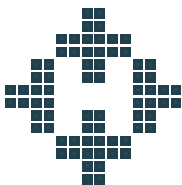


A Comparison of Preliminary and Adjusted Cost per Weighted Case Determinations for Manitoba Hospitals: Impact for Evaluation and Report Cards

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Members of MCHP consult extensively with government officials, health care administrators, and clinicians to develop a research agenda that is topical and relevant. This strength along with its rigorous academic standards enables MCHP to contribute to the health policy process. MCHP undertakes several major research projects, such as this one, every year under contract to Manitoba Health. In addition, our researchers secure external funding by competing for other research grants. We are widely published and internationally recognized. Further, our researchers collaborate with a number of highly respected scientists from Canada, the United States and Europe.

We thank the University of Manitoba, Faculty of Medicine, Health Research Ethics Board for their review of this project. The Manitoba Centre for Health Policy complies with all legislative acts and regulations governing the protection and use of sensitive information. We implement strict policies and procedures to protect the privacy and security of anonymized data used to produce this report and we keep the provincial Health Information Privacy Committee informed of all work undertaken for Manitoba Health.

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EXECUTIVE SUMMARY

Manitobans spent approximately \$453 million¹ in 1997/98 on health services provided to people who were inpatients in acute care hospitals, yet little is known about the financial performance of these important facilities. The purpose of this report is to evaluate whether information currently submitted by acute care hospitals to Manitoba Health can be used to make accurate and timely financial comparisons between facilities and types of hospitals.

Over the past seven years, researchers at the Manitoba Centre for Health Policy (MCHP) have produced three reports that have used, as their primary measure of financial performance, an indicator called the Average Cost per Weighted Case for acute inpatient hospital care (CWC). This indicator allows financial comparisons between acute care hospitals, types of hospitals, and RHAs. The CWC allows comparison of the cost of treating a hypothetical “standardized inpatient” to show which facilities or regions are relatively more costly than others, and which are less costly. A higher CWC indicates that it is more costly at a hospital, hospital type or RHA to treat a hypothetical standardized inpatient than it would be at a facility or RHA that has a lower CWC. Facilities or RHAs that have a higher CWC have higher input costs (e.g., labour, supplies), provide more costly services and/or operate less efficiently.

Researchers at MCHP have historically found some inconsistencies in the way hospitals classify financial and statistical information that is reported to Manitoba Health, and the accuracy of any financial indicator will depend on the size of this variation. In order to make fair financial comparisons between facilities, hospital types and RHAs for the fiscal year 1997/1998, researchers at MCHP spent considerable time working with hospital and RHA administrators to confirm that financial and statistical data submitted to Manitoba Health were reported in accordance with established reporting guidelines. Thirty-eight of the seventy-three acute care hospitals in Manitoba participated in this process. This review process resulted in the publication of a report in 2001 — *Using the Manitoba Hospital Management Information System: Comparing Average Cost Per Weighted Case and*

¹ This amount excludes expenditures for physician services and hospital capital costs.

Financial Ratios of Manitoba Hospitals. The time delay of nearly three years before the publication of indicators of financial performance does not enable administrators in hospitals and RHAs to respond in a timely fashion.

In this report we evaluated whether it is appropriate to use the financial and statistical information that is submitted directly to Manitoba Health (i.e., raw data) and determined what additional procedures would be required before these data could be used to calculate accurate measures of financial performance. We compared the CWC calculated using these raw data to CWC calculated using data derived following the extensive process of confirming the accuracy of this information, for acute care facilities and for different types of hospitals. This analysis was done to determine whether this confirmation process is necessary when calculating financial indicators on a routine basis.

In each of the CWC studies that MCHP has completed, adjustments have been made to the measure of the number of standardized inpatients served in each hospital. Because costs are assigned to a specific fiscal year, it is necessary to estimate the number of standardized inpatients served during this same time period. This process is called “in-year adjustment.” Since other researchers do not routinely make in-year adjustments when determining the CWC for hospitals, we calculated and compared CWC with and without these adjustments to determine whether this estimation process is necessary when calculating financial indicators on a routine basis.

We found that confirming the financial and statistical data for hospitals has a large impact on the CWC for a small number of hospitals and that, in general, the in-year adjustment process is important to calculating accurate CWC for small facilities. Of the 38 hospitals that confirmed their financial and statistical data, only 7 facilities (18%) made changes in their data that resulted in a CWC change of greater than 10 percent. Eight hospitals (21%) had changes that resulted in a change in their quintile rank. A quintile rank is a five-point ranking scheme; approximately 20% of the hospitals were contained in each rank. In-year adjustments were made for all 73 hospitals. Sixteen (22%) of small hospitals had CWC that

changed by more than 10% following in-year adjustments, and 21 facilities (29%) had changes from in-year adjustments that resulted in a change in their quintile rank.

The time-consuming process of confirming financial and statistical data for all hospitals does not produce substantially different CWC for most hospitals, although it makes a large difference for a few facilities. We have recommended that five specific checks be performed when financial and statistical data are submitted to Manitoba Health to identify what we found were the most common reporting errors. In addition, making in-year adjustments is an important part of the process of determining hospital CWC, particularly for smaller hospitals. Should the province of Manitoba move toward using routinely available financial, statistical and discharge information to calculate CWC as one measure of performance, we recommend that this indicator be calculated using in-year adjustments.

Once facilities are identified as having an unusually high or low CWC, financial officers should be contacted to confirm the accuracy of data upon which the indicator was calculated. By following this process, it is possible to routinely calculate and report an indicator to assess the relative financial performance of facilities and regions that offer acute care services in Manitoba.

1. INTRODUCTION

Manitobans spent approximately \$453 million² in 1997/98 on health services provided to people who were inpatients in acute care hospitals, yet little is known about the financial performance of these important facilities. The purpose of this report is to evaluate whether information routinely submitted by acute care hospitals to Manitoba Health can be used to make accurate and timely financial comparisons between hospitals and between types of hospitals. More specifically, we evaluated whether it is appropriate to use the financial and patient discharge information that is routinely submitted to Manitoba Health, and what additional procedures would be required before these data could be used to calculate measures of financial performance.

A measure of financial performance that could be used to make fair comparisons must be based on information that is believed to be valid and reflective of the diversity in acuity of patients seen by different hospitals. A statistic, called the Average Cost per Weighted Case (CWC), has been proposed as one such measure of the cost of inpatient care. The CWC statistic has been used in Canada to compare the operational efficiencies of different hospitals within a province (Baker et al., 1995; 2000; Finlayson et al., 2001), and the operational efficiencies of teaching hospitals across Canada (Helyar et al., 1998). This measure has also been used to identify costs for evaluating the cost-effectiveness of health services (Jacobs et al., 1997; 1999; Institute of Health Economics, 2000), to estimate the funding that should be provided to hospitals (Ladek, 2001; Lave et al., 1991), and to predict the financial implications of merging or consolidating hospitals (Metropolitan Toronto District Health Council, 1995).

The CWC measure can be calculated using routinely available financial and clinical information, and it measures the cost of providing care to a standardized patient. The CWC calculation involves dividing the costs of inpatient hospital care by the total number of “standardized patients” that the hospital treated during the period of study (Figure 1). Once a

² This amount excludes expenditures for physician services and hospital capital costs.

CWC is calculated for each hospital, one is able to compare the cost of providing care to a patient, as if that patient had been cared for at each of the facilities.

Figure 1: Calculating the Average Cost per Weighted Case

$$\text{Average Cost per Weighted Case (CWC)} = \frac{\text{Cost of Inpatient Care}}{\text{Total Standardized Inpatient Cases (TWC)}}$$

The numerator of the CWC statistic, the cost of inpatient care, is determined using data in the Management Information System (MIS) database maintained by Manitoba Health. The national reporting standards in the MIS Guidelines that are used for classifying the financial and statistical information were originally published in 1985 and began to be adopted by the provinces in 1989. While some provinces have engaged in processes to ensure strict compliance with these standards (e.g., Ontario Case Costing Project, 1993), other jurisdictions have not. Manitoba adopted this financial and statistical reporting system in 1995 and established reporting standards for Manitoba facilities. These standards added further detail and/or allowed deviation from the national MIS Guidelines' standards. Researchers at the Manitoba Centre for Health Policy at the University of Manitoba found some variability in MIS reporting practices between hospitals (Finlayson et al., 2001). Whether this variability is due to insufficient specificity in reporting requirements or non-compliance with the MIS Guidelines, the result is that policy-makers and administrators are skeptical about the appropriateness of using MIS data that have not been validated to make fair financial comparisons between facilities. MIS is used to calculate the numerator for the CWC calculation.

The denominator of the CWC statistic, the total number of "standardized inpatients," is determined using a classification system developed by the Canadian Institute for Health Information (CIHI). This system is the most recognized method of standardizing patient resource requirements in Canada, and involves classifying cases into homogeneous groups

and assigning a standard weight to each case. The weight that is assigned represents the standard relative cost that a particular case had, when compared to other cases. Patient discharge information is used to calculate the denominator for the CWC calculation—the total standardized inpatient cases (i.e., the Total Weighted Cases or TWC) is the sum of weights that are assigned to all patients who were discharged during the year. This measure assesses the acuity of patients treated in different facilities.

Given that one of the prime reasons for calculating the CWC is to make comparisons between hospitals, we needed to ensure that the numerator (cost of inpatient care) is determined in the same way for all hospitals, and that the denominator accurately reflects the total number of standardized patients treated in a hospital. We used four different ways of calculating the CWC. The numerator and/or denominator are determined in different ways for each measure. First, the CWC measure was calculated using the inpatient costs and standardized inpatient values without any adjustments. Throughout the remainder of this report, these data are called “Raw MIS and TWC Data.” Secondly, the CWC measure was calculated using information on inpatient costs that was validated through a two-year process whereby financial officers at hospitals or Regional Health Authorities (RHAs) verified their MIS data and researchers undertook a process to ensure standardization of these financial and statistical data across hospitals (Finlayson et al., 2001). In this report, these data are referred to as “Confirmed MIS Data.” This second CWC measure was calculated using the Confirmed MIS and Raw TWC data. The third measure was calculated using a value for the total number of standardized inpatients that was adjusted to reflect the number of inpatient days that occurred in each hospital during the same fiscal year for which the MIS data were used. The data used for this calculation are called “In-Year Adjusted TWC.” The CWC was then calculated using Raw MIS data and In-Year Adjusted TWC. Finally, the CWC that results from adjustments to both the costs and the standardized cases is shown. These data are referred to as “Confirmed MIS Data and In-Year Adjusted TWCs.” Should the CWC derived from all calculations be similar, the types of adjustments that were made in earlier studies would not be necessary in the future. Of particular interest is whether it is necessary to undertake the two-year verification process for MIS data, and if the in-year adjustment process is necessary for making fair CWC comparisons.

