

Impact of UK Primary Care Policy Reforms on Short-Stay Unplanned Hospital Admissions for Children With Primary Care–Sensitive Conditions

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ABSTRACT

PURPOSE We aimed to assess the impact of UK primary care policy reforms implemented in April 2004 on potentially avoidable unplanned short-stay hospital admissions for children with primary care–sensitive conditions.

METHODS We conducted an interrupted time series analysis of hospital admissions for all children aged younger than 15 years in England between April 2000 and March 2012 using data from National Health Service public hospitals in England. The main outcomes were annual short-stay (<2-day) unplanned hospital admission rates for primary care–sensitive infectious and chronic conditions.

RESULTS There were 7.8 million unplanned admissions over the study period. More than one-half (4,144,729 of 7,831,633) were short-stay admissions for potentially avoidable infectious and chronic conditions. The primary care policy reforms of April 2004 were associated with an 8% increase in short-stay admission rates for chronic conditions, equivalent to 8,500 additional admissions, above the 3% annual increasing trend. Policy reforms were not associated with an increase in short-stay admission rates for infectious illness, which were increasing by 5% annually before April 2004. The proportion of primary care–referred admissions was falling before the reforms, and there were further sharp reductions in 2004.

CONCLUSIONS The introduction of primary care policy reforms coincided with an increase in short-stay admission rates for children with primary care–sensitive chronic conditions, and with more children being admitted through emergency departments. Short-stay admission rates for primary care–sensitive infectious illness increased more steadily and could be related to lowered thresholds for hospital admission.

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INTRODUCTION

Pay-for-performance schemes have successfully driven improvements in care for chronic conditions in many countries. Unintended consequences of these reforms may, however, diminish primary care quality for some groups, such as children, whose care is not incentivized. In 2004, the UK National Health Service (NHS) introduced major reforms to primary care policy that aimed to improve working conditions for primary care physicians and health outcomes for patients (Table 1).^{1–3} The scheme focused heavily on improving chronic disease management in adults with long-term conditions, but very few (<3%) of the health targets applied to children's care.⁴ Additional revisions to primary care policy in 2004 allowing primary care physicians to opt out of providing acute primary care services during evenings and weekends have reduced access, which has been associated with increased emergency department visits.⁵ Access to high-quality primary care is strongly associated with reduced numbers of unplanned hospital admissions for some conditions that are potentially avoidable or primary care sensitive (PCS).^{6–9} These changes in primary care policy are thought to have contributed to a rise in unplanned hospital admissions among children over the past decade.^{1,4,10}

Conflicts of interest: authors report none.

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Table 1. Major UK National Health Service Reforms in 2004**Primary care reforms¹**

Allowed primary care physicians greater flexibility in the services they provided, for example, opting out of responsibility for out-of-hours care.

Financial incentive scheme for primary care physicians to deliver clinical and organizational care, assessed through performance target achievement (the Quality and Outcomes Framework).

Emergency care reforms

Tightening of targets so that 98% of patients wait no more than 4 hours in an emergency department from arrival to hospital admission, transfer, or discharge.²

Hospital reforms

Introduction of payment-by-results schemes changed the way a hospital was paid, from a block contract payment system for service provision to one remunerating activity, such as episodes of care.³

In England, unplanned admissions of children increased between 1997 and 2006, driven by admissions associated with short stays—those characterized by minor, self-limiting conditions and lasting fewer than 2 days—which rose by 41%.⁷ Previous studies implicating primary care reforms as responsible for rises in admissions had several design flaws. First, none of these studies took into account secular trends in admission rates, linked the rises to the timing of the reforms, or controlled for the falls in long stays. Also, previous studies focusing on all short-stay admissions did not compare changes in admission rates for PCS conditions against those for comparator conditions that should not have been affected by changes in primary care.⁷ For example, injuries that should be seen in the hospital may result in a short stay and should not be counted as being PCS. Pediatric quality indicators in the United States and United Kingdom such as those of the Agency for Healthcare Research and Quality (AHRQ)^{11,12} have been used to measure PCS admissions¹⁰ but account for only a minority of highly frequent causes of admission among young children.¹³

