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Original Article

Cost Structure of Hospital-Based Pharmaceutical Services: a Consideration of Reimbursement

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Abstract In Thailand, fee-for-service is employed for the civil servants medical benefit scheme. While there are variations in the services among hospitals, the mark-up method based on drug prices has been applied ignoring the pharmaceutical services provided. Therefore, this study was aimed to explore cost structure of pharmacy department and propose more appropriate reimbursement method. The study selected a 509-bed general hospital in southern Thailand by convenience. Resources consumed in fiscal year 2001 were collected. Standard costing method was employed. The costs covered capital, labor and material costs, and both direct and indirect costs. Results revealed that cost of all pharmaceutical services was accounted for 19% of the total drug cost. Costs of procurement and dispensing were 4.99% of the total drug cost. Cost of drug dispensing accounted for 9.07% of the total drug cost. Considering drug procurement as supporting activity of drug dispensing, both costs accounted for 14.06% of the total drug cost. Patient-specific pharmaceutical services provided cost 3.96% of the total drug cost. Sensitivity analysis regarding an increase of pharmaceutical personnel demonstrated an increase of the proportion of cost of pharmaceutical services from 19% to 26%. Based on the Ministry of Public Health guidelines on price setting, hospital drug prices are based on a 25% mark-up of purchasing prices. Comparing reimbursable amount to the cost, the analyses showed uncertainty of cost recovery of the pharmacy department, resulting from inappropriateness of the reimbursement method. Reimbursable components and reimbursement methods were reviewed. Variable professional fee was proposed. In conclusion, the proposed pharmacy reimbursement system should separate drug cost and the pharmaceutical services. Methods for basic drug dispensing and patient-specific pharmaceutical services should be bundled and debundled methods, respectively.

Keywords: fee-for-service, hospital pharmacy, pharmaceutical services, reimbursement, professional fee

INTRODUCTION

Health insurance schemes in many countries employ a fee-for-service reimbursement method.[1] Drug cost is a major cost category under the fee-for-service reimbursement in Thailand. In the United States, the cost of hospital-based pharmaceutical services can be divided into the drug cost and cost of professional services. Regarding composition of total cost of providing pharmaceutical services, one study[2] cited acquisition cost of drugs, cost of dispensing (labor cost and supplies), cost of auxiliary activities (or patient-specific pharmaceutical services), and indirect cost allocated from supporting departments providing activities (e.g., house keeping, maintenance, administration). The pharmaceutical reimbursement can be based on composition of services or marking-up of the drug cost.[3]

Concerning drug cost, there have been some studies on pricing methods and reimbursement.[4-7] However, pricing methods are not the focus of this study. Regarding pharma-

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ceutical services, there are variations reported among hospitals. For example, U.S. hospitals provided various patient-specific pharmaceutical services, i.e. drug therapy monitoring, pharmacokinetic consultations, parenteral-enteral nutrition teams, patient counseling, medical rounds, admission medication histories, cardiopulmonary resuscitation teams, adverse drug reaction management, and drug therapy protocol management.[8] In addition, a study on total pharmacy costs (total cost of pharmaceuticals purchased and pharmacy personnel) per occupied bed in U.S. hospitals in 1992[8] revealed that costs were affected by region, hospital size, ownership and pharmacy drug delivery systems. Recent studies in the U.S.[9-12] still show variations in practice.

In 1990, U.S. congress passed legislation regarding payment for pharmaceutical cognitive or clinical services.[13] This legislation has changed linkage of reimbursement from only distributing products to cover providing services, i.e. patient information, counseling patients and monitoring drug therapy. One study demonstrated charging system for pharmacists' cognitive services in the inpatient setting.[14] The charge level for a patient was determined by acuity of illness or injury and complexity of pharmacist decision making.

In Thailand, there are high variations of pharmaceutical services among hospitals. The Association of Hospital Pharmacy conducted a survey in 2003.[15] The survey covered all 1,397 hospitals (response rate 30.35%). Pharmacy departments provided various activities, i.e. general management, out- and inpatient drug dispensing, drug production, drug information services, clinical pharmacy services, drug procurement and inventory management, and consumer protection and Thai traditional medicine. Within this activity frame, there were more specific variations, for example pharmacists (instead of pharmacy assistants) screening prescriptions, rechecking prepared drugs, and handing drugs to patients (90%, 62% and 57%, respectively). In addition, for patient counseling, adverse drug reaction management, and drug use evaluation, 95%, 91% and 36% of respondents provided the respective services. In contrast, only 17%, 4% and 3% reported having clinical pharmacy services, therapeutic drug monitoring, and total parenteral nutrition, respectively.

