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Original Article

Cost and Expenditure of High-cost Consumables in Hospital: A Study in a Large Hospital in Shiraz during 2017-2018

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Abstract

Introduction: The present research aimed at investigating the optimum use of resources in hospitals by estimating and comparing the utilization and cost of consumables in a large hospital in Iran during 2017-2018.

Methods: The data were collected from accrual accounting system, store invoices and executive management department. Descriptive statistics were performed. Excel was used for data analysis.

Results: Syringe and surgical gas had the highest and lowest cost items, respectively, among the hospital consumables. Surgical gas had also the greatest growth of consumables cost from 2017 to 2018 (114%). Emergency department and ICU had the highest consumption among hospital departments. Moreover, greatest increases in consumable costs were observed in laboratory (258%), and osteology (72%) and digestion (72%) departments. The findings also showed that although utilization of most of consumables had a decreasing trend, their cost increased (overall 45%)

Conclusion: High rate of general inflation, lack of utilization plan for consumables, lack of supervision and monitoring system on resources consumption are among the reasons of increasing trend of resources cost. Two last issues can be addressed by hospital administrator in order to control consumables cost.

Keywords: Cost control, Hospital, Consumable, Consumption pattern, Resources

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Introduction

Today, the health system is one of the largest and most important service and economic sectors and is considered as one of the institutions of development and social welfare (1). One of the main concerns of decision makers and managers of the health system is the significant increase in the costs of the health care system (2), expansion of the diversity of health care in the world, change in the pattern of communicable and non-communicable diseases, growth of the use of expensive and complex technologies in different areas of the health system and the growing demand for health care have imposed a huge financial burden on countries (2-4). In 2000, almost 8% of the world's gross domestic product (GDP) was allocated to health sector costs (5), and in recent years, the cost of the health sector has reached 10% of the world GDP. In other words, the health expenditure has reached 7.2 trillion dollars in the world in recent years (6).

Iran allocates almost 7% of its GDP to the health sector (7). The health system in Iran, like other health systems, is facing the problem of increasing health expenditure. In other words, in the last two decades, the total expenditure in the economy has had a 30-fold growth, while the health sector has experienced a 71-fold growth in costs (8). The main reasons of increase in the costs of the health system in Iran in recent years have been the implementation of the health system transformation plan, population growth, aging and inflation in other sectors. Hospitals are the most costly and expensive part of health sector (9) and have received most of the health budgets in the country (10). Also, hospital services have been the main factor in the growth of the costs of the healthcare sector in most countries of the world (11), so that in Europe, about 35-70% and in Iran at least 50% of the costs of the health system

are spent on the hospital sector (12, 13). Also, about 40% of government health expenditures are allocated to hospital care (14). According to the report of the World Health Organization (WHO), in developing countries, almost three quarters of the total budget of the health sector is spent on hospital expenses, while the number of people using hospital services is lower than this percentage (15).

In addition to being expensive, hospitals as the most important health centers (16) play an important role in promoting the health of society (17) and are the most essential service provider organizations (9). Therefore, the optimal use of limited resources to maintain, provide and improve the health of patients, increase productivity, efficiency and control costs are the most important missions of medical centers, especially hospitals (18). (ref 19-23 ???)

According to the studies conducted, the waste of resources in the hospital sector is very high (24), and despite the high amount of resources allocated to the health sector, especially hospitals, there is a gap between the required resources and the growth of the available resources of the health sector, and this problem shows the necessity of effective and efficient use of hospital resources (25).

One of the factors affecting hospital costs, especially the cost of providing services, are supplies and consumables. According to the WHO, consumables are one of the main input sources in the health system (5). The absence of an optimal pattern for the correct use of consumables and their incomplete and incorrect storage in hospitals is one of the main reasons for increasing hospital costs (26).

Therefore, according to the increasing growth of hospital expenses and their major role in promoting the health of the society, it is necessary to pay attention to the cost control strategy in addition to their main mission (27).

The present study was conducted with the aim of identifying the most expensive consumables in different departments of Shiraz Namazi Hospital in 2016 and 2017 with a comparative approach to provide cost control solutions.

Methods

In this cross-sectional study, information on the consumption of expensive consumer goods in Shiraz Nemazi Hospital in 2017 and 2018 was investigated. Using financial systems, warehouse invoices and hospital accounting, the list of consumable items and their cost was extracted by different departments of the hospital. The required information was extracted and collected using the data collection form prepared by the researcher. In this research, 10 high-cost consumer goods were selected in Nemazi hospital from among all purchased goods. First, the list of the goods consumed in 2017 was extracted from the accrual accounting system; then, of the consumer goods used more than a thousand items were selected; finally, the items that cost more than 200,000,000 Toman per year were considered as the most expensive consumer goods. In addition, some goods, which had the possibility of tracking consumption in hospital departments, were categorized according to high consumption departments. High consumption sectors based on the consumption of 5 types of goods (10 cc syringe, 5 cc syringe, latex gloves, gloves without nitrile powder and disposable medical gown) and 19 high consumption sectors to identify and consume these 5 items in these sectors were checked. This point will be helpful for international comparisons as, on average, in the years of conducting this study, the exchange rate of one US dollar has been equivalent to 70,000 Iranian Rials.

