

# Appropriateness of Admissions and Discharges among Readmitted Patients

*Robert L. Ludke, N. Martin MacDowell,  
Brenda M. Booth, and S. Ann Hunter*

*This study examined the relationships between appropriateness of readmission within two weeks of discharge and appropriateness of previous admission and discharge, bed section, type of readmission, and patient demographic, medical condition, and hospital stay characteristics. Using the Department of Veterans Affairs (VA) Patient Treatment File and medical records, 445 readmissions to a highly affiliated midwestern VA Medical Center in fiscal year 1984 were examined. Appropriateness was determined by four trained medical record abstractors using InterQual admission and discharge standards. Type of readmission was based on a pilot-tested flowchart. Appropriateness of readmission was significantly associated with that of the previous admission and discharge, with the relationship varying by admission, discharge, and readmission bed sections. Reasons for inappropriate admissions, discharges, and readmissions also varied by bed section. For the majority of inappropriate readmissions, there was clear written evidence in the medical record during the previous hospital stay that the patient was directed to*

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Research was funded by the Department of Veterans Affairs Iowa Health Services Research and Development (HSR&D) Field Program. Statements contained in this article are solely those of the authors and do not necessarily reflect the views or policies of the Department of Veterans Affairs, the Iowa City Department of Veterans Affairs Medical Center, or the Iowa HSR&D Field Program.

Address correspondence and requests for reprints to Robert L. Ludke, Ph.D., Acting Director, Center for Health Services Research, The University of Iowa, S-517 Westlawn, Iowa City, Iowa 52242. Dr. Ludke was Director of the Iowa HSR&D Field Program, Department of Veterans Affairs (VA) Medical Center, Iowa City, Iowa, and is currently Acting Director, Center for Health Services Research, The University of Iowa, Iowa City, Iowa, and Associate Professor, Graduate Program in Hospital and Health Administration, The University of Iowa. N. Martin MacDowell, Dr.P.H. is Assistant Professor, Program in Health Planning/Administration, School of Planning, University of Cincinnati, Cincinnati, OH. Brenda M. Booth, M.S. is Acting Director, Iowa HSR&D Field Program and Assistant Research Scientist, Center for Health Services Research. S. Ann Hunter, R.N., M.A. is Quality Management Specialist, Iowa City VA Medical Center.

*return for readmission. Inappropriate readmissions were more likely than appropriate readmissions to have a primary diagnosis of neoplasm or digestive disorder. These results indicate the importance of examining both the operational efficiencies during the previous admission and the clinical criteria for admitting, discharging, and readmitting patients in assessing the appropriateness of readmissions.*

With implementation of the Medicare prospective payment system (PPS) and the Department of Veterans Affairs (VA) diagnosis-related group-based resource allocation methodology (RAM), considerable attention is being focused on reducing utilization of expensive hospital inpatient services while maintaining high-quality care. An issue of particular interest is hospital readmissions, i.e., admission of a patient after a previous hospital discharge. Both the Medicare PPS and VA RAM provide financial incentives to reduce patient length of stay, thereby potentially increasing the risk of readmission. Hospital readmissions, which have been found to occur relatively frequently, consume a substantial proportion of increasingly scarce health care resources (Anderson and Steinberg 1984; Zook and Moore 1980; Zook, Savickis, and Moore 1980; Graham and Livesley 1983).

A readmission shortly after discharge may be an indicator of problems in quality of care or operational efficiency that result in inappropriate use of resources. Therefore, the peer review organizations established under the Medicare PPS, as well as the VA occurrence screening program (Veterans Administration 1988), have the mandate to review readmissions within two weeks of discharge for appropriateness. When a patient is readmitted to a hospital within such a short time period, the necessity of the readmission and appropriateness of the previous discharge may be frequently questioned. Seldom, if ever, are questions raised about the appropriateness of the initial admission. However, situations may exist in which a readmission could have been avoided through more appropriate practices at the initial admission.

This study examined the appropriateness of readmissions within two weeks of discharge from the medical and surgical bed sections of a highly affiliated midwestern VA medical center (VAMC) and the relationships between appropriateness of readmission and the previous hospital stay. A pilot study conducted by three of the authors (MacDowell, Hunter, and Ludke 1985) found that 30 percent of admissions to the medical and surgical bed sections of the study VAMC had been discharged during the previous three months, with 49 percent of these readmissions occurring within two weeks. Of those patients discharged

during the previous two weeks, 58 percent were planned readmissions, that is, clear written evidence in the medical record during the previous hospital stay indicated that the patient was directed to return for readmission.

## METHODOLOGY

### DATA BASE

A total of 694 medical and surgical readmissions within two weeks of a previous hospitalization during fiscal year 1984 (October 1, 1983 through September 30, 1984) were identified by accessing the study VAMC's patient treatment file (PTF) data base stored on-line at the VA's data processing center in Austin, Texas. These readmissions constituted about 10 percent of the 6,743 medical and surgical discharges from the VAMC during the fiscal year. The patient's social security number and dates of admission and discharge for each hospitalization were obtained from the PTF to locate the patient's medical record. Admission, discharge, and readmission bed sections as well as patient demographic data such as age, race, marital status, and zip code were also recorded.

Seventy-seven (11 percent) of the medical records were unavailable due to patient transfers to other medical centers. A single patient medical record is used in the VA system and follows the patient between facilities. The data base was further reduced to eliminate dependencies among observations due to multiple readmissions by including only the first readmission for 91 patients with multiple readmissions in fiscal year 1984. Also, 26 readmissions in the first quarter of fiscal year 1984 were removed because the patient had been admitted to the VAMC within the three months at the end of fiscal year 1983, that is, the initial admission in fiscal year 1984 was actually a readmission. Of the remaining 467 readmissions, 22 were missing the previous admission bed-section designation in the PTF and thus were eliminated from the data base. Analyses of these 22 cases indicated that the distributions of inappropriate readmissions by readmission bed section were similar to those of the remaining 445 readmissions; thus, their elimination did not appear to bias the results, and the final data base for purposes of analysis consisted of 445 readmissions (64 percent of the readmissions initially identified).

