Assessing the performance of general practices caring for patients with asthma

P AVEYARD

SUMMARY

Background. *General practitioners (GPs) have had to record information about chronic disease management and send this to the health authorities since the introduction of the new contract in 1990.*

Aim. *To discover the relationship between practice emergency admission rates for asthma and the characteristics of the practice's patients and chronic disease management programme.*

Method. *This was an ecological study comparing practice emergency admission rates of asthma by general practice with the practice's performance in measuring the prevalence, peak flow, and number of patients on regular prophylaxis. In addition, prescribing analysis and costing (PACT) data and census linkage were used to assign social class to patients and, when aggregated, to practices. The practice admission rate was correlated against each of these variables and then the relationships were explored in multiple linear regressions.*

Results. *A high rate of admission in practices was correlated with deprivation of the patients, in the form of a practice Townsend score ($r = 0.33$, $P = 0.003$), and also with poorer prescribing, measured by the preventer–reliever ratio ($r = -0.38$, $P = 0.001$). Regression analysis showed that the relationship between good prescribing and low admission rates was not explained by confounding variables. Only 32% of the variation in admission rates between practices was explained by the regression equation. None of the variables recorded in the annual report were significantly related to admission rates.*

Conclusion. *Annual reports from the practice to the health authority are unhelpful in monitoring general practice performance, but prescribing, as measured by the preventer–reliever ratio, and hospital admission rates have limited usefulness.*

Keywords: asthma; performance indicator; chronic disease management.

Introduction

PERFORMANCE management for general practice is a reality.[1] Sheffield Health Authority informs GPs about the number of emergency admissions by practice, although the origin-ators deny that this is performance management.[2] The South and West Hampshire Health Commission provides this 'performance indicator', but leaves GPs to draw their own conclusions about what constitutes good practice.[3] This report explicitly links low emergency admission rates for asthma to high-quality chronic disease management care provided by practices.

We need to know what routinely collected data are of value in measuring the quality of care, so-called process measures, and also the results of that care — outcome measures. Vollmer *et al*[4] reviewed the case for using admission to hospital as an outcome indicator in asthma. Weiss *et al*[5] estimate that hospital admissions account for 47% of the direct costs of asthma, which is an important outcome as far as health care purchasers are concerned. Patients probably regard hospitalization as a poor outcome. It is also assumed that practices have low rates of admission because they offer good asthma care to all their asthmatic patients. This is untested, although a Norfolk general practice showed that intensive education of all patients with asthma was associated with a decline in consultations and oral steroid use.[6] Two trials have more than halved the asthma emergency admission rate, using enhanced education for patients attending respiratory outpatient clinics.[8,7] A trial to show that good asthma care in general practice reduces hospital admissions would need to be very large to have sufficient power, because hospital admissions are rare in general practice. Hence, we must use observational studies, such as this, to back up the indirect evidence from the above studies.

A model of the processes involved in asthma management (Table 1) has been constructed, and routinely collected data that pertain to each step have been put beside that step. Clearly, this model of care cannot be fully described by the routinely collected data sources. If measuring outcomes is to be useful, then it is also important to have a set of diagnostic process measures that can allow a practice to see where it is going wrong. This article describes the relationship between these processes and the outcome of hospital admission.

Method

The study took place in Warwickshire, a mixed urban and rural county of 485 000 inhabitants (Table 2). Data were extracted from the contract minimum data set (CMDS) for two complete years (financial years 1993/4 and 1994/5) to obtain all emergency asthma admissions. These admissions were aggregated by individual practices and converted into rates of admission by dividing by the practice population as of March 1995.

Prescribing analysis and costing (PACT) data for each practice were obtained for bronchodilator and corticosteroid item and net ingredient cost. The GP annual report to the family health services authority (FHSA) was used as the source of the data shown in Table 2. The expected prevalence of asthma was calculated by multiplying the numbers in each age–sex band of the practice by the age- and sex-specific prevalence of asthma found by the Fourth National GP Morbidity Survey (MSGP4).[9]

The prevalence of asthma is unrelated to social class,[10] but people in lower social class bands are more likely to be admitted than their higher class neighbours.[11] Socioeconomic status can be estimated by linkage from the registered patient's postcode to the ward of the patient and, hence, to census information,[12] as in this study. Concern has been expressed about the accuracy of this,[13,14] but it is more accurate to include an imperfect measure of social class than not to include any measure at all.

This was an ecological analysis in which the unit of study is a group of individuals (a practice population) rather than the individuals themselves (the patients). Pearson's and Spearman's correlation coefficients were calculated between the practice admission rate and the variables in Table 3. Multiple linear regression was performed first with all the variables entered into the model.

