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An Assessment of How Efficiently Manitoba's Major Hospitals Discharge Their Patients

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Executive Summary

Introduction

The Black and Frohlich (1991) report on hospital funding mechanisms concluded that global funding was one of the best instruments for constraining hospital expenditures but recommended that Manitoba Health incorporate concepts of efficiency and effectiveness into funding negotiations, to inform hospital budget allocation. Two developments have followed this report. The Manitoba Centre for Health Policy and Evaluation first conducted preliminary analyses of the efficiency with which our urban hospitals discharge patients. Concurrent with this, the government announced plans to downsize the acute sector. Our preliminary analyses suggested that addressing current inefficiencies in discharging patients might permit bed closures without jeopardizing patient access and without necessitating the expansion of other hospital-based services such as outpatient surgery. We were then asked to proceed with a more complete investigation of bed use.

This report assesses how efficiently eight Winnipeg and Brandon hospitals used the days they invested in treating acute care patients in 1990/91. Average length of stay was compared for different types of patients across the eight hospitals after adjusting for important factors likely to affect length of stay, including the reason for the patient's admission, how sick the patient was, patient age, sex, socioeconomic status, and other factors. The data were analyzed conservatively, excluding very long-stay patients, patients with the most serious illnesses, and those who were transferred to or from another institution. Potential savings to the hospital system (beds that could be cut from the system or put to better use) were estimated using discharge patterns at the more efficient Winnipeg/Brandon hospital(s) as the standard. In addition, potential savings were estimated using discharge patterns at typical U.S. hospitals.

Findings

- Hospitals differed markedly in average length of stay for similar patients.
- These findings were consistent over two years; hospitals discharging patients more efficiently in 1990/91 showed similar patterns in the previous year.[1]
- Overall HX, BX, and DX hospitals discharged their patients more efficiently and FX and AX discharged their patients less efficiently.[2]
- Patterns of efficiency within hospitals varied. For instance, within the more efficient hospitals, some categories of patients were discharged inefficiently. The converse was also true: within the less efficient hospitals, patients in some categories were discharged very efficiently.
- We estimate that a significant proportion of the days currently invested in treating acute care patients could be eliminated without decreasing access to hospital care. More efficient discharge patterns could lead to closing over approximately 150 beds (and approximately 200 beds using one set of assumptions) across Winnipeg and Brandon hospitals without decreasing patient access. These represent conservative estimates as more severely ill acute care cases, as well as long-stay patients, were excluded from the calculations of potential savings. (These exclusions represented fully 22.6% of the cases and 55.7% of the days produced in 1990/91.)

The Implications of These Findings

The hospital system appears to have the capacity to handle more patients or to absorb a sizeable number of bed closures without rationing access to hospital care. The hospitals and the government have tended to assume that every bed closed should be replaced by another type of service - possibly less intense and less expensive, but nevertheless a replacement. These data suggest that at least some of the bed closures could be accommodated simply through more efficient treatment of patients in available beds. Our major standard for judging hospital efficiency was to identify the urban hospital(s) with the shortest average lengths of stay for

[1] Because data from 1991/92 became available only near completion of this project it could not be incorporated into this report. However, analyses using the more recent data were quite consistent with the results reported here.

[2] To preserve anonymity of individual hospitals, hospital names have been substituted by letters in this report.

different types of admissions. Calculations were performed only where statistically significant differences in length of stay existed. Since these urban hospitals generally have quite similar access to home care services, the hospitals operating more efficiently are unlikely to have extra resources but rather physicians and administrators who have organized to treat their patients more efficiently. In fact, our discussions with CEOs and Medical Vice-Presidents of the urban hospitals have illustrated a lack of knowledge as to which hospitals had the more efficient practices. If Manitoba hospitals were to move to a level of efficiency resembling that found in U.S. hospitals, in terms of patient discharge, more beds could potentially be closed (over approximately 300 beds), but more resources to support better scheduling of tests, creation of short term skilled nursing facilities, etc., might be required. However, over half of the potential gains in efficiency identified using U.S. standards could be achieved by reaching standards already obtained in Manitoba.

Shorter lengths of stay found in U.S. hospitals may be caused partly by tighter utilization control. However, caution must be exercised when emulating the U.S. hospital system, since it is the most costly health care system in the world. Currently in the U.S., millions of dollars are spent on utilization management to control costs and improve efficiency, using case by case prospective payment and monitoring systems. In contrast, Manitoba has controlled hospital costs not by micro-managing every decision made by physicians but by controlling capacity, i.e., the number of beds, and by leaving the responsibility for increasing efficiency to each hospital. This report should help hospitals identify specific areas where the efficiency with which they discharge patients can be improved.

The findings also suggest that the use of acute care hospitals by mentally ill patients should be considered in the process of mental health reform. Patients admitted for mental disorders consume large numbers of acute care days and have high readmission rates. Furthermore, physicians at the different hospitals treat these patients in markedly different ways - with no apparent relationship to a key outcome measure, i.e., rate of readmission.

This report also highlights the need to:

- Review current and future plans to expand outpatient surgery. Less efficient hospitals should address inefficiencies in lengths of stay before they receive funds to expand outpatient surgery.
- Ensure that improved efficiency does not result in increased volume of cases. This could be accomplished by reducing the city's total acute care bed numbers in concert with efficiency improvement efforts.
- Because bed closures alone do not necessarily guarantee improved efficiency, incentives should be built into the system to reward hospitals for increased efficiency, for efforts beyond some agreed upon level that other hospitals are achieving.
- Recognize that although improved hospital efficiency may decrease costs within the acute care sector, additional costs may be generated in other sectors.
- Conduct similar analyses of efficiency of bed use for any rural hospitals requesting bed expansion.
- Set up a committee, possibly as a subcommittee of the Urban Hospital Council, to receive Manitoba Health Services Commission (MHSC) generated length of stay analyses or Hospital Medical Records Institute (HMRI) reports and oversee the implementation of plans for improving efficiency at AX and FX hospitals as well as outlier practices at other hospitals.
- Work toward a consensus among hospitals regarding the development of a systematic approach to care management that would not only standardize information across hospitals, but would also be cost effective. Inasmuch as inexpensive grouper systems, such as the Refined Diagnostic Related Groups (RDRG) used in this assessment, permit adjustment for case severity within and across hospitals, adapting such systems to utilization management within hospitals should be explored by the hospitals and monitored by MHSC.
- Review the effectiveness of alternative programs to reduce length of stay. Specifically, the effectiveness of discharge nurses should be compared to physician managers; consideration should be given to discontinuing the funding of programs that have not demonstrated success. One of the more efficient hospitals in this study was the only one not having a discharge nurse.

Conclusion

It is clear that achieving efficiency is not an easy task requiring, as it does, the cooperation of physicians, hospital administrators, and staff. Nevertheless, government has a fundamental responsibility to the public, which pays for and uses our hospitals, to ensure that the appropriate number of beds is available and that they are utilized to best advantage.

AN ASSESSMENT OF HOW EFFICIENTLY MANITOBA'S MAJOR HOSPITALS DISCHARGE THEIR PATIENTS

Introduction

Hospitals consume a considerable portion of health care resources in the Province of Manitoba. In the 1990/91 fiscal year $908 million (61% of the MHSC's health care budget) was spent on hospital services (MHSC Annual Report, 1990-91). The average daily in-patient cost in a Manitoba hospital increased from $444.19 in 1989/90 to $490.40 in 1990/91, representing an increase in total expenditures of approximately $62.8 million.

The rapidly growing costs of health care have left provincial governments across Canada questioning how best to control hospital expenditures. A recent report on hospital funding mechanisms (Black and Frohlich, 1991) concluded that the global funding mechanism is one of the best instruments for constraining hospital expenditures and should, therefore, be maintained, provided modifications are made to incorporate concepts of effectiveness and efficiency into funding negotiations. The goal of the current project was to investigate the efficiency of resource use across urban hospitals in Manitoba. While efficiency usually concentrates on identifying the institution producing a given activity for the least <u>cost</u>, this analysis focused exclusively on the efficient use of hospital beds, or more precisely, on the use of hospital days for patients with acute care needs.

This is an important focus given the Manitoba Government's intention to close tertiary care beds and redistribute patient care to lower cost facilities. A loss of 90 beds in urban acute care facilities is planned for 1992/93, with more closures intended the following year (Manitoba Health, 1992). Considering these proposed bed closures in the acute care sector, reductions in patients' lengths of stay could play an important role in maintaining the availability of acute health care in Manitoba without the need for expanding other parts of the system, e.g., day surgery, chronic care beds, etc.

Interinstitutional differences in length of stay for similar patients are routinely found. Such variations may be the result of structural factors such as bed availability, organizational factors such as the power of the hospitals' utilization committees to control bed use, or the bed use patterns of each hospital's particular constellation of physicians with admitting privileges.

Nevertheless, hospitals are responsible for ensuring the efficient use of their bed capacity. MHSC has sought to help them achieve this goal in recent years by funding discharge nurse positions (in all but one of the hospitals studied here) at the hospitals' requests.

Shorter stays have not been found to be related to adverse patient outcomes (Cleary et al., 1991; Manheim et al., 1992). In fact, in a study of close to 4,000 U.S. hospitals, Manheim et al. (1992) found a small but significant relationship between shorter stays and decreased post-discharge mortality rates.

This paper examines efficiency of resource use by studying variations in length of stay for patients across Winnipeg and Brandon hospitals. The specific objectives were:

- Determine whether factors such as reason for admission, severity of illness, age of the patient, and socioeconomic status affect patient length of stay, and if so, adjust for their impact on length of stay across the eight acute care urban hospitals.
- Present two analyses comparing length of stay across hospitals. 1) For each of several types of medical, surgical, and obstetrical categories of patients, assess the impact of hospital of treatment on length of stay. 2) For all acute admissions, assess the impact of patient characteristics on length of stay for the shortest stay hospital and, from this, estimate a predicted mean length of stay for all other hospitals.
- Determine the stability of discharge patterns, i.e., the degree to which hospitals that treated their patients more efficiently in 1990/91, also had more efficient discharge practices in 1989/90.
- Compare the efficiency of the eight Manitoba acute care hospitals' discharge practices with those of U.S. hospitals.
- Estimate the number of days that might be 'saved' across the eight hospitals if all hospitals discharged their patients as efficiently as the more efficient hospitals in the system.

Methods

Preserving Hospital Anonymity

A report of this nature presents a trade-off between the provision of enough information to illustrate comparisons across hospitals versus the preservation of hospital anonymity. To preserve anonymity of hospitals, tables that could potentially reveal hospital identity, by providing information about case numbers or proportions of certain types of cases, have been placed in a separate appendix. These tables, identified in the text as tables beginning with the letter 'B', have been placed in Appendix B, which we are providing to the Department of Health, the organization requesting this analysis.

