Do consultants differ? Inferences drawn from hospital in-patient enquiry (HIPE) discharge coding at an Irish teaching hospital

E D Moloney, D Smith, K Bennett, D O’Riordan, B Silke

Objective: To find out if there was a difference between hospital consultants, all trained in acute general medicine, in length of stay (LOS), re-admission rates, resource utilisation, and diagnostic coding, among patients admitted as emergencies to St James’ Hospital (SJH) Dublin.

Methods: A retrospective analysis was performed of data on discharges from hospital, recorded in the hospital in-patient enquiry (HIPE) system, relating to 9204 episodes among 6968 emergency medical patients admitted to SJH between 1 January 2002 and 31 October 2003. For comparative analysis, four physician groups were defined consisting of gastroenterology (GI, n = 4), respiratory (n = 3), general internal medicine (GIM, n = 2), or specialty (n = 5).

Results: GIM consultants had the shortest LOS (median 5 days); GIM and respiratory consultants were less likely to have long stay patients (> 30 days, p < 0.0001). Patients re-admitted under the same consultant had a longer LOS than those re-admitted under a different consultant (p < 0.0001). Endoscopy and GI radiology investigations were used most by GI consultants, computed tomography of the thorax by respiratory, ECHO by respiratory and specialty, and computed tomography of brain by GIM and specialty consultants. GI diagnostic codings were more frequent with GI consultants (p < 0.0001), respiratory diagnoses and malignancy with respiratory (p < 0.0001 for both), diabetes and hypertension with specialty (p = 0.0017), and heart failure more with GIM consultants (p = 0.001).

Conclusions: This study found that the HIPE database was very powerful in predicting differences between hospital consultants in LOS, re-admission rates, resource utilisation, and disease coding. It would be of interest to examine the extent to which protocols and guidelines could reduce such variations.

While previous studies have reported differences in length of hospital stay (LOS) and resource utilisation between various hospital physicians, there is a lack of such data between hospital consultants in the Republic of Ireland. Given growing pressures to manage costs and maximise efficiency in acute hospital services, information on patterns of resource utilisation, including LOS, by medical subspecialty is valuable. In North America, it has been suggested that physicians are responsible for an estimated 80% to 90% of hospital resource allocation charges, and determine how more than 10% of the gross national product is spent. Increasing specialisation and the more frequent use of expensive technologies by specialists have been cited as important factors increasing healthcare costs, and have stimulated interest in cost effective medicine. We have previously shown a median LOS of six days for patients admitted acutely via the emergency department over a one year period to a teaching hospital in the Republic of Ireland; the LOS was shorter with admission under a general medical service.

Data on discharges from acute public hospitals in Ireland are recorded in the hospital in-patient enquiry (HIPE) system. Sixty hospitals participate in the system and it is an invaluable source of hospital activity level and accreditation. The recent report of the HIPE Unit, from the Economic and Social Research Institute marks an important attempt to quantify the workload and case mix in Irish hospitals. The principal objective of this study is to find out whether there is a difference between hospital consultants in LOS, re-admission rates, resource utilisation, and diagnostic coding among patients admitted as emergencies to a general medical department of a teaching hospital in Dublin, Ireland.
national database of coded discharge summaries from acute public hospitals in Ireland. Ireland uses the International Classification of Diseases, ninth revision, clinical modification (ICD-9-CM) for both diagnosis and procedure coding since 1990, with updates every five years. Sixty hospitals participate in the system nationally; the computer based discharge abstracting system is designed to collect demographic, clinical, and administrative data on discharges and deaths from acute general hospitals. It is the only source of morbidity data available nationally for acute hospital services in Ireland. Linking the HIPE dataset with the patient administration system (PAS) permits application of routinely collected data for the purposes of research, planning, and quality control. Data collected include hospital number; patient’s name; dates of admission and discharge; date of birth; sex; area of residence by county; diagnosis—principal and up to nine additional secondary diagnoses; procedures—principal and up to nine additional secondary procedures; consultant responsible for care. The HIPE database of all coded diseases at time of discharge/death, together with procedures and investigations undertaken during the in-hospital stay was examined. Codes with less than 20 occurrences were not considered for analysis. Individual codes together with the combination of all related codes were evaluated.

