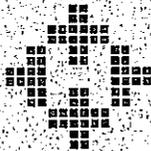


#94-01

## **Estimating Per Diem Costs for Manitoba Hospitals: A First Step**

February 1994



**Manitoba Centre for  
Health Policy and Evaluation**  
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## **The Manitoba Centre for Health Policy and Evaluation**

The Manitoba Centre for Health Policy and Evaluation (MCHPE) is a unit within the Department of Community Health Sciences, Faculty of Medicine, University of Manitoba. The MCHPE is active in health services research, evaluation and policy analysis, concentrating on using the Manitoba health data base to describe and explain patterns of care and profiles of health and illness.

Manitoba has one of the most complete, well-organized and useful health data bases in North America. The data base provides a comprehensive, longitudinal, population-based administrative record of health care use in the province.

Members of the MCHPE 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 and its exceptional data base, uniquely position the MCHPE to contribute to improvements in the health policy process.

The Centre's researchers are widely published and internationally recognized. They collaborate with a number of highly respected scientists from Canada, the United States and Europe.



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# ESTIMATING PER DIEM COSTS FOR MANITOBA HOSPITALS: A FIRST STEP

## EXECUTIVE SUMMARY

### Introduction

This paper reports the findings of a project undertaken by the Manitoba Centre for Health Policy and Evaluation (MCHPE) at the request of Manitoba Health, to examine the feasibility of using hospital accounting data for making comparative estimates of the costs of acute inpatient care across major urban hospitals.

Accounting data for fiscal year 1990/91 reported by five urban community hospitals were included in this project. The specific objectives were:

- to estimate the per diem costs of acute inpatient care for the five urban hospitals reporting accounting data to Manitoba Health through the Financial Information System (FIS);
- to estimate the per diem costs of acute inpatient care for these same five hospitals using summarized accounting data reported to Statistics Canada and Manitoba Health on part 1 of the hospital statistics (HS1) form;
- to compare estimates derived from these two data sources to test the feasibility of using HS1 data (available for all hospitals) to calculate acute per diem costs when FIS data are not available.

On the basis of this analysis, we believe existing hospital accounting data can be used for making comparative estimates of the average costs of acute inpatient care across hospitals. However, because this project was undertaken using only non-teaching urban hospitals, it is not clear that these results apply to other hospitals. Furthermore, it must be emphasized that the mean costs per patient-day of acute inpatient care estimated here are not adjusted for differences in patient characteristics that likely affect resource utilization. The rank ordering of hospitals by their per diem costs may change entirely after adjusting for patient characteristics like age, sex, severity and complexity of illness and for other factors affecting the utilization of resources. Both of these concerns are currently being investigated.

## **Methodology**

Two related approaches were used to estimate acute inpatient per diem costs. For the detailed financial and statistical FIS accounting data, the analytic technique was to fully use these data to ensure the accuracy and validity of estimated acute inpatient per diem costs. The detailed FIS data were checked for errors and inconsistent reporting. Also, by taking advantage of the rich set of allocation bases available from the FIS, supplemented through additional data gathered from the study hospitals, greater sensitivity in allocating support costs to the patient care and service departments was achieved, thus improving the accuracy of the estimated indirect costs of acute inpatient care and services.

The analytical approach employed with the summarized data available from HS1 reports was to use these unadjusted financial and statistical figures and a single allocation basis, paid-hours, to allocate support costs. Although we assume that the HS1 approach is less accurate, comparison of the results of this approach to estimates made using the FIS approach allows us to assess the sensitivity of per diem calculation using the HS1 data and allocation methodology. Good agreement between these two approaches suggests that HS1 data can be used to estimate per diem costs where detailed FIS accounting data is not available.

## **Results**

Overall, there was remarkable agreement between the mean costs per acute patient-day using the HS1 and the FIS data sources for the five urban community hospitals included in this project (Table 2). The difference between these two approaches is small, ranging from 0 to 4 per cent.

It must be strongly emphasized that the hospital acute per diem costs reported here were used only to compare alternative data sources and the methods used to estimate them. Because these estimates are not adjusted for patient case-mix and demographic characteristics, the effects of a one month nursing strike and other factors explaining between-hospital differences, these values cannot be meaningfully used to compare hospital performance. A subsequent research project currently underway at the MCHPE is designed to take the next analytic steps necessary to make hospital efficiency comparisons.

Given that the FIS contains detailed accounting data facilitating numerous adjustments that improve accuracy and comparability, and that it includes a large set of output indicators which were used to improve the sensitivity of the allocation of support costs to the patient care and service departments, the FIS approach can be regarded as "a current gold standard" for estimating hospital acute per diem costs. Because the estimates are remarkably similar, we have some confidence in using the HS1 approach to estimate per diem costs when FIS data are not available, even though HS1 reports lack the same degree of detailed data and the allocation methodology used was simpler (and hence less sensitive).

There are several reasons to apply the HS1 methodology to all hospitals in Manitoba. First, the HS1 approach is more straightforward and does not require the extensive processing that was applied to the FIS data. Second, all hospitals complete the HS1 report, whereas FIS data are not available for some institutions, notably the three largest urban hospitals. Further research is necessary to assess the generalizability of these findings to other hospitals.

There are complex issues yet requiring resolution before the HS1 methodology can be applied to all hospitals, particularly teaching institutions. Teaching hospitals have higher per diem costs than non-teaching hospitals, not only because of the costs of the teaching programs *per se* (costs which are excluded in most cost allocation methodologies because they are considered non-care costs), but also because the treatment regimen in teaching hospitals may be different. In future applications of the HS1 methodology, attempts should be made to estimate the indirect costs of educational activities over and above the direct costs of teaching programs.

Applying the methodology to rural hospitals presents different but equally complex challenges. Nursing care costs may not be separated between inpatient and outpatient care, or between acute and nursing home care. The provision of Diagnostic and Therapeutic services to some rural hospitals by provincial agencies complicates the allocation process. Finally, HS1 and FIS reports from smaller rural facilities lacking specialized finance and accounting departments may contain more inconsistencies.

## **Recommendations**

To make the HS1/FIS systems as useful as possible in the interim, our work suggests the following recommendations, in order of importance.

**RECOMMENDATION 1:** It is recommended that Manitoba Health and Manitoba hospitals develop a basic minimum FIS set of indicators for hospital departments, which all hospitals are required to report using agreed upon guidelines.

**RECOMMENDATION 2:** Uniform FIS and HS1 accounting requirements across hospitals should be maintained.

**RECOMMENDATION 3:** The inclusion of all physician remuneration should be considered in any future attempts to make cost comparisons across hospitals.

**RECOMMENDATION 4:** If further analyses are to be undertaken using FIS data for other Manitoba hospitals, FIS data should be compared to HS1 data to identify possible inconsistencies.

**RECOMMENDATION 5:** Analyses comparing care and service departments should not be undertaken without first ensuring that there are no major roll-up or organization-related comparability problems. Steps should be taken to ensure more consistent reporting of FIS and HS1 financial and statistical data at the departmental level.

**RECOMMENDATION 6:** To improve the comparability of outpatient departments, Manitoba Health and the hospitals should adopt a reporting system which captures all outpatient activity via fee-for-service equivalent claims and/or the hospital discharge abstract system.

# ESTIMATING PER DIEM COSTS FOR MANITOBA HOSPITALS: A FIRST STEP

## Introduction

This paper reports the findings of a project undertaken by the Manitoba Centre for Health Policy and Evaluation (MCHPE), at the request of Manitoba Health, to examine the feasibility of using hospital accounting data for making comparative estimates of the costs of acute inpatient care across major urban hospitals. Manitoba is one of the few provinces routinely compiling computerized hospital financial and statistical data over the past several years. This project was designed to determine if the detailed accounting data contained in the Manitoba Health Financial Information System (FIS) can be used to overcome some of the limitations associated with making estimates from less detailed sources, such as the summarized financial and statistical data reported annually to Statistics Canada using part 1 of the hospital statistics form (HS1). Estimates from these two sources were compared to assess the limitations of the HS1 data and to determine if HS1 data can be used where detailed FIS data are not available.

Some clarification of terms and abbreviations used in this paper is in order. All Manitoba hospitals report summarized financial and statistical data to Statistics Canada and Manitoba Health, using part 1 of the hospital statistics form (HS1). These data are aggregated at the departmental level. The Manitoba Health Financial Information System (FIS) file, essentially the hospital general ledger, provides extensive, detailed financial and statistical information. Unlike the HS1 reports, the FIS data are unaggregated, permitting corrections of misclassified items and errors. Both the HS1 and the FIS follow the Canadian Hospitals Accounting Manual (CHAM) Guidelines to classify their accounts. However, the CHAM Guidelines, developed in 1952 and revised in 1968 and 1974, do not enable patient-specific costs analyses. More recently, the Management Information System (MIS) Guidelines were initiated to accommodate the complex functional and organizational structures of modern hospitals and to allow patient-specific cost analysis. Although the MIS Guidelines are supported in principle by Manitoba Health and Manitoba hospitals, due to the costs of implementing accounting information systems that can provide the required level of detail, the MIS Guidelines have not yet been implemented in Manitoba.

High quality financial and statistical information is an integral input into research and managerial analysis undertaken to improve hospital performance (Chandler et al. 1991; Nestman 1989). Using the estimation methodology developed in this project, hospital acute care inpatient per diem costs can be used for several purposes. Given concerns about rising hospital expenditures, the accounting data contained in the FIS file and the HS1 reports could provide health-care system policy-makers and managers with information to improve hospital-sector performance. As one application, a recently initiated MCHPE project will compare the efficiency of Manitoba hospitals using their mean costs per acute care case adjusted for patient case-mix and demographic profiles as well as other factors affecting resource utilization.

Accounting data for fiscal year 1990/91 reported by five urban community hospitals were included in this project. The specific objectives were:

- to estimate the per diem costs of acute inpatient care for the five urban hospitals using accounting data available from the Manitoba Health FIS;
- to estimate the per diem costs of acute inpatient care for these same five hospitals using summarized accounting data reported to Statistics Canada and Manitoba Health using the HS1 format;
- to compare estimates derived from these two data sources to test the feasibility of using HS1 data (available for all hospitals) to calculate per diem costs when FIS data are not available.

The report consists of several sections. First, a conceptual framework for converting hospital accounting data into patient-specific costs is introduced. Data quality and methodologic issues affecting the validity of per diem estimates using different data sources are discussed.

Second, Manitoba data sources that can be used to estimate inpatient per diem costs are compared. Third, a conceptual model for allocating support costs to patient care and service departments and then partitioning these fully-allocated costs between acute care inpatients, non-acute care inpatients, and outpatients is developed. Two approaches complying with this model but consistent with the underlying limitations imposed by the FIS and HS1 data sources are described and used to estimate acute per diem costs, which are then compared. Finally, recommendations are made regarding future data reporting and processing.

The per diem costs estimated here are the average cost of care and services utilized by acute inpatients treated in the project hospitals during the 1990/91 fiscal year. These estimates may fail to generalize to other years because of organizational, clinical and other changes affecting hospital costs. For example, the financial, workload and output consequences of the one month nursing strike likely has reduced the comparability of the 1990/91 fiscal year accounting data to other time periods. Also, average cost may be limited or even misleading when used for certain analytical purposes. For example, analysis estimating resource savings from reducing inpatient length-of-stay should be calculated using marginal cost—i.e., the costs of patient care and services not consumed by reducing length-of-stay by one or more days. Marginal cost is typically less than average cost where length-of-stay reductions usually occur, especially near patient discharge.

