Unit costs of inpatient days in district hospitals in South Africa

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ABSTRACT

Introduction: This study aims to estimate the unit costs of inpatient days in five district hospitals in South Africa.

Methods: The study is based on a costing exercise carried out in five district hospitals in South Africa. The hospitals were purposely selected to reflect those providing most of the services included in the district hospital package, the availability of good quality data, and the rural/urban variations in the country. The study calculated costs from the perspective of the healthcare facility. The ingredients approach was used, combining a top-down and step-down allocation of overhead costs of the six final cost centres. The measures of inpatient care used were: admissions, inpatient days and average length of stay.

Results: The unit costs of inpatient days were between US dollars (USD) 65.31 and USD 212.09 for maternity patients, USD 37.23 and USD 93.55 for surgical patients, USD 37.23 and USD 70.86 for medical patients, and USD 38.37 and USD 139.60 paediatric patients. The unit costs per inpatient days were between USD 38.04 and USD 103.68 in the five hospitals. Personnel costs were the major cost component and ranged from 73 percent to 82 percent of the unit costs.

Conclusion: There was considerable variation in the unit costs of inpatient days in the hospitals studied. The average unit cost for maternity patients was more than double the average unit cost for medical patients. The very low bed occupancy rates in these hospitals are indicative of inefficiency in their operations. Measures need to be instituted to improve the efficiency of these hospitals in the provision of quality and effective healthcare services.

Keywords: district hospitals, healthcare cost, healthcare resources, hospital cost, inpatient days, inpatient unit costs

Singapore Med J 2007; 48(2):143–147

INTRODUCTION

In most developing countries, public hospitals, rather than the preventive and primary healthcare sectors, are the major consumers of healthcare resources. Overall, they receive the largest share of the healthcare resources, consume as much as 5% of the gross domestic product, account for 5%–10% of government expenditure, and 50%–80% of public sector healthcare resources in these countries.[1,2] This is because they require huge capital investments to employ highly-trained staff, and provide the maintenance of buildings and equipment. But questions remain about the efficiency of their operations. An understanding of the costs of the various activities in the hospitals will go a long way in assisting hospital managers to determine the relative efficiency of the component units of the hospitals.[3] In the developing countries, there is a lack of data on the unit costs and total costs of running inpatient services, and the various services in these hospitals.[4]

In any hospital setting, the costs of inpatient hospitalisation are usually the major components of the total treatment costs and the evaluation of inpatient costs is a major public issue.[5] This is because inpatient care needs a certain concentration of resources and technology to be effective.[6] The costs of inpatient days were 60% of the total treatment costs for bone marrow or stem cell transplantation for patients with non-Hodgkin's lymphoma or Hodgkin disease, and 73% of the total healthcare costs for patients with chronic obstructive pulmonary diseases.[4] In the management of childhood epilepsy, the cost of hospital admissions was as high as 65%, and was the highest component of the annual costs in patients with newly-diagnosed epilepsy, epilepsy in remission, active non-drug-resistant epilepsy and drug-resistant epilepsy.[7]

In South Africa, hospital services are disproportionately expensive and substantial inefficiencies have been reported in the delivery of hospital services.[8] The objective of this study is to calculate the unit costs of

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Table I. Descriptive statistics of the inpatient departments in the district hospitals.[15]

Hospital	McCord	Osindisweni	Pretoria West	Barberton	Harrismith	Average
Wards	8	8	5	12	4	5.4
Beds	180	318	166	227	81	194
Inpatient admissions	10,164	8,964	8,871	12,058	3,757	8,763
Inpatient days	30,600	78,996	38,591	43,134	11,578	40,580
Bed occupancy rate	47%	68%	64%	52%	39%	57%
Average length of stay	3.0	8.8	4.4	3.6	3.1	4.6

Table II. Unit costs of maternity inpatient days in district hospitals (in USD).[15]