Statistical methods

Descriptive analyses are presented in the form medians, interquartile range (IQR), and proportions. A categorical variable was computed for each patient based on whether they had a single or multiple admissions. Where there were multiple admissions, we examined the initial and first readmission, to see if each was under the care of the same consultant. As LOS was non-normal, associations were considered for analysis. Individual codes together with the combination of all related codes were evaluated.

RESULTS

Altogether 9204 episodes were recorded among 6968 patients admitted acutely via the emergency department in the 22 month study period, 1 January 2002 to 31 October 2003. The median age of admissions was 65.8 years (IQR 45.1–77.5); 10% of admissions were over 84 years. Less than half of patients (48.7%) were male. The median length of stay (LOS) was six days (IQR 2–12). Seven hundred and twenty-six episodes (8.0%) had a LOS >30 days. Patients were readmitted up to 28 times; 5662 patients (81.3%) had a single admission, 871 patients (12.5%) were admitted twice, 230 (3.3%) on three, 98 (1.4%) on four, and 54 (0.8%) on five occasions. A further 53 patients (0.8%) were admitted more than five times. Four patients (0.06%) were re-admitted 15 or more times.

Differences between consultant groups (LOS, re-admissions, and length stay patterns) (table 1)

The median LOS differed significantly (p < 0.0001) between the four consultant physician groups; LOS for GIM at five days (IQR 2.10) being lower than the other three groups at six days (IQR 2.12). For the 726 long stay patients with LOS >30 days, the frequency distribution differed significantly (p < 0.0001) between consultant groupings; compared with an 8.0% overall, GIM was lower and specialty higher. These results remained significant after adjusting for the number of comorbid diseases.

Consultant groups differed in re-admission rates (p = 0.003) over the 22 month period; compared with an overall re-admission frequency of 39%, respiratory consultants were higher (41.6%) and GIM lower (36.9%). Comparing patients on their first and subsequent re-admission, there was no difference between consultant groups (p = 0.425). The LOS for re-admissions was significantly shorter when readmitted under the GIM teams (p < 0.0001); compared with the overall median duration of six days (IQR 3.13) that for GIM was only five days (IQR 2.10). These results remained significant after adjusting for the number of comorbid diseases.

Patients were more likely to be re-admitted under the care of respiratory (30%) or GI (31.1%) consultants compared with specialty (18.8%) or GIM (22.3%) on the first readmission (p = 0.0003). Overall 25.5% of patients readmitted had the same consultant on both the initial and subsequent re-admission. The median (IQR) LOS between the same and different consultants at the first re-admission was seven days (4.16.5) and six days (2,11) respectively (p < 0.0001)—that is, re-admission under the same consultant resulted in a longer LOS on the second re-admission.

Resource utilisation between consultant groups (table 2)

There were some important differences between consultant teams in respect of resource utilisation. The use of oesophagogastroduodenoscopy (OGD) investigations was...
Do consultants differ?

The frequency with which hypertension (p = 0.0017), congestive heart failure (p = 0.001), any heart failure/left ventricular failure (LVF) (p = 0.0004), or atrial fibrillation (p = 0.0001) were coded, were significantly different between the four consultant groupings (Table 3). Hypertension was coded more frequently for patients admitted under specialty consultants. Heart failure was coded more frequently for patients cared for by GIM and respiratory consultants. Atrial fibrillation was coded more frequently by respiratory (9.4%) compared with GI (6.0%) consultants.

Respiratory disease codes
Pneumonia, a discharge code in 3.8% of patients, had similar discharge coding rates for all four groups. For any pneumonia diagnoses, and for any respiratory diagnosis, there were significant differences (p<0.0001) between consultant groups—being highest for respiratory (6.7% and 24.3% respectively) and lowest for GI (3.6% and 14.7%) respectively.

Gastrointestinal disease codes
Gastrointestinal codes included epigastic pain, gastritis, gastrointestinal haemorrhage, haematemesis, and peptic ulcer; considered together (5.4% of admissions) there were differences (p<0.001) for any GI coding between the groups. A GI code was more likely for GI consultants (7.5%), compared with respiratory (4.9%), specialty (4.2%), and GIM (5.2%) respectively. The alcohol related codes were alcohol withdrawal, alcohol abuse, alcoholic fatty liver, alcoholic gastritis.