Sample and Study Period

Hospital discharge data were obtained from the MHSC database for the fiscal years 1989/90 and 1990/91. Only inpatient cases (those with stays of one or more days) were selected from these data. All analyses focused on 1990/91 data except for those explicitly comparing consistency across two years. All seven acute care facilities in Winnipeg and the Brandon General Hospital were included in this study; only acute stays (generally stays of 60 days or less) at these institutions were examined.

The data were analyzed using two different approaches. The first (Analysis I) focused on a subset of several specific diagnostic categories, whereas the second (Analysis II) examined all acute admissions.

Analyses of Specific Diagnostic Categories (Analysis I)

All admissions for the fiscal 1990/91 year were grouped into diagnostic categories using RDRG software (Fetter and Freeman, 1989).[3] Several common medical, surgical, and obstetrical diagnostic categories were selected for analysis.

Selection Criteria. Three main criteria were used to select the diagnostic categories for analysis. First, the categories had to be common, defined as 500 or more inpatient discharges in one year across all eight hospitals. Second, the cases within a category had to be distributed across the hospitals. This was defined as 100 or more patients in at least four of the eight hospitals. Third, categories had to have a mean length of stay across the eight hospitals of three days or more. A list of the 14 diagnostic categories meeting these criteria is given in Table 1. As Table 2

[3] The RDRG software was designed to use the "principal diagnosis" to group patients into diagnostic categories. Because MHSC data does not identify a principal diagnosis, this data was grouped according to the "most responsible diagnosis".

Table 1
List of Diagnostic Categories Studied[1]

Simple Pneumonia
Bronchitis and Asthma
Acute Myocardial Infarction (AMI)
Heart Failure and Shock
Miscellaneous Digestive Disorders
Vaginal Deliveries without Complicating Diagnoses
Psychoses
Major Bowel Procedures
Anal and Stomal Procedures
Inguinal and Femoral Hernia Procedures
Total Cholecystectomy without Common Duct Exploration
Transurethral Prostatectomy
Uterine and Adnexal Procedures for Non-Malignancy
Caesarean Section

[1] The ICD-9-CM codes that these categories comprise are available on request from the Manitoba Centre for Health Policy and Evaluation.

Table 2
Proportions of Cases and Days for Diagnostic Categories Within Medical, Surgical, and Obstetrical Groupings at All Hospitals Studied for the Fiscal Year 1990/91[1]

Diagnosis/ Procedure	% Cases	% Days
Medical Categories		
Simple Pneumonia	4.1	4.2
Bronchitis/Asthma	4.1	2.0
AMI	3.5	4.2
Heart Failure/Shock	3.3	4.3
Digestive Disorders	5.9	3.6
Psychoses	3.9	10.0
Total	24.8	28.3
Surgical Categories		
Major Bowel	3.0	6.7
Anal and Stomal	2.1	1.4
Inguinal/Femoral Hernia	4.3	2.2
Cholecystectomy	4.6	4.6
Prostatectomy	3.7	3.9
Uterine and Adnexal	6.4	5.6
Total	24.1	24.4
Obstetrical Categories		
Vaginal Deliveries	51.0	46.3
Caesarean Section	11.6	23.5
Total	62.6	69.8

[1] All stays longer than 60 days have been excluded. Transfers, deaths, out-of-province cases, and rehabilitation cases have not been excluded from this table.

indicates, 24.8% of all medical admissions, 24.1% of all surgical admissions, and 62.6% of all obstetrical admissions with stays of 60 days or less (acute stays) were accounted for in these 14 diagnostic categories at all eight hospitals for the fiscal year 1990/91.

Exclusions. A category-specific cutoff was used to exclude patients with atypically long stays. An atypically long stay was defined as over 30, 60, or 90 days, depending on the medical, surgical, or obstetrical category. The cutoff chosen was the one that was closest to excluding the longest 2% of the stays.[4] Several patient types that could potentially bias the analyses were excluded. These exclusions consisted of patients who died, patients transferred to or from another institution (including nursing homes), and out-of-province patients. Patients at the Rehabilitation Centre and newborns were also excluded from all analyses.

The total number of cases and days at all eight hospitals in the specific diagnostic categories, before exclusions, was 29,307 cases and 266,776 days (Table B1). The number of cases and days per hospital ranged from 1,256 to 7,500 cases and from 10,380 to 64,484 days. Overall, 11.9% of the cases were excluded; however, this value varied across hospitals ranging from 7.8% to 19.1%. These exclusions accounted for 34.1% of inpatient days for these diagnostic categories, ranging from 18.5% to 50.7% across the eight hospitals. Although only 1.4% of these cases were excluded due to length of stay (referred to as LOS in tables) cut-offs, these excluded cases accounted for 23.7% of the total days in these categories.

Factors Affecting Length of Stay

All analyses focused on comparisons of length of stay across hospitals. Because length of stay can be influenced not only by hospital factors but also by differences in the characteristics of the patients admitted to the different hospitals, all variables listed in Table 3, using total cholecystectomy as an example of a specific diagnostic category, were taken into account when comparing length of stay across hospitals.

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[4] The only exception to this 2% rule was "psychoses" (the only category with a 90-day cutoff). Although this cutoff excluded the longest 10% of the stays, the 90-day cutoff was chosen because many patients in this category had extremely long stays.

Severity of illness of patients was assessed using RDRG software. This program judges the level of severity of illness for patients within the medical and surgical categories based on the comorbidities and complications recorded as additional diagnoses on their hospital record. There are three levels of severity for medical patients: those with comorbidities or complications expected to have had no or minor, moderate, or major impact on length of stay. For surgical patients, a fourth class is added for patients having catastrophic comorbidities or complications, such as Acute Myocardial Infarction (AMI) while under anaesthetic.

Age categories differed depending on the diagnostic category. For eight of the 14 diagnostic categories, the age groupings were the same as those shown in Table 3. For those diagnostic categories with a higher proportion of younger patients, the age groupings were lower (e.g., for vaginal deliveries the three age groups were 0-18, 19-30, and 31+ years), whereas diagnostic categories with a higher proportion of elderly patients had higher age groupings (e.g., for transurethral prostatectomy the three age groups were 0-65, 66-79, and 80+ years).

Those patients treated in the region where they resided were placed into the category of 'resident', whereas others (individuals travelling to Winnipeg or Brandon from other regions) were placed into a 'non-resident' category.

Hospitals draw patients from different neighbourhoods, and it is generally thought that patients with fewer resources at home will by necessity be kept longer in hospital. Our analyses used two measures of patient socioeconomic status: 1) Core area patients were identified using postal codes available on the MHSC registry. This group of patients have been shown to have a number of risk factors for poor health including high levels of poverty, unemployment, poor housing, and single-parent families. The core area is defined by R3A and R3B postal codes and comprises an area bounded by Portage Avenue, Sherbrook Street, the CPR railway lines, and the Red River. 2) Information on neighbourhood income level was obtained from 1986 Census public use data. Urban enumeration areas were ranked from poorest to wealthiest, and then grouped into five population quintiles, each containing 20% of the urban population, with Quintile 1 being the poorest. Because of the range of household incomes within the same enumeration areas in rural areas, all rural area residents were grouped into one category.

Table 3
Mean LOS in Days for Variables Used in Analyses for Total Cholecystectomy Without Common Duct Exploration

Variables	Mean LOS
Severity (Comorbidities and Complications - CCs)	
no/minor	6.7
moderate	7.6
major	9.6
catastrophic	13.3
Age	
0 - 30	6.3
31 - 60	6.9
61 +	9.1
Sex	
male	8.0
female	7.1
Residence in Service Area	
resident	7.4
non-resident	7.2
Treaty Indian Status	
Treaty Indian	7.3
all others	7.3
Area of Residence	
core	7.6
non-core	7.3
Urban Income Level Quintile	
1st (lowest)	7.6
2nd	7.8
3rd	7.0
4th	7.1
5th (highest)	7.4
rural	7.1

Overall Analyses of Acute Admissions (Analysis II)

An alternative approach, looking at all admissions rather than selected diagnostic categories, was used to provide an overall assessment of efficiency. As with Analysis I, this analysis focused on comparisons of length of stay across hospitals. Similar adjustments were made for patient characteristics. However, because all admissions were analyzed together, rather than separately, the severity adjustment measure had to consider not only the comorbidity and complication level of the patient, but also the reason for admission. To accomplish this, an RDRG weight was assigned to each acute care admission, depending on the level of severity and the reason for patient admission.

Development of RDRG weights. The RDRG weights were calculated from length of stay information on a sample of almost 2 million discharge records from the 1986 U.S. Medpar database (Health Care Financing Administration, 1986).[5] The average length of stay was computed for each RDRG and this was divided by the average length of stay for the entire sample to obtain a relative weight for each RDRG.[6]

Exclusions. Exclusions for the overall analyses were similar to the selected patient category analyses. In addition to excluding deaths, transfers, out-of-province patients, and those with atypically long stays[7], severely ill patients (with major or catastrophic comorbidities and complications) were also excluded from the overall analyses.

The total number of cases and days at the eight hospitals for this overall analysis, before exclusions, was 89,214 cases and 874,146 days (Table B2). The number of cases and days per hospital ranged from 3,904 to 27,530 cases and from 52,555 to 238,248 days. The proportions of cases and days excluded from these analyses were 22.6% and 55.7% respectively. These values ranged from 17.7% to 26.2% of the cases, and from 52.4% to 65.4% of the days, excluded across the eight hospitals. An additional 0.8% of the cases from the complexity-adjusted

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[5] These files contain discharges primarily for patients aged 65 years or older.

[6] Where there were very few (less than 10) or no cases for an RDRG, the weight was set to 'missing'.

[7] Because hundreds of patient categories were included in the overall analyses, specific length of stay cutoffs could not be determined and an overall 60-day cutoff was used.

analysis were excluded due to missing RDRG weights. Acute stays (60 days or less) accounted for 98.2% of the admissions and 68.4% of the days across the eight hospitals in 1990/91 (Table B2).

Results

Impact of Patient Characteristics on Length of Stay

Table 3 illustrates the impact of each of the variables discussed above on length of stay using the surgical procedure, total cholecystectomy, as an example. As can be seen, the length of stay varied markedly across severity categories, from 6.7 days for those with no/minor comorbidities or complications to 13.3 days for those with catastrophic comorbidities or complications. Older patients had longer stays, at 9.1 days, than younger patients, at 6.3 days. One might think that individuals living 'in region' would be discharged earlier than the non-residents, however, this was not generally found, and appears to be true only for certain age groups. Although not shown in this analysis, younger patients are more likely to travel out of their region for care and they tend to have shorter stays. The lengths of stay for Treaty Indians did not usually differ from the stays for other patients. In general, the socioeconomic indicators influenced length of stay in the expected direction, although the differences for the majority of the patient categories were not marked. Length of stay was affected similarly by severity, age, and the other variables within each of the hospitals (Table A1 - Appendix A).