Paul Aveyard, BSc, MBBS, MRCP, registrar in public health medicine, Warwickshire Health Authority, Warwick.
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Table 1. Model of chronic disease management and routinely collected data.

Theoretical model of care	Routinely collected data
1. Administration	
● Patient able to get suitable appointment	● Nursing and GP hours per patient
● Call and recall system	● Computerized
● Repeat prescriptions available	
2. Consultation skills	
● Multidisciplinary clinic	
● Sufficient nurse and GP time available	● Nursing and GP hours per patient
● Ability to educate	
● Following British Thoracic Society guidelines	● Proportion of patients diagnosed with asthma
	● Proportion PFR recorded
	● Proportion on regular prophylaxis
3. Prescribing appropriately	● Preventer–reliever ratio
	● Inhaled corticosteroids per head
	● Net ingredient costs of inhaled steroids
4. Patient characteristics	● Practice Townsend score

Table 2. Characteristics from the 1995 annual report of the 78 practices administered by Warwickshire FHSA.

	Minimum	Median	Maximum
Practice population	257	5204	14 552
Emergency asthma admissions*	0	22	123
Emergency asthma admission rate	0/1000/2 years	4.0/1000/2 years	10.7/1000/2 years
Practice asthma prevalence†	1.3%	6.2%	20.1%
Percentage of all asthmatics on regular prophylaxis	4.9%	69.1%	190.0%‡
Percentage of all asthmatics with peak flow rate measured	3.9%	55%	100%

*This is from the CMDS data, which did not agree well with the annual report data. †Using MSGP4 to predict asthma prevalence gave almost all practices a prevalence of 4%. ‡Two practices had more people on prophylaxis than patients with asthma. Is this prescribing for other conditions or erroneous data collection or entry?

Table 3. Variables entered into regression equations.

PACT derived	Ratio of corticosteroids over bronchodilator (preventer–reliever ratio)
	Corticosteroid items per head of population
	Net ingredient cost of corticosteroids over number of items of corticosteroid prescribed
	Cost of items
Annual report derived	Nursing hours per patient
	Whole-time partners per patient
	Labour hours per patient
	List size
	Computerized
	Number of practice sites
	Number of partners
	Proportion of practice known to have asthma
	Proportion with asthma taking regular prophylaxis
	Proportion with asthma who had peak flow measured in past year
Census derived	Practice Townsend score
MSGP4 derived	Proportion of practice population with asthma predicted from national age–sex prevalence and practice age–sex register

This model controls confounding but is useless for prediction, so backwards elimination was performed from this model when *P* was greater than 0.05 to produce a simpler model. (Backwards elimination removes variables from a regression equation if they are not statistically significantly related to the outcome variable.) Weighted least-squares regression, using the practice list size, was used as the weighting. Weighted regression has been recommended in ecological studies because it gives more weight to the larger practices with more individual observations when fitting the regression line.[15] This reduces the effect of random error on the fitted line. Statistical analysis was by *SPSS* for Windows.[16]

Most of the variables in Table 3 are continuous. Entering these into a regression equation as they were would have implied that the relationship between that variable and the admission rate was linear. The practices were therefore split into thirds for each variable, and each variable was entered into the equation as two dummy variables. Labour hours per patient is a variable constructed from nursing hours and GP hours. This was calculated by assuming that each partner works 40 hours per week and adding this to the number of practice nursing hours.

Results

Univariate analysis

The practice prescribing habits, as shown by the ratio of inhaled corticosteroid over β_2-agonist (preventer–reliever ratio), was negatively correlated with a high admission rate (Pearson's $r = –0.38$, $P < 0.001$). The admission rate was positively correlated with the Townsend score of the practice ($r = 0.33$, $P < 0.005$) and all but one of the four normalized components of the Townsend score. (Deprived areas have high Townsend scores.) Other measures of prescribing, from Table 3, showed no significant correlation with the admission rate. No other factors were significantly correlated with the admission rate. Unfortunately, the practice Townsend score and the preventer–reliever ratio are related ($r = –0.50$, $P < 0.001$). Practices that serve the more advantaged patients have significantly lower admission rates than those serving the less advantaged patients (Kruskal–Wallis test, $\chi^2 = 13.2$, $P < 0.005$). The confounded relationship between prescribing, patient social class, and admission rates was explored in multiple regression.

Multiple regression

All variables entered model. This model explained 44% of the variance in the admission rate. Most variables in this equation made no significant contribution to the model fit, but this is irrelevant when examining confounding. The preventer–reliever ratio was the only individual variable that was significant ($t = 2.59$, $P = 0.01$), suggesting that the other measures entered were not confounding the relationship between low admission rates and a high ratio.

