Variation in general practice medical admission rates for elderly people
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Abstract

**Background** Emergency medical admissions are rising, particularly in the elderly. Variation in admission rates between general practices has received little attention, and requires explanation.

**Methods** A retrospective review was carried out of emergency medical admissions to the District General Hospital (DGH) and the Community Hospitals (CHs) in West Gloucestershire in subjects over 75 years of age during 3 years. A survey of general practitioner (GP) attitudes to emergency admissions was carried out.

**Results** A five-fold spread in DGH and CH admission rates for elderly medical emergencies was found, and a three-fold spread of overall admission rates. Rates were consistent within a practice each year. The spread of practice mortality rates and myocardial infarction admission rates were smaller. The variation between practices was not explained by the Jarman Index or by attitudes identified in GPs. Practices with high admission rates had slightly higher annual hospital mortality rates, but lower episode fatality rates.

**Conclusion** Admission rates show considerable variation between practices, which is only partly explained by morbidity rates, and consistency over 3 years.

**Keywords:** general practitioners, emergency admissions, variation

Introduction

The increase in emergency admissions witnessed this decade has been a greater phenomenon for the elderly. This rise is only partly explained by population growth. The Elderly Care Department of the District General Hospital (DGH) in Gloucester, which has received all medical emergency admissions in subjects over 75 years for 15 years, has seen an 86 per cent rise in admission episodes in the last 10 years, whereas the over-75 years population has grown by only 24 per cent. Although the mean age of this elderly population has also risen over the decade, it seems likely that greater demand for admissions is occurring, whereas disease incidence may be more stable.¹

Admission rates for elderly people within a general practice are probably influenced by the morbidity of the population, and patient–doctor behaviour in the face of a crisis. Previous work in Bath² and Oxford³ concluded that DGH bed use was lower, but total in-patient bed use was higher, where the population had access to community hospital beds. A Bristol study⁴ examined rates by geographical area, and found that supply factors and socio-economic circumstances were correlated with admission rates. One known factor is that lower admission rates are seen for practices at a greater distance from their DGH.⁵,⁶ However, we have been struck by the large variation in admission rates even for practices at a similar distance from the DGH. This has been described in the United States,⁷ and also recently in the United Kingdom.⁸,⁹ The aim of this study was to examine characteristics of the practice and their population, and general practitioner (GP) attitudes within a practice, which might influence the admission rates to the DGH and the Community Hospital (CH), and subsequent bed usage. We wished to see whether these factors accounted for the observed variation in admission rates between practices.

**Methods**

Fifty-three general practices within West Gloucestershire served by the Gloucestershire Royal Hospital have been included in the study. The Health Authority provided data on list size, number of patients over 75 years and the Jarman UPA8 deprivation index¹⁰ for each practice. Direct distance from GP surgery to the DGH was calculated using the Ordnance Survey atlas.

Hospital admission data for the calendar years 1995, 1996 and 1997 were acquired from the Patient Administration System (PAS) at the DGH and from the community trust. PAS records the GP in 99 per cent of admissions; accuracy is subject to regular internal and external audits, and has been considered to be excellent in recent years. Out-of-area emergency referrals to neighbouring trusts were collated, but the numbers involved were very small and have not been added. Elective admissions, haematology and dialysis admissions and day cases were...
excluded. The elderly admissions to the separate Chest Hospital form less than 5 per cent of admissions, but were included. CH admissions included all medical admissions regardless of reason for admission, but excluded day cases.

Admission rates were calculated as admissions per 100 persons aged over 75 years on the practice list that year. A similar rate was calculated for bed-days for each practice. The relative admission rate by gender and age group was known from a prior longitudinal study,11 and this was used to standardize admission rates by 5 year age-bands and sex for each practice. However, this did not alter the analyses, as crude and standardized admission rates had a correlation coefficient of 0.99. Therefore, crude figures have been used throughout.

As one measure of the morbidity of elderly subjects in a practice, admissions with a primary diagnosis of myocardial infarction or gastro-intestinal haemorrhage were recorded. It was assumed that doctor and patient attitudes would have less influence on the decision to admit such patients. An additional proxy measure for morbidity was the percentage of the practice's over-75 population who died in hospital each year. The severity of illness in admissions was judged by the percentage of emergency admissions ending in death.

