-flu pandemic.

DISCUSSION

This analysis has shown that across England there was a 35% increase in the number of emergency admissions

Table 3 Numbers and rates of emergency admissions in 2001/2002 and 2010/2011 by condition

	2001/2002		2010/2011		Estimated cost (£ million)	Change over time		
	Observed number	Directly standardised rate per 100k	Observed number	Directly standardised rate per 100k		Percentage of change DSR	Qrtly trend p value*	Absolute annual change
Acute ACS conditions								
Cellulitis	44 048	77.8	62 305	100.0	118	29	0.005	+18257
Dehydration	5713	8.0	10 676	13.3	26	66	<0.001	+4963
Dental conditions	5287	11.3	10 132	20.0	14	77	<0.001	+4845
Ear, nose and throat infections	66 107	168.5	88 739	205.2	61	22	0.025	+22632
Gangrene (primary diagnosis)	1665	2.6	1472	2.1	7	-19	<0.001	-193
Gangrene (secondary diagnosis)	2321	3.5	6384	8.9		154	<0.001	+4063
Gastroenteritis	43 181	89.1	73 066	127.4	109	43	<0.001	+29885
Nutritional deficiencies	79	0.2	204	0.4	0.5	100	<0.001	+125
Pelvic inflammatory disease	4839	10.1	4561	8.9	8	-12	<0.001	-278
Perforated/bleeding ulcer	7773	12.0	5164	7.7	17	-36	<0.001	-2609
UTI/Pyelonephritis	61 630	101.3	145 132	204.8	316	102	<0.001	+83502
Chronic ACS conditions								
Angina	91 867	149.8	61 125	87.8	97	-41	<0.001	-30742
Asthma	57 234	125.5	61 151	124.9	58	0	0.762	+3917
Chronic obstructive pulmonary disease	94 035	142.8	117 248	161.3	271	13	0.246	+23213
Congestive heart failure	65 038	85.2	54 728	61.9	154	-27	<0.001	-10310
Convulsions and epilepsy	59 936	128.5	77 165	148.2	91	15	<0.001	+17229
Diabetes complications (primary diagnosis)	17 711	33.2	22 608	40.9	52	23	<0.001	+4897
Diabetes complications (secondary diagnosis)	14 089	23.8	31 085	46.5		95	<0.001	+16996
Hypertension	4970	8.5	6320	10.1	6	19	<0.001	+1350
Iron deficiency anaemia	7543	11.0	11 425	15.5	21	41	<0.001	+3882
Vaccine preventable ACS conditions								
Influenza (primary diagnosis)	679	1.4	7422	14.7	13	950	0.002	+6743
Influenza (secondary diagnosis)	203	0.4	1306	2.6		550	0.002	+1103

Continued

Table 3 Continued

	2001/2002		2010/2011		Change over time			
	Observed number	Directly standardised rate per 100k	Observed number	Directly standardised rate per 100k	Estimated cost (£ million)	Percentage of change DSR	Qtrly trend p value*	Absolute annual change
Other vaccine preventable (primary diagnosis)	1363	3.5	884	1.9	1	-46	0.103	-479
Other vaccine preventable (secondary diagnosis)	938	1.9	2278	4.2		121	<0.001	+1340
Pneumonia (primary diagnosis)	33 994	58.6	90 252	127.6	235	118	<0.001	+56258
Pneumonia (secondary diagnosis)	8071	12.1	28 045	37.3		208	<0.001	+19974
Tuberculosis	1681	3.2	1605	3.0	6	-6	0.005	-76
ACS insensitive	31 896	67.2	37 667	76.1	1	13	<0.001	+5771

*p Value is on quarterly trend in DSR being significantly different from zero. ACS, ambulatory care sensitive.

for 27 ACS conditions over a 10-year period—similar in magnitude to that seen for emergency admissions for all other (ie, non-ACS) conditions.

Most of the increase in age-standardised rates of admission occurred for the group of ‘acute’ ACS conditions (particularly urinary tract infections and gastroenteritis) and ‘vaccine preventable’ ACS conditions in particular pneumonia. For some specific conditions there were reductions in numbers and rates of emergency admissions, for example, for perforated/bleeding ulcer and pelvic inflammatory disease (-12%, p<0.001). These reductions were far less in scale than the increases of other acute conditions, representing just 3080 fewer admissions per year in 2010/2011 than in 2001/2002.

