Cost Analysis and Efficiency Indicators for Health Care:

Report Number 1
Summary Output for Bani Suef General Hospital, 1993-1994

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Acronyms

ALOS	Average Length of Stay
CEA	Cost-Effectiveness Analysis
DALY	Disability Adjusted Life Year
DOP	Department of Planning
DDM	Data for Decision Making
ENT	Ear, Nose, and Throat
FTE	Full Time Equivalent
L.E.	Egyptian Pound
Gyn/Obs	Gynecology and Obstetrics
ICU	Intensive Care Unit
CCO	Occupancy Rate
MOHP	Ministry of Health and Population
PWAF	Present Worth of Annuity Factor
PV	Present Value
QALY	Quality Adjusted Life Years
RP	Reference Period
GGH	Gamhuria General Hospital
TC	Total Cost
na	Not available/not applicable

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Comments and questions on the report are welcome:

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Arabic Executive Summary

Executive Summary

The governorates of Alexandria, Suez, Bani Suef, Dakahlia, Port Said, North Sinai, South Sinai and Aswan undertook detailed costing studies for eighty health facilities to analyze costs and efficiency in Ministry of Health and Population hospitals. This study presents the results of the costing analysis for the Bani Suef General Hospital in the Bani Suef Governorate. The data collection and analysis were conducted by a team from the Bani Suef Health Directorate in collaboration with the Data for Decision Making Project (DDM). The DDM project is a collaborative effort between the Department Of Planning (DOP), Ministry Of Health and Population (MOHP), United States Agency for International Development (USAID), the Harvard School of Public Health, and the University of California, Berkeley, School of Public Health.

The operating costs of the Bani Suef General Hospital from July 1993 to June 1994 were allocated to individual cost centers. These cost centers are classified as overhead, intermediate services and final services departments. The overhead departments such as personnel, finance, and maintenance provide support to intermediate and final services departments. The intermediate services departments, such as laboratory and operating theaters, provide procedures and services to patients in final services departments in the inpatient wards and outpatient clinics.

Fifty-four functional departments were identified as cost centers at the hospital. Overhead, intermediate, and final services departments account for 12, 19, and 69 percent, respectively, of total hospital-wide costs.

Five major categories of costs were selected to estimate the total costs: building and permanent structures, equipment and furniture, personnel, drugs and medical supplies, utilities, and food and clothing.

The study uses the step-down technique for allocating overhead and intermediate services departments costs to final services departments. The step-down technique was also used to allocate overhead and intermediate services department staff to final services departments, and to estimate the full-time equivalents for each department and clinic.

In general, the highest expenditure in hospitals is on personnel. These costs include take-home pay and all related benefits. Annual personnel costs account for 58 percent of the total expenditures at the Bani Suef General Hospital. Costs for personnel at intermediate services and final services departments constitute 86 percent of personnel costs, while salaries for personnel at overhead departments represent 14 percent of the total cost of personnel. Physicians' and nurses' salaries account for 64 percent, while other staff categories constitute 36 percent of the total costs of personnel.

Fourteen percent of the total annual costs for 1993-94 was spent on drugs and medical supplies. The total annual cost of drugs and medical supplies is estimated at 760,114 L.E., which includes not only the drugs actually used but also donated and wasted drugs. This estimate does not include prescription drugs purchased by patients out-of-pocket. The average cost of drugs per inpatient day is 2.8 L.E. This low expenditure suggests either the magnitude of the dependency of the system on patient drug purchases outside the hospital, or it suggests low quality of care. A small portion of the drugs and medical supplies (2 percent of the annual total) is consumed by the renal dialysis unit. The cost of drugs and medical supplies varies significantly across final services departments. For example, they constitute 22 percent of expenditures in the ENT department, while they account for only 5 percent of the inpatient treatment for general medicine patients.

The study assessed the actual cost of renal dialysis as an example of one of the interventions financially supported by the MOHP in spite of its high cost. The average cost per visit is 165

L.E., which totals 17,000 L.E. per patient annually taking into account that the renal failure patient needs 2 weekly visits (104 visits yearly on average, 4-6 hours for each visit). The cost of drugs and medical supplies constitute 16 percent of the total cost. See Table 27 for the distribution of costs per outpatient visit.

The average cost per admission is 147 L.E. Costs range from 76 L.E. for the pediatrics department to 4,064 L.E. for the intensive care unit (ICU). The cost per admission is highest in departments with low occupancy rates and long average lengths of stay (see Table 29). Some departments are very well staffed with an average of 1.35 staff for every occupied bed; however, the average occupancy rate is 55 percent resulting in high admission costs (see Graph 24 for annual admissions per full time physician output versus cost per admission).

The average cost per day, 31 L.E., varies depending on the occupancy rate. This daily cost ranges from 15 L.E. (psychiatry) to 549 L.E. (ICU) due to lower occupancy rates and higher input costs in these departments.

The average annual cost per bed is 6,192 L.E.. This ranges from 3,739 L.E. in the psychiatry department to 18,539 L.E. in the Incubator department (see Graph 22 for the total annual cost per bed).

The total maintenance cost in this hospital is about 83,100 L.E., which represents 1.83 percent of the annual recurrent costs. The international average percentage of maintenance costs ranges from between 10 to 15 percent of the annual recurrent costs to maintain effective hospital operation (Mills 1991).

Outpatient visits in this hospital cost an average of 7.34 L.E. Drugs account for 12 percent (0.88 L.E.) of the total amount, while personnel costs consume more than 41 percent. The cost of outpatient visits depends on the number of visits to each clinic. In general surgery it is 7 L.E. and 19 L.E. for gynecology and obstetrics, which respectively treat 63 and 12 patients daily (see Table 26 for the distribution of costs per outpatient visit). The cost per visit for the emergency unit is 5.73 L.E. Drugs and medical supplies make up 21 percent, which is more than the cost of drugs and medical supplies for outpatient clinics. Outpatient care at BSGH absorbs 58 percent (2,612,336 L.E.) of total hospital recurrent expenditures.

The average occupancy rate in 1993-94 was 55 percent. This rate ranges from 6 percent in the ICU department to 66 percent in the psychiatry department. The departments of gynecology and obstetrics and orthopedics have the highest turnover rates, 63 and 54 patients per bed, per year, respectively. Turnover rates decrease in the psychiatry department with 8 patients per bed per year and is at its lowest in the ICU at 3 patients per bed per year. The turnover rate in the Bani Suef General Hospital is 42 patients per bed per year.

This study assessed the average length of stay for 113 diagnoses to help determine the diseases with the longest lengths of stay. Deliveries account for the highest number of admissions (9.19 percent of total hospital annual admissions, ALOS 1.4 days), and wounds, contusions and abrasions represent the second highest number of admissions (8.63 percent of total hospital annual admissions, ALOS 2.83 days). Abortion is the seventh highest cause of admission with ALOS 1.62. In general, average lengths of stay appear appropriate for the most common diagnoses. Patients in the psychiatry department stay an average of 29 days, while they stay only 2 days in the gynecology and obstetric and pediatric departments. These figures are based on an analysis of the admission and discharge sheets of the hospital, which were reviewed to ensure the accuracy of results. (See Tables 12, 13, 14 and 15 for a list of average lengths of stay at the Bani Suef General Hospital).

The average number of inpatient days per full-time equivalent (FTE) physician was 1,707 patient days. Based on the fact that each physician works 270 days a year, each physician

attends to 6 patients during his/her 6 hour day. This number decreases to 94 patient days for a physician in the ICU, meaning he/she is responsible for fewer than one patient per working day.

Recommendations: Improving the efficiency of this hospital will require an increase in occupancy rate. This can be achieved through a number of changes in management.

Recommended changes include:

1. Increase hospital autonomy and decision-making by the hospital director in budget allocations, staffing, drugs purchases, etc. A performance-based incentive system is one feasible and practical method for rewarding good management practices and performance.

2. Staffing ratios per bed or bed day are not an infallible proxy for quality of service. Training and skill level, supporting technology, team work, and organization of services are all essential complementary co-determinants of quality. In addition, differences in the case mix inside and between departments has an important role. For example, ICU patients need more staff than orthopedics patients.

3. Increases in the budget for drugs and medical supplies. This will increase the total annual costs of the hospital, but, on the other hand, the availability of drugs will likely increase the quality of care and the utilization rate (number of admissions); this, in turn, will decrease the total cost per admission.

4. Treatment protocols for the same cause of admission vary among physicians of the same department. The average length of stay can be reduced by more than 50 percent by changing the standard practice for specific cases of admissions.

5. Increases in the budget for maintenance. Maintenance has important implications for the overall technical efficiency of the hospital. Unfortunately, maintenance costs are directed mainly towards repairing hospital equipment and not towards regular and preventive maintenance, for which there are no plans.

6. Increasing occupancy rates by reducing the average lengths of stay would increase the turnover rate that would enable a greater number of people to benefit from hospital services. The study investigated the main causes of long average lengths of stay for different diagnoses.

The following factors contribute to extended lengths of stay:

- Patients admitted for diagnostic tests remain in the hospital until the results are received before undergoing medical or surgical treatments.

- Physicians are often late or absent because of conflicts in appointments between their hospital service and private practice. It is critical for the hospital to work out arrangements with the physicians to ensure that such conflicts are minimized.

- An absence of standard practices and protocols for the same cause of admission creates variations in treatment among the physicians of the same department.

- Hospital infections as a result of poor sterilization (although there is little data available on the magnitude of hospital infections and their effect on ALOS).

7. It is evident that the existing information systems rarely produce the required information. Research is required into how routine systems can best be altered and augmented. Reliable

data will help in identifying resource allocation problems and in planning changes to health sector resource allocation patterns.

8. The results of this study will provide a definitive basis for negotiating a price for the daily reimbursement rate for private patients based upon the average cost per day of 31 L.E. The study can also be used for negotiating a reimbursement rate from health insurance companies and for health insurance companies to set insurance prices based on estimated annual costs for hospitalization and utilization in the population covered.

9. Increasing the capacity of the Bani Suef General Hospital to perform ambulatory surgery and other treatments. This would potentially assist in increasing hospital occupancy and efficiency, while fulfilling the patient demand for improved hospital care. This would require upgraded skills on the part of the surgeons and anesthesiologists, and possibly require some specialized equipment.

However, the current system of hospital admissions and management, which is divided between the governorate, the Ministry of Health and Population, and the hospital administration, provides no incentive to improve management, quality, and efficiency. Changing the decision-making system so that efficient, high quality care is rewarded will likely have the greatest impact. This change will require increased decision-making autonomy in the hospital regarding staffing patterns, maintenance budgets, and drug purchases, among other considerations. These changes might also lead to the hospital's increased accountability to provide efficient and patient-oriented services. The role of the central- and governorate-level health administration would expand to developing hospital policy and to monitoring and assuring quality services.

I. Introduction

In Egypt, as in other developing countries, the demographic and epidemiological transition is putting increasing pressure on scarce government resources.

Government spending on health care in Egypt, as a percentage of the gross domestic product, has remained fairly constant in the last decade. The budget tracking system of the Department of Planning demonstrates that scarce health resources are allocated towards services which are costly and result in limited benefits in terms of increased life expectancy. Only 5 percent is allocated to primary care services which are known to be most cost-effective. Under these circumstances, the challenge facing policy makers is to optimize returns on investments in health care.