**It must be strongly emphasized that the hospital per diem costs reported here were used only to compare alternative data sources and the methods used to estimate them.**

**Because these estimates are not adjusted for patient case-mix (severity, co-morbidities, intensity of resource utilization) and demographic characteristics (age, sex), the consequences of a one-month nursing strike plus other factors explaining between-hospital differences, these data cannot be meaningfully used to compare hospital performance. A subsequent project currently underway at the MCHPE is designed to take the next analytic steps necessary to make hospital efficiency comparisons.**

### **From Hospital Accounting Data to Patient-Specific Costs**

Figure 1 displays a flowchart showing several stages in converting hospital-specific accounting data into patient-specific costs. In moving from top to bottom in Figure 1, each analytical stage provides estimates that are increasingly patient-specific.

**FIGURE 1: FROM HOSPITAL ACCOUNTING DATA TO  
PATIENT-SPECIFIC COSTS**

**ACCOUNTING DATA:  
(STAGE 0)**

**PER DIEM COSTS:  
(STAGE 1)**

**ADJUSTED PER  
DIEM COSTS:  
(STAGE 2)**

**FULLY PATIENT-  
SPECIFIC COSTS:  
(STAGE 3)**

**\$, STATISTICS**



**\$ / acute care patient-day**



**adjusted \$ / acute care patient-day**



**MIS GUIDELINES (GLOBAL LEVEL)**

In stage 0, accounting financial data (eg. plant maintenance costs, nursing salaries) and statistical data (eg. patient visits, tests) have many limitations which make comparisons across hospitals impossible. Stage 0 accounting data:

- contain random and systematic errors plus items that may be inconsistently processed (physician payments, capital costs);
- include the costs of research, teaching, and other non-care activities;
- reflect a mixture of acute inpatient, non-acute inpatient, and outpatient care; and
- encompass heterogeneous activity arising from differences in patient case-mix (type, severity, co-morbidities, and resource intensity needs), patient profile (age, sex), and the availability of alternative sources of care facilitating patient discharge (home care).

In stage 1, both the relevance and comparability of accounting data can be improved by correcting for known errors and inconsistently processed costs, removing the costs of non-patient care activities, and excluding non-acute care inpatient and outpatient costs. The per diem costs of acute hospital care (mean costs per acute patient-day) are estimated by dividing corrected fiscal expenditures on acute care by the corresponding total number of acute care patient-days produced. This report focuses on the data processing needed to estimate stage 1 acute per diem costs.

Although non-trivial stage 1 tasks are essential for estimating accurate acute per diem costs, they are clearly insufficient to support meaningful comparisons of hospital performance. In stage 2, acute care per diem costs are adjusted for differences in patient case-mix and other characteristics needed in order to make meaningful comparisons of efficiency across hospitals. These adjustments are the focus of a recently initiated MCHPE project comparing Manitoba hospitals.

Stage 2 estimates are inadequate if users require patient-specific costs. For example, economic evaluation may require detailed information about the patient-specific costs of hospital care utilized by clinical trial subjects (see Drummond et al. 1987). Also, hospital operational management and strategic planning could clearly benefit from patient-specific data (see Chandler et al. 1991 and Nestman 1989). Although accounting information systems

complying with the national Management Information System (MIS) Guidelines will eventually provide patient-specific costs (stage 3), until such systems are fully operational in all Manitoba hospitals, both stage 1 and stage 2 level adjustments will advance our ability to estimate the costs of acute patient care.

### **Sources of Hospital Costs Data**

The only existing source of per diem costs for Manitoba hospitals is the set of inter-provincial per diem costs (IPPDC) used to reimburse the provinces for hospital care provided to out-of-province residents (Manitoba Health 1991). There are four categories of IPPDC: inpatient adult acute, adult extended, outpatient and newborn care. Adult acute care per diem costs (which include paediatric care) are hospital-specific in that they are calculated by dividing each hospital's global budget from the previous year by the number of patient-days, with an adjustment to account for potential liabilities like wage increases or inflation (Harvey 1993). Building costs, salaried physicians in emergency and estimated outpatient costs are excluded. A similar process is used to determine adult extended per diem costs for those facilities that have designated extended care beds. Sick newborns are calculated at the adult acute per diem rate. For outpatient visits and newborn care, a standard fee is applied to all Canadian hospitals. In addition, there is a schedule of fees applied to certain high-cost procedures, which may be either inpatient (for example, heart transplants) or outpatient (lithotripsy, dialysis). These standard fees are updated periodically and adjusted in a negotiating process between all provinces. Because all provinces must accept these common charges, the negotiating process may change all or some of these estimated costs. Clearly, they do not necessarily reflect Manitoba costs; indeed, they may not reflect anyone's costs.

All Manitoba hospitals report summarized accounting data to Statistics Canada using part 1 of the hospital statistics form (HS1), a copy of which is also provided to Manitoba Health. Because financial and statistical data summarized at the departmental level are reported using a specified format, any errors and misclassifications in the underlying accounting data cannot be easily identified and hence corrected. Therefore, little adjustment to improve accuracy is possible using these data alone. For example, misclassifications were noted in accounting for

hospital administration in the FIS data (Michael Loyd & Associates 1992)<sup>1</sup>, and it is likely that these problems are also reflected to some extent in the corresponding HS1 reports. Although unaudited, because HS1 data are reported nationally, they are generally assumed to be accurate and complete. HS1 data have been used over the past 20 years both in routine reports from Statistics Canada and for research purposes (Barer 1981, 1982; Evans 1971; Evans and Walker 1972; Jacobs et al. 1992; Lave et al. 1991). As HS1 data have recently been used in Alberta to address hospital funding inequities, this data source has gained some acceptance for making per diem comparisons.

The Manitoba Health Financial Information System (FIS) contains all financial and statistical data compiled by most Manitoba hospitals (i.e., this file is essentially the general ledger). These extensive, detailed data provide analysts with an important opportunity to estimate accurate, valid and comparable per diem acute care costs. Unlike HS1 reports, the FIS data are unaggregated, permitting corrections of misclassified items and errors. Also, support costs can be more accurately apportioned among the care and service departments using allocation bases more sensitive to each cost centre's output activity. However, because the FIS data for the study hospitals are not routinely used, checking for accuracy and completeness was one important objective of this study. Furthermore, FIS data require substantial processing as the 2,000 plus data items must be aggregated to the desired analytic level (departmental for this study). Nevertheless, the FIS dataset is clearly the most comprehensive source of hospital administrative data currently available in Manitoba.

### **Issues in Using Accounting Data**

Before using accounting data, analysts should determine if:

- the data quality is adequate;
- the accounting structure or reporting format will support further processing to prepare the data for analysis; and

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<sup>1</sup> Michael Loyd, of Michael Loyd and Associates, a consulting firm specializing in health economics, was hired by the MCHPE to liaise with the five hospitals and to manage the analysis of the FIS data, using the specifications designed by the MCHPE.

- the methodologic issues arising from data processing can be resolved.

Data quality is influenced by its accuracy, completeness, and comparability across hospitals. First, well-structured accounts reflecting organizational structure and function must be specified. Then, financial and statistical data must be consistently assigned to the correct accounts for the entire fiscal period. Finally, consistent accounting guidelines should be followed in each hospital in order to ensure meaningful between-hospital comparisons.

The FIS data were directly assessed for accuracy and completeness using statistical techniques to detect outlier hospitals (indicating potential problems), and through working with the staff of all project hospitals reporting this source of administrative data. The quality of HS1 reports was directly appraised using the criterion of consistent completion, and indirectly, by comparing HS1 derived per diem estimates to those estimated from the FIS accounting data.

Overall, accounting data should be highly comparable across hospitals because most Manitoba hospitals use the Canadian Hospitals Accounting Manual (CHAM) Guidelines to specify their chart of accounts. The CHAM Guidelines were "intended to provide a means of standardizing the classification of accounts within the hospital field, thereby facilitating the compilation and comparison of financial and statistical data, ratios, and trends" (The Canadian Hospital Association 1968, p. 1). CHAM was first published in 1952, in response to a growing need for uniform accounting data in Canada, and revised, first in 1959 to respond to the data needs of federal-provincial hospital programs, and again in 1968 to its present form (Canadian Hospital Association 1968). Concerns over mounting hospital costs since 1968 expanded the role of the CHAM Guidelines to include standardized methods for cost-analysis (Canadian Hospital Association 1974).

Other concerns potentially affecting data quality and comparability include:

- using preliminary data: data reported to Manitoba Health at year-end may be in error or incomplete until all adjustments have been made.
- analysis using periods of change: historic accounting data from time periods in which significant organizational, technological, or other changes have occurred may not

reflect future costs, nor provide an accurate basis for comparison in order to estimate relative hospital performance. For example, the one month nursing strike during the 1990/91 fiscal year likely imposed financial, workload, and output consequences on Manitoba hospitals. For this study, the comparison of FIS and HS1 per diem estimates is not affected because strike effects are equally incorporated in both data sources. However, as the strike likely influenced each study hospital differently, the **per diem costs reported here should be treated with caution**. Our interest was in developing a method which can be used and refined over the years.

- accounting policies: lack-of-fit of the CHAM Guidelines to the organizational structure of larger hospitals providing complex care is problematic as discretionary decisions regarding the assignment of these costs must be made by the affected institutions. Manitoba's two teaching hospitals have developed their own accounting systems to reflect their more complex organizational and functional structures and one community hospital is an MIS test site. These three hospitals were excluded from the study because their data were not reported to FIS due to inconsistent accounting formats. Some hospitals also systematically depart from the CHAM Guidelines or the HS1 reporting format for unknown reasons. For FIS data, such departures can be identified and rectified; however, for HS1 data, such departures may neither be identified or corrected. For example, one hospital consolidated obstetrical and surgical nursing care expenditures but reported these patient-days separately on its HS1. Also, as accounting for capital expenditures is generally not well performed by Canadian hospitals, the analysis focused on operating costs by excluding depreciation and long-term debt charges. Finally, as there are no accounting policies regarding the allocation of support costs to care and service units, approaches compatible with the FIS and HS1 data sources were developed (see below).
- use of data: data routinely used, and hence critically assessed, are more likely to be accurate and complete. Increasing attention paid to financial and statistical data for accountability, funding and other purposes will likely motivate Manitoba hospitals to improve the accuracy and completeness of their FIS data and HS1 reports.

The suitability of accounting data for estimating acute inpatient per diem costs also rests on the ability to distinguish costs pertaining to acute care from all other costs (e.g., rehabilitation units and ambulatory clinics). Using FIS and HS1 data, unique costs of inpatient care can be approximated because most care and service departments are either exclusively inpatient or outpatient, or report statistics by patient type for mixed activities. Assumptions must be made about partitioning costs for some departments for which output statistics are not compiled (e.g., Social Work on HS1 forms and Medical Records in both the HS1 and the FIS data sources).

### **Fundamentals of Cost Allocation**

The fundamental objective in undertaking hospital cost allocation analyses is to identify the total direct and indirect costs of some subaggregation of hospital activities, ranging from inpatient-outpatient breakdowns at one extreme (as performed here) to estimating the full costs of individual patient care at the other (one level of reporting available from accounting systems complying with the MIS Guidelines). Cost allocation is required because hospitals complying with the CHAM Guidelines report costs for departments, not patients, or in this case, the inpatient grouping.