The prediction model arising from backwards elimination. The results of backwards elimination from the all-variables model are shown in Table 4. Prescribing with a high preventer–reliever ratio was associated with a low admission rate, but prescribing a high number of corticosteroids per head was associated with a higher admission rate. Practices whose patients fell in the middle band of the Townsend scores also had a higher admission rate.

Discussion

There are three similar studies to this one. In Boston, USA, Gottlieb *et al*[11] showed that residents in poor neighbourhoods were more likely to be admitted for asthma, and that the prescribing in that area was marked by a low preventer to reliever ratio. A New York study also found that poverty was related to hospitalization with asthma.[17] In the UK, Griffiths *et al*[18] reported an association between good prescribing, as measured by the preventer to reliever ratio and low admission rates, and admission rates only in their middle ageband of 5–64 years. In this study, all age groups were considered together and a relationship persisted, as in the Boston study.[11] In Warwickshire and Boston there is confounding of the relationship between prescribing and admission rates. Those practices serving the more advantaged patients are better prescribers, and this study and others have shown that more advantaged patients are less likely to be admitted for asthma than those less fortunate. This study is the only one to attempt to control confounding of the relationship between prescribing and admission rates. In the first regression equation using all variables, the preventer–reliever ratio was still significantly associated with lower admission rates. Two caveats need to be mentioned. First, the relationship between prescribing and admission rates may be a result of confounding that has not been measured using routinely collected data. Secondly, the ecological fallacy means that confounding cannot be excluded.[15]

Three factors were significantly associated with asthma admissions. Of the PACT data, the preventer–reliever ratio stands out as the most useful variable. Some authorities have objected to the use of this ratio on the sensible grounds that it is difficult to interpret a figure that may vary according to the numerator, the denominator or both.[19] The fact is that, in this and two of the studies discussed above, this ratio was linked to a putative poor outcome: admission to hospital. This strengthens the case for its use. Other indicators of prescribing were either unrelated to hospital admissions or related in a way that is difficult to interpret. The relationship between high number of items of inhaled corticosteroid and a high admission rate could be explained by a higher prevalence of asthma, or labelling people with chronic obstructive airways disease as asthmatic. Another possibility is that this is simply a chance finding (type 1 error). On pragmatic grounds, it seems sensible to use the preventer–reliever ratio as the measure of asthma prescribing quality until a better measure is found.

I found no apparent relationship between admission rates and data from general practices' annual reports, such as the proportion of patients whose peak flows have been measured. Perhaps this relationship was swamped by random variation because of the small numbers in the study. The fact that prescribing measures in this and other studies were highly significantly related to admission rates suggests that this is not the only explanation. Either data are filled in wrongly by GPs or these measures are only weakly, if at all, related to high-quality care. This adds weight to the argument that the present system of monitoring chronic disease management is bureaucratic, fails in its intention, and should be replaced.

Hospital admission is an important indicator for health commissions that bear the cost of the stay in hospital. If it can be shown that investment in primary care will reduce admissions, this will make it more likely that such investment is made. This study and the work from east London[18] have shown that expensive asthma prescribing, marked by higher preventer–reliever ratios, is associated with lower hospital admission rates. Unfortunately, this work has shown no relationship between staff time, for instance, and hospital admission rates.

Table 4. Summary of results of regression equation arising from backwards elimination.

Term	Regression coefficient (standard error)	Additional percentage of variance explained (r^2)*	t -statistic	P value
Preventer–reliever ratio	–4.56 (1.08)	20%	–4.21	<0.001
Practices prescribing a high number of corticosteroids per head	0.76 (0.31)	7%	2.47	0.02
Practices in middle third of Townsend scores	0.71	5%	2.32	0.02

*Including the term 'practices prescribing a high number of corticosteroids per head' explains a further 7% of the variance when the preventer–reliever ratio has been included in the model. Practices in the middle third of the Townsend scores explain a further 5% when the other variables are already included.

It is important to use routinely collected data, despite its drawbacks. Health commissions are not equipped to collect data specially. It is better to work with what we have and use this so that practices begin to see the value in collecting the data when it is fed back to them with an interpretation. If we are to change the way in which chronic disease management is monitored, we need to make sure that the chosen measures are based on evidence of their usefulness. If more useful data are collected in the future, this approach may help health commissions to form a strategy for primary care. It could represent a move away from concentrating only on prescribing and towards the broader aspects of chronic disease management.

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Address for correspondence

P Aveyard, Department of Public Health and Epidemiology, Medical School, University of Birmingham, Birmingham B15 2TT.