### Table 2 Resource utilisation (% use among consultants)

<table>
<thead>
<tr>
<th>Variable</th>
<th>GI</th>
<th>Respiratory</th>
<th>Specialty</th>
<th>GIM</th>
<th>Total</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGD</td>
<td>11.1</td>
<td>3.5</td>
<td>4.4</td>
<td>3.6</td>
<td>5.7</td>
<td>&lt;0.0001 *</td>
</tr>
<tr>
<td>ERCP</td>
<td>7.4</td>
<td>0.1</td>
<td>0.6</td>
<td>0.1</td>
<td>2.1</td>
<td>&lt;0.0001 *</td>
</tr>
<tr>
<td>Cardiac</td>
<td>2.5</td>
<td>3.6</td>
<td>3.44</td>
<td>1.9</td>
<td>2.9</td>
<td>0.0019 *</td>
</tr>
<tr>
<td>Vascular</td>
<td>3.1</td>
<td>3.0</td>
<td>3.1</td>
<td>3.0</td>
<td>3.2</td>
<td>0.923</td>
</tr>
<tr>
<td>Abdomen</td>
<td>14.2</td>
<td>5.6</td>
<td>8.2</td>
<td>8.5</td>
<td>9.1</td>
<td>&lt;0.0001 *</td>
</tr>
<tr>
<td>Any CT</td>
<td>21.8</td>
<td>23.2</td>
<td>24.3</td>
<td>25.3</td>
<td>23.6</td>
<td>0.041</td>
</tr>
<tr>
<td>Brain</td>
<td>17.0</td>
<td>18.0</td>
<td>21.3</td>
<td>22.9</td>
<td>19.7</td>
<td>&lt;0.0001 *</td>
</tr>
<tr>
<td>Abdomen</td>
<td>4.2</td>
<td>2.6</td>
<td>1.9</td>
<td>1.45</td>
<td>2.6</td>
<td>&lt;0.0001 *</td>
</tr>
<tr>
<td>Thorax</td>
<td>1.3</td>
<td>4.7</td>
<td>2.1</td>
<td>1.45</td>
<td>2.4</td>
<td>&lt;0.0001 *</td>
</tr>
<tr>
<td>MRI spine</td>
<td>3.0</td>
<td>2.0</td>
<td>2.6</td>
<td>1.9</td>
<td>2.4</td>
<td>0.051</td>
</tr>
<tr>
<td>Pulmonary scan</td>
<td>2.5</td>
<td>2.7</td>
<td>2.4</td>
<td>2.2</td>
<td>2.5</td>
<td>0.68</td>
</tr>
<tr>
<td>Abdominal ultrasound</td>
<td>10.3</td>
<td>19.0</td>
<td>12.0</td>
<td>13.0</td>
<td>13.5</td>
<td>&lt;0.0001 *</td>
</tr>
</tbody>
</table>

OGD, oesophagogastroduodenoscopy; ERCP, endoscopic retrograde cholangiopancreatography. MRI, magnetic resonance imaging; CT, computed tomography. * Bonferroni corrections applied—comparisons with p<0.0038 are considered significant.