Length of Stay for Specific Diagnostic Categories (Analysis I)

Impact of Hospitals on Length of Stay. After controlling for the variables likely to impact length of stay discussed above, multiple regression analyses[8], conducted on each of the 14 selected diagnostic categories, demonstrated that the hospital of admission significantly affected patients' length of stay for 12 of the 14 patient categories studied. Table 4 illustrates the impact of the hospital of admission on length of stay in models fit separately for each diagnostic category, using the model without the hospital factor and the model with the hospital factor. The R^2 value is the proportion of variation in length of stay that can be explained by the variables studied. In the first column it indicates how much variation in length of stay was explained using patient characteristics (e.g., age, sex and severity of illness), before the hospital factor is considered.

[8] This regression analysis estimated the differences in length of stay that would occur if the same patient were treated at each of the different hospitals.

Table 4
Impact of Hospital Factor on Fit of Model for Length Of Stay for Each Diagnostic Category Studied

Diagnostic Categories	R^2 without hospital factor	R^2 with hospital factor
Medical		
AMI	.09	.15 ***
Psychoses	.03	.07 ***
Bronchitis and Asthma	.21	.22 ***
Digestive Disorders	.14	.15 *
Simple Pneumonia	.16	.16
Heart Failure and Shock	.09	.10
Surgical		
Inguinal/Femoral Hernia Procedures	.26	.34 ***
Total Cholecystectomy w/o CDE	.15	.23 ***
Transurethral Prostatectomy	.17	.22 ***
Uterine & Adnexal Procedures	.23	.25 ***
Anal and Stomal Procedures	.16	.19 **
Major Bowel Procedures	.22	.23 *
Obstetrical[1]		
Vaginal Deliveries	.03	.05 ***
Caesarean Section	.04	.05 **

* $p < .01$
** $p < .001$
*** $p < .0001$

[1] This analysis was repeated treating the dependent variable (length of stay) as a categorical variable, rather than a continuous variable, due to limited dispersion in length of stay for obstetrical admissions. The results for the categorical analysis were similar to those reported here, i.e., a significant impact of the hospital factor on length of stay.

The R^2 in the second column is the proportion of variation in length of stay explained by the hospital factor in addition to patient characteristics. The difference between these R^2 values measures the impact of hospital on length of stay.

Thus among the medical diagnoses, the hospital factor had the biggest impact on length of stay for patients with AMI. Figure 1 illustrates this marked difference; patients admitted to HX with this diagnosis remained in hospital an average 8.9 days compared to patients admitted to AX who stayed an average 13.4 days. These differences existed despite adjustments for all other variables discussed above, e.g., severity, age[9], etc.

Among the surgical categories, the hospital factor had the biggest impact on patients operated on for inguinal and femoral hernia procedures and total cholecystectomy procedures. Figure 2 shows the markedly different lengths of stay depending on hospital of admission for inguinal and femoral hernia procedures; patients at BX stayed an average 3 days for these procedures compared to 4.9 days at FX. The figures showing the adjusted average length of stay across hospitals for the remaining patient categories can be found in Appendix A (Figures A1 to A12).[10] The only two categories for which hospital did not influence length of stay were simple pneumonia and heart failure and shock.

The impact of hospital on length of stay tended to be more consistent and somewhat greater for patients in surgical categories than patients in medical categories, illustrated by larger differences in the two R^2 values (with and without the hospital factor).

Consistency in Hospital Rankings. One question that arises from the length of stay analyses is whether some hospitals consistently keep their patients longer, regardless of diagnosis, while others discharge their patients earlier than others. Visual inspection of Figures 1 and 2, as well as Figures A1 to A12 in Appendix A, suggests that AX and FX tend to keep patients longer,

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[9] To determine whether our age categories adjusted adequately for elderly patients, analyses were repeated for the three diagnostic categories with the highest proportions of elderly patients using five age categories (four of which were over 60 years of age). Results were virtually identical to those using only three age categories.

[10] For unadjusted averages see Table A2 in Appendix A.

Figure 1
Adjusted Mean LOS Across Hospitals for AMI

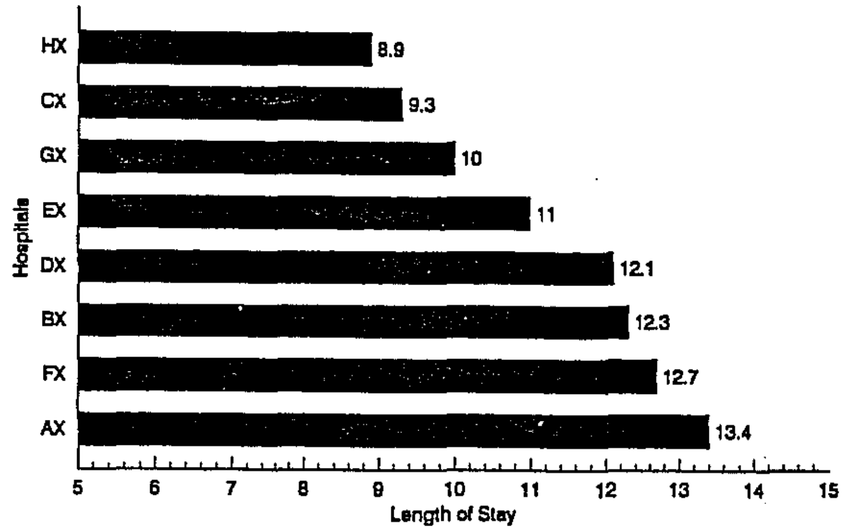
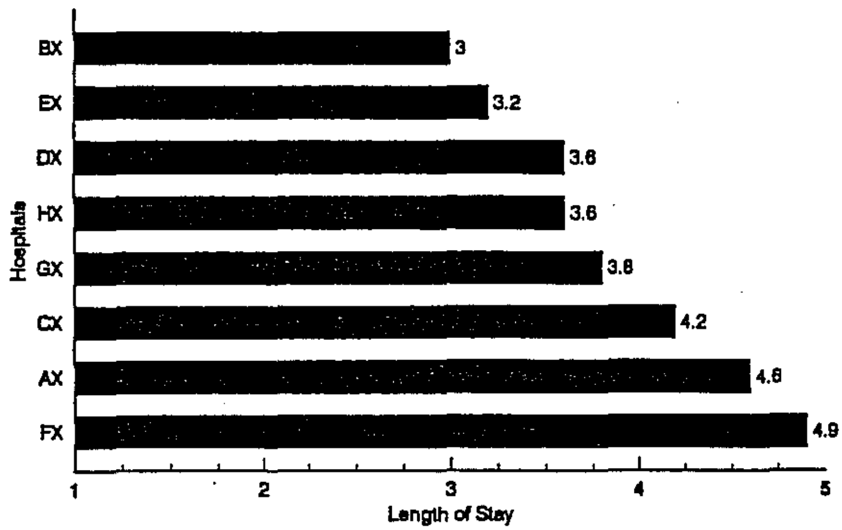


Figure 2
Adjusted Mean LOS Across Hospitals for Inguinal and Femoral Hernia Procedures



whereas HX and BX tend to have shorter stays. Table 5 shows the rank orderings for length of stay within each patient category for each hospital. Despite the apparent overall consistency of hospital ranking across diagnostic categories, there was still some variation evident within hospitals, with the same hospital having the longest average stay for one diagnostic category and the shortest for another. For example, CX hospital had the shortest mean stay for vaginal delivery and the longest for transurethral prostatectomy, whereas GX had the shortest mean stay for prostatectomy and the longest for total cholecystectomy.

A rank order test confirmed statistically the consistency of ranking of hospitals across patient categories. When the rankings were examined by types of admissions the greatest degree of consistency was found for surgical and obstetrical admissions, with BX and HX having the shortest stays for surgery, and CX and BX having the shortest stays for obstetrics. There was less consistency observed across the medical categories. Across all types of admissions, BX, HX, and DX had more efficient discharge practices, whereas AX and FX were less efficient.

Consistency of Hospital Rankings Across Years. If length of stay showed no consistent pattern from year-to-year across hospitals, it would be more difficult to identify practices amenable to change. However, as Figures 3 and 4 illustrate, the rankings of hospitals in terms of length of stay appear to be remarkably consistent across two years. As can be seen in Figure 3, the four shortest stay hospitals for total cholecystectomy procedures remained in the same position over two consecutive years. Likewise, Figure 4 shows that the five shortest stay hospitals, for patients with AMI, were the same for both years. As seen in Table 6, correlations between the rankings for the two years were very high for most of the diagnostic categories, providing statistical evidence for a consistent pattern in hospital rankings. Note in Table 6 that the length of stay rankings of hospitals for several diagnostic categories were more consistent across the two years than that shown in Figure 3. For only three of the diagnostic categories were correlations between the two years low, and two of these, simple pneumonia and heart failure and shock, were categories where hospital of admission had no impact on length of stay.

Table 5
Consistency of Hospital Rankings of Adjusted Length of Stay Across Diagnostic Categories[1]

	Hospitals							
	AX	BX	CX	DX	EX	FX	GX	HX
Medical								
AMI	8	6	2	5	4	7	3	1
Psychoses	1	2	4	5	*	6	3	*
Bronchitis	7	2	5	1	8	3	4	6
Digestive Disorders	7	2	4	1	5	8	3	6
Surgical								
Hernia	7	1	5	3	2	8	5	4
Cholecystectomy	6	3	5	4	2	7	8	1
Prostatectomy	5	2	8	7	6	3	1	4
Uterine/Adnexal	8	6	4	1	7	5	3	2
Anal/Stomal	7	2	6	3	1	8	5	4
Major Bowel	7	2	4	5	6	8	3	1
Obstetrical								
Vaginal Delivery	6	3	1	4	5	*	2	*
Caesarean Section	6	1	2	3	4	*	5	*

[1] Only the categories for which hospital makes a significant contribution to length of stay are included. Hospitals are ranked from 1 to 8, with 1 being the shortest average length of stay.

* denotes fewer than 25 cases in total.