Four trained abstractors (one registered nurse, two graduate nurses, and a medical records specialist) reviewed information in the

medical records pertaining to the previous admission, previous discharge, and readmission. Based on this information, they assessed the appropriateness of each event, documented the reasons for any inappropriate events, and classified the type of readmission. The abstractors also identified the primary diagnosis at admission and readmission.

Random samples of 80 and 82 readmissions were selected without replacement to measure the intra- and interrater reliability of the abstractors, respectively. Based on these samples, kappa statistic values within and among abstractors were calculated for the abstracted variables (Fleiss 1981). In general, the intra- and interrater reliabilities were high, with the interrater reliabilities a little less than the intrarater reliabilities, as expected (Table 1). With the exception of the variable "appropriateness of previous discharge," the kappa values for intrarater and interrater agreement were equal to or greater than .85, an "almost perfect" measure of agreement (Landis and Koch 1977). The kappa values for intrarater and interrater agreement for the decision on the appropriateness of the previous discharge were .83 and .77, indicating "substantial" agreement. The slightly lower values for the appropriateness of previous discharge decisions are probably due to the difficulties of applying the InterQual discharge criteria as discussed below. There appeared to be no consistent trend in the observed disagreements within and among abstractors, suggesting that disagreements were probably random.

#### APPROPRIATENESS OF ADMISSION, DISCHARGE, AND READMISSION

Appropriateness of the previous admission, previous discharge, and readmission were determined by the abstractors from the medical record using the InterQual admission and discharge standards (Jacobs and Lamprey 1979). Used throughout the United States for assessing hospital utilization, the standards incorporate screens for intensity of

Table 1: Kappa Statistic Values for the Intra- and Interrater Reliability of the Medical Record Abstraction

<i>Variable</i>	<i>Intrarater Reliability (N = 82)</i>	<i>Interrater Reliability (N = 80)</i>
Classification of reason for readmission	0.89	0.85
Appropriateness of previous admission	0.91	0.88
Appropriateness of previous discharge	0.83	0.77
Appropriateness of readmission	0.87	0.88

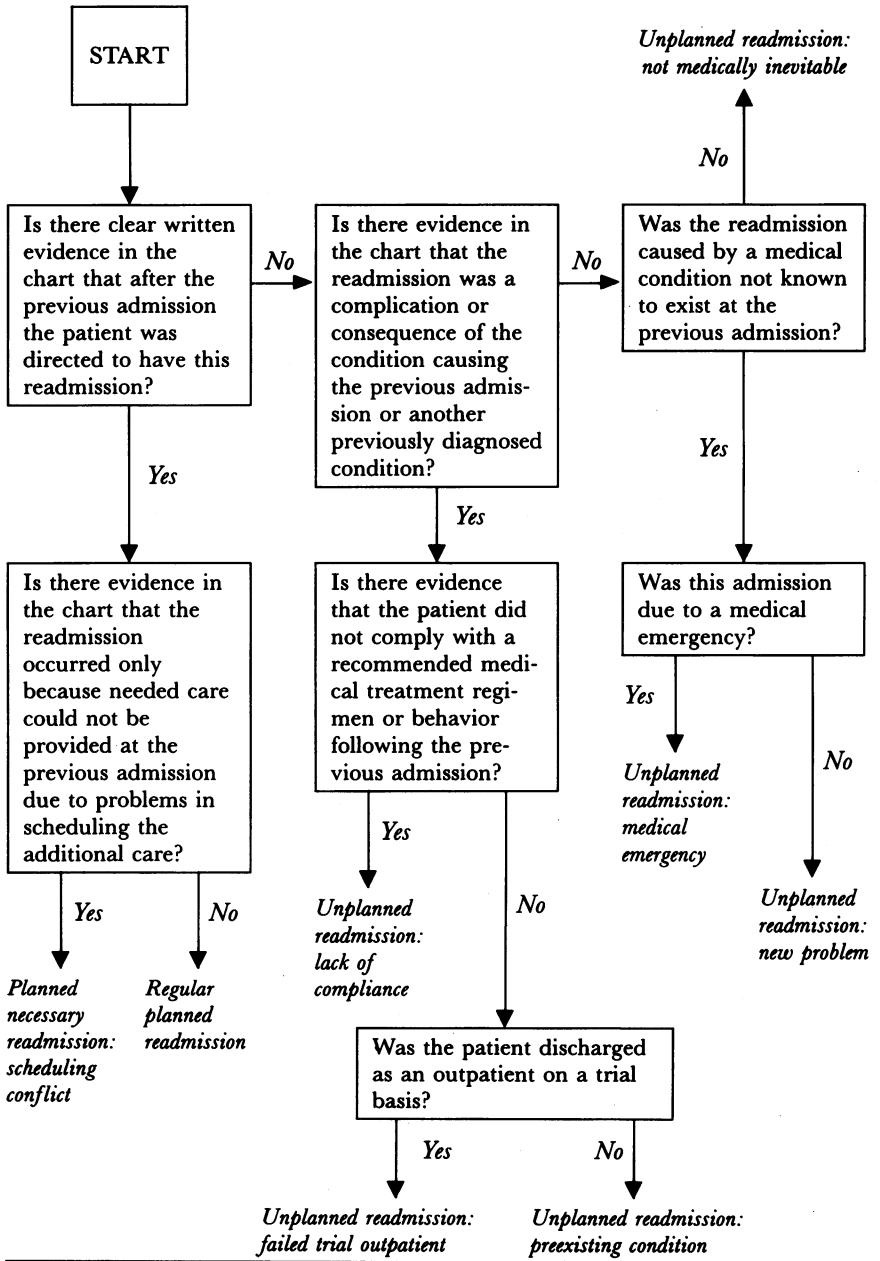
service, severity of illness, and discharge (ISD). These generic and body-specific ISD criteria, based on objective clinical signs of patient illness and not dependent on diagnosis-related length of stay norms, are used in conjunction with documented information in the hospital medical record. Generic criteria are applied without regard to reason for hospitalization, whereas each of the 12 body system-specific criteria sets are based on primary diagnosis. The patient must have at least one of the symptoms or service activities mentioned in the generic or body system screens for the admission or discharge to be considered appropriate. Determinations of appropriateness were made solely on the basis of the clinically oriented ISD criteria and did not take into consideration factors such as physician convenience, availability of outpatient facilities, or nonclinical patient characteristics such as distance from the medical center.