The objectives of this project are:

- to determine the effect of an extensive process of confirming MIS financial data on the CWC for Manitoba acute care hospitals
- to determine the effect of making in-year adjustments to the total weighted cases on the CWC for Manitoba acute care hospitals

Four CWC measures were calculated for each acute care facility, and also for each type of hospital. Manitoba hospitals have been classified according to their size and function into seven groups (Black et al., 1993): teaching, urban community, major rural, intermediate rural, small rural, northern isolated and small multi-use. Calculations of the CWC for a given type or class of hospital are deemed to be important, because facilities in a group might use this figure as a benchmark. We know from previous work that the financial performance and cost structure of different types of hospitals varies (Shanahan et al. 1994, Finlayson et al. 2001). In addition, this value enables policy-makers and administrators to compare the relative financial performance of different types of hospitals.

Finally, we ranked hospitals according to their relative performance for each of the four CWC values. Hospitals were ranked and assigned a value according to their CWC; they were ranked on a scale from 1 to 5, with 1 being assigned to the hospitals with the highest CWC and 5 being assigned with those with the lowest. This enables the comparison of the relative rankings of different facilities and the ranks of any given facility, using each of the four methods for calculating the CWC.

2. BACKGROUND

Four studies have been conducted by the Manitoba Centre for Health Policy in which the CWC has been calculated. The first study (Shanahan et al., 1994) used summary financial data (HS-1) submitted by hospitals to Statistics Canada to determine the cost of inpatient care. Case weights were developed using charge data (i.e., the cost of treatment to the payer) from the state of Maryland adjusted to reflect different length of stay experience in Manitoba, since national relative weights using Canadian cost data had not yet been developed. This study was designed to assess the efficiency of hospitals. In 1996, this study was replicated using 1993/94 financial and hospital discharge data (Shanahan 1996). With the province-wide implementation of MIS in 1995/96 and the availability of case weight data from CIHI, a study was done to determine the feasibility of using these new data for case-mix costing (Finlayson et al., 1999). This study involved 18 of the largest hospitals in the province and demonstrated that the MIS data could be used for making comparisons between different types of hospitals. The most recent study (Finlayson et al., 2001) focused on making comparisons of CWC and other financial ratios between all hospitals. In completing the two most recent reports that used MIS as the basis for determining the cost of inpatient care, it was noted that there were inconsistencies in reporting. As a result, substantial time and effort was put into validating the data. The current study is designed to determine whether this two-year validation process substantially increased the accuracy of the results. Should there be no differences in the CWC, this time consuming process could be avoided and financial indicators could be calculated and reported in a more routine and timely manner.

Earlier studies (Shanahan 1994, 1996) had used two years of discharge data to determine the number of standardized inpatient cases that were treated in each hospital during a year. Two years of data were necessary because information on who is in hospital at a particular time is not available until after a person is discharged. People who are admitted to hospital during the year being reviewed and who are not discharged until the subsequent year would not be counted unless data for two full years were available. In the more recent studies (Finlayson 1999, 2001) an algorithm was used to estimate the number of cases that were still in hospital

at the end of the year, as well as to account for long-stay cases that were discharged during the year. This approach makes it possible to estimate the CWC without waiting for two years of discharge data, although the effect of making adjustments had never been evaluated. The importance of making adjustments to the number of cases would be demonstrated if there were substantial differences in the CWC resulting from these adjustments.

2.1 Inpatient Costs

The underlying concepts of the MIS Guidelines have been described in several sources (CIHI, 1999; McKillop et al., 2000). Briefly stated, each financial transaction is classified within a framework that is specified in the MIS Guidelines. This classification system uses two types of accounts—primary and secondary. Primary accounts identify the type of transaction. Secondary accounts further classify the items related to that transaction as being financial or statistical. The primary accounts can be viewed as a series of “buckets” in which expenditures, revenues and statistics are recorded. The buckets are arranged hierarchically into five levels. In level 1, one codes the overall identity of the transaction, such as whether the item transacted is identified as a current asset, a liability, or a revenue or expense occurring in an operating centre; in the case of the latter, the transaction is coded as a “7”. The fund type is also identified in the account code (e.g., the code for an operating fund is 1). Thus the account code for a transaction which relates to a functional centre (e.g., an inpatient nursing unit) that is being funded from the operating fund would begin with “71”.

Further detail is recorded in the functional centre framework codes (level 2) where the specific type of functional centre is identified. For example, inpatient nursing services are coded as “2” and diagnostic and therapeutic services are coded as “4.” Further coding details provide additional definition of the transaction. For example, a back pain rehabilitation unit is identified in a more detailed account as “25”, and so expenditures in an inpatient nursing unit for back pain rehabilitation would be coded as “71 2 25.” Revenues, expenditures and statistics related to a particular functional centre are captured using the secondary accounts. Thus, staff compensation in a back pain nursing unit would be coded as “3” in a secondary account, attached to the “71 2 25.”

Despite the degree of detail in the MIS classification system, an absence of uniformity between hospitals in reporting financial and statistical data can occur if organizations do not comply with the reporting standard. To provide an example of how such classification differences between hospitals can occur, let us assume that a hospital provides nurses with benefits equal to 20 percent of wages. Assume that the nurses work in the back pain inpatient rehabilitation unit and that total nursing wages in this unit are \$200,000. If the hospital assigns these employee benefits (equal to \$40,000) to the functional centre, it would record them in account “71 2 25” and use secondary account 3 (compensation). However, some hospitals record employee benefits as “administrative and support services” expenses, and code them in account “71 1”. In the first case, when calculating the cost of inpatient care, the expenses would be recorded as entirely in the inpatient category. In the second case they would be undistributed, and only a portion of them would be allocated back to inpatient care, with the rest going to other operating areas. Inpatient costs would appear lower in the hospital which recorded fringe benefits in account “71 1.”³ Details concerning how the inpatient costs referred to in this report are provided in the MCHP report *Using the Manitoba Hospital Management Information System: Comparing Average Cost Per Weighted Case and Financial Ratios of Manitoba Hospitals* (Finlayson et al., 2001).

2.2 Standardized Inpatient Cases

The standardized inpatient cases used to calculate the CWC measure is based on inpatient clinical and cost data collected from hospitals. The method of standardizing cases using hospital discharge and cost data has been developed and refined by CIHI. Case weight information enables us to make comparisons between hospitals regardless of differences in the severity of illness and complexity of cases served by these facilities. Every patient who is discharged from an acute hospital in Manitoba is assigned a case weight score or “resource intensity weight” that reflects the average resources expected to be consumed by individuals throughout Canada who were served in hospital and have relatively the same burden of

³ According to the Manitoba Facility Reporting System User Guide (1996), employee benefit costs should be assigned to the same functional centre that is used for salaries and wages.

illness. The case weight assigned to each patient is based on the expected relative cost of care and reflects both the nature of the illness(es), as well as outcomes (e.g., survival, length of stay) (CIHI, 1998). By summing the weights for patients discharged from a specific facility, a total level of morbidity or resource requirements can be calculated. We call this number the “total weighted cases” (TWC) of a hospital, and it reflects both the number of patients discharged and the average amount of resources required to care for these individuals.

2.3 Average Cost per Weighted Case (CWC)

When the total expenditures for inpatient care in a particular acute care hospital for one year is divided by the total weighted cases of the same hospital during the same year period, the result is the average cost of providing care to a patient with a weighted case of one (Figure 1). This is the CWC, or the cost associated with providing care to a standardized inpatient. The calculation of total weighted cases for any one-year period (e.g., a fiscal year spanning April 1 to March 31), however, requires a time delay, as the data used for this purpose is only available at the time of discharge. Therefore, if CWC is used as an indicator of financial performance it can only be calculated accurately when all the people who were in hospital during this one-year term are discharged. In addition, the case weights of people admitted to hospital during the period but who continued to receive inpatient care after the year must also be considered. Independent data on hospital census do exist, and can be used to make adjustments to the TWC measure. These data are important because they provide a way to estimate the number of weighted cases in a one-year period without the delay of waiting for everyone to be discharged. Appendix A provides additional explanation of the types of situations that will affect the TWC measure.

3. METHODS

We used financial data derived from MIS and hospital discharge abstracts that had been assigned a standardized weight by CIHI. Both were submitted by acute care facilities in Manitoba for the fiscal year 1997/98. In addition, we used MIS data that underwent validation through a process⁴ described in a previous report (these data are referred to as “Confirmed MIS Data” throughout the remainder of this report)(Finlayson et al., 2001). Only 38 (52%) of the acute care hospitals in Manitoba provided feedback during the MIS data verification process; therefore, the analyses are presented separately for participants and non-participants in this process. The breakdown of hospitals by category is shown in Table 1.

Table 1. Manitoba Hospitals by Type

Type of Hospital	# of Hospitals Confirming MIS Values	# of Hospitals Not Confirming MIS Values	Total
Teaching	2	0	2
Urban Community	4	1	5
Major Rural	6	4	10
Intermediate Rural	4	6	10
Small Rural	16	20	36
Northern Isolated	4	0	4
Small Multi-Use Facilities	2	4	6
Total	38	35	73

The CWC was calculated for each hospital and each type of hospital by dividing the cost of inpatient care by the total weighted cases (TWC) for each hospital (or type). The cost of inpatient care excludes physician and capital expenditures, as we were unable to standardize the reporting of these costs across all hospitals. Direct educational program expenditures

⁴ Briefly stated, financial and weighted case data was reported back to each institution for verification. Suggested alterations to the amount and/or classification of expenses and revenues were made by the finance officers or representatives of RHAs and/or hospitals in response to information that we provided. We altered the MIS data when it was necessary to enhance the accuracy of any reporting deemed not to comply with MIS guidelines. In addition to correcting errors, it was necessary to do additional calculations to determine inpatient costs, such as assigning portions of administrative, support services, diagnostic and therapeutic services costs to inpatients.

were also excluded, as we anticipated differences between hospitals in these expenditures. For example, teaching facilities are likely to have greater expenditures in this area than other types of hospitals. All inpatient stays were limited to a maximum of 365 days (i.e., a maximum of one year), and then the TWCs were adjusted accordingly to reflect the actual inpatient days for the year as reported in MIS. The method of making in-year adjustments to TWCs is described in the Appendix.