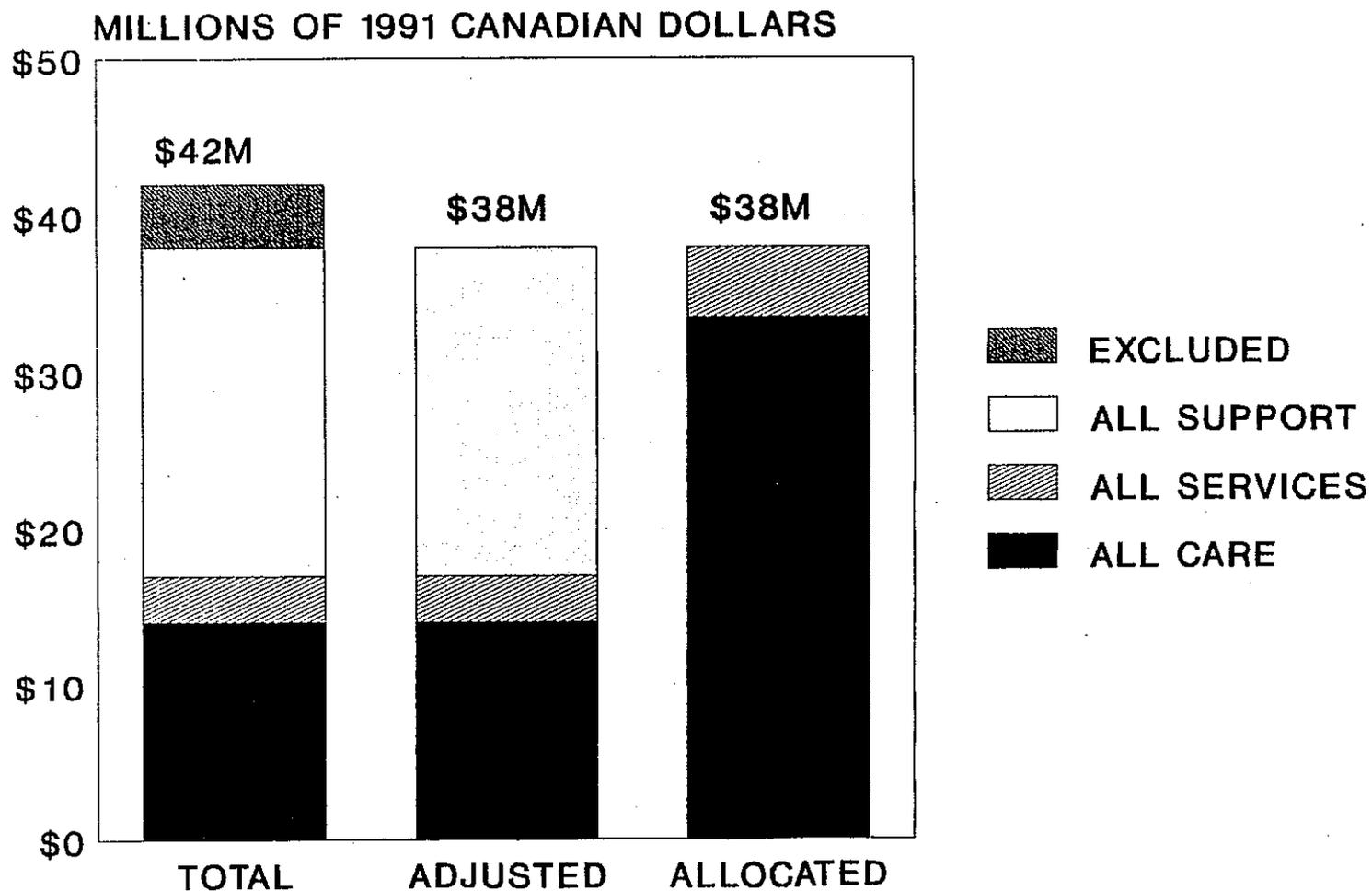
Analysis to estimate comparable hospital per diem costs should exclude some reported expenses. First, because accounting for capital costs is generally inadequate, only operating costs were considered for this project. Furthermore, as expenditures for some physician salaries (e.g., emergency medicine and some specialists) and the occurrence of special payments (e.g., pay equity awards for prior time periods) varies across hospitals, these costs were also excluded. Also, in addition to providing patient care, hospitals are also places for student training and sites for clinical and other research. Therefore, analysis undertaken to estimate comparable hospital acute per diem costs should exclude expenditures on research, non-staff education, pay equity for wages paid in previous fiscal years, physician payments plus all recognized depreciation and interest paid on long-term debt.

Patients are cared for in nursing units and they receive therapeutic and diagnostic services (care and services or direct costs). However, goods and services provided by the hospital infrastructure (administration, physical plant, and other support departments) affect patients and their caregivers (support or indirect costs). Therefore, the task is to first allocate appropriate shares of the support costs to the care and service departments, and then to partition these fully-allocated care and service costs between acute inpatients and other patients. The following hypothetical example outlines the methodology used to estimate hospital per diem costs.

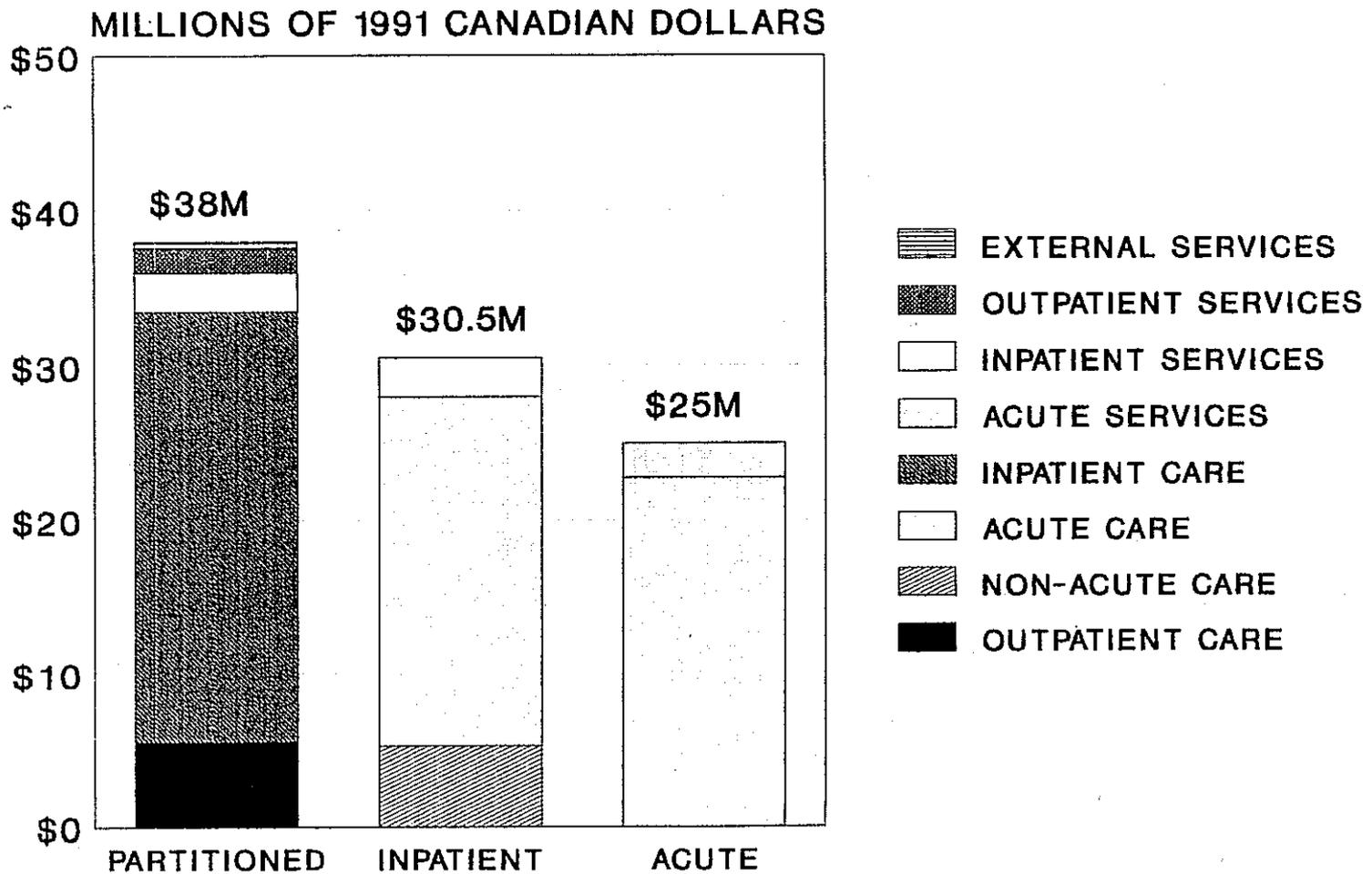
The three bars in Figure 2 illustrate the process of converting total hospital costs to allocated costs. In the first bar, total hospital costs of \$42M (TOTAL) are the arithmetic sum of nursing care costs (\$14M), diagnostic and therapeutic services costs (\$3M), infrastructure support costs (\$21M), plus the above excluded costs (\$4M). In the second bar (ADJUSTED), excluded costs have been removed. In the third bar (ALLOCATED), support costs (\$21M) are allocated to care and service departments, increasing these costs respectively from \$14M and \$3M to \$33.5M and \$4.5M (ALLOCATED). Ideally, accounting information systems would cost the actual consumption of administrative and other support activities using appropriate charges. However, in the absence of such data, support costs are usually allocated using surrogate measures of utilization (Drummond et al. 1987; Kaplan 1982). For this project, approaches consistent with the respective measures of activities reported in the FIS and HS1 data sources were developed.

In Figure 3, allocated costs are further partitioned and reorganized. In the first bar (PARTITIONED), the fully-allocated care and services costs (\$38M) from Figure 2 are divided between inpatient, outpatient and external recipients. Nursing care costs (\$33.5M) are partitioned between inpatient care (\$28M) and outpatient care (\$5.5M) using utilization

**FIGURE 2: ADJUSTING HOSPITAL COSTS AND ALLOCATING SUPPORT COSTS TO PATIENT CARE AND SERVICE ACTIVITIES.**



**FIGURE 3: PARTITIONING FULLY-ALLOCATED COSTS BETWEEN ACUTE CARE INPATIENTS, NON-ACUTE CARE INPATIENTS & OUTPATIENTS.**



statistics. The fully-allocated costs of diagnostic and therapeutic services (\$4.5M) are partitioned between inpatients (\$2.5M), outpatients (\$1.5M) and external recipients (\$0.5M) using utilization statistics. In this example, the \$0.5M costs of diagnostic tests performed for the public health unit by the hospital laboratory, plus the costs of meals produced for catering, meals-on-wheels, and other institutions by dietetics are excluded from further analysis. In the second bar (INPATIENT), the \$30.5M costs of inpatient care are estimated as the arithmetic sum of nursing care (\$28M) plus the diagnostic and therapeutic services (\$2.5M) consumed by all inpatients. Because hospitals record utilization data by the type of nursing unit, inpatient care costs (\$28M) can be further partitioned between acute care (\$22.75M) and non-acute care (\$5.25M) inpatients. In contrast however, partitioning inpatient diagnostic and therapeutic service costs between acute and non-acute care inpatients is problematic due to the absence of relevant utilization statistics. Whereas non-acute care patients likely use comparatively little diagnostic services, they may receive at least some therapeutic services, for example, occupational therapy. One estimate of the cost of diagnostic and therapeutic services utilized by such patients is \$7.62 per non-acute patient-day (Michael Loyd & Associates 1992) or for this example, \$0.25M in total over the fiscal year. In the final bar (ACUTE), the \$25M costs of acute inpatient care are estimated as the arithmetic sum of \$2.25M for services plus \$22.75M for nursing care. Finally, the hospital acute inpatient per diem costs would be calculated as the quotient of these fully-allocated acute care and services costs divided by the total acute care patient-days produced.

