

**FINANCIAL ANALYSIS  
OF  
MYMENISNGH MEDICAL COLLEGE HOSPITAL  
FY, 1994-95**

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## List of Abbreviations

AES	Annual Expenditure Statement
AHA	American Hospital Association
ALOS	Average Length of Stay
ARV	Anti Rabies Vaccine
Ave	Average
BTC	Blood Transfusion Centre
CCU	Coronary Care Unit
CDD	Control of Diarrhoeal Diseases
c/o	Without
CPD	Cost per Patient Day
CPS	Cost per Patient Stay
CMMU	Construction and Maintenance Management Unit
CMS	Central Medical Supplies
CMSD	Central Medical Supplies in Dhaka
COP	Casualty Out Patient
Dep	Depreciation
Dept	Department
DGHS	Director General of Health Services
DISCH	Discharge
ECG	Electrocardiogram
EDC	Emergency Dispensary Counter
ENT	Ears, Nose & Throat
EENT	Eyes, Ears, Nose & Throat
ER	Emergency Room
ESC	Emergency Supply Counter
Est	Estimated
Exp	Expense
FIFMCH	Further Improvement of Four Medical College Hospitals
FY	Fiscal Year
F/W	Female Ward
GP Fund	General Provident Fund
GoB	Government of Bangladesh
Gyn	Gynecology
HEU	Health Economics Unit
Hsp	Hospital
IDA	International Development Association
IDF	Infectious Disease Hospital
I/p	Inpatient
LDA	Lower Division Assistant
LOS	Length of Stay
L/W	Labour Ward
Med	Medical
MFP	Model Family Planning
MHL	Monowara Hospital, Ltd.
MMC	Mymensingh Medical College
MMCH	Mymensingh Medical College Hospital
MO	Medical Officer
MOHFW	Ministry of Health and Family Welfare
MOP	Medical Out Patient

N C	New Cabin
OB	Obstetrics
OEM	Original Equipment Manufacturer
OPD	Out Patient Department
O p	Outpatient
OT	Operating Theatre
PA	Personal Assistant
Ped	Pediatrics
Prt Hsp	Private Hospital
PT	Physical Therapist
Pt	Patient
PWD	Public Works Department
Qty	Quantity
Ref	Reference
POD	Radiotherapy Out Patient
RMO	Resident Medical Officer
S C	Supply Counter
SKH	Surgo Kanto Hospital
SOP	Surgical Out Patient
SOPD OT	Surgical Out Patient Department Operation Theatre
SOT	Surgical Operation Theatre
TB	Tuberculosis
THC	Thana Health Complex
UDA	Upper Division Assistant



## Glossary

Admission Fee	A fee paid for an inpatient admission
Annual Expenditure Statement	An annual report prepared by MMCH of the expenses for MMCH during the year ending 30 June
Arrears	A payment made to an employee for retirement or prior bonus
Average Length of Stay	The average number of days a patient stays in the hospital or department derived by dividing the number of patients into the corresponding number of patient days
Calculated Salary	The average budgeted salary and benefits for an employee within a specified position multiplied by the actual number of employees within the specified position
Census Units	MMCH's designations for reporting daily census
Department	The accumulation of wards by medical speciality or a designated outpatient area
Festival Bonus	A bonus paid to employees during the months of November, December, February, and April
Fixing Water	Developing solution containing silver residue from x-ray film
Intern Allowance	A monthly fee paid to medical interns of MMC
Leave Leftover	The amount of accrued time off not used by an employee
Lower Division Assistant	Clerk
Medical Stores	The department of the Hospital responsible for distribution of pharmaceuticals and medical supplies
MLSS	Orderlies
New Cabin	A newer section of semi private rooms reserved for staff and government VIP, paying patients
Nurse Stipend	The monthly payment made to student nurses by the Nurse Training Institute
Other Allowance	Money paid to employees for festival, recreation, travel
Outdoor Fee	The fee charged for an outpatient visit
Patient Department	The study's designated inpatient departments
Paying bed	Patient receives additional services for paying a daily fee for the bed

Registrars	A physician assigned to one or more wards with the overall responsibility of the patients within the wards
Runaway	Patient who leaves the Hospital without medical permission
Schedules	A listing of items to be auctioned
Seat Rent	Fee charged per day for a paying bed
Sit-no	The bed number of a patient
Staff Cabin	Room with two to four beds distributed among the wards reserved for staff
Student Cabin	Room with two to four beds distributed among the wards reserved for medical and nurse students
Upper Division Assistant	The clerical staff in charge of other clerks in a specific section

## Executive Summary

Without detailed, organised financial information facilities cannot better manage or control their expenditures and revenues. As a result they are not likely to be efficient or effective in the long run. The best uses of financial information are:

- Helping facility managers and planners to raise the efficiency of the facility through understanding how the facility is financed and how it controls its finances
- Suggesting ways for enhancing facility revenues while improving financial controls at the facility
- Providing baseline information for comparison with the relative efficiency and financial management of similar.

This Health Economics Unit [HEU] research paper offers an extensive body of information about these subjects. The study provides a comprehensive financial review and analysis of Mymensingh Medical College Hospital [MMCH], a major third-level or “tertiary” teaching-research hospital in Bangladesh. During the period of the HEU study—fiscal year, 1994-95—MMCH and its associated infectious disease hospital, Surgo Kanto Hospital [SKH], had an average of 825 operational beds with a daily census of 850 patients and over 250,000 outpatient visits. MMCH provided the training arena for medical students and student nurses. MMCH’s employed 701 employees and 112 physicians. The HEU study of MMCH develops financial information regarding this facility and its financial management.

Because the financial analysis of an 825-bedded hospital in a developing country poses significant methodological and technical problems, the HEU study of MMCH also offers a detailed illustration of how to conduct financial analysis for management system development and planning facility system controls.

It is important to recognise that this information is very specialised, however. By focusing on financial analysis, the full economic costs (“opportunity costs”) of the facility are not incorporated into the financial model. Nevertheless, the importance of financial analysis makes this study highly significant for those wanting to improve expenditure planning and control—a subject of vital importance in Bangladesh, where resource-expenditure gaps abound. The health economics potential for the data developed in this financial review and analysis of the Mymensingh Medical College Hospital is clear from the central findings of the report provided below.

## Study Design and Methods

As was noted above, MMCH and its associated infectious disease hospital, Surgo Kanto Hospital (SKH), had an average of 825 operational beds with a daily census of 850 patients and over 250,000 outpatient visits during the HEU study period. MMCH provided the training arena for medical students and student nurses. MMCH’s employed 701 employees and 112 physicians. It had 41 professors and 155 interns providing

patient care. The Nurse Training Institute had 144 student nurses at the Hospital. The Hospital's occupancy rate was 103 percent. Patient department occupancy rates varied from 28 percent for psychiatric to 129 percent for pediatrics. The student and staff designated bed occupancy was 24 percent. Census information showed that the average length of stay for MMCH's patients was 7.2 days. SKH's tuberculosis patients had the longest length of stay of 39.5 days. The death rate for MMCH was 5.4 deaths per 100 admissions.

Available records regarding the MMCH census, bed distribution, and supply distribution information permitted the HEU study to combine patient wards and data into eight inpatient "departments" [some consisting of multi-departments (e.g., EENT) and some not being departments in the strict sense (i.e., SKH)]:

- Medical
- Surgical
- Gynecology/Obstetrics
- Pediatrics
- CCU
- EENT
- Psychiatric
- SKH

These "departments" became "final cost centres" for the financial analysis. The procedure used in this process was one commonly used in the managerial and cost-accounting analysis of hospitals: "step-down" allocation. In effect, costs were aggregated in terms of expenditure categories that were suited for the real work done at the hospital and the actual utilisation information of the facility.<sup>1</sup> These aggregated costs were assigned to a variety of direct and indirect ("overhead") cost areas and then, through a detailed procedure, allocated to final cost centres or departments.

This overview does not, however, provide even a "hint" of the numerous methodological and technical problems involved with the aggregation and allocation of costs on the basis of available records. Because the HEU study of MMCH provides a step-by-step look at how available records can be used to develop a financial analysis, an appreciation of the difficult decisions of method and technique involved in such an analysis be understood from the start. Personnel data in the MMCH study provides a direct example of the numerous procedural problems of using available facility data in the study's step-down procedure.

Individual salaries and benefits at MMCH were obtained from numerous different and frequently incompatible source document, all of which had to be made compatible for the analysis. The problems encountered in dealing with personnel data illustrate the points

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<sup>1</sup> Census information was obtained from the Hospital's daily census records and monthly summaries. Other utilization data was obtained from individual department registers and the Hospital's daily summary report. Information for the fees, revenues, and fee exemptions was obtained from the MMCH statistician, and the MMCH cashier office.

involved. First, available records and summary reports differed. The detailed personnel expense information, obtained by HEU staff, was equal to only 94 percent of MMCH's "Annual Expenditure Statement's" [AES] salaries and benefits. MMCH's personnel expense, including interns, was 49.3 percent of the total, identified, recurrent expense. Second, the financial analysis required that forty-four personnel positions had to be amalgamated into specific cost centres. Eighteen, representing 6.9 percent of the hospital's personnel expense, pertained to administration or were not identifiable to a specific cost centre.

Third, no simple method existed for assigning personnel expenses to patient departments. The procedures finally used included a mix of methods and standards: surveys, interviews, staff registers, square meters of patient departments, medical supply distribution, pharmaceutical distribution, patient days, patient admissions, diagnostic procedures, and other allocated expenses. In all instances of aggregating personnel costs, methodological and technical decisions important to carrying out a financial analysis had to be made. The readying of costs for use in the step-down allocation method used in the MMCH study should provide a useful example of how to allocate costs in accord with accepted principles of managerial accountancy. It also shows how difficult and time-consuming financial analysis can be.<sup>2</sup>

## Summary of Study Findings

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<sup>2</sup>Similar problems of method and technique occurred in aggregating costs for allocation in other areas of the HEU study. Pharmaceuticals and medical supplies represented 24.9 percent of the Hospital's "Annual Expenditure Statement" (AES). Actual distribution for the pharmaceuticals and medical supplies was determined from issue slips maintained by the central stores at MMCH. The distributed pharmaceuticals and medical supplies were used to allocate AES supply expense. Other areas posed methodological and technical problems for cost accumulation. Dietary and laundry expense was allocated based on patient days. Equipment repair expense was identified to specific patient departments except for one repair, which was assigned to administration. Fifty-nine percent of the equipment depreciation expense was identified to specific patient departments with the balance of the equipment depreciation expense assigned to administration. Maintenance salaries, electricity, building repairs, and building depreciation had to be allocated on the basis of square meters of the patient departments. Staff housing depreciation and repairs cost assignments were based on the Hospital's personnel expense. Diagnostic expense of the laboratory and radiology was allocated to inpatient departments based on patient admissions. Operations Theatre expense was identified or allocated to gynecological surgery and general surgery. "New Cabin expenses," applied to a series of semi-private rooms, were assigned to inpatient departments based on the diagnosis of the New Cabin patients. Administrative expense, 2.2 percent of the total identified, recurrent expense, was allocated based on the accumulated expense of patient departments. Depreciation, building repairs, Mymensing Medical College [MC] microbiology, MC pathology, MC professors, student nurses, Control of Diarrhoeal Diseases Project [CDD], and Further Improvement for Medical College Hospitals Project [FIMC] expenses were not contained in the MMCH "Annual Expenditure Statement" [AES]; still, including them resulted in an increase of 31.3 percent in the Hospital's total expenditures. Information for the additional expenses was obtained from Central Medical Supplies, Dhaka [CMSD], Construction and Maintenance Management Unit [CMMU], Public Works Department [PWD], MC and MMCH. Internal reports were varied in content, time periods, and completeness. Utilization data also posed serious methodological and technical problems since it was summarized on an annual basis while the AES was based on the fiscal year.

Because the MMCH study treats departments as final cost centres for allocating functional expenses, it raises a number of quite specific financial management and information questions. Among these are questions about the resource use ratios at the hospital, the allocation of staff activities to the separate departments, the adequacy of hospital records for the management of finances at the facility, and the potential for revenue raising strategies now in use at the facility. Nevertheless, the main findings of the study can be summarised as follows.

### 1. *Baseline Hospital Data*

Occupancy: Varies widely across departments, with a low of 28.0 percent in Psychiatry and a high of 129.4 percent in Pediatrics. New cabin beds were only 55.7 percent occupied.

Average Length of Stay: For all inpatients, the ALOS was 7.2 days [total number of patient days (310,181) divided by the total number of patients (43,000)]. SKH had an ALOS of 2.3 days and Psychiatry had an ALOS of 12.5 days.

Death Rate: 5.4 per 100 admissions. EENT department had 0.9 deaths per 100 admissions; CCU had 12.1 deaths per 100 admissions; Pediatrics had 10.3 deaths per 100 inpatients.

Births: 2,252 births occurred at the hospital. Of the Gynae/Obs patients, 28.4 percent were for delivery.

### 2. *Total Expenditures*

Total costs during the study year were 118,461,474 Taka or about US\$ 2.5 million.

These costs were increased by 31.3 percent [about US\$ 830,000] above costs listed in the MMCH Annual Expenditure Statement to take account of items not identified: additional diagnostic services, personnel, depreciation, repairs and projects not reported in the AES.

### 3. *Other Total Cost Components*

Medical Staff Expense amounted to 18,882,107 Taka or 15.9 percent of total expenses—Professor expenses were 2,057,343 and Intern expenses were 7,425,000 from these expenses. Personnel expense without medical staff expenses was 29.0 percent of total hospital expenses.

Depreciation Costs are now estimated; 15.1 percent of total study expenditures came from building and equipment depreciation (17,841,407 Taka).

(MSR) Pharmaceuticals and medical supplies, including radiology supplies, were 19.1 percent of total expense, while food was 6.8 percent and electricity was 6.6 percent of total hospital expense.

### 4. *Patient Care Costs—Inpatient (Indoor)*

- Total Cost Per Patient-day: 311 Taka, 48 of which was for medical staff.
- Departments above 311 Taka: Psychiatry, CCU, SKH, Medical.
- Departments below 311 Taka: Pediatrics, EENT
- Highest medical expense areas: Psychiatry (360 Taka), CCU (268 Taka).
- Lowest medical expense areas: Surgery (24 Taka), Gynae/obs (35 Taka),

- Average Cost per Admission: EENT (34 Taka), SKH (38 Taka)
  - Highest Cost per Admission: 2,246 Taka for 43,000 admissions
  - Lowest Cost per Admission: Psychiatry (3,500 Taka), EENT (3,022 Taka), CCU (2,993 Taka)
  - Medical (2,078 Taka)
  - Medical, Surgery, Pediatrics, And Gynae/obs departments: Pediatrics (1,083 Taka), SKH (2,064 Taka), 81.6 percent of patients and consumed 78.7 percent of all hospital expenditures
  - Highest Relative Resource Index (RRC): Psychiatry (6.50), EENT (1.35), CCU Consumption (1.33) [>1 is high; <1 is low]
  - Lowest RRC Index: Pediatrics (0.48), Medical (0.92)
- 5 *Patient Care Costs—Inpatient (Outdoor)*
- Outpatient Departments: Dental, Gynae, Medical, Surgery, Emergency, General Outpatient (including rabies vaccine)
  - Outpatient expenses: 18.5 percent of total expenses for 257,852 patients in outpatient clinics—of which 32,240 emergency room patients
  - Average cost per emergency Room visit: 217 Taka, with 37 Taka for medical staff expense
  - Average cost per outpatient Visit—including emergency: 58 Taka, with 15 Taka for medical staff expense
  - Average cost per outpatient Visit—excluding emergency: 66 Taka
  - Outpatient surgery per visit: 507 Taka
  - Emergency expense per visit: 37 Taka
  - High RRC Index Departments: Surgery (6.00) and Emergency (2.56)
  - Low RRC Index Departments: General outpatient (0.37), Dental (0.76)

## 6. *Non-recurrent and Recurrent Costs*

*Non-recurrent costs:* Building depreciation (16,925,159) and equipment depreciation (106 items/10 fully depreciated—17,841,407)

*Recurrent costs:*

Personnel:

- Average salary & benefit: 31,330 for 4<sup>th</sup> Grade, 197,087 for 1<sup>st</sup> Grade, 79,105 for Medical Staff
- Medical staff = 22.1 percent of total salary /benefits and Nursing staff = 25.6 percent
- Overall benefits were 44.0 percent of employee salaries
- RRC Indexes were highest for 1<sup>st</sup> Grade officers (3.75), Medical staff (1.60) and for 2<sup>nd</sup> Grade (1.67);
- RCC Indexes were lowest for 4<sup>th</sup> Grade (0.64), 3<sup>rd</sup> Grade (1.19) and Nurses (1.28)
- Interns were greatest part of inpatient medical staff expenses (57.5 percent) while physician expense was the greatest part of outpatient expense (85.0)
- Administrative expense: 5.5 percent of total expense, with 56.5 percent going to administrative

Overall personnel: highest for Psychiatry, lowest for Pediatrics

Diagnostics: Laboratory and pathology were 3,754,704

Taka, Radiology was 3,301,441 Taka per year

Support/maintenance: building repairs were 4,094,974

Taka per year and dietary expense of 9,299,867

Drugs were 15.8 percent of total recurrent costs with 99.7 percent from CMSD---

1.6 million items issued with 68.2 percent for inpatients

## *7. Other Key Cost Elements*

Building repair and maintenance for MMCH and SKH was 4,094,974 Taka or 3.5 percent of MMCH total expense. Capital equipment repair expense was 1.2 percent of the cost for the equipment. Dietary expense was 30 Taka for each patient day. Laundry expense was .3 Taka for each patient day. Pharmaceutical expense was 15.8 percent of the Hospital's recurrent expense. The cost for each patient day for pharmaceuticals was 35 Taka and each admission was 253 Taka. Medical supplies were 6.6 percent of the hospital's recurrent expense. The medical supply expense for each patient day was 8 Taka and each admission was 61 Taka.

## *8. Revenues*

MMCH revenue from patients was 88.7 percent of the hospital's total revenue, outside of the government budget. Non-patient revenue included auctions, radiology film silver, and other revenue. Patient revenue was from emergency room/outpatient fees of 3.3 Taka, admission fee of 5.5 Taka, paying bed fee of 54 Taka per day, cabin fee of 129 Taka per day and service fees. Private patients in cabin beds paid for additional services. The annual revenue was 3.8 percent of the Annual Expenditure Statement's expenditures.

## **Management and Financial Analysis in Health Economics**

Ordinarily, health economics attempts to consider full economic costs, not only financial costs as reflected in available or exhumed hospital records. In this study by the HEU an attempt was made to analyze, in detail and for the first time in Bangladesh, the baseline of financial costs at MMCH. The development of full economic costs, including costs to consumers of a variety of kinds (work foregone, transportation, wait time, family expenses, and unofficial fees, e.g.), remains for future work. This report provides a more fundamental level of financial information but critical information required for good financial management and cost-control for tertiary facilities in Bangladesh.

To the extent that such expenditure control and allocation is important, this study is important, since the HEU financial analysis of MMCH presents the first detailed accounting of a major tertiary care centre in Bangladesh. The full cooperation of the Director General of Health Services and the Director of the Hospital and the Dean of the Medical College made this detailed exploration possible. The value for management and design of the Medical College Hospitals in Bangladesh remains to be seen. But it seems



clear that knowing costs per patient day for inpatients and outpatients and for departments as well as the maintenance costs, salary and benefits costs, capital costs, and other key costs of the hospital will prove invaluable to planners and policy-makers in the future.

With the MMCH study, steps have been taken to identify from actual expenditure data the department-level financial management of a US\$ 2.5 million per year facility. Because Bangladesh is concerned to provide an Essential Services Package to its population, the improved financial management of such high-cost facilities is of paramount concern for cost-savings and efficiency in the country's health system. Finally, the additional potential of the study to model techniques of step-down financial accounting should ensure the continued value of the MMCH research for planners and policy-makers concerned for the Bangladesh health and population sector.

## **1. Introduction and Study Rationale**

### **1.1 Financial analysis for health sector efficiency and effectiveness**

In Bangladesh efficiency in the use of health resources is of paramount importance for the health of the population. Efficient fund management at the facility level can contribute directly to efficient use of funds for health service provision. Further, there are, in any health system, areas where efficient management capacity can lead to resource efficiency only through greater knowledge of what the system costs and how it is working. In these areas, knowledge can lead to controlled and functionally improved spending and, when carried further, to significant cost-savings and overall gains in effectiveness.

The over-arching aim of this HEU study is to begin building a fund of information about financial management in the most expensive area of Bangladesh health services, namely high unit cost hospital services provided by its advanced care hospitals. This HEU report initiates that process by providing a financial analysis for the 825 operational beds at Mymensingh Medical College Hospital [MMCH] in the fiscal year of 1994-95. This facility is one of the eight major teaching-research facilities operated since 1968 by the government of Bangladesh under the Directorate General of Health Services [DGHS] and includes the Surgo Kanto Infectious Diseases Hospital [SKH] as one of its components. The study demonstrates the type of management-relevant financial data that can be gathered from an in-depth field analysis of a single facility. In so doing, the MMCH analysis provides a working example of how financial cost information and analysis can be linked with management systems and improved hospital information systems to enhance expenditure controls for medical college hospitals of Bangladesh.