Four different CWC measures were calculated for each hospital and for each hospital type (See Table 2). First, we calculated the CWC using Raw MIS Data. Second, we calculated the CWC using Confirmed MIS data. Third, we calculated the CWC using In-Year Adjusted TWC. Finally, we calculated the CWC using Confirmed MIS and In-Year Adjusted TWC. These measures enabled us to verify whether it is important to undertake an intensive process of confirming MIS data or to make in-year adjustments to the CWC data.

Table 2. Definition of Data Sources Used to Calculate the CWC

Title used in this report	Numerator	Denominator
Raw MIS and TWC Data	MIS inpatient cost data as submitted to Manitoba Health	Total Weighted Cases discharged from a hospital during the fiscal year
Confirmed MIS Data	MIS inpatient cost data confirmed by hospitals/Regional Health Authorities	Total Weighted Cases discharged from a hospital during the fiscal year
In-Year Adjusted TWC	MIS inpatient cost data as submitted to Manitoba Health	Total Weighted Cases adjusted to match the actual number of inpatient days during the fiscal year
Confirmed MIS and In-Year Adjusted TWCs	MIS inpatient cost data confirmed by hospitals/Regional Health Authorities	Total Weighted Cases adjusted to match the actual number of inpatient days during the fiscal year

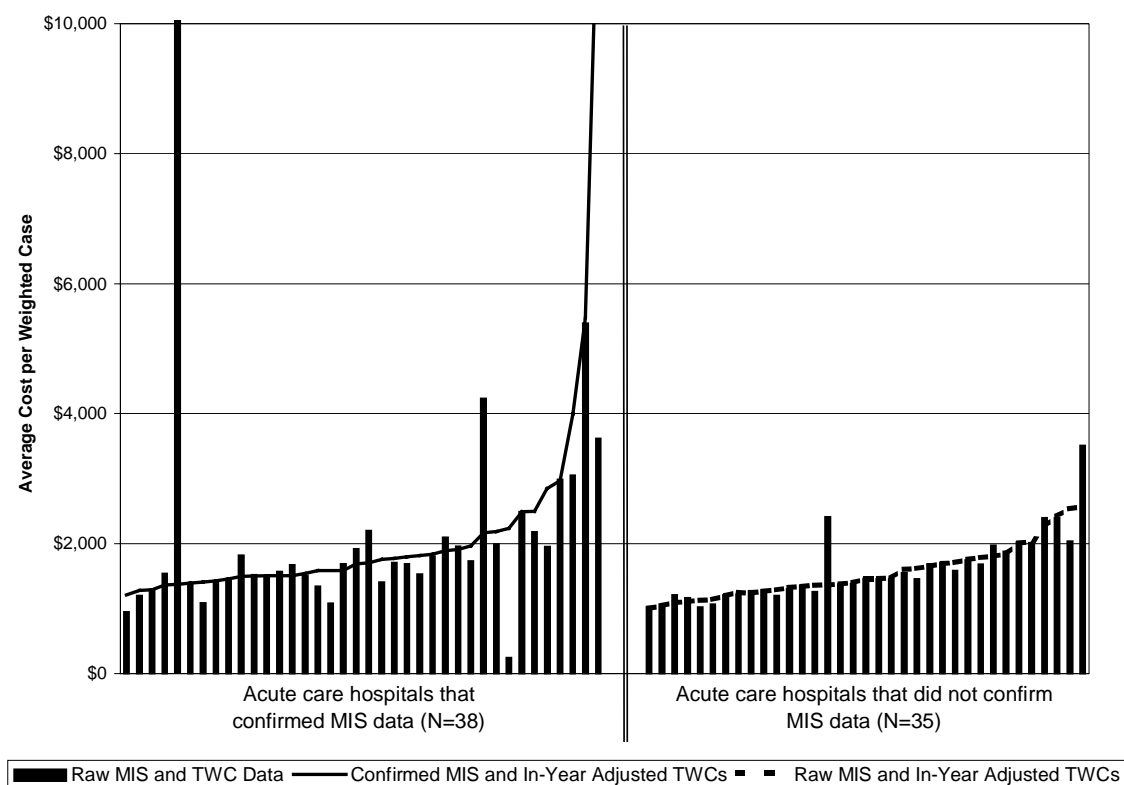
4. RESULTS

The results of this study are presented in two ways. First, we present the CWC statistic using dollar values. This value can be used for making comparisons of relative costliness between hospitals as well as for economic evaluations and hospital funding allocations. The second method of presentation, which relies on group rankings, has been used in other jurisdictions for hospital “report cards.”⁵ The CWC for each hospital has been assigned a quintile rank from 1 to 5. Each of these five quintiles contains an equal number of hospitals —quintile 1 represents the 20% of hospitals with the highest CWC values and quintile 5 represents the 20% of hospitals with the lowest CWC values.

In Figure 2 we compare the CWC statistic for each hospital, when the statistic: (1) was calculated using Raw MIS and TWC data (vertical bars) and (2) using Confirmed MIS Data and In-Year Adjusted TWCs (solid line) and (3) In-Year Adjusted TWCs (dotted line). The bars appear for all hospitals, the solid line is only used for those hospitals that confirmed their MIS data, and the dotted line applies to hospitals that did not confirm their MIS data so the only adjustment was for In-Year TWCs. The figure is separated into two parts based on whether a hospital participated in the verification process conducted as part of a prior project (Finlayson et al., 2001). In each group, hospitals are ordered by their CWC value using Confirmed MIS Data and In-Year Adjusted TWCs or, for hospitals that did not confirm their MIS data, the In-Year Adjusted TWCs. The bars indicate the pre-adjustment CWC and the solid and dotted lines indicate the post-adjusted value. There is much larger variation in the unadjusted data for the participating hospitals; those hospitals that did not participate may have found their data to be accurate and accordingly did not respond. For several hospitals that verified their MIS data, adjustments markedly affected the value of their CWC. For the two hospitals with the most extreme pre-adjustment average cost per weighted case [\$249 and \$101,000 (the top value is not shown on the graph)] there was a single error in each hospital that required correction to bring their CWC in line with others. This suggests that hospitals with a CWC that is a potential outlier/extreme value should have the opportunity to verify their data prior to its use as a measure of financial performance.

⁵ Most report cards include multiple measures of hospital performance. The CWC measure is only one indicator of the financial performance that may be used.

Figure 2. Comparison of Average Cost per Weighted Case (CWC) Using Raw and Adjusted Data



The mean and median CWC values for different hospital types, along with a measure of variation (i.e., standard deviation; SD), are provided in Tables 3 and 4. In Table 3, those hospitals that participated in the process of confirming MIS data are described. The overall SD reveals considerable variation in the CWC between hospital types. This indicates that comparisons should be made among hospitals of a similar type rather than among all hospitals in the province. The SD for most types of hospitals is smaller than the overall SD; this indicates that hospitals of a specific type operate under similar circumstances and hence have similar costs.

Table 3 also reveals that although the SD for hospitals that confirmed their MIS data decreased for four of the seven types of hospitals, it increased for three types when MIS and in-year adjustments are made. However, there are a small number of hospitals in several of

these groups—it is more insightful to notice the overall improvement in the SD—this shows that the adjustments decrease the variability of CWC between hospitals.

In Table 4 (hospitals that did not confirm MIS values) the SDs are less variable than in Table 3. Also, in the largest groups (Small Rural Hospitals and “Overall”) the in-year adjustments resulted in a reduction in the standard deviation. The changes seen in Table 3 are entirely due to In-Year adjustments to TWC, suggesting that these adjustments make a small, but important difference when considering the CWC for different types of hospitals.

We have made specific mention of the SD in these observations because this measure shows the variability of the CWC measure within each type of hospital. There is variability not only between different types of hospitals, but also within each type. This suggests that it is not simply the size of the hospital that affects the CWC but also the manner in which individual hospitals operate.

Table 3. Cost per Weighted Case (\$) by Hospital Type: Hospitals Confirming MIS Values

Type of Hospital	N	CWC Using Raw MIS and TWC Data ⁶			CWC Using Confirmed MIS and In-Year Adjusted TWC ⁷		
		Mean	SD	Median	Mean	SD	Median
Teaching	2	2,621	622	2,621	2,732	330	2,732
Urban Community	4	1,697	206	1,638	1,731	243	1,726
Major Rural	6	17,975	41,117	1,418	1,561	346	1,488
Intermediate Rural	4	1,594	322	1,603	1,856	693	1,651
Small Rural	16	1,589	353	1,607	1,593	196	1,586
Northern Isolated	4	4,077	996	3,926	6,021	4,497	4,732
Small Multi-Use Facilities	2	2,240	355	2,240	2,335	215	2,335
Overall	38	4,538	16,247	1,689	2,195	1,891	1,693

⁶ This column reports the average cost per weighted case for all hospitals, for the type indicated, using raw MIS and TWC data

⁷ This column reports the average cost per weighted case for all hospitals, for the type indicated, using adjusted MIS and TWC data

Table 4. Cost per Weighted Case (\$) by Hospital Type: Hospitals Not Confirming MIS Values⁸

Type of Hospital	N	CWC Using Raw MIS and TWC Data			CWC Using Raw MIS and In-Year Adjusted TWC		
		Mean	SD	Median	Mean	SD	Median
Teaching	0	-	-	-	-	-	-
Urban Community	1	N/A	N/A	N/A	N/A	N/A	N/A
Major Rural	4	1,544	599	1,387	1,558	612	1,400
Intermediate Rural	6	1,311	107	1,325	1,294	126	1,306
Small Rural	20	1,556	429	1,463	1,516	346	1,432
Northern Isolated	0	-	-	-	-	-	-
Small Multi-Use Facilities	4	2,286	846	1,962	2,187	433	2,190
Overall	35	1,602	521	1,460	1,564	423	1,460

4.1 Revisions to Total Weighted Cases – The “In-Year” Adjustment

The impact of the in-year adjustment of case weight data used to calculate the CWC is shown in Figure 3 and Figure 4. In these figures, each bar corresponds to a single hospital. Because this adjustment was made using a method that did not require hospitals to verify the data that were used, it was applied to all hospitals. The value of each bar represents the percent change in CWC following in-year adjustments to case weights. For example, if a hospital had a pre-adjustment CWC of \$1,000, and a post-adjustment value (due only to adjustments in weighted cases) of \$1,200, then the adjustment effect would be +20 per cent. A reduction in CWC to \$800 would result in an adjustment effect of –20 per cent. In Figure 3, we can see that there is a range of adjustments –44 per cent of the original CWC to +46 per cent. This suggests that the CWC can change significantly once case weights are adjusted to reflect the actual number of days of care provided in a hospital during a fiscal year. The in-year adjustment process resulted in 18 (25%) hospitals having a change of more than 10% in CWC.