Questionnaires were sent to all 206 GPs in West Gloucestershire, who were asked to rate their responses to 11 questions on a visual analogue scale, which covered their attitude to handling medical emergencies in primary care, and their opinion about factors that influence the decision to admit. Responses were converted to a figure on a scale 0–10, and then averaged within a practice to represent the opinion of the practice as a whole. This was necessary because the PAS database permitted mapping admissions only to a practice, and not to the admitting GP. Responses graded 0–3 were categorized as ‘definitely agree’; 4–6 as ‘no view expressed’; 7–10 as ‘definitely disagree’.

Univariate analysis of factors that might be related to admission rates and bed-days were examined by Spearman’s rank correlation coefficient, as the data were significantly skewed, with positive kurtosis. Spearman’s rank was used to compare the rank order of practices from one year to the next. The influence of access to the CH on overall admission rates and bed-days was examined by Mann–Whitney U-tests. Data were analysed by SPSS version 8.0.

Results

Practice characteristics and admission rates

The 53 practices had a mean of 485 patients over 75 years (range 74–985), a mean of 2.8 doctors (range 1–7), and a mean Jarman Index of 2.1 (range –17 to 29.5). DGH admissions increased from 5150 (20.6/100 over 75 years) in 1995, to 5722 (22.3/100 over 75 years) in 1997, a rise in admissions of 11 per cent. Thirty-one practices made use of a Community Hospital. CH admissions increased slightly from 1566 (11.2/100 over 75 years) in 1995, to 1654 (11.4/100 over 75 years) in 1997. Dividing the population into urban and rural areas, overall admission rates were similar (Table 1).

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When admission rates were broken down by practice, a five-fold variation (10th–90th centile) in both DGH and CH admission rates was revealed (Tables 2 and 3), with a large right skew. The overall admission rate had a 10th centile of 15.0 admissions/year/100 patients over 75 years, a 90th centile of 48.9, and a median of 24.6 in 1997.

Myocardial infarction (MI) accounted for 151 and 127 admissions in 1996 and 1997, respectively, and gastro-intestinal haemorrhage (GIH) for 75 and 94 admissions, respectively. The mean annual admission rate for MI and GIH combined, per 100 over 75 years, was 0.87 (10th centile 0.41; 90th centile 1.34) with a normal distribution.

An average of 8.9 per cent of all DGH admissions from each practice (10th centile 5 per cent; 90th centile 12.4 per cent) ended in death. Hospital deaths amounted to an average of 3.6 per cent of the over-75 practice population each year, with

| Table 1 Admission rates (admissions per 100 persons over 75 years) for rural and urban populations |
|----------------------------------|----------|--------|--------|--------|--------|--------|
| Urban                            | 11026     | 23.8    | 24.8    | 28.8    |
| Rural – DGH                      | 13959     | 18.1    | 16.8    | 17.3    |
| Rural – CH                       | 13959     | 11.2    | 10.7    | 11.3    |
| Rural – overall                  | 13959     | 29.3    | 27.5    | 28.6    |

* 1996 population figures.

| Table 2 Admission rates* to DGH by practice (n = 53) |
|----------------------------------|----------|--------|---------|--------|---------|--------|
| Area                             | Year     | Minimum| 10th centile | Median | 90th centile | Maximum |
| Urban                            | 1995     | 2.9    | 10.1    | 19.3    | 40.2    | 49.4    |
| 1996                             | 10.0    | 12.0   | 21.2    | 42.1    | 43.0    |
| 1997                             | 8.8     | 11.9   | 24.3    | 62.4    | 72.4    |
| Rural                            | 1995     | 4.5     | 7.1     | 12.1    | 55.6    | 108.7   |
| 1996                             | 6.2      | 9.0     | 13.3    | 40.0    | 61.8    |
| 1997                             | 5.9      | 10.1    | 13.0    | 35.6    | 54.7    |

* Admissions per 100 persons over 75 years on the practice list.
again a two-fold spread between practices (10th centile 2.3 per cent; 90th centile 5.2 per cent).