### **Methodology Used with the FIS Data and the HS1 Reports to Estimate Hospital Acute Inpatient Per Diem Costs**

Two related approaches were used to estimate acute inpatient per diem costs. The philosophy of adjustment and analysis using FIS accounting data was to work with these financial and statistical figures to the furthest extent possible and to use the most sensitive allocation bases to ensure the accuracy and validity of the estimated acute inpatient per diem costs. Using the detailed accounting data available from the FIS, the consultant was able to detect missing or otherwise suspect values and, through working with hospital staff, to improve both the accuracy and the completeness of these financial and statistical data. By taking advantage of

the detailed set of allocation bases available in the FIS, supplemented through additional data gathered from study hospitals, greater sensitivity in allocating support costs to the patient care and service departments was achieved.

The analytical approach using summarized data available from HS1 reports was to use these unadjusted financial and statistical figures and a single allocation basis, paid-hours, to allocate support costs. A single allocation basis was used to simplify analysis; paid-hours was selected as it, to some extent, reflects the consumption of administrative and other support activities. Although we assume that the HS1 approach is less accurate, comparison of the results of this approach to estimates made using the FIS approach allows us to assess the sensitivity of per diem calculation using the HS1 data and allocation methodology. Good agreement between these two approaches suggests that HS1 data could be used to estimate acute per diem costs where detailed FIS accounting data are not available.

### **FIS Accounting Data and Allocation Methodology**

A modified step-down approach was used to allocate costs using FIS data for the five project hospitals.<sup>2</sup> The method was chosen for its understandability, simplicity and inherent logic. To improve the methodology and its credibility, the five hospitals were consulted with regard to their accounting and statistical data as well as the allocation of difficult indirect costs departments (Appendix A identifies those consulted). Interhospital differences were also identified and discussed with the hospitals. In addition, a steering committee provided guidance to the project, and helped to resolve methodological problems (Appendix B lists the steering committee members).

Step-down approaches involve allocating administrative and support costs in a logical series of steps until all are either fully allocated to patient care or patient service cost centres or excluded. Different steps use different allocation methods and/or allocation bases. A

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<sup>2</sup> The description of the FIS allocation methodology draws heavily from the report prepared by Michael Loyd and Associates for the MCHPE. Because it identifies individual hospitals, the report remains confidential. It is identified as Appendix D, and is available only through Manitoba Health.

department may be combined with others for which the same allocation method and base are appropriate and then allocated in one step.

Step-down methods must be modified to handle interdependencies among General Services Departments (that is, servicing of some overhead departments by other overhead departments), particularly Hospital Administration, Other Administration, Housekeeping, Plant Maintenance and Plant Operations/Security. In this study, the first two were allocated hospital-wide, congruent with the provision of their services. Separate regression models were developed and tested for the allocation of Housekeeping, Plant Maintenance and Plant Operations/Security costs. Independent variables tested in the models were hourly wages, total patient-days per year, ambulatory care visits and hospital square footage. For Housekeeping and Plant Maintenance, the total patient-days variable overwhelmed the other variables to such an extent that these costs were allocated entirely to inpatient departments based on each department's share of total inpatient days. For Plant Operations/Security, both total patient-days and square footage were important. Based on the results of the regression equation and the average area breakdowns provided by the study hospitals, it was estimated that 85% of Plant Operations/Security should be allocated to inpatient activities and 15% to outpatient activities.

The steps used in the FIS allocation method are represented in Figure 4. First, the financial and statistical files were combined, so that output indicators would be available as an allocation base. Before any allocations could begin however, costs and indicators had to be clarified, and some additional information, for example square footage, was added.

Next, all costs were separated into:

- Direct inpatient—Nursing Area Departments plus inpatient shares of Outpatient Departments (OPD), Diagnostic and Therapeutic Departments (D&T) and Dietetics;
- Direct outpatient—outpatient shares of OPD, D&T, and Dietetics;

Figure 4: FIS Methodology Flowchart

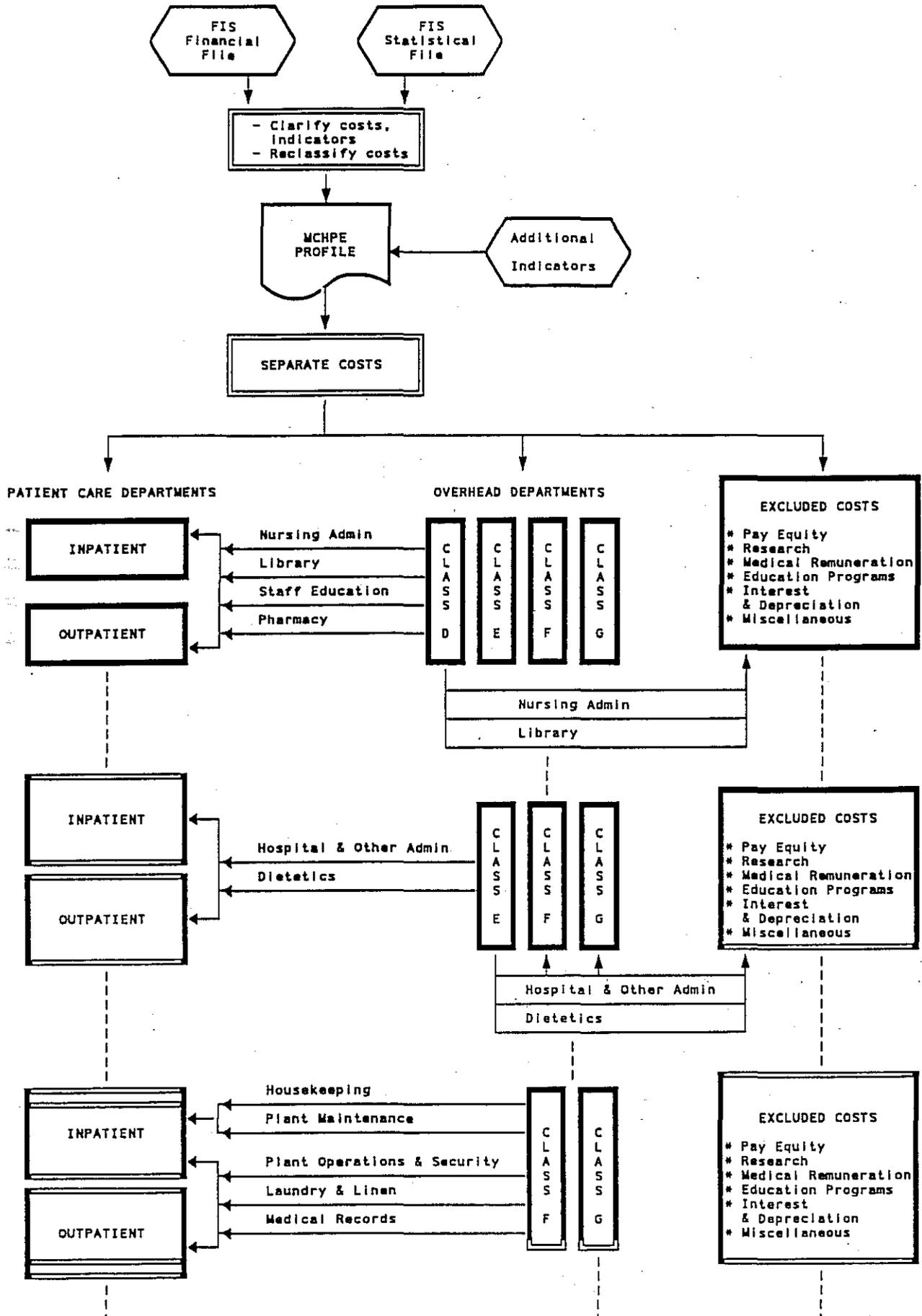
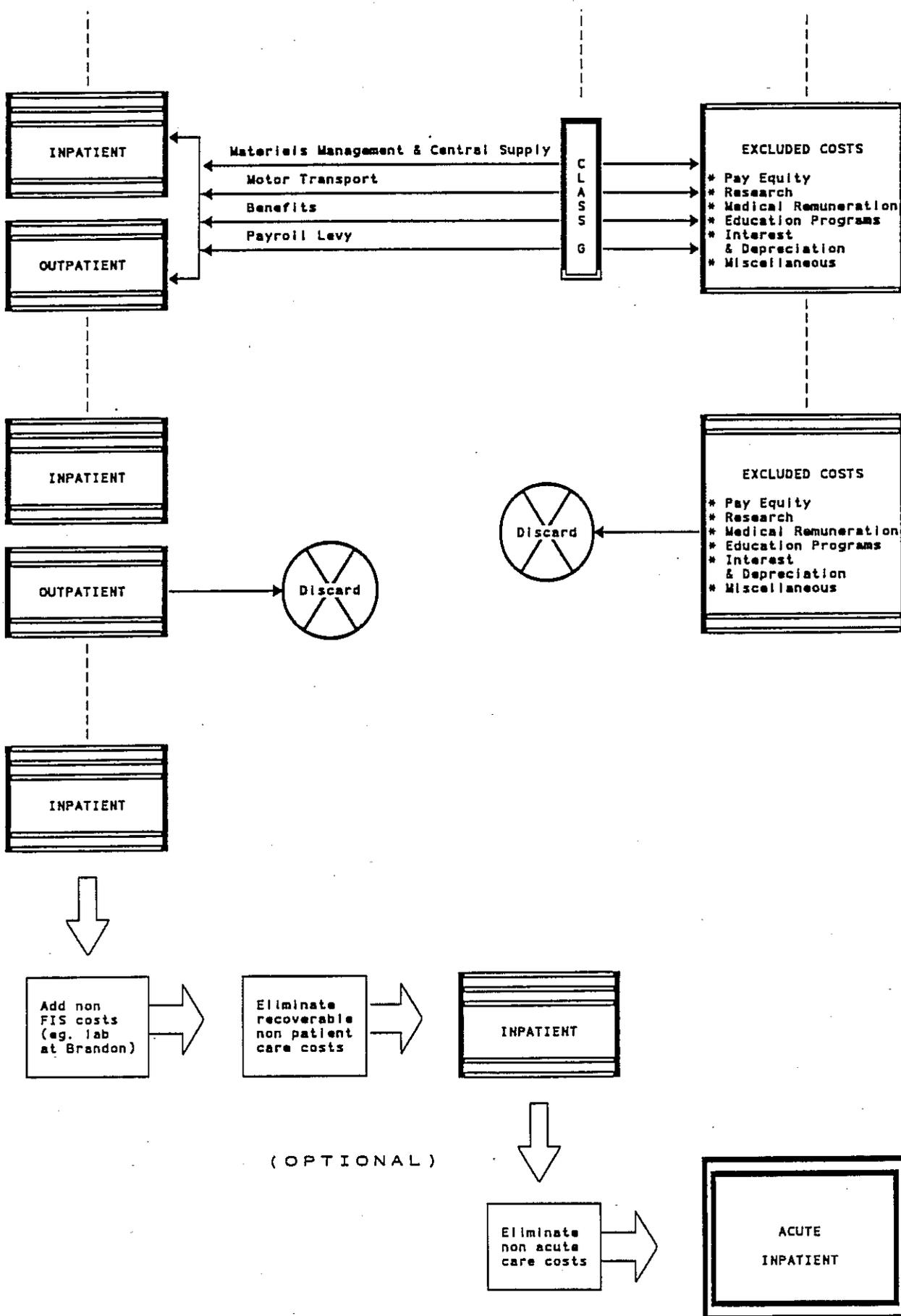


Figure 4 (continued)



- Excluded costs—pay equity, research, education programs, medical remuneration, depreciation, interest and other non-patient care costs; and
- one of four overhead categories.