Financial analysis itself is a tool borrowed from managerial and cost accounting. It may be defined as the application of international accounting principles to the activities and information of an organisational unit to provide accurate, record-based summary cost

information for decision-makers at one or more facilities. In this case a single financial analysis is developed for one Bangladesh hospital and its multiple components—the MMCH hospital. Where possible, comprehensive health economic analysis should take *full costs*, including opportunity costs to the patient (foregone wages, transportation costs, unofficial charges, etc.) into account to arrive at a complete economic picture of health activities. In this case, the HEU follows a more modest plan and limited its efforts to what proved to be an immense task: providing *the first financial or accounting-based analysis* of an advanced care facility in Bangladesh and one of the few studies of advanced, high-cost hospital care in South Asia. In fact, the HEU study of MMCH was only the eighth step-down financial accounting analysis conducted for a developing country hospital at the time of its field research.<sup>3</sup>

Financial analysis has proven itself to be almost indispensable for the improvement of management and internal facility efficiency at hospitals, whether these are in low-income or in high-income economies. While the full cost approach is recognized as correct from the standpoint of theory, the advantages of improved facility efficiency and cost-control through improved financial management at the facility level make financial analysis an almost essential first step. The overall concern of experts in the field is *how best to conduct financial analysis*, certainly not whether to do it.<sup>4</sup>

In the MMCH field study, a series of quite specific for financial analysis emerged, all of them related to the Bangladesh planning and capacity development process. They are:

1. Assessing where direct provider costs of providing hospital health services are comparatively high or low and investigating what accounts for these varying levels of expense.
2. Supplying a baseline of costs for the provision of advanced-level hospital services that can be used for identifying management-related cost trends.
3. Providing department-level cost information for managers to use at MMCH in making comparisons of cost per output ratios amongst hospital departments.
4. Making available for Ministry-level managers financial information about total facility costs, cost per admission, cost per inpatient and outpatient, as well as cost per admission and cost per patient day at the department level.
5. Furnishing a view of costs that isolates for managers and planners the separate “cost centers” and key cost areas of the facility. These include: overhead or administrative costs by multiple categories, salary and overall personnel costs by functional and civil service classes, maintenance and food supply costs, and a variety of revenue descriptions for the facility.
6. Suggesting areas where hospital records and information must be automated, streamlined, and controlled to improve the efficiency and accountability of health care facilities such as MMCH.

<sup>3</sup> See . Barnum, Howard and Joseph Kutzin, *Public Hospitals in Developing Countries* (Baltimore: Johns Hopkins University Press, 1993, p. 86.

<sup>4</sup> See Barnum and Kutzin’s useful discussion of the “step-down” or accounting approach vs. the “statistical” approach to generating cost estimates for hospitals. Barnum and Kutzin, *Op. Cit.*

## 1.2 Economic analysis and financial analysis

The HEU study of MMCH attempts to strike a balance between economic analysis and the study of financial management. As a financial analysis, the study is useful for facility management purposes. As a case study of Bangladesh medical college hospitals, the study addresses the broader aims of expenditure analysis and resource allocation in health economics. But it is important to see how a financial analysis differs from more comprehensive health economics studies.

Normally and for good reasons, economists prefer to capture “full economic costs.” Included in this typical economic analysis are the many opportunity costs borne by patients (foregone wages, transportation costs, unofficial charges, etc.) and costs to the society as a whole when services as those available at MMCH are provided. These full costs are then used with financial data to arrive at a reasonably complete economic picture of health activities. Further, health economists are especially interested in aggregate resource allocation (technical/allocative efficiency) and a macro-view of “management,” with the result that economic analysis frequently focuses upon improved management of the global health system.

Since 1987, however, the resource-expensive hospital systems of low-income countries have come under increasing scrutiny through the methods of financial analysis.<sup>5</sup> Though narrower in scope and theory than a “full economic cost” approach, a financial analysis can provide an important first step toward a more ambitious economic analysis. Financial analysis is a tool borrowed from managerial and cost accounting. It may be defined as the application of international accounting principles to the activities and information of an organisational unit to provide accurate, record-based summary cost information for decision-makers at one or more facilities. The HEU follows this more modest plan and limits its efforts to what itself proved to be an immense task: providing *the first financial or accounting-based analysis* of a advanced care facility in Bangladesh. The study has proved to be one of the few studies of advanced, high-cost hospital care in South Asia, being only the eighth step-down financial accounting analysis conducted for a developing country hospital of any sort at the time of its field research.<sup>6</sup>

The financial analysis model was chosen for three main reasons.

- First, results of the MMCH study can be used as a first step toward broad health system comparisons. Health economics has regularly and routinely used financial analysis as a step toward full costing.
- Second, policy-makers, planners, and those responsible for improved facility management in Bangladesh should find this financial analysis of considerable value for multiple reasons having to do with *general policy development*.<sup>7</sup>

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<sup>5</sup> See . Bamum, Howard and Joseph Kutzin, *Public Hospitals in Developing Countries* (Baltimore: Johns Hopkins University Press, 1993).

<sup>6</sup> See . Bamum, Howard and Joseph Kutzin, *Public Hospitals in Developing Countries* (Baltimore: Johns Hopkins University Press, 1993, p. 86).

<sup>7</sup> Five reasons are commonly listed:

- Third, the MMCH study documents the view that greater hospital efficiency and effectiveness for the Bangladesh health system *can* result through improved financial management of its expensive teaching-research hospitals. Improved financial management and accounting information have been recognised as essential for instituting such controls since they target *controllable expenditures of significant scale*.

The first point has led to an increasing use of financial analysis. Recognizing the importance of this mode of analysis, for example, the World Health Organisation has commissioned a manual developed by Prof. Donald Shepard and colleagues which is designed to improve the management capacity of hospitals in developing areas: *Analysis of Hospital Costs in Developing Countries: A Manual for Managers*.<sup>8</sup> The manual features modifications of standard financial accounting approaches as tools for the improved management of costs in the hospitals of developing countries.

The second point, benefit for policy-makers, is already in evidence. In Bangladesh, the MMCH analysis has provided a valuable information base for the HEU country-wide facility efficiency study and for the development of a spreadsheet for cost-analysis of district hospitals. The former is of value for planning more efficient service systems and the latter benefits cost-containment at Bangladesh hospitals. Further, as autonomous hospitals are developed under the Health and Population Sector Programme [HPSP] of the Ministry of Health and Family Welfare [MOHFW], the MMCH study should valuable provide baseline information for policy-makers who want to compare the financial performance of autonomous and non-autonomous hospitals.

The third point, control of expenditures requires the identification of expenses that are like candidates for control. As the MMCH study demonstrates, controllable expenditures for Bangladesh tertiary hospitals are extensive. And unlike household expenditure, expenditures that follow multiple provider pathways and depend upon household and frequently individual choices, large portions of total hospital expenditures are under the

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- 1 *Financial accounting.* As a financial accounting report the study provides policy-makers and planners with an important baseline of financial and medical information essential for improving the efficiency and effectiveness of hospitals in the country. The demand for these services is strong, as household surveys and the experience of parliamentarians can attest.
  - 2 *Actual expenditures.* The HEU report provides costs based on actual expenditures. Although budget allocations and revised allocations were used for selected purposes in the study, most expenditures reported are drawn from actual documented expenditures at the facility. In this regard, the financial analysis is a faithful representation of actual provider costs for major hospital services, not one based on estimation or extrapolation.
  - 3 *Utilisation and costs data.* The HEU study links utilisation and cost-analysis at multiple levels, including total costs, recurrent and non-recurrent costs, costs per visit and cost per inpatient day, and cost by service area at MMCH. As a result, the actual expenditures of the facility are analysed by the use of multiple financial standards.
  - 4 *Database development.* The data in the study are presented in a form that makes them useful for application in other analyses. For example, the full year of data on pharmaceuticals issued at the hospital and their separate costs—both as brand name and generics—provide data suited for studies of leakage and wastage at the facility and similar facilities in Bangladesh. Similarly, antibiotic prescribing practices at medical college hospitals can be compared through the MMCH data.
  - 5 *Autonomous revenue projections.* The autonomous revenue [income not drawn from GOB general revenues] picture of the hospital is presented alongside the expenditure analysis so that provider costs and provider revenue can be analysed simultaneously. The extent to which the hospital is already dependent on patient revenue is a striking finding of the study.

<sup>8</sup> Shepard, Donald S., Dominic Hodgkin, and Yvonne Anthony, *Analysis of Hospital Costs in Developing Countries: A Manual for Managers* (Geneva: World Health Organization, 1998).

control of the Ministry of Health and Family Welfare. Further, the amount of public expenditures for health is extensive for hospitals. The HEU has compiled National Health Accounts showing that the proportion of funds used for medical college and specialist hospitals accounts for 28 percent of the revenue budget total for the country. With government district hospitals added to the picture this rises to 37 percent. Since advanced hospitals account for 37 percent of the MOHFW development budget as well, the total amount of potentially controllable expenditure must be above 45 percent of total government health spending. Since the country's overall health policy already gives a high priority to efficient, effective resource use, financial management controls and control systems *can* yield a significant benefit for Bangladesh.

Finally, the MMCH study can provide important financial information useful in making subsequent statistical evaluations of Bangladesh facility efficiency. As Barnum and Kutzin have shown, statistical comparisons benefit from financial analyses, extending them through broader economic analysis to system-wide comparisons. These statistical comparisons can focus direct attention upon the issues of drug logistics, inter-departmental cost variation, salary allowances, use of outpatient services, and implied points concerning patient referral based on the MMCH financial analysis.

### 1.3 Main components of the MMCH financial analysis report

The HEU analysis of MMCH consists of six main sections:

- Introduction and study rationale
- Background statement,
- Methodology,
- Study constraints,
- Detailed findings,
- Conclusions and policy recommendations.

For readers who are most concerned for the use of the report as a model for further financial analysis, it is recommended that attention be given to the methodology and study constraints sections first. For those most interested in the results of the study, the section on findings and the section about methodology might be read first. Finally, for those most concerned with policy development, the findings and the conclusions and recommendations should be the place to begin.

The main components of the study serve four useful functions. First, the study provides a detailed demonstration of the method of financial analysis for hospitals *in Bangladesh*. Because other health facilities in Bangladesh would benefit from a careful and periodic financial analysis, the MMCH study provides a *specific* template for how to proceed. As the report summarises the many decisions and difficult data collection processes involved determining the *cost centres* for direct and indirect patient care costs. It is easy to see that, *in a Bangladesh setting*, standard accounting allocation methodology for clustering hospital support and overhead costs as well as for determining final cost centres must take into account the many constraints that are commonly found in Bangladesh facilities.

Further, the detail provided by the MMCH appendixes, will provide ample detailed information for those who may carry out a financial analyses of large, complex health care organisations in Bangladesh. The section concerned with methodology and the study appendixes can be used to explore the problems of financial analysis in Bangladesh health facilities.

Second, the MMCH study documents the extent to which *Bangladesh hospital records from the official accounts of Bangladesh hospitals* can be readily and feasibly used for financial analysis that aims to improve quality of care, managerial capacity, and overall facility efficiency. Ultimately, the MMCH analysis was made difficult by several orders of magnitude due to the poor reliability of available records, the accessibility of those records, and make-up work in areas where records required for the financial analysis did not exist. The step-by-step review of these deficiencies in the study provide strong support for the idea that managerial and resource utilisation in developing countries can gain greatly from a widespread application of modern information approaches. The MMCH study documents the heroic scale of effort required to produce workable yet manual records for the hospital, demonstrating that great strides have been made at the facility. Nevertheless, the relative ease with which training and the use of minimal computing capacity could improve patient services, management, and overall facility efficiency are one of the striking features of the report. The sections concerned with constraints and recommendations address these questions.

Third, findings from the financial cost analysis of the paper link utilisation and broad outcome statistics with total and average costs at MMCH in a manner that encourages management comparisons. This part of the HEU study provides total cost figures and average inpatient costs per day and per admission, as well as costs per outpatient day ("outdoor" patients). Specialised cost information is developed for the following:

- non-recurrent and recurrent costs—which does receive priority? Which should receive priority? Can either be handled more efficiently?
- administrative and personnel costs—can this, the largest area of costs, be managed more effectively in the separate departments of the facility? On an outpatient and inpatient basis?
- operation theatre costs—do these expenditures vary widely and for what reasons? How to they relate to utilisation at the department level?
- diagnostic costs—are investigation costs managed to provide greatest efficiency?
- pharmaceutical and supply costs—are record keeping methods appropriate for ensuring quality and accountability in this key area of hospital services?
- "new cabin" costs—who benefits most from cabin utilisation and what revenue enhancement could come from a more controlled financial management of this area of hospital income?

In each of these areas, the financial analysis is carried beyond average per inpatient and per outpatient costs to the level of the department and service area of the hospital. Thus, the study provides an indicative and comparative picture of how the various departmental services of the hospital fared financially during the fiscal year.

Finally, the MMCH financial analysis presents a series of detailed appendixes about a tertiary health facility in Bangladesh. These complex appendixes provide detailed supporting information for the main study, thus pointing to the challenges of financial analysis for facility efficiency and management improvements. Furthermore, they represent a detailed baseline database suited for further research in this expensive area of Bangladesh health care. They will be made available through the HEU Resource Centre and Data Archive to researchers and trainers and policy-makers in the country. These appendixes and their accompanying abbreviations and glossary consist of the following sections:

- Analysis Appendix of Main Findings
- Cost Allocations
- Financial Statements
- Revenue Statements
- Salary Allocations
- Supplies
- Maintenance
- Depreciation
- Hospital Census
- Ancillary Services and Outpatient (Outdoor) Services
- Staffing (Professional Staff)
- Bed Distribution
- Miscellaneous Information

## 2. Study Background

The focus of this financial analysis is Mymensingh Medical College Hospital [MMCH] in the fiscal year, 1994-95. It is one of eight major teaching-research facilities now functioning in Bangladesh and has been operated since 1968 under the Directorate General of Health Services [DGHS] of the Ministry of Health and Family Welfare [MOHFW]. The *tertiary services* provided by MMCH are among the most specialised tier of hospital services in Bangladesh.

Tertiary services at MMCH and other medical college hospitals involve a programme of teaching and research requiring a relatively extensive investment in medical equipment and technical hospital services. Operationally, the tertiary level in Bangladesh consist of MMCH and seven other medical college teaching hospitals: Rajshahi Medical College Hospital, Rangpur Medical College Hospital, Sher-e-Bangla Medical College Hospital in Barisal, Dhaka Medical College Hospital, Sir Salimullah Medical College Hospital in Dhaka, MAG Osmani Medical College in Sylhet, and Chittagong Medical Hospital

Originally, MMCH was sanctioned for 500 beds and SKH for 146. During the period of the field data collection—roughly from December, 1995 to March, 1997—MMCH averaged:

- 825 operational beds
- a daily census of 850 patients
- over 250,000 outpatient visits

Total MMCH employees numbered 701 with 112 physicians during the period of field investigation. Also for the purposes of the study, MMCH is treated as a unit with the Surgo Kanto Hospital [SKH], an infectious disease hospital located 1.5 km from the main hospital and operated by MMCH. Surgo Kanto Hospital (SKH) averaged 136 operational beds during the time of field data collection.

The scope of services offered at MMCH also includes links with the Mymensingh Medical College [Medical College] for teaching and research but, for this financial analysis, the Medical College was treated separately from MMCH proper. More specifically, MMCH provides training for medical students from the Medical College and student nurses from the Nurse Training Institute affiliated with the Medical College and MMCH. During the interval of the field data collection and data entry, Mymensingh Medical College (MMC) had 41 professors on its staff and involved 155 interns in the provision of patient care. The Nurse Training Institute had 144 student nurses at the Hospital.

Utilisation data for the hospital during the period of the study ranged from an average occupancy rate of 28 percent to one of 129 percent, with the average overall occupancy rate for the facility being 103 percent. The average length of stay across all MMCH



patients was 7.2 days. SKH tuberculosis patients averaged 39.5 days. The death rate for the facility was 5.4 deaths per 100 admissions during the study period.

Once patient census data, bed distribution patterns, and supply distribution information had been combined into eight inpatient departments, the average occupancy rate became clear for each. The range was

No previous financial analyses of large-scale, public tertiary care exist for Bangladesh and, in addition, thorough financial analyses of teaching-research hospitals in South Asia have been quite rare. More importantly, an understanding of the unit costs at such facilities is most important to improved financial planning for the sector as a whole as well as to the successful examination of human resource development and service production in the Bangladesh health sector. The results of this study focus attention on resource allocation questions critical for the health services of the country.

### 3. Methods of the study.

#### 3.1 Hospital cost methods

Interest in hospital cost analysis in developing countries did not spring from thin air in the 1980's. Rather, the pressures of health sector reform, health services finance, and the urge to reallocate hospital resources to improve overall health care provision, prompted a growing interest in the costs and efficiency of developing country hospitals.<sup>9</sup> Especially important among these studies were techniques devised for projecting recurrent hospital costs for effective health system planning. Most of these recent investigations have been financial analyses, with about half of the studies using standardised approaches to classifying and grouping costs. Financial analysis has been seen as a useful base for improved resource use and a useful tool for planners, managers, and policy-makers.

The methods of financial analysis are reasonably clear. They represent borrowings from the approved, internationally recognised methods of modern managerial and cost accounting. The dominant approach and the one used in the MMCH study involves a "step-down" cost procedure for deriving average costs for units of service or other managerially relevant units of a hospital. Even though the procedure is easy to describe, it is not straightforward in application. In fact, deciding what the unit of service should be a great challenge—just as it was in the MMCH study.<sup>10</sup>

This discussion will first review the question of what "costs" to count. Afterwards, the issue of how to treat costs through the "step-down" procedure used in this study for allocating costs is taken up. As a key part of using the step-down procedure, the MMCH study also had to allocate costs to "cost centres" for financial analysis. In presenting the methods of the study, the discussion attempts to remain focused on concrete problems of the MMCH analysis and the particular adjustments in method that had to be made to carry the HEU study forward.

##### 3.1.1 Critical Issue: what costs should count as "costs"

Financial cost analysis remains a practitioner's art operating under standardised rules. The field study of MMCH quickly revealed that knowing which "costs" to count would not be simple. For example, there were a many personnel "external" to the hospital's straightforward payroll lists. These included professors, associate professors, assistant professors, interns and residents, and student nurses—all of whom were involved with the direct provision of patient care at MMCH. Were these MMCH "costs"? As a further illustration, external diagnostic interventions at MMCH included pathology, microbiology, and nuclear medicine; the former provided by the Medical College and the

<sup>9</sup> Barnum and Kutzin, *Op. Cit.*, ch. 3.

<sup>10</sup> Some ambiguity over this point stems from the nature of hospital organisation and clinical medicine; some results from the way records are kept at a hospital; some further ambiguity is owed to a host of other factors including the sometimes conflicting views of effective management in a hospital and differences between patients, physicians, administrators, and governments (payors) about service goals and values.

latter by the Bangladesh Atomic Energy Commission. And at least two major “external” governmental agencies were involved in providing building and equipment repair for MMCH. Were these MMCH “costs” or costs of the agency external to MMCH? And since two donor-funded projects—one for construction at the hospital and one involving the control of diarrhoeal diseases—were involved in MMCH patient care, the subject of what counted as MMCH “costs” provided a clear challenge to the methods planned initially for the study.

In the end, the questions of what to count as “costs” required the establishment of final department and service categories representing constructed activity centres of MMCH. The costs—both direct and indirect or “overhead” costs (see below)—from hospital wards and actual functioning departments at the hospital were grouped into a series of “services” or final service categories (see the discussion of cost centres below) for the allocation of hospital costs. The “departments” so constructed as final activity centres represented the lowest level of unit costs focused upon in the study and provided the organising focus for determining what “costs” to include in the study.

Their choice of these final activity centres or departments was criteria based. Although the application of the criteria still called for considerable judgment, the criteria for determining what “costs” or sources of costs to use in the MMCH can be stated quite simply. They include:

- If the aim is to incorporate all the major cost components involved in the production of a department or final activity centre, what expenditures must be linked with that final activity centre or department?
- Are there available records at the hospital or other documents which can be used for determining meaningful “unit costs” for the department or final activity centre (i.e., with records on patient census, bed distribution patterns, supply distribution information, and computed information such as the occupancy rate of the service)?<sup>11</sup>
- Can the various contributing components of the final activity or department be traced back, in a reasonable manner, to all the separate sources of costs at the facility and at “external” locations?
- Can the final activity centres be re-aggregated to yield unit-cost information for less detailed classifications of hospital activity, for example, inpatient and outpatient unit costs?
- Are the departments or final activity centres identified for the study likely to be a useful focus for improved management of costs and overall hospital finance?

Based upon these criteria, the application of international cost accounting norms, available records<sup>12</sup> of activities and other inputs for these final departments or

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<sup>11</sup> Where “meaningful” means intelligible to those who provide and receive care at the facility.

<sup>12</sup> Since financial analysis attempts to link patient utilisation with production inputs, production constraints, and broad outcome statistics (e.g., available number of beds per day), activity areas must be intelligible to the facility itself—they cannot be simply dreamt-up.

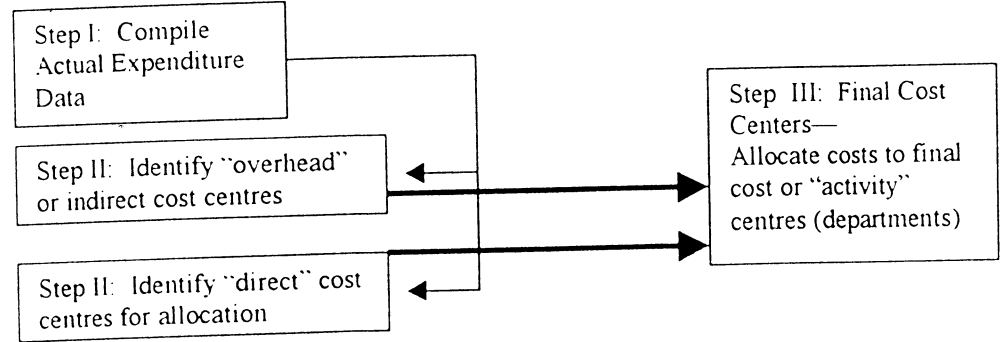
service/activity categories, the question of what “costs” to count was settled.<sup>13</sup> The departments or service/activity categories that guided this operation were, thus, neither departments pure and simple nor functional activity areas. Rather, they were a composite of both:

- Medical Department
- Surgery
- Gynae/Obstetrics Department
- Pediatrics
- Coronary Care Unit [CCU]
- Eye, Ear, Nose, Throat [EENT]
- Psychiatry
- Surgo Kanto Hospital [SKH]

3.1.2 Critical Issue: step-down accounting-based procedures and the MMCH study

For MMCH detailed cost information was developed directly from the records of the hospital and from all elements involved in the production of services at the facility. This information was then organised in a manner that permitted it to be allocated into final activity centers—roughly departments—for the sake of analysis. The procedure used for this allocation is referred to as a “step-down” method.

