The impact of weekends on outcome for emergency patients

L Schmulewitz, A Proudfoot and D Bell

ABSTRACT - Levels of staffing and access to diagnostics at weekends are recognised to be significantly lower than on weekdays. It is unclear if subsequent inpatient mortality and readmission rates for acute medical admissions are increased for weekend admissions compared to those on a weekday. A large Canadian study demonstrated increased weekend mortality but does the Edinburgh healthcare model support these findings? This study analysed all hospital admissions in 2001 to the Royal Infirmary of Edinburgh for six predetermined diagnoses (total 3,244): chronic obstructive pulmonary disease, cerebrovascular accidents, pulmonary embolism, pneumonia, collapse and upper gastrointestinal bleed. We compared hospital mortality rates, readmission rates and hospital length of stay for weekend admissions as compared to those on a weekday. Weekend admission was not associated with significantly higher in-hospital mortality, readmission rates or increased length of stay compared to the weekday equivalent for any of the six conditions. The implementation of an acute medical admissions unit in the Royal Infirmary of Edinburgh, with consistent staffing levels and 24-hour access to diagnostics for the early phase of critical illness, may have helped address the discrepancy in care suggested by previous studies.

KEY WORDS: hospital mortality, length of stay, levels of staffing, medical admissions units, outcome assessment, readmission rates, weekday admission, weekend admission

Within the health service, levels of staffing and access to diagnostics at weekends are recognised to be significantly lower than on weekdays. Working at the weekend is unpopular and those who do often have less seniority and experience compared to their weekday counterparts. There are few data investigating this 'weekend phenomenon' or the impact of these staffing disparities on subsequent patient mortality and morbidity. Moreover, while there have been multiple previous studies examining in-hospital mortality amongst surgical patients, few data exist regarding mortality and morbidity of acute medical admissions. A recent British study found that weekend admission to the surgical intensive care unit (ICU) was associated with an increased hospital mortality rate, although this disparity was not reproduced for weekend admissions to the medical ICU.¹

Of the few analyses to date regarding in-hospital mortality for weekend medical admissions as compared to those admitted on weekdays, studies in the USA and Canada have shown that for a number of predetermined emergency conditions, including ruptured aortic aneurysms, acute epiglottitis and pulmonary embolism, risk adjusted mortality is both significantly and generally increased for the weekend groups.²⁻⁴ Other international studies have found higher mortality rates among infants born at weekends^{5,6} and acute myocardial infarctions admitted on Saturdays and Sundays.⁷ These studies have suggested that this difference is not explained by any greater severity of illness in patients presenting at the weekend. A 2003 study of deaths after emergency medical admission showed that the major shortfalls of care occurred in those admitted at night and included delay in both seeing doctors and initiating investigations in treatment.8 The analyses have also demonstrated an increased length of inpatient stay for weekend medical admissions for certain conditions including syncope, pneumonia and upper gastrointestinal bleeds.^{4,9,10}

We conducted a study of admissions for six predetermined common medical emergencies to the medical assessment unit (MAU) at the Royal Infirmary of Edinburgh over a 1-year period, to examine whether the British healthcare model supported these findings.

data collection and

procedure

Methodology

Data collection

We identified all hospital admissions to the Royal Infirmary of Edinburgh between 1 January 2001 and 31 December 2001 via the Lothian NHS Trust (PAS) database. From these, consecutive patients with the six preselected conditions were extracted according to the diagnostic code in the *International classification of diseases, tenth revision* (ICD-10) detailed as the primary reason for their hospital admission.

These patients were then identified according to

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the day of the week when they were admitted. 'Weekend' was defined as the period from midnight on Friday to midnight on Sunday, in line with hospital admission dataset statistics. This is also the timeframe used by the Canadian study² and so was utilised in this analysis for comparative purposes. Public holidays were incorporated within the weekend groupings. Further data extracted included age and gender of the patients, the course and length of their hospital stay, discharge data regardless of whether they died in hospital, were discharged home or transferred to another facility within the Trust, and details of readmission within 6 months of discharge date. We maintained the confidentiality of the study data.

conditions

Preselected conditions

The conditions selected were common emergency conditions that are treatable, cared for in clinical settings other than a critical care unit or emergency department, and in which early management in hospital may be expected to influence outcome. The six chosen conditions were:

Table 1. Numbers of emergency admissions and characteristics of patients admitted on weekdays and weekends.