We combined several criteria to develop a deliberately broader composite measure to capture the majority of potentially PCS childhood illnesses for which children would consult a primary care physician. Our hypothesis was that major restructuring in NHS primary care in England in 2004 adversely affected the availability of this care to children and, as a result, increased PCS short-stay unplanned hospital admissions for acute infectious and chronic conditions. We compared these trends with trends in short-stay admissions for injury as an index marker of background trends in hospital admissions and examined long-stay admissions to explore an alternative hypothesis that the burden of illness has increased over time.

METHODS**Data and Definitions**

We analyzed data from Hospital Episodes Statistics, the national administrative database for hospital activity in England.¹⁴ We examined all unplanned (emergency) admissions from April 1, 2000 to March 31, 2012 among children aged younger than 15 years; an unplanned admission was an unexpected event that occurred when a child presented with an acute problem and was immediately referred for hospital treatment. Admission diagnoses are recorded in Hospital Episodes Statistics as the main reason for admission or primary diagnosis using *International Classification of Diseases, 10th Revision (ICD-10)* codes that can be mapped to the AHRQ Clinical Classifications Software.¹⁵

We developed broad composite indicators to identify admissions that were minor, self-limiting, and potentially PCS. Our main outcomes were short-stay admissions having a length of stay of less than 2 days and no readmission for any cause within 28 days for 2 broad groups of PCS conditions: acute infectious illness and chronic disease. We used clinical coding lists based on the AHRQ Clinical Classifications Software drawn up by a clinician expert panel (Supplemental Appendix 1, available at <http://www.annfam.org/content/13/3/214/suppl/DC1>). Discrepancies were resolved by discussion and consultation with literature to achieve consensus. Our comparator group was short-stay admissions for injury. We also examined a secondary outcome measure of a small subset of admissions for asthma, diabetes, urinary tract infection, and intestinal infection that have been used to reflect the quality of care outside of the hospital for children aged younger than 17 years and identify potentially avoidable hospitalizations among children at an area level by the AHRQ.¹¹ We grouped admissions into 326 English local authority areas, based on patients' residential area, by sex, financial year of admission, and developmental age-group (<1, 1 to 4, 5 to 9, and 10 to 14 years). Annual denominator data were Office of National Statistics midyear population estimates.¹⁶ We flagged each admission referred by a primary care physician.

To examine the effect of improved efficiency as an alternative explanation for the rise in short-stay admission rates, we assessed trends in long-stay admissions, defined as those lasting 2 days or more, which we considered to be moderate or serious and hence not PCS. We also examined same-day discharges, a subset of short-stay admissions, as a secondary outcome of minor conditions presenting to hospitals. Age- and sex-specific short- and long-stay unplanned admission rates were directly standardized to the national population of children in 2011.

Data Analysis

To estimate changes associated with primary care policy reforms in 2004, we fitted an interrupted time series regression model of our time series for all children in England. The model had 3 main parameters: the first parameter estimated the annual trend in our outcome associated with each year from 2000 until the primary care policy reforms were introduced in April 2004, the second parameter estimated the immediate level change associated with policy change in 2004, and the third parameter estimated the trend change in our outcome associated with each year thereafter to 2011.^{17,18} For each outcome, we applied a generalized estimating equation model clustering by the combination of local authority area, age, and sex with robust standard errors and an autoregressive correlation matrix.^{19,20} We report annual rate ratios (RRs) calculated from the parameter estimations, which represent population-averaged rates. Sensitivity analyses investigated (1) an additional change in trend seen in 2008 and (2) the confounding effect of trends in long-stay admission rates on short-stay admission rates. To investigate referral by primary care physician as the outcome, adjusted annual odds ratios (ORs)

were calculated from an interrupted time series trend analysis using logistic regression. The Health and Social Care Information Centre provided ethical approval to use Hospital Episodes Statistics data for our research. We performed all analysis using Stata 11 (Stata Corp).