Costs for patient care areas that service both inpatients and outpatients, for example diagnostic and therapeutics departments, were allocated to inpatients and outpatients according to their share of chosen departmental indicators. To illustrate, if 40% of a department's units, treatments or examinations were provided to inpatients, then 40% of its costs were classified as inpatient and 60% as outpatient.

The overhead categories were separated based on their impact on hospital services. Specialized overhead components (Class D) include Nursing Administration, Library, Staff Education, and Pharmacy. The first three were allocated to Nursing Areas, OPD and excluded areas commensurate with non-medical salaries. Pharmacy costs were allocated based on the proportion of drugs in each patient care department cost centre. The allocation of pharmacy costs by department using FIS data is superior to that possible using HS1 data, which centralizes drug costs.

Hospital-wide personnel-related overheads (Class E), including Hospital Administration, Other Administration and Dietetics (excluding inpatient and outpatient already allocated),<sup>3</sup> are allocated to direct patient care departments, excluded cost areas and other overhead departments still to be allocated, based on non-medical salaries.

Overhead departments with complex allocation bases unrelated to personnel or supplies (Class F), include Housekeeping, Plant Maintenance, Plant Operations/Security, Laundry and Linen, and Medical Records. As stated previously, the first three of these were allocated based on multivariate analyses. Laundry and Linen costs were allocated based on the consensus opinion of the pilot hospitals, 80% to inpatient departments and 20% to outpatient

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<sup>3</sup> Inpatient Dietetics are meals for all inpatients. Outpatient Dietetics include meals-on-wheels, meals supplied to other institutions and meals for ambulatory patients. Other Dietetics are meals prepared for staff and visitors.

departments. Medical Records costs were allocated to inpatient and outpatient departments based on weighted units, developed in consultation with the pilot hospitals. For example, Emergency Visits were weighted at 2.5, whereas an acute patient-day was weighted at 0.7.<sup>4</sup>

Overhead departments whose allocation bases are hospital-wide (Class G) include Materials Management and Central Supply, Motor Transport, and Employee Benefits and Manitoba Payroll Tax. Employee Benefits and Manitoba Payroll Tax were allocated based on salaries. The other costs in this category were allocated based on a department's share of medical-surgical, drugs and other supplies and expenses.

The Allocation Summary (Appendix C) summarizes the above allocation steps, each department's allocation basis and the allocation base. Inconsistency of output indicators reported by the hospitals was one of the biggest problems in the allocation process. For example, Electrocardiography Departments reported utilization in terms of ECGs, units, exams or visits. If, after consulting with the hospital(s), it was found that the output indicators were truly different, and not just different verbal descriptions of the same indicator, more than one indicator was identified. The primary indicator was the one used by most hospitals; secondary, tertiary or quaternary indicators were identified as necessary in order to capture an indicator for each hospital.

Because one hospital receives Laboratory services at no charge from a regional laboratory, the cost of these services were imputed, based on the hospital's reported utilization of lab units per day and the laboratory's costs per 100 units.

Costs per acute patient-day were isolated from total inpatient costs per patient-day. To accomplish this, recoverable costs (for example, cafeteria recoveries, parking), and non-acute diagnostic and therapeutic services and allied health costs were removed from inpatient

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<sup>4</sup> The complete set of weights are: Emergency Visits, 2.5; Clinic Visits, 1.0; Day Surgery Visits, 3.5; Other Day/Night Visits, 3.0; Short-Term Patient Days, 0.7; Long-Term Patient Days, 0.1; and Newborn Days, 0.7.

costs.<sup>5</sup> Non-acute patient costs were defined as costs for those units specifically designated as long term care units. Patients who were in acute care beds but were awaiting placement in chronic, rehabilitation or nursing home facilities were not identified as non-acute patients—neither in the assignment of costs nor the recovery of the per diem fee which comes into effect after patients have been panelled for admission to a nursing home. Costs per acute inpatient-day include fully allocated acute inpatient nursing and dietetics costs, acute diagnostic and therapeutic plus allied health costs, less recoverables.

### **HS1 Data and Allocation Methodology**

The allocation methodology used to process HS1 data is also a simplified step-down approach. Because a single basis (paid-hours) is used for allocating all support costs, concerns about the handling of interdependencies are avoided; however, the sensitivity of the allocation process is reduced as no single basis is likely to adequately measure the consumption of the diverse set of support outputs used by the care and service departments.

Data quality was assessed against the criterion of the consistent completion of the HS1 reports. Overall, most hospitals included in this project completed all relevant sections of their HS1 reports. In addition, where applicable, many hospitals also reported financial and statistical data for some care units (e.g., Neonatal Intensive Care, Palliation, Geriatric Assessment) and service departments (e.g., Ultrasound, Speech Therapy, Audiology) not specifically designated on the HS1 form. On occasion, however, expenditures (statistics) were reported but not the corresponding statistics (expenditures). For example, one hospital reported Obstetrical Nursing statistics but no corresponding expenditures. It was not clear if omitted values were missing or combined with that of another unit. Overall, data from HS1 reports were largely complete and appeared to be accurate for the hospitals included in this project; however, the quality of HS1 reporting may not be similar for other Manitoba hospitals.

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<sup>5</sup> The main recoverable costs were cafeteria recoveries, vending recoveries, group purchasing, parkades and non-patient services provided to institutions. The recovery adjustment involved identifying recoveries eligible for exclusion, totalling the costs, expressing them in terms of patient days and multiplying by the ratio of total acute and non-acute inpatient costs to the sum of total inpatient and outpatient costs.

TABLE 1: HSI SUMMARIZED COSTS BY COSTS-GROUPING

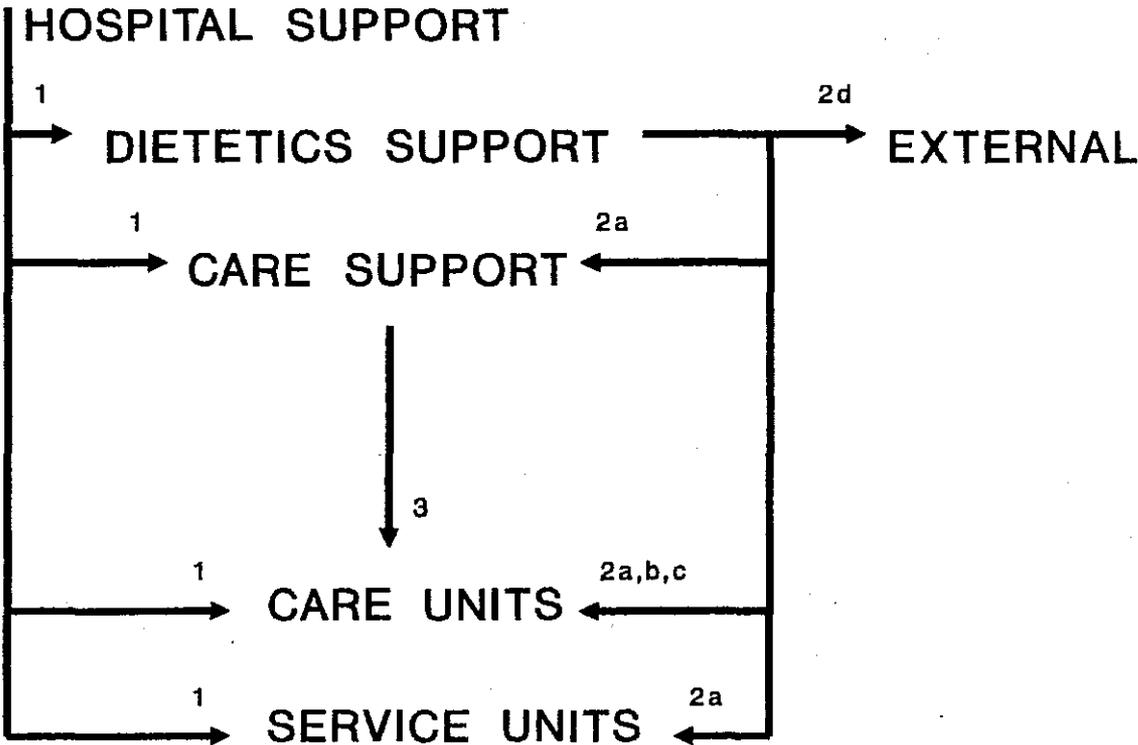
EXCLUDED COSTS	SUPPORT COSTS	SERVICE COSTS	CARE COSTS
Physician Payments Research Non-Staff Education Depreciation Interest Pay Equity Payments	<b>HOSPITAL</b> Staff Benefits Administration Chief-of-Staff Materials Management Physical Plant  <b>DIETETICS</b>  <b>CARE</b> Administration Nursing Float Staff Education Drugs Pharmacy Medical Supplies Central Supply Laundry/Linen Housekeeping Medical Records Medical Library	Laboratory Electrocardiography Electroencephalography Nuclear Medicine Radiology Respiratory Physiotherapy Occupational Therapy Home Care Social Work Other	<b>ACUTE INPATIENT</b> Medical Surgical Intensive Obstetrical Nursery Paediatric Psychiatric Other  <b>NON-ACUTE INPATIENT</b> Rehabilitation Extended Other  <b>OUTPATIENT</b> Emergency Clinics Day/Night Other  <b>SUITES</b> Obstetrical Surgical  <b>OTHER</b>

The methodology used to process data obtained from HS1 reports is outlined in Figures 5 and 6. First, each summarized cost-item included in the HS1 report was assigned to a cost-grouping: excluded costs, support costs, service costs, or care costs (see Table 1). As for the FIS approach, excluded costs consist of research and non-staff education costs, depreciation and interest, all physician payments, plus pay equity adjustments for prior years. Support costs were specified as either hospital-wide, dietetics, or care-only. Hospital-wide support activities provided to all departments include Employee Benefits, General Administration, Medical Director's Office, Materials Management and Physical Plant Operations, Maintenance and Security. Dietetics support activities consist of meals prepared by Dietetics for inpatients, some outpatients and staff/visitors. Patient care support activities consist of Nursing Administration, the Nursing Float Pool, Staff Education, Patient Education, Drugs and Pharmacy, Medical Supplies and Central Supply, Laundry and Linen, Housekeeping, Medical Records and the Medical Library. Patient service costs include Laboratory, Electrocardiography, Electroencephalography, Nuclear Medicine, Radiology, Respiratory Technology, Physiotherapy, Occupational Therapy, Hospital-Based Home Care, Social Work and other services utilized by inpatients and outpatients. Patient care is provided in acute care (Medical, Surgical, Intensive, Obstetrical, Nursery, Paediatric, Psychiatric) and non-acute care (Rehabilitation, Extended) inpatient nursing units, outpatient settings (Emergency, Clinics, Day and Night Care), specialized suites (Obstetrics, Surgery) and other units as identified by individual hospitals.