Diagram I: Step-Down method for MMCH analysis



3.1.3 Critical Issue: “Departments” and final cost centre determination

In any financial analysis, the determination of final cost centres is perhaps the most critical step. Cost centres for the MMCH study are the final centres of activity—the departments and constructed departments the hospital—to which contributing direct and

<sup>13</sup> Primary external sources of “costs” included: Construction and Maintenance Management Unit, Central Medical Supplies, Dhaka, DGHS, Mymensingh Medical College, Control of Diarrhoeal Disease Project, Further Improvement of Four Medical College Hospitals, Public Works Department, International Development Association, and the College of Nursing and Nurse Training Institute.

indirect or overhead costs are to be assigned.<sup>14</sup> In very simple terms, final cost centres are the assigned “unit” whose health care production activities are of ultimate concern in a study.

In the MMCH study, an early decision was made to focus on the cost of producing department-level hospital services, i.e. what financial resources go into the production of hospital services at the department-level of the hospital? This focus leads to the following kinds of questions:

- Does a department providing services thought to be only distantly related to essential primary care, absorb an extensive amount of total resources?
- Does a department focused on children fare poorly relative to one whose services focus on aging adults?
- Do the salary components allocated to a final, department-level activity centre appear disproportionately expensive relative to another?

These are the sort of questions which arise when departments or constructed departments such as “EENT” become the final cost centres of a hospital study. Thus, the determination of cost centres and standardised cost accounting norms ultimately governed what costs should count as MMCH “costs” and, in turn, “department” cost centres of the MMCH study served as the final recipients of allocated hospital costs.

Making allocations to final cost centres for MMCH proceed sequentially by the step-down method, as noted above in Diagram I. Of course, the first step in the MMCH analysis, as in any analysis, was to simply collect the costs and expenditures of the facility. In analytic terms, the second step involved distinguishing between direct costs and indirect costs for the facility. This determination relied upon standard norms used by cost and managerial accounting to sort such costs as “central administrative salaries” into the indirect cost category and the salaries and allowances of “resident interns” into the direct cost category associated with patient care delivery. Numerous methods were then employed to allocate the captured cost to the eight department-level or “final cost centres” of the study, with each sub-step being evaluated for its consistency.

#### 3.1.4 *Critical Issue: basis for allocation to final cost centres*

To allocate costs to the department level, it is essential that a basis be found for placing each hospital expenditure into the appropriate intermediate cost category and then into the appropriate final cost category. Some illustrations of the many bases are as follows:

1. When possible surveys, interviews and staffing registers were used to assign personnel costs directly to specific departments.

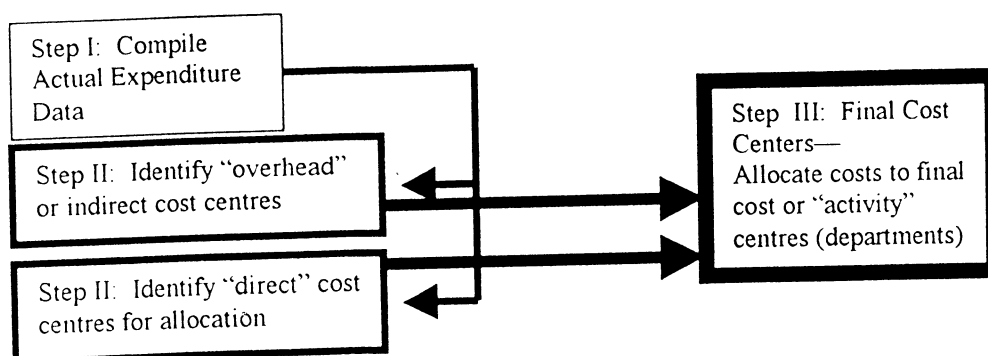
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<sup>14</sup>*Ibid.*, pp. 5-6; this text follows US accounting standards and, as a result, refers to “indirect” costs rather than “overheads.” It also does not divide “indirect” costs into “overheads” and “indirect costs,” as is sometimes done in the U.K.

2. Pharmaceuticals and supplies cost were determined through actual vouchers and then distributed to the wards on the basis of actual issues.
3. MMCH building maintenance and depreciation cost were allocated to cost centres on the basis of square meters for the patient departments.
4. Employee departmental salaries determined the allocation for staff housing repairs and depreciation.
5. Inpatient diagnostic expense was allocated on the basis of admissions.
6. Operating theatre cost were assigned to inpatient departments based on actual procedures in use at MMCH.
7. "Other costs" were allocated on the basis of patient admissions, patient days, male/female beds, outpatient visits and discharge registers, depending upon the nature of the expenditure.
8. Administrative costs were allocated on the basis of the actual accrued cost of the departments.

These different *bases* were used to sort or allocate indirect and direct costs into their appropriate bin as shown in the highlighted boxes of Diagram II, below:

**Diagram II: Allocation decision pathways for step-down cost analysis, MMCH.**



### 3.2 Structuring the Step-Down Method for MMCH

Although a detailed discussion of the use of the Step-down Method for cost classification at MMCH becomes somewhat involved, it is valuable for understanding the method used in operational terms. Since the aim of the HEU study is to serve as a model for conducting such financial cost analysis it is worth taking extra pains in this presentation to show in detail how the allocation of costs to final cost centres and to intermediate cost centres at the hospital actually was accomplished. Should the reader choose to pass over this section, being content with the sketch of method already presented, proceeding to the detailed findings or study constraints may be appropriate.

### 3.2.1 Indirect cost structure

After the assembly of hospital expenses, the step-down approach called for separating out the indirect or “overhead” costs. Not only is this procedural step methodologically correct, it also is important for identifying the extent to which indirect costs—especially those that might be controlled by the hospital or the central Ministry—compare with the actual, direct service delivery costs at the department level. Does the overhead of surgery exceed dramatically that of obs/gynae? Do specific indirect or overhead costs weigh heavily on certain departments or final cost centres, but not on others? These questions can be addressed only after indirect or overhead costs have been isolated from direct service costs and then each allocated, in turn, to specific departments. To make this procedural step clearer, the next paragraphs describe what was done in the case of MMCH to isolate indirect costs.

A distinct feature of the MMCH study is the fact that Mymensingh Medical College [MMC] provides patient care, pathology, and microbiology services for MMCH. Of the seventy-four professors, associate professors and assistant professors, forty-one were found to be involved in the provision of patient care during the study (Appendix J, p. 3)—some of it direct patient care and some of it through indirect services such as pathology and microbiological support. The College’s pathology and microbiology departments provide diagnostic testing for hospital and non-hospital patients (Appendix L, p. 1 - 5). The expense of the professors, pathology department, and microbiology department [*although not contained in the hospital’s Annual Expenditure Statement* (Appendix B, p. 1)—*thus understating hospital costs*] were treated as a part of the hospital’s indirect costs.

Other indirect costs included two external projects were occurring during the field analysis at MMCH: “Control of Diarrhoeal Diseases” [CDD] and “Further Improvement of Four Medical College Hospitals” [FIMC]. The CDD project had various personnel from medical officers to audio-visual operators (App. L, p. 6 - 7). The FIMC project, funded by GOB and IDA, was engaged in the construction of a pediatric ward, ramps, an arboriculture initiative, and installation of a new well for water. The project was under the direction of the Construction and Maintenance Management Unit [CMMU] (App. G, p. 5). The expenses for CDD and FIMC were incorporated into the HEU study for their contribution to indirect costs [*although they were also not contained in the MMCH Annual Expenditure Statement* (App. B, p. 1)—*thus understating reported hospital costs*].

The hospital based indirect costs for the HEU study were:

- Administration costs—including central MOHFW and DGHS costs: director, typists, clerks, drivers, cashiers, accounting areas, and medical records, telephone, security, taxes, transportation, and miscellaneous expenses (App. A, p. 37).
- Dietary expenses: supplies and personnel (App. A, p. 37).
- Central stores expense: included medical supplies (App. E, p. 1 - 2) and personnel (App. A, p. 38):

- Maintenance costs: personnel (App. A, p. 39) as well as the cost of building maintenance and equipment repair (App. F, p. 1 - 2).
- Utilities expenses: electrical costs (App. B, p. 1) only; water from a deep tube well.
- Housekeeping expenses.
- Laundry expense: diesel fuel used for the laundry was included in the laundry expense (App. L, p. 13).

### 3.2.2 *Direct Cost Structure: Inpatient “departments”*

The direct cost centres or final cost centres of the MMCH study, as noted previously, were “departments.” Although a higher level of analysis was also generated, namely costs for inpatient and outpatient areas of the facility—this analysis focused attention on the department level as the lowest level of service or output of interest in the study. How the costs and expenses for “departments” were linked to these final cost centres is a step worth noting in some detail. Again, the method of the procedure is that of step-down cost analysis, but the judgments involved in using the procedure make it important to present in a manner integrated with the discussion of method. Otherwise, one might draw the quite mistaken conclusion that the procedure is as simple and straightforward to use as it is to state.

MMCH was not set up according to the structure of “final activity centres” required for the HEU financial analysis of MMCH. To arrive at the final and direct service cost centres (“departments”) for the facility, the separate wards involved in the delivery of departmental services had to be compiled by service type to link expenses with the final direct service cost centres or departments used in the study. The final inpatient departments or direct cost centres were as noted above: Medical, Surgical, Gynecology/Obstetrics, Pediatrics, CCU, EENT, Psychiatric, and SKH (App. K, p. 1). MMCH had twenty-six wards and SKH had five wards (App. K, p. 2) active during the study period. The wards of gynecology, obstetrics, labour, pediatric, CCU, ophthalmology, ENT, and orthopedics were directly assigned to the corresponding departments, but other wards and their costs required detailed investigation before assignment.

Wards nineteen and twenty were combined medical and surgical wards. One half of the beds in each of these ward were for medical patients and one half were for surgical patients. Observation wards (wards 21 & 22) were staffed primarily by casualty physicians. The observation wards were assigned to the surgical department except for two beds in ward twenty-one. The two beds were for female psychiatric patients and were assigned to the psychiatric department. Ward seventeen had both ophthalmology and ENT patients; therefore, wards sixteen, seventeen, and eighteen were combined into the Eyes, Ears, Nose and Throat (EENT) department. The “New Cabin” ward costs were partitioned into EENT, Medical, Surgical, and Gynecology departments based on a detailed review of the relevant discharge registers (App. H, p. 2).



The following patient “departments” were linked with the expenses associated with specified wards:

**Department: Medical**  
Ward 12, Medical, Female  
Ward 13, Medical, Male  
Ward 14, Medical, Male  
Ward 15, Medical, Male  
Ward 19, 50% Medical, Male  
Ward 20, 50% Medical, Female

**Department: Surgical**  
Ward 6, Surgical, Male  
Ward 7, Surgical, Male  
Ward 8, Surgical, Male  
Ward 9, Orthopedic, Male  
Ward 10, Surgical, Female  
Ward 11, Surgical, Female  
Ward 19, 50% Surgical, Male  
Ward 20, 50% Surgical, Female  
Ward 21, 83% Observation, Female  
Ward 22, Observation, Male  
Ward 26, New Cabin

**Department: Obs/Gynae**  
Ward 1, Gyn  
Ward 3, Gyn/Labour  
Ward 4, Gyn  
Ward 5, Gyn  
Ward 24, Labour

**Department: Pediatrics**  
Ward 2, Pediatrics

**Department: CCU**  
Ward 25, CCU

**Department: EENT**  
Ward 16, ENT, Male  
Ward 17, Eye & ENT, Female  
Ward 18, Eye, Male

**Department: Psychiatric**  
Ward 23, Psychiatric, Male  
Ward 21, 17% Psychiatric, Female

**Department: EENT, 14.8%**  
**Medical, 29.6%**  
**Surgical, 41.6%**  
**Obs-Gynae, 14.0%**

**Department: Surgo Kanto Hospital**  
Ward TB, Male  
Ward TB, Female  
Ward Infectious, Male  
Ward Infectious, Female  
Ward Infectious, Child

### 3.2.3 Direct Cost Structure: Outpatient or “Outdoor”

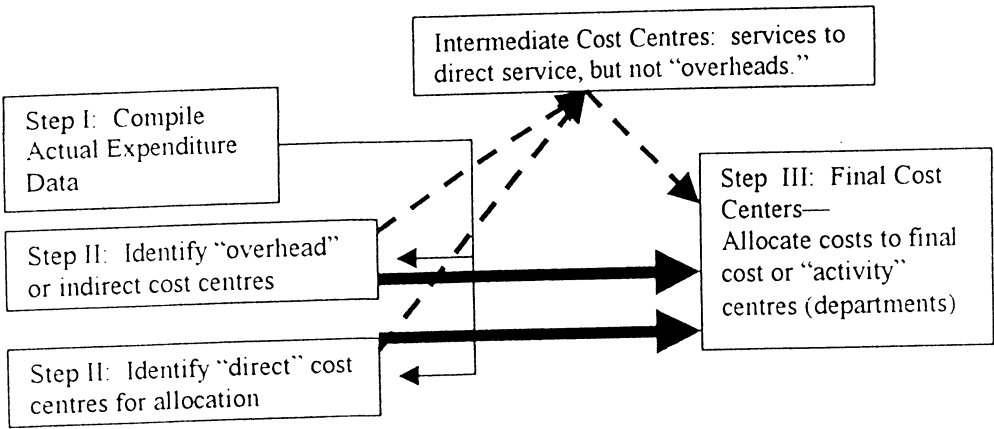
In the same sense that wards had to be linked with the MMCH “departments” within the zone of inpatient or “indoor” services, a department classification for “outdoor” or outpatient services was also established. In this way, outpatient and inpatient services and their many sub-components could be compared and contrasted.

The outpatient department at MMCH consists of the emergency room, anti-rabies vaccine, casualty, dental, gynecology, medical, surgical, and radiotherapy. Costs were captured for each of the outpatient areas with the final analysis broken into the following sub-components: Emergency Room, dental, gynecology, medical, surgical and the combined outpatient departments—excluding emergency room.

### 3.2.4 Intermediate Cost Structure

A cluster of direct patient care costs which are neither purely “indirect” nor purely “direct” are the ones called “intermediate” cost centres in the MMCH analysis. These included: operation theatre, laboratory, and radiology. Some of these intermediate cost centres were internally complex, the operation theater, for example, incorporated two areas of expenses: general surgery and gynecology surgery. Pharmaceuticals, medical supplies, repairs, and building depreciation linked with general surgery or gynecology surgery were placed in these intermediate categories. Medical staff were assigned only to surgery, and these costs were distributed between general surgery and gynecology surgery. Laboratory services included pathology and microbiology, drawn from MCH. Radiology included radiotherapy, another set of intermediate costs. Nuclear medicine was under the direction of the Ministry of Science and Technology and housed in a separate facility, a set of intermediate expenses not available from nuclear medicine due to the refusal of its staff to cooperate. Diagram III adds these intermediate costs into the cost centres chart from Diagram I.

**Diagram III: Step-Down method for MMCH analysis**



Once isolated as intermediate costs, expenses for operations theatre, laboratory, and radiology were allocated to the inpatient and outpatient “departments” or final cost centres of the study.

### 3.3 Numerators and denominators for Step-down

Financial analysis must produce cost ratios that managers and planners can use. The department and final cost centre structure must be linked with key utilisation denominators and key cost numerators to produce these ratios.

### 3.3.1 *The allocation process: bases for cost ratio denominators*

Not only must the shell or framework for allocations be set up for a financial analysis, it is also essential that an appropriate basis be defined and used consistently in the actual process of allocating each of the separate cost elements. The next sections sets forth in detail the actual bases for specific allocation choices concerning “denominators”—census and “beds.” These denominators are crucial in establishing “unit costs” at the department or final cost centre level.

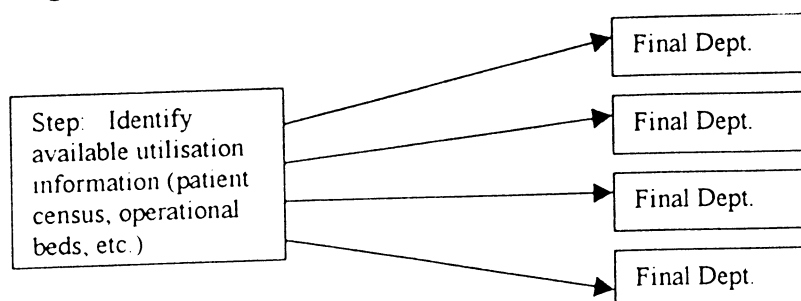
While the detail in this section is considerable, it provides a useful and close look at how the results of the study were developed. For those who would have to produce a financial cost analysis for management and planning purposes at other facilities, this detailed review may prove invaluable. In fact, it is not recommended that the detail of this section be skipped over by those interested in MMCH itself or the general method of financial analysis. Understanding the details of allocation are essential to a grasp of the benefits of the MMCH and similar studies.

As a general point it is useful to see that in allocating expenses to departments or final cost centres, some basis must be set forth for each element of the financial analysis. Many candidates present themselves as suitable to serve as the basis for an allocation decision. The basis chosen must match the kind of choice involved. Consider, for example, the range of bases used in the HEU study of MMCH. Each of the bits of information, despite their obvious range and variety, proved useful as bases for the HEU study, although some were appropriate for one allocation decision and some for another:

- patient admissions
- patient days
- personnel surveys
- staff assignment registers
- accumulated salaries
- pharmaceutical and medical supply distribution
- equipment location
- outpatient visits
- procedures
- square meters of patient areas
- student/staff bed distribution
- male/female bed ratio
- accumulated expenses

The basic step is to sort these candidates into two types: those useful for establishing the cost “denominators” and those useful in sorting costs for use as “numerators.” Using hospital utilisation and other allocation bases to develop a financial analysis first depends upon aligning the utilisation figures with the final departments or cost centres. Otherwise measures such as cost per bed or cost per inpatient day will not have appropriate denominators. This is shown in Diagram IV.

**Diagram IV: Alignment of Utilisation and Final Departments**



The section below shows concerns the actual steps taken to distribute utilisation (census and “beds”) to final department cost centres, thereby creating key denominators for the study.

### 3.3.1.1 Census

Daily census is important in calculating costs per inpatient day, cost per outpatient visit, costs per patient for inpatient and outpatient activities, and, of course, for the same measures at the department level. Daily census cannot be taken at face value, however. Any analysis that does so misunderstands the requirements of working with “available information.” For this reason, it is critical that missing census data essential for estimating cost ratios be identified and dealt with. In this section, the allocation basis of census is traced out *in detail* for those who might wish to reproduce the methodological steps of the MMCH study.

First, the separate *sources* of the census for MMCH and SKH were identified. These sources of census information focused on the daily patient census registers at MMCH. According to these registers, the census units were recorded as census units the following:

- Medical, Surgical
- Gynecology/Obstetrics
- Pediatrics
- CCU
- ENT
- Eye
- Orthopedics
- Dermatology & VD
- Casualty
- Cancer
- Psychiatry
- New Cabin
- Student Cabin
- Staff Cabin

- SKH TB
- SKH Infectious (App. H, p. 7).

To make use of the available data at MMCH, numerous crucial decisions had to be made. Perhaps to the novice in hospital cost analysis these issues may seem to be problems of data alone. Actually, they are deeply methodological questions. They go to the heart of the controversy in the analysis of hospital costs about whether available records can actually be used in hospital costing. The central question of method for the census data was this: what should be done if records are missing?

In fact, nineteen of 356 daily census registers were missing for the year period. The missing data were obtained from summaries of the monthly census for twelve of the nineteen missing daily census registers (App. H, p. 10 - 17). Nevertheless, the acquisition of these data was hardly a trouble-free bit of work. The monthly census summary contained the number of admissions, discharges, births, and deaths for each day of the month and the total for the MMCH, but the summaries of the monthly census did not provide census information for each census unit. Further, for the months of February and June of 1995, the monthly census summary could not be located. In February, six daily census registers were missing and June had one missing.

*The methodology solution? Calculate averages as a kind of data-smoothing exercise.* Thus, averages of the data available for February and the average of the data available for June were used to calculate the missing data for each respective month (App. H, p. 15 & 17). The missing data represented 5.0 percent of the patient days, 4.9 percent of the patients and 4.6 percent of the hospital discharges (App. H, p. 7) for the study period.

Second, once the methodological problems of *missing census data* were addressed, a new question arose. How should the available census information be linked with the final activity or “department” cost centres so that meaningful cost analysis can be performed? The answer in terms of method was to link census records with departments by “matching.” To match census units with inpatient wards, some census units were combined or distributed to other departments. The census units of Medical, Dermatology & VD were combined for the Medical Department. The census units of Surgical, Orthopedics, Casualty and Cancer were combined into the Surgical Department (App. H, p. 4). Eye and ENT were combined into EENT department.

The “New Cabin” category at MMCH posed still other challenges for the census, since records used it as a census record focus and since New Cabin was used for an element of cost control that hospital *management* would want to consider—i.e. the use of hospital facilities by hospital staff, government personnel, private patients and VIP inpatients. A method solution was needed to distribute New Cabin patients to final departments. After review of over 23,000 discharge records, 243 patients were identified as New Cabin patients. The 243 patients represented 32.6 percent of the total New Cabin patients for the year. Based on the New Cabin discharge records review, 14.8 percent of the New Cabin patients were hospitalized with a diagnosis pertaining to EENT, 29.6 percent for Medical, 41.6 percent for Surgical, and 14.0 percent for Gynecology (App. H, p. 2). The

New Cabin patient days of 7,720 (App. H, p. 3) were allocated to the other inpatient department based on the aforementioned percentages (App. H, p. 2). New Cabin patient days were 2.5 percent of MMCH total patient days. Student/staff beds are contained on the various wards (App. K, p. 3). Student/staff census unit data was distributed based on the number of student/staff beds in each department (App. H, p. 2). Student/staff patient days represented 1.9 percent of the Hospital's total patient days. Medical staff, pharmaceutical, and medical supply cost information were reported for the combined wards of Surgo Kanto Hospital; therefore, the census units of SKH were combined.