The InterQual ISD standards were used rather than other criteria-based utilization review methods, such as the appropriateness evaluation protocol (AEP) (Gertman and Restuccia 1981), because at the time of data collection the ISD standards were the predominant utilization review instrumentation in the VA system. However, some of the InterQual standards were modified slightly to reflect the VAMC's admitting and discharging policies more accurately. For example, patients admitted or readmitted for coronary artery bypass grafts (CABG) that are not performed by the VAMC were considered appropriate regardless of other standards because those patients must be admitted by the study VAMC prior to transfer to another hospital for surgery. In addition, patients were considered appropriate if they were in compliance with the established local VAMC policies for the InterQual discharge standards regarding intactness of skin after surgery, presence of catheter with male reproductive and genitourinary diagnosis, length of observation of cardiovascular patients for postoperative bleeding, length of time off telemetry for cardiovascular patients, and certain laboratory standard values. These modifications resulted in the reclassification of 2 previous admissions, 8 readmissions, and 34 previous discharges from inappropriate to appropriate. In addition, appropriateness of the previous discharge for 134 cases could not be assessed because the InterQual criteria were not sufficiently defined.

#### CLASSIFICATION OF TYPE OF READMISSION

Abstractors used the flowchart shown in Figure 1 to determine the type of readmission. The flowchart was developed and tested during the earlier pilot study (MacDowell, Hunter, and Ludke 1985). All deci-

Figure 1: Method for Classifying Type of Readmission



sions made by the abstractors about the type of readmission were based on written documentation in the medical record.

#### ANALYSIS

Associations between the appropriateness of previous admission, previous discharge, and readmission by bed-section designation were measured by the matched odds ratio (OR) and tested for significance using McNemar's test for the significance of change (Schlesselman 1982). The odds ratio is a measure of association used to test whether the odds of an event, such as an inappropriate admission, vary significantly by values of another variable, such as whether the admission was the readmission or the previous admission. In this particular example, the odds of an inappropriate admission given that the admission was the readmission are divided by the odds of an inappropriate admission given that the admission was the previous admission. If the odds are equal, the odds ratio is one. An odds ratio larger than one indicates that the odds of an inappropriate admission are greater for the readmission than for the previous admission. If the odds ratio is less than one, the odds of an inappropriate admission are less for the readmission than for the previous admission. In this particular study, appropriateness was measured on different occasions on the same individuals, necessitating calculation of matched odds ratios for paired data. For such data, the odds ratio is estimated by the ratio between counts of discordant pairs only. This estimate is then used with McNemar's test to test the null hypothesis that the odds ratio is one.

Because the overall odds ratio might be confounded by admission bed section, a chi-square test of homogeneity was performed to examine whether the odds ratios were the same across strata defined by admission bed section at the previous admission, previous discharge, and readmission (Breslow and Day 1980). If the null hypothesis of homogeneity is not rejected, a single odds ratio can be calculated by pooling information across strata. If the null hypothesis is rejected, the odds ratios must be calculated and reported separately for each stratum.

Chi-square tests of independence were performed to examine the relationships between appropriateness of the readmission and other variables from the medical record and PTF. Where necessary, table cells were combined to avoid expected frequencies of less than 5 in more than 20 percent of the cells. Analyses using the previous admission or readmission as the unit of analysis were based on the total sample of 445 patients. Analyses using the previous discharge as the

unit of analysis or making comparisons with the previous discharge were based on the 311 cases for which an appropriateness assessment could be made.

## RESULTS

### APPROPRIATENESS OF PREVIOUS ADMISSION, DISCHARGE, AND READMISSION

A large number of patients were admitted, discharged, or readmitted inappropriately. Approximately 46 percent (207/445) of the patients readmitted within two weeks of prior hospitalization had an inappropriate readmission, and 40 percent (178/445) had an inappropriate previous admission. Previous admissions and readmissions to a surgical bed section were more likely to be inappropriate than those to a medicine bed section (59 percent versus 31 percent and 52 percent versus 28 percent, respectively). Of the 311 discharges for which an assessment could be made, only 54 (17 percent) had an inappropriate previous discharge. Discharges from a medicine bed section tended to be slightly more inappropriate than those from a surgery bed section (20 percent versus 15 percent). Approximately 4 percent (13/311) of the readmitted patients had an inappropriate admission, discharge, and readmission.

Appropriateness of the previous admission, previous discharge, and readmission were significantly associated according to McNemar's test (Tables 2-4). However, the relationship between appropriateness of the previous admission and that of the readmission differed significantly by bed section (chi-square test of homogeneity,  $p < .001$ ). For patients admitted and readmitted to the same bed section, the readmission was more likely to be inappropriate than the previous admission (ORs greater than 1.00). However, this relationship was only statistically significant for patients in a surgery bed section (OR = 47/26 = 1.81;  $p < .025$ ).