### Table 3 Diagnostic discharge codes by consultant group

<table>
<thead>
<tr>
<th>Discharge codes</th>
<th>GI</th>
<th>Respiratory</th>
<th>Specialty</th>
<th>GIM</th>
<th>Total</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any coronary code</td>
<td>7.3</td>
<td>9.7</td>
<td>9.2%</td>
<td>9.1</td>
<td>8.8</td>
<td>0.026</td>
</tr>
<tr>
<td>Chest pain</td>
<td>1.8</td>
<td>1.3</td>
<td>1.7</td>
<td>2.6</td>
<td>1.8</td>
<td>0.012</td>
</tr>
<tr>
<td>Hypertension</td>
<td>11.5</td>
<td>13.2</td>
<td>15.2</td>
<td>12.8</td>
<td>13.2</td>
<td>0.0017 *</td>
</tr>
<tr>
<td>Heart failure</td>
<td>5.0</td>
<td>7.5</td>
<td>6.5</td>
<td>7.6</td>
<td>6.6</td>
<td>0.001</td>
</tr>
<tr>
<td>Any CHF/LVF</td>
<td>5.9</td>
<td>8.6</td>
<td>7.3</td>
<td>9.0</td>
<td>7.7</td>
<td>0.001</td>
</tr>
<tr>
<td>Any stroke code</td>
<td>5.0</td>
<td>5.5</td>
<td>5.9</td>
<td>6.1</td>
<td>5.6</td>
<td>0.41</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>6.0</td>
<td>9.4</td>
<td>8.3</td>
<td>8.9</td>
<td>8.1</td>
<td>0.0001 *</td>
</tr>
<tr>
<td>UFI</td>
<td>4.1</td>
<td>4.7</td>
<td>4.1</td>
<td>4.0</td>
<td>4.2</td>
<td>0.65</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>3.0</td>
<td>4.2</td>
<td>4.0</td>
<td>4.2</td>
<td>3.8</td>
<td>0.0098</td>
</tr>
<tr>
<td>Any pneumonia</td>
<td>3.6</td>
<td>6.7</td>
<td>5.2</td>
<td>5.0</td>
<td>5.1</td>
<td>&lt;0.0001 *</td>
</tr>
<tr>
<td>Any respiratory disease</td>
<td>14.7</td>
<td>24.3</td>
<td>19.3</td>
<td>21.6</td>
<td>19.9</td>
<td>&lt;0.0001 *</td>
</tr>
<tr>
<td>Any gastrointestinal</td>
<td>7.5</td>
<td>4.9</td>
<td>4.2</td>
<td>5.2</td>
<td>5.4</td>
<td>&lt;0.0001 *</td>
</tr>
<tr>
<td>Any psychiatric code</td>
<td>5.2</td>
<td>6.4</td>
<td>6.6</td>
<td>6.7</td>
<td>6.2</td>
<td>0.133</td>
</tr>
<tr>
<td>Any alcohol code</td>
<td>7.8</td>
<td>5.2</td>
<td>4.9</td>
<td>6.1</td>
<td>6.0</td>
<td>&lt;0.0001 *</td>
</tr>
<tr>
<td>Seizure code</td>
<td>3.2</td>
<td>4.1</td>
<td>4.0</td>
<td>4.4</td>
<td>3.9</td>
<td>0.213</td>
</tr>
<tr>
<td>Any syncope code</td>
<td>3.6</td>
<td>3.7</td>
<td>4.4</td>
<td>4.5</td>
<td>4.0</td>
<td>0.265</td>
</tr>
<tr>
<td>Any neoplasm</td>
<td>6.3</td>
<td>11.3</td>
<td>4.7</td>
<td>4.5</td>
<td>4.7</td>
<td>&lt;0.0001 *</td>
</tr>
<tr>
<td>Any anaemia</td>
<td>3.5</td>
<td>2.4</td>
<td>3.5</td>
<td>3.2</td>
<td>3.2</td>
<td>0.093</td>
</tr>
<tr>
<td>Any diabetes</td>
<td>5.7</td>
<td>5.7</td>
<td>10.0</td>
<td>5.6</td>
<td>6.8</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

* Bonferroni corrections applied, comparisons with p<0.0026 are considered significant. † Total does not add up to 100% as some patients can have multiple discharge codes. CHF, congestive heart failure; LVF, left ventricular failure; UFI, urinary tract infection.
alcohol liver damage, alcohol cirrhosis of liver, and alcoholic hepatitis; considered together any alcohol related code (6.0% of admissions) differed (p<0.0001) between the groups. Any alcohol code was more likely for GI consultants (7.8%), compared with respiratory (5.2%), specialty (4.9%), and GIM (6.1%) respectively.