Hospitals in Thailand directly receive provider payments from the Social Security Office, the Comptroller General's Department and the National Health Security Office, for private employees under the Social Security Scheme (SSS), civil servants under the Civil Servants Medical Benefit Scheme (CSMBS) and others under the Universal Coverage of Health Care Scheme (UC), respectively. The hospitals that provide services for patients under the CSMBS are reimbursed by a retrospective fee-for-service model.[16] A mark-up method based on drug prices has been applied, ignoring the cost of pharmaceutical services provided. While there are variations in the services among hospitals, generally, hospital-based pharmaceutical services in Thailand are not well developed. Therefore, this study aimed to explore the cost structure of a pharmacy and propose a more appropriate reimbursement method.

METHODS

The study was designed as a descriptive study. One 509-bed general hospital in southern Thailand was selected by convenience. The study covered resources consumed in fiscal year 2001. Standard or conventional costing method was employed.[17, 18] Hospital's departments were categorized into 48 patient service or production cost centers, and 27 non-patient service or supporting cost centers. The Pharmacy Department was classified into five cost centers; outpatient dispensing, inpatient dispensing, drug procurement and inventory management, general drug production, and sterile drug production. The costs covered capital, labor and material costs. Capital cost calculation employed an accounting-based-straight line.[19] Useful lives were 20 and 5 years for building and other capital assets, respectively.[19,20] Full cost of the cost centers were the sum of both direct costs and indirect costs allocated from the hospital's supporting departments. Simultaneous equation method[17] was employed for indirect cost allocation. Services or outputs of supporting cost centers were selected as allocation criteria for the allocation, e.g. number of staff for administration

department. From the full cost of cost centers, cost of individual services was calculated using a micro-costing method.[21,22] Micro-costing is a method to allocate cost of production cost centers to each unit of service. The first step was to value resources directly consumed by each unit of service. Then, shared cost of the cost center was allocated to the services by proportion of direct cost of the services. Descriptive statistics were used for analyses. Change of labor cost regarding variation on number of pharmacist was used for sensitivity analysis. Based on a survey,[16] median number of pharmacists of hospitals with 501-600 beds was 19.50. The study hospital had 12 pharmacists. The extreme scenario is that the number of pharmacists and pharmacy staff, then labor cost could increase by approximately 60%.

RESULTS

The study hospital had 934 staffs. Ratio of number of beds to number of physicians, pharmacists and professional nurses were 19.58:1, 42.47:1 and 2.81:1, respectively. There were 841 outpatients per day, a 71% occupancy rate of hospital beds, and 4 day average length of stay. The Pharmacy Department had 12 pharmacists and 40 pharmacist assistants.

Total cost of the hospital was 277,456,429 THB (approximately US$ 1 = 37.28 Thai baht; THB). This was composed of capital cost (15.89%), labor cost (49.10%) and material cost (35.01%). As demonstrated in Table 1, full cost of the Pharmacy Department was 48,715,323 THB; 96% direct costs and 4% indirect costs. Drug cost (acquisition cost) accounted for 77% of the full cost. Table 2 shows costs in terms of pharmaceutical services and total drug cost. Hospital drugs' supply had two methods, i.e. purchasing from pharmaceutical companies and manufacturing of the Pharmacy Department. Therefore, total drug cost was a sum of acquisition cost of drugs and drug production cost, production, quality control and research and development. When considering proportions of cost of pharmaceutical services to the total drug cost, it was found that operations cost (the remainder of full cost after deducting total drug cost) or cost of all services was equivalent to 19% of the total drug cost. Regarding proportion of individual activities shown in Table 2, cost of drug dispensing for both in- and outpatients accounted for 9.07% of the total drug cost. Cost of drug procurement including purchasing (1.61%) and inventory management (3.38%) was 4.99%. Considering drug procurement (4.99%) as supporting activity of drug dispensing (9.07%), both costs accounted for 14.06% of the total drug cost. Patient-specific pharmaceutical services provided cost 3.96% of the total drug cost. They composed of counseling cost (0.25%), drug information service (DIS) (2.50%), adverse product reaction (APR) management (0.68%), drug use evaluation (0.28%), and pharmaceutical education (0.25%). The remaining 0.96% was external support to other, i.e. support to the mobile medical service (0.49%) and support to district hospitals (0.47%). Results of sensitivity analysis due to an increase of pharmaceutical personnel show that the proportion of cost of pharmaceutical services increased from 19% to 26% (Table 2). Total drug cost also increased due to an increase of drug production cost.