In Figure 5, support costs were allocated to the care and service departments in several steps (designated respectively by the symbols "1", "2a", "2b", "2c", "2d" and "3"). In step 1, hospital support costs were apportioned among the dietetics support department, the care support departments, the care departments, and the service departments using the paid-hours reported for these departments as the basis of allocation. The treatment of dietetics support costs in step 2 is complex because this department prepares meals for staff/visitors, inpatients, outpatients and institutions/agencies external to the hospital (e.g., meals prepared for other institutions, catering). Fully-allocated dietetics support costs, estimated as the Dietetics operating costs plus a share of the hospital support costs (see step 1), were allotted to staff/visitors, inpatients, outpatients and external consumers on the basis of the meal-days

**FIGURE 5: FLOWCHART SHOWING THE ALLOCATION OF SUPPORT COSTS TO THE CARE AND SERVICE UNITS**

STEP 1:  
STEP 2:  
STEP 3:

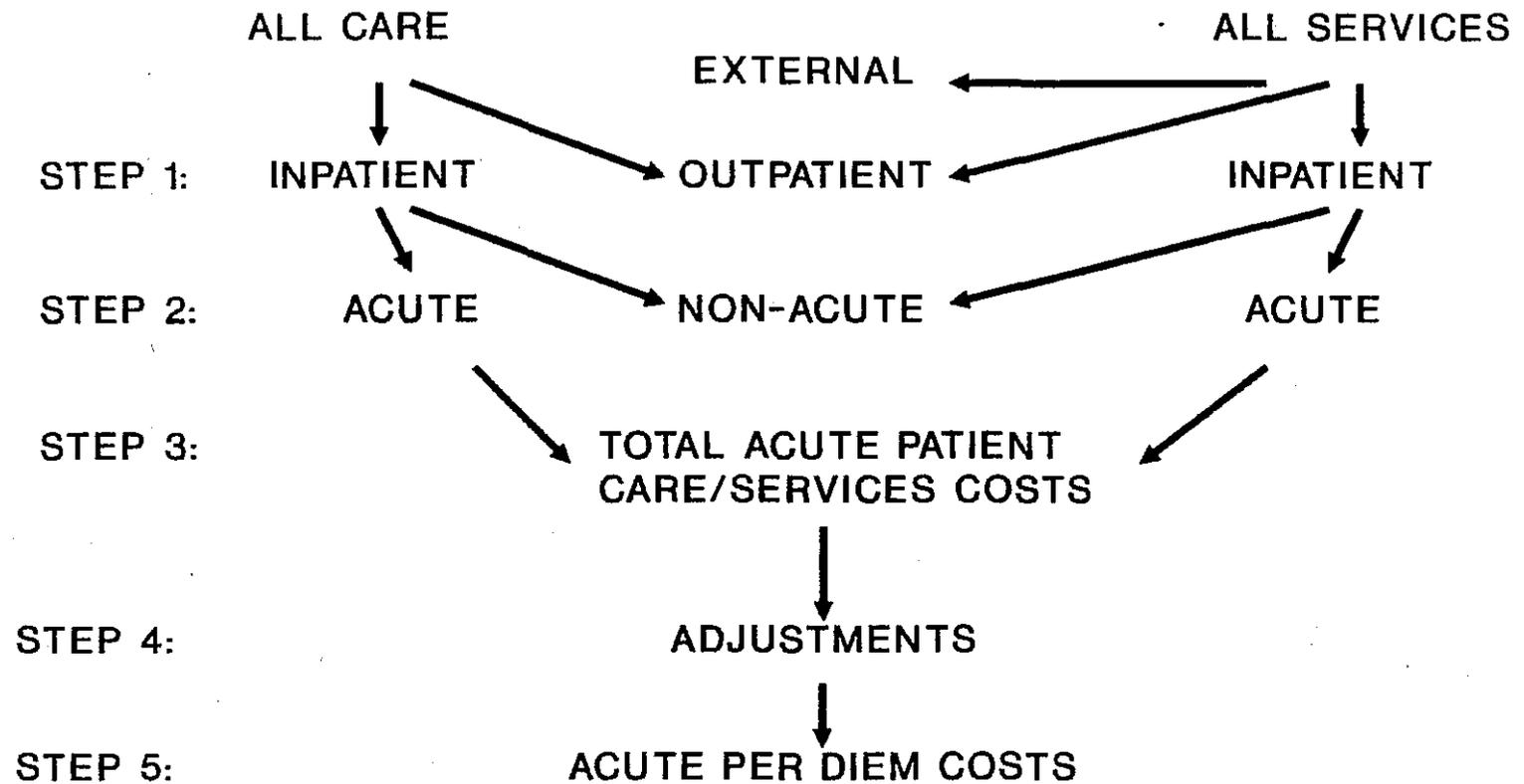


reported for each category. The treatment of the costs of meals prepared for staff/visitors is problematic. One approach is to exclude these costs. Alternatively, net costs (preparation costs less cafeteria revenue) could be treated as a staff "benefit" and distributed across the support, care and service departments. To ensure comparability with per diem costs estimated from FIS data, the latter approach is used here. The costs of staff/visitor meals (assumed to be staff) were allocated on the basis of the paid-hours reported for each affected department (step 2a); adjustment for the recovery of cafeteria revenue from the sale of these meals is made below. The costs of inpatient meals were respectively allocated on the basis of patient-days reported for each acute and non-acute inpatient care unit (step 2b), while costs of outpatient meals were assigned on the basis of ambulatory visits reported for each outpatient care unit (step 2c). The costs of meals prepared for external consumption were excluded from further analysis (step 2c). Finally, the fully-allocated costs of the care support departments, estimated as operating expenses plus appropriate shares of hospital and staff/visitors dietetics support costs (see steps 1 and 2a) were allocated on the basis of paid-hours reported for the inpatient and outpatient care units (step 3).

In Figure 6, the fully-allocated costs of patient care and services were estimated using several steps successively partitioning total costs until only the acute costs remain. In step 1, patient care costs were partitioned between inpatients and outpatients by each nursing unit's designation (see Table 1). The costs of Therapeutic and Diagnostic services were then partitioned between inpatients, outpatients, and external users (e.g., Laboratory processing referred-in requests) using reported utilization by these patient-groupings. Where no statistics were available (e.g., Social Work), costs were assigned to the patient-grouping that likely consumes most (or all) of these services (e.g., discharge planning for acute care inpatients, home care used by community residents). As for the FIS approach, the costs of Laboratory services provided externally at no charge were estimated using utilization data reported by the hospital and financial and statistical data compiled by the regional laboratory.

In step 2, fully-allocated inpatient care costs were partitioned between acute and non-acute inpatients by each nursing unit's designation (see Table 1). Although most units exclusively

**FIGURE 6: FLOWCHART SHOWING THE PARTITIONING OF FULLY-ALLOCATED CARE AND SERVICE COSTS**



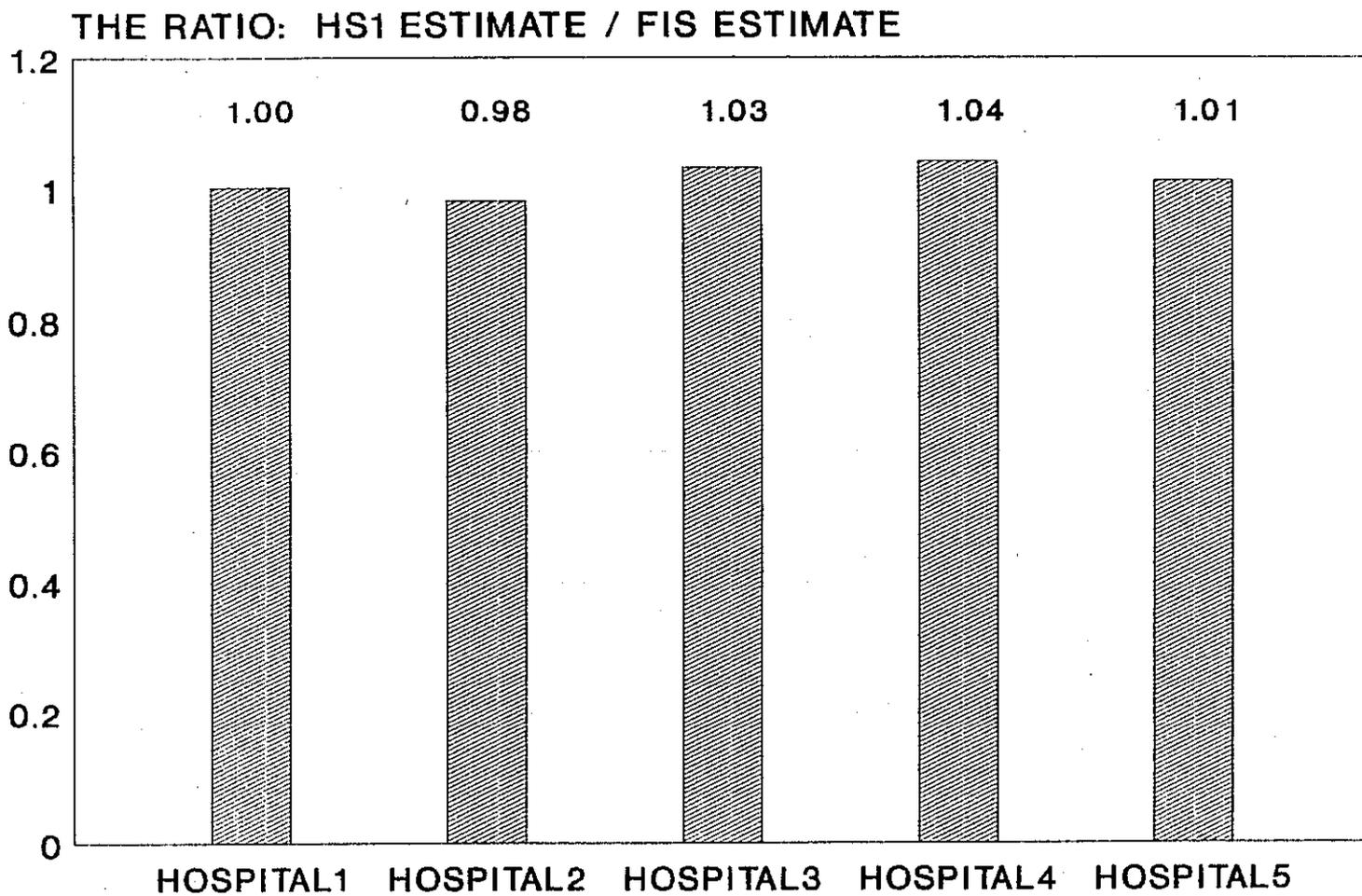
treat one type of patient, the Surgical Suite can be used by both inpatients and outpatients and, in some hospitals, the Emergency Room and other Ambulatory Units also treat small numbers of inpatients; such costs were partitioned between inpatients and outpatients using utilization statistics reported for these units. Also, to ensure comparability with per diem costs estimated using the FIS data, inpatient utilization of the Surgical Suite was weighted as three relative to one for outpatient usage to adjust for the higher complexity and hence greater consumption of resources (time, drugs and supplies) by inpatient surgery. The costs of inpatient surgery and inpatients' utilization of ambulatory care were assigned to the acute care patient-grouping. As above, patients who occupied acute care beds while waiting for placement in chronic, rehabilitation or nursing home facilities were not identified as non-acute patients in the assignment of costs. Although the costs of Therapeutic and Diagnostic services consumed by acute inpatients cannot be calculated from the HS1 data, the \$7.62 amount estimated by Michael Loyd & Associates (1992) was also used here to ensure comparability with the acute per diem costs estimated from the FIS data.

In step 3, fully-allocated acute inpatient costs are calculated as the arithmetic sum of the costs of all care and services utilized by this patient-grouping. To ensure comparability with per diem costs estimated from the FIS data, the acute inpatient costs estimated here are adjusted in step 4 for cafeteria and other revenues recovered by the study hospitals as estimated by Michael Loyd & Associates (1992). Finally, in step 5, hospital acute per diem costs are estimated as the quotient of the acute inpatient costs divided by the corresponding acute patient-days produced.

## **Results**

Overall, there was remarkable agreement between the mean costs per acute patient-day estimated from the HS1 and the FIS data sources for the five urban community hospitals included in this project (Table 2). Figure 7 graphically displays the ratio of the mean costs per acute patient-day estimated using the FIS data and allocation methodology to that calculated using the HS1 approach; the difference between these two approaches is small,

FIGURE 7: THE RATIO COMPARING ACUTE PER DIEM COSTS ESTIMATED USING HS1 AND FIS DATA AND ALLOCATION METHODS BY HOSPITAL.