For patients admitted and readmitted to different bed sections, the results depended on the order of the bed sections. Patients previously admitted to a medicine bed section and then readmitted to a surgery bed section were more likely to be inappropriate at the readmission than at the previous admission (OR = 14/4 = 3.50;  $p = .31$ ). On the other hand, patients previously admitted to a surgery bed section and then readmitted to a medicine bed section were more likely to be inappropriate at the time of the previous admission than at readmission (OR = 1/10 = 0.10;  $p = .011$ ).



The relationship between appropriateness of readmission and appropriateness of the previous discharge was similarly dependent on bed section (chi-square test for homogeneity,  $p < .001$ ). In general, readmissions were more likely to be inappropriate than the previous discharge ( $OR \geq 1.00$  in all cases). However, this relationship was only statistically significant for patients discharged from and readmitted to a surgery bed section ( $OR = 69/6 = 11.50$ ;  $p < .001$ ).

There appeared to be no relationship between appropriateness at time of the previous admission and that at discharge for patients previously admitted to or previously discharged, or both, from a medicine bed section. However, patients admitted to and discharged from a surgery bed section were more likely to be inappropriately admitted than inappropriately discharged ( $OR = 12/60 = 0.20$ ,  $p < .001$ ). Tables regarding patients previously admitted and discharged from different bed sections were too sparse for analysis.

#### REASONS FOR INAPPROPRIATE ADMISSION, DISCHARGE, AND READMISSION

Previous admissions and readmissions were determined to be inappropriate for similar reasons within bed section, but for different reasons across bed sections (Table 5). The most frequently cited reason (61 percent) for both inappropriate admissions and readmissions to a surgery bed section was that no test/procedure, either therapeutic or diagnostic, was scheduled and/or completed within the first 24 hours, that is, no medical tests or treatment activity occurred within the first 24 hours of admission, and the patient's condition did not change. This would be the situation associated with a premature admission. Procedures that could have been performed on an outpatient basis were cited as a reason for 25 percent of the inappropriate surgical admissions and 15 percent of the inappropriate surgical readmissions. Eighteen percent of the inappropriate admissions and readmissions to a surgery bed section did not meet at least one of the InterQual clinical criteria for admission or readmission.

On the other hand, failure to meet InterQual standards was the most frequently cited reason for inappropriate admissions (45 percent) and readmissions (34 percent) to a medicine bed section. The next most frequent reason, no test/procedure scheduled and/or performed within the first 24 hours of stay, was cited for 40 percent of the inappropriate medical admissions and 25 percent of the inappropriate medical readmissions. Over 30 percent of the inappropriate medical admissions

Table 2: Cross-Tabulations of Appropriate (A) and Inappropriate (I) Previous Admissions with Appropriate (A) and Inappropriate (I) Readmissions, by Bed Section

		<i>Medicine Readmission</i>				<i>Surgery Readmission</i>			
		A	I	Total	A	I	Total		
M e d i c i n e	A	98	28	126	21	14	35		
	I	21	22	43	4	15	19		
Total		119	50	169	25	29	54		
		70.4	29.6	100.0	46.3	53.7	100.0		
M e d i c i n e									
A d m i s s i o n									

Odds Ratio = 28/21 = 1.33

Odds Ratio = 14/4 = 3.50

*Medicine  
Readmission*

	A	I	Total
A d m i s s i o n	10	1	11
S u r g e r y	10	12	22
Total	20	13	33
	60.6	39.4	100.0

Odds Ratio = 1/10 = 0.10

*Surgery  
Readmission*

	A	I	Total
A d m i s s i o n	48	47	95
S u r g e r y	26	68	94
Total	74	115	189
	39.2	60.8	100.0

Odds Ratio = 47/26 = 1.81

Table 3: Cross-Tabulations of Appropriate (A) and Inappropriate (I) Previous Discharges with Appropriate (A) and Inappropriate (I) Readmissions, by Bed Section

		Medicine Readmission			Surgery Readmission			
		A	I	Total	A	I	Total	
M e d i c i n e	A	72	27	99	14	5	19	
	I	14	7	21	2	7	9	
Total		86	34	120	16	12	28	
		71.7	28.3	100.0	57.1	42.9	100.0	

Odds Ratio =  $27/14 = 1.93$

Odds Ratio =  $5/2 = 2.25$

*Medicine  
Readmission*

	A	I	Total
D i s c h a r g e			
A	10	6	16 72.7
I	6	0	6 27.3
Total	16 72.7	6 27.3	22 100.0

Odds Ratio = 6/6 = 1.00

*Surgery  
Readmission*

	A	I	Total
D i s c h a r g e			
A	54	69	123 87.2
I	6	12	18 12.8
Total	60 42.6	81 57.4	141 100.0

Odds Ratio = 69/6 = 11.50

Table 4: Cross-Tabulations of Appropriate (A) and Inappropriate (I) Previous Admissions with Appropriate (A) and Inappropriate (I) Previous Discharges, by Bed Section

		<i>Medicine Discharge</i>			<i>Surgery Discharge</i>		
		A	I	Total	A	I	Total
M e d i c i n e	A	91	18	109 75.7	6	2	8 80.0
	I	24	11	35 24.3	2	0	2 20.0
Total		115 79.9	29 20.1	144 100.0	8 80.0	2 20.0	10 100.0

Odds Ratio =  $18/24 = 0.75$

Odds Ratio =  $2/2 = 1.00$

*Medicine  
Discharge*

	A	I	Total
A d m i n i s t r a t i o n	1	0	1 25.0
S u r g e r y	2	1	3 75.0
<b>Total</b>	<b>3</b> 75.0	<b>1</b> 25.0	<b>4</b> 100.0

Odds Ratio = 0/2 = 0.00

*Surgery  
Discharge*

	A	I	Total
A d m i n i s t r a t i o n	71	12	83 54.2
S u r g e r y	60	10	70 45.8
<b>Total</b>	<b>131</b> 85.6	<b>22</b> 14.4	<b>153</b> 100.0