⁸ Only TWC adjustments were made for these hospitals

Figure 4 shows the impact of in-year adjustments by type of hospital. The in-year adjustments affected smaller hospitals more than the larger ones. The effect is seen in more hospitals, and at higher percent rates in the smaller facilities, suggesting that the CWC measure for smaller facilities should only be used after making the in-year adjustment.

Figure 3. Percent Change in Average Cost Per Weighted Case Resulting from In-Year Adjustments, All Hospitals (N=73)

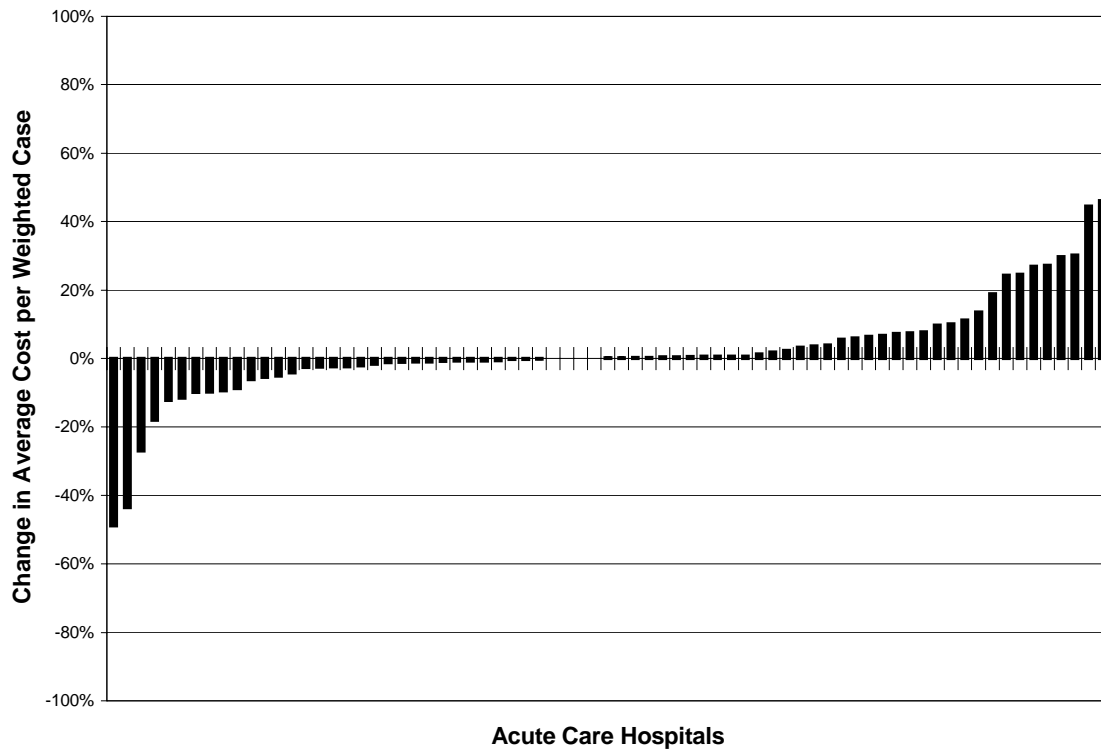
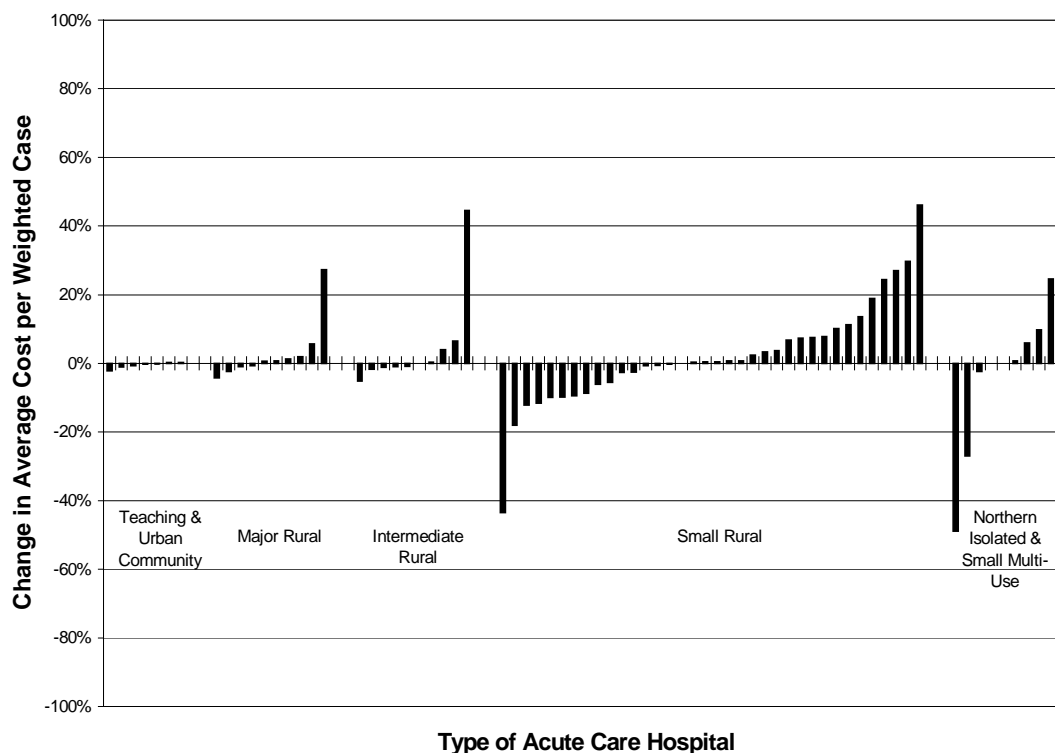


Figure 4. Percent Change in Average Cost per Weighted Case Resulting from In-Year Adjustments, by Hospital Type



The in-year adjustments also had an impact on the quintile assignment of 21 (29%) of the hospitals—11 hospitals moved down by one or more quintile ranks (i.e., their CWC relative to other hospitals decreased), while the remaining 10 moved up (i.e., their CWC increased) (see Tables 5a and 5b). Nearly 25% of the hospitals changed rank by two quintiles in either direction. The change was most notable in the smaller hospitals (small rural, northern isolated and small multi-use), where nearly one third of these facilities were affected. Only one of the largest facilities (teaching and urban community) changed in its ranking. Again, this finding supports the observation that in-year adjustments are important, particularly for small acute care facilities.

Hospital specific results are presented in tables 5a and 5b.

Table 5a. Effects of Adjustments on Average Cost per Weighted Case: Hospitals That Confirmed MIS Data (N=38)

	Average Cost per Weighted Case (\$)				EFFECTS OF ADJUSTMENTS ON CWC (% Change from Raw MIS and TWC Data)			RANK		
	RAW MIS DATA		CONFIRMED MIS DATA		Effect of In-Year Adjustments	Effect of MIS Adjustments	Overall Effects of Adjustments	Unadjusted	Adjusted	Change in Rank (Adjusted - Unadjusted)
No In-Year Adjustments	In-Year Adjusted	No In-Year Adjustments	In-Year Adjusted							
Teaching Hospitals										
Health Sciences Centre	2,985	2,953	2,998	2,965	-1.1%	0.4%	-0.7%	6	4	-2
St. Boniface	2,177	2,183	2,492	2,498	0.3%	14.4%	14.7%	9	6	-3
Urban Community Hospitals										
Brandon	1,962	1,946	1,925	1,910	-0.8%	-1.9%	-2.6%	12	12	0
Concordia	1,520	1,517	1,505	1,502	-0.2%	-1.0%	-1.2%	25	28	3
Seven Oaks	1,512	1,511	1,543	1,541	-0.1%	2.0%	1.9%	26	24	-2
Victoria	1,732	1,737	1,963	1,968	0.3%	13.3%	13.6%	17	11	-6
Major Rural Hospitals										
Bethel (Winkler)	1,395	1,386	1,400	1,390	-0.7%	0.3%	-0.4%	31	33	2
Dauphin	1,572	1,506	1,572	1,506	-4.2%	0.0%	-4.2%	22	26	4
Flin Flon	100,947	128,465	1,075	1,369	27.3%	-98.9%	-98.6%	1	34	33
Morden	1,291	1,279	1,296	1,283	-0.9%	0.4%	-0.6%	33	36	3
Swan River	1,345	1,421	1,497	1,581	5.6%	11.3%	17.5%	32	23	-9
The Pas	245	250	2,191	2,234	2.0%	794.7%	812.3%	38	8	-30
Intermediate Rural Hospitals										
Churchill	1,951	2,821	1,969	2,846	44.6%	0.9%	45.9%	13	5	-8
Souris	1,503	1,491	1,517	1,505	-0.8%	0.9%	0.1%	27	27	0
Ste. Rose	1,689	1,756	1,730	1,798	4.0%	2.4%	6.4%	19	16	-3
Virten	1,200	1,277	1,200	1,277	6.4%	0.0%	6.4%	34	37	3
Small Rural Hospitals										
Arborg	1,530	1,820	1,530	1,820	18.9%	0.0%	18.9%	24	15	-9
Baldur	1,411	1,755	1,411	1,755	24.4%	0.0%	24.4%	29	18	-11
Boissevain	1,803	1,816	1,820	1,833	0.7%	1.0%	1.7%	16	14	-2
Deloraine	1,709	1,773	1,709	1,773	3.7%	0.0%	3.7%	18	17	-1
Desalaberry (St Pierre-Jolys)	1,917	1,684	1,919	1,686	-12.1%	0.1%	-12.1%	14	20	6
E. M. Crowe (Eriksdale)	1,689	1,586	1,689	1,586	-6.1%	0.0%	-6.1%	20	21	1
Glenboro	1,540	1,361	1,540	1,361	-11.6%	0.0%	-11.6%	23	35	12
Grandview	2,201	2,501	1,496	1,700	13.6%	-32.0%	-22.8%	8	19	11
McCreary	1,821	1,493	1,821	1,493	-18.0%	0.0%	-18.0%	15	29	14
Melita	1,675	1,509	1,675	1,509	-9.9%	0.0%	-9.9%	21	25	4
Pinawa	1,398	1,398	1,427	1,427	0.0%	2.1%	2.1%	30	31	1
Roblin	953	1,210	953	1,210	27.0%	0.0%	27.0%	37	38	1
Rock Lake (Crystal City)	1,082	1,581	1,085	1,586	46.1%	0.3%	46.6%	36	22	-14
Tiger Hills (Treherne)	1,086	1,409	1,086	1,409	29.7%	0.0%	29.7%	35	32	-3
Wawanasa	2,093	1,888	2,093	1,888	-9.8%	0.0%	-9.8%	10	13	3
Winnipegosis	1,463	1,453	1,463	1,453	-0.6%	0.0%	-0.6%	28	30	2
Northern Isolated Hospitals										
Gillam	3,053	3,977	3,066	3,994	30.3%	0.4%	30.8%	5	3	-2
Leaf Rapids	5,390	5,391	5,471	5,471	0.0%	1.5%	1.5%	2	2	0
Lynn Lake	4,231	2,165	4,231	2,165	-48.8%	0.0%	-48.8%	3	10	7
Snow Lake	3,621	3,621	12,454	12,454	0.0%	243.9%	243.9%	4	1	-3
Small Multi-Use Facilities										
Benito	2,491	2,509	2,469	2,487	0.7%	-0.9%	-0.2%	7	7	0
Reston	1,989	2,183	1,989	2,183	9.7%	0.0%	9.8%	11	9	-2