On the basis of the percentage analysis of available records, the following census units were assigned to final patient departments or cost centres for calculating department-level unit costs at the stage of analysis:

**Department:** Medical  
**Census Unit:**  
 Medical  
 Derm & VD  
 New Cabin (29.6%)  
 Staff/Student (29.9%)

**Department:** EENT  
**Census Unit:**  
 Eye  
 ENT  
 New Cabin (14.8%)  
 Staff/Student (23.9%)

**Department:** Surgical  
**Census Unit:**  
 Surgical  
 Orthopedics  
 Casualty  
 Cancer  
 New Cabin (41.6%)  
 Staff/Student (20.9%)

**Department:** CCU  
**Census Unit:** CCU

**Department:** Pediatrics  
**Census Unit:** Pediatrics

**Department:** Psychiatric  
**Census Unit:** Psychiatric

**Department:** SKH  
**Census Unit:**  
 Infectious Diseases - TB  
 Infectious Diseases - Other

**Department:** Obs/Gynae  
**Census Unit:** Obs/Gynae

### 3.1.1.2 Beds at MMCH

Another methodological issue area for the MMCH study concerns the use of available data about operating beds at the facility to yield a suitable denominator the calculation of “cost per bed” or “cost per bed-day” for MMCH, its inpatient/outpatient areas, and for its departments or final cost centres. Like census data, this important denominator must be consistently and logically developed from available data and methodological steps must be taken for resolving any conflicts between the data and the “department” classification scheme for MMCH cost centres.<sup>15</sup>

<sup>15</sup> Eventually, these figures also would serve a second purpose, namely to allocate costs. For example, when the distributed medical supply contained the designation of either male or female ward, bed

During the HEU study period, MMCH used three classifications of beds:

1. non paying
2. paying
3. student/staff.

The number and type of beds were identified for use in the allocation of costs for the twenty-six wards and SKH. The total number of beds were 825 with 629 beds for non paying patients, 129 beds for paying patients and 67 beds for students and staff. The final bed distribution was based on an analysis of ward bed usage so that a department-level distribution could be devised. The department results were 142 beds in medical, 222 beds in surgical, 143 beds in gynecology/obstetrics, 59 pediatric beds, 11 beds in CCU, 64 EENT beds, 10 psychiatric beds, 38 New Cabin beds, and 136 beds at SKH. The two beds in New Cabin reserved for VIP were classified as non paying. The number of GOB sanctioned beds were 500 beds at MMCH and 146 beds at SKH (App. K, p. 1).

### 3.3.2 *The allocation process: bases for cost ratio numerators*

If costs are to be useful for managers at a facility as large as MMCH, it is critical that cost ratios such as “costs per bed” or “costs per inpatient day” be linked to departments—as was noted above. It is equally critical, though, that these costs be developed as disaggregated costs, so that personnel, supplies, drugs, and other key sub-components of these departmental and inpatient/outpatient costs can be compared. In methodological terms, this amounts to an explanation of how the most detailed numerators for cost ratios in the MMCH study were derived.

#### 3.3.2.1 General and specific allocation assumptions.

Several assumptions had to be made for the step-down allocation of expenses, largely due to incomplete information, missing data, and summarised data. Missing census data was determined for seven days in the months of February and June by using the average of the data of each month, respectively. The allocation of the missing data into departments was based on the assumption that the accumulated data of each department in each month was representative.

Specific assumptions entered the allocation process in the following areas:

- The medical supply distribution ratios for the outpatient departments and operations theatre closely paralleled the pharmaceutical expense ratios for the same departments.
- Supply distribution ratios for the outpatient department were proportional to the diagnostic investigations utilised by these departments.

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distribution was used in allocation of the medical supply expense. The percent of medical supply allocation based on bed distribution was .4% of the distributed medical supplies as discussed below.

- Resources required for an inpatient surgery were treated as three times greater than the resources required for an outpatient surgery; resources required for gynecology surgery were equal to the resources required for general surgery.
- The level of payments for pathology procedures was assumed to be representative of the payments received for microbiology procedures.
- The utilization of capital equipment was treated as having an equal ratio between outpatient visits and patient days. The life of capital equipment had to be estimated for 14 percent of the equipment and the resulting estimates were incorporated into the analysis.

In the sections that follow, each major area of disaggregation is presented on a step-by-step basis. The presentation begins with *personnel* costs.

### 3.3.2.2 Questions of method: Personnel

MMCH had 813 working employees during the period of study, with budgeted employees numbering 830 (App. D, p. 15 - 17). The MMCH employee listing excludes professors, assistant professors, associate professors, interns, student nurses, and CDD personnel. As the MMCH financial analysis shows, the personnel costs at MMCH are a significant proportion of total hospital costs. They are, in short, important costs!

Methodologically, personnel issues concerning the disaggregation and allocation of costs to departments or final cost centres involves the use of existing hospital classifications. MMCH classifies personnel into four grades in accord with civil service breakdowns.

- **First grade** contains the positions (19) of Director, Deputy Director, Senior Store Officer, Senior Clinical Pathologist, Resident Physician, Resident Surgeon, Dental Surgeon, Registrar, Assistant Registrar, Radiologist, Radiotherapist, Clinical Pathologist, Anesthesiologist, Emergency Medical Officer, Medical Officer, Resident Orthopedic Surgeon, Administrative Officer, Bio-Chemist, and Statistician
- **Second grade** positions (4) include Administrative Officer, Accounts Officer, Deputy Nursing Superintendent, and Social Welfare Officer
- **Third grade** positions (38) were Dietician, Nursing Supervisor, Senior Staff Nurse, Diploma Pharmacist, Pharmacist Graduate, Medical Technologist, Chief Technician, Head Assistant, Stenographer, Steno Typist, U.D.A., Accountant, L.D.A, Cashier, Steward, Ward Master, Assistant Nurse, Housekeeper, Store Keeper, Photographer, Telephone Operator, Instrument Caretaker, Pathology Technician, Cardiographer, Driver, Medical Record Keeper, Instrument Technician, Sterilizer Mechanic, Electrician, Cash Sarkar, Tailor, Carpenter, Kitchen Supervisor, Peon, Calenderar, Mechanic, Store Assistant, and Moazzin
- **Fourth grade** positions (6) include Sarder, Jamader, Security Guard, MLSS, Cook, and Sweeper.



In the first grade, actual salaries and benefits were obtained for physicians, director, deputy director and store officer. In the second grade, actual salaries and benefits were obtained for each of the positions of social welfare officer, deputy nurse supervisors, administration officer, and accounts officer. The actual salaries and benefits of the third grade were obtained for senior nurses, assistant nurses, and third grade other. Five senior nurses and five assistant nurses were on deputation to the College of Nursing and the Nurse Training Centre, respectively, but continued to receive their salary through MMCH. The calculated salary and benefits of the ten deputed nurses were deducted from the actual salary and benefits. In the fourth grade, actual salaries and benefits were obtained for MLSS, sweepers, Sarder and Jamader, and fourth grade other (App. D, p. 4 - 6).

A first major method hurdle concerned physician salaries and benefits. The actual salaries and benefits of physicians were recorded for *all the specialities combined*. The individual positions not identified in the third and fourth grade were classified as "other", and contained combined actual salary and benefits for unidentified positions for each grade. This problem was solved in the following manner.

To determine the total salary for each of the positions for physicians, third grade "other" and fourth grade "other", the average budgeted salary and benefits per position (App. D, p. 18 - 21) were calculated from the MMCH Annual Payroll Budget (App. D, p. 22 - 43). The approach used involved dividing total budgeted salaries and benefits for each position by the total number of budgeted employees for each position. The actual number of employees for each position was identified (App. D, p. 15 - 17) and multiplied by the average budgeted salary/benefit for each position to derive a calculated salary/benefit amount for each position in each grade. Utilizing this method, the actual physician salary and benefits were .64 percent less than calculated salary and benefits for each of the medical specialties/positions combined. The calculated salary per medical speciality was then adjusted by .64 percent to equal actual total salaries for physicians. In the third and fourth grade "other", the calculated salary by position was 24.3 percent and 36.4 percent (respectively) below the actual total salary and benefits and was adjusted accordingly (App. A, p. 41 - 43). This reconciles reported and computed salaries but raises serious question about the record-keeping for third and fourth class employees.

The following sequence was used for salary calculation:

- Detailed salaries and benefits for each grade were identified and adjusted to equal the salary and benefit component of the Annual Expenditure Statement, less the AES amount paid to interns.
- Average budgeted salary and benefits by specialty/position were determined by dividing the total budgeted salary and benefits of each position by the number of budgeted employees in each position.
- Average budgeted salary and benefits for each position (multiplied by the actual number of personnel in each position) were used to determine the calculated total salary for each position

- The total calculated salary and benefits for the positions were then summarized for each grade and adjusted to equal the captured actual salaries for each grade as adjusted to the AES.

A second method question concerned discrepancies between actual salary records at the hospital and those officially reported in the MMCH Annual Expenditure Statement. *Total captured, detailed wages were 93.9% of the total salary and benefits reported on MMCH's Annual Expenditure Statement.* This method issue could not be resolved, since no basis could be found to show which figure was the more authentic record. The detailed salaries and benefits were increased by 6.1% to equal the figure of the Annual Expenditure Statement (App. D, p. 1 - 2).

A third method question concerning personnel related to how to develop a criterion for allocating costs to departments or final cost centres. This issue was resolved through survey methods. Personnel surveys and interviews were conducted to determine the staffing patterns for physicians, professors, MLSS personnel, and sweepers. The physicians' survey and interviews determined the amount of time by speciality expended on patient care in each of the inpatient and outpatient departments (App. J, p. 2). Calculated salary figures for each physician speciality were allocated into each patient department based on the percent of time each speciality expended in each patient department (App. A, p. 18 - 19).

A fourth method issue concerned how to incorporate the cost of Medical College professor's activities *which were only linked to MMCH.* Each category of professor posed specific problems. The professors' survey and interviews determined the number of professors involved in direct patient care as well as the amount of time they expended for outpatients, inpatients, teaching, and administration (App. J, p. 3). As a result, this report refers to professors, associate professors, and assistant professors are collectively referred to as *professors* hereafter. The percent of direct patient care time in relation to total time in each patient department then became the allocation basis for the calculated salary of professors. Methodologically, it was also important to know how to calculate salary figures for professors, since there was more than one salary for professors of a class. The average of starting salary and maximum salary for professors was utilized as the calculated salary figures for the report (App. J, p. 4). The allocated expense for professors salaries was 10.9 percent of the total medical staff expense, 3.8 percent of the total personnel expense, and 1.7 percent of total MMCH expense for the fiscal year (App. A, p. 22).

Interns posed still further payroll questions, since, as in many developing countries, interns are a key part of hospital service delivery. There were 155 medical interns receiving a stipend from MMCH during the interns' fifty-two weeks of training. All interns were required to have twenty-six weeks of training in Medicine and then compelled to choose between continuation in medicine or proceeding on to obstetrics/gynecology or to surgery for an additional training period of twenty-six weeks. *One half of the interns continued medicine, 25 percent selected gynecology/obstetrics and 25 percent selected surgery, according to MMC. The total calculated stipend for the 155*

interns was increased by .96 percent to equal MMCH's Annual Expenditure Statement stipend amount. The interns' stipend was then allocated based on the rotation period for interns in each department (App. A, p. 20 - 21).

For several classes of payroll, the method question posed by the MMCH study concerned either insufficient information or information that was not grouped by "department." Several different techniques were used to address this crucial problem of method. The fourth grade staffing pattern of MLSS and sweepers was determined through interviews with the Ward Master. Forty-seven of the 218 MLSS and twenty-three of the 127 sweepers worked in non patient care areas and were allocated into the patient departments based on the assignment in patient departments of the other MLSS and sweepers, respectively (App. J, p. 7). The number of MLSS and sweepers in patient care departments was the basis for allocation of the MMCH AES-adjusted actual salaries of MLSS and sweepers (App. A, p. 29). The salaries of the ward master, jamader, sarder, and house keepers were allocated into the patient departments based on the combined, allocated salaries of MLSS and sweepers. (App. A, p. 28).

The nurse staff register provided the number of senior, assistant and student nurses assigned to each department (App. J, p. 6). Although student nurses receive a stipend from the Nurse Training Institute, the stipend was not included in MMCH Annual Expenditure Statement. The second and third year student nurses worked three days a week at MMCH, while the fourth year student nurses worked seven days a week. The annual individual stipend was adjusted based on the percent of time at MMCH for the second and third-year student nurses. The number of students for each of the three years were multiplied by the adjusted stipend for each year to determine the total stipend for allocation. Based on the nurse staffing register (App. J, p. 6), the adjusted student nurse stipend amount was allocated into the patient departments (App. A, p. 27). Senior nurses' and assistant nurses' salaries were allocated to the patient department on the basis of their respective assignments (App. A, p. 25 - 26). Nurse supervisors' salaries were allocated on the basis of the accumulated, allocated salaries of senior nurses, assistant nurses, and student nurses (App. A, p. 24).

For the salaries of some personnel, a variety of basis had to be devised for solving the method question, "How should these personnel costs be assigned to departments or final activity/cost centres?" The salaries of carpenters and electrician/mechanics, for example, were classified as maintenance salaries and were allocated based on the square meters of patient departments (App. A, p. 32). The salaries of the chief technician, laboratory technicians, and pathology technicians were assigned to the laboratory (App. A, p. 11). The radiology technicians' and the radiotherapy technicians' salaries were allocated to radiology (App. A, p. 11). The number of electrocardiograms for each patient department was not available; therefore, the salary of the ECG technician was included in radiology. The salary of the dental technicians was allocated to outpatient dental department (App. A, p. 14). According to Physical Therapy records, the total number of patients treated was 432, of which 37 were inpatients (8.6 percent). The wards or departments of the inpatients receiving physical therapy were not available; therefore, physical therapist salaries were allocated to the outpatient department. The salaries of

dietitians, cooks and kitchen supervisor were assigned to dietary department (App. A, p. 39) and allocated based on patient days (App. A, p. 36). Salaries of instrument caretaker, instrument technician, store keeper, sterilizer mechanic, and tailors were assigned to Central Stores (App. A, p. 38) and were allocated on the basis of the medical supply distribution (App. A, p. 40). Salaries of pharmacists were allocated on the basis of pharmaceutical distribution (App. A, p. 40). The remaining balance of personnel and their salaries were assigned to administration (App. A, p. 38). The allocated administrative salaries represented 6.9 percent of MMCH total personnel expenses.

Once the foregoing method questions were settled and the actual decisions taken about how to proceed, the actual work of making payroll cost allocations could begin. But this called for an answer to yet another method question: "What should be the sequence or order in which the allocation of personnel costs should be taken up?" The following complex sequence was required for the allocation of salaries and benefits:

#### I. Sequence I

- Physician, professor, MLSS, and sweeper surveys were used to determine the number of personnel and percent of time each position expended in each department.
- Intern rotation patterns were used to determine the percent of time for interns in each department.
- The nurse staffing register was used to determine the number of senior nurses, assistant nurses, and student nurses in each department as well as the percent of each type of nurse present in each department.
- The measurement of the patient departments established the percent of square meters for the department in comparison with the total square meter area available for patient care at MMCH.
- Expense of pharmaceutical and medical supplies distributed to each department was divided by the total cost of the distributed pharmaceuticals and medical supplies, respectively, to determine the percent of pharmaceutical and medical supply distribution to each department.

#### II. Sequence II

- Professor salary was calculated.
- Intern stipend was calculated.
- Student nurse stipend was calculated.
- MLSS and sweepers assigned to non patient care areas were allocated to patient care areas based on patient care assignment of other MLSS and sweepers, respectively.

#### III. Sequence III

- Calculated physician's salary for each speciality/position was multiplied by the number of personnel in each position and by the percent of time expended

in each department by each speciality/position as determined in the first sequence, above.

- The calculated salary of professors was multiplied by the number of professors in each department and by the percent of time expended for direct patient care in each department, as determined in the first sequence.
- The calculated stipend of interns was multiplied by the number of interns and by the percent of time they expended in each department, again as determined in the first sequence.
- Total AES-adjusted salaries of senior nurses, less the calculated salaries of senior nurses on deputation, were multiplied by the staffing percent of each department as determined in the first sequence.
- Total AES-adjusted salaries of assistant nurses, less the calculated salaries of assistant nurses on deputation, were multiplied by the staffing percent of each department as determined in the first sequence.
- The calculated stipend of student nurses was multiplied by the percent of time expended in the hospital, by the number of student nurses, and by the staffing percent of each as determined in the first sequence.
- Total AES-adjusted salary for each position of MLSS personnel and sweepers was multiplied by the percent of time expended in each department as determined in the first sequence.
- The total calculated salaries of carpenters and electrician/mechanics were multiplied by the square meter percent of each department as determined in the first sequence.
- The total calculated salaries for instrument caretaker, instrument technicians, store keeper, sterilizer mechanics, and tailors were multiplied by medical supply distribution percent as determined in the first sequence.
- The total calculated salaries of pharmacists were multiplied by the pharmaceutical distribution percent as determined in the first sequence.

#### IV. Sequence IV

- The salaries for senior, assistant and student nurses, as determined in sequence III, were summarized for each department and the percent of salaries contained in each patient department was determined.
- The salaries for MLSS and sweeper, as determined in sequence III, were summarized for each department and the percent of salaries contained in each patient department was determined.

#### I. Sequence V

- Deputy nurse supervisors' and nurse supervisors' total calculated salary was multiplied by the nurse department percent as determined in the fourth sequence.
- Total calculated salaries for Sarders, Jamaders, ward master, and housekeepers were multiplied the MLSS/sweeper department percent as determined in the fourth sequence.

After passing through these steps, the allocation of personnel costs to departments could be considered satisfactory. As is obvious, numerous methodological problems occurred for personnel or salary costs in the MMCH study. It is hoped that the detailed presentation of answers to these method questions will illustrate an approach for how such analysis can be performed in complex hospital settings.

### 3.3.2.3 Questions of method: Supplies

*The MMCH Annual Expenditure Statement category "Pharmaceuticals and Medical Supplies" amounts to 24.9 percent of the Hospital's AES (App. B, p. 2).* This significant proportion of total hospital expenses raised a number of methodological issues. First among them concerned discrepancies between supply purchases and supply reports. As in the case of personnel, a central question for the MMCH concerned the actual count of supply expenses conducted by the HEU and the costs reported in the AES. Detailed listings of the purchases of pharmaceutical, medical supplies, and radiological supplies from the Central Medical Stores, Dhaka were compiled and found to represent 94.2 percent of the AES supply expense category (App. E, p. 1 - 24). The unidentified supplies were classified as "Other Medical Supplies" in the Adjusted Financial Statement (App. B, p. 6) as determined by deducting the identified supplies from the Annual Expenditure Statement's "Pharmaceuticals and Medical Supplies" information.

A second methods question for supplies concerned how to allocate pharmaceutical supplies to departments or final cost centres, since ward information was available but not "department" information. The steps taken to solve this problem were as follows.

- First, information was compiled on the distribution of pharmaceutical and medical supplies to each ward from MMCH Central Stores and the Central Stores of SKH (App. A, p. 57 - 168, 333, 336 - 380).<sup>16</sup> The distributed expenses of the pharmaceutical and medical supplies to the wards (App. A, p. 169 - 329, 333, 336 - 380) were used as the basis for allocating the actual expense of the supplies and pharmaceuticals to each department (App. A, p. 48 & 330).
- Information from pharmacy issue slips was used to determine pharmaceuticals issued to wards. The issue slips indicated the following wards: one through twenty-three, wards 21 and 22 combined, labour, New Cabin, CCU, ER, and other (App. A, p. 48). The "other" category was for operation theatre and the outpatient departments. Pharmaceutical "other" expense was allocated based on the same ratio as medical supply distribution (App. A, p. 47).
- The wards were combined into departments on the same basis of census and bed allocations, including the combined wards of 21 and 22 (observation) having two

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<sup>16</sup> At this point a subsidiary method issue arose: prices provided by MMCH central stores for the distributed pharmaceuticals and medical supplies did not correspond to the prices obtained from CMSD for the purchased pharmaceuticals and medical supplies—see below.

female psychiatric beds. The pharmaceutical allocation for wards 21 and 22 was 93.3 percent into surgical and 6.7 percent into psychiatric (App. A, p. 46).

- Medical supply issue slips provided the information used to determine medical supplies issued to wards. The issue slips indicated wards one through 20, 25, 26 as well as the combined wards of 13, 14 & 15; 16 & 17; 17 & 18; 21 & 22; 3 & 24; and wards 9 & 10. Another designation on the same issue slips was “female ward” and “male ward” (App. A, p. 331). The combined wards of 13, 14 & 15 were wards in the medical department. EENT department included the wards of 16, 17 & 18. Wards 3 and 24 were in the gynecology/obstetrics department, and wards 9 and 10 were in the surgical department. The male and female wards distributed supply expense allocation to the other wards was based on the combined supplies distributed to each male ward and each female ward, except for the combined wards of 21 & 22, 25; 16 & 17; 17 & 18; 9 & 10; and 26. For the combined wards mentioned earlier, the number of male beds to female beds was used as the basis for supply allocation (App. A, p. 334 - 335). The amount of the male/female ward distributed supply expense allocation, based on bed designation, represented .4 percent of the distributed medical supply expense. The allocation method, for the distributed supply expense for wards 21 and 22, was the same method utilized for pharmaceuticals (App. A, p. 330). The total male/female distributed supply expense was 1.17 percent and .44 percent, respectively, of the total distributed supply expense.