RESULTS

Rates of Unplanned Admissions

Between 2000 and 2011, there were 7.8 million unplanned admissions in a population of 16 million children aged younger than 15 years, of which 811,154 (10%) were readmissions within 28 days of discharge. More than one-half (4,144,729 of 7,831,633) of all unplanned admissions were potentially PCS short-stay admissions, of which 32% (2,492,038) were for acute infectious illness and 21% (1,652,691) were for chronic conditions. The AHRQ pediatric care quality indicators accounted for less than 10% of unplanned admissions and did not change significantly across the study period. The proportion of all unplanned admissions that were for a short stay increased from 66% in 2000 to 75% in 2011 (Table 2), driven by same-day discharges, which increased from 31% to 46%.

Table 2. Unplanned Hospital Admissions for 2000-2001 and 2010-2011 Among Children by Age-Group and Overall

Measure	<1 Year		1-4 Years		5-9 Years	
	2000-2001	2011-2012	2000-2001	2011-2012	2000-2001	2011-2012
Population, No. ^a	575,000	679,100	2,405,900	2,649,600	3,176,900	2,990,100
Children admitted, No.	115,132	159,486	163,508	207,573	94,857	96,232
Total unplanned admissions, No.	150,694	215,401	202,161	267,553	112,772	118,500
Mean no. of admissions per child	1.31	1.35	1.24	1.29	1.19	1.23
Length of stay, mean (SD), days	3.0 (27.0)	1.5 (4.5)	2.1 (23.7)	1.0 (2.8)	2.4 (25.0)	1.2 (3.2)
Boys, No. (%)	86,823 (57.6)	123,384 (57.3)	115,818 (57.3)	152,984 (57.2)	65,481 (58.1)	67,636 (57.1)
Readmission, No. (%) ^b	17,554 (11.6)	28,426 (13.2)	16,995 (8.4)	26,523 (9.9)	8,545 (7.6)	11,023 (9.3)
Same-day discharge, No. (%) ^c	45,595 (30.3)	97,531 (45.3)	71,376 (35.3)	134,516 (50.3)	33,424 (29.6)	52,827 (44.6)
Overnight stay, No. (%) ^c	45,271 (30.0)	55,142 (25.6)	74,900 (37.0)	81,322 (30.4)	43,260 (38.4)	37,671 (31.8)
≥2-day stay, No. (%)	58,731 (39.0)	56,391 (26.2)	55,098 (27.3)	46,099 (17.2)	35,525 (31.5)	24,961 (21.1)
Type of admission						
Infection, No. (%)	83,281 (55.3)	104,770 (48.6)	101,918 (50.4)	154,743 (57.8)	37,154 (32.9)	40,943 (34.6)
Chronic, No. (%)	40,693 (27.0)	63,226 (29.4)	57,253 (28.3)	63,301 (23.7)	35,613 (31.6)	39,839 (33.6)
Injury, No. (%)	5,980 (4.0)	9,156 (4.3)	26,454 (13.1)	34,840 (13.0)	28,323 (25.1)	28,236 (23.8)
Other, No. (%)	20,740 (13.8)	38,249 (17.8)	16,536 (8.2)	14,669 (5.5)	11,682 (10.4)	9,482 (8.0)
AHRQ Pediatric Quality Indicators ¹¹						
Intestinal infection, No. (%) ^d	7,959 (5.3)	10,008 (4.6)	10,995 (5.4)	13,647 (5.1)	2,459 (2.2)	2,735 (2.3)
Urinary tract infection, No. (%)	3,023 (2.0)	5,088 (2.4)	2,686 (1.3)	3,570 (1.3)	1,624 (1.4)	1,992 (1.7)
Asthma, No. (%)	936 (0.62)	166 (0.08)	13,267 (6.6)	9,796 (3.7)	6,607 (5.9)	7,233 (6.1)
Diabetes, No. (%)	21 (0.01)	21 (0.01)	680 (0.3)	737 (0.3)	1,310 (1.2)	1,286 (1.1)
Referred by primary care physician, No. (%)	65,466 (43.4)	64,338 (29.9)	69,675 (34.5)	68,542 (25.6)	34,156 (30.3)	25,370 (21.4)

AHRQ = Agency for Healthcare Research and Quality.