Cost centre	McCord	Osindisweni	Pretoria West	Barberton	Harrismith	Average
Personnel	75.5%	75.6%	83.1%	74.1%	80.7%	78.3%
Equipment	1.7	2.0	4.9	2.1	2.4	2.9
Materials	8.8	7.2	3.2	17.9	6.4	8.5
Drugs	7.6	5.5	1.5	2.6	4.1	4.0
Utilities	6.0	9.1	3.2	1.8	5.0	4.4
Buildings	0.3	0.6	4.1	1.5	1.3	1.9
Total	180.49	65.29	212.03	143.62	105.48	141.38

inpatient days in five district hospitals in South Africa. This information will be useful in the estimation of the costs of providing healthcare, for the assessment of relative efficiency and monitoring the quality of healthcare provided in these district hospitals.

METHODS

This analysis of the unit costs of inpatient days is based on data from a costing exercise carried out in five district hospitals from four provinces in South Africa in 2002. The real exchange rate in 2002 was used in the calculation of the costs in US dollars (USD).[9]

The hospitals were purposely selected to reflect those providing most of the services included in the district hospital package, the availability of good quality data and the rural/urban variations in the country. Purposive sampling is a form of non-probability sampling where cases are not selected randomly. Rather, cases are selected because they possess certain characteristics, which may include the potential to provide useful information.[10] The district hospital package is the clinical and non-clinical priority healthcare services that could feasibly be provided based on the competencies and healthcare resources that exist at the district hospital level.

All the costs associated with the treatment and care of patients were measured. The costs were calculated from the perspective of the healthcare facility. The perspective of an economic evaluation study is the objective of this study. It is crucial in the definition of the costs and the criteria for inclusion in a study. Some possible perspectives of an economic evaluation study include the Ministry of Health, the healthcare sector, the specific hospital or healthcare provider, the patient and the society.[4,11–13] The ingredients approach was used, combining a top-down and step-down allocation of overhead costs to the final cost centres. The ingredients approach is one of the approaches used in the estimation of future costs. It views the resources used such as medical/nursing times, drugs, equipment and buildings as "ingredients".[14] The measures of inpatient care used are: admissions, inpatient days and average length of stay (ALOS). The cost centres used were: personnel, equipment, materials, drugs, utilities and hospital buildings.[15]

RESULTS

The descriptive statistics of the inpatient departments in the five district hospitals are shown in Table I. The number of patients admitted varied between 3,757 and 12,058 per year. Inpatient days ranged from 30,600 to 78,996. The bed occupancy rates varied between 39% and 68%. ALOS was between three and 8.8 days. The costs of maternity inpatient days in the five district hospitals are shown in Table II. The costs ranged from USD 65.29 and USD 212.03. In all the maternity wards, hospital personnel costs were the major cost component, and ranged from 76% to 83%. In most of the maternity wards, the costs of

Table III. Unit costs of surgical inpatient days in district hospitals (in USD).[15]

Cost centre	McCord	Osindisweni	Pretoria West	Barberton	Harrismith	Average
Personnel	73.3%	76.6%	76.6%	69.9%	83.1%	75.7%
Equipment	1.9	2.0	4.7	2.0	2.1	2.4
Materials	6.3	5.6	4.7	18.9	3.5	7.6
Drugs	9.5	4.9	5.8	5.3	4.1	6.4
Utilities	8.7	10.3	4.9	2.0	5.5	6.4
Buildings	0.3	0.7	3.3	1.9	1.7	1.4
Total	93.39	37.23	49.04	54.63	65.62	60.08

Table IV. Unit costs of medical inpatient days in district hospitals (in USD).[15]

Cost centre	McCord	Osindisweni	Pretoria West	Barberton	Harrismith	Average
Personnel	65.0%	76.6%	75.7%	72.0%	83.1%	74.2%
Equipment	1.8	2.0	4.2	1.8	2.1	2.5
Materials	8.6	5.6	6.7	17.0	3.5	8.1
Drugs	10.9	4.9	6.4	5.5	4.1	6.6
Utilities	13.1	10.3	3.8	2.1	5.5	7.0
Buildings	0.6	0.7	3.2	1.6	1.7	1.6
Total	70.86	37.23	65.31	50.43	65.62	57.96