There were some clear differences in trends between ACS conditions. The reductions in rates of emergency admissions for angina and CHF could be linked with reductions in the prevalence of ischaemic heart disease⁴⁰ which are in part due to changes in health-related behaviours and availability of effective preventive treatment, for example statins. This trend in admission rates has been identified in other countries.⁴¹

The significant reduction in admissions for perforated/bleeding ulcers may be due to the use of antibacterials and proton pump inhibitors in the preceding 20 years. Admissions for pelvic inflammatory disease have also fallen which is consistent with evidence of a falling prevalence of PID observed in GP records.⁴² The increase in admissions linked with complications of diabetes could in part be explained by increases in the prevalence of diabetes.⁴³

The rise the number and rate of emergency admissions for pyelonephritis and urinary tract infection could be attributed to a number of factors. Diagnosis of symptomatic infection in older people is difficult⁴⁴ and can be complicated by the presence of asymptomatic bacteriuria and non-specific symptoms. A rise in admissions for pneumonia in the older age groups has been observed internationally from at least the 1980s⁴⁵ while nationally GP consultations for pneumonia and pneumonitis have been falling.⁴⁶

For a range of chronic conditions, the position is ambiguous—taking into account changes in the age of the population leaves increases in rates of emergency admissions of 0% for asthma and 13% for COPD. These chronic respiratory conditions have been the particular focus for a range of national policy initiatives.

Potential limitations

This analysis is based on assumption that emergency admissions for ACS conditions are a reasonable indicator of the performance of ambulatory care. It could in fact be that, for frail elderly people this indicator also reflects the availability and quality of social care.

Any study of changes over time is susceptible to artefacts caused by the way information is collected or recorded. In this case the accuracy and completeness of hospital data has probably improved during this period

especially since the introduction of case mix-based systems of reimbursement such as payment by results.⁴⁷ The fact that ACS conditions recorded as secondary diagnoses in an admission increased more than those in primary suggests a shift in data recording during this time.

Policy implications

Using ACS indicators as an outcome measure in the Commissioning Outcomes Framework²³ will be challenging for the NHS. There are clearly some aspects of measurement that will need to be considered in their presentation and interpretation (such as seasonal effects, the strong correlations with deprivation and the change in frequency of diagnostic recording). The behaviour of any metric based on ACS admissions will also be sensitive to the range of conditions included and their definition. These problems are not insurmountable.

There a range of differing explanations behind the observed increases in ACS admissions. For some ACS conditions changes could be due to differences in the underlying prevalence of disease; changes in health-related behaviours such as smoking or improvements in the effectiveness of treatments for acquired diseases for example, statins for angina.

In addition, there are possible explanations due to changes in the way health systems operate such as the admission threshold—is it that patients admitted now are less sick than they were 10 years ago or that decisions are risk averse and require admissions? The most significant increases in ACS conditions appear to be linked with short-term treatment of an acute problem in older people. It is quite probable that the increases are due to changing thresholds for admission rather than the severity of the problems of the presenting patient. Any changes in emergency admissions for ACS conditions have to be considered against the backdrop of increases associated with short stay emergency admissions and will form part of the general pattern of rising emergency admission.⁴⁸ It may be that admission decisions are in part influenced by the perceived lack of alternatives to inpatient care, or the introduction of new forms of care to the inpatient setting.

The decade under observation saw record growth in NHS funding and a large range of initiatives to improve care. These include for example changes in the funding of secondary care through payment by results, the reorganisation of primary care in PCTs, the implementation of funding incentives in primary care and major changes to out-of-hours care.⁴⁹ However, on this basis our results suggest that these changes have not meant improved care to the extent of reducing overall rates of avoidable admissions, although there has been some success for specific ACS conditions. Perhaps most significant though is that fact that some of the more common ACS conditions show trends that closely mirror the rise in rates of emergency admission for non-ACS conditions. This suggests that those factors linked with the

organisation and financing of the health system itself are perhaps more important determinants than just the changing health needs of the population over the decade.

While many policy initiatives have been proposed as driving the increase in admissions, evidence connecting the trend to specific policies is weak.⁴⁸ For example the introduction of the 4-hour A&E target and changes to the GP out-of-hours contract (both in 2004) are commonly cited as increasing the overall level of emergency admissions, yet [figure 1](#) suggests that emergency admissions continued an established increasing trend at this point, with no obvious deviation in ACS or non-ACS admissions.

