

also form a potential feedback loop for assessing the effectiveness of the programmes.

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Contributors: JS designed the study protocol, collected and analysed the data, and participated in writing the paper. CO'H, PH, and JAS conceived the study, developed the study design, and participated in writing the paper. JRB and SS guided the study design and participated in writing the paper. JS and CO'Halloran will act as guarantors for the paper.

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Changes in risk of hospital readmission among asthmatic children in Denmark, 1978-93

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The management of asthma in children has changed over the two most recent decades, with increasing emphasis on early anti-inflammatory treatment and complete disease control with inhaled steroids.^{1,2} We estimated the changes in hospital readmission rates for asthma in children in Denmark in 1978-93 with a view to evaluating concomitant changes in disease control.

Methods and results

Data on hospital admissions and subsequent readmissions with asthma in children aged 5-14 at first admission were obtained from the Danish National Board of Health for the period 1978-93. Readmission was defined as any subsequent admission related to asthma that was separated by 12 months or more from the first admission.

The age standardised incidence of admission to hospital for asthma was calculated by dividing the number of first admissions to hospital for asthma by the corresponding population group in the Danish population. Sequences in which a person was discharged from hospital and again admitted on the same day (as is often the case when a patient is moved from one department to another) were combined into a single admission. Age standardised rates were calculated by giving equal weights to different age groups and to the two sexes. Relative risks of readmission in different groups of patients were estimated with Cox proportional hazards regression, account being taken of sex, diagnosis at first admission, age at first

admission, and period in which the first admission occurred.

The incidence of admission to hospital for asthma over the period studied was constant at roughly 1 per 1000 children per year (table). The proportional hazards regression analysis showed that the relative risk of readmission for asthma decreased gradually; in children who were first admitted to hospital for asthma in 1990-3 the estimate was 0.50, compared with 1.00 in children first admitted in 1978-81 (table). Furthermore, the mean number of days per admission decreased over the study period.

Comment

The risk of readmission for asthma in Danish children fell by half during the period from 1978 to 1993; the incidence of admission for asthma in these children was constant in this period.

The frequency of hospital admissions may be affected by at least three factors, all expected to favour

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Incidence of admission to hospital for asthma, relative risk of readmission, and average number of days in hospital per admission among asthmatic children during 1978-93

Period	Incidence of first admissions (per 1000)	Relative risk of readmission (95% CI)	P value	Average No of days in hospital per admission	
				First admission	Readmissions
1978-81	0.93	1		5.1	5.9
1982-5	1.10	0.75 (0.66 to 0.85)	<0.001	3.5	5.0
1986-9	1.14	0.64 (0.53 to 0.74)	<0.001	3.5	4.6
1990-3	1.09	0.50 (0.32 to 0.68)	<0.001	3.2	3.7

an upward trend: the underlying incidence of asthma seems to have been increasing over recent decades in children in industrialised countries^{3,4}; awareness of asthma is believed to have increased during the observation period; and a labelling shift from bronchitis to asthma has probably occurred during this period.

Because an increased incidence of new admissions to hospital for asthma was not observed, other factors must have had a moderating influence on the risk of admission. The factors favouring an increased incidence of asthma may mainly contribute mild cases of asthma, which would add little to the risk of admission to hospital and readmission. This is probably not, however, a major factor, since the relative contribution of short admissions was unchanged throughout the period. The reduced risk of readmission over the study period therefore suggests that the treatment of chronic asthma has improved. The reduced length of stay in hospital for both first admissions and readmissions substantiates this interpretation of our data.

In conclusion, these data provide evidence suggesting that the management of asthma in Danish children has improved, leading to less frequent readmission and to shorter stays in hospital.

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Outcome and use of health services four years after admission for acute myocardial infarction: case record follow up study

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Acute myocardial infarction affects around 250 000 people each year in the United Kingdom. To our knowledge, medium term outcome and use of resources, other than revascularisation rates,¹ have not been reported in a non-selected population.

Subjects, methods, and results

All patients resident in Nottingham Health District who had been admitted in 1992 for acute myocardial infarction to either of Nottingham's two hospitals were identified from the Nottingham heart attack register.² We reviewed all hospital and general practitioner case notes for investigations, interventions, readmissions, clinic visits, and symptoms up to August 1996. Data on deaths were obtained from the Office for National Statistics.

Overall, 900 patients were admitted for myocardial infarction (mean age 66.6 years; 561 men). Data extraction was completed in 899 (99.9%). The table shows the outcomes in the 695 patients who were discharged alive.

In all, 537 patients received a clinic appointment on discharge (eight did not attend and seven others had died). The remaining 158 did not receive follow up—medical records did not indicate why.

Only 126 (24%) patients who were followed up had had a previous myocardial infarction compared with 66 (42%) of those who were not ($\chi^2 = 20.47$, $P < 0.001$). The two groups did not differ in size of infarct (as measured by rise in creatine kinase concentrations ($\chi^2 = 1.51$, $P = 0.219$), location of infarct ($\chi^2 = 0.72$, $P = 0.399$), or Killip score at hospital presentation ($\chi^2 = 2.27$, $P = 0.132$)). Patients without follow up were,

however, less likely to have received thrombolysis ($\chi^2 = 25.01$, $P < 0.001$) and to have been under the care of a cardiologist; 142 of the 519 (27%) patients managed by a physician and 16 of the 176 (9%) managed by a cardiologist were not followed up ($\chi^2 = 24.97$; $P < 0.001$). These patients were no more likely to require readmission in the four years after infarction, but after adjustment for age, sex, and previous infarction 79 (50%) had died compared with 130 (24%) ($z = 3.44$, $P = 0.001$). There were no differences in the proportion of deaths from coronary heart disease in the two groups (52 of the 78 deaths (67%) in those not followed up *v* 88 of the 129 deaths (68%) in those followed up; $\chi^2 = 0.54$, $P = 0.817$). By the end of the study 135 patients had never had an outpatient cardiology review and 62 had had no further hospital contact.

Of the 488 patients alive at August 1998, 282 were recorded as having or not having angina. Ninety eight had documented ongoing anginal symptoms, of whom 45 required two or more antianginal drugs; none of the 21 patients under the care solely of their general practitioner but 20 of the 24 patients under specialist review were being investigated.

Comment

Survivors of myocardial infarction comprise a mixed group with varying degrees of underlying coronary disease, cardiac impairment, and socioeconomic status, all of which influence health care needs.³ The prospects for a patient surviving an infarction are not particularly