Other disease codes

Codes of patients presenting with “funny turns” included syncope, dizziness and giddiness; these were present in 4.0% of admissions and rates of discharge coding did not differ between the consultant groups. Similarly, patients with seizure codes, present in 3.9% of cases, were similar between groups. Anaemia related codes included iron deficiency anaemia non-specific, and anaemia non-specific present in 3.2% of admissions did not differ between groups. Diabetes related codes included diabetes mellitus (DM) type I uncomplicated and DM type II uncomplicated; these were present in 6.8% of admissions. There were highly significant differences (p<0.0001) in discharge coding of the latter related to consultant groups with higher rate for specialty (10.0%), compared with the other groups (5.7%). The overall reporting rate of any neoplasm at discharge was 6.7%; there were highly significant (p<0.0001) differences between discharge coding rates of GI (6.3%), specialty (4.7%), respiratory (11.3%), and GIM (4.5%) respectively.

**DISCUSSION**

In this study comparing differences between hospital consultants, all trained in acute general medicine, the median LOS for acute general medical admissions was shorter when the patient was admitted under GIM consultants, compared with other consultant groups. Both GIM and respiratory consultants were less likely to have long stay patients (>30 days). After discharge from hospital, consultant groups differed in re-admission rates, being higher for respiratory consultants. Overall, patients who were re-admitted under the same consultant had a longer LOS than those who were re-admitted under a different consultant. However, patients re-admitted to hospital had the shortest LOS under GIM consultants. Endoscopy and GI radiological investigations were used predominately by GI consultants, while CT thorax and echo procedures were used most by respiratory consultants. Overall, the most used CT procedure was CT brain, being used most by GIM and specialty consultants. Respiratory diagnoses, malignancy, and atrial fibrillation were diagnosed more frequently by respiratory consultants; GI diagnoses more by GI consultants; diabetes and hypertension more by specialty consultants; and heart failure more by GIM and respiratory consultants.

We linked the hospital PAS and HIPE dataset to define a clinically useful database relating to emergency admissions to the division of medicine. Analysis of such data requires information that is comprehensive, accurate, and timely. Given the costs associated with such data collection, there is considerable literature using these type of data, and supporting their use for research, planning, and monitoring purposes.

However, the fact that the coding is done with a supporting their use for research, planning, and monitoring considerable literature using these type of data, and information that is comprehensive, accurate, and timely. Analysis of such data requires

We used a validated method in adjusting for the differences in physicians’ LOS and readmission rate, with the frequency of comorbid diseases. Others have compared differences between physicians’ severity adjusted LOS, and how through counselling and monitoring individual physicians’ LOS may be reduced. Moreover, severity adjusted LOS provides a more accurate measure of LOS than unadjusted LOS, and the presence of comorbidity is significantly associated with longer LOS and hospital costs.

We found great variation in LOS, re-admission rates, resource use, and diagnostic coding among physician groups, but comparatively little information to relate these variations systematically to specific physician characteristics. Others have reported greater test use by physicians trained in more academically oriented medical schools compared with those trained in less academically oriented settings.

Differences between consultants’ practice can be expected as, while defined standards for the management of several diseases exist, there is often a lack of consensus or guideline approaching the investigation of a patient with a given constellation of symptoms and signs. For those instances in which guidelines do exist, a decision to investigate beyond these may be taken either in response to additional findings, increasing demand for care, fear of litigation, ease of investigation availability, and the urge to make use of new technology. While it has been suggested that physicians overuse investigations in clinical practice without an associated increase in health status, it is generally accepted that before performing any test, the cost-benefit ratio is evaluated in each clinical situation, and if a diagnostic test is unlikely to change the patient’s management, then the test should not be ordered.

Standardised protocols and guidelines are therefore needed to formalise optimal practice in medical test ordering.

A study of emergency admissions under different consultant groups found that almost half of the acute in-patient bed days were inappropriate for acute care. Importantly, if discharge decisions are only made at the consultants’ ward round, then the frequency of these ward rounds can influence LOS. However, one of the main contributors towards prolonged LOS is discharge delay pending placement into residential care or the provision of community support services. Early and frequent input from the social work department shortened LOS in a group of frail elderly patients requiring social care provision. Organisational strategy therefore seems to be an important potential tool for tackling the resource crisis, and underlines the effectiveness of a well coordinated multidisciplinary team. After discharge from hospital, high re-admission rates are sometimes considered to be the price for shorter inpatient stays among different consultant groups.

Moreover, from a financial standpoint, re-admissions entail returns for the most expensive types of health services, acute inpatient care. However, it is generally accepted that many re-admissions may not be preventable, representing fresh events in patients with chronic illnesses and frequent comorbidity.