Figure 3
Adjusted Mean LOS Across Hospitals for Two Years of Data for Total Cholecystectomy

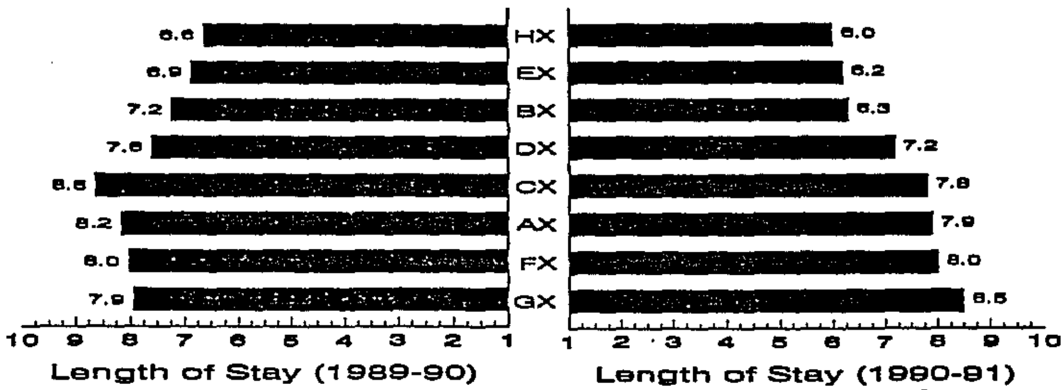


Figure 4
Adjusted Mean LOS Across Hospitals for Two Years of Data for AMI

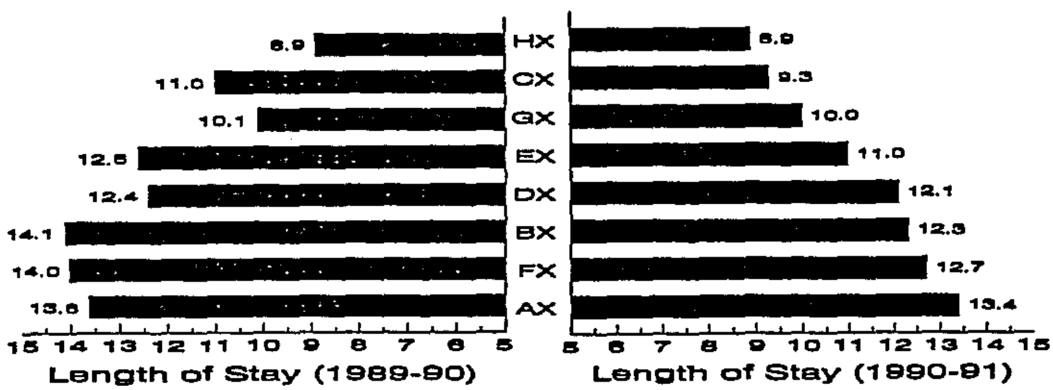


Table 6
Consistency of Hospital Rankings Within Diagnostic Categories Across Two Fiscal Years: 1989/90 and 1990/91

Patient Categories	correlation*
Uterine and Adnexal Procedures	.95
Psychoses	.94
Inguinal and Femoral Hernia	.93
AMI	.86
Digestive Disorders	.86
Transurethral Prostatectomy	.83
Anal and Stomal Procedures	.81
Bronchitis and Asthma	.79
Caesarean Section	.77
Total Cholecystectomy	.74
Vaginal Delivery	.66
Heart Failure and Shock	.36
Major Bowel Procedures	.21
Simple Pneumonia	-.17

* Spearman's Rank Correlation Coefficient.

Length of Stay for All Admissions (Analysis II)

The preceding analyses using selected diagnostic categories showed that for 12 of the 14 categories studied, the hospital of admission impacted significantly on patient length of stay. We then sought to determine whether these results generalized to all admissions. To do this we conducted two multiple regression analyses on all admissions together, first with a model fit for the average of all hospitals, and then with a model fit for the shortest stay hospital. In each case, the characteristics of the patients admitted to each of the hospitals were used to calculate the length of stay anticipated if these patients had gone to i) an average stay hospital, or ii) the shortest stay hospital. These models adjusted for the age and sex of the patient, as well as for the complexity (in terms of severity of illness) of cases admitted, using the RDRG weights.[11]

Table 7 shows the actual and predicted mean lengths of stay across the eight hospitals after adjusting for the age, sex, and complexity of the admissions. The R^2 value representing the variation explained by these three variables was .29.[12] Two different sets of predicted means were calculated. The first set was based on the average stays for all eight hospitals for the different types of patients treated, i.e., patients with different complexity weights, different ages, different gender, and interactions among these factors. These values are presented in the second row of Table 7. Looking at this first section of Table 7, HX and DX had the most efficient discharge practices, indicated by the lowest ratios of actual to predicted length of stay, while AX and FX were the least efficient. For example, the actual (unadjusted) length of stay at HX was 6.25 days for the patients included in this analysis.

[11] Because the previous analyses found that residence in service area, Treaty Indian status, area of residence, and income level did not impact significantly on length of stay, this analysis did not adjust for these variables.

[12] It should be noted that the R^2 value for this analysis, before excluding the two most severely ill levels of patients (those with major and catastrophic comorbidities), was .35. A U.S. analysis (McMahon et al., 1992) that went back to records of all laboratory tests performed on patients and established values recorded within 24 hours of admission as well as the worst value recorded, when combined with DRG, achieved an R^2 of .34 in predicting length of stay (compared with an R^2 of .20 when using DRG's alone). This suggests that Manitoba hospitals' coding of diagnosis is thorough enough to support using case-mix adjusters relying on discharge diagnosis, and that the RDRG system for adjusting for case severity is equal to that of a system requiring much more detailed data to be abstracted from a hospital record.

Table 7
Actual and Predicted Mean LOS Given the Case Complexity (per RDRG weight) at Each Manitoba Hospital

	Hospitals							
	AX	BX	CX	DX	EX	FX	GX	HX
Mean for eight hospitals as standard								
Actual	6.03	5.73	5.06	5.73	5.26	6.77	5.36	6.25
Predicted	5.39	5.86	5.10	6.20	5.40	6.30	5.33	6.77
Ratio Actual to Predicted	1.12	0.98	0.99	0.92	0.97	1.08	1.01	0.92
Mean for shortest stay hospital as standard								
Actual	6.03	5.73	5.06	5.73	5.26	6.77	5.36	6.25
Predicted	4.91	5.32	4.56	5.59	4.92	5.76	4.67	6.25
Ratio Actual to Predicted	1.23	1.08	1.11	1.03	1.07	1.17	1.15	1.00

Given the mix of patients found at HX, and the average stays found for these types of patients at all eight hospitals, the predicted mean length of stay at HX was 6.77 days. The ratio of actual to predicted mean length of stay for HX was .92, suggesting their patients were discharged sooner than would be predicted by the mean stays across the eight hospitals for these types of patients.

The second set of predicted means (row 5 of Table 7) was based on using the most efficient hospital's (HX) lengths of stay for different patient types to determine the predicted stays for each of the other hospitals. The results of this analysis are shown in the second section of Table 7. For example, the actual length of stay at AX was 6.03 days. Given the particular types of patients treated at AX, if these patients were discharged as efficiently as similar patients at HX, the predicted mean length of stay would be 4.91 days. The ratio of actual to predicted mean stays for AX was 1.23, suggesting patients stayed 23% longer at AX than HX.

An Estimate of Potential Savings Based on Analysis I

How Many Days Could be 'Saved'? Given the often sizeable differences in length of stay across hospitals, it is interesting to speculate how many days could be saved in the system if efficiency improved. That is, how many days could be saved if each hospital discharged patients as early as the hospital with the shortest stay? The potential days that could be saved within each of the specific diagnostic categories studied were calculated for four different age and severity groupings of patients. The selected diagnostic categories were grouped together depending on whether they were surgical (Table 8), medical (Table B3), or obstetrical (Table B4) admissions. Only admissions for patients with no/minor or moderate comorbidities and complications who were 18 years of age and older were examined[13], and potential days saved were estimated only where differences between the shortest stay hospitals and the others were statically significant. For instance, BX hospital had the shortest stay for patients undergoing inguinal and femoral hernia procedures who were 18 to 65 years of age, and had no/minor comorbidities and complications, and thus 0 days could be saved at this hospital (second row of Table 8).

[13] Paediatric patients were excluded from these analyses as they are concentrated at the two teaching hospitals and often have shorter stays. Their exclusion does not imply that efficient discharge practices are already operating for these patients, however a preliminary analysis looking only at paediatric patients with no or minor comorbidities or complications in three of the selected patient categories found lengths of stay for the two Manitoba teaching hospitals to be comparable to those at U.S. hospitals.

Table 8
Potential Surgical Days That Could Be Saved By Specific Hospitals if All Hospitals Discharged Patients in the Same Time Period as the Most Efficient Hospital According to Age and Severity Groups of Patients

	Hospitals								
Categories	AX	BX	CX	DX	EX	FX	GX	HX	TOTAL
	Surgical Patients Aged 18-65 Years with No/Minor CCs								
Cholecystectomy	166	**	135	143	**	126	129	0	699
Hernia	164	0	43	63	**	131	56	27	484
Anal/Stomal	94	**	98	**	0	154	**	**	346
Uterine/Adnexal	192	62	0	0	61	13	**	**	328
Major Bowel	*	**	112	**	88	52	**	**	252
Prostatectomy	118	**	66	30	9	7	0	6	236
Total	734	62	454	236	158	483	185	33	2345
	Surgical Patients over 65 Years with No/Minor CCs								
Cholecystectomy	79	**	41	46	**	102	4	0	272
Hernia	83	0	49	29	**	103	28	8	300
Anal/Stomal	*	*	*	*	*	*	*	*	*
Uterine/Adnexal	59	*	23	0	37	*	**	**	119
Major Bowel	*	*	*	*	*	*	*	*	0
Prostatectomy	280	**	124	81	194	150	0	39	868
Total	501	0	237	156	231	355	32	47	1559
	Surgical Patients Aged 18-65 Years with Moderate CCs								
Cholecystectomy	72	**	74	50	**	34	109	0	339
Hernia	*	*	*	*	*	*	*	*	0
Anal/Stomal	*	*	*	*	*	*	*	*	0
Uterine/Adnexal	23	21	20	0	18	19	**	**	101
Major Bowel	*	*	*	*	*	*	*	*	0
Prostatectomy	*	*	*	*	*	*	*	*	0
Total	95	21	94	50	18	53	109	0	440
	Surgical Patients over 65 Years with Moderate CCs								
Cholecystectomy	*	*	*	*	*	*	*	*	0
Hernia	*	*	*	*	*	*	*	*	0
Anal/Stomal	*	*	*	*	*	*	*	*	0
Uterine/Adnexal	*	*	*	*	*	*	*	*	0
Major Bowel	*	*	*	*	*	*	*	*	0
Prostatectomy	229	**	87	93	*	66	0	79	554
Total	229	0	87	93	0	66	0	79	554
TOTAL	1559	83	872	535	407	957	326	159	4898

* Cells with less than 10 patients.