At this point, expenses for supplies and pharmaceuticals were allocated to departments.

#### 3.3.2.4 Questions of method: dietary and laundry issues

In the case of dietary and laundry expenses, the issue was that of finding a meaningful basis for allocation. In the end, these costs were allocated on the basis of patient days (App. A, p. 36). Dietary expense consisted of supplies and personnel expense (App. A, p. 37). Meals were served only to inpatients. Laundry expense was comprised of soda, soap, and diesel fuel (App. L, p. 13). Because laundry would normally be expected to benefit both outpatient and inpatient services, a method issue for the MMCH study was whether to allocate any expenses to outpatient services. The director of the laundry services at the hospital stated that less than 1 percent of the laundry was for outpatient departments; therefore, the laundry expense was allocated to the inpatient departments. The laundry occasionally washed door curtains and window screens for the outpatient departments and it was not considered significant to allocate these expenses to the cost of outpatient service provision.

#### 3.3.2.5 Questions of method: repairs and electric—maintenance issues

*An interesting question of method is what to do when a category is simply missing. Astoundingly, this category is “equipment and building repair expense. These expenses were not contained in the MMCH “Annual Expenditure Statement.”*

First, the HEU team collected data on all major items of equipment repair during the field study period. Then, equipment repair expense was to be allocated to specific departments, *but on what basis?* This problem of method led to the use of multiple allocation methods. Radiology, CCU, and other departments received allocations based on equipment description and location (App. F, p. 1). The Sirecust 402 Cardimonitor Unit was used exclusively in CCU. The Theracard 400 Defibrillator was used by several departments and this expense was assigned to administration because of its multi-usage pattern (as if it were “overhead”). The balance of the repair work was for radiology. Calculated salaries for electricity and maintenance were allocated on the basis of square meters within patient departments. Building repairs proved somewhat difficult, but they were essentially either MMCH or SKH expenses. Thus, these expenses were divided between MMCH and SKH, but again, “on what basis.” In the end, a traditional method was used: the building repair expenses for MMCH and SKH were allocated to patient departments based on MMCH’s and SKH’s square meters, respectively (App. A, p. 32).

#### 3.3.2.6 Questions of Method: Depreciation issues

*Building and equipment depreciation expenses also were not contained in MMCH’s “Annual Expenditure Statement.”* This is a significant oversight within the financial reporting of the hospital and should be taken into account for management and planning. To fill this gap, the HEU team obtained the 1992-93 current value for MMCH and SKH buildings separately (App. G, p. 5). Then a method or basis for allocation had to be devised. A traditional method was settled upon: allocation of the building depreciation expense for MMCH was based on the square meters of each patient department and the depreciation expense for SKH was allocated between infectious and TB departments based on their respective square meters (App. A, p. 33).

Capital equipment depreciation expense was linked to patient departments when possible. Given the “constructed” nature of some of the final cost centre departments, this was not a straightforward matter, however. The equipment depreciation expense categories were:

- CCU
- Dental
- EENT
- Inpatient
- gynecology/obstetrics
- operation theatre
- radiology
- general equipment depreciation (App. G, p. 1 - 4).

The CCU, Dental, O.T., and Radiology depreciation expense were allocated directly to their respective departments. The EENT equipment depreciation expense was divided between EENT inpatient and outpatient based on the ratio of EENT patients days and EENT outpatient visits. This method was used because of the “constructed” nature of the EENT department and represented a usage based method for allocation of expenses.



Capital equipment used by several inpatient departments was classified as “inpatient equipment”. Inpatient equipment depreciation expense was allocated to inpatient departments on the basis of patient days, again linking it methodologically to usage. The capital equipment depreciation expense for gynecology/obstetrics inpatient and outpatient departments was allocated on the basis of a ratio between inpatient days and outpatient visits. The aforementioned allocations are contained in Appendix A, page 34. The capital equipment depreciation expense classified as “general” was assigned to administration (App. A, p. 37).

### 3.3.2.7 Questions of Method: Staff Housing Repairs and Depreciation

The importance of staff housing lies in its role as a personnel benefit, ultimately. *But staff housing depreciation and repair expenses were not contained in MMCH's "Annual Expenditure Statement."* The 1992-93 current value of staff housing (App. G, p. 5) and building maintenance information (App. F, p. 2) were provided by Public Works Department of the GOB. The cost of electricity for staff housing was not identified. Staff housing depreciation and repair expenses were allocated based on accumulated personnel expense of each patient department (App. A, p. 35). With the multiple step-down cost allocation methodology employed in this study, the staff housing expense allocation was based on 60 percent of the salaries of the hospital.

### 3.3.2.8 Questions of Method: Diagnostics

*External pathology and microbiology diagnostic expenses also were not contained in MMCH's "Annual Expenditure Statement."* The procedures, performed by the pathology and microbiology departments of MMC, were identified and quantified (App. L, p. 2 & 5). Cost of examinations performed by MMC was drawn from the College's examination fees (App. L, p. 9) multiplied by the number of examinations. The pathology department collected fees for the procedures performed for private citizens staying in the New Cabin ward and for non-hospital patients. The fees collected by the College's pathology department (App. L, p. 3 - 4) were treated as a deduction from the calculated total pathology revenue (App. L, p. 1). The fees collected were 1.4 percent of the total calculated revenue. The same methodology was employed to determine the College's microbiology department's calculated revenue. The amount collected for microbiology procedures was not obtained; therefore, the pathology department's collection rate of 1.4 percent was used to reduce microbiology's calculated revenue (App. L, p. 5). The net calculated revenue of the College's pathology and microbiology departments was an allocated diagnostic expense to MMCH (App. A, p. 11).

The hospital's diagnostic cost centres were Laboratory and Radiology. Laboratory included pathology expense as well as MMCH diagnostic expenses. Radiology consisted of radiology and radiotherapy. Expenses allocated to the diagnostic departments included:

- medical staff salaries

- technician salaries
- pharmacy salaries
- central store salaries
- fourth grade salaries
- pharmaceuticals
- medical supplies
- building repairs
- equipment repairs
- depreciation expense
- electricity (App. A, p. 11).

Laboratory and radiology allocated expenses were allocated between inpatients and outpatients based on the number of inpatient/outpatient procedures performed by each respective diagnostic department (App. A, p. 10). The inpatient diagnostic expense was further allocated to inpatient departments using as a basis patient admissions (App. A, p. 9). Outpatient diagnostic expense was further allocated by the use of a pharmaceutical and medical supply expense ratio for the outpatient departments (App. A, p. 8).

#### 3.3.2.9 Questions of Method: Operation Theatre

Operating theatre allocated expenses included salaries, pharmaceuticals and medical supplies, repairs, building depreciation, equipment depreciation, and electricity (App. A, p. 7). Medical staff, MLSS, and sweepers personnel expense and equipment depreciation expense were without differentiation at MMCH between general surgery and gynecology surgery so that the number of surgeries for gynecology and general surgery was used as proportions to allocate these expenses into the two surgical departments.

Medical supplies, pharmaceuticals, repairs, and building depreciation expenses were allocated to the operations theatre with the designations of general surgery and gynecology surgery. To acknowledge the increased resources required for inpatient surgery relative to outpatient surgery, inpatient surgeries were increased by a factor of three (App. A, p. 12). Operating theatre's allocated expense for the two surgical departments were allocated between inpatients and outpatients based on the number of adjusted surgeries. The operation theatre departments used for expense allocation were inpatient general surgery, inpatient gynecology surgery, outpatient general surgery and outpatient gynecology surgery (App. A, p. 6).

#### 3.3.2.10 Questions of Method: New Cabin

Patients from New Cabin ward were classified, as noted above, into four areas:

- EENT
- Medical
- Surgical
- gynecology

The allocated new cabin expenses included personnel, supplies, laboratory, radiology, laundry, dietary, depreciation, and repairs (App. A, p. 5). The accumulated, allocated expenses were further allocated to the four inpatient departments based on New Cabin patient classification proportions obtained from discharge registers review (App. H, p. 2).

### 3.3.2.11 Questions of Method: Administration

Administrative expenses include:

- personnel
- non-classified equipment repairs
- CDD project
- telephone and postage
- municipal tax
- transportation fuel and maintenance
- non-classified equipment depreciation
- miscellaneous expense (App. A, p. 37 - 38).

Administrative expense was 5.5 percent of MMCH total expenses. The administrative expenses were further allocated on the basis of the accumulative, allocated expense of the patient departments. Ultimately, the administrative expense allocation was separated into medical staff, inpatient departments (medical, surgical, gynecology/obstetrics, pediatrics, CCU, EENT, psychiatric, and SKH) and outpatient departments (emergency, outpatient, dental, gynecology, medical, and surgical) (App. A, p. 2). Because of the four-part, step-down cost allocation methodology, rounding errors occurred with the various allocations. The amount of the rounding errors amounted to 109 Tk from the total identified cost of 119,029,175 Tk (App. A, p. 1).

## 4. Study Constraints

### 4.1 *Main study constraints*

Chiefly, the MMCH study faced constraints having to do with challenges of data and data collection for an operating, multi-hospital teaching facility in a developing country. These data constraints were both general ones that could be faced in any such facility and ones that were quite specific to the MMCH study. They are discussed here to assist those who may conduct financial analyses in Bangladesh in the future. Other study constraints were linked with this constraint, as might be expected, since the validity and reliability of financial information are the heart of any financial analysis. One constraint was the direct result of HEU study solutions for data constraints in the MMCH analysis. In effect, the hospital's Annual Expenditure Statement [AES] was found to have extensive missing information—information which should be included in an adequate AES. A final constraint concerned the estimation of MOHFW contribution to the expenses of MMCH.

### 4.2 *General constraints of available data at MMCH*

The MMCH study is based upon available records or “data” that have been transformed and converted into financial information. Data quality and problems place a significant constraint on the quality of the financial information that results from the data analysis. Without a thorough understanding of limits and strengths of available data sources, recommendations for management and policy improvement based upon the field work may misfire. Furthermore, management improvements for Bangladesh hospitals are not likely to be effective until steps are taken to improve records and available facility data. Whether quality of care, the health referral system, or another issue is the subject of discussion, not very much is likely to be improved without improved hospital data.

In the MMCH study, the use of available hospital records to calculate per patient healthcare expenses and other unit costs has proved to be a difficult process. There are three principal reasons for these difficulties:

1. the impact of external entities on data quality and availability
2. documentation of information about utilization at the hospital
3. documentation of expenditures within and outside the hospital

#### 4.2.1 *External data source examples*

Several *external entities* provided services for MMCH, but the costs of these services were not included in the expenditure statements of the hospital. In short, data did not exist and were not counted in the available records. The educational and training facilities of MC provided direct patient care through professors, interns, and student nurses. The Public Works Department provided building construction and maintenance for the hospital; CMMU provided medical equipment repair, building repair, and construction.

Yet another external entity, Central Medical Supplies, Dhaka [CMSD] was responsible for purchasing and issuing all pharmaceuticals, medical supplies, instruments and medical equipment for all government medical facilities. CMSD also contracted with Original Equipment Manufacturers [OEMs] for equipment maintenance.

The expense data of other entities were not within the available records of the hospital. The Ministry of Science and Technology was responsible for Nuclear Medicine. The nuclear medicine clinic provided diagnostic testing of inpatients at no cost to the Hospital or patient. “Further Improvements through the Four Medical College Hospitals” project and the Control of Diarrhoeal Diseases project also took place during the year of this study. *The external expenses identified in the study period were 31.3 percent of the MMCH “Annual Expenditure Statement” (App. B, p. 7).*

#### **4.2.2 Hospital utilisation data examples**

The available internal census and financial records for MMCH varied by time period covered, form/format of the record, content (for the same function), and size—with some financial source documents varying in size from a few centimeters to several meters. Patient statistical data, for example, were summarized on a calendar year basis, while expenditures were reported for the fiscal year ending June 30<sup>th</sup>. The reporting of diagnostic services by inpatient area simply did not exist, thus denying an important quality control and management tool to the hospital. Departmental documents for MMCH existed in a daily journal form but many were without a monthly or annual summation.

#### **4.2.3 Data documentation examples**

The Annual Expenditure Statement [AES] of MMCH was irregular in form, containing overly general information in some places and irregularly categorised information in others. For example, the AES was divided into two very general sections—personnel expense and other expenses. These sections became irregularly specific, with AES personnel expense contained the categories of officer salaries, staff’s salaries and various benefits. Officer salary included salary information for medical staff and administrative personnel. Other AES expenses were divided into eight categories: telephone, postage, municipal tax, electricity, transport maintenance and fuel, miscellaneous, diet, and pharmaceutical/ medical supplies. Meaningful categories had to be devised and data made to fill these information bins.

Perhaps the best illustration of incompleteness in the AES is that patient revenues were not reported in there at all. A vast majority of the on-site project time for the HEU study was expended to obtain data for salary, pharmaceutical, and supply expenses, due to AES shortcomings.

#### **4.2.4 Specific data constraints**

Detailed available data constraints also existed for the MMCH study. These were:

#### 4.2.4.1 Census data constraints at MMCH

The data for each census unit at MMCH were obtained from the daily census registers maintained at the administrative offices of the statistician. Some daily census registers were missing. These missing data had to be obtained from monthly census summaries when and where they were available. These monthly census summaries contained the hospital's total admissions, discharges, births, and deaths for each day of the month and a total for the month. Because the summaries did not provide census information for individual census units, they had to be estimated from the patterns found in available daily census registers.

Further, for the months of February and June, the monthly census summary could not be located. February had six missing days and June one. The missing data of the daily census registers amounted to 5.0 percent of the patient days, 4.9 percent of the total patient population and 4.6 percent of the hospital discharges (App. H, p. 7). New Cabin information was amalgamated for staff, student, general patients and VIP regardless of reason for admission. Over 22,000 discharge records had to be reviewed to identify the New Cabin patients by inpatient departments for allocation of census data and expenditures (App. H, p. 2 & App. A, p. 5).

#### 4.2.4.2 Departmental statistics data constraints

Utilization information was obtained from logs or registers maintained for the departments of radiology, radiotherapy, electro-cardiography, ambulance, surgery, blood bank, dental, laboratory, and outpatient departments. Information for surgeries from July, 1995 through December, 1995 was collected from Operation Theatre registers. Statistics pertaining to SKH were drawn from monthly reports submitted to DGHS. Inpatient and outpatient summary information was obtained from the MMCH Daily Summary report. Because the "department" was the final cost centre of the study, departmental data deficiencies slowed and encumbered the study significantly as it worked toward the goal of providing unit cost information for this level of operational activity at the hospital.

#### 4.2.4.3 "Bed" data constraints

MMCH was authorised by the MOHFW to have 500 operating beds during the period of field study. But these sanctioned beds did not include the 287 beds which were "locally arranged." Furthermore, the New Cabin beds were not among these 500 beds. Still more challenging from the standpoint of financial analysis was the fact that the number of beds being operated on any given day varied according to "the Hospital's requirements." Only the number of student and staff beds appeared to remain constant during the study period. The sanctioned bed information was obtained from DGHS. In the end, the number of beds reported in this study was obtained by HEU survey of the current beds in the hospital, since information concerning the number of beds utilized during the time period of study was not otherwise available.

#### 4.2.4.4 Revenue data constraints

Fee amounts charged for hospital services had to be obtained separately from the MMCH statistician. Monthly revenue at the hospital was obtained from revenue reports maintained by MMCH cashier's office. Since revenue had to include counts of otherwise eligible patients from whom no fees were collected, data on patients exempted from hospital fees was collected separately from the Emergency and Outpatient Exempted Registers. Paying bed and cabin information about revenue and utilization was obtained, again separately, from the Rent Controller in the Cashier's office where the register for Seat Rent from Cabin and Paying Beds was maintained.

#### 4.2.4.5 Personnel data constraints

The MMCH Annual Payroll Budget was prepared by MMCH, submitted to DGHS, and maintained in the MMCH Accounts office. First, there were problems regarding the staffing position of each employee category. The payroll budget was used to determine an average budgeted salary for each personnel position. The actual number of staff was obtained from the MMCH statistician as well as from physician and professor surveys. Staffing patterns for physicians and professors were then determined by HEU surveys and by interviews with physicians and professor and the salary structure for professors was obtained from MMC records. Nurses posed other data problems: the Nurse Superintendent's office prepares a monthly register indicating the nursing staffing assignments, but the monthly register is discarded at the end of each month. Further, the Superintendent's office regularly reassigned nurses depending on the number of daily patients in each ward during the month. To deal with nursing payroll data problems, the June, 1996, register was used to establish the staffing pattern of senior, assistant, and student nurses. The MLSS and sweeper staffing patterns were obtained through HEU interviews with the MMCH Ward Master.

Second, although all salary information was drawn from individual payslip registries, this *salary information* was actually obtained from several different sources. More importantly, certain categories of personnel data were not treated in a uniform manner. In particular,

*the Accounts Office prepared all payslips except for those of physicians, Director, Deputy Director, Senior Store Officer and Administrative Officer. The physicians prepared their own payslips and submitted the payslips to the Cash Peon. The payslips for the Director, Deputy Director, Senior Store Officer and Administrative Officer were submitted to the authorizing peon at DGHS office and paid through the Treasury.*

All the other employees were paid through the Cash Peon with the records maintained by the Accounts Office, except for student nurses. The student nurses received a stipend from the Nurse Training Institute, Mymensingh.

To add to the complexity of the personnel data, the data concerning benefits of employees had to be collected from various sources, perhaps involving different standards or formats for record keeping. Employee benefit data were obtained from several different registers. The Arrears Register, maintained by the Accounts Office, provided individual detail of payments for retirements, unused leave, medical allowance, festival bonus, and other allowance not previously paid. The Staff Festival Bonus Register provided the information for festival bonus payments.

#### 4.2.4.6 Supplies, pharmaceutical, and “other” data constraints

Data for medical supplies and pharmaceuticals were obtained from several different sources. Medical supply information was drawn from the individual vouchers of the CMSD, the MMCH Medical Store, and the daily supply log of the hospital. The documents available indicated:

- the date of purchase
- item description
- quantity and unit price and/or
- total price for supplies.

The sources of information were reviewed carefully. Items with the same month of issue and description were eliminated. According to Mr. Abu Taher, Section In Charge, CMSD, transport cost from CMSD to MMCH was borne by MMCH. Prices of pharmaceuticals, medical supplies and equipment obtained from CMSD, were assumed to include the cost of procurement and storage. Under ideal circumstances, this assumption would be put to a field test, but in the MMCH study resources did not allow such testing.

Data for medical supplies distributed from the MMCH Store Office to the departments/wards were collected for the three month period from July through September, 1994. The information was obtained from individual receipts containing the date, name of the medical supply, quantity issued, and the department/ward. The records were located at the Store Office, the issuing source of all medical and pharmaceutical supplies. Unfortunately, these individual receipts pointed to a new specific data issue:

*the price of the individual supply items was not on the receipt.*

The Store Office provided an “acceptable price list,” but the “acceptable prices” differed from the prices for supplies procured from CMSD and local businesses. The MMCH study solution was as follows. First, the distributed medical supply expense for each department/ward was used to determine the distribution percent to each department/ward. Then, the distribution percentages were applied to actual procurement prices obtained from CMSD and local businesses to determine annual supply expense for each department/ward. Distributed pharmaceutical expense for each ward was then accumulated for the entire twelve-month period of the study.



Information for the twelve-month period, came from the Medicine Issue Register located at the Store Office. The register had the date, recipient's name, department/ward, name of the pharmaceutical, and quantity issued. But again a specific available data problem emerged:

*Drug prices were not maintained in the register.*

To deal with this data issue, the following steps were taken. First, all wards were designated by the ward number, with the only exceptions being the two designations "Emergency Room" and "Other." The Instrument Care Taker, who was responsible for all pharmaceutical supplies, then provided the missing prices. Unfortunately, HEU staff were not given access to the source documents for these prices. The expense for pharmaceuticals issued to the wards was used to determine proportions to use for allocating ward expenses between the departments. The actual expenses for pharmaceuticals, with prices obtained from CMSD, were allocated to the departments based on distribution proportion of expense borne by the patient departments.

"Other" expenses posed data constraints in the case of laundry expense. This information was provided by the Laundry In-Charge from registers with item name, unit cost, and total cost. The three laundry expense items were soda, soap, and diesel fuel.

#### 4.2.4.7 Repairs data constraints

Equipment repair expense information was obtained directly from CMSD. Most equipment repairs were for X-ray and CCU equipment. Building repair expense was obtained from the Public Works Department, Mymensingh. PWD maintained repair registers for MMCH, SKH, and staff quarters. The remarkable question posed for MMCH investigators was whether this could be all the equipment repair occurring at the hospital. This question remained unanswered, but a more complete study is warranted of this very vital issue.

#### 4.2.4.8 Depreciation data constraints

Capital equipment information had to be obtained from two different sources. The data for equipment procured during the study year was drawn from CMSD records. The data for equipment procured from 1985 through June, 1995 came from the MMCH Instrument Caretaker. The data elements required were:

- equipment description
- date of purchase
- equipment quantity
- unit cost
- total cost.

But a serious problem concerned the useful life of equipment in Bangladesh. Eventually, the MMCH study had to settle for a less than desirable source for its standard in this area.

The American Hospital Association's "Estimated Useful Life of Depreciable Hospital Assets" was used to determine the life of 86 percent of the equipment listed. The remainder of equipment useful life was estimated from information gained at the facility in the following manner. First, through interviews and equipment descriptions, equipment was linked, when possible, with the department utilizing the equipment. The departments with identifiable equipment were CCU, dental, EENT, obstetrics/gynecology, operation theatre and radiology. This represented 58.9 percent of the equipment items in these departments. The balance of the capital equipment was either for use with reference to inpatients globally or for the entire hospital's general use. Through these two standards, useful life for hospital equipment was obtained for calculating depreciation and allocating it to departments—"final cost centres."