^a Office of National Statistics England midyear estimate population figures.

^b Readmission within 28 days of an index admission.

^c Same-day discharge and overnight stay combined make short-stay admissions (those with a stay lasting <2 days).

^d Includes gastroenteritis.

Short-stay admission rates were highest among infants and fell with age, ranging from 194 (95% CI = 193 to 195) per 1,000 children aged younger than 1 year in 2011 to 74 (95% CI = 73 to 74), 28 (95% CI = 27 to 28), and 23 (95% CI = 23 to 24) among children aged 1 to 4, 5 to 9, and 10 to 14 years, respectively. Owing to the large numbers of admissions, CIs generated were narrow and are not presented in full subsequently.

Infectious illness was consistently the most common reason for short-stay admissions in children aged younger than 5 years (Supplemental Appendix 2, available at <http://www.annfammed.org/content/13/3/214/suppl/DC1>). Infectious illness and chronic conditions accounted for similar proportions among children aged 5 to 9 years. Because of steep rises after 2004, chronic conditions surpassed injury as the most common reason for short-stay admissions among children aged 10 to 14 years.

There were steady increases in age- and sex-standardized short-stay admission rates for infectious illness and injury over the study period, whereas rates for chronic conditions peaked in 2008 (Table 3). There were corresponding falls in long-stay admission rates (Supplemental Appendix 2).

10-14 Years		Overall	
2000-2001	2011-20112	2000-2001	2011-2012
3,197,800	3,067,400	9,355,600	9,386,200
95,601	91,354	469,098	554,645
115,547	114,339	581,174	715,793
1.21	1.25	1.24	1.29
3.2 (31.5)	1.6 (4.8)	2.6 (26.5)	1.3 (4.0)
65,753 (56.9)	61,722 (54.0)	333,875 (57.4)	405,726 (56.7)
10,032 (8.7)	11,631 (10.2)	53,126 (9.1)	77,603 (10.8)
27,167 (23.5)	43,562 (38.1)	177,562 (30.6)	328,436 (45.9)
42,333 (36.6)	36,608 (32.0)	205,764 (35.4)	210,743 (29.4)
45,307 (39.2)	30,378 (26.6)	194,661 (33.5)	157,829 (22.0)
29,736 (25.7)	28,600 (25.0)	252,089 (43.4)	329,056 (46.0)
34,142 (29.5)	39,366 (34.4)	167,701 (28.9)	205,732 (28.7)
31,255 (27.0)	29,862 (26.1)	92,012 (15.8)	102,094 (14.3)
20,414 (17.7)	16,511 (14.4)	69,372 (11.9)	78,911 (11.0)
1,145 (1.0)	1,306 (1.1)	22,558 (3.9)	27,696 (3.9)
943 (0.8)	1,162 (1.0)	8,276 (1.4)	11,812 (1.7)
4,128 (3.6)	4,171 (3.6)	24,938 (4.3)	21,337 (3.0)
2,614 (2.3)	2,775 (2.4)	4,625 (0.8)	4,819 (0.7)
32,191 (27.9)	21,557 (18.9)	201,488 (34.7)	179,807 (25.1)