**Bed-days by practice**

The spread of bed-days used by each practice was similar to the spread of admission rates. A significant skew to the right was seen for bed-days at the DGH, but the skew was much smaller for combined DGH and CH bed-days. The Figure displays combined bed-day rates for each practice arranged in ascending order. Practices using the CH used more bed-days overall (Mann–Whitney $U = 131$, $p = 0.001$); indeed, the top 15 practices all used the CHs.

**Survey of GP attitudes**

The questionnaire was returned by 139 GPs (63 per cent), with at least one response from 87 per cent of general practices, and results are shown in Table 4. GPs were split equally on whether or not the rise in emergency admissions reflected higher expectations from patients, and only 19 per cent felt rising admissions related to unrealistic expectations. More than half of GPs admitted they were greatly influenced by patient and family views about the need for hospitalization. One-third felt they did not have time to manage medical emergencies at home, and a third also felt emergency admissions are required to expedite medical investigations. A large majority thought that best practice guidelines and advice from an on-call registrar were unlikely to reduce emergency admissions.

**Relationships between admission rates and other factors**

Considerable stability in the ranked position of each practice was seen over the 3 years. The DGH admission rates in 1997

### Table 3 Admission rates* by practice to Community Hospitals ($n = 31$)

<table>
<thead>
<tr>
<th>Year</th>
<th>Minimum</th>
<th>10th centile</th>
<th>Median</th>
<th>90th centile</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>0.34</td>
<td>3.1</td>
<td>11.3</td>
<td>22.5</td>
<td>30.7</td>
</tr>
<tr>
<td>1996</td>
<td>0.68</td>
<td>3.7</td>
<td>10.4</td>
<td>20.5</td>
<td>29.7</td>
</tr>
<tr>
<td>1997</td>
<td>1</td>
<td>3.8</td>
<td>10.0</td>
<td>20.9</td>
<td>32.7</td>
</tr>
</tbody>
</table>

* Admissions per 100 persons over 75 years on the practice list.

### Table 4 Questionnaire to GPs ($n = 139$) (values are percentages)

<table>
<thead>
<tr>
<th>Question</th>
<th>Definitely agree</th>
<th>No view expressed</th>
<th>Definitely disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rising emergency admissions are an appropriate response to higher expectations of the best health care</td>
<td>42</td>
<td>16</td>
<td>42</td>
</tr>
<tr>
<td>2. Rising emergency admissions are fuelled by unrealistic expectations of health care</td>
<td>19</td>
<td>55</td>
<td>26</td>
</tr>
<tr>
<td>3. CHs are increasingly inappropriate for emergencies, and are unable to reduce DGH admissions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) CH users</td>
<td>38</td>
<td>36</td>
<td>26</td>
</tr>
<tr>
<td>(b) Those not using CHs</td>
<td>24</td>
<td>57</td>
<td>19</td>
</tr>
<tr>
<td>4. I am greatly influenced by patient and family’s views about whether to send to hospital for treatment or investigation</td>
<td>54</td>
<td>24</td>
<td>22</td>
</tr>
<tr>
<td>5. The time required in managing a medical case in a patient’s home to avoid admission is incompatible with other commitments of my job</td>
<td>31</td>
<td>14</td>
<td>55</td>
</tr>
<tr>
<td>6. Acute admissions are increasingly required to expedite investigations of medical problems</td>
<td>37</td>
<td>14</td>
<td>49</td>
</tr>
<tr>
<td>7. I feel experienced enough to manage a host of medical emergencies at home</td>
<td>60</td>
<td>11</td>
<td>29</td>
</tr>
<tr>
<td>8. Regular protocols/updates on the management of emergency cases might remove the need for some admissions</td>
<td>11</td>
<td>2</td>
<td>87</td>
</tr>
<tr>
<td>9. Good advice from the on-call registrar, access to fast track investigations would often avoid admission</td>
<td>26</td>
<td>2</td>
<td>72</td>
</tr>
</tbody>
</table>
were strongly related to the admission rates in 1996 \((r = 0.79, p \text{ value considered inappropriate})\) and 1995 \((r = 0.54)\), with the same pattern for CH rates. Practices admitting to CHs made less use of the DGH (Mann–Whitney \(U = 136, p < 0.001\)), but the combined rate was unrelated to using CHs (Mann–Whitney \(U = 267, p = 0.28\)). Admission rates were also unrelated to the size of the practice or the Jarman Index.