DISCUSSION

Under the existing reimbursement system, we considered cost structure, price setting guidelines and reimbursement methods. Following guidelines on price setting by the Thai Ministry of Public Health,[23] hospital drug prices are based on a 25% mark-up of purchasing prices. The studied hospital had total costs of pharmaceutical services accounted for 19% of the drug cost. Regarding the reimbursement system of the Civil Servants Medical Benefit Scheme, hospitals are reimbursed based on actual drug charges for drugs in the national drug list.[16] This reimbursement method is called a mark-up method[24] and includes cost of pharmaceutical services in the drug cost.

Table 1. Basic cost structure of the Pharmacy Department (THB in 2001)

Activity	Labor cost	Drug cost	Other material cost	Capital cost	Indirect cost	Full cost
Drug purchasing	521,127	-	6,957	26,364	105,056	659,505
Inventory management	845,623	-	76,423	242,192	220,597	1,384,835
Dispensing	2,636,485	32,839,105	76,046	298,280	703,750	36,553,666
Cost of counseling	72,736	-	2,849	4,303	21,166	101,053
Drug information service (DIS)	252,594	-	6,502	602,820	160,580	1,022,496
Adverse product reaction (APR) management	218,391	-	6,525	9,187	46,171	280,273
Drug use evaluation	86,814	-	3,961	5,716	17,197	113,688
Drug production cost	1,567,028	4,468,476	358,811	1,297,075	453,824	8,145,214
Production research and development	41,607	-	2,270	5,982	12,185	62,044
Support for mobile medical service	162,580	-	1,580	3,773	31,820	199,753
Support for district hospitals	151,758	-	2,495	6,046	32,496	192,795
Total	6,556,742	37,307,581	544,420	2,501,738	1,804,841	48,715,323
Proportion	13.46%	76.58%	1.12%	5.14%	3.70%	100.00%

Assuming that the hospital set drug prices based on the guidelines and that there was no cross-subsidy from the Pharmacy Department to the other departments, the reimbursable amount would cover all pharmaceutical services when drugs were priced at the 25% mark-up. This covered all of the service costs. Moreover, should the hospital provide only drug procurement and dispensing services, that account to 14% of the drug cost, the hospital would receive profit by 11% (Table 2). In another scenario, when pharmaceutical services (counseling, drug information service, adverse product reaction management, drug use evaluation, and pharmaceutical education) were provided, the hospital's profit decreased by 7% (from 25% to 18%). The profit was even more varied regarding variation in types of pharmaceutical services. If the pharmacy department provides more and more professional services, it may lead to financial problems.

These scenarios demonstrated uncertainty of cost recovery of the pharmacy services based on the existing reimbursement method. The uncertainty was demonstrated by sensitivity analysis in the scenario of labor cost increase due to increase of pharmacy staff. When labor cost increased by 60%, costs of all pharmacy services were accounted as 26% of the total drug cost, resulting in the hospital's deficit.

To consider appropriate reimbursement method, cost components have to be explored. Generally, prices at full-margin level consist of five cost components: the actual cost of merchandise; the direct expenses of the department producing products or services; the indirect expenses allocated from supporting departments or overhead cost;

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Table 2. Cost of pharmaceutical services and proportions to total drug cost

Category	Base case			60% labor cost increase		
	Cost (THB)	Proportion	Accumulative proportion of the services	Cost (THB)	Proportion	Accumulative proportion of the services
Total drug cost	40,945,672	100.00%		41,876,435	100.00%	
Cost of drug purchasing	659,505	1.61%	1.61%	977,263	2.33%	2.33%
Cost inventory management	1,384,835	3.38%	4.99%	1,883,931	4.50%	6.83%
Cost of dispensing	3,714,561	9.07%	14.06%	5,317,180	12.70%	19.53%
Cost of counseling	101,053	0.25%	14.31%	145,135	0.35%	19.88%
Cost of drug information service (DIS)	1,022,496	2.50%	16.81%	1,148,302	2.74%	22.62%
Cost of adverse product reaction (APR) management	280,273	0.68%	17.49%	415,418	0.99%	23.61%
Cost drug use evaluation	113,688	0.28%	17.77%	167,532	0.40%	24.01%
Cost of pharmaceutical education	100,691	0.25%	18.02%	133,056	0.32%	24.33%
Cost of support for mobile medical service	199,753	0.49%	18.50%	299,201	0.71%	25.04%
Cost of support for district hospitals	192,795	0.47%	18.98%	285,915	0.68%	25.73%
Total	7,769,651	18.98%		10,772,933	25.73%	

