

FIG 6—Readmission rates at 28 days directly standardised for age group and sex for three districts by acute specialty, 1988 (standard differs for each specialty). Bars are 95% confidence intervals

Readmission rate at 28 days for general surgery directly standardised for age group and sex by consultant in district A, 1988

	Standardised readmission rate	No of readmissions	95% Confidence interval
Consultant 1	69	23	36 to 135
Consultant 2	113	65	60 to 213
Consultant 3	104	78	62 to 177
Consultant 4	107	24	39 to 296
All	100	190	

rates that we found must reflect different readmission thresholds. The propensity to readmit might be predicted to correspond with increasing age and the perceived frailty of patients in older age groups. But the difference relating to sex remains more difficult to interpret.

There were appreciable differences among the readmission rates in different specialties with those in surgical specialties being lower than in medical specialties (for example, general surgery 4.1% *v* geriatric medicine 15.1%). This finding fits with known differences of case mix and severity. General medical patients commonly have more than one illness or problem and have more chronic conditions, both of which might result in an increased likelihood of readmission. The readmission rates at 28 days are similar to those found in the Oxford record linkage

study.<sup>5</sup> Surprisingly, for each specialty the differences in readmission rates among districts were not significant once the rates were standardised for age and sex. This suggests that reliable annual comparisons between districts will require data aggregated from more than one specialty. Furthermore, it should be remembered that similar specialties in different districts are liable to have differences of case mix and severity that systematically affect the readmission rates. This effect was not examined here but will need to be considered if rates are to be compared reliably. Differences among readmission rates for individual consultants within the same specialty over a year are likely to be based on too few events to allow reliable comparisons. Data aggregated over several years would give larger numbers for comparison but would result in less timely feedback and mask short term trends.

To summarise, although certain difficulties were encountered, readmission rates may be measured with routinely collected health service data. They require standardisation for age and sex as readmission is more likely in male patients and in older age groups. Readmission rates showed a decay pattern with time that was specialty specific; surgical readmission rates were lower than medical readmission rates. Statistically valid annual comparisons of readmission rates may be made among districts only for combinations of specialties. Routine comparisons at the level of individual consultants or specialties, however attractive, are inadvisable.

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## Are readmissions avoidable?

Aileen Clarke

### Abstract

**Objective**—To examine the possible use of readmission rates as an outcome indicator of hospital inpatient care by investigating avoidability of unplanned readmissions within 28 days of discharge.

**Design**—Retrospective analysis of a stratified random sample of case notes of patients with an unplanned readmission between July 1987 and June 1988 by nine clinical assessors (263 assessments) and categorisation of the readmission as avoidable, unavoidable, or unclassifiable.

**Setting**—District in North East Thames region.

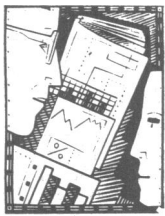
481 General medical, geriatric, and general surgical inpatients with a readmission at 0-6 days or 21-27 days after the first (index) discharge between July 1987 and June 1988 from whom 100 case notes were selected randomly and of which 74 were available for study.

**Main outcome measures**—Assessment of readmissions as avoidable, unavoidable, unclassifiable, variability of assessment within cases and variability among assessors according to specialty and duration to readmission.

**Results**—General medical and geriatric readmis-

Health Service Research Unit, London School of Hygiene and Tropical Medicine, London WC1E 7HT  
Aileen Clarke, MRCP, senior registrar

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sions and surgical readmissions at 0-6 days after discharge were more likely to be assessed as avoidable than those at 21-27 days (medical readmissions 32 v 6%, surgical admissions 49 v 19%). General surgical readmissions were significantly more frequently assessed as avoidable than general medical and geriatric readmissions. The extent of agreement between doctors varied, with general medical and geriatric readmissions at 21-27 days after first discharge causing the greatest variability of judgment.

**Conclusions**—Differences were apparent in the extent of avoidability of readmissions in different groups of admissions. However, assessors rated only 49.3% of the group with the highest proportion of avoidable admissions (surgical readmissions at 0-6 days) as avoidable. The remainder were thought to be unavoidable except for 2%, which could not be classified. The use of readmission rates as an outcome indicator of hospital inpatient care should be avoided.