Impact of 2004 Policy Reforms on PCS Admissions

Estimated trends for all-cause short-stay admission rates were increasing by 4% annually (RR = 1.04; 95% CI = 1.04 to 1.04) before 2004 but leveled off at 3% per year thereafter. There was no immediate level change in 2004 (Table 4). Short-stay admission rates for infectious illness were increasing by 5% annually before April 2004 (RR = 1.05). Rates leveled off in 2004 (RR = 1.00) and remained at 4% annually thereafter. The annual increase in short-stay admissions for chronic conditions was 3% (RR = 1.03) before 2004; an immediate increase in 2004 of 8%, equivalent to 8,500 additional short-stay admissions, gave a total annual increase of 11% in 2004; rates continued to rise at 4% (RR = 1.04) per year thereafter. These estimated parameters measuring pre-2004 trend and 2004 level change were unaffected by modeling a 2008 change in trend and adding long-stay admission rates as an explanatory variable. Short-stay admission rates for our comparator condition, injury, increased by 1% to 2% annually throughout the study period.

Long-stay admission rates fell annually by 4%, 4%, and 2% before 2004 for infectious illness, chronic conditions, and injury, respectively (Table 4). There was an interruption in the decline for chronic conditions in 2004 (RR = 1.01) but not for the other categories.

Trends in Admissions Referred by Primary Care Physicians

More children were referred by primary care physicians for infectious illness, 40% (1,122,656 of 2,797,011), than for chronic conditions, 35% (549,800 of 1,578,757). Referrals for injury were lowest at 5% (54,889 of 1,051,991). The proportion of unplanned admissions referred by primary care physicians for infectious illness and chronic conditions was decreasing annually by 8% (OR = 0.92) and 7% (OR = 0.93) before the policy reforms in April 2004, dropped by a further 5% and 6%, respectively, and gradually leveled off thereafter (Table 5). The biggest reductions of 8% occurred among children aged 4 to 9 years (OR = 0.92).

DISCUSSION

Main Findings

Our findings confirm an association between the timing of major national primary care policy reform in the United Kingdom in 2004 and increases in short-stay admission rates for PCS chronic conditions in children. The 8% rise in 2004, above the increasing trend, was equivalent to 8,500 extra short-stay admissions. These increases were accompanied by falls in admissions of children referred by a primary care physician. We did not find an immediate change in the level of

Table 3. Standardized Short- and Long-Stay Annual Admission Rates by Year

Year	Infectious Illness		Chronic Conditions		Injury		All Cause	
	Short Stay	Long Stay	Short Stay	Long Stay	Short Stay	Long Stay	Short Stay	Long Stay
2000	17.3	8.8	10.8	5.4	7.2	2.2	39.3	19.1
2001	19.0	8.5	11.6	5.3	7.5	2.3	42.3	18.7
2002	18.6	7.7	12.0	5.0	7.4	2.2	42.1	17.3
2003	20.1	7.8	12.1	4.8	7.6	2.1	44.1	17.1
2004	19.9	7.3	13.4	4.8	7.6	1.9	45.4	16.4
2005	21.7	7.6	13.8	4.7	7.9	1.9	47.8	16.4
2006	21.4	6.9	14.7	4.6	8.1	1.8	48.3	15.3
2007	21.7	6.5	14.5	4.4	7.9	1.7	48.5	14.7
2008	22.6	6.6	15.4	4.4	7.9	1.5	50.6	14.7
2009	24.0	6.7	14.8	4.3	8.2	1.6	51.6	14.8
2010	25.1	7.1	14.5	4.2	8.4	1.5	53.0	15.0
2011	23.8	6.4	14.0	4.0	8.7	1.5	51.3	14.0

Notes: Directly standardized unplanned admission rates are per 1,000 children aged 0 to 14 years with no readmission within 28 days. Short-stay admissions were unplanned admissions with a length of stay of less than 2 days. Long-stays admission were admissions with a length of stay of 2 days or more. CIs for the standardized rates are very narrow (maximum span 0.3) and are not shown.

short-stay admission rates for infectious illness, which were increasing annually by 5% annually well before the reforms of 2004 against a steadily rising trend for injury admissions of 1% to 2% annually.