Odds Ratio = 12/60 = 0.20

Table 5: Number and Percentage of Reasons for Inappropriate Previous Admission and Readmission, by Bed Section

Reason	Admission		Readmission	
	Medicine (N = 62)	Surgery (N = 116)	Medicine (N = 63)	Surgery (N = 144)
No test/procedure in first 24 hours	25 (40.3)*	71 (61.2)	16 (25.4)	88 (61.1)
Does not meet InterQual standards	28 (45.2)	21 (18.1)	22 (34.9)	27 (18.8)
Could be performed as outpatient	19 (30.6)	29 (25.0)	15 (23.8)	22 (15.3)
For consultation	3 ( 4.8)	7 ( 6.0)	7 (11.1)	3 ( 2.1)
Mohs procedure	0 ( 0.0)	11 ( 9.5)	0 ( 0.0)	9 ( 6.3)
Admission for radiation therapy	3 ( 4.8)	1 ( 0.9)	5 ( 7.9)	10 ( 6.9)
Other	6 ( 9.7)	7 ( 6.0)	12 (19.0)	8 ( 5.6)

\*Percentages (in parentheses) are based on number (N) of inappropriate admissions and readmissions to each bed section, and may not sum to 100 due to multiple reasons per admission and readmission.

Table 6: Number and Percentage of Reasons for Inappropriate Previous Discharge by Bed Section

Reason	Medicine (N = 30)	Surgery (N = 24)
Lack of documentation	8 (26.7)*	11 (45.8)
Patient choice	4 (13.3)	2 ( 8.3)
Lack of lab results availability	3 (10.0)	2 ( 8.3)
Being discharged to nursing home	3 (10.0)	1 ( 4.2)
Discharge instead of pass	2 ( 6.7)	1 ( 4.2)
Other	11 (36.7)	8 (33.3)

\*Percentages (in parentheses) are based on number (N) of inappropriate discharges from each bed section, and may not sum to 100 due to multiple reasons per discharge.

and 23 percent of the inappropriate medical readmissions could have been cared for on an outpatient rather than an inpatient basis.

Lack of sufficient nonlaboratory documentation to justify discharge was the most frequently cited reason for inappropriately discharged patients from both the medicine (27 percent) and surgery (46 percent) bed sections (Table 6). For inappropriate surgical discharges, the next most frequent reasons were the patient's own decision to be discharged (8 percent) and the unavailability of laboratory results to compare with the InterQual standards (8 percent). The second most



common reason for inappropriate medical discharges was the patient's own decision to be discharged (13 percent).

#### TYPE OF READMISSION

Due to small cell sizes, the categories within the classification scheme (Figure 1) were combined into three major groups according to the underlying decision tree. The first group was the planned readmissions, where there was clear written evidence in the medical record at the time of the previous hospital stay that the patient was directed to return, either as the result of scheduling conflicts (9.4 percent of all readmissions) or for other reasons (45.8 percent of readmissions). The second group was the unplanned readmissions with existing problems, that is, the readmissions that were the result of a complication or consequence of the condition causing the previous admission or other previously diagnosed conditions that were unplanned. Included within this second group, which accounted for 39 percent (174/445) of all readmissions, were readmissions associated with a preexisting condition (36.6 percent of all readmissions), due to lack of compliance (1.8 percent of all readmissions), and related to a failed trial as an outpatient (0.6 percent of readmissions). The third group comprised the unplanned readmissions with new problems, which accounted for 6 percent (25/445) of the readmissions. This group consisted of those medical conditions, either new presenting problems (3.8 percent of all readmissions), medical emergencies (1.1 percent of readmissions), or nonmedical problems (0.7 percent of readmissions), that were not known to exist at the previous admission.

Type of readmission varied significantly by readmission bed section (chi-square test,  $p < .001$ ). Approximately 68 percent of the readmissions to a surgery bed section were planned as compared to only 40 percent of the medical readmissions. On the other hand, 54 percent of the readmissions to a medicine bed section were unplanned for an existing condition as compared to 27 percent for surgery readmissions. This suggests that readmissions to a surgical bed section may be used as a way of scheduling or rescheduling a patient for a surgical procedure.

As illustrated in Table 7, a very clear relationship also existed between the appropriateness of readmission and the type of readmission for both medical and surgical readmissions (chi-square test,  $p < .001$ ). Approximately 60 percent of the inappropriate readmissions to a medicine bed section were planned as compared to only 30 percent of the appropriately readmitted patients. Similarly, over 80 percent of the inap-

**Table 7: Number and Percentage (in Parentheses) of Each Type of Readmission for Appropriate and Inappropriate Readmissions to Medicine and Surgery Bed Sections**

<i>Type of Readmission</i>	<i>Medicine</i>		<i>Surgery</i>	
	<i>Appropriate</i>	<i>Inappropriate</i>	<i>Appropriate</i>	<i>Inappropriate</i>
Planned readmission	42 ( 30.2)	38 ( 60.3)	50 ( 50.5)	116 ( 80.6)
Unplanned existing condition	87 ( 62.6)	22 ( 34.9)	42 ( 42.4)	23 ( 16.0)
Unplanned new condition	10 ( 7.2)	3 ( 4.8)	7 ( 7.1)	5 ( 0.4)
Total	139 (100.0)	63 (100.0)	99 (100.0)	144 (100.0)

appropriately readmitted patients to a surgery bed section were planned as compared to 50 percent of the appropriately readmitted patients. The most frequently cited reason why the planned readmissions to both medicine and surgery bed sections were inappropriate was that no test/procedure was scheduled or performed within the first 24 hours of the previous admission. On the other hand, 63 percent of the appropriate readmissions to a medicine bed section and 42 percent to a surgery bed section were unplanned readmissions due to an existing condition as compared to 35 percent and 16 percent, respectively, for inappropriate readmissions. The primary reason for these inappropriate, unplanned readmissions to both the medicine and surgery bed sections was that the patient did not meet InterQual standards for an inpatient admission.