The information for building depreciation expense was obtained from the Public Works Department office in Mymensingh and from CMMU. The estimated useful life of MMCH buildings and construction again was based on AHA's "Estimated Useful Life of Depreciable Hospital Assets." A key part of depreciation information also concerned the "Further Improvement of Four Medical College Hospitals" project. FIMC was started in 1993, with work beginning in 93-94. The purpose of the project was essentially Mother and Child Health (MCH) development, but it included construction consisting of an outdoor pediatric ward, a ramp, installation of new deep tubewell, and arboriculture. Data issues focused on how to piece together the costs for depreciation calculation. First, the construction expense, including salaries, was not contained in the AES, so this source could not be used. Total FIMC construction cost was obtained from the personal assistant to the Project Director, CMMU, Dhaka. Of the construction expense, GOB paid 396,195 Taka and the IDA paid 3,565,760 Taka. The total construction and salary expense was capitalized.

#### 4.2.4.9 External expense data constraints

External expense data documents were also a constraint on the study. They were concerned with pathology, microbiology, and Control of Diarrhoeal Diseases project (CDD). The number of tests and revenue collected for pathology was obtained from the Medical College Pathology Department. Microbiology test figures were obtained from the Medical College Microbiology Department. Both departments prepared reports for the HEU from their test registers. CDD was a country-wide project and had to be scaled-down to MMCH. The CDD personnel, assigned to MMCH, consisted of a medical officer, audio-visual operator, a MLSS and a sweeper. The salary information for the four staff members was provided by the MMCH accountant and was included in Administrative expenses.

### 4.3 Annual Expenditure Statement constraint

The "Annual Expenditure Statement" is prepared by MMCH and submitted to DGHS. After the detailed expense data for salaries, medical supplies, and pharmaceuticals were obtained from individual records, as noted above, the results reported in the AES could

no longer be taken as straightforwardly valid. The following AES items were clearly deficient in the existing AES:

*Depreciation, repairs, the microbiology and pathology of MMC, professors, student nurses, CDD project, and FIMC project expenses were not contained on the AES. The expense information, obtained directly from the AES, represented 20 percent of the AES total expense and 15 percent of the MMCH's total captured expense. This finding suggests that important management control issues must be addressed at the facility.*

In fact, only telephone, postage, municipal tax, electric, fuel and maintenance, miscellaneous, and food expenses (excluding laundry supplies and fuel) were obtained directly from the AES.

#### **4.4 Central Ministry expense constraint**

A final constraint for the study, one mentioned elsewhere, involves the estimation of Central Ministry expenses that are involved in the cost of service provision at the departments of MMCH. The problem involves information about the allocation of direct costs and overhead costs associated with the Central Ministry of the MOHFW and the DGHS to MMCH "final cost centres." Ultimately, a financial analysis of the facility should know how much each of the inpatient costs per patient day at an MMCH department, say the Gynae/Obs. Department, could be traced back to Central Ministry and DGHS as direct or indirect costs. In the case of the Central Ministry this was not attempted. For DGHS, only those direct costs linked to the operation and planning of MMCH were counted. The basis for assessing the DGHS costs was expert opinion in DGHS and interviews at MMCH. Sources for the information were GOB revenue and development budget revised allocations.

## 5.0 Financial Analysis

### 5.1 Major findings of the analysis

This financial analysis begins with a summary of major findings of the MMCH study. As with all such reports, such findings cannot be read in isolation but must be seen in terms of detailed financial analysis findings to attain their full significance.

#### 5.1.1 Occupancy

Occupancy rates are a measure of inpatient resource utilization, but the meaning of the measure depends upon whether its basis is accurate. Since “locally arranged” beds at MMCH expanded and contracted in keeping with the number of patients admitted to the hospital, the occupancy rates of most departments could not be determined with accuracy. Using the number of beds available in each department during the on-site visits in the next fiscal year as a standard, the HEU study computed occupancy rates

Computed occupancy rates for the hospital varied from a low of 28.0 percent for the psychiatric department to a high of 129.4 percent for pediatrics. The CCU occupancy rate was 100 percent. SKH’s occupancy was 49.2 percent for TB and 31.4 percent for infectious diseases (App. H, p. 1). The number of staff beds and New Cabin beds remained constant (App. K, p. 1) over the study period. Patient days pertaining to the staff beds were 5,869 with an occupancy rate of 24.0 percent. New Cabin’s patient days were 7,720 with an occupancy rate of 55.7 percent (App. H, p. 2). Excluding pediatrics and SKH beds, 51.9 percent of the beds were designated for male patients and 48.1 percent were for female patients.

The MMCH occupancy rates become important as management and resource allocation questions. Pediatrics, with its 129.4 percent occupancy rate, contrasts sharply with psychiatry at 28.0 percent, although a number of other departments could have been chosen for such a comparison as well. Given the relative costs per inpatient day of the two departments, there is reason to explore carefully the details behind these figures and to explore the mission and goals statement of the hospital to assess relative priorities.

#### 5.1.2 Average Length of Stay

The average length of stay (ALOS) at the hospital was determined by dividing the total patient days (310,181 days) for the Hospital by the total number of patients (43,000 patients) in the period. **The ALOS for all the patients of MMCH was 7.2 days.**

At the department level, the story changes further. SKH’s TB department had the longest ALOS of 39.5 days. SKH’s infectious department had the shortest ALOS of 2.3 days. The Psychiatric Department had the second longest ALOS: 12.5 days. Patients in the medical department stayed an average of 6.2 days, and surgery department patients

averaged 9.8 days. The Pediatric Department ALOS was 4.4 days, and gynecology/obstetric patients had an ALOS of 7.7 days. CCU patients had an ALOS of 3.9 days and EENT patient ALOS was 11.9 days (App. H, p. 1). Patients in the staff beds stayed an average of 9.9 days, and New Cabin patients stayed an average of 10.4 days (App. H, p. 3 & App. K, p. 2).

### 5.1.3 MMCH Birth and Death Rates

The death rate for the entire Hospital was 5.4 deaths per 100 admissions. The EENT department had the lowest death rate of 0.9 deaths per 100 admissions and gynecology/obstetrics department had the next lowest death rate of 2.3 deaths per 100 admissions. CCU had the highest death rate of 12.1 deaths per 100 patients. It is important from a clinical point of view to note the following:

*Pediatrics had the second highest death rate of 10.3 deaths per 100 patients.*

This high death rate, given the high average occupancy of the department, points to an area for managerial exploration.

The number of births for the year was 2,252. Of the patients admitted to the gynecology/obstetrics department, 28.4% were for delivery (App. H, p. 1).

### 5.1.4 Total Cost Per Unit

The AES for MMCH was increased by 27,789,474 Taka to account for the identification of additional diagnostic services, personnel, depreciation, repairs and projects not reported in the document. As was noted above under "Study Constraints," the AES may require revision before it can serve as a valid document for planning purposes. The main point about the AES can be summarised as follows:

*The identified expenses not contained in the AES represented a 31.3 percent increase of AES totals. In the fiscal year, this amounted to approximately US\$ 830,000 of under-reported expenses.*

Since these expenditures are significant amounts, their non-reporting on the AES has a most serious implication for the real costs of operating MMCH. If such under-reporting is characteristic of the hospital sector generally, then overall hospital costs could be widely under-reported.

The total cost of facility operations for MMCH during the study year, including depreciation expense and medical staff expense, was 118,461,474 Taka (App. A, p. 1)—roughly US\$ 2.5 million.<sup>17</sup>

Several key points are worth emphasizing here. First,

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<sup>17</sup> The total cost of operations excluded the salaries of the ten nursing staff on deputation.

*Medical staff expense was 18,882,107 Taka or 15.9 percent of total study year expenditures.*

Medical staff expense included professor expenses of 2,057,342 Taka and intern expenses of 7,425,000 Taka (App. A, p. 16). Personnel expense, excluding medical staff was 29.0 percent of the total identified expense (App. A, p. 15).

Building and equipment depreciation expense for the year of study was 17,841,407 Taka or 15.1 percent of total study year expenditure (App. G, p. 1 & 5). Of the total expense, pharmaceuticals and medical supplies, including radiology supplies, represented 19.1 percent, food was 6.8 percent and electric was 6.6 percent (App. B, p. 6).

A most important point is to recognize that the key components of costs at the hospital are few in number. In fact:

*Medical staff, personnel, supplies (including drugs), depreciation, food, and electric expenses accounted for 92.5 percent of the MMCH total identified expenditures.*

Control of these costs are essential from a managerial standpoint.

The total allocated expense for inpatients was 96,580,583 Taka or slightly more than US\$ 2 million in the fiscal year. *The MMCH total cost for each patient day was 311 Taka, which included 48 Taka per patient day for medical staff expense.* The inpatient departmental average cost for each patient day, including medical staff, ranged from 244 Taka to 1,202 Taka.

The highest costs per patient day expenses were found to be those of the Psychiatric department. Allocating building depreciation expense on the basis of square meters and general inpatient equipment depreciation expense on the basis of patient days, depreciation expense amounted to 37.2 percent of the expense allocated to the Psychiatric department. With only eighty-two patients during the year in the Psychiatric department and each staying an average of 12.5 days, the expense per patient day was predictably high. Other departments showing high costs per patient day were:

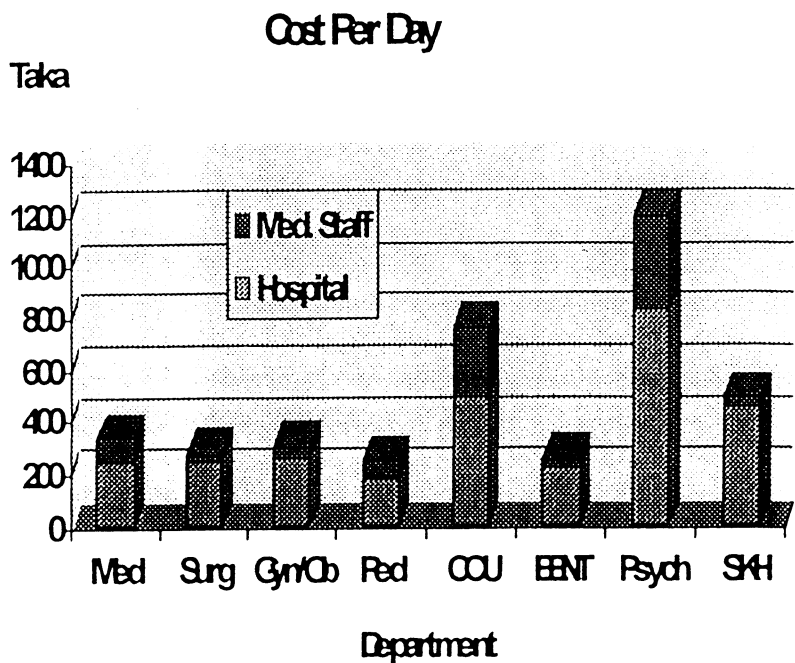
- CCU—761 Taka
- SKH—488 Taka
- Medical Department—336 Taka
- Gynecology/obstetrics—303 Taka
- Surgical—280 Taka
- EENT—253 Taka
- Pediatrics—244 Taka.

#### **5.1.5 Medical Staff Expense**

Medical staff expense for each patient day for the departments ranged from 24 Taka to 360 Taka per patient day. Medical staff expense for each patient day included:

- Psychiatric—360 Taka
- CCU—268 Taka
- Medical—89 Taka
- Pediatrics—61 Taka
- SKH—38 Taka
- EENT—34 Taka
- Gynecology/obstetrics—35 Taka
- Surgical—24 Taka

Medical staff expense as a percent of the total expense within each department for each patient day ranged from 7.8 percent for SKH to 35.2 percent for CCU. The Psychiatric department had the lowest medical staff expense, and the Medical department had the highest. As a percent of total medical staff expense, 35.7 percent was in medical, 18.0 percent in Surgical, 14.1 percent in Gynecology/obstetrics, 11.3 percent in Pediatrics, 7.2 percent in CCU, 6.4 percent in EENT, 2.5 percent in Psychiatric and 4.8 percent in SKH (App. Analysis, p. 1).



**5.1.6 Cost Per Admission**

Average costs per admission can be summarised as follows:

*The MMCH average cost per admission was 2,246 Taka for the 43,000 inpatients admitted in the fiscal year of the study.*

Medical staff expense for each admission was 348 Taka or 15.5 percent of the average cost per admission. Again, the highest cost per admission was for the Psychiatric department. The next highest department for each patient admission was EENT at 3,022 Taka, primarily due to its ALOS of 11.9 days. Cost per admission for other departments were

- CCU—2,993 Taka
- Surgical—2,730 Taka
- Gynecology/obstetrics—2,325 Taka
- Medical—2,078 Taka
- SKH—2,064 Taka
- Pediatrics—1,083 Taka.

Excluding the Psychiatric department, medical staff expense per patient ranged from 160 Taka for SKH to 1,052 Taka for CCU (46.8 percent of the average cost per admission)

Hospital cost per patient, excluding medical staff, ranged from 812 Taka for Pediatrics to 2,613 Taka for EENT. Inpatient expense was 81.5 percent of the total hospital expense. The surgical department required 32.1 percent of the inpatient resources for 26.4 percent of MMCH inpatients. The key departments in terms of patients treated and resources consumed can be summarised:

*Medical, Surgical, Pediatrics, and Gynecology/obstetrics department had 81.6 percent of the patients and consumed 78.7 percent of MMCH inpatient expenditures (App. Analysis, p. 1).*

#### **5.1.7 Relative Resource Consumption: Inpatient Departments**

The Resource Consumption index provides a comparative method for identifying high and low resource consumption departments in relation to the number of patients in each department as a percentage of a hospital's total patient load. The index numbers for the HEU study were derived by dividing the percent of resource consumption by the percent of total patients for each department. A value of 1.00 indicates that the resource consumption and patients are equal in relationship to the rest of the departments. A value of less than 1.00 indicates that the resource consumption for each patient was less than the hospital average for the departments concerned; a value greater than 1.00 indicates that resource consumption for the department is greater than the hospital average for its departments.

Table I presents the MMCH departmental percentages for inpatients, resource consumption percentages and the departmental resource index:



**Table I: Relative Resource Use by Inpatient Department**

<u>Department</u>	<u>Percent of Total Patients</u>	<u>Percent of Resource Consumption</u>	<u>Resource Index</u>
Medical	22.5%	20.8%	.92
Surgical	26.4	32.1	1.22
Gyn/Ob	18.1	18.8	1.04
Pediatrics	14.6	7.0	.48
CCU	2.4	3.2	1.33
EENT	5.4	7.3	1.35
Psychiatric	.2	1.3	6.50
SKH	10.4	9.6	.92

The RRI suggests that the Psychiatric department relative resource consumption is considerably greater for its patient load than any other department, with EENT, CCU, and Surgery also showing high relative resource consumption. The Surgery RRI is probably not unexpected. A key fact is this:

*The Pediatrics department RRI suggests that its relative consumption of resources stands well below average, given its patient load.*

It is important to note that, in all cases, the implications of Table I for relative resource use decisions should involve MMC educational goals and not merely MMCH service efficiency goals.

### **5.1.8 Relative Resource Consumption: Outpatient Services**

From the MMCH total expenditures, 18.5 percent were required for outpatients. During the year, 32,240 patients were seen in the emergency room. Outpatient clinics, including emergency room, had 257,852 patients during the year. The average cost for each emergency room visit was 217 Taka of which 37 Taka (17.1 percent) was for medical staff expense. The average cost for each outpatient visit, including Emergency Room, was 58 Taka with 15 Taka for medical staff. Excluding the emergency room visits, the cost for each outpatient visit was 66 Taka.

The Outpatient departments included:

- Dental
- Gynecology
- Medical
- Surgical
- Emergency Room
- General Outpatient (including Anti-Rabies Vaccine)

The Surgical Outpatient department expense for each visit was 507 Taka. The cost for each visit for the other departments was Medical at 89 Taka, Gynecology at 88 Taka, Dental at 64 Taka, and General Outpatient at 17 Taka. Medical staff expense was 22.9 percent of the total expense for each outpatient visit including the emergency room. Surgical outpatient department had the highest medical staff expense per visit at 91 Taka. Medical staff expense for each visit for the other outpatient departments was 44 Taka for Medical, 37 Taka for Emergency Room, 26 Taka for Dental and 18 Taka for Gynecology.

Emergency Room visits required 32 percent of the outpatient resources for 12.5 percent of the patients. The outpatient surgical department consumed 18.6 percent of the outpatient resources for 3.1 percent of the patients (App. Analysis, p. 2). Table II presents the department percentages for the outpatients, resource consumption percentages, and the RRI for outpatient areas of MMCH:

**Table II: Relative Resource Use by Outpatient Area**

<u>Department</u>	<u>Percent of Total Patients</u>	<u>Percent of Resource Consumption</u>	<u>Resource Index</u>
Emergency	12.5%	32.0%	2.56
Dental	5.8	4.4	.76
Gyn	6.8	7.0	1.03
Medical	17.4	18.1	1.04
Surgical	3.1	18.6	6.00
Other O/P	54.4	19.9	.37

Again, some departments stand out relative to the others. Outpatient Surgery and Emergency departments, relative to their total patient load, appear to consume considerable resources. While “Other O/P” consumes a small amount of resources relative to its case load, it is not clear what the expenditures for “Other O/P” are providing, though they might be equivalent to the “Limited Curative Care” component of the Essential Services Package of the MOHFW.

### 5.2 Non-Recurrent Expense: Inpatient and Outpatient

The three components of the non-recurrent expenses at MMCH were the FIMC project, building depreciation and equipment depreciation expense. The FIMC project, directed by CMMU, began in 1993, and continued through the year of the HEU study. The construction expense for that project, in the amount of 4,089,580 Taka, was included in the value of the buildings and depreciation. The total building value, including FIMC project, MMCH itself, SKH and staff quarters, was 677,006,349 Taka with an annual depreciation of 16,925,159 Taka (App. G, p. 5).

The historical cost of capital equipment was 9,596,369 Taka, with annual depreciation of 916,248 Taka for 106 equipment items. Ten equipment items with a historical cost of 14,587 Taka had been fully depreciated. An additional eleven equipment items became

fully depreciated during the year of study. (App. G, p.1). The annual non-recurrent expense for depreciation of buildings and equipment was 17,841,407 Taka.

As previously stated, the non-recurrent expense for the Psychiatric department was high due to the number of psychiatric patients and the lengths of their stay at the hospital. The non-recurrent expense for the Psychiatric department was 287 Taka for each patient day and 3,577 Taka for each admission. The non-recurrent expense for the other hospital inpatient departments are as shown in Table III (App. Analysis, p. 3).

**Table III: Non-recurrent Costs for Inpatient Departments**

<u>Department</u>	<u>Cost per Patient Day</u>	<u>Cost per Admission</u>
Medical	46 Taka	285 Taka
Surgical	36 Taka	351 Taka
Gyn/Ob	41 Taka	316 Taka
Pediatrics	22 Taka	98 Taka
CCU	76 Taka	299 Taka
EENT	46 Taka	553 Taka
SKH	97 Taka	412 Taka

Outpatient departments were directly allocated 11.9 percent of the annual depreciation expense in the study year. The cost for each emergency room visit for non-recurrent expense was 13 Taka. The outpatient non-recurrent expense for each visit was:

- 12 Taka for Dental
- 13 Taka for Gynecology
- 15 Taka for Medical
- 36 Taka for Surgical.

The average non-recurrent cost for all outpatient visits including Emergency Room visits was 8 Taka (App. Analysis, p. 3).

Diagnostic departments were allocated 7.8 percent of the annual depreciation expense of the hospital. The non-recurrent expense for diagnostics was 29 Taka for each radiology procedure and 7 Taka for each MMCH and MMC laboratory procedure. The non-recurrent expense for the laboratory was low due to the low cost of MMC pathology and microbiology procedures. MMCH performed 20,832 laboratory procedures while MMC performed 25,742 procedures. The non-recurrent cost for MMCH investigative procedures alone was 15 Taka for each procedure. The operating theatre was allocated 4.4 percent of the annual depreciation expense. Operating theatre non-recurrent expense for each surgery was 98 Taka (App. Analysis, p. 3).

## 5.3 Recurrent Expense

Understanding recurrent expense is critical for planning future capital investment and for managing existing departments. This section looks at key components of recurrent expense, using several approaches to isolate the impact and scope of these expenses at MMCH.

### 5.3.1 Personnel Recurrent Expense

The HEU salary and benefit analysis included all personnel directly paid by MMCH, except for the medical intern stipends. As noted earlier, personnel are classified by MMCH into four grades: first through fourth. The first grade classifications include physicians, director, deputy director, and senior store officer. The second grade classifications were administrative officer, accounts officer, deputy nursing superintendent, and social welfare officer. The third grade contained the nursing supervisors, senior staff nurses, pharmacist, technicians, clerks, tailors, etc. The fourth grade included security, MLSS, sweepers, and cooks (App. D, p. 15 - 17).

#### 5.3.1.1 Overall Personnel Expense

For the purposes of the HEU analysis, personnel were divided into six categories:

- Medical staff
- Other first grade (director, deputy director, and senior store officer)
- Second grade
- Nursing staff
- Other third grade (excluding nursing staff)
- Fourth grade.

Medical staff salary and benefits were 22.1 percent of total MMCH salary and benefits, while nurse's salary and benefits were 25.6 percent of the total. MMCH benefits for all employees amounted to 44.0 percent of the employee salaries during the study year.

It is important to see the unusually high ratio of benefits to base salary for the various groups of hospital employees.