Strengths and Weaknesses in Relation to Previous Research

Our study is the first to use interrupted time series analysis to investigate the timing of primary care policy reforms on PCS admissions among children. Our study's strengths include its size and national population coverage. National administrative admission data are a useful tool for exploring the impact of national policy change as they are not subject to bias due to regional variations of individual clinicians.²¹ Our definition of a PCS admission was deliberately broad and captured a wide spectrum of potentially avoidable admissions. Pediatric indicator sets adopted by previous studies^{10,22} accounted for only selected infectious and chronic conditions that, together, explained less than 30% of short-stay admissions in children. By contrast, in our study, the 10 most frequent causes for admission for potentially avoidable admissions for PCS infectious and chronic conditions accounted for more than 70% of short-stay admissions (Supplemental Appendix 3, <http://www.annfam.org/content/13/3/214/suppl/DC1>). Our broader composite indicators for acute and chronic PCS conditions may be useful for future research to monitor the impact of primary care on potentially avoidable admissions among children.

We acknowledge that our results are subject to a

number of limitations, however. Inherent biases exist in the use of clinical codes and length of stay to derive a proxy for identifying PCS admissions. Changes in accuracy and completeness of clinical coding could have affected diagnosis categorization or referral information over the study period,³ although the use of broadly defined diagnosis groups is less likely to be affected by variations in coding of individual conditions.²³ As we present only 4 years of data before policy reform, it is possible that a more important underlying trend could have been obscured; however, our previous report of a 41% increase in short-stay admissions over a 10-year period (between 1997 and 2006) is comparable to our findings of a pre-2004 rate of 4% per year.^{7,8}

Our findings may be confounded by concurrent health policy and service changes in hospital care around 2004 (Table 1). UK government performance targets introduced in 2000 were tightened in 2004 whereby emergency departments incurred heavy penalties if patients waited longer than 4 hours. In response, many hospitals introduced short-stay admission facilities for assessment and observation, which may explain increases in same-day discharge rates but not differing trends across diagnosis categories.^{2,10,24} Financial tariff schemes for hospital activities including admissions were introduced starting in 2003, but there was only limited evidence of "gaming" by a small number of hospital trusts to increase payments.^{3,25} Shorter length of stay is associated with improved efficiency in hospitals when offset by a reduction in longer-stay admissions of 2 days or more; we adjusted for changes in long-stay admission rates and found increased efficiency does not explain the increases in short-stay admissions.

Implications and Future Research

Although we cannot infer causation from our findings, the magnitude of an 11% increase in short-stay admissions for chronic disease lends weight to speculation from previous reports that such admissions may increase when primary care provision is withdrawn.¹⁰ Our findings that short-stay admission rates among children with chronic conditions changed immediately in 2004 and are now surpassing other causes of admission in older children are particularly concerning. This development may indicate an adverse impact of

Table 4. Annual Rate Ratios Estimating Trends Before and After 2004 Primary Care Policy Reforms in Admission Rates

Admission Type	Short-Stay Admission Rates ^a		Long-Stay Admission Rates ^b	
	% Annual Change	Rate Ratio ^c (95% CI)	% Annual Change	Rate Ratio ^c (95% CI)
Infectious illness				
Trend pre 2004	5	1.05 (1.05-1.05)	-4	0.96 (0.96-0.96)
Change 2003 to 2004	0	1.00 (1.00-1.00)	-6	0.94 (0.94-0.95)
Trend post 2004	3	1.03 (1.03-1.03)	-1	0.99 (0.99-0.99)
Chronic conditions				
Trend pre 2004	3	1.03 (1.03-1.04)	-4	0.96 (0.96-0.96)
Change 2003 to 2004	11	1.11 (1.11-1.12)	1	1.01 (1.01-1.02)
Trend post 2004	1	1.01 (1.01-1.01)	-1	0.99 (0.98-0.99)
Injury				
Trend pre 2004	1	1.01 (1.01-1.02)	-2	0.98 (0.98-0.99)
Change 2003 to 2004	0	1.00 (0.99-1.01)	-7	0.93 (0.91-0.95)
Trend post 2004	2	1.02 (1.01-1.03)	-4	0.96 (0.95-0.97)
All cause				
Trend pre 2004	4	1.04 (1.04-1.04)	-4	0.96 (0.96-0.97)
Change 2003 to 2004	4	1.04 (1.03-1.04)	-3	0.97 (0.97-0.97)
Trend post 2004	2	1.02 (1.02-1.02)	-2	0.98 (0.98-0.98)