**LENGTH OF STAY AND OUT-TIME**

Patients readmitted within two weeks of a previous discharge stayed an average of 9.2 days during the previous hospitalization and 10.7 days during the subsequent hospitalization, with an average of 8.1 days between previous discharge and readmission (“out-time”). Although there were no significant differences in admission and readmission length of stay and out-time between medical and surgical readmissions, patients readmitted to a surgery bed section stayed two days longer, on average, than patients readmitted to a medicine bed section (11.7 days versus 9.7 days). Whereas only 37 percent of the readmissions to a medicine bed section stayed more than one week, over 49 percent of the readmissions to a surgery bed section had lengths of stay greater than seven days (Table 8).

No significant association was found between appropriateness of readmission and the length of stay at previous admission or readmission, for patients admitted or readmitted to either a medicine or surgery bed section. The average length of stay during the previous admission for inappropriate surgical patients was almost four days

Table 8: Length of Stay and Out-Time for Appropriate and Inappropriate Medicine and Surgery Previous Admissions and Readmissions

Variable	Medicine*		Surgery*	
	Appropriate	Inappropriate	Appropriate	Inappropriate
	N (%)	N (%)	N (%)	N (%)
Admission Length of Stay	(N = 161)	(N = 62)	(N = 106)	(N = 116)
≤ 1 day	11 ( 6.8)	11 (17.7)	3 ( 2.8)	25 (21.6)
2-7 days	75 (46.6)	26 (41.9)	62 (58.5)	61 (52.6)
8-14 days	41 (25.5)	8 (12.9)	17 (16.0)	14 (12.1)
≥ 15 days	34 (21.1)	17 (27.4)	24 (22.6)	16 (13.8)
Mean (Std. Dev.)	9.9 ( 9.0)	0.4 (12.8)	11.2 (16.8)	7.6 (12.5)
Readmission Length of Stay	(N = 139)	(N = 63)	(N = 99)	(N = 144)
≤ 1 day	16 (11.5)	8 (12.7)	9 ( 9.1)	17 (11.8)
2-7 days	68 (48.9)	34 (54.0)	41 (41.4)	56 (38.9)
8-14 days	26 (18.7)	12 (19.1)	23 (23.2)	39 (27.1)
≥ 15 days	29 (20.9)	9 (14.3)	26 (26.3)	32 (22.2)
Mean (Std. Dev.)	8.9 ( 8.3)	11.1 (18.4)	12.0 (13.7)	11.3 (13.4)
Out-Time	(N = 139)	(N = 63)	(N = 99)	(N = 144)
≤ 1 day	4 ( 2.9)	0 ( 0.0)	5 ( 5.1)	4 ( 2.8)
2-7 days	62 (44.6)	25 (39.7)	49 (49.5)	58 (40.3)
8-14 days	73 (52.5)	38 (60.3)	45 (45.5)	82 (56.9)
Mean (Std. Dev.)	8.2 ( 4.0)	8.0 ( 3.2)	7.6 ( 3.9)	8.3 ( 3.5)

\*For admission length of stay, medicine and surgery refer to admission bed section; for readmission length of stay and out-time, medicine and surgery refer to readmission bed section.

shorter than that for appropriate surgical patients. This was due primarily to the large difference in the percentage of patients staying for one day or less (22 percent versus 3 percent). These patients may have been admitted only to be discharged, with no diagnostic or treatment activity occurring during that brief stay—and then requested to return for a surgical procedure during the readmission. Also, there was no association between appropriateness of readmission and out-time.

#### PRIMARY DIAGNOSIS AND PATIENT CHARACTERISTICS

Patients with a primary diagnosis of neoplasms or circulatory conditions accounted for approximately 52 percent of the readmissions, with about 57 percent of the readmissions to a medicine bed section and 46 percent to a surgery bed section. As expected, greater percentages of the medical readmissions had primary diagnoses associated with ill-defined conditions and respiratory problems, whereas greater percent-

ages of the surgical readmissions were for digestive, genitourinary, nervous system, musculoskeletal, and injury and poisoning-related diagnoses. The majority of patients (60–68 percent) had concordant primary diagnoses for the previous admission and the readmission.

There was an association between type of primary diagnosis at admission and appropriateness of readmission for both medicine and surgery bed sections (chi-square test,  $p < .05$ ), but not between type of primary diagnosis at readmission and appropriateness of readmission (Table 9). Patients who were inappropriately admitted to a medicine bed section appeared more likely to have a primary diagnosis of neoplasms (42 percent) and less likely to have circulatory (21 percent) or respiratory (5 percent) problems than appropriately admitted patients (21 percent, 34 percent, and 12 percent, respectively). On the other hand, patients inappropriately admitted to a surgery bed section were more likely to have a primary diagnosis associated with the nervous system (10 percent) and less likely to have circulatory problems (12 percent) than appropriately admitted patients (4 percent and 27 percent, respectively).

On average, patients readmitted within two weeks of a previous discharge were 62 years old and traveled 81 miles to receive care (Table 9). Almost all were white and 69 percent were married. There were no significant differences in age, marital status, race, or travel distance between those patients appropriately or inappropriately readmitted to either a medicine or surgery bed section.