** Values not significantly different from lowest value.

AX hospital, whose stays were significantly longer than BX's, could potentially save 164 days if its average stay for patients undergoing these hernia procedures was the same as BX's. Summing across hospitals for these patients (18-65, no/minor comorbidities or complications) in this category (hernia procedures), 484 days could potentially be saved if each hospital could achieve BX's shorter length of stay.

Although surgical patients with major and catastrophic comorbidities or complications were excluded from these analyses, Table 8 shows that an estimated total of 4,898 surgical days could potentially be saved if more efficient discharge practices were adopted. These values ranged from 83 days at BX to 1,559 days at AX. Similar calculations were made for the six categories of medical patients (Table B3) and for the two categories of obstetrical patients (Table B4) reviewed, again excluding patients with major or catastrophic comorbidities or complications. An estimated total of 11,786 medical days could be saved through more efficient discharge practices, ranging from 252 to 3,231 days across hospitals, and an estimated total of 1,554 days could be saved for obstetrical patients, ranging from 0 to 580 days across hospitals.

The total of 11,786 days that could be saved for medical patients (Table B3), given more efficient discharge practices, was largely due to patients with psychoses, who comprised 64% of these days (7,544 days). Because our regression analyses showed we were not very successful in explaining the variations in stays of patients with psychoses using the factors such as age, sex and case severity, one should be cautious in assuming that the discharge practices at AX (the shortest stay hospital for these patients) could be adopted across the system. However, by one important measure, the likelihood that patients with psychoses would be readmitted within the year, AX did as well as most other hospitals (readmission rates ranged from 16.1% to 23.5%); two of the hospitals who kept their patients much longer than AX had a higher proportion of their patients readmitted within a year. For subsequent analyses, psychiatric days were separated from other medical days.

The information on potential days saved for the medical, surgical, obstetrical, and psychiatric categories was summarized and reported both as an absolute number and as a percentage of the total days utilized for admissions within the categories (Table B5). For example, the total days used by patients in the six surgical categories at AX hospital was 6,311; the potential days this hospital could save by adopting more efficient discharge practices was 1,559, or 25% of the total surgical days used at this hospital. Across all hospitals, 13% of the surgical, 21% of the medical, 4% of the obstetrical, and 26% of the psychiatric days could potentially be saved with increased efficiency. The ranges for these values across the eight hospitals was 2 to 25% for surgical, 11 to 37% for medical, 0 to 15% for obstetrical, and 0 to 33% for psychiatric admissions. Although previous analyses suggested that the impact of hospital on length of stay was greater and more consistent for surgical than medical cases, a greater proportion of medical days could potentially be saved, in part because of the longer stays and larger number of cases in each of the medical categories.

Are There Lessons From U.S. Data? National Hospital Discharge Survey data (National Center for Health Statistics, 1989) from a representative sample of 233,393 U.S. patients were used for comparison. Length of stay was adjusted identically in both U.S. and Manitoba samples using age and case severity, the two factors having the biggest impact on Manitoba patient length of stay. Only U.S. hospitals with 200 or more beds were included. Transfers, deaths, and stays longer than 60 days were excluded from both samples. Selecting cases in the same 14 diagnostic categories and using the same type of analyses that were used in Tables 8 and B5 to calculate the potential days that could be saved through increased efficiency, we replicated the analyses using the U.S. hospitals' mean length of stay as the standard (rather than the shortest hospital stay in Winnipeg and Brandon).

The potential savings tended to be greater using U.S. standards. Across all hospitals, 29% of the surgical, 22% of the medical, 27% of the obstetrical, and 32% of psychiatric days could be saved, if each Manitoba hospital could achieve the mean length of stay observed at the U.S. hospitals (Table B6). Whereas using the lowest Manitoba hospitals as standards indicated a potential savings of 18,238 days for these patient categories (Table B5), applying typical U.S. discharge practices, 38,495 days could potentially be saved (Table B6). The savings using U.S. standards are less conservative, however, since all differences in lengths of stay between the Manitoba and the U.S. hospitals were used to calculate savings, not just statistically significant differences. Caution should be exercised when comparing Manitoba and U.S. lengths of stay. U.S. hospitals are more costly than Manitoba hospitals and are rewarded in their payment system for discharging patients quickly. To achieve comparative lengths of stay at Manitoba hospitals, expensive additions might be required, such as running operating rooms on weekends and evenings, having more outpatient diagnostic capability, and developing the equivalent of the skilled nursing facility for post-hospital short-term care.

Estimated Potential Savings. The preceding analyses suggest considerable potential savings in acute care days given increased efficiency in discharge practices. Considering that less than a third of all cases discharged from these hospitals within 60 days are represented in the specific diagnostic categories studied[14], it is interesting to speculate about the total potential savings possible for the eight hospitals if patients in all diagnostic categories were considered. Estimates of the potential days that might be saved through efficient discharge practices were calculated, assuming the potential efficiencies found in the diagnostic categories studied above could be achieved across all acute stay patients 18 years of age or older (Table B7). All stays longer than 60 days were excluded, as were transfers, deaths, out-of-province patients, and patients with major or catastrophic comorbidities or complications. Potential bed savings were calculated given our estimates of days that could be saved (Tables B5 and B6) and from occupancy rates at specific hospitals. Occupancy rates for each hospital were obtained from the "1990-91 Annual Return of Health Care Facilities - Hospitals" records and are shown in Table A3, in Appendix A. Table A3 shows the overall occupancy rates for acute beds in each hospital, as well as separate acute rates for medical, surgical, obstetrical, and psychiatric wards.

For example, the total days used by all surgical patients (except those excluded for reasons mentioned above) at AX was 17,767 days (Table B7). Our previous analysis suggested a 25% saving of surgical days at this hospital for the selected diagnostic categories, using the shortest Manitoba stays as the standard. If we use this same proportion for all surgical patients at AX, a potential 4,442 days could be saved. Given the 62.1% occupancy rate for surgical beds at this hospital, this translates into a potential saving of 20 surgical beds at AX hospital (4,442 days divided by 62.1% of 365 days). Using U.S. standards which suggest potentially 38% savings of surgical days at this hospital, an estimated 6,752 days could be saved at AX, or 30 surgical beds. The total estimated potential savings (surgical, medical, obstetrical, and psychiatric together) for all eight hospitals using Manitoba standards was 58,847 days, or 201 beds. These values ranged from 1,940 to 11,541 days and from 6 to 43 beds across hospitals. The savings were greater (96,421 days and 333 beds) if U.S. standards were applied. However, as mentioned previously,

[14] See Table 2.

differences in hospital costs and available resources may make the U.S. mean lengths of stay difficult to achieve without increased funding.

The estimated days and beds saved (Table B7) represent crude approximations, based on selected diagnostic categories of admissions. Because of the variability in efficiency demonstrated across categories, the actual potential savings may be over- or under-estimated. For this reason the estimate of potential savings was also calculated using the results of Analysis II.

An Estimate of Potential Savings Based on Analysis II

An alternative estimate of the potential days that could be saved if efficiency increased was calculated using the overall estimates of hospital efficiency. This was a more conservative approach for estimating potential savings than that in the first set of analyses. Rather than looking at the most efficient hospital within each patient category, the hospital that was most efficient overall was chosen as the standard. As noted previously, even the more efficient hospitals sometimes had inefficient discharge practices for some types of admissions. Despite this more conservative approach, an estimated 166 beds (Table B8) could potentially be saved in the system if more efficient discharge practices were adopted.

Discussion

Several aspects of the analysis are important to emphasize. First of all, when comparing discharge patterns across hospitals, adjustments for the severity of illness, and age and sex of patients are important. While hospitals differ in terms of the socioeconomic characteristics of their patients and whether the patients reside in the area in which they were treated, these factors do not appear to independently affect a patient's length of stay. One indication that the adjustment for differences in patient characteristics worked reasonably well is that the hospitals with the longest lengths of stay were not consistently the tertiary care/teaching hospitals. Longer stays therefore do not necessarily appear to represent patient requirements but more likely reflect physician discharge practices or administrative inefficiencies.

This analysis has demonstrated marked differences across hospitals in the efficiency with which patients are discharged.[15] The more efficient hospitals tended to show the same patterns over a two-year period.[16] It is therefore likely that the discharge patterns observed are real and not random variations in rankings that change from year to year. These differences exist for 12 of the 14 categories of diagnoses examined. The overall analysis suggests that similar differences in efficiency likely exist across the great majority of diagnoses not examined separately. Even though some hospitals were consistently more efficient (HX, BX, DX) and two hospitals consistently less efficient (FX and AX), most of the efficient hospitals had inefficient discharge practices in some diagnostic areas (BX's AMI and HX's bronchitis patients were among those with the longest lengths of stay). Even the less efficient hospitals showed some areas of remarkable efficiency (AX's efficient treatment of psychiatric patients).

Would more efficient discharge patterns, i.e., reducing length of stay, compromise patient outcomes? The literature reviewed suggests that shorter patient stays have not been found to be related to adverse patient outcomes. These studies have been conducted in the United States where hospitals have much shorter average stays than even the more efficient hospitals in Manitoba. We also found that patients with psychoses discharged from the urban hospital with

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[15] We received conflicting reports on the extent to which one of the more efficient hospitals adhered to MHSC instructions on reporting the hospital days of persons presenting at emergency wards. Further investigation regarding this hospital revealed that before a recent policy change, medical patients could be held in emergency without admission. We feel confident, however, that our analyses were not biased by this practice for two reasons. First, we were told that this practice was rare for surgical admissions, yet our selected diagnostic category analyses (Analysis I) showed this hospital to be one of the more efficient hospitals for both medical and surgical categories. Second, based on an estimate of the number of patients affected by this practice provided to us, the estimated proportion of patients held in emergency without admission for the analysis of all acute admissions (Analysis II) was relatively small (less than 5%).

[16] The analyses in this paper were based on 1990/91 fiscal data, with 1989/90 used for comparison. Because data for 1991/92 became available only near the time of completion of this project, comprehensive reanalyses were not feasible. To determine whether length of stay differences across hospitals reported for 1990/91 were similar in 1991/92, two specific diagnostic category analyses (those showing the greatest impact of hospital on length of stay in 1990/91 in Analysis I) and the overall analysis (Analysis II) were repeated on the 1991/92 data. Correlations for hospital rankings for the specific diagnostic categories for the two years were r_s=.83 for inguinal and femoral hernia, and r_s=.71 for AMI. Although the correlation for AMI suggests some change in hospital ranking for length of stay, the overall analysis showed almost identical hospital ordering for the two years, with only two adjacent hospitals switching positions. These preliminary analyses suggest similar patterns of results in the 1991/92 fiscal year.

the shortest length of stay were not readmitted to hospital any more frequently than patients discharged from two hospitals who kept their patients much longer (their patients averaged 28 days in hospitals versus 19 days in the most efficient hospital). Finally, patterns varied within the same hospital, i.e., CX's patients undergoing prostatectomy had the longest stay of all eight hospitals whereas patients admitted for vaginal deliveries had the shortest length of stay across all hospitals.