*The benefit percent ranged from 54.3 percent of the employee salaries for other third grade to 37.4 percent for the medical staff. The average salary and benefit ranged from 31,330 Taka for fourth grade to 197,078 Taka for first grade other. The medical staff's average salary and benefits were 79,105 Taka. The MMCH average salary was 27,562 Taka with average benefits of 21,676 Taka (App. Analysis, p. 7 - 8).*

Medical staff and nurses composed 33.8 percent of the staff and 47.7 percent of MMCH salary and benefits. The fourth grade had 50.2 percent of the staff and received 31.9

percent of the hospital's salary and benefits. Medical staff, nurses, and other third grade represented 48.8 percent of the hospital staff. Medical staff, nurses, pharmacists, and technicians comprised 38.9 percent of the total personnel—with 316 employees. The remainder of hospital staff were from support categories. *The ratio of MMCH's employees to the number of patients each day was .96 FTE/patient* (App. Analysis, p. 8). The following table shows the percent of the employees in each of the six grades, their resource consumption percentage and their relative resource index scores:

**Table IV: Relative Resource Use by Personnel Category**

<u>Grade</u>	<u>Percent of Total Employees</u>	<u>Percent of Resource Consumption</u>	<u>Resource Index</u>
Medical Staff	13.8%	22.1%	1.60
1st Grade Other	.4	1.5	3.75
Second Grade	.6	1.0	1.67
Nurses	20.0	25.6	1.28
3rd Grade Other	15.0	17.9	1.19
Fourth Grade	50.2	31.9	.64

It is interesting to note that all RRI scores were greater than 1.0 for all classes except for Fourth Grade employees. The RRI scores for 1<sup>st</sup> Grade Other and Second Grade employees—relative to their expected value in the process of patient care—is also worthy of note. It appears that benefits are used to compensate lower grades fairly extensively. The benefits accruing to 1<sup>st</sup> Grade and Medical staff are significant ones. Further, the base pay for these top positions is significant.

#### 5.3.1.2 Medical Staff Personnel Expense

General medical staff expenses—including expense for professors and interns—for each patient day and admission was previously discussed above. *MMCH cost for each patient day for physicians was 14 Taka, professors at 4 Taka and interns at 24 Taka.* Physician, professor, and intern expense for each patient day for the Medical department was 21 Taka, 3 Taka, and 58 Taka, respectively. Intern expense in the medical department was high because all interns spend six months in Medicine and then 50 percent of their time continuing in Medicine.

Average costs per patient admission or per outpatient visit reflect some of the work and service patterns of the hospital:

*The average cost for a patient admission for physicians was 100 Taka, for professors it was 26 Taka and for interns 169 Taka. Physician expense was 33.9 percent of the inpatient medical staff cost and 85.0 percent of the outpatient medical staff cost. Interns represented the largest component of the medical staff's inpatient expense at 57.5 percent and the lowest proportion of outpatient expense at 3.5 percent.*

This pattern reflects the teaching mission of the hospital, but also suggests that the teaching focuses on the more high-end curative care cases rather than those sorts of cases characterising outpatient care.

Professors’ percent of the medical staff expense was 8.7 percent for inpatient and 11.5 percent for outpatients. The medical staff percentage for both inpatient and outpatient reported physician expense at 46.4 percent, professors at 9.3 percent and interns at 44.3 percent. Associate professor expense represented 47.6 percent of the professors’ allocated expense. The professors were 18.2 percent and assistant professors at 34.2 percent of the Medical College’s teaching staff allocated expense, respectively.

MMCH’s physicians’ cost for an outpatient visit ranged from 12 Taka for Dental to 64 Taka for Surgical outpatient. Physicians expense for all outpatient visits, including emergency room, was 14 Taka. Professors provided patient services in the outpatient departments of Dental, Medical and Surgical with the respective cost per visit of 13 Taka, 4 Taka and 13 Taka. Interns rotated through all the outpatient departments with the cost per outpatient visit of .6 Taka. The following were the cost for each patient day for medical staff categories (App. Analysis, p. 9 - 10):

**Table V: Cost per Patient Day for Medical Staff Categories**

<u>Department</u>	<u>Physicians</u>	<u>Professors</u>	<u>Interns</u>
Medical	21 Taka	3 Taka	58 Taka
Surgical	7	2	9
Gyn/Obs	7	4	16
Pediatrics	17	6	31
CCU	98	43	107
EENT	26	5	-
Psychiatric	79	48	212
SKH	9	-	23

Although the figures are strongly affected by patient numbers seen in the departments, it is clear that significant professional personnel resources are concentrated in the CCU and Psychiatric areas of the hospital. This allocation of professional resources might not be surprising in high-income countries, but the CCU case does reflect priorities that contrast with the priorities of the Health and Population Sector Programme and its commitment to Essential Service Package health care. One might expect that CCU services would be found in the private sector with teaching focusing on MCH-related training and Limited Curative Care in the outpatient area. This prioritisation did not seem to be the case at MMCH during the period of the HEU field study.

The following were the cost for each patient admission for physicians, professors and interns:

**Table VI: Cost per Patient Admission for Medical Staff Categories**

<u>Department</u>	<u>Physicians</u>	<u>Professors</u>	<u>Interns</u>
Medical	129 Taka	20 Taka	358 Taka
Surgical	71	15	83
Gyn/Obs	52	28	120
Pediatrics	75	26	138
CCU	386	169	422
EENT	311	59	-
Psychiatric	988	601	2637
SKH	38	-	96

It is important to recognize the implication Table VI, since it suggests a pattern worth analysis at all medical college hospitals in Bangladesh:

*The role of interns at the hospital is an especially interesting feature of these costs. Since their costs per unit of time is lower than, for comparison sake, professor salaries and benefits, they appear to be performing a considerable portion of the routine work of the hospital. With the exception of Psychiatry, the Physicians and Professors appear to be providing, in terms of costs, the bulk of the specialist care.*

5.3.1.3      Nursing Staff Personnel Expense

Twenty percent of the hospital staff were nursing personnel. By standards in many other countries, this proportion seems low. Of these personnel, supervisors represented 10.6 percent of the nursing staff, with senior nurses at 71.0 percent, assistant nurses at 6.5 percent, and student nurses at 11.9 percent. The allocated cost for nursing personnel was 10,880,744 Taka (94.2 percent) for inpatients and 664,564 Taka (5.8 percent) for outpatients. The nursing personnel expense for each hospital patient day was 35 Taka.

Psychiatric cost for each patient day and admission was the highest due to the reasons discussed previously. Nursing expenses for each patient day for the remaining departments were as follows:

- Medical—35 Taka
- Surgical—35 Taka
- Gynecology/obstetrics—35 Taka
- Pediatrics—28 Taka
- CCU—99 Taka
- EENT—34 Taka
- SKH—54 Taka

The nursing expense per patient admission was 214 Taka for medical, 293 Taka for surgical, 124 Taka for pediatrics, 271 Taka for gynecology/obstetrics, 390 Taka for CCU, 408 Taka for EENT, and 230 Taka for SKH. The expense for each Hospital admission for nursing personnel was 253 Taka. In the case of EENT and SKH, these Taka amounts per patient admission may warrant a closer examination to determine the use of these nursing resources. In short, are nurses allocated to departments for reasons of skill requirements or other reasons?

The nursing personnel expense for each emergency room visit was 8 Taka. Nursing personnel were not assigned to general outpatient or dental departments. The outpatient expense for nursing personnel was 4 Taka for each gynecology visit, 3 Taka for each medical outpatient visit, and 26 Taka for each outpatient surgery (App. Analysis, p. 11 - 12). Again, the question of resource allocation for the scarce nursing personnel merits managerial examination at MMCH.

#### 5.3.1.4 Surgery Personnel Expenses

Personnel directly assigned to the operations theatre were medical staff, nursing staff, and “other” personnel. “Other” personnel assigned to the operations theatre included MLSS, sweepers, and their supervisors (App. A, p. 28 - 29). The allocated salaries included the personnel in central stores and pharmacy. Major surgeries were classified as inpatient and minor surgeries were classified as outpatient for analysis purposes. Of the 11,225 surgeries, 87.3 percent were major. The Hospital averaged 36 surgeries each day of a six day work week. The major and minor surgeries were allocated between general surgery and gynecology surgery based on the ratio of general and gynecology surgeries (App. A, p. 12).

- Medical staff expense for each major surgery was 78 Taka for general or gynecology surgery. Minor surgery medical staff expense was 48 Taka for general or gynecology surgery.
- Nursing personnel expense for each major surgery was 165 Taka for general surgery and 172 Taka for gynecology surgery. The expense for minor surgeries for the nursing personnel was 102 Taka for general surgery and 106 Taka for gynecology surgery. These amounts, relative to those for medical staff, may warrant closer examination from a resource management point of view.
- Pharmacy’s and central stores’ personnel expense was 37 Taka and 11 Taka for major general and gynecology surgery, respectively. The minor surgery expense for the pharmacy and central stores personnel was 23 Taka for general surgery and 7 Taka for gynecology surgery.
- Other personnel expense was 90 Taka and 85 Taka for major general and gynecology surgery, respectively, and 55 Taka for minor general or gynecology surgery.

The total personnel expense for the Operating Theatre was 370 Taka for major general surgery, 351 Taka for major gynecology surgery, 227 Taka for minor general surgery and 215 Taka for minor gynecology surgery (App. Analysis, p. 13).



#### 5.3.1.5      Laboratory Personnel Expenses

Laboratory procedures were performed by MMCH (20,832 procedures) and by MMC (25,742 procedures). MMCH's personnel expense was largely for internal procedures while specimen collection characterised external procedure. Personnel expense included medical staff, laboratory technicians, pathology technicians, fourth grade and the allocated personnel expense of pharmacy and central stores.

- Medical staff expense for each internal procedure was 38 Taka.
- Chief technicians', laboratory technicians' and pathology technicians' combined salary expense was 32 Taka for each internal procedure
- Pharmacy and central stores allocated salary expense for each internal procedure was 3 Taka
- Fourth grade personnel expense was 9 Taka for each internal procedure.

The total personnel expense for each internal procedure was 83 Taka. The personnel expense for the combined internal and external procedures was 37 Taka per procedure. Expense information did not differentiate between inpatient and outpatient; therefore, the expense for each inpatient and outpatient procedure was not identifiable (App Analysis, p. 14).

#### 5.3.1.6      Radiology Personnel Expenses

All radiology procedures were performed by MMCH with the exception of nuclear medicine. Information for nuclear medicine was not obtainable. During the year of study, 36,375 radiology procedures were performed. Radiology personnel included radiologists, radiotherapists, radiology technicians, ECG technician, nursing, central stores, and fourth grade. One senior nurse was assigned to radiology.

Medical staff expense for each radiology investigation was 14 Taka

- Technicians salary expense was 22 Taka for each procedure
- Nursing personnel expense was 2 Taka for each procedure
- Central stores and fourth grade personnel expense for each procedure was 1 Taka and 5 Taka, respectively.

The total personnel expense was 44 Tk for each radiological investigative procedure. Expense information did not differentiate between inpatient and outpatient, therefore, the expense for each inpatient and outpatient procedure was not identifiable (App Analysis, p. 14).

#### 5.3.1.7      Pharmacy Personnel Expenses

The total salary expense for the seventeen pharmacists was 1,348,137 Taka. The personnel expense was allocated based on pharmaceutical distribution figures. Pharmacists' personnel expense allocated to inpatients was 919,568 Taka with the Hospital's cost for each patient day being 3 Taka and 21 Taka for each patient admission.

Pharmacy personnel costs are about 10 percent of those for nursing personnel at MMCH. Inpatient departmental allocated pharmacy personnel expense for each patient day was:

- Medical—3 Taka
- Surgical—3 Taka
- Gynecology/obstetrics—2 Taka
- Pediatrics—2 Taka
- CCU—6 Taka
- EENT—1 Taka
- Psychiatric—6 Taka
- SKH—8 Taka

The pharmacy personnel expense for each patient admission was 20 Taka for medical, 24 Taka for surgical, 10 Taka for pediatrics, 23 Taka for gynecology/obstetrics, 24 Taka for CCU, 13 Taka for EENT, 78 Taka for psychiatric, and 34 Taka for SKH. Again, it is interesting to note the loading of these expenses toward psychiatry.

The outpatient expense per visit for pharmacy personnel was 4 Taka for emergency room and 10 Taka for surgical. Dental, gynecology, and medical outpatient pharmacy personnel expense for each outpatient was .1 Taka, .4 Taka, and .1 Taka, respectively. The pharmacy personnel expense for all outpatient departments including emergency room was .8 Taka for each outpatient. Pharmacists' personnel expense was also allocated to operations theatre and laboratory (App. Analysis, p. 15).

#### 5.3.1.8 Central Stores Personnel Expenses

The total salary expense for central store personnel was 466,548 Taka, with 184,031 Taka being allocated to inpatient expense. Medical supply distribution was the basis for expense allocation. Central stores' personnel expense for each patient day was .4 Taka for medical, .8 Taka for surgical, .5 Taka for gynecology/obstetrics, .4 Taka for pediatrics, 1.6 Taka for CCU, .3 Taka for EENT, 1.4 Taka for psychiatric, and .7 Taka for SKH.

The central stores' personnel expense for each patient admission was 2.3 Taka for medical, 8.2 Taka for surgical, 3.6 Taka for gynecology/obstetrics, 1.6 Taka for pediatrics, 6.3 Taka for CCU, 3.7 Taka for EENT, 17.9 Taka for psychiatric, and 2.9 Taka for SKH. MMCH expense for central store personnel was .6 Taka for each patient day and 4.3 Taka for each patient admission. The central stores' personnel expense for each outpatient was 1.5 Taka for emergency room, .1 Taka for dental, .2 Taka for gynecology, and .7 Taka for surgical. The cost for each outpatient for central stores' personnel including emergency room was .4 Taka (App. Analysis, p. 16). In general, these figures will assist managers in deciding whether, relative to activities at the hospital, too great an amount of resources flow to one or another department within the hospital from central stores.

#### 5.3.1.9 Support Personnel Expenses

Personnel support expense includes administration, maintenance, dietary, laundry, and housekeeping/MLSS. Administration cost per patient was discussed above. Maintenance total salary expense was 256,934 Taka or .6 percent of total hospital salaries. Analysis of maintenance personnel expense is included in maintenance department analysis, section 7.6.5. Dietary and laundry expense was allocated based on patient days. The cost of dietary supplies was 86.0 percent of the cost of the dietary department. Personnel were not identified by position for the laundry department. Dietary and laundry department analysis is in section 7.6.5.3.

#### 5.3.4 Operation Theater Expenses

As discussed perviously, the recurrent expense for nursing personnel, pharmaceuticals, and medical supplies for the Operations Theater were distributed between general surgery and gynecology surgery. Medical staff and housekeeping personnel data which was captured for the operating theatre were allocated to general surgery and gynecology surgery departments, based on surgery ratios. Eight physicians, two professors, twenty senior nurses, twenty-four student nurses, fourteen MLSS, and eight sweepers worked in the operating theatre. Personnel expense was 44.1 percent of the operating theatre's total expense. Of the personnel expense, the following percentages appeared:

Medical staff	21.5 percent
Nursing staff	46.4 percent
Fourth grade employees	24.0 percent
Central Stores & Pharmacy	7.4 percent

It is probably worthwhile to see these personnel expenses in light of the overall expenses for surgery and surgery activity itself. MMCH reported annual surgery data of 1,424 minor surgeries and 9,801 major surgeries, with major surgeries representing 87.3 percent of the total surgeries performed at the hospital. Surgery data, captured for inpatient and outpatient surgeries for a six-month period, was used to allocate the expense of the operating theatre to the surgical and gynecology inpatient departments. General surgeries, including orthopedic and EENT surgeries, were 59.7 percent of the total surgeries. The recurrent expense of the Operating Theatre was 7,984,242 Taka or 91 percent of the total expense. The components of these recurrent expenses were:

Personnel	48.4 percent
Pharmaceuticals	26.7 percent
Medical supplies	18.9 percent
Repairs	6.0 percent

Non recurrent expenses were 508,996 Taka for building depreciation and 272,756 Taka for equipment depreciation. Recurrent expenses for each surgery were 711 Taka and non recurrent expenses were 70 Taka. The components of recurrent expenses for each surgery were:

Salaries	344 Taka
Pharmaceuticals	190 Taka
Medical supplies	134 Taka
Repairs	43 Taka.

Recurrent expense was 859 Taka for a general surgery and 493 Taka for gynecology surgery. The personnel expense for a general surgery and gynecology surgery were 352 Taka and 333 Taka, respectively.

Pharmaceutical expenses for a general surgery were 263 Taka and 81 Taka for gynecology surgery. Medical supply expenses were 186 Taka for each general surgery and 57 Taka for each gynecology surgery. Repair expenses for each general surgery were 58 Taka and 21 Taka for a gynecology surgery.

When personnel expenses and other surgery expenses are taken into account, a major finding of the MMCH study is this:

*In light of the weighted ratio of three outpatient surgeries to one inpatient surgery, 91.8% of operating theatre expenses were for inpatient surgeries. If all major surgeries were inpatient, and all minor surgeries were outpatient; then the expense for a major surgery was 62.7% greater than the expense for a minor surgery (App. Analysis, p 17 - 18).*

What this suggests is that the costs of major surgery should be compared with minor surgeries in other developing countries to determine whether these ratios are exceptional. Further, it is important to see whether minor surgery costs are exceptionally high or within acceptable ranges since this zone of "limited curative care" will be increasingly performed within the Essential Package of Services provided by MOHFW.

### 5.3.5 Administrative Recurrent Expense

Administrative expense was 5.5 percent of MMCH total expense. Of this amount, administrative personnel accounted for 56.5 percent of the total administrative expense and 6.9 percent of total MMCH personnel expense. The miscellaneous expense category of the AES was the next largest component at 20.3 percent of the administrative expense (App. A, p. 37). Administrative expense was allocated based on cumulative allocated department expenses. Medical staff was allocated 16.9 percent of the administrative expense (App. A, p. 2).

An interesting way to view the impact of administrative expense is to remove it from the various cost centres. Without administrative expense, the cost for each patient day decreased from 14 Taka in Pediatrics to 67 Taka in Psychiatry, reflecting the patient load in each department. The cost for each admission, without administrative expense, became 60 Taka in Pediatrics and 828 Taka in the Psychiatric department [Note: Pediatrics, it is important to recall, had the second-highest death rate per 100 admissions

during the study period—just slightly less than CCU]. MMCH’s average cost for each patient day without administrative expense was 294.2 Taka, representing 17 Taka per patient day for these costs. Expense for a patient admission when administrative costs were screened out was 124 Taka.

The previously discussed medical staff expense included administrative expense allocation. The medical staff expense, without administrative expense, is shown in Table VII (App. Analysis, p. 5):

**Table VII: Medical Staff Expenses without Administrative Expenses**

<u>Department</u>	<u>Medical Staff Cost per Patient Day</u>	<u>Medical Staff Cost per Patient Admission</u>
Medical	84 Taka	523 Taka
Surgical	23	225
Gyn/Ob	33	255
Pediatrics	58	256
CCU	253	994
EENT	32	386
Psychiatric	340	4,242
SKH	36	152

Administrative expense allocated to outpatient departments was 1,204,465 Taka or 14.2 percent of total MMCH administrative expenses. The cost for each emergency room was 205 Taka without administrative expense compared to 217 Taka with administrative expense included. The cost of an outpatient visit, including emergency room visits and without administrative expense, was 55 Taka. Medical staff expense represented 22.9 percent of the outpatient expense. The following are the cost of the Emergency Room and Outpatient departments without administrative expense (App. Analysis, p. 6):

**Table VIII: Outpatient Costs without Administrative Costs**

<u>Department</u>	<u>Hospital Cost Per Visit</u>	<u>Med. Staff Cost Per Visit</u>	<u>Total Cost Per Visit</u>
Emergency	170 Taka	35 Taka	205 Taka
Outpatient	14	2	16
Dental	36	25	60
Gyn	66	17	83
Medical	42	42	84
Surgical	393	86	479

### 5.3.6 *Diagnostics Recurrent Expense*

The recurrent annual expenses for the laboratory/pathology department of MMCH were 3,754,704 Taka, and non-recurrent expenses were 317,716 Taka. The annual expenses included the allocated expense of the pathology and microbiology procedures performed by MMC, as discussed earlier. MMC's allocated expense was 697,297 Taka for pathology and 173,005 Taka for microbiology. As a percent of the annual recurrent expense, including MMC's pathology and microbiology allocated expense, personnel expenses were 45.9 percent of total expenses, MMC's pathology expenses were 18.6 percent of total expenses, the MMC microbiology expenses were 4.6 percent, supplies were 22.9 percent and repairs were 8.0 percent. Excluding the allocated expense for MMC's pathology and microbiology procedures, personnel expense amounted to 59.8 percent of recurrent annual expense with supplies accounting for 29.8 percent and repairs for 10.4 percent.

Classified as internal procedures, the number of procedures performed by MMCH were 20,832 or 44.7 percent of the total procedures for the hospital. MMC pathology procedures were 23,131 and microbiology procedures numbered 2,611. Inpatient procedures represented 61.1 percent of the total procedures. Excluding MMC pathology and microbiology procedures and their expenses, recurrent expense for each internal procedure was 139 Taka. Recurrent internal expenses for each procedure were:

Personnel Expense	83 Taka
Supplies	41 Taka
Building/equipment Repair	4 Taka.

After MMC pathology and MMC microbiology procedures and expense are included, the recurrent expense for each procedure decreased to 81 Taka. The allocated costs for each procedure performed by MMC for pathology and microbiology were 30 Taka and 66 Taka, respectively (App. Analysis, p. 19).

The hospital employed six pathologists. MMC had four professors expending 39 percent of their time in the laboratory (App. J, p. 2 - 3). Allocated expenses for the professors were 4 percent of laboratory total recurrent expense. Medical staff expense was 12.9 percent of the total recurrent expense. Excluding the MMC allocated expense, medical staff expense was 16.9 percent of the recurrent expense. The expenses for the laboratory were allocated on the basis of patient admissions to the inpatient departments and on the basis of supply allocations to the outpatient departments (App. A, p. 9). Because expense information did not differentiate between inpatients and outpatients, the expense for each inpatient and outpatient procedure could not be identified.