## DISCUSSION

The findings provide evidence of a strong relationship, as expected, between a readmission within two weeks of prior discharge and the previous episode of care. However, this relationship appears highly related to the patient's admission, discharge, and readmission bed sections. Overall, surgery bed-section admissions, both at the previous admission and at the readmission, were more likely to be inappropriate than medical admissions. When patients were admitted and readmitted to two different bed sections, it was the surgery bed-section admission or readmission that was more inappropriate. However, when patients were both admitted and readmitted to surgery bed sections, the readmission was more inappropriate. These results indicate that both bed section *and* whether the admission is a first admission or a readmission are important risk factors for inappropriate admissions. As a result, patients may be prematurely admitted to either a medicine

Table 9: Patient Characteristics for Appropriate and Inappropriate Medicine and Surgery Readmissions

Variable	Medicine		Surgery	
	Appropriate N (%)	Inappropriate N (%)	Appropriate N (%)	Inappropriate N (%)
Admission Diagnosis*	(N = 160)	(N = 62)	(N = 105)	(N = 116)
Neoplasms	33 (20.6)	26 (41.9)	26 (24.8)	32 (27.6)
Circulatory	55 (34.4)	13 (21.0)	28 (26.7)	14 (12.1)
Digestive	11 ( 6.9)	6 ( 9.7)	10 ( 9.5)	13 (11.2)
Ill-defined conditions	20 (12.5)	6 ( 9.7)	3 ( 2.9)	7 ( 6.0)
Genitourinary	5 ( 3.1)	3 ( 4.8)	9 ( 8.6)	13 (11.2)
Respiratory	20 (12.5)	3 ( 4.8)	3 ( 2.9)	3 ( 2.6)
Nervous system	1 ( 0.6)	2 ( 3.2)	4 ( 3.8)	12 (10.3)
Musculoskeletal	2 ( 1.3)	1 ( 1.6)	12 (11.4)	4 ( 3.5)
Other	13 ( 8.1)	2 ( 3.2)	10 ( 9.6)	18 (15.5)
Readmission Diagnosis	(N = 139)	(N = 63)	(N = 99)	(N = 144)
Neoplasms	27 (19.4)	19 (30.2)	23 (23.2)	46 (31.9)
Circulatory	50 (36.0)	20 (31.8)	20 (20.2)	27 (18.8)
Digestive	4 ( 2.9)	5 ( 7.9)	10 (10.1)	15 (10.4)
Ill-defined conditions	15 (10.8)	7 (11.1)	4 ( 4.0)	5 ( 3.5)
Genitourinary	7 ( 5.0)	2 ( 3.2)	9 ( 9.1)	10 ( 6.9)
Respiratory	18 (13.0)	3 ( 4.8)	4 ( 4.0)	2 ( 1.4)
Nervous system	2 ( 1.4)	2 ( 3.2)	3 ( 3.1)	10 ( 6.9)
Injury and poisoning	3 ( 2.2)	0 ( 0.0)	12 (12.1)	11 ( 7.6)
Other	13 ( 9.3)	5 ( 8.0)	14 (14.2)	18 (12.5)
Age	(N = 139)	(N = 63)	(N = 99)	(N = 144)
≤ 44 years	10 ( 7.2)	0 ( 0.0)	13 (13.1)	13 ( 9.0)
45-64 years	72 (51.8)	34 (54.0)	53 (53.5)	78 (54.2)
≥ 65 years	57 (41.0)	29 (46.0)	33 (33.3)	53 (36.8)
Mean (Std. Dev.)	63.0 (10.7)	63.8 ( 7.8)	59.1 (13.2)	61.4 (11.5)
Marital Status	(N = 139)	(N = 63)	(N = 99)	(N = 144)
Married	99 (71.2)	41 (65.1)	70 (70.7)	96 (66.7)
Divorced/Separated	16 (11.5)	10 (15.9)	79 (19.2)	22 (15.3)
Widowed	17 (12.2)	7 (11.1)	3 ( 3.0)	16 (11.1)
Never married	7 ( 5.0)	5 ( 7.9)	7 ( 7.1)	10 ( 6.9)
Race	(N = 139)	(N = 63)	(N = 99)	(N = 144)
White	134 (96.4)	62 (98.4)	98 (99.0)	139 (96.5)
Other	5 ( 3.6)	1 ( 1.6)	1 ( 1.0)	5 ( 3.5)
Travel Distance	(N = 139)	(N = 61)	(N = 99)	(N = 142)
≤ 50 miles	31 (23.1)	13 (21.3)	20 (20.2)	27 (19.0)
51-100 miles	78 (58.2)	31 (50.8)	44 (44.4)	72 (50.7)
101-150 miles	17 (12.7)	11 (18.0)	27 (27.3)	38 (26.8)
≥ 151 miles	8 ( 6.0)	6 ( 9.8)	8 ( 8.1)	5 ( 3.5)
Mean (Std. Dev.)	76.6 (44.0)	81.5 (43.7)	87.9 (53.3)	83.2 (39.4)

\*Number and percentages reported for previous admissions to a medical or surgical bed section. Remainder of table reports results for readmissions to a medical or surgical bed section.

or surgery bed section for a workup that could have been performed on an outpatient basis; requested to return at a later time for a surgical procedure; and then readmitted prematurely at *that* time for a surgical procedure that could have been performed on an outpatient basis. On the other hand, the patients admitted and readmitted to a medicine bed section might also have been seen for related conditions, but many of those patients did not require an acute hospital level of care at the time of admission or readmission and could have been treated on an outpatient basis.

The results are also in conflict with the traditional view that readmissions are necessarily unplanned events resulting from inappropriate discharging and/or readmitting behaviors. Approximately 55 percent of the readmissions examined in the study were in fact planned readmissions, that is, with clear written evidence in the medical record during the previous hospital stay that the patient was directed to return for a readmission. For readmissions to a surgical bed section, the percentage of planned readmissions was in fact 68 percent. In addition, the appropriateness of the readmission was strongly associated with the appropriateness of the previous admission, particularly for surgical patients, suggesting that a substantial number of readmissions may in fact be planned events resulting from potentially unnecessary previous admissions. If this is the case, monitoring of readmissions for the purposes of determining appropriateness must focus not only on the previous discharge and readmission, but also on the previous admission. Also, the combination of the high rate of inappropriate previous admissions for surgical patients and increased risk of inappropriateness at the readmission may imply the need for increased targeting of surgical patients for utilization review.