(1990-91 HOSPITAL ACCOUNTING DATA)

ranging from 0 to 4 per cent. Given that the FIS contains detailed accounting data facilitating numerous adjustments that improve accuracy and comparability, and that it includes a large set of output indicators that were used to improve the sensitivity of the allocation of support costs to the patient care and service departments, the FIS data and allocation methodology can be regarded as "a current gold standard" for estimating mean hospital acute per diem costs. Because these two sets of estimates are remarkably similar, we have some confidence in using the HS1 data and allocation methodology to estimate per diem costs when FIS data are not available, even though HS1 reports lack the same degree of detailed data and the allocation methodology used was simpler (and hence less sensitive). These findings corroborate anecdotal reports suggesting hospital cost estimates are robust irrespective of the methodology used to allocate support costs to the patient care and service departments. Clearly, however, where detailed data are available, efforts should be made to ensure both the accuracy and the validity of the estimated hospital acute per diem costs. Current research is comparing the per diem costs of rural hospitals estimated using FIS and HS1 data and methodologies.

**Table 2: Hospital Acute Care Per Diem Costs by Data Source**

<u>Hospital</u>	<u>FIS Data</u>	<u>HS1 Report</u>
Hospital 1	428	429
Hospital 2	344	336
Hospital 3	338	349
Hospital 4	296	307
Hospital 5	281	283

We find that existing data sources can be used to estimate hospital acute care per diem costs. Through the work undertaken in this project, problems were resolved in order to make the per diem costs estimated here as accurate as possible. However, readers must understand that this is only a first step—although these estimates are as accurate and consistent as the data and allocation methodology described here can make them, without further adjustments for case-

mix and other factors explaining between-hospital variation, hospitals cannot be fairly or meaningfully compared. Furthermore, the accounting misclassifications identified in the FIS data suggest that a process should be initiated to ensure data comparability across Manitoba hospitals.

## **Summary and Recommendations**

The goal of this project was to examine the feasibility of using existing hospital accounting data for making comparative estimates of the costs of acute inpatient care across hospitals. On the basis of this analysis, we believe such "estimates" can be made. The analyses undertaken for this report suggest that the financial data necessary for estimating costs across Manitoba hospitals are adequate to support taking the next step: adjusting costs for patient characteristics. However, it must be emphasized that the mean acute costs per patient-day reported here are crude—i.e., they are not adjusted for differences in patient characteristics that likely affect resource utilization. The rank ordering of hospitals by their acute per diem costs may change entirely after adjusting for patient case-mix and demographic characteristics plus other factors affecting resource utilization.

Given that analyses using the HS1 and FIS data sources yield very similar results, it seems possible to apply the HS1 approach to all hospitals in Manitoba. There are several reasons to do this. First, the HS1 method is more straightforward, and does not require the extensive processing that was applied to the FIS data. Second, all hospitals file HS1 reports, whereas FIS data are currently not available for all institutions. Clearly, further research is necessary to assess the generalizability of these findings to other hospitals.

As noted, both the FIS data and the HS1 reports are compiled using the CHAM guidelines. A key limitation of the CHAM Guidelines is accommodating the complex organizational and functional structure of large (especially tertiary care) hospitals providing complex patient care. The MIS Guidelines were designed to overcome this and other limitations (Nestman 1989). The current structure of the accounting information systems of the three urban hospitals not covered in this report—the Health Sciences Centre (tertiary care, teaching), St. Boniface

General Hospital (tertiary care, teaching), and Misericordia Hospital (MIS test site)—have substantially deviated from the CHAM Guidelines. Although these hospitals are attempting to provide reports following CHAM Guidelines to Manitoba Health, such data are not available at present. However, because aggregated data are produced at the departmental level by all accounting systems, HS1 reports are available for all hospitals. Therefore, given that per diem costs estimated using FIS data and HS1 reports are comparable, HS1 reports could conceivably be used when FIS data are not available—i.e., for these three hospitals and for fiscal years prior to the advent of FIS. For hospitals that report both data sources, using FIS data to supplement HS1 data can improve estimates of inpatient per diem costs.

There are complex issues requiring resolution before the HS1 methodology can be applied to all hospitals. Teaching hospitals have higher costs than non-teaching hospitals, not only because of the costs of the teaching programs *per se* (costs which are excluded in most cost allocation methodologies because they are considered non-care costs), but also because the treatment regimen in teaching hospitals may be different. For example, physicians and other caregivers in teaching hospitals may treat all patients more aggressively (Lave et al. 1991). "Teachingness" has been identified as a factor requiring cost adjustment in British Columbia (Barer 1982) and Alberta (Jacobs et al. 1992; MacKenzie et al. 1991). In future applications of the HS1 methodology, attempts should be made to estimate the indirect costs of educational activities over and above the direct costs of teaching programs.

The treatment of rural hospitals presents different but equally complex challenges. Where the same nursing staff provides both inpatient and outpatient care, these costs may not be separated. Also, a number of rural hospitals have juxtaposed nursing homes, and may submit joint financial statements for the hospital and nursing home combined. Therefore, partitioning costs between inpatient and outpatient care, and between acute and nursing home care will be difficult for some rural facilities. Diagnostic services are provided to most rural facilities by a provincial laboratory, under a variety of arrangements. For example, there may or may not be diagnostic personnel on the hospital premises, and payments for technicians are not standardized. Similarly, therapeutic services (physiotherapy and occupational therapy) may be purchased from Community Therapy Services, an independent agency which provides

itinerant physio- and occupational therapists, or the personnel may be hired directly by the hospital. Whereas the urban hospitals included in the project have specialized finance and accounting departments, smaller rural facilities do not. Therefore, there may be more inconsistencies in both their HS1 and FIS reporting.

Manitoba currently has rich sources of hospital financial data which can be used by Manitoba Health for managing the hospital system. While the eventual benefits of introducing the MIS Guidelines across Manitoba hospitals may be great, even if there were funds available and a commitment to introduce the guidelines immediately, benefits beyond those currently available from the HS1/FIS system would not follow immediately due to the time required to implement new computer hardware, accounting software, and data collection processes.

To make the HS1/FIS systems as useful as possible in the interim, our work suggests the following recommendations.

**RECOMMENDATION 1: It is recommended that Manitoba Health and Manitoba hospitals develop a basic minimum FIS set of indicators for hospital departments, which all hospitals are required to report using agreed upon guidelines.**

Inconsistency of output indicators reported by the hospitals was one of the biggest problems in the allocation process. The consultant was forced to identify up to four indicators in order to capture an indicator for each hospital. If a hospital needs to report additional indicators for its own purposes beyond the basic minimum data, it could do so as long as it also reported the consensus primary indicators. All hospitals including the three hospitals not currently using FIS should adhere to these guidelines.

**RECOMMENDATION 2: Uniform FIS and HS1 accounting requirements across hospitals should be maintained.**

While hospitals may have good reasons for changing their internal accounting practices, Manitoba Health should only allow such changes if they do not compromise the ability of the

hospital to report data comparable with that obtained from other Manitoba hospitals. The onus should not be on Manitoba Health to interpret data to make it comparable. Because the three hospitals not currently reporting under the FIS system have each adopted unique reporting systems, straightforward comparisons across all hospitals are not now possible. A solution to this problem should be found.

**RECOMMENDATION 3: The inclusion of all physician remuneration should be considered in any future attempts to make cost comparisons across hospitals.**

Physician remuneration was excluded in this project for several reasons:

- 1) Medical care is considered to be separate from hospital care.
- 2) Physician remuneration is often for teaching positions, which as previously noted, should be excluded. However, where direct care is being provided over and above the teaching function, arguably such costs should be included.
- 3) Interhospital inconsistencies exist in modes of payment for similar services, for example Emergency physicians may be paid on either a fee-for-service or salary basis.

Excluding physician remuneration for all hospitals "evens out the playing field" when calculating costs. However in doing so, we exclude physician costs for areas in which medical care may legitimately be considered a cost of hospital care: laboratory services, diagnostic services, and emergency medicine. Furthermore, a case could be made for including the costs of some salaried medical specialities in the per diem costs estimated for tertiary care and possibly some community hospitals.

**RECOMMENDATION 4: If further analyses are to be undertaken using FIS data for other Manitoba hospitals, FIS data should be compared to HS1 data to identify possible inconsistencies.**

Because FIS data have not been routinely used by Manitoba Health, inaccuracy is possible. In this project, one hospital failed to report some indicators for one or more reporting periods. This kind of reporting error would not materially affect the allocation because there

is no reason to suspect that the missing data problem would bias the inpatient-outpatient proportions. However, the missing data would obviously affect the cost per unit of output estimated at the departmental level.

**RECOMMENDATION 5:** Analyses comparing care and service departments should not be undertaken without first ensuring that there are no major roll-up or organization-related comparability problems. Steps should be taken to ensure more consistent reporting of FIS and HS1 financial and statistical data at the departmental level.

To identify unusual aspects of hospital roll ups which could result in inconsistent allocations and skew departmental comparisons, the consultant reviewed the FIS profiles of the project hospitals and met with hospital financial officers. The review resulted in reclassification of activity costs between departments in a number of areas of the profile, particularly Hospital Administration, Materials Management, and Outpatient Departments. Some nursing department costs also were reclassified whenever the consultant concluded that the CHAM number inappropriately reflected the department's activities. The most important of these were ones that resulted in a shift of a cost centre from acute to non-acute care. It is likely that these problems also apply to HS1 reports.

High coefficients of variation and extreme outlier values in cost per unit of output indicators should be construed as flags for possible comparability problems. One can be confident that the general comparability of data for hospitals is good when, as we found for the five hospitals we studied, the coefficients of variation in input ratios are very small in key areas. This indicates homogeneity and comparability of reporting patterns.

There are certain areas where one can anticipate possible comparability problems. These departments include the Obstetrics Wards, Nurseries and Obstetric Suites, Surgery Suite, Surgical Day Care, Emergency Departments, Materials Management and Central Supply, Medical Records and Plant Maintenance and Plant Operations. The typical kinds of problems with these departments are outlined below.

- Obstetrics Wards, Nurseries and Obstetric Suites: Functions may overlap, particularly in combined care units.
- Surgical Suite: May or may not handle day surgery cases, endoscopies and/or Caesarian sections. May or may not sterilize instruments.
- Surgical Day Care: May or may not include a day care surgery suite and recovery room; may or may not deal with general anaesthesia cases.
- Emergency Department: May or may not include observation units and patient registration personnel.
- Materials Management and Central Supply: May serve different departments and provide different services such as sterilization.
- Medical Records: May include admitting.
- Plant Maintenance and Operations: Distribution of functions may vary. Hospital costs will differ depending on whether for example, they produce their own steam. Combining these two departments ameliorates the problems.
- Plant Services Departments Generally: May sell services to other institutions. In general, this is not a big problem in the five project hospitals.

**RECOMMENDATION 6:** To improve the comparability and usefulness of outpatient financial and statistical data, Manitoba Health and the hospitals should adopt a reporting system which captures all outpatient activity via fee-for-service equivalent claims and/or the hospital discharge abstract system.

The heterogeneity of activities rolled up in outpatient departments severely compromises the usefulness of simple outpatient department indicators such as costs per visit. Little weight should be placed on interhospital cost differences in outpatient departments using HS1 and FIS data sources alone. For example, activity mixes may not be comparable. A case-mix adjusted cost methodology for outpatient activity, similar to that used for inpatient adjustment, could correct for patient case-mix and severity if all activities were captured by the administrative data system. They are not. Currently hospitals are only *required* to report day surgical procedures, and *encouraged* to report scheduled visits to Emergency Departments for

minor, non-surgical procedures. Reporting of other outpatient department activities, such as chemotherapy, is optional and therefore irregularly reported.