Two major avenues for increasing health benefits from scarce resources are 1) increasing the efficiency and improving the management of existing health facilities and health programs and 2) increasing the allocation of resources to those programs that are most cost-effective. In order to increase the use of scarce resources for more cost-effective and efficient services, the Ministry of Health and Population undertook a cost-effectiveness exercise.

Cost-Effectiveness Analysis is a method for identifying interventions that achieve the greatest level of health impact per unit of expenditure. Effectiveness is typically measured in terms of improvements in health status. Various measures, including years of life gained through reduced mortality, Disability Adjusted Life Years (DALYs), and Quality Adjusted Life Years (QALYs) are used to assess effectiveness. An important aspect of cost-effectiveness analysis is that it can be used to assess technical and allocative efficiency.

Allocative efficiency measures the optimal distribution of resources among a number of competing uses. Technical efficiency is the extent to which the choice and utilization of input resources produce a specific health output, intervention or service at the lowest cost (WDR 1993). Inefficiency of inputs can lead to high costs per unit of service delivered to patients. Technical inefficiency occurs when output is less than is technically possible with the mix of inputs used by the hospital (Barnum 1993).

To define costs and efficiency in hospitals the governorates of Alexandria, Suez, Bani Suef, Dakahlia, Port Said, North Sinai, South Sinai and Aswan undertook detailed costing studies for eighty health facilities. This study presents results for the costing of Bani Suef General Hospital at Bani Suef Governorate. The data collection and analysis was conducted by a team from Bani Suef Health Directorate in collaboration with the Data for Decision Making Project (DDM). The DDM project is a collaborative effort between the Department of Planning (DOP), Ministry of Health and Population (MOHP), Harvard University School of Public Health, and the University of California Berkeley, School of Public Health.

The study uses step-down analysis to cost hospital-based services in general hospitals run by the MOHP. Efficiency indicators point to significant technical and economic inefficiencies. Nearly half of the expenditures in the hospital go to paying for salaries of personnel, leaving less than optimal resources for drugs and medical supplies. Major intra-hospital differences exist in costs per admission, total full time equivalent staff per bed, output per physician, bed turnover rate and bed occupancy rate. The analysis shows that with better allocation of resources (human and financial), major efficiency gains can be achieved.

A. Why Hospital Costing and Efficiency Indicators for Bani Suef General Hospital?

The main objectives of the cost and allocative efficiency study of the Bani Suef General Hospital are to:

- Develop a clear and appropriate methodology for calculating the service cost.

- Increase the technical capability of professionals at the governorate in undertaking costing studies and using the information for decision making.

- Estimate the actual economic costs of services delivered by each medical department of the hospital.

- Increase the efficiency of resource use by not only understanding the costs of services under the current operating system, but also providing some understanding of how resources can be used to provide the optimal level of service.

- Create a basis for a pricing system of medical services delivered by the hospital that can be used to establish fees for services and contracts.

B. Use of Data to Detect Inefficiencies in Resource Allocation and Identify Strategies to Improve Them

The data from the Bani Suef General Hospital can be used to identify areas of inefficiencies by comparing the costs and outputs with other similar facilities, both nationally and internationally.

By comparing the results of the various facilities, the range of costs for outpatient and inpatient services becomes evident and reasons for the differences can be better analyzed: low utilization, high administrative costs, differences in personnel staffing, differences in equipment and maintenance budgets, etc. Strategies can then be developed to treat the identified problems which may include increasing utilization of under-utilized facilities, changing staffing patterns, closing under-utilized facilities, etc.

C. Description of Bani Suef General Hospital

The Bani Suef Governorate is located 124 km south of Cairo. It is a mostly rural governorate (only 26 percent is urban) with a total population of 1.8 million. Bani Suef General Hospital (BSGH) is the only general hospital for the Bani Suef governorate. It was built in 1960 and currently houses about 576 beds. The hospital is operated by the MOHP and its primary objective is to provide general medical and surgical services to the local community.

Bani Suef hospital is a full-service general hospital with the following specialties: ear, nose, and throat (ENT), general medicine, general surgery, gynecology and obstetrics (Gyn/Obs), intensive care (ICU), incubator, orthopedics, pediatrics, urology and psychiatry. The hospital also houses operating theaters, a laboratory, radiology services, and a renal dialysis unit. Outpatient services are provided in all of these specialties, as well as in dentistry, dermatology, rehydration, treating rabies, psychiatry, diabetes and cardiology.

Being an MOHP hospital, BSGH is administered under MOHP regulations and guidelines, as well as those of the Ministry of Manpower. Funds allocated from the Ministry of Finance to the MOHP for personnel, including physicians, are controlled by the Ministry of Manpower and assigned by the MOHP to the Bani Suef governorate. The governorate, through the office of Medical Affairs, assigns individuals to local health facilities. This system does not give hospitals sufficient control to select the numbers and quality of appointed personnel. This puts hospitals in a difficult position in terms of management autonomy and financial decision making.

The primary mission of the Bani Suef General Hospital, as of other MOHP hospitals, is to provide free medical care. Unfortunately, in recent years, the MOHP's budget has not been

adequate to defray the financial needs of such hospitals and other health units across the country. In order to help counterbalance overall costs, some facilities have introduced limited user fees. During the fiscal year of 1993-94, the BSGH revenues from these fees were 649,164 L.E. (for total admissions which represents 5 percent of the total annual admissions of the hospital). In addition, BSGH charges hospital visitors L.E. 0.50 per visit. These fees collected from inpatients and outpatient visitors are used as bonuses for physicians and other staff, for drug purchases and other expenditures.

The staff consists of 1,098 employees (including 174 physicians and 454 nurses). This staffing level provides a ratio of employees to occupied beds (assuming Bani Suef hospital's most recent occupancy rate of 55.28 percent) of 1.35 to 1. In relation to total beds, this ratio decreases to 0.74 to 1.

The total annual admissions in 1993-94 was 24,298 patients, with an average length of stay of 4.78 days. Total annual outpatient visits (including emergency and renal dialysis units) was 253,759 visits.

II. Methods

A. Allocation of Costs Between the Three Tiers

Economic costs are used for the purpose of this analysis. The Bani Suef General Hospital is organized into three tiers based upon the nature of service provided. These are identified as overhead departments, intermediate services, and final services departments. Intermediate services departments provide support and services to patients in final services departments. Table 1 identifies the functional departments of the hospital in the overhead, intermediate and final services categories.

The costs of the overhead departments are distributed to the intermediate and final services departments through a step-down method, according to allocation criteria devised to reflect as closely as possible the actual use of resources by each of the departments. The resources for the director's office, the overhead department serving the most departments, are distributed first; the resources for finance, the overhead department serving the second-largest number of departments is distributed next. Resources are then allocated to the intermediate services and final services departments.

B. Cost Allocative Among Departments

Total costs consist of recurrent costs and the discounted present value of capital costs. These are allocated to the overhead, intermediate services, and final services departments according to the proportion of support required by each department. Data collected for costs estimation were grouped under five broad categories: major and minor equipment, building and permanent structures, labor (personnel costs), utilities, drugs and medical supplies.

1. Capital Costs are the annual costs of resources that have a life expectancy of more than one year. They include depreciated annual costs for buildings, equipment and furniture. The study uses replacement costs for capital items, which is the cost of the item if it were to be replaced at the current market price. The study was conducted between 1 July 1993 to 30 June 1994.

The costs of buildings and equipment are depreciated according to the unified accounting method currently practiced in Egypt, with 25 years useful life for the building.

2. Recurrent Costs are costs associated with inputs that will be consumed or replaced in one year or less, such as personnel salaries, training (refresher courses), drugs, food and utilities.

C. Cost Categories

Capital Costs

1. Annual Depreciation Costs For Equipment and Furniture

The study used the replacement costs of equipment and furniture during the period of data collection from July 1, 1993 to June 30, 1994. (See appendix V for the data collection sheet for equipment). Six categories of equipment and furniture, each with a secondary categorization of 2, 3, 5, 10, 15 or 20 working life years, were assessed. This categorizing system was designed with the assistance of MOHP experts in the field of medical supplies who are familiar with the

actual productive lifetime for equipment and furniture in Egypt according to the level of maintenance and use of the equipment.

The number of units of equipment and furniture and their locations were obtained through a physical inventory and technical description in log books no. 118, 112, 121. Table 2 shows the total costs of equipment and the annual depreciation costs.

2. Annual Building Depreciation Costs

The study used the replacement cost for the building during the period of time the data was collected. The replacement cost was 575 L.E. per sq. meter (including the cost of elevators and oxygen lines). These figures were obtained from the DOP at the MOHP, which is responsible for budget allocation in different governorates to establish and renovate health facilities. The building costs that are depreciated assume an effective life of 25 years. The price of the land has not been included in this estimation.

For allocation of corridors to cost centers (departments), we first allocated the special corridors, or the spaces located between departments. (See the diagram at the bottom of Table 3). These corridors were allocated according to the following rules:

- For overhead and intermediate services departments, allocation was set according to the percentage of personnel using the corridors within each department.

- For inpatient departments (691 sq. m.), allocation was set according to the percentage of admissions using the corridors within each department

- For outpatient clinics (593 sq. m.) allocation was set according to the percentage of outpatient visits using the corridors within each clinic.

The other type of corridors are general corridors (1,504 sq. m.), which include all space outside the departments. These corridors have been allocated to the three main departments (overhead, intermediate and final services departments) of the hospital according to the proportion of occupied space from the total space area of the hospital. Again, inside each department of the three main departments, general corridors have been allocated according to the number of personnel at each cost center. This data was collected by preparing a floor plan of the hospital identifying and categorizing rooms according to their activities, and estimating the size of each room and corridors. The information about building characteristics was obtained from the engineering (maintenance) department.

Table 3 shows the base cost center space and the total space for each cost center after allocating special and general corridors. It also shows the total cost of the building for each cost center and the annual depreciation cost using 25 years as useful life and 3 percent for the Present Worth Annuity Factor (PWAF).

Recurrent Costs

1. Annual Personnel Costs

Staff are allocated to five categories, (see Table 4 for personnel allocation):

1. Physicians: Includes all medical doctors working in the intermediate and final services departments, in addition to dentists. Pharmacists are not included in this category.

2. Nurses: Includes all nurses who graduated either from the school of nursing or from the high institute of nursing.

3. Technicians/ skilled personnel: Includes personnel with a university degree or a special skill. They include lab technicians, dietitians, pharmacists and drivers for vehicles or ambulances. The largest numbers of personnel included in this category work in the intermediate services department, while a minimal number work in the final services department.

4. Administration: Includes personnel performing administrative work. Most personnel in this category are working in the overhead department while very few work in the final services department.

5. Unskilled personnel: Includes all personnel working as janitors and messengers.

The annual personnel costs or the "total pay" for each person working at the hospital, which includes:

- Take-home pay.

- Benefits (including exceptional honoraria and family planning), health insurance contributions, labor day allowance, feast honoraria, pay for working overnight, accommodation and food for doctors and nurses.

- Deductions such as insurance, pension and income tax.