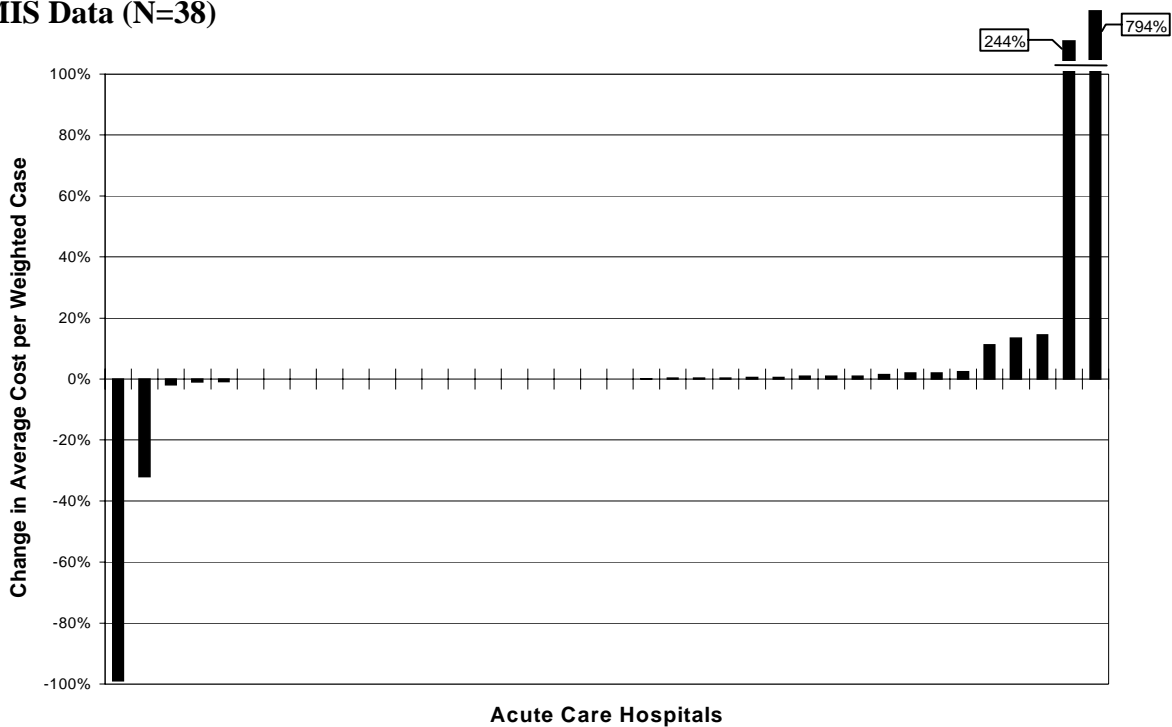
Table 5b. Effects of Adjustments on Average Cost per Weighted Case: Hospitals That Did Not Confirm MIS Data

	Average Cost per Weighted Case (\$)				EFFECTS OF ADJUSTMENTS ON CWC (% Change from Raw MIS and TWC Data)			RANK		
	RAW MIS DATA		ADJUSTED MIS DATA		Effect of In-Year Adjustments	Effect of MIS Adjustments	Overall Effects of Adjustments	Unadjusted	Adjusted	Change in Rank (Adjusted - Unadjusted)
	No In-Year Adjustments	In-Year Adjusted	No In-Year Adjustments	In-Year Adjusted						
Urban Community Hospitals										
Salvation Army Grace	1,687	1,651	N/A	N/A	-2.1%	N/A	-2.1%	12	13	1
Major Rural Hospitals										
Bethesda (Steinbach)	1,028	1,003	N/A	N/A	-2.4%	N/A	-2.4%	34	35	1
Portage	1,462	1,470	N/A	N/A	0.5%	N/A	0.5%	16	16	0
Selkirk	1,307	1,324	N/A	N/A	1.3%	N/A	1.3%	23	24	1
Thompson	2,400	2,418	N/A	N/A	0.8%	N/A	0.8%	3	3	0
Intermediate Rural Hospitals										
Altona	1,460	1,460	N/A	N/A	0.0%	N/A	0.0%	19	18	-1
Beausejour	1,355	1,339	N/A	N/A	-1.2%	N/A	-1.2%	22	23	1
Carman	1,288	1,266	N/A	N/A	-1.7%	N/A	-1.7%	24	26	2
Johnson (Gimli)	1,209	1,197	N/A	N/A	-1.0%	N/A	-1.0%	28	29	1
Minnedosa	1,374	1,380	N/A	N/A	0.4%	N/A	0.4%	21	20	-1
Neepawa	1,166	1,106	N/A	N/A	-5.2%	N/A	-5.2%	31	32	1
Small Rural Hospitals										
Birtle	1,743	1,755	N/A	N/A	0.7%	N/A	0.7%	10	10	0
Carberry	2,414	1,363	N/A	N/A	-43.5%	N/A	-43.5%	2	21	19
Emerson	1,973	1,802	N/A	N/A	-8.7%	N/A	-8.7%	8	8	0
Erickson	1,068	1,039	N/A	N/A	-2.7%	N/A	-2.7%	32	34	2
Hamiota	1,386	1,393	N/A	N/A	0.5%	N/A	0.5%	20	19	-1
Hunter (Teulon)	1,065	1,137	N/A	N/A	6.8%	N/A	6.8%	33	30	-3
Lakeshore (Ashern)	1,200	1,286	N/A	N/A	7.2%	N/A	7.2%	30	25	-5
Lorne (Swan Lake)	1,274	1,242	N/A	N/A	-2.5%	N/A	-2.5%	25	28	3
Morris	1,587	1,706	N/A	N/A	7.5%	N/A	7.5%	14	11	-3
Notre Dame	2,026	2,011	N/A	N/A	-0.8%	N/A	-0.8%	6	6	0
Pine Falls	1,208	1,094	N/A	N/A	-9.5%	N/A	-9.5%	29	33	4
Riverdale (Rivers)	1,021	1,125	N/A	N/A	10.2%	N/A	10.2%	35	31	-4
Russell	1,218	1,246	N/A	N/A	2.4%	N/A	2.4%	27	27	0
Seven Regions (Gladstone)	2,007	2,017	N/A	N/A	0.5%	N/A	0.5%	7	5	-2
Shoal Lake	1,699	1,696	N/A	N/A	-0.2%	N/A	-0.2%	12	12	0
St. Claude	2,398	2,265	N/A	N/A	-5.5%	N/A	-5.5%	4	4	0
Ste. Anne	1,261	1,358	N/A	N/A	7.7%	N/A	7.7%	26	22	-4
Stonewall	1,455	1,461	N/A	N/A	0.4%	N/A	0.4%	18	17	-1
Tri-Lake (Killarney)	1,452	1,615	N/A	N/A	11.3%	N/A	11.3%	17	14	-3
Vita	1,549	1,601	N/A	N/A	3.4%	N/A	3.4%	15	15	0
Small Multi-Use Facilities										
MacGregor	3,513	2,564	N/A	N/A	-27.0%	N/A	-27.0%	1	1	0
Pembina Manitou	2,036	2,536	N/A	N/A	24.6%	N/A	24.6%	5	2	-3
Rosburn	1,881	1,836	N/A	N/A	-2.4%	N/A	-2.4%	9	7	-2
Whitemouth	1,683	1,783	N/A	N/A	6.0%	N/A	6.0%	13	9	-4

4.2 Revisions to Inpatient Costs

The impact of the revisions to MIS reporting for the 38 hospitals that confirmed their MIS data is shown in Figure 5. We see from this figure that adjustments ranged from -100 per cent to almost 800 per cent. Of the 38 hospitals that confirmed their MIS data, 7 (18%) facilities reported adjustments that resulted in a CWC change of more than 10%, and 16 (42%) had changes that resulted in a small CWC adjustment (less than 10%). Therefore, 23 (61%) of facilities had a different CWC as a result of confirming their MIS data. Fifteen (39%) had no change in the CWC following the data confirmation process.

Figure 5. Percent Change in Average Cost per Weighted Case Resulting from Confirming MIS Data (N=38)



MIS adjustments resulted in fewer quintile rank changes. However, for two hospitals the changes made a substantial difference. A change in quintile rank was observed for 8 (21%) of the 38 facilities (see Table 6a) which is less than the number of facilities (15 of 38; 39%) for which there was a change in CWC following verification. This suggests that using quintiles for comparisons results in less misrepresentation of financial performance. The verified MIS data resulted in one hospital moving from the first quintile rank (i.e., highest

cost) to the last quintile rank (lowest cost). Another hospital moved from the fifth-place rank (lowest CWC) to the second quintile rank. While the in-year adjustments were most likely to affect the smallest hospitals, the MIS adjustments were most likely to affect the larger hospitals. All but one of the quintile rank changes occurred among teaching, urban community or major rural hospitals.