## **Conclusion**

This paper reports the findings of a project undertaken by the Manitoba Centre for Health Policy and Evaluation (MCHPE) at the request of Manitoba Health, to examine the feasibility of using hospital accounting data for making comparative estimates of the costs of acute inpatient care across major urban hospitals.

On the basis of this analysis, we believe existing hospital accounting data can be used for making comparative estimates of the average costs of acute inpatient care across hospitals. However, because this project was undertaken using only non-teaching urban hospitals, it is not clear that these results apply to other hospitals. Furthermore, it must be emphasized that the mean costs per patient-day of acute inpatient care estimated here are not adjusted for differences in patient characteristics that likely affect resource utilization. The rank ordering of hospitals by their per diem costs may change entirely after adjusting for patient characteristics like age, sex, severity and complexity of illness and for other factors affecting the utilization of resources. Both of these concerns are currently being investigated.

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**APPENDIX A: Hospital Contacts**

**Hospital Contacts**

Ann Marie Bell, Director  
Nursing Practice for Critical Care  
Seven Oaks General Hospital

Murray Davidson  
Director of Financial Services  
Brandon General Hospital

Bill Daviduk  
Director of Finance  
Seven Oaks General Hospital

Colin Grummett  
Director of Finance  
Grace General Hospital

Elaine Hunnie  
Comptroller  
Victoria General Hospital

John Koschuk  
Assistant Executive Director of Finance  
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Susan Reid  
Business Officer Manager  
Concordia Hospital

Tom Woodward  
Associate Executive Director  
Seven Oaks General Hospital

Susan Yurkiw  
Accountant  
Victoria General Hospital

**APPENDIX B:**  
**Members of the Hospital Costing Methodology**  
**Steering Committee**

## **Hospital Costing Methodology Steering Committee**

Judith Bebchuk  
Programmer  
Manitoba Centre for Health Policy and Evaluation

Ed Golembioski  
Chief Finance Officer  
Hospital Services  
Manitoba Health

John Horne  
Senior Vice President  
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Associate  
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**APPENDIX C:**

**Allocation Summary for FIS Methodology**

## ALLOCATION SUMMARY

DEPARTMENTS	PROFILE No.	ALLOCATION STEP	ALLOCATION BASIS <sup>1</sup>	ALLOCATION BASE
Nursing Administration	P1	2a	Non-Medical Salaries	Nursing Areas, OPD Depts & Excluded Education Programs <sup>2</sup>
Intensive Care Patient	P2	1	Assigned to inpatient	Not applicable to Patient Care Depts
Medical Nursing Unit	P3	1	Assigned to inpatient	Not applicable to Patient Care Depts
Obstetrical Nursing Unit	P4	1	Assigned to inpatient	Not applicable to Patient Care Depts
Paediatrics Nursing Unit	P5	1	Assigned to inpatient	Not applicable to Patient Care Depts
Psychiatric Units	P6	1	Assigned to inpatient	Not applicable to Patient Care Depts
Surgical Nursing Unit	P7	1	Assigned to inpatient	Not applicable to Patient Care Depts
Other Short-Term Units	P8	1	Assigned to inpatient	Not applicable to Patient Care Depts
Long-Term Rehabilitation Beds	P10	1	Assigned to inpatient	Not applicable to Patient Care Depts
Other Long-Term Units	P11	1	Assigned to inpatient	Not applicable to Patient Care Depts
Nursery	P14	1	Assigned to inpatient	Not applicable to Patient Care Depts
Obstetrical Suite	P15	1	Assigned to inpatient	Not applicable to Patient Care Depts
Surgical Suite and Recovery Room	P16	1	Utilization Statistics-Visits	Not applicable to Patient Care Depts
Other Nursing	P17	1	Assigned to inpatient	Not applicable to Patient Care Depts

<sup>1</sup> Classification of allocation basis indicators as "utilization" or "workload" is undertaken in terms of the primary indicators. Secondary, tertiary and quaternary indicators are displayed in brackets consecutively depending on how many indicators were needed to capture an indicator for each hospital's department.

<sup>2</sup> Technically, Nursing Administration Department costs should be allocated to the nursing education programs subcomponent of Education Programs. Constraints on programmer time prevented necessary revisions for this report. The distortion effect will be small for the five pilot hospitals because most Education Programs Department activity, if any, is nursing related.

DEPARTMENTS	PROFILE No.	ALLOCATION STEP	ALLOCATION BASIS	ALLOCATION BASE
Emergency Dept incl Observation	P19	1	Utilization Statistics- Visits	Not applicable to Patient Care Depts
General and Specialty Clinics	P20	1	Utilization Statistics- Visits	Not applicable to Patient Care Depts
Surgical Day Care	P21	1	Utilization Statistics- Visits	Not applicable to Patient Care Depts
Day and Night Care	P22	1	Utilization Statistics- Visits	Not applicable to Patient Care Depts
Laboratory	P24	1	Workload Statistics- Units	Not applicable to Patient Care Depts
Electrocardiography	P25	1	Utilization Statistics- ECGs (Units/Exams/ Visits)	Not applicable to Patient Care Depts
Electro- encephalography	P26	1	Utilization Statistics- EEGs (Units/Exams/ Visits)	Not applicable to Patient Care Depts
Nuclear Medicine	P27	1	Utilization Statistics- Exams (Units)	Not applicable to Patient Care Depts
Pharmacy	P28	2d	Drug costs by	Direct inpatient & outpatient drug costs incl accumulated allocation from Steps 2a, 2b and 2c
Computerized Tomography	P29	1	Utilization Statistics- Exams	Not applicable to Patient Care Depts
Radiology -Diagnostic	P30	1	Workload Statistics- Units (Exams)	Not applicable to Patient Care Depts
Ultraound- Diagnostic	P31	1	Utilization Statistics- Exams (Units)	Not applicable to Patient Care Depts
Radiology- Therapeutic	P32	1	Workload Statistics- Units (Exams)	Not applicable to Patient Care Depts
Respiratory Therapy	P33	1	Workload Statistics- Units (Weighted Units, Treatments, Patients)	Not applicable to Patient Care Depts
Physical Medicine and Rehabilitation	P34	1	Workload Statistics- Weighted Units (Time Units, Units by Facility, Attendances)	Not applicable to Patient Care Depts

DEPARTMENTS	PROFILE No.	ALLOCATION STEP	ALLOCATION BASIS	ALLOCATION BASE
Physiotherapy	P35	1	Workload Statistics-Weighted Units (Time Units, Units by Facility, Attendances)	Not applicable to Patient Care Depts
Occupational Therapy	P36	1	Workload Statistics-Weighted Units (Time Units, Units by Facility, Attendances)	Not applicable to Patient Care Depts
All Other Physical Medicine and Rehabilitation	P37	1	Utilization Statistics-Visits (Weighted Units)	Not applicable to Patient Care Depts
Home Care	P38	1	Utilization Statistics-Visits	Not applicable to Patient Care Depts
Social Work	P39	1	Utilization Statistics-Visits (Units)	Not applicable to Patient Care Depts
Other D & T	P40	1	Assigned 50 percent split	Not applicable to Patient Care Depts
Hospital Administration	P44	3a	Non-Medical Salaries	Direct Patient Care Depts incl accumulated allocations from Step 2 plus excl Depts & other overhead areas to be allocated
Materials Management and Central Supply	P45	5a	Shares of Medical and Surgical and Other Supplies & Expenses <sup>3</sup>	Direct Patient Care Depts incl accumulated allocations from Step 4 plus excl Depts & their allocations
Staff Education Departments	P46	2c	Non-Medical Salaries	Nursing Areas and OPD
Medical Records	P47	4c	Weights- Emergency Visits 2.5 Clinic Visits 1.0 Day Surgery Visits 3.5 Other Day/Night 3.0 Short-term Days 0.7 Long-term Days 0.1 Newborn Days 0.7	Direct Patient Care Depts with weighted units, in proportion to the Dept's share of weighted units

<sup>3</sup> Technically, for this allocation, only nature-of-expense suffixes 20-48 should be included because Materials Management and Central Supply do not handle types of "supplies and other expenses" to which some of the higher suffix codes are generally applied.

DEPARTMENTS	PROFILE No.	ALLOCATION STEP	ALLOCATION BASIS	ALLOCATION BASE
Library	P48	2b	Non-Medical Salaries	Nursing Areas, OPD Depts, & excl Education Programs
Dietetics	P49	1 3b	Workload Measurement-Meal Days  Cafeteria etc.-Non-Medical Paid Hours	Not Applicable to Care Departments  Direct Patient Care Dept incl accumulated allocation from Step 2 plus excl Depts & other overhead areas to be allocated
Laundry and Linen	P50	4b	80% distributed in relation to share of inpatient days  20% distributed in relation to shares of visits	Inpatient Depts with patient days  Outpatient Depts with visits
Housekeeping	P51	4(a)i	Share of inpatient days	Inpatient Depts with patient days
Motor Transport	P52	5b	Share of Medical and Surgical, Drugs and Other Supplies and Expenses	Direct Patient Care Depts incl accumulated allocations from Step 4 plus excl Depts & their allocations
Plant Operations	P53	4(a)iii	85% distribution in relation to share of inpatient days  15% distributed in relation to share of visits	Inpatient Depts with patient days  Outpatient Depts with visits
Plant Security	P54	4(a)iii	85% distribution in relation to share of inpatient days  15% distributed in relation to share of visits	Inpatient Depts with patient days  Outpatient Depts with visits
Plant Maintenance	P55	4(a)iii	Distributed in relation to share of inpatient days	Inpatient Depts with patient days

DEPARTMENTS	PROFILE No.	ALLOCATION STEP	ALLOCATION BASIS	ALLOCATION BASE
Other Administrative and Supportive	P56	3a	Non-Medical Salaries	Direct Patient Care Depts incl accumulated allocations from Step 2 plus excl costs & other overhead Depts still to be allocated
Employee Benefits & Manitoba Payroll Tax	P58	5c	All Salaries	Direct Patient Care incl accumulated allocations after Step 5b plus all excl salaries & medical remuneration
Special Research	P60	1	Excluded	Not applicable to Excluded Costs
Educational Programs	P61	1	Excluded	Not applicable to Excluded Costs
Interest, Depreciation and Medical Remuneration	P62	1	Excluded	Not applicable to Excluded Costs
Pay Equity	P63	1	Excluded	Not applicable to Excluded Costs
Miscellaneous	P64	1	Excluded	Not applicable to Excluded Costs

## MANITOBA CENTRE FOR HEALTH POLICY AND EVALUATION

Report List: February 1994

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Population Health Information System (analyses for 1991/92 to be released in 1993/94)

*Population Health: Health Status Indicators*, by Marsha Cohen, M.D., F.R.C.P.C. and Leonard MacWilliam, M.Sc., M.N.R.M.

*Socio-Economic Characteristics*, by Norman Frohlich, Ph.D. and Cam Mustard, Sc.D.

*Utilization of Hospital Resources*, by Charlyn Black, M.D., Sc.D., Noralou Roos, Ph.D. and Charles Burchill, B.Sc., M.Sc.

*Utilization of Personal Care Home Resources*, by Carolyn DeCoster, R.N., M.B.A., Noralou Roos, Ph.D. and Bogdan Bogdanovic, B. Comm., B.A.

*Utilization of Physician Resources*, by Douglas Tataryn, Ph.D. and Noralou Roos, Ph.D.

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