All staff have been assigned to the three main departments. The Full-Time Equivalent (FTE) was calculated dividing the physician's work by the ratio of his/her work in outpatient, inpatient, operations and emergency departments. The numbers shown in the personnel column are equal to the full time equivalent of personnel working at each cost center. Table 5 shows the breakdown of the cost centers and final services expenditures by percentage of each specialty's working hours amongst different departments. Graph 7 shows the distribution of hospital staff for inpatient departments. Nurses accounted for the highest percentage (41percent) of annual personnel costs, followed by physician costs (25 percent of annual personnel costs). See Graph 8 for the distribution of personnel costs for each staff category. Table 6 shows the criteria for the distribution of overhead and intermediate services department personnel to final services departments. Tables 7 and 8 display the proportion of overhead and intermediate services department used by the final services departments. The average number of hospital personnel per bed is 1.09. Since the occupancy rate is 55 percent, this means an FTE staff of 1.98 per occupied bed. The ICU has the highest number with 13.77 FTE staff per occupied bed. See Table 9 and graphs 1,2 and 3 for the total number of personnel working at final services departments before and after using the step-down technique for hospital staff.

Data on personnel salaries were collected from Sheets no. 50 and 132 A.H. at the finance and personnel departments. Cost analysis shows that 58 percent of annual hospital expenditure was spent on personnel.

In addition, trying to allocate personnel not working in specific cost centers was somewhat ambiguous. For example, there are 25 head nurses working in inpatient departments, who are not affiliated with a specific department. The allocation of these personnel was computed according to the percentage of admissions for each inpatient department in which they work.

The allocation rules of such personnel are:

- In overhead departments: Because all of the non-allocated personnel in this department are non-skilled workers (working in cleaning services), they are allocated according to the space area in each cost center.

- In intermediate services departments: The same rule as in overhead departments.

- In direct service departments: Allocation is assigned according to the percentage of days of stay for inpatient departments or outpatient visits for outpatient clinics.

2. Annual Utility Costs

This category includes electricity, water, telephone lines, vehicle gas, and kitchen oil. The annual costs of meals, patient and personnel apparel, stationery, building and equipment maintenance and travel per diem were also added to this category. Data on the cost of utilities and the official records of invoices was obtained from the financial department. Table 10 shows the total annual cost of utilities and their allocation to cost centers. Cost analysis shows that 11 percent of annual hospital expenditures was spent in annual utility costs (see Annex IV for data sources).

The following are the criteria for the allocation of each utility cost to cost centers:

- Personnel food costs: Allocated according to the number of meals for personnel in each department.

- Patient food costs: Allocated according to the annual number of patient days in each department. The total annual cost of food for patients and personnel accounted for 59 percent of the utility costs (see Graph 9).

- Personnel apparel: Allocated to intermediate and final services departments according to the number of personnel in each of them. Personnel in overhead departments do not receive apparel.

- Stationery: Allocated to the overhead department according to the percentage of personnel at each cost center.

- Equipment maintenance: Allocated to each department according to the equipment cost at each cost center as a total cost of equipment at the hospital.

- Building maintenance: Allocated to different cost centers according to the space area as a percentage of the total space area of the hospital.

- Vehicles maintenance: Completely allocated to the vehicle and ambulatory departments.

- Travel per diem and mail: Allocated completely to the personnel department.

- Fuel and oil: Allocated completely to vehicles.

- Natural gas: 70percent allocated to the kitchen, the rest to the generators (which are allocated to all departments according to the space area of each).

- Water: Allocated to all departments according to space area.

- Electricity: Allocated according to the electricity consumption measured by using an avometer. The highest consumers of electricity are the laundry and operating theaters.

- Telephone: Allocated according to the number of phone sets in each cost center.

3. Annual Cost of Drugs and Medical Supplies

This category includes drugs and medical supplies provided by the hospital. It does not include prescribed drugs that patients purchase outside of the hospital. Table 11 shows the total annual cost of drugs and medical supplies in each department and outpatient clinic. The study used the price list of Drugs and Medical Supplies Department at MOHP for purchasing drugs and medical supplies for its health facilities. Data related to drugs and medical supplies consumed by the final services departments were collected from the Pharmacy and Store Departments. Cost analysis shows that 14 percent of annual hospital expenditure was spent on drugs and medical supplies.

The operating theater department accounts for 20 percent of the total expenditure on drugs and supplies. The second highest consumer is the emergency unit at 15spercent, followed by inpatient departments at 43percent (the general surgery department uses 14 percent), outpatient clinics at 17percent (of which the general surgery clinic is the highest consumer at 3 percent). The renal dialysis unit is at 2 percent of the annual cost of drugs and medical supplies of the hospital.

III. Results

Description of Bani Suef General Hospital

Bani Suef General Hospital (BSGH) is a full service general hospital with 576 beds and 54 functional departments. Of these, 12 are overhead departments, 14 intermediate services departments, and the remaining 28 are direct services departments. The hospital has a total area of approximately 17,160 square meters, with inpatient departments making up 29 percent of the total area. BSGH has 1,098 employees made up of 174 physicians, 454 nurses, and 470 other employees. Put another way, 190 employees are in the overhead departments, 188 are in intermediate services departments, and 720 are in final services departments. The emergency unit is the largest department in the hospital with 90 full-time equivalent employees. Operating theaters are the largest intermediate services department with 58 employees, and the general surgery department is the largest direct services department with 108 full-time equivalent employees. See Table 4 for the allocation of hospital personnel. In 1993-94 there were a total of 24,298 admissions with an average length of stay of 4.78 days. Total outpatient visits (including the emergency and renal dialysis units) was 253,759 visits.

Results of Costing Study

This section presents the main findings from the cost study. To recapitulate, the total annual cost is the sum of the annualized capital costs and recurrent costs. In turn, capital costs and recurrent costs are subdivided into five subcategories. The total annual cost for BSGH in 1993-94 was L.E. 5,473,463.

Cost by Budget Category

Graph 5 presents the breakdown of total costs by capital and recurrent costs.

- Annualized capital costs represented 17percent of total costs. Of these, building costs accounted for 7percent and equipment and furniture 10 percent. For the analysis, the cost of land is not taken into consideration.

- Recurrent costs represent 83 percent of the total cost. Personnel accounted for 58 percent of the total cost, followed by drugs and medical supplies at 14 percent and utilities at 11 percent.

  - Nurses make up 41 percent of personnel costs followed by physicians at 25 percent, and other personnel making up the remaining 34 percent.

  - A large portion of the cost of drugs and medical supplies - 20 percent - is attributable to the operating theaters department.

  - Only 1.83 percent of the total annual recurrent costs are spent on maintenance.

Cost by Department

Hospital costs were initially broken down into three departments: overhead, intermediate services and final services. Graph 6 gives the breakdown of costs by these three departments.

- 12 percent of total annual costs are attributable to overhead departments. From Table 16 it can be seen that of this 25 percent are for capital costs, 67 percent for personnel costs, and 8 percent are for other recurrent costs.

- 19 percent of total annual costs are attributable to intermediate services departments. Again, from Table 16 it can be seen that, of this, 22 percent are for capital costs, 55 percent are for personnel costs, and 23 percent are for other recurrent costs.

- 69 percent of total costs are attributable to direct service departments. Of these, 14 percent are for capital costs, 57 percent are for personnel costs, and 29 percent are for other recurrent costs.

Step-down Allocation of Overhead and Intermediate services Departments Costs

Capital and recurrent costs are assigned to overhead, intermediate services and final services departments through direct distribution (as in the dental lab and emergency pharmacy) or by step-down allocation.

Costs of the overhead departments are first allocated to intermediate services and final services departments. Total costs of the intermediate services departments after allocation of overhead costs are then allocated to the final services departments. Finally, final services department costs are allocated to inpatient departments, outpatient clinics, emergency and renal units. (See Graph 10 for the distribution of annual hospital costs to the direct services departments after step-down allocation).

a. Allocation of the Overhead Departments

Table 17 shows the allocation criteria for the distribution of overhead and intermediate services departments costs to the final departments. Fifty percent of cost centers within overhead departments are allocated according to their proportion of the total annual costs of the hospital. Table 18 shows the allocation of overhead departments and the total costs of intermediate services and final services departments after the allocation of overhead department costs. Approximately 15 percent of overhead department costs were distributed among intermediate services and 85 percent to final services departments. The operation theaters, emergency unit, and gynecology and obstetric department received the largest share of overhead department allocations (3, 5 and 7 percent, respectively).

b. Allocation of Intermediate services Departments

intermediate services departments costs were distributed among the final services departments according to the number of procedures or services used. The proportion of intermediate services department procedures and services used by the final services departments and the amount of the costs distributed are shown in Table 19. The orthopedic department is the largest user (10 percent) of intermediate services department, followed by 9 percent for the general surgery department. The emergency unit uses 3 percent of intermediate services department services.

c. Composition of Costs for Inpatient Departments

The distribution of costs and percentages for inpatient departments by major categories is presented in Tables 22 and 23. Overhead departments represent 10 percent of the total final costs of inpatient departments, while intermediate services departments procedures and services represent 27 percent. Cost of FTE personnel within inpatient departments (hospital staff working only at inpatient departments) represent 32 percent of total annual costs of inpatient departments (See Graph 11 for the average distribution of costs by category in inpatient departments).

d. Allocation of Costs for Inpatient Departments

Estimates were made of the number of admissions in inpatient departments from July 1993 to June 1994 (see Graph 14). The average cost per admission for inpatient care at Bani Suef Hospital (ALOS 4.78 days) was L.E. (see Graph 15 for the average cost per admission). There is a substantial variation in inpatient admission costs by department (see Table 24 and Graph 16 for the distribution of costs per admission).

The highest cost per admission is in the ICU department (L.E. 4,064) which is the result of a low turnover rate (3 patients per bed per year). The lowest cost per admission is for the pediatric department (L.E. 76), which is the result of a low average length of stay (2.21 days) and a high number of admissions and turnover rate.

The average cost of an inpatient day is estimated to be L.E. 31. The annual cost per bed reached L.E. 12,529 for the ICU with an average annual cost per bed of L.E. 6,192. See the cost analysis and efficiency indicators for inpatient departments for more details.

e. Composition of Costs for Outpatient Clinics

The distribution of costs and percentages by major categories of outpatient clinics are presented in Tables 25 and 26. Outpatient clinics, including the emergency and renal dialysis units, represent 35 percent of annual hospital costs. The cost of FTE personnel, hospital staff working only in outpatient clinics, 62 percent, and the cost of drugs, 13 percent of the total cost, are the largest cost items allocated to outpatient clinics (see Graph 17 for the average distribution of cost by category at outpatient clinics).

There are, however, wide variations in the composition of costs among different clinics. About 77 percent of the cost for obs/gyn outpatient visits are personnel costs. In the renal dialysis unit, personnel costs represented the lowest percentage of the total cost of outpatient visits (25 percent), while drugs and medical supplies costs represented only 10 percent (see Graph 18 and Tables 25 and 26 for the distribution of the annual cost by category).

f. Allocation of Costs for Outpatient Clinics

Estimations were made according to the number of outpatient visits in outpatient clinics and emergency units from July 1, 1993 to June 30, 1994. There is substantial variation in outpatient visit costs (see Table 26 and Graph 19 for the distribution of costs per outpatient visit).