The primary reasons for revisions to the MIS data during the confirmation process are described below:

- Employee benefits were responsible for the largest dollar value of corrections. Two hospitals placed all benefits in the “Undistributed-Operating” accounting centre. One hospital put all benefits into the “Administrative and Support” functional centre. MIS guidelines require that employee benefits be distributed to the functional centre from which the salaries and wages are paid. This suggests that the verification process could be used to make significant enhancements to the quality of the MIS data submitted in future time periods. Such improvements in data quality may reduce the workload associated with the verification process.
- The “Health and Education Levy,” which is a percent of the payroll of employers, was responsible for the second largest dollar value correction. According to MIS guidelines, this expense is to be reported in the “Undistributed-Operating” functional centre. One hospital distributed this cost to all functional centres, and one hospital reported the cost in the “Administrative and Support Services” functional centre.
- Three hospitals did not bring the “Patient Food Services Clearing Account” to zero at year-end, even though this is a requirement specified in the MIS guidelines. As a result, the costs were reported in the “Unallocated-Operating” accounting centre rather than the “Patient Food Services” centre.
- Two hospitals reported inpatient food in the “Clinical Nutrition” functional centre rather than the “Patient Food Services” centre.
- Four hospitals reported revenue incorrectly—three reported “Patient Services Revenue” (payments from Manitoba Health) in an “Interdepartmental Recovery” account, and

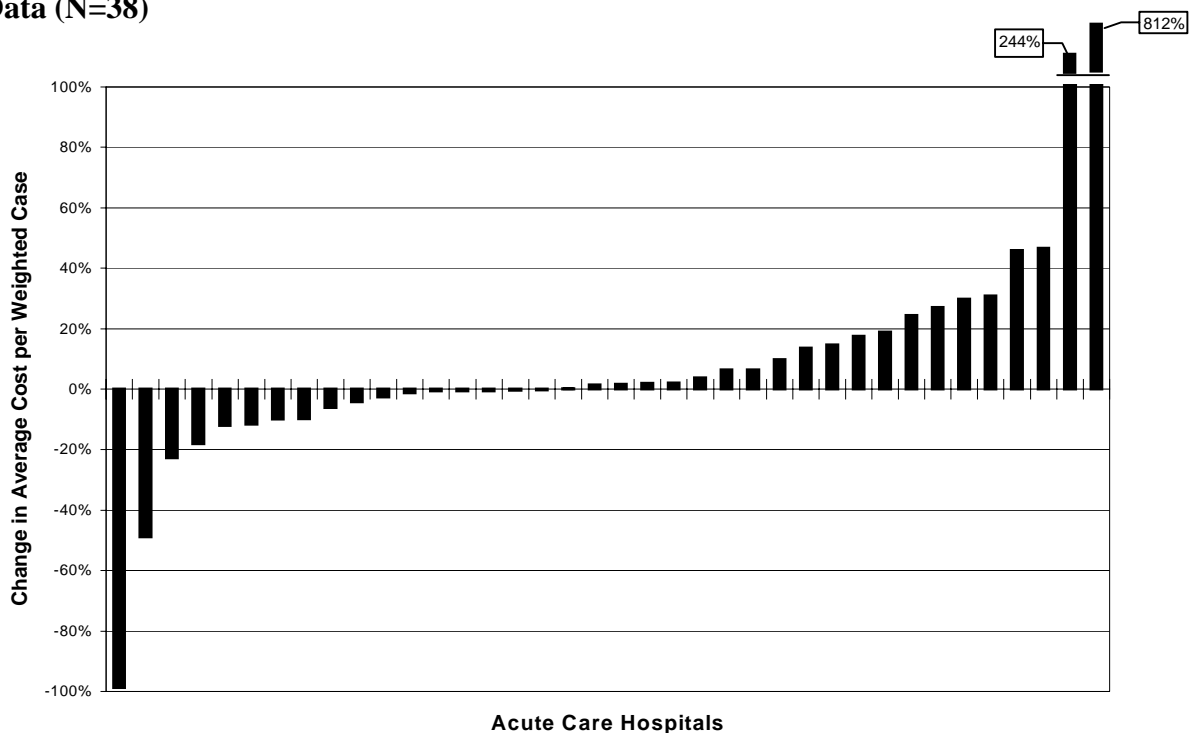
another reported a recovery for physician services as a compensation recovery rather than patient services revenue.

- At one hospital, non-patient food services expenses (e.g., cafeteria) were reported as patient food services expenses. As well, at this hospital the “Patient Meal Days” statistic was under-reported by 2300 days.

4.3 Combined Revisions

Referring once again to Figure 2, the solid and dotted lines, which are presented alongside the bars representing the original CWC statistics, shows the overall revised CWC, by hospital. In-year adjustments affected all but four hospitals, with this adjustment accounting for more than 10% in 18 of the 73 hospitals. Eleven hospitals had adjustments in both TWC and costs. The CWC changed by more than 10% for 23 hospitals, when both adjustments are considered. The post-adjustment line shows a much smoother progression in cost estimates across hospitals. However, one hospital had a very large post-adjustment value (\$12,000 per weighted case) compared with the pre-adjustment value (\$3,000 per weighted case), resulting from MIS adjustments. For the hospitals that did not verify MIS data, the differences between the two lines is entirely due to TWC adjustments. Figure 6 shows the overall effect of adjustments for each hospital that verified its MIS information. Only the hospitals that confirmed their MIS information are presented in this figure. These results indicate that for a small number of hospitals that confirmed cost information, there was a substantial change in the CWC measure—8% (3 hospitals) had a change of more than 50%, while 39% (15 hospitals) had a change of between 10% and 50%. Ensuring that the cost information and TWCs are accurate is important for making valid comparisons of CWC between hospitals.

Figure 6. Percent Change in Average Cost Per Weighted Case Resulting from In-Year Adjustments to TWC and Inpatient Cost Adjustments: Hospitals with Verified MIS Data (N=38)



Overall, 23 (32%) of 73 hospitals changed quintile rank as a result of all adjustments (see Tables 6a and 6b). Changes in quintile rank are not cumulative in that a one-rank change due to In-Year Adjustments and a one-rank change due to MIS adjustments will not necessarily result in a two-quintile rank change overall. In fact, in three hospitals that had quintile changes due to either in-year or MIS adjustments, there was no quintile change when both in-year and MIS adjustments were made—the two adjustments offset each other. Eleven hospitals moved to a lower quintile rank while 12 moved to higher CWC quintile ranks. Fifteen hospitals changed position by a single quintile rank, six moved two quintile ranks, and two moved three or more quintile ranks.

Table 6a. Effect of Adjustments on Average Cost Per Weighted Case Quintile: Hospitals That Confirmed MIS Data (N=38)

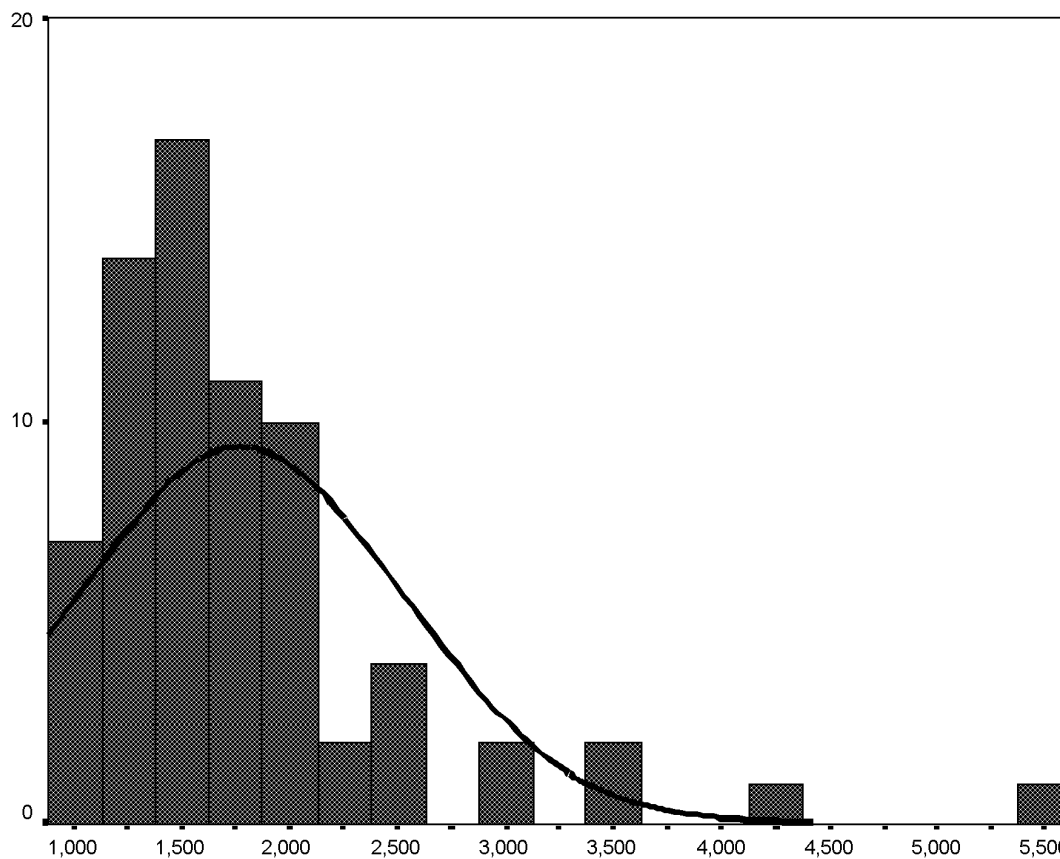
	Average Cost Per Weighted Case Quintile (1=highest cost)				Effects of Adjustments		
	A	B	C	D	Number of quintiles of change		
	Raw MIS and TWC Data	In-Year Adjusted TWC	Confirmed MIS Data	MIS and In-Year Adjusted Data	(Col B - Col A) In-Year Adjusted TWC	(Col C - Col A) Confirmed MIS Data	(Col D - Col A) MIS and In-Year Adjusted Data
Teaching Hospitals							
Health Sciences Centre	1	1	1	1	0	0	0
St Boniface	2	2	1	1	0	-1	-1
Urban Community Hospitals							
Brandon	2	2	2	2	0	0	0
Concordia	4	3	4	4	-1	0	0
Seven Oaks	4	4	3	4	0	-1	0
Victoria	3	3	2	2	0	-1	-1
Major Rural Hospitals							
Bethel (Winkler)	4	5	5	5	1	1	1
Dauphin	3	4	3	4	1	0	1
Flin Flon	1	1	5	5	0	4	4
Morden	5	5	5	5	0	0	0
Swan River	5	4	4	3	-1	-1	-2
The Pas	5	5	2	2	0	-3	-3
Intermediate Rural Hospitals							
Churchill	2	1	2	1	-1	0	-1
Souris	4	4	4	4	0	0	0
Ste Rose	3	3	3	3	0	0	0
Virден	5	5	5	5	0	0	0
Small Rural Hospitals							
Arborg	4	2	4	2	-2	0	-2
Baldur	4	3	4	3	-1	0	-1
Boissevain	3	2	3	2	-1	0	-1
Deloraine	3	3	3	3	0	0	0
Desalaberry (St Pierre-Jolys)	2	3	2	3	1	0	1
EM Crowe (Eriksdale)	3	3	3	3	0	0	0
Glenboro	3	5	3	5	2	0	2
Grandview	2	2	4	3	0	2	1
McCreary	2	4	2	4	2	0	2
Melita	3	4	3	4	1	0	1
Pinawa	4	5	4	4	1	0	0
Roblin	5	5	5	5	0	0	0
Rock Lake (Crystal City)	5	3	5	3	-2	0	-2
Tiger Hills (Treherne)	5	4	5	5	-1	0	0
Wawanessa	2	2	2	2	0	0	0
Winnipegosis	4	4	4	4	0	0	0
Northern Isolated Hospitals							
Gillam	1	1	1	1	0	0	0
Leaf Rapids	1	1	1	1	0	0	0
Lynn Lake	1	2	1	2	1	0	1
Snow Lake	1	1	1	1	0	0	0
Small Multi-Use Facilities							
Benito	1	1	1	1	0	0	0
Reston	2	2	2	2	0	0	0