Table V. Unit costs of paediatric inpatient days in district hospitals (in USD).[15]

Cost centre	McCord	Osindisweni	Pretoria West	Barberton	Harrismith	Average
Personnel	76.8%	76.8%	82.6%	78.6%	-	79.6%
Equipment	2.08	2.1	3.6	1.6	-	2.3
Materials	5.9	7.4	4.9	16.2	-	8.5
Drugs	5.5	2.7	0.9	0.9	-	2.8
Utilities	7.1	10.2	4.2	1.4	-	5.2
Buildings	0.4	0.8	3.8	1.3	-	1.6
Total	139.60	38.37	95.70	100.14	-	93.39

materials were the second highest cost component.

The costs of surgical inpatient days in the district hospitals are shown in Table III. The costs ranged from USD 37.23 and USD 93.39. In all the surgical wards, personnel costs were the major cost component, and ranged from 73% to 83%. The second highest cost component varied between drugs (McCord and Pretoria West), utilities (Osindisweni and Harrismith) and materials (Barberton), depending on the hospital. The costs of medical inpatient days in the district hospitals are shown in Table IV. The costs ranged from USD 37.23 and USD 70.86. In all the medical wards, personnel costs were the major cost component and ranged from 65% to 83%. In most medical wards, the costs of utilities were the second highest cost component.

The costs of paediatric inpatient days in the district hospitals are shown in Table V. In Harrismith Hospital, there was no separate ward for paediatric inpatients that were admitted. Parts of the adult wards were used for paediatric inpatients. Hence, there was no data available for paediatric inpatients in this hospital as the relevant data had been included in the respective adult wards. The costs ranged from USD 38.37 to USD 139.60 in the rest of the hospitals. In all the paediatric wards, personnel costs were the major cost component and ranged from 77% to 83%. The second highest cost component was utilities in two hospitals (McCord and Osindisweni) and materials in two other hospitals (Pretoria West and Barberton). The unit costs per inpatient day in all the district hospitals are shown in Table VI. The unit costs per inpatient day ranged between USD 38.04 and USD 103.68. Personnel costs were the major cost component, and ranged from 73% to 82% of the unit costs. The second highest unit cost component varied between the hospitals. All the unit

Table VI. Unit costs per inpatient day in district hospitals (in USD).[15]

Cost centre	McCord	Osindisweni	Pretoria West	Barberton	Harrismith	Average
Personnel	72.7%	76.1%	79.1%	73.2%	82.2%	76.4%
Equipment	1.8	2.0	5.1	1.9	2.2	2.5
Materials	7.5	6.1	4.6	17.5	4.4	8.1
Drugs	8.9	4.2	3.0	4.0	4.2	5.3
Utilities	8.7	10.6	4.3	1.9	5.4	6.1
Buildings	0.4	0.9	3.8	1.6	1.5	1.6
Total	103.68	38.04	64.49	68.53	74.06	69.76

cost categories exhibited substantial variation between the hospitals.

DISCUSSION

The unit costs of inpatient days were calculated for the maternity, surgical, medical and paediatric wards as well as for the entire hospital in five district hospitals in South Africa. Hospitals operate most effectively and efficiently at 80%–90% bed occupancy rates.[16] The bed occupancy rates for the five district hospitals in this study, between 39% and 68%, were very low, when compared to the ideal situation, and indicated inefficiency in the operations of these hospitals. In Vietnamese district hospitals, the bed occupancy rates were much higher, and ranged between 64% and 100%.[17] Low bed occupancy rates arise due to some factors and imply some opportunity costs. The factors responsible for low bed occupancy rates include low catchment population, low demand for care, the existence of many alternative healthcare providers perceived as providing better quality of care, and poor referral or impediments to referral from lower level facilities.[16]