A study of acute hospital admissions for end stage liver disease found that patients admitted under the care of a consultant gastroenterologist had a significantly shorter LOS (four compared with five days) and had less mortality, compared with patients admitted under the care of a non-gastroenterologist. This difference persisted after adjustment for patients’ age, morbidity, and number of procedures performed. Furthermore, costs of care were not significantly
different between physician groups.44 A further study of 124 patients admitted acutely to hospital with upper gastrointestinal haemorrhage found that the median LOS for patients admitted under the GI service was significantly shorter (two compared with four days), and hospitalisation costs lower, than for patients admitted under the care of other physicians.45

It has been shown that patients hospitalised with acute heart failure under the care of cardiologists are more likely to undergo invasive procedures such as right heart catheterisation or cardiac catheterisation, than patients admitted under the care of general physicians.11 However, at 30 days there was no difference in adjusted survival between the groups.5 Similarly, others found that patients admitted with acute heart failure under the care of a cardiologist, had longer LOS and more invasive procedures, but were less likely to be readmitted with heart failure within six months compared with those admitted under the care of a general physician.12 Therefore, the implications for costs and survival differences among patients with congestive heart failure managed by cardiologists or general physicians require further study to understand how to best optimise care for these patients.

A study of 866 adults with severe COPD, including patients ventilated in an intensive care unit setting, found no difference in resource utilisation, hospital costs, or mortality whether treated by respiratory physicians or GIM physicians.24 Similar results were found for ambulatory patients with COPD.25 A possible explanation for the lack of association between physician specialty and resource use or survival is that patients may have received similar treatment as a result of uniform practice protocols or guidelines. Moreover, as the choice of treatments for COPD is limited, differences in the type of care may not have led to differences in survival or hospital costs. Similarly, in a study of 260 patients admitted to hospital with diabetic ketoacidosis (DKA), after adjusting for case mix and severity of DKA, there was no difference in the LOS or diabetes related complications in those patients treated by endocrinologists compared with those treated by general physicians.12 However, the endocrinologist treated group had a lower readmission rate for DKA than the general physician treated group.26

There is growing evidence that, compared with specialists, hospitalist grade physicians can shorten the LOS and decrease inpatient costs while maintaining the quality of patient care.44 Because the hospitalist model may offer a partial solution to the inflationary rise in hospital costs, it is being routinely considered as a model for teaching hospitals, and has prompted comparisons of outcomes and costs of generalist compared with specialist care. However, it should be emphasised that potential negative effects of the hospitalist model include depletion of the specialist workforce, de-skilling of other physicians, and physician burnout, making it unlikely to be an attractive long term career option.

In our study we found that the HIPE database was very powerful in predicting differences between hospital consultants in LOS, re-admission rates, resource use, and disease coding. We found little information to relate these differences to specific physician groups. Variations between consultants’ practice may reflect a genuine special interest bias, or absence of definitive guidelines for the management of common acute medical conditions. It would be of interest to examine the extent to which protocols and guidelines could reduce such variations.

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REFERENCES


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A 18 year old woman presented with a two month history of headache and two episodes of seizures in the past. On examination, she was afebrile, had no focal signs and no neurological deficit.

Computed tomography showed multiple intracranial hyperdense focii (calcifications), seen diffusely distributed in both the cerebral and cerebellar hemispheres (fig 1). No evidence of any perilesional oedema or midline shift was seen. These widespread intra-parenchymal calcifications, giving a starry sky appearance on computed tomography are consistent with a diagnosis of neurocysticercosis.

Cysticercosis is the most common parasitic disease involving the brain. It is seen in both immuno-suppressed and immuno-competent people from endemic regions. It is caused by ingesting the ova of the pork tapeworm (*Taenia solium*), through unwashed fecally contaminated vegetables or water. Humans are the intermediate hosts of *Taenia solium*. The location of involvement in brain can be parenchymal, intra-ventricular, or meningo-basal. The diagnosis of cysticercosis is based on clinical, radiological, and serological indicators. Treatment is mostly medical (praziquantel), however surgical treatment may be required if ventricular obstruction is present.