Although there is much interest in how health services can safely reduce avoidable demand for hospital care, the evidence on the effectiveness of this is not always convincing.⁵⁰ The trends reported in this paper clearly point to the need for much harder thinking, in particular how a combination of national and local policies are impacting on the need for admission for patients, either because of suboptimal preventive ambulatory care, or reducing the threshold for admission to hospital. The government is beginning to encourage integrated care⁹ as one solution, although the size of this challenge should not be underestimated.⁵¹ Similarly, the availability and quality of social care for frail older patients will be crucial to help maintain independent living and reduce the need for admission—there are some hard policy choices here too and it remains to be seen whether the forthcoming White Paper on social care will address them.

Contributors All authors were involved in the study design, analysis and interpretation of data and the writing of the article. MB and JD conceived the idea of the study, and MB was the lead writer. IB was the lead data analyst, and produced the tables and figures. SD assisted data analysis and reviewed the condition-specific literature. MB will act as guarantor for the work. The guarantor accepts full responsibility for the conduct of the study, had access to the data and controlled the decision to publish (<http://bmj.com/cgi/content/full/323/7313/588>).

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APPENDIX: DEFINITION OF AMBULATORY CARE SENSITIVE (ACS) CONDITIONS

Condition	ICD-10 codes	Deviation from Victoria	Deviation from Purdy (tab3, common)
Acute ACS conditions			
Cellulitis	L03, L04, L08, L88, L980, L983 Principal diagnosis only	None	Added L089, L983 from Victorian
Dehydration	E86 Principal diagnosis only	Split from gastro	Split from gastro
Dental conditions	A690, K02-K06, K08, K098, K099, K12, K13 Principal diagnosis only	Addition of A690 (necrotising ulcerative stomatitis)	None
Ear, nose and throat infections	H66, H67, J02, J03, J06, J312 Principal diagnosis only	None	None
Gangrene	R02 Any diagnosis	None	None
Gastroenteritis	K522, K528, K529 Principal diagnosis only	Split from dehydration	Split from dehydration
Nutritional deficiencies	E40-E43, E55, E643 Principal diagnosis only	None	None
Pelvic inflammatory disease	N70, N73, N74 Principal diagnosis only	None	None
Perforated/bleeding ulcer	K250-K252, K254-K256, K260-K262, K264-K266, K270-K272, K274-K276, K280-K282, K284-K286 Principal diagnosis only	None	None
Urinary tract infection /Pyelonephritis	N10, N11, N12, N136, N390 Principal diagnosis only	None > name change	Added N390 from Victorian
Chronic ACS conditions			
Angina	I20, I240, I248, I249 Principal diagnosis only	None	None
Asthma	J45, J46 Principal diagnosis only	None	None
Chronic obstructive pulmonary disease	J20, J41-J44, J47 Principal diagnosis only, J20 only with diag2 of J41 J42 J43 J44 J47	None	None
Congestive heart failure	I110, I50, J81 Principal diagnosis only	None	None
Convulsions and epilepsy	G40, G41, O15, R56 Principal diagnosis only	None	None
Diabetes complications	E100-E108, E110-E118, E120-E128, E130-E138, E140-E148 In any diagnosis field	None	None
Hypertension	I10, I119 Principal diagnosis only	None	None
Iron deficiency anaemia	D501, D508, D509 Principal diagnosis only	None	None
Vaccine preventable ACS conditions			
Influenza	J10, J11 In any diagnosis field, excludes cases with secondary diagnosis of D57, and people under 2 months	Split from pneumonia	Split from pneumonia
Pneumonia	J13, J14, J153, J154, J157, J159, J168, J181, J188 In any diagnosis field, excludes cases with secondary diagnosis of D57, and people under 2 months	Split from influenza	Split from influenza

Continued

Continued

Condition	ICD-10 codes	Deviation from Victoria	Deviation from Purdy (tab3, common)
Tuberculosis	A15, A16, A19 Principal diagnosis only	Added	Added
Other vaccine preventable	A35-A37, A80, B05, B06, B161, B169, B180, B181, B26, G000, M014 In any diagnosis field	None	None

Other vaccine preventable conditions: A35 other tetanus; A36 diphtheria; A37 whooping cough; A80 acute poliomyelitis; B05 measles; B06 rubella (German measles); B16.1 acute hepatitis B with δ -agent (co-infection) without hepat coma; B16.9 acute hepatitis B without δ -agent and without hepat coma; B18.0 chronic viral hepatitis B with δ -agent; B18.1 chronic viral hepatitis B without δ -agent; B26 mumps; G00.0 haemophilus meningitis; M01.4 direct infections joint in infectious and parasitic dis EC.