The gynecology and obstetric and family planning outpatient clinics have the highest cost per outpatient visit, L.E. 19. Personnel costs account for more than 65 percent of the total visit cost, which is due to a low to utilization rate (less than 5,000 visits per year). The lowest cost per visit is for the ENT, dermatology and endemic diseases clinics where drugs represent 17 percent of the total visit costs, followed by 51 to 59 percent for personnel costs. The average cost per outpatient visit at Bani Suef Hospital is L.E. 7.34; the average cost of drugs per visit is L.E. 0.86.

The average cost per visit for renal dialysis patients is L.E. 165; of this, drugs and medical supplies cost L.E. 15. For the emergency unit, the average cost per visit is L.E. 5.73 which includes L.E. 1.22 for drugs and medical supplies. See Table 28 for the average cost per visit for the dental clinic, outpatient clinics, and the emergency unit.

Step-Down Allocation of Hospital Staff To Final services Departments

The total hospital staff of the Bani Suef Hospital is comprised of five categories of personnel: physician, nurse, technician, administrative and unskilled workers. Each category of personnel is assigned to overhead, intermediate services and final services departments through direct distribution. They are then converted to FTEs.

Personnel of the overhead departments were first allocated to intermediate services and final services departments. The total personnel of the intermediate services departments, after the allocation of overhead departments, is then allocated to the final services departments. Finally, personnel of the final services departments are allocated to the inpatient department, outpatient clinics, emergency and renal units. See Graph 2 and 3 for the distribution of hospital staff to direct service departments after step-down allocation.

a. Allocation of Overhead Departments Personnel

Table 6 gives the criteria used to allocate personnel within overhead departments to intermediate and final services departments. Eighty percent of hospital staff within overhead departments are allocated according to the proportion to total annual admissions for each department (one admission is equal to three outpatient visits). Table 7 illustrates the allocation statistics of overhead departments and personnel of intermediate and final services departments after the allocation of overhead department personnel. Only 1.57 percent of overhead department personnel was distributed amongst intermediate services departments; 98.43 percent was distributed to final services departments. The emergency unit received the largest share of overhead department allocations (26.84 percent).

b. Allocation of Intermediate services Departments Personnel to Final services Departments:

Personnel within intermediate services departments were distributed among the final services departments according to the number of procedures or services used (see Table 6 for allocation criteria for distributing intermediate services department personnel). The distribution of costs from intermediate services departments to final services departments for procedures and services are shown in Table 8.

Cost Analysis and Efficiency Indicators

Cost Analysis

For the year 1993-1994 the total annual cost for the Bani Suef General Hospital was L.E. 5.5 million. Personnel costs amounted to 58 percent of the total annual cost, followed by 14 percent for drugs and medical supplies (these figures represent averages for the hospital). Inpatient departments varied from 7 to 49 percent for FTE personnel, and from 5 to 22 percent for drugs and medical supplies, depending on the total number of annual admissions (see Graph 14). Table 24 presents the distribution of costs per admission by cost categories.

The study included the actual cost of renal dialysis patients as an example of an intervention financially supported by the MOHP in spite of its high cost. The average cost per visit for renal dialysis is L.E. 165 which adds up to L.E. 17,160 per patient per year as a renal failure patient requires 2 visits weekly (104 visits yearly). The cost of drugs and medical supplies constitute 10 percent of the total cost which is a lower drug and medical supply cost compared with other MOHP general hospitals.

The average cost per admission is L.E. 147. The highest cost per admission is L.E. 4,064 for the ICU department, while the cost is L.E. 76 for the pediatric department. The variations in cost depend on the occupancy rate and average length of stay in the departments (see Table 29). Some departments were very well-staffed with an average of one physician per two beds. The average cost per day is L.E. 31, which varies depending on the occupancy and turnover rates. It was found that this daily cost could vary from L.E. 21 (orthopedics department) to L.E. 549 (ICU) due to the large difference in the annual admissions in these departments.

The average annual bed cost is L.E. 6,192 and varies between L.E. 4,000 in the urology department to L.E. 18,000 in the incubator department. The psychiatry department had the lowest cost of L.E. 3,739 per bed (see Graph 22 for total annual cost per bed).

The total cost of maintenance in this hospital is about L.E. 83,100, which represents 1.83 percent of the annual recurrent cost. The international average percentage of maintenance costs ranges between 10 to 15 percent of the recurrent cost.

In general, personnel costs absorb the largest proportion of total costs for outpatient visits: 25 to 78 percent of total costs for outpatient visits, versus 7 to 49 percent of total costs per admission. These variations are due to the absence of ambulance, operating rooms, food costs and the relatively fewer diagnostic procedures in outpatient clinics. Salaries and drugs together take up a higher share of outpatient clinics. Salaries and drugs together take up a higher share of outpatient than inpatient expenditures.

Outpatient visits in the Bani Suef Hospital cost an average of L.E. 7.34. The cost of drugs reaches 12 percent of the total amount, while personnel costs consume more than 62 percent. The costs for outpatient visits depend on the number of visits to each clinic. The cost varies from L.E. 4 per visit in the skin clinic, which see 63 patients daily, to L.E. 19 per visit in the gynecology and obstetric clinic, which sees 12 patients daily (see Table 27 for the distribution of costs per outpatient visit; see Graph 20 for the cost of an outpatient visit).

The cost per visit for the emergency unit is L.E. 5.73. Drugs and medical supplies represent 17 percent of the total costs, which is more than the cost of drugs and medical supplies for outpatient clinics.

Efficiency Indicators in Inpatient Departments

The study prepared some efficiency indicators in the general hospitals that will help decision - makers to evaluate the level of performance in both the inpatient and outpatient departments.

Occupancy Rate

The average occupancy rate in 1993-94 was 55 percent. This rate varies from 64 percent in the orthopedics department to 6 percent in the ICU department. See Graph 21 for the occupancy rate versus the turnover rate.

Turnover Rate

Both the pediatrics and gynecology and obstetric departments have the highest turnover rate (74 and 63 patients per bed per year, respectively). This rate decreases for the psychiatry department with 8 patients and 3 patients in the ICU department, the lowest rate in the hospital. This translates into an average length of stay of 29 to 7 days, respectively, for these departments. The average turnover rate in the Bani Suef General Hospital is 42 patients per bed per year.

Number of Inpatient Days per FTE Physician

The average number of inpatient days per full-time equivalent physician was 1,707 patient days. Based on the fact that each physician works 270 days a year, each physician treats 94 patients during his/her 6 hour working day. This number decreases to 13 treatment days per year for a physician in the ICU, meaning he/she is responsible for only one patient per month, which is a very low ratio.

Number of Physicians per Bed

If we base our computations on an occupancy rate of 55 percent, there are 0.21 physicians for each occupied bed or an average number of 0.12 FTE physicians per bed.

Hospital Staff

Using the step-down technique for the allocation of overhead and intermediate services departments, the study obtained an estimation of the total hospital staff working for final services departments. The general medicine, general surgery and obstetrics and gynecology departments have the largest number of hospital FTE staff (more than 100 FTE personnel for each). The emergency unit absorbs 13 percent of FTE hospital staff or 51 personnel.

Number of FTE staff per Bed

The study used the step-down technique to allocate the personnel of the overhead and intermediate services departments to the final services departments. The average number of hospital personnel per bed is 1.09 or 1.98 staff per occupied bed. The ICU department has the highest number of staff per bed, or 13.77 FTE staff.

Number of Nurses per Physician

The average number of nurses per physician is 4.07. This number varies from 17 nurses in the psychiatry department to 0.36 nurses in the ICU department.

Number of Annual Admissions per FTE Physician

The average annual admissions per FTE physician is 357, or 30 admissions per month. This figure drops to 13 admissions per year (one case a month) in the ICU department. See Figure 26 for the annual number of admissions per FTE physician.

Average Length of Stay By Diagnosis

The study measured the average lengths of stay for 113 diagnoses at Bani Suef General Hospital from July 1993 to June 1994. The data was collected from the admissions and discharge sheets of the hospital to assure the accuracy of results. Unfortunately, the diagnoses do not follow the international classification of diseases. Deliveries comprise the highest number of admissions (9.19 percent of total hospital annual admissions, ALOS 1.4 days), and wounds; contusions and abrasions were the second highest cause of admissions (8.63 percent of total hospital annual admissions, ALOS 2.83 days). Abortions are the seventh highest cause of admission with ALOS 1.62. In general, average lengths of stay appear appropriate for many of the diagnoses. However, without further information about the severity of cases, it is not possible to assume that the patients are hospitalized appropriately. One third to one half of the diagnoses appear to require longer lengths of stay than commonly occurs in U.S. hospitals. For example, patients in the psychiatry department stay an average of 29 days, while they stay only 2 days in the gynecology and obstetric and pediatric departments (See Tables 12, 13, 14, and 15), for a list of average lengths of stay for Bani Suef Hospital.

Graph 21 summarizes some of the efficiency indicators of the Bani Suef General Hospital. The x-axis represents the occupancy rate, while the y-axis represents the annual turnover rate. The graph is divided into four regions by two intersecting lines, the vertical line representing the average bed occupancy rate and the horizontal line representing the average turnover rate. As it deals only with two indicators, the graph is more useful for descriptive than policy purposes as it does not answer the question of whether a given department is performing efficiently. Other efficiency indicators, such as unit cost, number of FTE personnel, are required for policy purposes (see Appendix I for glossary).

Departments in Region I accounted for 52 percent of the total annual cost of inpatient departments and 57 percent of total annual admissions. Departments in this region (orthopedics, general surgery, general medicine and incubator) may be characterized by:

- Small proportion of unused beds.
- High bed turnover rate.

Departments in Region II (urology and psychiatry) accounted for 13 percent of the total annual cost of inpatient departments and 7 percent of total annual admissions. Departments in this region may be characterized by:

- Small proportion of unused beds.
- Low bed turnover rate.
- Long lengths of stay.

Departments in Region III (pediatrics, gynecology and obstetrics) accounted for 28 percent of the total annual cost of inpatient departments and 33 percent of total annual admissions. Departments in this region may be characterized by:

- Excess bed availability.
- High bed turnover rate.

Departments in Region IV (ENT and ICU) account for 7 percent of the total annual costs of inpatient departments and 3 percent of total annual admissions. Departments in this region may be characterized by:

- Excess bed availability.
- Low bed turnover rate.

Efficiency Indicators In Outpatient Clinics

Using the step-down technique, the study was able to obtain some indicators of the efficiency level in the outpatient departments.

The average number of visits per physician in outpatient clinics is 9 visits a day (see Graph 27 for annual outpatient visits for each clinic). The highest number of visits was in the physiotherapy and orthopedic clinics with 58 and 49, respectively on average daily visits (see Graph 28 for annual outpatient visits per physician). Orthopedics and physical therapy only have one physician, who is assisted by nurses and other health personnel.

The number of staff in each clinic (physicians, nurses, administration and support services which includes personnel at overhead and intermediate services departments) can reach 33, as in the general surgery clinic with 7.5 physicians and 25.5 support services personnel. The total number of personnel working for outpatient clinics (including overhead and intermediate services personnel) is 316, with an average of 482 personnel per outpatient visit per staff. In the emergency unit there are 151 personnel with an average of 600 personnel per emergency unit visits per staff.