### Introduction

If readmission rates are to be used as an outcome indicator it is necessary to show that a high proportion of readmissions would have been avoidable if a better quality of hospital care had been received. Various authors have attempted to measure avoidability of readmissions (table I). Eleven per cent of medical and surgical readmissions,<sup>1</sup> 48% of geriatric readmissions,<sup>2</sup> and up to 77% of surgical readmissions after hysterectomy<sup>3</sup> were considered avoidable. However, variable definitions for readmission were used, and the differing results are not surprising.

This study concerns unplanned readmissions to hospital at fewer than 28 days after an index discharge. (The basis for this definition is explained in the previous paper.<sup>6</sup>)

### Methods

The study was performed in an outer London district in North East Thames region. The Körner reporting system was used to generate a list of case note numbers of general medical, geriatric, and general surgical patients who had an unplanned readmission between July 1987 and June 1988 after a planned or unplanned first admission. A random sample of 100 case note numbers was selected from a sampling frame of 481 patients with unplanned readmissions that occurred at 0-6 days or 21-27 days after discharge in the selected specialties; case notes for general medical and geriatric patients were selected and analysed together (table II). Those parts of the case notes relating to both admissions were copied and the identity of the patient and his or her clinical attendants were masked. The copies were circulated to teams of assessors, who were asked to assess the avoidability of the second admission with respect to the hospital care given in the first admission. The teams included senior and junior general surgeons, general physicians, and public health physicians, and there were five medical and four surgical assessors. They were asked to classify the readmissions as avoidable, unavoidable, and unclassifiable according to a classification scheme provided to

TABLE I—Summary of avoidable readmissions in five studies

Study	Category of patients	Follow up	No of readmissions	% Avoidable readmissions*
Graham and Livesley <sup>1</sup>	Elderly	1 Year	153	48
McInnes <i>et al</i> <sup>2</sup>	Elderly	4 Months	153	30
Popplewell <i>et al</i> <sup>3</sup>	General medical	Up to 2 months	73	18
McDowell <i>et al</i> <sup>4</sup>	Medical and surgical	3 Months	78	11
Roos <i>et al</i> <sup>5</sup>	After hysterectomy	1 Month	199	77

\*Not common method for assessing avoidability.

TABLE II—Case notes of patients studied according to specialty and duration to readmission after discharge

Duration to readmission after discharge (days)	Sampling frame	No of case notes selected	No of case notes available
<i>General medical and geriatric patients</i>			
0-6	207	25	18
21-27	166	25	19
<i>Surgical patients</i>			
0-6	60	25	19
21-27	48	25	18
Total	481	100	74

TABLE III—Assessments of avoidability of readmission according to specialty and duration to readmission after discharge

Duration to readmission after discharge (days)	% Avoidable readmissions	No of assessments	95% Confidence interval
<i>General medical and geriatric patients</i>			
0-6	31.5	54	19.1 to 43.9
21-27	6.3	84	1.0 to 11.7
Total	16.5	133	10.9 to 22.8
<i>Surgical patients</i>			
0-6	49.3	67	37.3 to 61.3
21-27	19.0	63	9.3 to 28.7
Total	34.6	130	26.4 to 42.8

help their decisions (box). The assessments were performed individually. All of the available sample was seen by two assessors, and half of the sample was seen by four assessors or more.

### Analysis

The avoidability of readmissions at 0-6 days after discharge was compared with that of readmissions at 21-27 days, and 95% confidence intervals were calculated for the proportions of avoidable readmissions with the binomial approximation to the normal distribution. Avoidability of readmissions in general medical and geriatric patients was compared with that in surgical patients, and variability within cases and among observers in assessing avoidability was analysed.

### Results and discussion

Of the sample of 100 case notes, 74 were available for further investigation (table II) and 263 assessments were made of them. In all, 259 (98%) of the assessments classified cases as avoidable or unavoidable, with the remainder (four assessments) being unclassified.

#### Classification scheme for assessing readmissions\*

##### Unavoidable

—Chronic or relapsing disorder; care at home desirable if possible. Unavoidable complication

—Readmission for social or psychological reason. Reasons probably beyond control of hospital services (may include compliance)

—Completely different diagnosis from previous admission.

##### Avoidable

—Recurrence or continuation of disorder leading to first admission

—Recognised avoidable complication

—Readmission for social or psychological reason. Reasons probably within control of hospital services (may include compliance).