The high proportions of inappropriate previous admissions, previous discharges, and readmissions may be related to the efficiency with which all patients, not just readmitted patients, are treated. However, without further data collection, it is not possible to determine the relative contribution to the suspected inefficiencies of facility operating policies and procedures versus medical practice patterns. The finding that inappropriate admissions and readmissions are the result of (1) no tests/procedures being scheduled or performed within the first 24 hours while the patient's condition remains unchanged, (2) patients having abnormal results but not meeting InterQual admission standards, and (3) procedures that could be performed on an outpatient basis suggest a need to examine the admitting criteria and first-day policies and procedures, particularly in light of potential difficulties in scheduling ancillary services and operating rooms. The reasons why no test/procedure

was scheduled or performed within 24 hours were not assessed in this study. They likely relate to problems in promptly evaluating patients after admission or in admitting patients too early. The number of inappropriate discharges related to lack of documentation suggests further investigation into the completeness and quality of information in the medical records.

Given that inappropriate readmissions tend to be planned but are not necessarily due to scheduling conflicts, a review of the criteria, policies, and procedures for readmitting patients is indicated to ensure that patients actually need to be readmitted or admitted initially. The findings suggest that a large number of patients are admitted, only to receive very little care, and are then discharged with instructions to return in another week. However, there is no evidence to suggest that the readmissions were planned for the purpose of "gaming" the VA's resource allocation methodology (RAM) by attempting to increase the number of admissions and thus enhance the VAMC's operating budget. The readmissions examined in this study are the type of readmissions targeted for review by the VA's occurrence screening program (Veterans Administration 1988) to minimize "gaming."

It may also be possible that the level of identified inappropriate admissions, discharges, and readmissions is a result of the InterQual criteria not being appropriate standards for assessing care in the VAMCs. However, the InterQual standards have been widely implemented within the VA and serve as the foundation of many VAMC utilization review and quality assurance activities. To fully address the issue of the validity of the InterQual standards, a careful evaluation of the InterQual standards should be undertaken in light of the nature of the VA population and the operating structures, policies, and constraints of the VAMCs.

In conclusion, this study demonstrated that it is possible for either individual medical centers or external monitoring agencies (such as peer review organizations) to examine the appropriateness of readmissions within two weeks of a prior discharge. Using computerized medical record discharge abstract systems, readmitted patients can easily be identified and their medical records located. Abstractors can be trained to assess in a reliable manner the appropriateness of the readmissions with established standards and to collect additional information to explain and interpret the reasons for and nature of the readmissions.

Given the level of inappropriate use, medical centers appear to need to examine readmissions closely from an operational perspective, including investigation of the medical staff's practice patterns. Although incentives exist for facilities to maintain high levels of admis-

sions under the Medicare PPS and VA RAM, substantial savings in inpatient costs—as well as improved convenience for patients—may result through improved patient care planning.

Also, external monitoring of readmissions appears to be needed given the levels of identified inappropriate admissions, discharges, and readmissions. However, the focus of such external monitoring must also include the initial admission. The results of this study suggest that readmissions may in fact be associated with unnecessary admissions, not just inappropriate discharging and readmitting behaviors. These results have implications for using readmission rates as measures of patient outcomes and quality of care. A substantial portion of readmissions may not be related to the medical care provided or not provided during the previous hospitalization, but may instead be associated with operational inefficiencies.

## ACKNOWLEDGMENTS

We would like to acknowledge the support of Rodney R. Zeitler, M.D. and Linda M. Eastman, R.N. for their invaluable assistance in the conduct of the study, and of Janice Y. Bunn for her help with the reanalysis of the data in light of the reviewers' insightful comments.

## REFERENCES

- Anderson, G. F., and E. P. Steinberg. "Hospital Readmissions in the Medicare Population." *New England Journal of Medicine* 311, no. 21 (1984):1349-53.
- Breslow, N. E., and N. E. Day. *Statistical Methods in Cancer Research*. Vol. I, *The Analysis of Case-Control Studies*. Lyon, France: International Agency for Research in Cancer, 1980.
- Fleiss, J. L. *Statistical Methods for Rates and Proportions*. 2d. ed. New York: Wiley & Sons, Inc., 1981.
- Gertman P. M., and J. D. Restuccia. "The Appropriateness Evaluation Protocol: A Technique for Assessing Unnecessary Days of Hospital Care." *Medical Care* 19, no. 8 (1981):855-71.
- Graham, H., and B. Livesley. "Can Readmissions to a Geriatric Medical Unit Be Prevented?" *Lancet* 1, no. 8321 (1983):404-406.
- Jacobs, C. M., and J. Lamprey. *A Guide to Systematic Utilization Monitoring*. Chicago: InterQual, 1979.
- Landis, J. R., and G. G. Koch. "The Measurement of Observer Agreement for Categorical Data." *Biometrics* 33, no. 1 (1977):159.
- MacDowell, N. M., S. A. Hunter, and R. L. Ludke. "Readmissions to a



- Veterans Administration Medical Center." *Journal of Quality Assurance* 7, no. 2 (Spring 1985):20-23.
- Schlesselman, J. J. *Case-Control Studies: Design, Conduct, Analysis*. New York: Oxford University Press, 1982.
- Veterans Administration. *Occurrence Screening*. Circular 10-88-71. Washington, DC: Veterans Administration, Department of Medicine and Surgery, June 20, 1988.
- Zook, C. J., and F. D. Moore. "High Cost Users of Medical Care." *New England Journal of Medicine* 302, no. 18 (1980):996-1002.
- Zook, C. J., S. F. Savickis, and F. D. Moore. "Repeated Hospitalization for the Same Disease: A Multiplier of National Health Costs." *Milbank Memorial Fund Quarterly* 58, no. 3 (1980):454-71.