Department Specific Results

A. Ear, Nose and Throat Department

Cost Analysis

- Annual cost of the department; L.E. 95,094 (2.67 percent of total annual expenditures of inpatient departments)
- Cost per inpatient admission: L.E. 163
- Cost per day: L.E. 45
- Annual cost per bed: L.E. 5,005

Efficiency Indicators

- Annual admissions: 582 (2.40 percent of total annual admissions)
- Number of beds: 19 (3.30 percent of total hospital beds)
- Annual patient-days of stay: 2,107 (1.81 percent of annual patient-days)
- Occupancy rate: 30.38
- Bed turnover rate: 31
- Average length of stay: 3.62

Department Staff

- Number of full time equivalent physicians: 405
- Annual admissions per FTE physician: 144
- Annual patient-days per FTE physician: 520
- Number of FTE physicians per bed: 0.21
- Number of nurses per FTE physician: 0.16
- Staff in the department (including overhead and intermediate services departments personnel):
  - Number of FTE staff: 12.78
  - Number of FTE staff per bed: 0.67
  - Number of FTE staff per bed (according to occupancy rate): 2.21
- Staff in the inpatient department (not including overhead and intermediate services department personnel):

- Number of FTE staff: 5.7

- Number of FTE staff per bed: 0.3

These departments have the lowest annual total cost or L.E. 96,094 (2.67 percent of total annual expenditures for inpatient departments). Occupancy rate is quite low at 30 percent, which is the second lowest occupancy rate after the ICU department at 6 percent. Inpatient departments are located in Region V in graph 21, which includes departments having excess bed availability and a low bed turnover rate.

The annual cost per bed in this department is L.E. 5,005, which is relatively low because of the low annual total expenditure of the department (L.E. 95,094) Note that the number of beds is quite low, 19 or 3 percent of total hospital beds.

Drugs and medical supplies constitute 21.63 percent or L.E. 35.35 of admission costs, the highest percentage cost of all inpatient departments. Personnel costs accounted for 13.30 percent. This department is the only one where drug and medical supplies were greater than personnel costs. The operating rooms absorb only 12 percent of the total admission costs per patient, L.E 20.

The numbers of nurses per FTE physician is 0.90. This is the lowest figure in the hospital. Step-down allocation of hospital staff shows that the total number of FTE staff for the ENT department is only 12.78, which is the second smallest number for inpatient departments after the ICU department (10.34).

B. General Medicine Department

Cost Analysis

- Annual cost of the department: L.E. 473,863 (13.29 percent of total annual expenditure of inpatient departments).

- Cost per inpatient admission: L.E. 108

- Cost per day: L.E. 21

- Annual cost per bed: L.E. 4,646

Efficiency Indicators

- Annual admissions: 4,406 (18.13 percent of total annual admissions).

- Number of beds: 102 (17.7 percent of total hospital beds)

- Annual patient-days of stay: 22,050 (18.97 percent of total annual patient-days)

- Occupancy rate: 59.23
- Bed turnover rate: 43

- Average length of stay: 5

Department Staff

- Number of full-time equivalent physicians: 8.70
- Annual admissions per FTE physician: 506
- Annual patient-days per FTE physician: 2,534
- Number of FTE physicians per bed: 0.09
- Number of nurses per FTE physician: 6.53
- Staff at the department (including overhead and intermediate services department personnel):
  - Number of FTE staff: 105.07
  - Number of FTE staff per bed: 1.03
  - Number of FTE staff per bed (according to occupancy rate): 1.74
- Staff within the inpatient department (not including overhead and intermediate services departments personnel):
  - Number of FTE staff: 82.55
  - Number of FTE staff per bed: 0.81

The cost of 21 L.E. per day is the lowest of the inpatient departments in the hospital due to the large number of admissions, 4,406 per year, and the long duration of stay, 22,050 days. This is the second highest ALOS rate after the general surgery department at 22,942.

Personnel working in the general medicine inpatient department only receive 49 percent of the cost of admission. This is the highest percentage of personnel costs for the inpatient departments, followed by utilities and accounting at 16 percent. Drugs and medical supplies accounted for only 5 percent or 5 L.E. of the total cost of admission. See Graph 12 for the average distribution of the cost per admission for the general medicine department. See Table 24 for the distribution of costs per admission at BSGH.

The occupancy rate in the department is one of the highest in the hospital. The turnover rate is relatively high as well, at 43 patients, due to the relatively long lengths of stay.

The general medicine and gyn/obs departments have the second highest number of admissions, 50 patients, per FTE physician. The highest number of admissions, 819 patients, is in the orthopedic department.

C. General Surgery Department

Cost Analysis

- Annual cost of the department: 795,643 L.E. (22.31 percent of total expenditures of inpatient departments).

- Cost per inpatient admission: 185 L.E.
- Cost per day: 35 L.E.
- Annual cost per bed: 7,506 L.E.

Efficiency Indicators

- Annual admissions: 4,307 (17.73 percent of total annual admissions)
- Number of beds: 106 (18.4 percent of total hospital beds)
- Annual patient-days of stay: 22,942 (19.74 percent of total annual patient-days)
- Occupancy rate: 59.3
- Bed turnover rate: 41
- Average length of stay: 5.33

Department Staff

- Number of full-time equivalent physicians: 13.5
- Annual admissions per FTE physician: 319
- Annual patient-days per FTE physician: 1,699
- Number of FTE physicians per bed: 0.13
- Number of nurses per FTE physician: 6.59
- Staff of the department (including overhead and intermediate services departments personnel):
  - Number of FTE staff: 154.12
  - Number of FTE staff per bed: 1.45
  - Number of FTE staff per bed (according to occupancy rate): 2.45
- Staff of the inpatient department (not including overhead and intermediate services departments personnel):
  - Number of FTE staff: 115.43
  - Number of FTE staff per bed: 1.09

This department has the highest annual expenditure in the hospital at 795,643 L.E. representing 22 percent of the total annual expenditures for inpatient departments of the hospital. The higher annual costs are due to the following:

- High annual patient-days of stay. General surgery has the highest annual patient-days of stay, or 20 percent of total annual days of stay.

- High number of staff working at the department. The department has 115.43 personnel, the highest number of staff of any inpatient department.

- High number of hospital staff. Using the step-down technique for the allocation of hospital personnel, the number of personnel serving this department, including overhead and intermediate services departments, is equal to about 154.12 FTE personnel. This is the highest number of FTE personnel for an inpatient department (see Graph 2 for the distribution of hospital personnel to final services departments).

- Large number of beds. The department has 109 beds, or 18.4 percent of the total hospital beds, which is highest number of beds for an inpatient department.

In spite of the long lengths of stay, the number of patient-days per physician is still low. This is because the department has a large number of FTE physicians, 13.5, which is the second highest number of FTE physicians after the gynecology and obstetrics department at 15 FTE physicians.

In spite of the high annual cost of the department, the annual total cost per bed is relatively low at 7,506 L.E. due to the large number of beds (see Graph 22 for annual cost per bed).

The cost per admission is 185 L.E. (see Graph 15 for the cost per admission). Of this, the operating theater absorbs 18 percent (32 L.E.) and drugs and medical supplies absorb 13 percent (26 L.E.) of the total cost per admission. Graph 13 shows the average distribution of costs per admission for the general surgery department.

D. Gynecology and Obstetrics Department

Cost Analysis

- Annual cost of the department: 767,652 L.E. (21.52 percent of total annual expenditures of inpatient departments)
- Cost per inpatient admission: 161 L.E.
- Cost per day: 67 L.E.
- Annual cost per bed: 10,101 L.E.

Efficiency Indicators

- Annual admissions: 4,780 (19.67 percent of total annual admissions)
- Number of beds: 76 (13.19 percent of total hospital beds)
- Annual patient-days of stay: 11,528 (9.92 percent of total annual patient-days)
- Occupancy rate: 41.56
- Bed turnover rate: 63
- Average length of stay: 2.41

Department Staff

- Number of full time equivalent physicians: 15.00
- Annual admissions per FTE physician: 319
- Annual patient-days per FTE physician: 769
- Number of FTE physicians per bed: 0.20
- Number of nurses per FTE physician: 4.62
- Staff at the department (including overhead and intermediate services departments personnel):
  - Number of FTE staff: 143.52
  - Number of FTE staff per bed: 1.89
  - Number of FTE staff per bed (according to occupancy rate): 4.54
- Staff within the inpatient department (not including overhead and intermediate services department personnel):
  - Number of FTE staff: 99.36
  - Number of FTE staff per bed: 1.31

This department has the second highest annual total cost or L.E. 767,652 constituting 22 percent of the total annual expenditures for inpatient departments. In spite of the high annual admissions rate of 4,780 patients, which is the second highest annual admission after orthopedics at 4,914 patients per year, the cost is high at 67 L.E. per day. This high cost per day is a result of the low average length of stay at 2.4 days, resulting from the relatively low total annual days of stay.

The high annual total cost in the department is a result of:

- High number of FTE staff, 99, which is the second highest number of personnel after the general surgery department. Using the step-down method, the number of personnel serving this department (including overhead and intermediate services departments) is equal to about 143.52 FTE personnel. See Graph 2 for the distribution of hospital personnel to final services departments.
- Operating theaters absorb 41 L.E. per admission, which is the highest in the hospital. Note that operating theaters account for only 25 percent of the admission cost.
- The OB/GYN department has 76 beds or 13 percent of total hospital beds.

The number of annual patient days and admissions per physician is relatively low at 769 and 319 respectively due to the high number of FTE physicians (15.00 FTE physicians within the inpatient department).

intermediate services departments, including the operating theaters, account for 33.63 percent of the total cost per admission, while overhead departments account for 8.72 percent. The five cost categories -- equipment, building, personnel, utilities and drugs -- of the Gyn/Obs

department represent 57.65 percent of the total cost per admission. See Table 24 for the distribution of costs per admission.

E. Intensive Care Unit

Cost Analysis

- Annual cost of the department: 150,351 L.E. (4.22 percent of total expenditures for inpatient departments)
- Cost per inpatient admission: 4,064 L.E.
- Cost per day: 549 L.E.
- Annual cost per bed: 12,529 L.E.

Efficiency Indicators

- Annual admissions: 37 (0.15 percent of total annual admissions)
- Number of beds: 12 (2.08 percent of total hospital beds)
- Annual patient-days of stay: 274 (0.24 percent of total annual patient-days)
- Occupancy rate: 6.26
- Bed turnover rate: 3
- Average length of stay: 7.41

Department Staff

- Number of full time equivalent physicians: 2.9
- Annual admissions per FTE physician: 13
- Annual patient-days per FTE physician: 94
- Number of FTE physicians per bed: 0.24
- Number of nurses per FTE physician: 0.36
- Staff at the department (including overhead and intermediate services departments personnel):
  - Number of FTE staff: 10.34
  - Number of FTE staff per bed: 0.86
  - Number of FTE staff per bed (according to occupancy rate): 13.77
- Staff of the inpatient department (not including overhead and intermediate services departments personnel):

- Number of FTE staff: 7.94

- Number of FTE staff per bed: 0.66

The intensive care unit is the least efficient department in Bani Suef Hospital for the following reasons:

- High cost per admission. The ICU is the highest of the inpatient departments at 4,064 L.E.
- Low annual admission, occupancy and bed turnover rates at 37 admissions, 6.26 percent and 3 patients, respectively.