Our analyses were by intent conservative, excluding the sickest, most fragile patients from all assessments of efficiency and all calculations of days or beds that could be potentially 'saved'. This was done by not including patients with the most severe complications and/or comorbidities, patients transferred to or from other hospitals or nursing homes, patients who died, and patients with atypically long stays.[17] The intent of these analyses was not to insist that a certain length of stay for a particular diagnostic category could be achieved by all hospitals, nor that a certain number of beds could be reduced at a particular hospital. Our intent was to identify whether there is room for improving efficiency within the system. Our analyses highlighted that there are differences in the efficiency with which the large acute care hospitals in Manitoba discharge their patients. Thus, there is potential to close beds without denying patients access if hospitals improve their operations.

This analysis has focused only on acute hospital stays, essentially those patients in hospital for 60 days or less.[18] While such stays make up 98% of admissions, they only represent 68% of the days in any given year in the Winnipeg and Brandon hospitals. Most of the beds that have been proposed for closure to date have not come from these acute wards. By excluding stays over 60 days (except in those particular diagnostic groups, such as psychoses, where most cases have long stays), we might have underestimated the inefficiencies of hospitals such as FX which had such a high proportion of its days excluded.

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[17] Recall from Tables B1 and B2 that the selected diagnostic category analyses (Analysis I) excluded 11.9% of the inpatient cases and 34.1% of the inpatient days, while the overall analysis of acute admissions (Analysis II) excluded 22.6% of the inpatient cases, and 55.7% of the inpatient days.

[18] Of course, despite using this cutoff most patients are in hospital for a very short time - on average 6.3 days. If we had used a 30-day cutoff, the mean length of stay would fall only to 5.5. days.

Our analyses of American hospitals' length of stay used the same key adjusters (case severity, age and sex), and we found that in most diagnostic areas the U.S. average length of stay was shorter than the most efficient Manitoba hospital. These results strongly suggest that more efficient discharge patterns in Manitoba hospitals should be achievable without compromising patient care. (We are, of course, not the first to observe that patients in Canadian hospitals have longer lengths of stay than patients in U.S. hospitals (Newhouse et al., 1988) and that patients in U.S. Health Maintenance Organizations such as Kaiser Permanente have lengths of stay markedly shorter than the U.S. hospital average.)

The Implications of These Findings

The hospital system appears to have the capacity to handle more patients or to absorb a sizeable number of bed closures without rationing access to hospital care. Gains in efficiency without closing beds will simply increase patient volume. If accompanied by bed closures, improvements in efficiency are key to counterbalancing the possible increase in services provided at the front end of a hospitalization episode since the less efficient hospitals can then use their current staff complement to better advantage. Bed closures alone do not necessarily guarantee improved efficiency. Incentives should be built into the system to reward hospitals for more efficient discharge practices.

The hospitals and the government have tended to assume that every bed closed should be replaced by another type of service - possibly less intense and less expensive, but nevertheless a replacement. These data suggest that at least some of the bed closures could be accommodated simply through more efficient treatment of patients in the remaining beds. Our major standard for judging hospital efficiency was to identify the urban hospitals with the shortest average lengths of stay for different types of admissions. Calculations were performed only where statistically significant differences in length of stay existed. Since these urban hospitals generally have quite similar access to home care services, the hospitals operating more efficiently are unlikely to have extra resources; their physicians or administrators appear to have organized to treat their patients more efficiently. In fact, our discussions with CEOs and Medical Vice-Presidents of the urban hospitals have highlighted a lack of knowledge as to which hospitals had the more efficient practices. If Manitoba hospitals were to move to a level of efficiency in terms of patient discharge comparable to that found in U.S. hospitals, more resources to support better scheduling of tests, creation of short-term skilled nursing facilities, etc. might be required. However, a large proportion of the gains identified using U.S. standards for the selected diagnostic categories could be achieved using the standard of the shortest stay Manitoba hospital. That is, achieving a U.S. standard of efficiency for the specific diagnostic category analysis (Analysis I) would only raise our estimates of beds to be saved from 201 to 333.

Shorter lengths of stay found in U.S. hospitals may be partly due to tighter utilization control; however, caution must be exercised when emulating the U.S. hospital system, since it is the most costly health care system in the world. Currently in the U.S., millions of dollars are spent on utilization management to control costs and improve efficiency, using case by case prospective payment and monitoring systems. In contrast, Manitoba has controlled hospital costs not by micro-managing every decision made by physicians but by controlling capacity, i.e., the number of beds, and by leaving the responsibility for increasing efficiency to each hospital.

This report provides feedback that hospitals can use to identify specific areas in which their length of stay efficiency can be improved. When confronted with data showing less efficient discharge practices, hospitals may be tempted to invest heavily in U.S.-based proprietary systems designed to demonstrate that their casemix is different. These systems are typically expensive and require extensive coding of data from the primary record. There are many such costly systems that depend on re-abstraction of medical records, all with aggressive sales representatives, however none of these systems has proven significantly better than the type of computerized system used in this report.[19] Because one of the hospitals in this report is currently using a chart-based abstraction system, the opportunity for a comparison of systems exists within the province and should be explored.

The differences in efficiency found among the urban hospitals studied suggest that similar analyses of the efficiency of bed use should be conducted for any major rural hospitals requesting bed expansion. To permit analyses of the efficient use of beds by non-Winnipeg hospitals, two options exist:

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[19] The RDRG system used in this report is both inexpensive to acquire (approximately $1000) and inexpensive to use since it relies only on the diagnoses and procedures coded in the already computerized hospital discharge abstracts.

1. MHSC could be given the mandate and funds to support analyses such as those contained in this report (MHSC has undertaken similar analyses in the past); or
2. major rural hospitals could be encouraged to join HMRI.[20]

The second option would provide information to individual hospitals that would allow them to understand their efficiency relative to similar hospitals across the country. HMRI would not, unless specifically negotiated, provide this information to funders in a manner that would permit comparisons across hospitals to support funding decisions. The first option has the potential to meet the needs of both the Manitoba hospitals and funders for this information. While it can be argued that comparisons within Manitoba (option 1) are more limited than comparisons with peer hospitals across the country (option 2), the sophistication of the adjustments possible with the Manitoba data more than compensate for this relative deficiency. To the extent that information is required to inform decisions about resource allocation, the first option would be of higher priority.

The findings also suggest that the use of acute care hospitals by mentally ill patients should be considered in the process of mental health reform. Patients admitted for mental disorders consume large numbers of acute days and have high readmission rates. Furthermore, physicians at the different hospitals treat these patients in markedly different ways with no apparent relationship to a key outcome measure - rate of readmission.

MHSC has, at hospitals' requests, funded one or more discharge nurse positions at all Winnipeg hospitals except one. Before additional funds are provided for utilization review, the work of these nurses should be critically reviewed. Clearly, marked inefficiencies in hospital discharge patterns remain despite the funding of these positions. Their effectiveness is further challenged since one of the more efficient hospitals achieved this record without such a position. Any investment in utilization management, including physician managers, should be critically assessed.

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[20] Currently, all Winnipeg hospitals reviewed in this report have joined HMRI at an approximate basic cost of $175,000 per year (for all seven hospitals), based on $1.29 per inpatient abstracted record, and $1.01 per outpatient record. Substantial additional costs can be incurred if special reports are requested.

This report also highlights the need to:

- Review current and future plans to expand outpatient surgery. Less efficient hospitals should address inefficiencies in discharging patients before they receive funds to expand outpatient surgery.
- Recognize that although improved hospital efficiency may decrease costs within the acute care sector, additional costs may be generated in other sectors.
- Set up a committee, possibly as a subcommittee of the Urban Hospital Council, to receive MHSC-generated length of stay analyses or HMRI reports and oversee the implementation of plans for improving efficiency at AX and FX hospitals as well as outlier practices at other hospitals.
- Work toward a consensus among hospitals regarding the development of a systematic approach to care management that would not only provide standardization of information across hospitals, but would also be cost effective. Inasmuch as inexpensive grouper systems, such as the RDRGs used in this assessment, permit adjustment for case severity within and across hospitals, the adaptation of such systems to utilization management within hospitals should be explored by the hospitals and monitored by MHSC.

Conclusion

It is clear that achieving efficiency is not an easy task. It requires the cooperation of physicians, hospital administrators and staff. Nevertheless, government has a fundamental responsibility to the public, which supports and uses our hospitals, to ensure that the appropriate number of beds is available and that they are utilized to best advantage.

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APPENDIX A

LIST OF TABLES AND FIGURES IN APPENDIX A

Table A1
Mean LOS Within Each Hospital for Variables Used in Analyses for Total Cholecystectomy Without Common Duct Exploration

VARIABLES	MEAN LOS							
	Hospitals							
	AX	BX	CX	DX	EX	FX	GX	HX
Severity (CCs)								
no/minor	7.3	5.8	7.8	6.9	5.6	8.1	7.2	5.7
moderate	10.1	6.2	8.4	7.2	6.9	7.0	9.7	5.7
major	10.7	9.3	*	*	9.4	*	12.5	9.3
catastr.	*	*	*	*	*	*	*	*
Age								
0 - 30	6.8	5.6	7.5	6.1	5.8	6.5	7.4	5.0
31 - 60	7.8	5.9	7.6	6.9	5.8	7.4	8.2	6.1
61 +	10.0	8.5	9.1	9.0	8.0	9.7	10.9	7.8
Sex								
male	9.9	6.7	8.4	7.6	7.2	9.0	8.6	7.4
female	7.7	6.2	8.0	7.1	6.2	7.4	8.8	6.1
Residence in Service Area								
resident	8.2	6.4	8.1	7.2	6.6	8.1	8.4	6.5
non-res	8.1	6.1	8.0	7.2	6.4	7.3	8.8	6.0
Treaty Indian Status								
Treaty Indian	*	6.0	*	*	*	*	8.2	*
All Others	8.2	6.3	8.2	7.2	6.5	7.9	8.8	6.5
Area of Residence								
core	*	*	*	*	*	*	*	*
non-core	8.2	6.3	8.1	7.2	6.4	8.0	8.7	6.4
Urban Income Level Quintile								
1st (low)	9.0	6.3	8.2	7.9	6.4	7.8	7.9	7.0
2nd	8.7	7.2	7.7	6.7	8.2	8.6	9.9	7.0
3rd	7.3	6.5	8.0	7.2	6.1	7.9	*	6.7
4th	7.3	6.0	8.8	7.6	6.1	8.0	8.1	5.8
5th (high)	8.5	6.3	8.1	7.3	6.4	7.8	10.2	6.2
rural	8.2	5.9	7.6	6.9	6.5	7.5	8.5	5.8

* Cells with fewer than 15 cases.