Distance from the DGH to the practice was inversely related to DGH rates \((r = -0.38, p = 0.005)\), positively related to CH rates \((r = 0.73, p < 0.001)\), and unrelated to the combined rate \((r = 0.04)\). Admission rates for MI and GIH were unrelated to DGH admission rates for all other diagnoses \((r = -0.1, p = 0.48)\), and unrelated to distance from the DGH \((r = -0.04, p = 0.8)\).

The percentage of the practice’s elderly population dying in hospital each year was related to the Jarman Index \((r = 0.44, p < 0.01)\) and the DGH admission rates \((r = 0.42, p < 0.01)\), but not the overall admission rate \((r = 0.1, p = 0.44)\). However, the percentage of episodes ending in death was inversely related to admission rates \((r = -0.35, p = 0.01)\), i.e. fewer episodes ended in death from those practices with the higher admission rates. The regression lines indicated that for a practice with an admission rate of 15/100 patients, 10 per cent of episodes would end in death, amounting to 3.5 per cent of their over-75 population; for an admission rate of 45/100, 8 per cent of episodes would end in death, amounting to 3.8 per cent of their elderly population.

From the GP survey, none of the responses regarding GP attitudes to admission related to admission rates.

**Discussion**

Admission rates and bed-use broken down by practice have received little attention in the past, although these data are routinely recorded. Moore and Roland\(^{12}\) discussed whether this variation could be explained by chance, and suggested that longer studies over several years would establish whether patterns were consistent. The present study has confirmed that the rank order for practices was very consistent over 3 years. The skewness of the distribution each year with a right tail of the rank order for practices was very consistent over 3 years.

Patterns were consistent. The present study has confirmed that longer studies over several years would establish whether variation could be explained by chance, and suggested that the proxies used for morbidity showed modest evidence of a relationship between case-mix and admission rates. The episode fatality rate was inversely related to admission rates, which suggested that practices with high admission rates were admitting less severe cases. A recent study from the United States\(^{9}\) found huge variation in referral rates to hospital, which were attenuated little by case-mix adjustment and were fairly consistent across specialties. The researchers in that study believed that physician practice rather than morbidity was more important in determining referral rates. A British study\(^{13}\) concluded that differential pressure from patients in relation to the experience of the GP explained some of the variation observed, and a Finnish study concluded that experience and specialist training in the subject was associated with lower referral rates.\(^{14}\) A study of asthma\(^{15}\) concluded that the practice night visiting rate, and not the social demography, was associated with admission rates. However, that study failed to identify attitudes or organizational factors associated with high admission rates. GP co-operatives became widespread in Gloucestershire in 1997, and currently refer about 20 per cent of the elderly emergency medical admissions. This study found no evidence that in their first year the co-operatives had reduced the variation between practices.

The study was limited by the absence of a true measure of the morbidity of the populations served by each practice. The Jarman Index reflects social risk factors, and is related to morbidity, and yet in this study was unrelated to admission rates grouped at practice level. This may be a reflection of the ecological fallacy, where an association between deprivation and admission for individuals is masked by aggregating at the practice level. A single Jarman score used for the whole population in the practice, based upon the location of the practice premises, cannot reflect the risk of admission for any individual.\(^{16}\) A previous study,\(^{17}\) using the Townsend score calculated for each individual, found that deprivation was associated with a doubling of risk of admission. This seems to be confirmed by the most recent British study,\(^{9}\) which found a two-fold spread between the 10th and 90th centiles for all-age admission rates, and again noted that organizational characteristics of general practice explained little of the variation. However, by deriving social deprivation data based on the postcode of patients on each practice list, the researchers in that study found that patient characteristics explained 45 per cent of the variation.

The introduction of clinical governance, and the recent publication of hospital league tables both emphasize that it is no longer possible simply to assume that variance in performance is accounted for by case-mix. This study supports previous
work suggesting that GP or patient behaviour may explain
variations in referral rates of medical emergencies to hospital.
The routine collection of a more robust measure of morbidity
would enable researchers in future studies to understand this
further. In the mean time, stemming the tide of rising
emergency admissions should include identifying and working
with the practices with the highest admission rates.

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