- The FTE physician per occupied bed is 3.86, which is the highest rate in the hospital.

- Number of admissions per physician. The total number of admissions for the 2.9 FTE physicians is 37. This figure means that there is only one admission per physician per month.

- Number of FTE staff per occupied bed. The number is astonishing at 10.58 FTE staff, forming the highest rate not only in inpatient departments for Bani Suef General hospital but in all MOHP hospitals.

- The step-down allocation of hospital staff shows that the total number of FTE staff is 13.77 per occupied bed.

- Number of patient-days per FTE physician is 94, the lowest number of all inpatient departments. This means that, based on 270 annual work days, each FTE physician examines only one patient every 2.9 days.

- Drugs and medical supplies for ICU patients account for only 5 percent of the cost of admission.

As a result of the high annual depreciation costs, equipment and furniture in the ICU constitute 60 percent of all annual depreciated costs of the inpatient departments, and 18 percent of the total hospital equipment depreciation costs. These are the highest depreciation costs in the hospital.

F. Incubator Department

Cost Analysis

- Annual cost of the department: 129,773 L.E. (3.64 percent of total annual expenditure for inpatient departments)

- Cost per inpatient admission: 459 L.E.

- Cost per day: 82 L.E.

- Annual cost per bed: 18,539 L.E.

Efficiency Indicators

- Annual admissions: 283 (1.16 percent of total annual admissions)
- Number of beds: 7 (1.22 percent of total hospital beds)
- Annual patient-days of stay: 1,592 (1.37 percent of total annual patient-days)
- Occupancy rate: 62.31
- Bed turnover rate: 40
- Average length of stay: 5.63

Department Staff

- Number of full time equivalent physicians: 5.25
- Annual admissions per FTE physician: 54
- Annual patient-days per FTE physician: 303
- Number of FTE physicians per bed: 0.75
- Number of nurses per FTE physician: 0.44
- Staff at the department (including overhead and intermediate services departments personnel):
  - Number of FTE staff: 18.71
  - Number of FTE staff per bed: 2.67
  - Number of FTE staff per bed (according to occupancy rate): 44.29
- Staff of the inpatient department (not including overhead and intermediate services departments personnel):
  - Number of FTE staff: 12.55
  - Number of FTE staff per bed: 1.79

The annual cost per bed, 18,539 L.E., is the highest in the hospital. This is because the department has only 7 beds or 1.22 percent of the total, which is the lowest number of beds in the hospital.

The average cost per admission is 459 L.E., which is the second highest cost after the ICU. This high cost per admission is a result of the low annual admission or 283 patients, representing 1.16 of total annual admissions.

The cost per day is 82 L.E. Again, this number represents the second highest cost after the ICU. Drugs and medical costs account for 17.56 percent, the second highest percentage after the ENT department (21.63 percent). The annual depreciated cost of equipment and furniture absorbs 15.92 percent.

The incubator department is the most frequently used department and accounts for 3.29 of admission costs.

The ALOS is within range of the average at 5.63 days. However, because of the high occupancy and turnover rates at 63.75 and 40 respectively, the department, which is located in Region 1 in Graph 21, is characterized by a small proportion of unused beds and a high bed turnover rate.

The total number of personnel working within the incubator department is only 1.79 per bed, which is the highest of the inpatient departments, and can reach 2.88 per occupied bed. See Table 27 for the number of FTE inpatient department personnel per bed. The number of FTE physicians per bed is 0.75, which is the highest of all inpatient departments, and can reach 1.2 per occupied bed.

The step-down allocation of hospital staff reveals that the total number of FTE staff per bed reaches 2.67, which is the highest rate in the inpatient departments. The rate reaches 4.29 personnel per occupied bed.

Overhead support departments absorb 19.80 percent of the total annual costs of the incubator department and 5.63 percent of intermediate services departments. The five cost categories of the department -- equipment, building, personnel, utilities and drugs -- represent 74.57 percent of the total annual costs of the department. See Tables 21 and 22 for the distribution of annual costs.

G. Psychiatry Department

Cost Analysis

- Annual cost of the department: 302,864 L.E. (8.49 percent of total annual expenditures for inpatient departments)
- Cost per inpatient admission: 447 L.E.
- Cost per day: 15 L.E.
- Annual cost per bed: 3,739 L.E.

Efficiency Indicators

- Annual admissions: 677 (2.79 percent of total annual admissions)
- Number of beds: 81 (14.06 percent of total hospital beds)
- Annual patient-days of stay: 19,635 (16.89 percent of total annual patient-days)
- Occupancy rate: 66.41
- Bed turnover rate: 8
- Average length of stay: 29.00

Department Staff

- Number of full-time equivalent physicians: 1.5

- Annual admissions per FTE physician: 451
- Annual patient-days per FTE physician: 13,090
- Number of nurses per FTE physician: 16.5
- Staff at the department (including overhead and intermediate services department personnel):
  - Number of FTE staff: 54.45
  - Number of FTE staff per bed: 0.67
  - Number of FTE staff per bed (according to occupancy rate): 1.01
- Staff within the inpatient department (not including overhead and intermediate services department personnel):
  - Number of FTE staff: 50.25
  - Number of FTE staff per bed: 0.62

The psychiatry department is considered to be one of the most efficient departments in the hospital for the following reasons:

- The cost per day is the lowest in the hospital, 15 L.E., because the department has the highest average length of stay at 29 days.
- The occupancy rate is the highest at 66.41. Again, the high occupancy rate is a result of long ALOS.
- The number of patient-days per physician is 13,090, which is the highest rate in the hospital.
- The number of FTE staff per occupied bed, including overhead and intermediate services departments, is one of the lowest in the hospital (0.67). The urology department is the lowest with only 0.64 FTE staff per occupied bed.
- The number of FTE physicians per occupied bed is 0.02, which is the lowest number in the inpatient departments in the hospital. This figure means that each physician is responsible for 50 occupied beds, which reflects the severe shortage of psychiatric physicians at Bani Suef General Hospital.

The cost per admission is 447 L.E. This high cost is a result of the long ALOS. Personnel account for 40.67 percent of the admission cost, followed by the annual depreciation costs of the building, which absorbs 27.97 percent. Utilities account for 8.70 percent, and drugs and medical supplies account for 6.18 percent of the admission cost.

Both the high occupancy and low turnover rtes of the department place the department in Region II in Graph 21.

Overhead support departments account for 11.71 percent of the total annual cost of the psychiatry department and intermediate services departments account for 16.06. The five cost categories --equipment, building, personnel, utilities and drugs -- of the psychiatry department

represent 72.23 percent of the total cost per admission. See Table 24 for the distribution of costs per admission.

H. Orthopedics Department

Cost Analysis

- Annual cost of the department: 437,560 L.E. (12.27 percent of the total annual expenditure for inpatient departments).
- Cost per inpatient admission: 89 L.E.
- Cost per day: 21 L.E.
- Annual cost per bed: 4,808 L.E.

Efficiency Indicators

- Annual admissions: 4,914 (20.22 percent of total annual admissions)
- Number of beds: 91 (15.8 of total hospital beds)
- Annual patient-days of stay: 21,176 (18.22 percent of total annual patient-days)
- Occupancy rate: 63.75
- Bed turnover rate: 54
- Average length of stay: 4.31

Department Staff

- Number of full-time equivalent physicians: 6.00
- Annual admissions per FTE physician: 819
- Annual patient-days per FTE physician: 3,529
- Number of FTE physicians per bed: 0.07
- Number of nurses per FTE physician: 1.4
- Staff at the department (including overhead and intermediate services departments personnel):
  - Number of FTE staff: 61.81
  - Number of FTE staff per bed: 0.68
  - Number of FTE staff per bed (according to occupancy rate): 1.07
- Staff within the inpatient department (not including overhead and intermediate services department personnel):

- Number of FTE staff: 15.38
- Number of FTE staff per bed: 0.17

The department has the following good efficiency indicator:

- The annual number of admissions is the highest at one hospital (4,914).
- The cost per admission is the least in the inpatient department (21 L.E.)
- The occupancy rate and turnover rate are high, 63.75 and 54 receptively.
- The number of admissions per physician is the highest in the inpatient departments (819).
- Number of the patient-days per physician is 3,529, which is second highest rate after psychiatry (13,090).
- The number of FTE physicians per occupied bed is the least in the hospital (0.27).

The number of FTE physicians per occupied bed is the second lowest in the hospital (0.10) after the psychiatry department (0.02).

Forty percent of admission costs are absorbed by the operating theater, followed by personnel working in the inpatient department, accounting office for 6.8 percent, which is the lowest percentage of personnel costs in the inpatient departments. Drugs and medical supplies account for only 5.77 percent of admission costs.

Intermediate services departments account for 61.81 percent of the total cost per admission, while overhead departments account for 4.77 percent. The five cost categories -- equipment, building, personnel, utilities and drugs -- in the orthopedics department represent 33.42 percent of the total cost per admission. See Table 24 for the distribution of costs per admission.

I. Pediatrics Department

Cost Analysis

- Annual cost of the department: 248,337 L.E. (6.96 percent of total annual expenditure for inpatient departments).
- cost per inpatient admission: 76 L.E.
- Cost per day: 35 L.E.
- Annual cost per bed: 5,644 L.E.

Efficiency Indicators

- Annual admissions: 3,252 (13.38 percent of total annual admissions)
- Number of beds: 44 (7.64 percent of total hospital beds)
- Annual patient-days of stay: 7,185 (6.18 percent of total annual patient-days)

- Occupancy rate: 44.74
- Bed turnover rate: 74
- Average length of stay: 2.21

Department Staff

- Number of full-time equivalent physicians: 6.3
- Annual admissions per FTE physician: 516
- Annual patient-days per FTE physician: 1.140
- Number of FTE physicians per bed: 0.14
- Number of nurses per FTE physician: 3.57
- Staff at the department (including overhead and intermediate services departments personnel):
  - Number of FTE staff: 44.53
  - Number of FTE staff per bed: 1.01
  - Number of FTE staff per bed (according to occupancy rat): 2.26
- Staff within the inpatient department (not including overhead and intermediate services departments personnel):
  - Number of FTE staff: 28.77
  - Number of FTE staff per bed: 0.65

The turnover rate of 74 patients per year is the highest in the hospital. The average length of stay of 2.21 days is the lowest for inpatient departments.

High turnover and low ALOS lead to the lowest cost per admission (76 L.E.). Drugs and medical supplies represent only 4.96 percent of the cost, or 3.78 L.E., for drugs and medical supplies per admission for inpatient cost departments, which is the lowest.

Intermediate services departments account for 32.26 percent of the total cost per admission, while overhead departments account for 13.74 percent. The five cost categories - - equipment, building, personnel, utilities and drugs -- of the department absorb 54 percent of the total cost per admission. See Table 23 for the distribution of costs per admission.