the reductions in inventory due to losses as spoilage, pilferage, discounts and markdown; and the anticipated net profit or return on investment. Reimbursement methods can be classified into percentage mark-up policy and professional-fee policy. For percentage mark-up policy, reimbursable amount is composed of cost of drugs and a mark-up based on percentage of drug cost. Unlike, professional-fee policy provides reimbursable amount that consists of cost of drugs and cost of profession services.[25] The percentage mark-up method is convenient to implement but we might not encourage providing professional services. In terms of quality of care improvement, professional-fee policy is more appropriate.

Regarding the cost structure of pharmaceutical services, Haugtvedt *et al.* suggested in a study[2] that total cost of providing pharmaceutical services could be classified as acquisition cost of drugs, cost of dispensing (labor cost and supplies), cost of auxiliary activities, and indirect cost allocated from supporting departments providing activities (e.g., house keeping, maintenance, administration). For the costing method employed in this study, indirect cost was included in full cost of the department. Cost of reimbursable pharmaceutical services should compose of drug cost, basic dispensing cost and cost of auxiliary services. The examples of auxiliary services or patient-specific pharmaceutical services[8] are drug therapy monitoring, pharmacokinetic consultations, parenteral-enteral nutrition teams, patient counseling, medical rounds, and adverse drug reaction management. In this report, the reimbursement system of drug cost is not the focal point. A review of methods and applications in some countries can be found in a report by Drummond *et al.*[5]

Regarding payment or reimbursement methods for basic dispensing and patient-specific pharmaceutical services, the mark-up method provides incentives to the provider by supporting an increase in quantity or high price of drugs prescribed.[7] In addition, it does not encourage providing patient-specific pharmaceutical services since there is no benefit for such services. On the other hand, cost of dispensing and patient-specific pharmaceutical services are reimbursed as professional fees. Professional fees are mainly categorized as a fixed professional fee (The pharmacy receives an identical fee regardless of the operating costs and quality of services rendered) and variable professional fee (Fee paid to individual pharmacies is varied because of variations in operating costs and variety of services rendered).[24] The variable professional fee should be more appropriate than the fixed one because it is fair for both providers and payers. Moreover, it encourages provision of the services because it creates benefits for additional services.

Specifically, charges for profession services are of two basic types; bundled and debundled.[26] In the bundled method, all patients are charged a daily flat rate for all services regardless of receiving the services or not. The debundled method is to identify service(s) received by individual patients and charge each individual patient's bill accordingly. Several studies explored reimbursement for patient-specific pharmaceutical services.[3,26-29] This study proposes a bundled method or an average method for basic drug dispensing per prescription. It is not efficient to apply a debundle method (e.g., charging based on number of drug items in each prescription) for basic drug dispensing because the dispensing cost for each prescription would not vary highly. In contrast, debundled methods were recommended for patient-specific pharmaceutical services. This was because the services had a high variation in unit cost and high variation in magnitude of services among hospitals. Therefore, an average payment based on drug cost would not motivate provision of such services.

Regarding external validity of the results, there were some limitations since the study explored only one hospital. Normally, a sample should be at least one hospital from each type or level of services. Cost structures of pharmacy departments from different scales, specialties, levels and utilization capacities would be varied. Therefore, the authors did not intend to propose the results as a reference for cost structure, particularly for reimbursement. What we wanted to focus

on was to show the possibility of variation in proportions of costs of professional services. The existing payment system that ignores compensation for the services would not motivate provision of the services. Improvement of the payment system would encourage a professional service development. This concept could be acceptable to all public hospitals in Thailand.

CONCLUSIONS

In conclusion, based on the cost structure of the Pharmacy Department, the existing mark-up reimbursement method results in uncertainty of the cost recovery of the department. In addition, the method discourages providing patient-specific pharmaceutical services. To be equitable to all parties (insurers, providers and consumers), all pharmacy departments should conduct unit cost analysis of all pharmaceutical services. The study proposes a reimbursement system that should separate acquisition costs of drugs and costs of the pharmaceutical services. The services should be separated into basic dispensing cost and patient-specific pharmaceutical services. The reimbursement method should compose of a bundled (or average method) for basic drug dispensing and debundled methods for patient-specific pharmaceutical services.

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