The recurrent annual expense of the radiology department was 3,301,441 Taka. The annual expense was for personnel at 1,610,658 Taka, supplies 704,959 Taka, and building/ equipment repair at 985,825 Taka. As a percent of the recurrent annual expense, personnel represented 48.8 percent of the total with supplies at 21.3 percent and repairs at 29.9 percent. The number of radiology procedures performed during the year

was 36,375, with 46.5 percent for inpatient. The recurrent expense for each procedure was 91 Taka. The expense components per procedure were:

Personnel	44 Taka
Supplies	19 Taka
Repairs	27 Taka (App. Analysis, p. 19).

The hospital employed one radiologist and one radiotherapist. MMC had three professor who expend 48.8 percent of their time in the radiology department (App. J, p. 2 - 3). Medical staff expense was 15.0 percent of the department's recurrent expense, with professors representing 4.6 percent of the radiology recurrent expenses (App. A, p. 16). Radiology expenses were allocated on the basis of patient admissions to the inpatient departments and on the basis of supply allocations to the outpatient departments (App. A, p. 9). Equipment repair expense was 14.9 percent of the building/equipment repair expense. The equipment repair expense was 7 percent of the cost of the radiology equipment (App. A, p. 32). Expense information at the hospital did not differentiate between inpatient and outpatient. Therefore, the expense for each inpatient and outpatient procedure could not be identified.

### 5.3.7 Support Recurrent Expenses

Allocated administrative expense for inpatients and outpatients was discussed earlier. Expenses for maintenance personnel, for MMCH and SKH building repairs, and for electricity were allocated on the basis of patient area square meters. Seventy-eight percent of the patient area was for inpatients. Outpatient area represented 8.3 percent of the patient area with the balance of the square meters contained in operating theatre, laboratory, and radiology (App. A, p. 32). Staff housing repairs were allocated based on 59.9 percent of the allocated personnel expense (App. A, p. 35). The seven personnel in maintenance held the positions of carpenter and electrician/mechanic. The personnel expense was 298,817 Taka for maintenance and represented less than one percent of the captured personnel expense for MMCH (App. A, p. 39). Building repairs for MMCH and SKH were 3,758,881 Taka and 336,093 Taka, respectively, for a total of 4,094,974 Taka.

The building repair expense for MMCH and SKH was 4.0 percent of the total captured, recurrent expense for MMCH. Repair expense for staff quarters was 1,539,127 Taka. The building repair expense by PWD for MMCH increased in both FY 1994 and FY 1995. In FY 1993, the PWD building repair expenditures for MMCH were 994,793 Taka and in FY 1994 building repair expenditures were 2,965,384 Taka. SKH building repair expense decreased from 1,223,991 Taka in FY 1993, to 173,039 Taka in FY 1994. Staff quarter repair expense for PWD decreased from 2,969,040 Taka in FY 1993, to 1,202,042 Taka in FY 1994. The PWD combined expenditures for MMCH, SKH, and staff quarters decreased by 16.3 percent from FY 1993 to FY 1994 and increased in FY 1995, by 8.6 percent from FY 1993. MMCH building repair expenses by PWD in FY 1995 were less than one percent of the cost of the buildings. SKH and the staff quarters building repair expenses were .5 percent and 1.1 percent, respectively, of the cost of the buildings (App. F, p. 2 and App. G, p. 5).

Central Medical Stores, Dhaka equipment repair expenses for the year were 117,434 Taka for eleven equipment items. The repairs were for nine radiology equipment items, one CCU monitor repair, and one defibrillator repair. The equipment repair expense was assigned to specific departments, except for the defibrillator repair allocation to administration. Equipment repair expense represented 1.2 percent of the capital equipment cost and 12.8 percent of the current annual equipment depreciation expense for the hospital (App. F, p. 1 and App. G, p. 1).

Dietary expense of 9,299,867 Taka consisted of 8,000,000 Taka for supplies and of personnel expense amounting to 1,299,867 Taka (App. A, p. 37). Dietary personnel included one supervisor, one dietician, and twenty-seven cooks (App. A, p. 42 - 43). The salary expense of the twenty seven cooks was 90.8 percent of the dietary personnel expense. The cost for each patient day for food supplies was 26 Taka and salary expense was 4 Taka for a total dietary cost per patient day of 30 Taka. Laundry expense of 105,262 Taka was comprised of soda, soap, and diesel oil, with the diesel fuel amounting to 70.5 percent of laundry expenses. The total laundry expense was .3 Taka per patient day (App. Analysis, p. 20).

### 5.3.8 *Supplies Recurrent Expense*

Drugs and their costs are critical elements of service at any hospital. Although they are a significant, but not overwhelming component of recurrent expenses at MMCH, it is nevertheless vital to understand their function in the financing of hospital services.

*Pharmaceutical expense was 15.8 percent of the total identified recurrent expense for MMCH.*

Pharmaceuticals received from CMSD were 99.7 percent of these pharmaceutical expenses, with the balance being purchased locally (App. B, p. 6). The cost of pharmaceuticals for each patient day, with personnel expense excluded from the amounts, were:

Department	Cost per Patient Day	Cost per Admission
Medical	38 Taka	238 Taka
Surgical	30 Taka	288 Taka
Gynecology/obstetrics	35 Taka	270 Taka
Pediatrics	26 Taka	114 Taka
CCU	71 Taka	279 Taka
EENT	13 Taka	152 Taka
Psychiatric	74 Taka	918 Taka
SKH	93 Taka.	396 Taka



In summary:

*Pharmaceutical costs for each emergency room visit were 41 Taka and for outpatient surgery they were 118 Taka per visit.*

The cost of pharmaceuticals for outpatients, including emergency room visits, were 9 Taka per visit (App. Analysis, p. 21). Inpatients received 68.2 percent of the pharmaceutical expenses, outpatients received 15.3 percent, operating theatre received 13.4 percent, and the laboratory received 3.2 percent (App. A, p. 45). Operating theatre and laboratory pharmaceutical expenses were further allocated to inpatient and outpatient departments. A total of 1,692,688 pharmaceutical items were issued to patients during the year. Of the total issue, 146,097 items were issued to the emergency room, and 1,459,012 items were issued to inpatients excluding SKH (App. A, p. 168). The pharmaceutical expense for the emergency room was 1,321,242 Taka and the pharmaceutical expense for the inpatient departments, excluding SKH, was 9,098,151 Taka (App. A, p. 46).

*The average cost for each individual pharmaceutical item issued was 9 Taka in the emergency room and 6 Taka in the inpatient departments.*

Medical supplies were classified as general medical supplies, radiology supplies, and other medical supplies. Other medical supplies amounted to the balance of the AES "Pharmaceutical and Medical Supplies" expenditures after deducting the identified pharmaceutical, medical and radiology supplies. The captured, detailed medical supplies (App. E, p. 1 - 4) were 4.6 percent of the identified recurrent expenses. Radiology supplies were .7 percent and other medical supplies was 1.3 percent of the identified recurrent expenses.

Medical supply cost for each patient day and patient admission were as follows:

Department	Cost per Patient Day	Cost per Admission
Medical	5 Taka	33 Taka
Surgical	12 Taka	117 Taka
Gyn/Obs	7 Taka	51 Taka
Pediatrics	5 Taka	23 Taka
CCU	23 Taka	90 Taka
EENT	4 Taka	52 Taka
Psychiatric	21 Taka	255 Taka
SKH	10 Taka	41 Taka

The cost per visit for medical supplies was 21.6 Taka for emergency room, 3.2 Taka for gynecology, .9 Taka for dental, .5 Taka for medical, and 9.4 Taka for surgical. The average cost per outpatient visit, including emergency room visits, was 5.7 Taka (App. Analysis, p. 22).

### 5.3.9 *New Cabin Recurrent Expense*

“New Cabins” consisted of nineteen semi-private rooms with one room reserved for VIP patients. The semi-private rooms were available for MMCH and MMC personnel and for private patients and represent a device for generating revenue—all of which had to be deposited in the Treasury at the time of the MMCH study. Private patients pay for their New Cabin room, as well as for diagnostic and surgical services.

*When operated according to the rules, “New Cabins” represent a potential area of cross-subsidy from the non-poor to the poor. In this regard, the amount of expenses and revenues generated by them are significant to record.*

New Cabin had 744 patients during the year with 7720 patient days and an average length of stay of 10.4 days. New Cabin patient occupancy was 57.7 percent. Wages, excluding physician salaries, were allocated based on HEU surveys. Maintenance expense allocations were based on square meters. Pharmaceutical and medical supply expenses were based on their actual distribution. Laboratory and radiology expense were allocated on the basis of patient admissions. Dietary and laundry expense was allocated based on patient days.

New cabins had the fourth longest average length of stay of all the patient departments—10.4 days. Cost per admission were 3,307.8 Taka for new cabins and their cost per patient day were 318.8 Taka (App. Analysis, p. 23). Total costs for New Cabins were 2,461,500 Taka. As will be shown below, revenues generated from New Cabins amounted to 674,146 Taka for a net loss of 1,787,354 Taka (US\$ 38,028).

### 5.3.10 *Patient Revenues*

At the time of the HEU study, MMCH had three levels of inpatient revenues: admission ticket only revenues, paying bed revenues and cabin revenues. An admission ticket cost 5.5 Taka. Paying bed fees were 54 Taka per day. Cabin fees were 129 Taka per day and only private cabin patients paid for additional services. Level I government employees paid only for meals when occupying New Cabin rooms, in effect being exempted from payment as a benefit of employment. The outpatient and emergency room fee was 3.3 Taka (App. L, p. 8).

Revenue collected, during the year of study, from all sources was 3,437,392 Taka. Of the revenue, 82.7 percent was collected for emergency room fees, outpatient fees, paying bed and cabin fees. Ambulance, ECG, X-ray, and radiotherapy was 6.0 percent of the total revenue collected. The remaining balance of the MMCH annual revenue came from donations, fixing water and other sources. Fixing water was X-ray film developing solutions. The other sources were not identified and represented .3 percent of the annual revenue (App. C, p. 1). The total annual revenue was 3.8 percent of the AES expenditures and 2.9 percent of total identified hospital expenses..

A feature of the system which is linked with the low level of New Cabin revenues is the “exemption” process. The EMO had the authority to waive outpatient fees and admission fees. The criteria for exemption was not available to the HEU survey team. During the first six months of the fiscal year, patients exempted from fees for the seat rent included 31.0 percent of the ER patients and 12.4 percent of the outpatients. During the same time period, the admission fee was waived for 26.6 percent of the patients from ER and .4 percent of the patients coming from outpatient departments. The total number of patients exempt from the outpatient fee for the fiscal year was 41,806. The admission fee was waived for 10,180 patients (App. C, p. 5).

*The revenue, that would have been generated from the exempt outpatient fees and admission fees, was 137,960 Taka and 55,990 Taka, respectively (App. C, p. 3). The waived fees represented 27.7 percent of the admission fees and outpatient fees collected during the year. If these fees were added to collected revenue, the net loss on New Cabins would have been 1593304 Taka. If exemptions were restricted, 48.6 percent of New Cabin costs would have been recovered. Still the New Cabins would not generate a surplus for the facility.*

Revenue from cabins for the year was 674,146 Taka. The average length of stay for patients in cabins was 9.3 days with the average payment per stay of 1,052 Taka (App. C, p. 6). Revenue from paying beds for the year was 1,795,470 Taka. The average length of stay for patients in paying beds was 7.6 days and the average payment per stay was 433 Taka (App. C, p. 7). It would seem that paying beds yield a greater volume of revenue for the system.

# 6.0 Conclusions

The efficiency and effectiveness of facility personnel and other facility-based resources are greatly assisted by financial and a thoughtful linkage with utilization data. Financial analysis of available hospital data can provide such information for managers, planners, and policy-makers. The HEU study of MMCH consisted of a financial analysis of available data at a single facility in order to present a model for the use of step-down cost analysis in Bangladesh for tertiary care facilities. Full cost data, including opportunity costs and other elements of economic costs, would have enhanced this analysis. Similarly, financial analysis of all 8 Bangladesh medical college hospitals would have strengthened the MMCH study. Nevertheless, the study proceeded and has yielded certain conclusions.

## 6.1 Summary Findings

The summary findings of the HEU financial analysis of MMCH are presented in the keynote boxes below:

### *Baseline Hospital Measures.*

Occupancy: Varies widely across departments, with a low of 28.0 percent in Psychiatry and a high of 129.4 percent in Pediatrics. New cabin beds were only 55.7 percent occupied.

Average Length of Stay: For all inpatients, the ALOS was 7.2 days [total number of patient days (310,181) divided by the total number of patients (43,000)]. SKH had an ALOS of 2.3 days and Psychiatry had an ALOS of 12.5 days.

Death Rate: 5.4 per 100 admissions. EENT department had 0.9 deaths per 100 admissions; CCU had 12.1 deaths per 100 admissions; Pediatrics had 10.3 deaths per 100 inpatients.

Births: 2,252 births occurred at the hospital. Of the Gynae/Obs patients, 28.4 percent were for delivery.

### *Total Expenditures*

Total costs during the study year were 118,461,474 Taka or about US\$ 2.5 million. These costs were increased by 31.3 percent [about US\$ 830,000] above costs listed in the MMCH Annual Expenditure Statement to take account of items not identified: additional diagnostic services, personnel, depreciation, repairs and projects not reported in the AES.

Medical staff, personnel, supplies (including drugs), depreciation, food and electrical expenses were 92.5 percent of the total expenditures of MMCH. These items should be the focus of cost-control at MMCH and perhaps at other Medical College Hospitals in Bangladesh.

*Other Main Costs*

Medical Staff Expense amounted to 18,882,107 Taka or 15.9 percent of total expenses—Professor expenses were 2,057,3432 and Intern expenses were 7,425,000 from these expenses. Personnel expense without medical staff expenses was 29.0 percent of total hospital expenses.

15.1 percent of total study expenditures came from building and equipment depreciation (17,841,407 Taka).

Pharmaceuticals and medical supplies (MSR), including radiology supplies, were 19.1 percent of total expense, while food was 6.8 percent and electricity was 6.6 percent of total hospital expense.

*Patient Care Cost Summaries—Inpatient Focus*

- Total Cost Per Patient-day: 311 Taka, 48 of which was for medical staff.
- Departments well above 311 Taka: Psychiatry, CCU, SKH, Medical.
- Departments below 311 Taka: Pediatrics, EENT
- Highest medical expense areas: Psychiatry (360 Taka), CCU (268 Taka).
- Lowest medical expense areas: Surgery (24 Taka), Gynae/obs (35 Taka), EENT (34 Taka), SKH (38 Taka)
- Average Cost per Admission: 2,246 Taka for 43,000 admissions
- Highest Cost per Admission: Psychiatry (3,500 Taka), EENT (3,022 Taka), CCU (2,993 Taka)
- Lowest Cost per Admission: Pediatrics (1,083 Taka), SKH (2,064 Taka), Medical (2,078 Taka)
- Medical, Surgery, Pediatrics, And Gynae/obs departments: 81.6 percent of patients and consumed 78.7 percent of all hospital expenditures
- Highest Relative Resource Consumption Index: Psychiatry (6.50), EENT (1.35), CCU (1.33)
- Lowest RRC Index: Pediatrics (0.48), Medical (0.92)

## *Patient Care Cost Summaries—Outpatient Focus*

- Outpatient Departments: Dental, Gynae, Medical, Surgery, Emergency, General Outpatient (including rabies vaccine)
- Outpatient expenses: 18.5 percent of total expenses for 257,852 patients in outpatient clinics—of which 32,240 emergency room patients
- Average cost per emergency Room visit: 217 Taka, with 37 Taka for medical staff expense
- Average cost per outpatient Visit—including emergency: 58 Taka, with 15 Taka for medical staff expense
- Average cost per outpatient Visit—excluding emergency: 66 Taka
- Outpatient surgery per visit: 507 Taka
- Emergency expense per visit: 37 Taka
- High RRC Index Departments: Surgery (6.00) and Emergency (2.56)
- Low RRC Index Departments: General outpatient (0.37), Dental (0.76)

## *Recurrent and Non-recurrent Costs*

Non-recurrent costs: Building depreciation (16,925,159) and equipment depreciation (106 items/10 fully depreciated—17,841,407)

Recurrent costs:

Personnel:

- Average salary & benefit: 31,330 for 4<sup>th</sup> Grade, 197,087 for 1<sup>st</sup> Grade, 79,105 for Medical Staff
- Medical staff = 22.1 percent of total salary /benefits and Nursing staff = 25.6 percent
- Overall benefits were 44.0 percent of employee salaries
- RRC Indexes were highest for 1<sup>st</sup> Grade officers (3.75), Medical staff (1.60) and for 2<sup>nd</sup> Grade (1.67);
- RCC Indexes were lowest for 4<sup>th</sup> Grade (0.64), 3<sup>rd</sup> Grade (1.19) and Nurses (1.28)
- Interns were greatest part of inpatient medical staff expenses (57.5 percent) while physician expense was the greatest part of outpatient expense (85.0)

Administrative expense: 5.5 percent of total expense, with 56.5 percent going to administrative personnel; highest for Psychiatry, lowest for Pediatrics

Diagnostics: Laboratory and pathology were 3,754,704 Taka, Radiology was 3,301,441 Taka per year

Support/maintenance: building repairs were 4,094,974 Taka per year and dietary expense of 9,299,867

Drugs were 15.8 percent of total recurrent costs with 99.7 percent from CMSD—1.6 million items issued with 68.2 percent for inpatients

6.2 Issues and inconsistencies found in the study

Certain findings stood out as inconsistencies or matters requiring explanation at MMCH.

6.2.1 Personnel expense and payroll budget gap

Personnel was the largest component of MMCH expenditures, but the MMCH study found that personnel expenditures of the hospital were 7.3 percent below the payroll budget. How can such a gap be accounted for?

- Six medical officers and four assistant registrars were above the budgeted personnel positions.
- There were 12 registrars and 19 assistant registrars at MMCH—1.6 assistants for each registrar.
- The nursing service had 12 supervisors and 151 senior nurses—12.6 senior nurses for each supervisor.
- The ratio of assistant registrars to registrars was disproportionate to the nursing ratio.
- During the year of study, the position of statistician was vacant. And it is important to note that the statistician’s responsibilities include the accumulation of census and procedure information.

6.2.2 Hospital occupancy rate

The hospital occupancy rate was 103 percent, but patient department occupancy rates varied from 28 percent for psychiatric to 129 percent for pediatrics. The student and staff designated bed occupancy was 24 percent. New Cabin occupancy rate was 57.7 percent. Thus, psychiatric, student, staff and New Cabin beds were under-utilized when compared to the MMCH overall occupancy rate.

6.2.3 Control of expenses and reporting

The total identified cost for MMCH for the study year—including medical staff and depreciation—was 118,461,474 Taka. As a percent of total cost, the expense for MMCH were as follows:

Medical Staff Expenses	15.9 percent
Other Personnel	29.5 percent
Pharmaceuticals and Medical Supplies	19.0 percent
Depreciation	15.1 percent
Food	6.7 percent
Electric	6.6 percent

These six categories represent 92.8 percent of MMCH total expenses. Personnel and supply expenses amount to about 64 percent of the total expenditures of the hospital. *It is vital to see that it is virtually impossible to monitor and control sixty-four percent of MMCH expenditures with the current reporting system.*

#### 6.2.4 *Repair and maintenance issues—short-term outlook*

Excluding the capital building expenditures of CMMU during the year of the HEU study, the building maintenance, provided by the Public Works Department, was .8 percent of the cost of the MMCH buildings. Capital equipment repair expense was 1.2 percent of the cost for the equipment. *The lack expenditures for the repair and maintenance of building and equipment is likely to significantly decrease the life of the buildings and equipment. The replacement expense would be greater the cost of maintenance.*

#### 6.2.5 *Cost of laboratory procedures*

The cost for a laboratory procedure performed by the hospital was over 100 percent greater than the allocated expense for a procedure performed by the Medical College. The cost for each procedure performed by Medical College was based on the its fee structure, less the Medical College collection rate of 1.4 percent. The cost per procedure for laboratory personnel was 70.3 Taka. The cost per procedure for pathology and microbiology at MMC was 30.1 Taka and 66.3 Taka, respectively. Fees at MMC were low compared to the private sector, but the fee structure does not account for all of the difference.

#### 6.2.6 *Fee exemption—reduced revenue collection*

The cost of a medical teaching hospital is always greater than a private sector hospitals. A fee structure, designed equal the expenditures for a teaching hospital, will not be competitive with the private hospitals. Clearly, revenues for MMCH can be enhanced, by review of exemptions. Written criteria for exempting patients from hospital fees did not exist in the HEU study year. *Forty-five percent of the admission and outpatient fees were waived—an exceptionally high figure. The MMCH fee structure was not complete at the time of the HEU study and the fees were significantly below private sector levels. Less than twelve percent of the patients paid for beds during the study year. Application of fees for inpatient services, excluding room fees, was applied to less than two percent of the patients.*

#### 6.2.7 *Need for improved reports*

Summarized financial information at MMCH was not available in sufficient detail to be of value to the HEU survey team. Thus, supplemental information had to be obtained and in some cases developed almost originally from individual entities such as CMSD, the Central Ministry of MOHFW, PWD, and others. Census and other reported utilization data available at MMCH did not correspond to the time period of the annual financial data—utilization data was summarized on an annual basis while the AES was based on the fiscal year. Furthermore, the unit of analysis sometimes required modification, since some census units pertained to multiple wards and medical departments. Without census units and financial information that corresponded to the



same medical departments and time periods, the efficiency of individual medical departments could not, strictly speaking, be determined. These areas, and others noted above under "data constraints" require improved reports for financial control at MMCH and, in all likelihood, at other facilities as well.