J. Urology Department

Cost Analysis

- Annual cost of the department: 165,567 L.E. (4.64 percent of total annual expenditure for inpatient departments)

- Cost per inpatient admission: 156 L.E.
- Cost per day: 21 L.E.
- Annual cost per bed: 4,357 L.E.

Efficiency Indicators

- Annual admissions: 1,060 (4.36 percent of total annual admissions).
- Number of beds: 38 (6.6 of total hospital beds)
- Annual patient-days of stay: 7,732 (6.65 percent of total annual patient-days)
- Occupancy rate: 55.75
- Bed turnover rate: 28
- Average length of stay: 7.29

Department Staff

- Number of full-time equivalent physicians: 4.9
- Annual admissions per FTE physician: 216
- Annual patient-days per FTE physician: 1,578
- Number of FTE physicians per bed: 0.13
- Number of nurses per FTE physician: 0.46
- Staff at the department (including overhead and intermediate services department personnel):
  - Number of FTE staff: 24.49
  - Number of FTE staff per bed: 0.64
  - Number of FTE staff per bed (according to occupancy rate): 11.16
- Staff within the inpatient department (not including overhead and intermediate services department personnel):
  - Number of FTE staff: 11.16
  - Number of FTE staff per bed: 0.29

The average cost per admission is 156 L.E. Drugs and personnel costs in the inpatient department constitute an average of 17 percent of this cost. This is one of the few examples where personnel costs equal drug costs per admission. The operating rooms constitute only 8.3 percent, as most admissions do not require surgery, and the radiology department constitutes 6.26 percent.

The average length of stay is relatively high at 7.29 days, and the turnover rate is relatively low at 28 patients. These figures locate the department in Region IV in Graph 21, which has a low bed turnover rate.

Intermediate services departments account for 32.26 percent of the total cost per admission, while overhead departments account for 13.74 percent. The five cost categories--equipment, building, personnel, utilities and drugs -- of the urology department represent 54.00 percent of the total cost per admission. See Table 22 for the distribution of costs per admission.

IV. Conclusion

Average costs are customarily used to provide data needed to rate hospital performance. The average cost, however, is not sufficient to reach decisive conclusions regarding the sources of hospital efficiency. Ideally, a comparative study of the cost per unit of output for several hospitals would provide useful data on the hospitals that have provided optimal services with the greatest efficiency. Understandably, several minimum conditions, including the quality of services provided and the clinical composition of the patients for each hospital, would have to be known to give credibility to such results.

Without an understanding of the differences in quality and the case mix across the different departments of Bani Suef General Hospital, the efficiency implication of variation in average costs cannot be properly interpreted. High average costs may reflect high quality -- expensive equipment and adequate provision of drugs. Low average costs may be a result of an inadequate provision of drugs, thus representing poor quality, as is the case in the general medicine, ICU and pediatric departments where drugs and medical supplies account for only 5 percent of the total cost of admission. If information on the quality of services and the case mix of patients is added to cost data, the efficiency implications of average cost information become comprehensible.

The average length of stay (ALOS) is an important indicator of the efficiency of hospital resource utilization. Differences in the average length of stay among comparable types of departments imply differences in prevailing treatment practices across the hospital. However, without information about case mix and severity, it is difficult to use length of stay as a direct indicator of efficiency. However, stays that are unusually long raise many questions regarding efficiency and prompt a closer look at the possible causes.

A high bed occupancy rate does not always indicate better hospital performance. Indeed, bed occupancy rates can be too high, meaning that the volume of services is above the level designed for the hospital. The implications of high occupancy rates may reflect relatively efficient situations, as when many patients with modest lengths of stay are served (that is, the department has a high bed turnover rate).

Long lengths of stay tend to have lower than average costs per day because the treatment costs for the additional days are likely to fall below the average. However, low bed costs are not necessarily a true indicator of inefficiency. This is because lower bed costs can be the result of higher occupancy without increases in inefficiency. Preferably, following a policy to increase the bed occupancy rate through a greater number of admissions per bed, rather than longer stays will allow more patients to be served and thus boost the hospital productivity.
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The study demonstrated many inefficiencies in the operation of Bani Suef General Hospital, particularly in low occupancy rates and excessive staffing in many departments. The following section details recommendations to improve management.

V. Recommendations to Help Improve the Performance and Cut Cost in Bani Suef General Hospital

Hospitals perform a range of different functions: provision of inpatient treatment services within various medical specialties, specialist and general outpatient care, medical and paramedical support services, and other support services such as administration. It is important to know the balance of resources absorbed by different functions. To examine the efficiency with which departments of the hospital carry out their intended functions it would be desirable to have studies which specify cost functions and estimate average costs.

In nearly all countries, the largest share of public sector health expenditure is for hospitals, regardless of a country's health status and income level. It is both conventional and traditional to describe developing-country health systems as hospital dominated.

Hospitals internationally absorb approximately 30-50 percent of health sector expenditures, and 50-60 percent of current government health sector expenditures. General and central hospitals account for 60-80 percent of the total budget for hospitals, the remainder going to district hospitals (Mills 1990). In Jordan in 1987, the MOH spent 75 percent of the total recurrent health budget on hospitals. In Tunisia, hospitals represent 85 percent of national government health facilities stet (Mills 1990).

In Egypt, as in other developing countries, the distribution of recurrent resources within the government health sector strongly favors hospitals. The available data reveal that 50 percent of MOHP resources are assigned to hospitals (National health account, 1995).

Recommendations to improve the efficiency of Bani Suef General Hospital include:

1. Hospital Autonomy

Currently, the hospital director has relatively little power for determining the number of staff, types and amount of items in the budget, drugs, maintenance, and equipment purchases. Increased hospital autonomy is the foundation for making hospitals more responsive and accountable to local conditions and demands for health services. In addition to increased hospital autonomy and decision making power for the hospital administration, an incentive system that reward increased efficiency and improved performance and good management is key. The rewards for good management and efficiency might include, for example, financial gain, recognition, or more rapid advancement. In the United States, the incentive to improve management, efficiency, and quality is frequently health insurance reimbursement and contracts only for those hospitals demonstrating the highest standards. Reimbursements are essential for the hospitals to remain in business.

A performance-based incentive system that incorporates efficiency indicators as those assessed in this cost analysis, plus additional indicators of quality of care, patient satisfaction, and rewards for the hospitals and mangers that achieve outstanding gains is one feasible method for improving management.

In a system with greater hospital autonomy, the Ministry of Health and Population role could change into one of determining policies, developing incentive systems, guidelines and regulatory systems to ensure quality of care and access for the poor and undeserved. This would diminish the role of the ministry in determining staffing, but would increase its role in developing standards of care, and potentially clinical guidelines.

2. Quality of Care

This cost study does not address how quality of care and efficiency interact. Quality of care depends upon technically skilled staff, effective operation of equipment used for diagnosis and treatment, adequate drugs, medical supplies, and proper sanitary conditions. This hospital is deficient in several areas and ideally should improve both its efficiency and quality. Improved quality of care is likely to increase patient utilization, while improving the operating efficiency of the hospital.

3. Hospital Staff

There is no internationally accepted protocol for staffing ratios, because staffing choices must be made in the context of local constraints. Staffing ratios per bed or bed day are not an infallible proxy for quality of service. Training and skill level, supporting technology, drugs and supplies, team work, and organization of services are all essential complementary co-determinants of quality. In addition, differences in case mix between departments have an important role. For example, ICU patients need more staff than orthopedics patients.

An examination of staffing ratios reveals cross hospital variation in the total staff per bed and composition of staff. The numbers show that inpatient departments as well as outpatient clinics probably have excess personnel. The number of personnel (working in inpatient departments only) per bed is as high 0.66 person, while 93.7 percent of time (more than 11 months per year) the bed is not used because of low occupancy rats (ICU department). These numbers will be translated to 11 persons per occupied bed in some departments. Using the step-down technique to allocate hospital staff to final services departments shows that the number of personnel per occupied bed goes up to 14. These numbers are the highest compared to other developing countries.

Each department has to assess its need for physicians and nurses in different specialties through the efficiency indicators and studies of patient case mix. Current figures imply discrepancies between the number of staff needed in each department with the actual patient number and occupancy rates. This study recommends linking the hospital needs for staff according to the level of occupancy rate for each department.

4. Drugs and Medical Supplies

Drugs and medical supplies account on average for 9 percent of the total costs per admission. This number decreases to 5 percent in the ICU. Increases in the budget for drugs and medical supplies will increase the total annual costs of the hospital: however, the availability of drugs will likely increase the quality of care and the utilization rate (number of admissions) and this, in turn, will decrease the total cost of admission. See Graph 29 for the annual number of outpatient visits compared to drug costs. Graph 30 shows the annual bed days against the cost of drugs.

This study did not assess the availability of drugs in the hospital. However, during the study the team members heard informal comments about temporary lapses in drug supplies during which patients had to purchase their pharmaceuticals from private pharmacies to ensure a continuous supply to the hospital. A continuous, reliable supply of drugs is a **sine qua non** for quality care.

Increasing the autonomy of hospitals in managing the supply of drugs may assist in preventing these lapses in supplies and therefore maintaining a better quality of care. Hospitals could hold a portion of the drugs budget and not use it all to purchase drugs though the MOHP. The MOHP may have access to favorable pricing: however, turn-around-time for drug orders can be many months. During this interim, hospitals could purchase needed drugs from the private sector in emergencies. Alternatively, some income from the hospital services could be set aside in an

emergency drug purchase fund. Hospitals could consider joining with other private and public sector health agencies to pool drug purchasing and negotiate for lower prices.

5. Treatment Protocols

Physicians exert ultimate control over the way in which treatment procedures are used and the subsequent length of stay of patients. Diagnosis and treatment procedures for the same cause of admission vary among physicians of the same department. The quality of care may likely be improved by establishing a standard practice for specific admissions. However, there may be considerable professional controversy concerning the development of treatments standards.

6. Maintenance

Maintenance has important implications for the overall quality of the hospital environment and the services provided. Clean and attractive surroundings increase patient satisfaction and demand for services. The total cost of maintenance represents 1.83 percent of the annual recurrent costs. Unfortunately, maintenance costs are directed mainly towards repairing hospital equipment and not towards regular and preventive maintenance, for which there are no plans. The level of required maintenance depends on the operating environment, but the international average of maintenance costs ranges between 10-15 percent of the annual recurrent costs to uphold the hospital operation effectively (Mills 1991).

7. Average Length of Stay

Reducing the average length of stay by increasing occupancy rate would increase the turnover rte and would extend hospital benefits to a greater number of people. Without information about case mix and severity, it is difficult to use length of stay as a direct indicator of efficiency for departments. however, stays that are unusually long raise questions regarding efficiency and should provoke a closer look at possible explanations.

The study informally investigated the main causes of long average lengths of stay for different diagnoses. The following factors presents some sources of extended lengths of stay:

- Most of the cases admitted to inpatient care for diagnostic tests are confined until results are received and then proceed for medical or surgical treatments.

- Physicians' lateness or absence due to the conflicting appointments arising from their dividing their time between hospital service and private practice. It is critical for the hospital to work out arrangements with the physicians to ensure that such conflicts are minimized.

- Absence of standard treatment practices, and treatment protocols for the same cause of admission vary among the physicians of the same department.