##### Unclassifiable

\*Derived in part from Graham and Livesley<sup>1</sup>

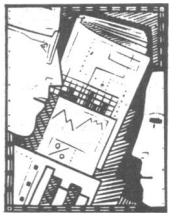


TABLE IV—Assessment of avoidability of readmission in six patients

Case No	Age/sex	Duration to readmission after discharge	Diagnosis		Overall assessment	Comment
			At first admission	At second admission		
1	65 F	4 days	Ischaemic heart disease, chest infection, and untreated hypothyroidism	Congestive heart failure	Avoidable	Readmission probably avoidable if hypothyroidism had been treated
2	74 M	2 days	Subendocardial infarct. Serious aortic stenosis	Collapse	Mixed	?Calculated risk. Assessed as "well today" by discharging doctor
3	23 M	6 days	Removal of anal warts and warts in groin	Wound infection	Avoidable	Mixture of "clean" and "dirty" surgery, but two anaesthetic procedures avoided
4	61 F	1 day	Cholecystectomy repair. Fever on discharge. Instructed to return if unwell	Probable chest infection	Mixed	Disagreement among assessors whether calculated risk was acceptable or unacceptable
5	42 M	26 days	Carcinoma oesophagus for dilatation	Jaundice, carcinoma oesophagus	Unavoidable	Recognised unavoidable complication
6	11 M	23 days	Right ischio-rectal abscess. No underlying cause found	Left ischio-rectal abscess	Unavoidable	Unlucky

TABLE V—Variability of assessment within cases (n=74) according to intraclass correlation coefficient

Duration to readmission after discharge (days)	Intraclass correlation coefficient	F value	p Value
<i>General medical and geriatric patients</i>			
0-6	0.48	F17,30=3.43	<0.05
21-27	0.07	F18,61=1.35	NS
<i>Surgical patients</i>			
0-6	0.15	F18,47=1.62	<0.1
21-27	0.55	F17,44=5.53	<0.05

Table III shows the results of the assessments of avoidability of readmissions at 0-6 days and 21-27 days after discharge and table IV gives examples of details of some cases and the assessments of avoidability. The extent to which the same cases were judged differently by different assessors was examined with intraclass correlation coefficients (table V),<sup>7</sup> which are of value when there is a different number of assessors per case. Higher values indicate a greater degree of agreement. Variability among observers was measured with  $\chi^2$  tests (table VI), the lower the value the greater the agreement.

The assessors identified "calculated risk" as an important cause for readmission and suggested that patients were commonly allowed home early to see whether they would manage, having been told of any complications to be aware of.

Of the 100 case notes selected for study seven were found to have been miscoded because they did not refer to a readmission, the patient was from the wrong specialty, or transfer of a patient had been wrongly coded as a readmission. This underlines the fact that use of readmission rates as an outcome indicator will partly reflect differences in the quality of data collection among different districts.

The assessors found surgical readmissions significantly more avoidable than medical readmissions, confirming previous research. Further, readmissions within 0-6 days were found to be significantly more avoidable than those within 20-27 days. Although such a finding might be predicted, it has not previously been reported. The extent of agreement between assessors varied, with readmissions of medical patients at 21-27 days after discharge causing the most disagreement. This might be predicted: the presence of multiple

conditions is common in general medical and geriatric patients and is likely to make the reasons for readmission at up to a month after discharge from hospital difficult to disentangle. The category "unclassifiable" was seldom used, suggesting that mostly assessors were able to rate a readmission according to its avoidability. However, the number of avoidable readmissions found was lower than in some other studies<sup>8</sup> and might have been increased by using more independent assessors.

The pattern of hospital care is changing<sup>8</sup> with a good use of hospital beds entailing shorter length of stay and a recognition of the ability of patients to care for themselves. In the district studied, as elsewhere, clinicians are apparently starting to encourage responsibility and self care by allowing patients home earlier than they might otherwise have done, on condition that they return if their condition deteriorates. This practice raises the rate of unplanned readmissions and would be much less used if readmission rate were introduced as an indicator of outcome.

The few avoidable readmissions found, even in early surgical readmissions, suggests that trying to reduce a readmission rate by improving the standard of care given may have little effect. The findings suggest that the use of readmission rate as an outcome indicator of hospital inpatient care should be avoided.

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TABLE VI—Variability of assessments of readmissions among assessors

Duration to readmission after discharge (days)	$\chi^2$ Value	p Value
<i>General medical and geriatric patients</i>		
0-6	$\chi^2_{2,1}=9.98$	<0.05
21-27	$\chi^2_{2,4}=10.76$	<0.05
<i>Surgical patients</i>		
0-6	$\chi^2_{2,3}=9.82$	<0.05
21-27	$\chi^2_{2,3}=2.6$	NS