Notes: Interrupted time series regression models were individually constructed for short- and long-stay admissions in 3 diagnosis categories. Data are for 326 local authority areas over 12 years (2000-2001 through 2011-2012) among children aged younger than 15 years.

^a Unplanned admissions with a length of stay of less than 2 days.

^b Unplanned admissions with a length of stay of 2 days or more.

^c Calculated from model parameter coefficients.

Table 5. Annual Odds Ratios Estimating Trends in Primary Care Physician-Referral Admissions Before and After 2004 Primary Care Policy Reforms

Admission Type	% Annual Change	Odds Ratio ^a (95% CI)
Infectious illness		
Trend pre 2004	-8	0.92 (0.92-0.92)
Change 2003 to 2004	-12	0.88 (0.86-0.89)
Trend post 2004	-2	0.98 (0.98-0.99)
Chronic conditions		
Trend pre 2004	-7	0.93 (0.93-0.93)
Change 2003 to 2004	-13	0.87 (0.86-0.89)
Trend post 2004	-3	0.97 (0.96-0.98)
Injury		
Trend pre 2004	-5	0.95 (0.94-0.96)
Change 2003 to 2004	-10	0.90 (0.85-0.95)
Trend post 2004	-1	0.99 (0.96-1.02)

Note: Data are for 12 years (2000-2001 through 2011-2012) among children younger than 15 years.

^a Annual odds ratios were estimated from the model parameter coefficients, which were adjusted for age and sex.

financial incentive schemes focusing on chronic conditions in adults.²⁶ The success of the scheme on improving quality of care and clinical outcomes has been questioned,^{27,28} and there has been concern that it has

widened inequalities as a result of unintended consequences for children and other groups.^{29,30} Continuity of care, important in building a parent-physician relationship and preventing the use of emergency health services, also reportedly suffered with the introduction of pay for performance.³¹⁻³³ Evidence of the impact of pay for performance in the United Kingdom on children's access to primary care physicians is limited, but primary care consultation rates rose between 1995 and 2006 in all age-groups except for children aged 5 to 14 years.³⁴

We did not find a direct relationship for rising admissions for infectious illness in children, which predated the primary care policy reforms. Infectious illness is common among young children and particularly sensitive to the availability of out-of-hours care. Steep increases before 2004 may reflect gradual changes in out-of-hours primary care provision from

2000³⁵; by 2004, more than 95% of primary care physicians had opted out of this care provision nationally. Certainly, the large increases in admissions with same-day discharge may reflect a trend in emergency departments toward hospitalizing children for observation.^{10,36}

The expansion in primary care-based activity as a result of reforms has meant that primary care physicians are struggling to maintain their existing workload,³⁷ and existing health care provision in England is not sufficient to contain childhood illness in the community. Concerns about rising emergency department visits and short-stay admissions have sparked calls for a reversal of policy reform, suggesting UK primary care physicians should extend access to primary care outside of core hours, and controversial pilot schemes for 24/7 care are now proposed in many areas.³⁸ Such changes, however, have huge implications for the primary care physician workforce and UK health system budgets. We recommend further research to model clinical and cost-effectiveness and survey parental attitudes to weigh best options for avoiding admissions in children.

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Key words: pay for performance; unplanned admissions; short-stay admissions; children; out-of-hours health care; trends; primary care

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