- Hospital infections as a result of poor sterilization (although very few data are available on the magnitude of hospital infections and their effect on ALOS). International data calculate 13.2 percent of surgery cases and 10.3 percent of orthopedics cases may obtain nosocomial infection (Blanpain 1987).

8. Information Systems

It is evident that the existing information systems rarely produce the required information. Research is required into how routine systems can best be altered and augmented to provide reliable data which will help identify resource allocation problems, planning changes in health sector resource allocation patterns, monitoring changes, taking adequate account of the

recurrent cost burden of the hospital in investment decisions and implementation of plans. Collection and analysis of the data required to calculate average costs can be made a routine hospital activity with the objective of improved planning, management and budgeting. A detailed, reliable information system for the collection of admissions, discharges, lab tests, drugs, personnel and other costs is needed for the implementation of any performance-based incentive system.

9. Use of Results for Pricing and Contracts

Bani Suef General Hospital currently has a "economic ward" where private patients or patients covered by corporate plans stay when hospitalized. The results of this study will provide a definitive basis for negotiating a cost plus price for the daily reimbursement rate for these private patients based upon the average cost per day of 31 L.E. It can also be used for negotiating a reimbursement rate from health insurance companies and for health insurance companies to set insurance prices based on estimated annual costs for hospitalization and utilization in the population covered. In the current health sector reform environment in which the government is considering social insurance schemes, this information will provide a basis for estimating costs of hospitalization in the population.

10. Ambulatory Surgery

In industrialized countries, the hospital admission rate per capita has steadily declined. For example, in the United States, the number of occupied hospital beds per capita has declined more than 30 percent in the last 15 years despite the increasing age of the population. This phenomenon has resulted from an increasing transfer of inpatient services to outpatient care. most dramatically, surgical procedures have changed to outpatient services. The development of new techniques, instruments, better diagnostic tests and improved anesthesia with fewer side effects have resulted in short non-traumatic operations, rapid patient recovery and improved patient outcomes despite dramatically shorter hospitalizations.

Ambulatory surgery can be located either in hospitals or in independent sites. When located outside of the hospital, operations within the hospitals have decreased resulting in lower occupancy rates. However, when located within hospitals, the capacity to perform ambulatory surgery can assist in maintaining or even increasing utilization. In a study in Cali, Colombia, the costs per surgical case is about 30 percent of the cost of traditional surgical procedures, while patients satisfaction was greater for the outpatient procedure (Shepard, Walsh, et al., 1994). Other types of procedures have also been transferred to the outpatient department from inpatient, such as, long-term therapy for cancer or chronic infections and diagnostic procedures. In Cali, as an alternative to building new hospitals when the general hospital became overcrowded, ambulatory surgical and reference units were built around the city.

For Bani Suef General Hospital, increasing the capacity of the general hospital to perform ambulatory surgery and other treatments would potentially assist in increasing efficiency in terms of cost per admission while fulfilling the patient demand for improved hospital care. This would require upgraded skills, on the part of the surgeons and anesthesiologist, as well as specialized equipment. The average length of stay for many operative admissions is many days longer than the US. See Table 14.

11. Nosocomial Infection

A study in one university hospital n Cairo revealed that the overall hospital-acquired infection rate was 5.6 percent of the total patients discharged. Post-operative wound infection is the most frequent infection site. The infection rate reached 10 percent of the total patients discharged I special surgery departments. Bani Suef General Hospital should use a surveillance system for

the continuous monitoring of hospital-acquired infection. Controlling hospital acquired infection will increase the bed turnover rate and reduce both the average length of stay and the total cost per admission.

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Annex I: Text Tables

Annex II: Text Figures

Annex III: Definitions and Data Notes

Admission per physician: The average number of patient admissions per full time equivalent physician during one year.

= annual admissions / total number of FTE physicians

Allocative efficiency: The extent of optimality reached in the distribution of resources among a number of competing uses.

Ancillary service cost: These include the cost of all cost centers in intermediate services departments except kitchen and laundry cost centers.

Annual admissions: Total number of admissions during reference time (July 1, 1993 to June 30, 1994).

Annual days of stay: The total number of patient-days from admission to discharge during one year.

Annual cost of department: The total annual cost of the department after allocation of overhead and intermediate services departments using the step-down allocation method (see table 17).

Annual hospital expenditures: Includes the annual cost of personnel, medications, depreciation of buildings and equipment, and food and utilities.

Annual values: Values of the use of capital items for health services, such as equipment, vehicles and building, for one year.

Average cost (unit cost): Defined as the total cost divided by number of units of output, e.g., cost per admission, cost per patient-day and cost per outpatient visit. Similarly, marginal cost is the additional cost required to produce one more unit of output.

Average length of stay (ALOS): The mean number of days from admission to discharge for diagnosis and inpatient department.

ALOS = Annual number of inpatient days/Annual number of admissions.

Bed turnover rate (T): The average number of patient admissions per bed during one year.

T = Annual number of admissions/Average number of available hospital beds during a year.

Costs: The products of price (or unit costs) and the number of units consumed (or service intensity). The higher the average level of unit costs, the more important the variation in service intensity.

Capital cost: The annual cost of resources that have a life expectancy of more than one year, e.g., buildings, equipment and vehicles. Staff training also can be classified as capital cost if the new skills are expected to last for one year or more. The costs of refresher training courses that occur throughout the year should be classified as recurrent.

Cost-effectiveness analysis: The technique used for identifying which health interventions achieve the greatest level of health impact per unit of investment.

Cost per admission = Total annual cost of inpatient department/total annual number of admissions for the department.

Direct costs of department: The costs attributed to each cost center prior to the allocation of the cost centers associated with hospital outputs.

Disability-adjusted life year (DALY): The unit used for measuring both the global burden of disease and the effectiveness of health interventions, as indicated by reductions in the disease burden. It is calculated as the present value of the future years of disability-free life that are lost as the result of the premature deaths or cases of disability occurring in a practical year.

Equipment operation and maintenance: Cost of maintaining equipment in operating order.

Economic cost: Presents the opportunity cost of using resources and inputs in one intervention rather in their next best intervention use. More formally, it is the payment required to keep that input in its present employment, or… the remuneration the input would receive in its best alternative employment (Nicholson, W., Microeconomics Theory: Basic Principles and Extensions, Fourth Edition, Dryden Press, New York, 1989, p. 309).

Economic efficiency: Economic inefficiency occurs when the hospital is not using the least expensive combination of inputs for a given output (Barnum 1993).

Final service departments: Cost centers which provide services directly to patients and not to other departments, e.g. inpatient departments and outpatient clinics.

Financial cost: The actual expenditures or outlays made for a specific intervention.

Full-time equivalent (FTE) physician: FTE was calculated by dividing each physician's work by specialty by the ratio of his/her work in outpatient clinics, inpatient departments, operation theaters and the emergency unit (table 6 presents the percentage of working time per activity for physicians for each department).

FTE physician for inpatient departments: The total number of physicians working at inpatient departments and operating rooms.

FTE physician per bed: Measures the number of physicians working full-time per bed for inpatient departments.

= Total number of physicians working at inpatient departments and operating rooms/total number of beds.

FTE staff step-down: The study used the step-down allocation technique to allocate overhead and intermediate services department personnel to final service departments to get the total number of full-time equivalent personnel working in each final service department.

Hotel services cost: This includes food and laundry costs.

Intermediate services departments: Intermediate services departments are those that offer services both directly to patients and to other final medical departments. Examples include: operating theaters, laboratory and X-ray. In this analysis, kitchen and laundry departments were also included in the intermediate category because costs in these centers were estimated and distributed in a way similar to those of other intermediate services departments.

Intervention (in health): A specific activity meant to reduce disease risks, treat illness, or palliate the consequences of disease and disability.

Number of nurses per FTE physician: Measures the number of nurses working with a full-time physician.

= Total number of nurses/total number of FTE physicians

Overhead departments: Cost centers which produce only those services that are consumed by other departments (cost centers) of the hospitals, not by patients. Examples include: maintenance, legal affairs and finance.

Overhead cost: These costs remain essentially constant regardless of whether a bed is occupied.

Occupancy rate (OCC): Measures the percentage of total available beds that are occupied by patient during on year.

OCC = (Annual number of patient days) X 100 /(Average number of available hospital beds during a year) X 365 days.

Patient days per FTE physician:

= annual number of patient days at inpatient department/ Total number of FTE physicians working at the inpatient department.

Per Diem: Cost of daily stipends for health workers involved in supervision activities.

Personnel cost: Value of labor, including health professionals, administrative staff, and non-health personnel (e.g., drivers), used to provide health services during the reference period.

Present value (current values): Estimates the current value of the capital item – the amount you would have to pay to purchase a similar item at the present time (the replacement value rather than the original price). It is the market value of the item e.g., equipment, square meter of constructions (WHO cost analysis manual 1992).

Reference time: The period of data collection for costing of the health facilities from July 1, 1993 to June 30, 1994.

Recurrent cost: The cost associated with inputs that will be consumed or replaced in one year or less, for example, staff salaries, utilities, drugs and medical supplies.

Step-down method: The technique used to distribute costs from the overhead departments to other overhead departments and finally to intermediate and final services departments, according to allocation criteria devised to resemble as closely as possible the actual use of resources by each department. The term “step-down” is used because of the format in which the distribution of costs is made.

Technical efficiency: The extent to which choice and utilization of input of resources produces a specific health output, intervention or service at the lowest cost (WDR 1993).

Tertiary-based health services: A hospital or other health facility that offers a specialized, highly technical level of health care for the population of a large region. Characteristics include

specialized intensive care units, advanced diagnostic support services and highly specialized personnel.

Useful life: Estimates the number of years of useful life the item realistically can be expected to have after being acquired

Annex IV: Data Sources

I. Hospital Cost

A. Capital Cost

1. Building space:
    - Engineering Department
    - Maintenance Department

2. Equipment, vehicles and furniture:
    - Physical inventory
    - Log books no. 118, 112, and 121
    - List of received items for nurses at different departments.
    - Purchase dept. at health directorate.

B. Recurrent Cost

1. Personnel:
    - Sheet no. 132 A.H.
    - Sheet no. 50 A.H.
    - Log book for salary
    - Personnel Department

2. Drugs and medical supplies:
    - Log book for inpatient, outpatient and emergency pharmacies
3. Utilities, include
    - Water: Receipts for water
    - Electricity: Receipts for electricity
    - Telephone: Receipts for telephone
    - Gas: Receipts for gas
    - Benzene, oil: Receipt for benzene and oil
4. Others, include

- Food: Receipts for food
- Stationery: Receipts for stationery

5. Maintenance, include:

   - Building: Receipt for maintenance
   - Equipment: Receipt for maintenance
   - Vehicle: Receipt for maintenance

II. Hospital Statistics

Number of admission: Admissions discharge log book for 1993-94.

ALOS: Admissions discharge log book for 1993-94.

Outpatient visits: Outpatient log book for 1993-94.

Surgical procedures: Log book for operation theaters for 1993-94.

Lab tests: Log book for inpatient laboratory for 1993-94.

X ray: Log book for inpatient and outpatient radiology departments.

Annex V: Data Collection Forms