Condition	Characteristic	Weekday admissions	Weekend admissions
All conditions	Total – n (%) Female – n (%)	2,306 (71.1) 1,058 (45.9)	938 (28.9) 464 (49.5)
	Age (years) – mean (SD) ≤54 – n (%)	67.4 (16.8) 453 (19.6)	68.5 (17.1) 170 (18.1)
	55 – 69	611 (26.5)	222 (23.7)
	70 – 79 ≥80	672 (29.1) 570 (24.7)	273 (29.1) 273 (29.1)
COPD	Total – n (%)	595 (72.4)	226 (27.6)
	Female – n (%)	298 (50.1)	125 (55.3)
	Age (years) – mean (SD)	70.6 (9.9)	71.2 (9.3)
CVA	Total – n (%)	342 (65.3)	182 (34.7)
	Female – n (%)	176 (51.5)	91 (50.0)
	Age (years) – mean (SD)	74.2 (11.0)	76.1 (11.3)
PE	Total – N (%)	112 (81.8)	25 (18.2)
	Female – N (%)	54 (48.2)	15 (60.0)
	Age (years) – mean (SD)	59.6 (18.0)	59.0 (17.5)
Pneumonia	Total – n (%)	408 (72.7)	153 (27.3)
	Female – n (%)	173 (42.4)	76 (49.7)
	Age (years) – mean (SD)	65.7 (18.9)	65.3 (18.9)
Collapse	Total – n (%)	409 (66.3)	208 (33.7)
	Female – n (%)	195 (47.7)	104 (50.0)
	Age (years) – mean (SD)	67.0 (20.1)	68.9 (20.2)
UGIB	Total – n (%)	440 (75.3)	144 (24.7)
	Female – n (%)	162 (36.8)	53 (36.8)
	Age (years) – mean (SD)	61.5 (19.1)	59.0 (19.7)

COPD = chronic obstructive pulmonary disease; CVA = cerebrovascular accidents;

PE = pulmonary embolism; UGIB = upper gastrointestinal bleeds.

- 1 cerebrovascular accidents (CVAs) (excluding subarachnoid haemorrhage, non-traumatic subdural haemorrhage and non-traumatic extradural haemorrhage)
- 2 chronic obstructive pulmonary disease (COPD), including bronchitis and emphysema
- 3 pneumonia (all causes)
- 4 pulmonary embolism (PE)
- 5 syncope and collapse
- 6 upper gastrointestinal bleeds (UGIB)

Chest pain was excluded because it can incorporate a number of different conditions and is often cared for within the specialised cardiac care unit setting.

analysis (measurement)

Statistical analyses

We compared the in-hospital mortality rates (for both total length of stay and early mortality within 2 days of admission), readmission rates within 6 months of discharge and <u>hospital</u> length of stay, for patients admitted at a weekend with those of

> weekday admissions. <u>Relationships between day of</u> <u>admission and mortality and readmission were</u> <u>determined using logistic regression</u>. To assess for statistical significance, differences are expressed as odds ratios, both unadjusted and adjusted for age and sex, for patients admitted at a weekend compared to those admitted on a weekday, with 95% confidence intervals (CI). We did not adjust data for severity of illness on admission although we did subsequently look for information on those admissions that had passed through high dependency unit (HDU) and ICU settings.

Results

Among the six diagnoses of interest, there were 3,244 emergency admissions to the Royal Infirmary of Edinburgh during the 1-year study period: 2,306 (71.1%) were on a weekday and 938 (28.9%) at a weekend or public holiday. The main diagnoses were COPD, representing 25.3% of the total admissions, CVA (16.2%), PE (4.2%), pneumonia (17.3%), collapse/syncope (19.0%) and UGIB (18.0%). A breakdown by disease and admission day is shown in Table 1. Mean age on admission was 67.7 years ranging from 13 to 102 years. There were no differences in baseline characteristics between patients admitted on weekdays and those admitted at weekends (Table 1).

Mortality

A total of 332 (10.2%) patients died in hospital, 91 (2.8%) of these within 2 days of admission. For the 561 patients admitted with pneumonia, the mortality rate was significantly lower for those