Figure A1
Adjusted Mean LOS Across Hospitals for Psychoses

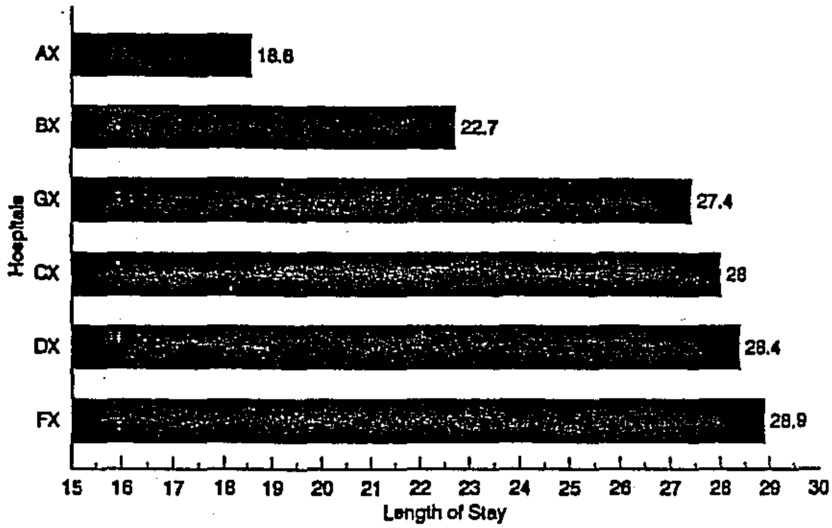

Figure A2
Adjusted Mean LOS Across Hospitals for Bronchitis and Asthma

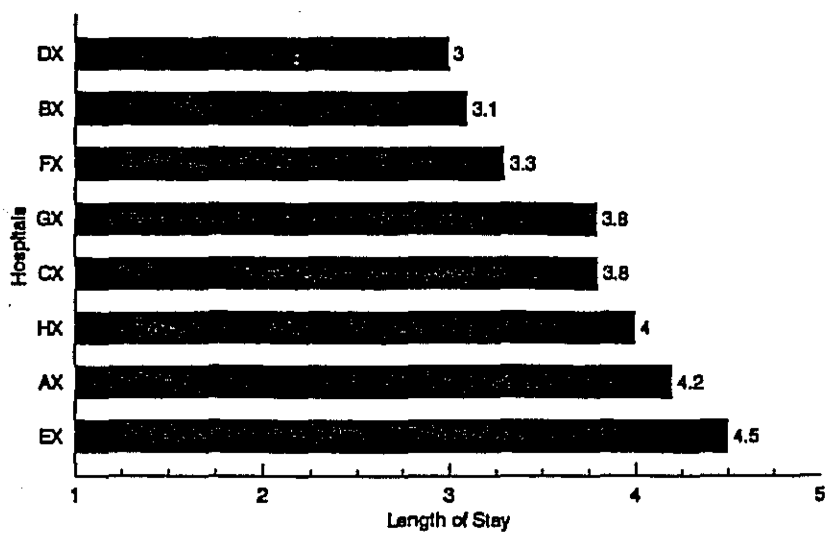

Figure A3
Adjusted Mean LOS Across Hospitals for Miscellaneous Digestive Disorders

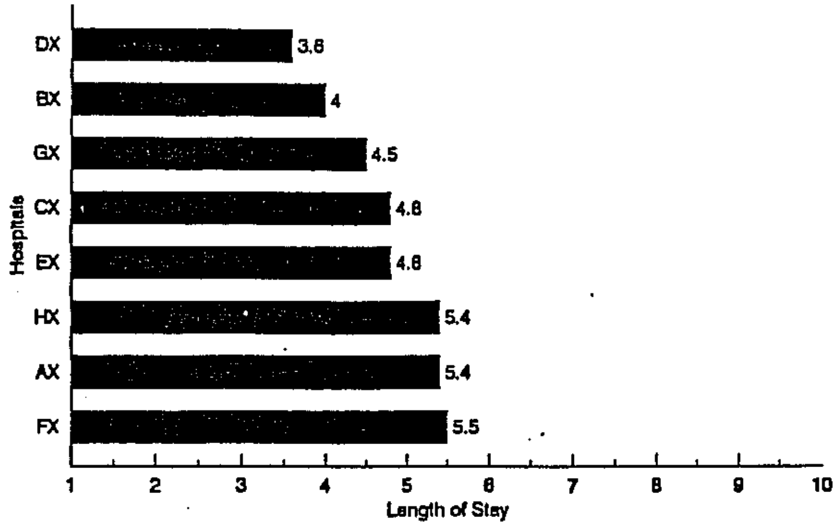

Figure A4
Adjusted Mean LOS Across Hospitals for Simple Pneumonia

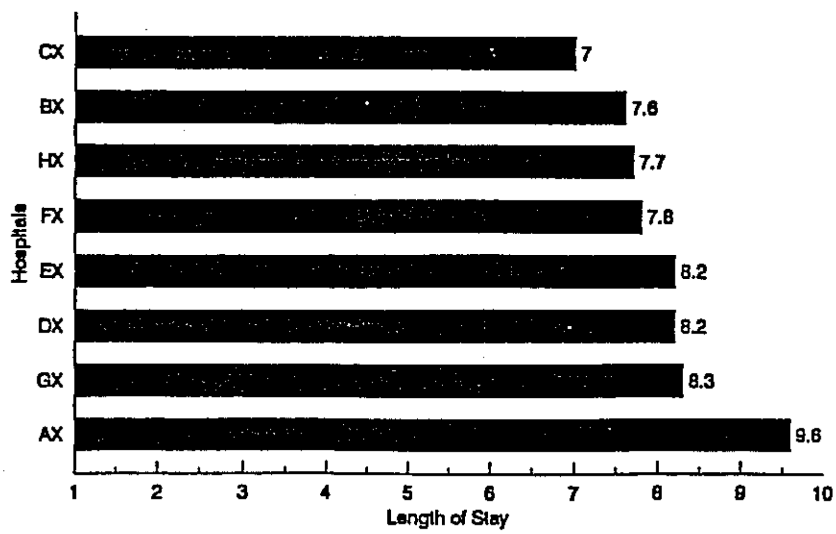

Figure A5
Adjusted Mean LOS Across Hospitals for Heart Failure and Shock

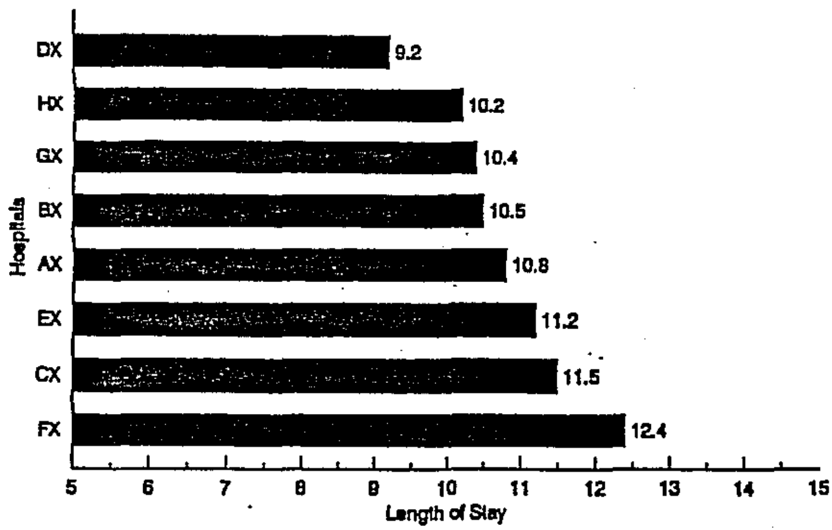

Figure A6
Adjusted Mean LOS Across Hospitals for Total Cholecystectomy

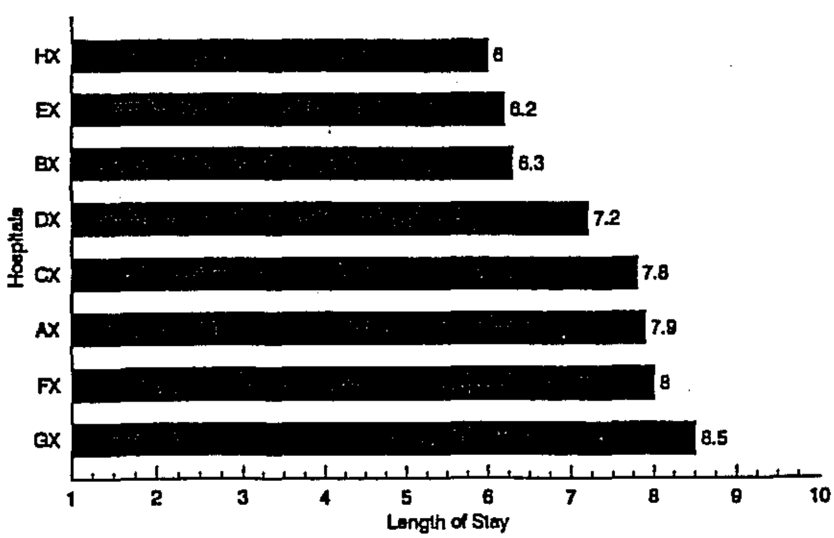

Figure A7
Adjusted Mean LOS Across Hospitals for Transurethral Prostatectomy

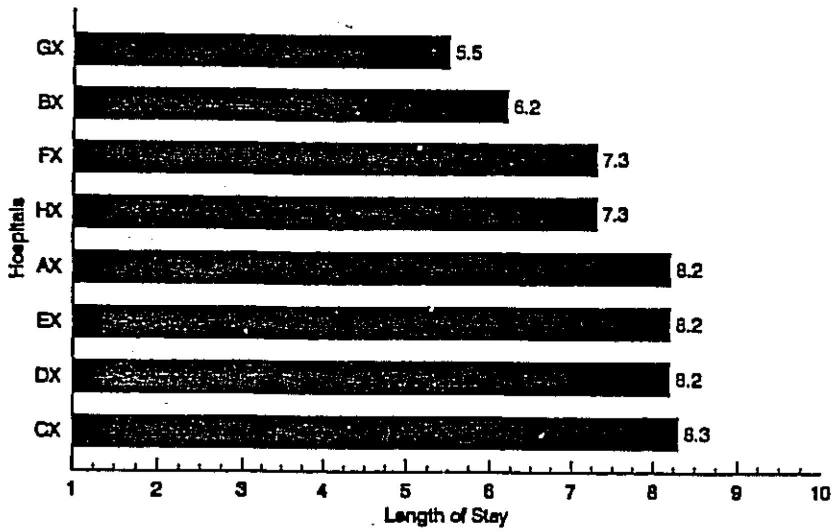

Figure A8
Adjusted Mean LOS Across Hospitals for Uterine and Adnexal Procedures for Non-Malignancy