Table 6b. Effect of Adjustments on Average Cost Per Weighted Case Quintile: Hospitals That Did Not Confirm MIS Data (N=35)

	Average Cost Per Weighted Case Quintile (1=highest cost)				Effects of Adjustments Number of quintiles of change		
	A	B	C	D	(Col B - Col A)	(Col C - Col A)	(Col D - Col A)
	Raw MIS and TWC Data	In-Year Adjusted TWC	Confirmed MIS Data	MIS and In- Year Adjusted Data	In-Year Adjusted TWC	Confirmed MIS Data	MIS and In-Year Adjusted Data
Urban Community Hospitals							
Salvation Army Grace	2	2	N/A	2	0	N/A	0
Major Rural Hospitals							
Bethesda (Steinbach)	5	5	N/A	5	0	N/A	0
Portage	3	3	N/A	3	0	N/A	0
Selkirk	4	4	N/A	4	0	N/A	0
Thompson	1	1	N/A	1	0	N/A	0
Intermediate Rural Hospitals							
Altona	3	3	N/A	3	0	N/A	0
Beausejour	4	4	N/A	4	0	N/A	0
Carman	4	4	N/A	4	0	N/A	0
Johnson (Gimli)	4	5	N/A	5	1	N/A	1
Minnedosa	3	3	N/A	3	0	N/A	0
Neepawa	5	5	N/A	5	0	N/A	0
Small Rural Hospitals							
Birtle	2	2	N/A	2	0	N/A	0
Carberry	1	3	N/A	3	2	N/A	2
Emerson	2	2	N/A	2	0	N/A	0
Erickson	5	5	N/A	5	0	N/A	0
Hamiota	3	3	N/A	3	0	N/A	0
Hunter (Teulon)	5	5	N/A	5	0	N/A	0
Lakeshore (Ashern)	5	4	N/A	4	-1	N/A	-1
Lorne (Swan Lake)	4	4	N/A	4	0	N/A	0
Morris	2	2	N/A	2	0	N/A	0
Notre Dame	1	1	N/A	1	0	N/A	0
Pine Falls	5	5	N/A	5	0	N/A	0
Riverdale (Rivers)	5	5	N/A	5	0	N/A	0
Russell	4	4	N/A	4	0	N/A	0
Seven Regions (Gladstone)	1	1	N/A	1	0	N/A	0
Shoal Lake	2	2	N/A	2	0	N/A	0
St Claude	1	1	N/A	1	0	N/A	0
Ste Anne	4	4	N/A	4	0	N/A	0
Stonewall	3	3	N/A	3	0	N/A	0
Tri-Lake (Killarney)	3	2	N/A	2	-1	N/A	-1
Vita	3	3	N/A	3	0	N/A	0
Small Multi-Use Facilities							
MacGregor	1	1	N/A	1	0	N/A	0
Pembina Manitou	1	1	N/A	1	0	N/A	0
Rosburn	2	1	N/A	1	-1	N/A	-1
Whitemouth	2	2	N/A	2	0	N/A	0

We had hoped to develop a statistical methodology that would allow us to identify those hospitals that were most likely to have a substantial change in the CWC or the quintile rank of their CWC resulting from adjustments to their MIS data. A common method of identifying nontypical results in normally distributed data is to calculate two standard deviations from the mean, and classify all results outside of these bounds as outliers. This approach only identified one of the five hospitals that had a CWC change of greater than 10% due to MIS adjustments, and none of the 8 hospitals that changed quintile rank. It also identified five additional hospitals as outliers—the verified MIS data for these hospitals made little or no change in the CWC. It may be that these results are influenced by the non-normal distribution of the data (see Figure 7). To normalize the distribution of the data, the log value of the CWC was calculated, and a more stringent criterion for defining typical results (i.e., 1 standard deviation from the mean) was applied to the data. This methodology resulted in the identification of one hospital that subsequently showed a CWC change of greater than 10% due to MIS adjustments; it also resulted in the identification of eight hospitals for which MIS adjustments resulted in no CWC or quintile rank change. Equally important, this approach missed five hospitals for which a change in quintile rank resulted from MIS adjustments. Therefore, these statistics were not judged to be useful in identifying outliers; rather, visual inspection of the data and analysis of change in ranks was deemed to be more useful.

Figure 7. Frequency Distribution & Fitted Curve for Average Cost Per Weighted Case – Raw MIS and TWC Data (N=71)⁹



Despite not being able to utilize a statistical methodology to reliably identify hospitals that would likely have significant changes in their CWC as a result of MIS adjustments, we believe that this approach may be effective once other verification procedures (described later in this report) are implemented.

⁹ Two hospitals had extreme outlier CWC values. These facilities are not included in this chart.

5. DISCUSSION AND RECOMMENDATIONS

The CWC measure has the potential to be used for planning, funding, managing and evaluating facilities, and for conducting economic evaluations, if the data upon which it is based is valid and reflective of acuity of patients seen by different facilities. It has been used for planning purposes with regard to the prediction of the movement of resources following hospital consolidation in metropolitan Toronto (Metropolitan Toronto District Health Council, 1995). The CWC has been used as a management tool, focusing on differences in operational efficiency between hospitals in Ontario (Baker, R et al., 1995; 2000) and differences between teaching hospitals in Canada (Helyar et al., 1998). The CWC is one of the costing methods used in cost lists for economic evaluation (Jacobs et al., 1997; 1999; Institute of Health Economics, 2000). All of the above-mentioned scenarios use the CWC with MIS data that have not been confirmed for consistency (beyond audit procedures that may be in place) and no in-year adjustments. Here, we have shown the effect that adjustments can have on the CWC for individual hospitals and conclude that these adjustments are necessary.

In this project we analyzed the effects of the two types of revisions on individual hospital CWCs. These revisions were the alignment of total weighted cases with hospital census data, and the adjustment of MIS expenditure data to standardize them to established reporting standards. When we adjusted weighted case data the CWC changed for a number of hospitals, by magnitudes of up to 40 per cent of the original CWC measure. Confirming MIS data resulted in a small number of very substantial revisions to CWC. Overall, the adjustments resulted in considerable changes in the quintile ranks of individual hospital's CWC (see Table 6a and Table 6b).

The CWC measure is becoming the standard overall measure of hospital financial performance in Canada. It has been used for hospital funding in Ontario, for financial review in Québec, and more informally for a variety of purposes in other provinces. It has a recent origin, however, and improvements in this measure are continually being made. The

accuracy of the CWC is dependent on the validity of case-weight information and financial and statistical MIS data

Canadian-origin standardized case weights have only been used in recent years; there is little information available on their validation, especially for low volume, high cost items. Furthermore, there is very little information available on ICD-9CM coding practices in Manitoba hospitals and how these practices may affect the distribution of case groupings and resource intensity weights. Other provinces (notably Ontario) may make adjustments to case weight data when calculating the CWC in order to align the number of patient days as recorded in the patient discharge records with the reported census data. There is no explicit documentation of this. As we have shown here, total weighted case adjustments can have a large impact on the CWC, particularly for smaller hospitals. When making comparisons between hospitals (or when using total weighted cases as the basis for a funding formula), it is important to consider the impact of these adjustments. Because little work has been done to validate the weights that are assigned to cases it is unclear if differences in CWC are due only to cost issues. It is possible that the resource intensity weight assigned to cases may not sufficiently adjust for differences in the types of cases that are seen in different types of hospitals. Further review of this issue would be necessary to determine the impact on the CWC.

When this report was initiated, MIS had only been operational throughout the province for two years and administrators and policy-makers were skeptical about the accuracy of these data. Ontario has a longer tradition of formally auditing financial data because these data are used to fund hospitals. The review procedure of MIS in the present study succeeded in eliminating several very large discrepancies. Differences in reporting among more detailed accounts would not be detected by this process. Each month, hospitals submit an electronic copy of their general ledger to Manitoba Health. This submission is checked to ensure that only valid accounts have been used. This limited audit process provides minimal confidence in the validity of the data—hospitals are expected to follow the MIS Guidelines but there is no process in place to ensure that the necessary reporting consistency exists. On an annual basis, statistical accounts are reviewed to identify potential reporting errors. Our analyses

suggest that implementing a reasonably straightforward monthly audit process would identify those items that have the greatest influence on the consistency of reporting the cost of inpatient care. The focus of this audit is described in section 5.3 of this report.

Others have identified the need to adjust the CWC that is assigned to an individual hospital. A CWC measure adjusted for hospital characteristics is used in Ontario for funding purposes (Ladek, 2001). To obtain these measures, raw CWC measures for each hospital are adjusted for variables such as location and types of hospital in this formula. In this way, hospitals are placed on an even footing.

When using the CWC measure for individual hospitals, whether it be for “report cards” or funding purposes, it is important to ensure that the measure is accurate. For all of the purposes except economic evaluation, the authors of the reports used CWCs for individual hospitals. The adjustments that were identified in this report also focus on individual hospital data. Thus, the importance of a system that will accurately report individual hospital CWCs is underscored.