The ALOS in the district hospitals was less than five days, except for that of Osindisweni which was 8.8 days. The high ALOS in Osindisweni is due to the long hospital stay of tuberculosis (TB) patients, which was as high as 119 days in the male TB ward.[15] The ALOS in this study was shorter than the ALOS in district hospitals in Vietnam which ranged from 6.3 to 7.8 days.[17]

There is no ideal or standard ALOS. The length of stay for a patient in the hospital depends on the severity of illness suffered by the patient, among other factors. Prolonged inpatient hospital stay is costly for both the hospital and the patient concerned.[16] A longer ALOS in a hospital may be a sign of inefficiency.[15]

Healthcare personnel are considered as a costly and scarce resource.[14] Hence, they must be used efficiently.[1,6] A large proportion of the highly-trained healthcare personnel are working in hospitals. In Kenya, 60% of all the physicians and 80% of the nursing officers were assigned to hospitals.[1] In a study of the unit costs of inpatient days in general and in university hospitals in the Netherlands, 38%–48% of the total costs were due to nursing costs.[4] It is therefore not surprising that the personnel costs in this study were as high as 83% of the unit cost of inpatient days. Personnel accounted for 74%–83% of the unit costs of maternity inpatients in this study. This is comparable to the 82%–88% due to personnel costs for maternity services in municipal hospitals in Argentina.[18]

The proportion of the unit costs of inpatient days that were due to medications were lower. Drugs accounted for between 2.8% and 6.6% of the inpatient days in the different categories of patients studied. But it should be noted that considerable technical inefficiency has been reported in the use of drugs in developing countries. Technical inefficiency occurs when the maximum amount of an output is not being produced for a given set of inputs or when the minimum amount of inputs are not being used to produced a given output level.[19] Other examples of technical inefficiency in the hospital setting include excessive length of stay, performing unnecessary tests, wastage of stocks and overstaffing. In Mali, as much as 40% of the existing pharmaceutical expenditure could be saved through the adoption of better management practices.[1] Rational drug use in a hospital is an indication of efficiency and quality of care.[16]

The unit cost of an inpatient hospital day is an important factor that influences total costs. Unit costs are useful in the valuation of the use of resources. They may reflect variations in the patient case mix, accounting or management systems in hospitals, the methods used in the valuation of costs and the inclusion of incidental costs.[4] Hospital costs are also influenced by the volume of services, costs of inputs like transportation, efficiency of resource delivery and medical practice style like in the choice of drugs, the number of drugs prescribed and the method or route of administration.[16]

McCord Hospital had the highest unit costs for medical, paediatric and surgical wards as well as the highest unit cost per inpatient hospital day. This could be due to the fact that McCord Hospital had more physicians and nurses than the other hospitals and therefore incurred higher personnel costs. It also treated more complicated and severe cases than the other hospitals. Pretoria West Hospital had the highest unit cost for the maternity ward. The average unit cost was highest for maternity inpatients at USD 141.39. This was more than double the lowest average unit cost for the medical inpatient days at USD 57.96. Other average unit costs were for surgical inpatients at USD 60.08 and paediatric inpatients at USD 93.39. Osindisweni Hospital had the lowest unit costs for all the four wards and per inpatient hospital day. The low unit costs in Osindisweni Hospital could have resulted from the higher number of inpatient hospital days reported. This was because the bulk of inpatient costs were mostly incurred in the early days of hospital stay.

This study showed that the unit costs of inpatient days varied considerably between the hospitals. The average unit cost for maternity patients was the highest. It was more than double the average unit cost for medical patients. The very low bed occupancy rates in these hospitals were indicative of inefficiency in their operations. It is important to institute measures to improve the efficiency of these hospitals in the provision of quality and effective healthcare services to their catchment population.

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