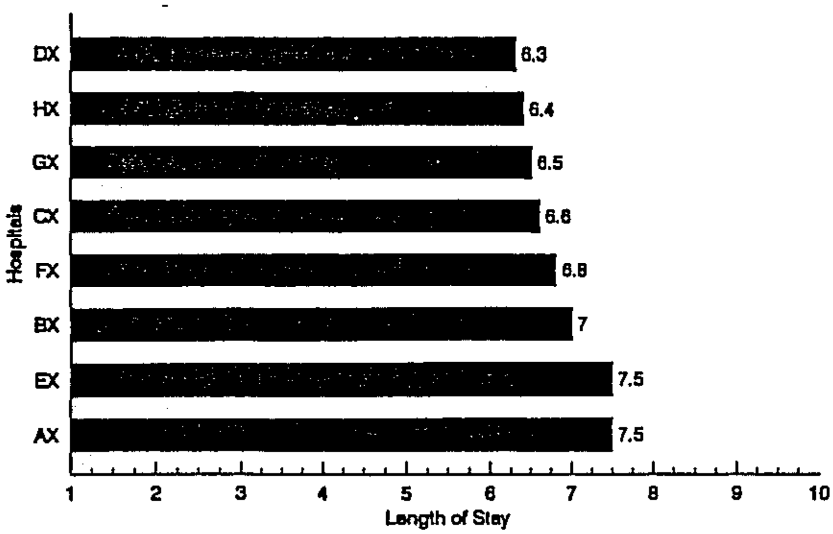

Figure A9
Adjusted Mean LOS Across Hospitals for Anal and Stomal Procedures

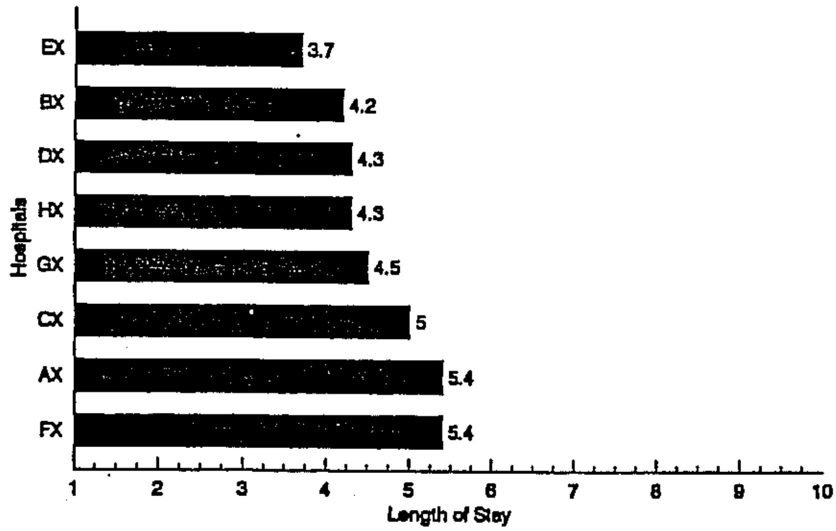

Figure A10
Adjusted Mean LOS Across Hospitals for Major Bowel Procedures

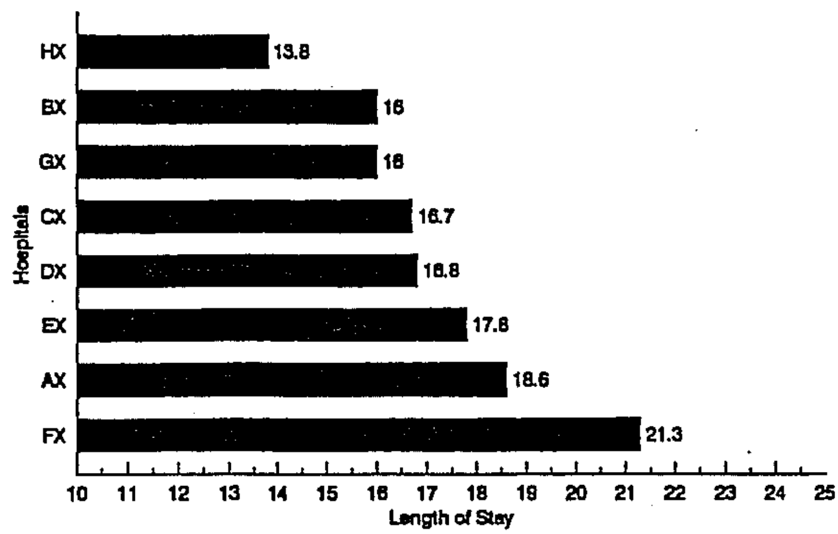

Figure A11
Adjusted Mean LOS Across Hospitals for Vaginal Deliveries Without Complicating Diagnoses

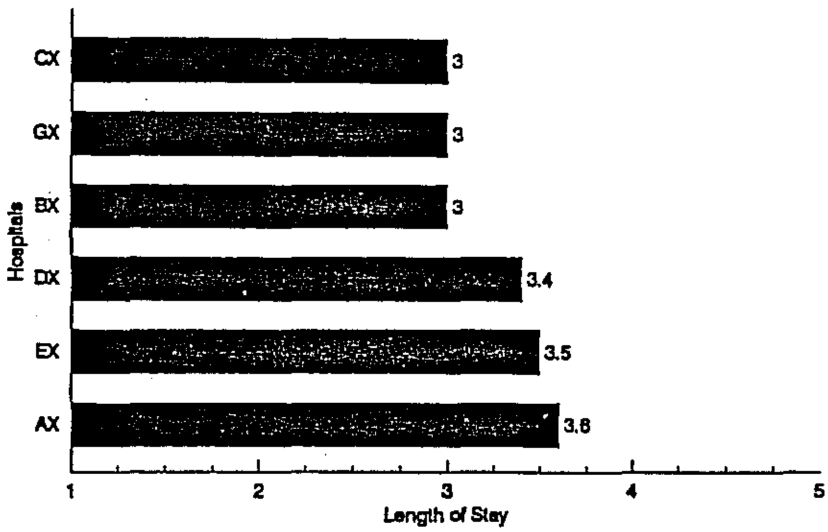

Figure A12
Adjusted Mean LOS Across Hospitals for Caesarean Section

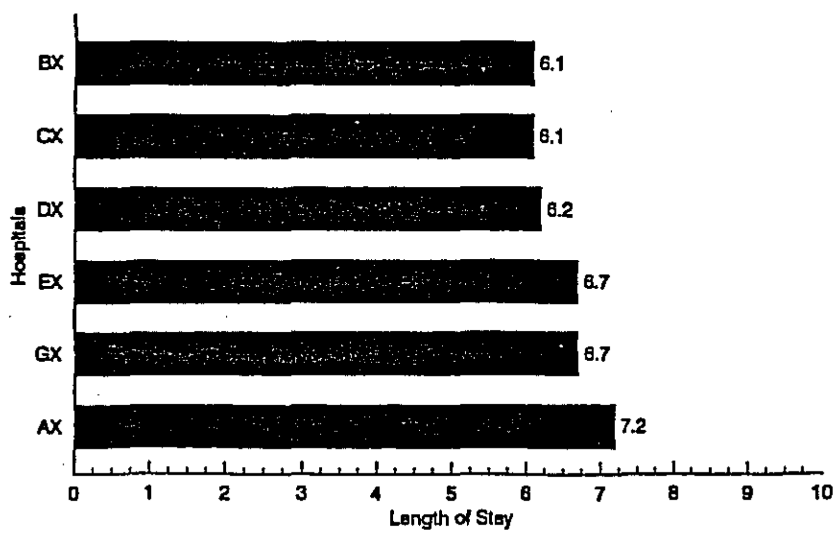

Table A2
Unadjusted Mean LOS Across Hospitals for Selected Diagnostic Categories.[1]

	Hospitals							
	AX	BX	CX	DX	EX	FX	GX	HX
Medical								
Simple Pneumonia	9.8	8.3	6.7	9.3	7.3	8.4	7.9	9.0
Bronchitis/Asthma	4.8	4.4	3.8	3.4	4.6	4.2	3.2	4.6
AMI	14.3	12.3	9.1	12.1	10.3	12.9	9.9	8.9
Heart Fail/Shock	9.9	11.3	12.2	9.2	10.1	11.7	9.6	10.5
Digestive Disorders	6.1	4.8	4.5	4.0	4.6	6.4	4.6	7.5
Psychoses	18.9	23.1	28.4	29.0	.	30.1	26.8	.
Surgical								
Major Bowel	20.2	14.7	16.3	16.0	17.4	20.8	16.7	15.0
Anal/Stomal	5.3	4.2	5.2	4.1	3.3	5.2	4.8	4.4
Hernia	4.6	3.1	4.4	3.6	3.2	4.9	3.8	3.5
Cholecystectomy	8.2	6.3	8.1	7.2	6.5	7.9	8.6	6.4
Prostatectomy	8.0	6.2	8.6	8.3	7.7	7.3	6.2	7.7
Uterine/Adnexal	7.8	6.7	6.7	6.4	7.7	6.6	6.4	6.7
Obstetrical								
Vaginal Delivery	3.5	2.9	3.0	3.3	3.4	.	2.9	.
Caesarean Section	7.1	5.9	6.4	5.9	6.6	.	6.7	.

[1] All exclusions listed in the Table B1 have been applied here.

Table A3
Occupancy Rates Across Hospitals Based on Staffed and In-Operation Beds for Short-Term Units, 1990/91 Fiscal Year

	Hospitals							
%	AX	BX	CX	DX	EX	FX	GX	HX
Medical	84.1	95.1	94.9	105.7	69.9	88.4	86.2	97.9
Surgical	62.1	79.3	74.5	91.4	59.8	81.5	78.8	79.6
Obstetrical	60.3	67.9	104.3	69.8	55.9		74.4	
Psychiatric	95.8	76.6	84.2	92.7		83.9	87.4	
Total for Short-term Units	68.8	78.8	79.7	87.2	59.5	83.5	78.0	88.2

Source: Annual Return of Health Care Facilities - Hospitals, 1990-91.

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