It should also be emphasized that the CWC measure, by itself, is not usually considered to be sufficient to compare the economic performance of hospitals. At the very least, hospitals should be placed into peer groups such as the “hospital type” categories used in this report. In Ontario, a very involved procedure was used to develop adjustment factors for the CWC measures (Ladek, 2001). The adjustment factors pertain to the characteristics of hospitals and their operating environments, rather than to the measurement practices used by the hospitals. However, before one adjusts for these variables, the raw CWC measure across hospitals should be the result of common accounting and reporting practices.

The CWC statistic has been used in Ontario as one of the measures of financial performance for hospital “report cards” (Ontario Hospital Association, 2000). In the Ontario report, hospitals are assigned to one of three groups (above average, average, below average) according to the percentage by which the expected cost per weighted case differs from the actual cost per weighted case (Baker et al., 2000). We have used five classifications

(“quintiles”) of average cost per weighted case as a basis for “grading” hospitals in our analysis.

In this report, we have described the effects of confirming inpatient costs and/or adjusting total weighted cases on the quintile assignment of hospitals. The largest change in how a hospital would be graded on a report card was caused by adjustments to MIS cost data, but this affected only a few hospitals. The broadest impact resulted from in-year adjustment of the total weighted cases. The in-year adjustment process resulted in a quintile change for 30% of facilities and the MIS verification process resulted in a change for 20% of facilities. This clearly indicates the importance of ensuring that in-year adjustments are made and that extreme CWC values be investigated to ensure validity of this measure for Manitoba hospitals.

In the earlier report that presented hospital specific CWC with confirmed MIS data (when available) and in-year adjusted total weighted cases (Finlayson et al., 2001), characteristics that may effect the CWC of each facility were provided (see Appendix E of the earlier report). In the current report we have not attempted to measure the impact of these differences.

5.1 Making In-Year Adjustments

We recommend that hospital specific CWC be calculated only after making in-year adjustments to the total weighted cases of hospitals.

Acute care hospitals with more than 25 beds are affected only minimally by in-year adjustment, although there were two exceptions—in-year adjustments resulted in a 45% and a 27% increase in CWC for two hospitals in this group, with 31 and 75 beds, respectively.

For smaller hospitals, the effect of TWC adjustments resulted in a change in the CWC that ranged from -49% to +46%. Sixteen hospitals (35% of hospitals in this group) had a CWC change of greater than 10%.

Making in-year adjustments to the total weighted cases for hospitals as described is straightforward, and avoids having to wait an extra year before calculating the CWC for hospitals. We have found that in many situations failing to make this adjustment seriously under- or over-states the CWC for an individual hospital.

5.2 Validating Costs

Contacting 73 hospitals and 12 RHAs to validate costs was a time-consuming process. For many hospitals, the effect of these adjustments was minimal. Of the 38 hospitals that participated in reviewing their financial data, there was a change in CWC of greater than 10% in only 7 (18%) of these (see Table 5a). If valid inter-hospital comparisons are to be made it is important to first identify and correct major errors in the financial records.

5.3 Specific Recommendations – Improving Consistency in Cost Data

1. The most common financial reporting errors could be eliminated through a simple monthly audit check involving the following items:
 - ◆ compare the employee benefit rate (employee benefit cost over labour cost) for each of the level 2 functional centres (e.g., Administration and Support, Nursing Inpatient Services, etc.) with the hospital wide benefit rate. This will show if employee benefits are being distributed to the functional centre that is reporting the labour cost.
 - ◆ confirm that the “health and education levy” (secondary financial account 69548) is reported only in primary account 8199002.
 - ◆ confirm that “food” costs (secondary account 45***) are primarily reported in the “food services clearing account” (81910) or in the “patient food services” and “non-patient food services” accounts (71195 and 71910**).
2. At year-end, operating clearing accounts (e.g., “food services clearing account”) should have a \$0 balance.

3. At year-end, the balance in all level 3 functional centres should be determined, and any that have a credit balance should be reviewed to determine if revenues have been reported correctly.

This is not an exhaustive list of data validity checks but implementing these items would identify the majority of the errors that had an impact on the CWC in this study.

4. If these checks are implemented, it may be possible to implement a formal statistical methodology to identify hospitals that require further review. Given the amount of time that was involved in attempting to verify financial data for all hospitals, it is recommended that for future studies of average cost per weighted case only hospitals that have a CWC that is statistically different from the average would receive further analysis of MIS data. After making in-year adjustments to the total weighted cases, hospitals that are obvious outliers (in this study we used boundaries of \$500 and \$7500) would be removed from the statistical analysis and flagged for follow-up. Of the remaining hospitals, only hospitals where the natural logarithm of the CWC is not within one standard deviation of the mean for all hospitals would receive further review.

5.4 Conclusion

The results of this study have shown that confirming inpatient cost data and making in-year adjustments made an important difference in the average cost per weighted case (CWC) for individual hospitals. In-year adjustments made smaller differences to a larger number of hospitals, while confirming inpatient costs made a large difference for a few hospitals. We conclude that:

- the most common errors in reporting inpatient costs can be identified without confirming MIS data with all hospitals, and that monthly and annual audit checks would minimize errors that would have a significant impact on the CWC
- in-year adjustments should be made whenever the CWC for individual hospitals is being determined

- hospitals that have a CWC that is statistically different from other hospitals should have the inpatient costs reviewed in detail to ensure that the costs have been reported according to MIS guidelines.

Implementation of these procedures would make it possible to calculate and report an accurate indicator to assess the relative financial performance of acute care facilities and RHAs in Manitoba.

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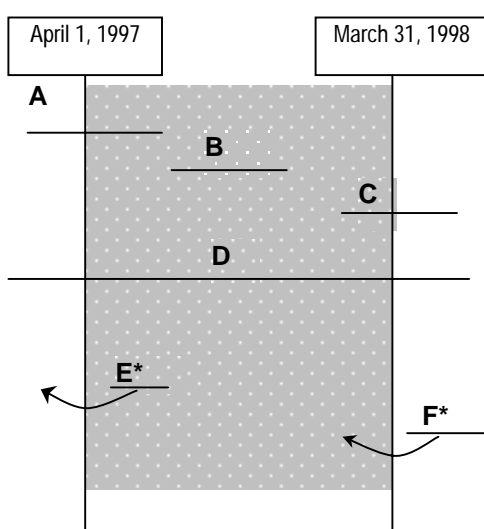
Appendix

Making Adjustments to Total Weighted Cases

To calculate the average cost per weighted case (CWC), it is necessary to match each facility's inpatient expenditures with cases and days that occurred within the same reporting period (i.e., "in-year days"). Although hospital data includes information on inpatients discharged during a fiscal year, it does not include information about stays in progress. At the same time, discharge data includes information about inpatients admitted before the beginning of the fiscal year and discharged during the fiscal year. In this case, the assigned case weight reflects resources consumed throughout the course of the hospital stay – not just the portion that occurred during the fiscal year.

There are six possible scenarios that describe the time-sequence of patient care; Figure 8 illustrates each.

Figure 8. Possible Time-Sequences of Patient Care That Would Affect the Measurement of Total Weighted Cases



* Cases in these scenarios relate to the previous fiscal year (i.e., they were filed after the year-end cut-off)

	Admission Date	Discharge Date
A	Before April 1/97	Between April 1/97 and March 31/98
B	Between April 1/97 and March 31/98	Between April 1/97 and March 31/98
C	Between April 1/97 and March 31/98	After March 31/98
D	Before April 1/97	After March 31/98
E	Before April 1/97	Before April 1/97
F	Before March 31/97	Before March 31/98

For scenarios A, B and E, case weights are available. Scenarios C, D and F each have hospital days within 1997/98 but because the cases were not discharged at the end of the fiscal year, information on their case weights is unavailable.

The earlier case-mix costing report (Finlayson et al., 1999) that used Case Mix Group (CMG) grouped cases and MIS financial data described reasons for making adjustments to the total weighted

cases (TWC) for hospitals. In summary, three possible occurrences would necessitate an adjustment to the TWCs:

1. the length of stay for an individual case exceeds 365 days (if a person is in hospital for more than 365 days they clearly have received care in more than one fiscal year)
2. the sum of the lengths of stay for all cases in a facility is less than the number of inpatient or census days reported by the hospital (i.e., there were people remaining in the hospital at the end of the year who had been in hospital for a good part of the current year and would not be discharged until a subsequent year)
3. the sum of the lengths of stay for all cases in a facility exceeds the number of inpatient or census days reported by the hospital (i.e., there were people discharged from the hospital who had received more care in the previous fiscal year than in the current one)

This issue is of particular importance to facilities with a relatively small number of beds. Factors such as the loss of a physician or a long holiday taken by a physician can have an impact on when a person is discharged, and the discharge of just one or two patients with a very long length of stay can have a substantial effect on the total weighted cases for these facilities.

Methods used to adjust separation days and weights are described in the following sections. Note that the weight for all cases with a length of stay greater than 365 days was adjusted prior to calculating the TWC for the facility.

Adjusting the weight assigned to a case when the length of stay of the case exceeds 365 days

- | |
|---|
| <ol style="list-style-type: none"> 1. When length of stay (LOS) exceeds 365 days, truncate at 365 days; 2. Adjusted case weight = case weight - ((LOS-365) x daily blended outlier weight for the particular CMG) |
|---|

When the number of inpatient days reported in MIS for a facility is less than the total separation days (truncated at 365 days)

- | |
|---|
| <ol style="list-style-type: none"> 1. Select outlier cases (based on the statistically defined trim point for long stay outliers for the CMG); 2. Place selected cases in random order; 3. Remove one day from each case until the total days equal the total separation days for the facility; 4. Repeat for all cases in sequence as necessary but do not remove days from any cases once the trim point for the CMG has been reached; 5. Subtract the CMG-specific daily blended outlier weight for each hospital day that has been removed to recalculate the weight that is assigned to the case. |
|---|

When the number of inpatient days reported in MIS for a facility is greater than the total separation days

- | |
|--|
| <ol style="list-style-type: none"> 1. For each facility, calculate the average daily weight for cases classified as outliers: (total weights/total days); 2. Add days and associated daily weights as follows: (total days - total separation days) x average daily weight for outliers. |
|--|

NOTE: Cases that were admitted prior to April 1 of the fiscal year under review and that had not been discharged by March 31 of the same fiscal year were not included in the total weighted cases as the case weight is not assigned until the case is discharged.

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