Descriptive statistics were used for data analysis. Using the variables of goods consumption and their average unit price, their cost was calculated in different departments and compared using descriptive statistics. A comparison was made between 2017 and 2018 and between different departments of the hospital. This research was approved by the ethics committee in Shiraz University of Medical Sciences with the code of IR.SUMS.REC.1399.1294.

Results

The results showed that the ten most expensive items included syringes, sterile gas, examination gloves, garbage bags, surgical gloves, paper towels, oxygenators, micro-sets, disposable gowns, and disposable sheets. In Tables 1-3, the average price, quantity, and total cost of this product in 2017 and 2018 have been compared with each other. 19 high consumables used in hospital that were examined in terms of the consumption of 5 cc syringes, 10 cc syringes, disposable gloves, latex gloves, and gloves without nitrile powder were emergency, general ICU, PICU1, general 1, ICU 2, surgical ICU, central ICU, bone, internal Gastroenterology, NICU B, general 3, Hematology 1, general internal, NICU A, Neurology, Laboratory, Cardiology, Pediatric internal, and dialysis departments.

In the following section, selected high-use consumables (5 and 10 cc syringes, disposable gowns, and gloves) are sorted by different departments of the hospital in the tables based on the highest to the lowest amount of consumption in 2018 compared to 2017.

Table 1: Comparison of the average unit price of the most expensive consumables in 2017 and 2018

Product Type	The average price of in 2017 (Tomans)	The average price in 2018 (Tomans)	Percentage change in 2018 compared to 2017
Syringe	275	535	95% increase
Numerical gas	220	490	122% increase
Micro-set	5455	6730	23% increase
Garbage bag (kilo)	6015	11200	86% increase
Surgical gloves	2145	2570	20% increase
Oxygenator	942000	896000	5% decrease
Examination gloves	260	365	40% increase
Disposable gown	2520	4725	87% increase
Disposable sheets	2300	4160	80% increase
Paper towel	2155	4215	95% increase
Kilo gas	35600	56740	59% increase

Table 2: Comparison of the consumption of expensive consumables in 2017 and 2018

Product Type	Quantity in 2017	Quantity in 2018	Percentage change in 2018 compared to 2017
Syringe	4704900	4386970	7% decrease
Numerical gas	2889810	2783000	4% decrease
Micro-set	110500	146870	36% increase
Garbage bag (kilo)	100400	87085	13% decrease
Surgical gloves	279150	358080	28% increase
Oxygenator	591	566	4% decrease
Examination gloves	2829075	1126000	60% decrease
Disposable gown	122800	61583	50% decrease
Disposable sheets	98300	66940	32% decrease
Paper towel	97456	61074	37% decrease
Kilo gas	3990	4124	3% increase

Table 3: Comparison of the total expenditure of expensive consumables in 2017 and 2018

Product Type	Total expenditure in 2017 (Toman)	Total expenditure in 2018 (Toman)	Percentage change in 2018 compared to 2017
Syringe	1297746000	2344000000	81% increase
Numerical gas	639549000	1372000000	114% increase
Micro-set	602700000	988000000	63% increase
Garbage bag (kilo)	604000000	975400000	61% increase
Surgical gloves	585700000	921000000	60% increase
Oxygenator	556640000	507140000	8% decrease
Examination gloves	738700000	413200000	44% decrease
Disposable gown	309800000	291000000	6% decrease
Disposable sheets	226000000	278300000	23% increase
Paper towel	210000000	257300000	23% increase
Kilo gas	142000000	234000000	65% increase
The total cost of the all consumables	77143000000	88528000000	15% increase
The total cost of the top 10 consumables	5912835000	8581340000	45% increase

According to Table 4, the highest increase in the total cost of the selected items was related to the laboratory (258%), bone (72%) and internal gastrointestinal departments (72%); also, as the highest decrease in the total cost of the selected items was related to the central ICU (34%).

Discussion

The current study was designed with the aim of investigating the most expensive consumables in 2017 and 2018 and identifying the most consumed sectors. The findings showed that the ten high-cost consumer items included syringes, sterile gas,

Table 4: Comparison of the cost spent on high-cost consumables in the years 2017 and 2018 in the high-use departments of the hospital

Department	Total cost in 2017 (Toman)	Total cost in 2018 (Toman)	Percentage change in 2018 compared to 2017
Emergency	194531000	264044000	36% increase
General ICU	59210000	50995000	14% decrease
PICU 1	32760000	48100000	46% increase
General 1	31350000	45655000	45% increase
ICU 2	44810000	36050000	19% decrease
Central ICU	58845000	38715000	34% decrease
Surgical ICU	23735000	33960000	43% increase
Bone	17205000	29740000	72% increase
Internal digestive system	13440000	23127000	72% increase
NICU B	26195000	24245000	7% decrease
General 3	14845000	23526000	58% increase
Hematology 1	14715000	21555000	46% increase
General interior	22795000	23130000	1% increase
NICU A	13375000	21125000	58% increase
Neurology	14960000	18953000	27% increase
Laboratory	9140000	32735000	258% increase
Heart	23135000	19580000	15% decrease
Interior of children	10462000	17285000	62% increase
Dialysis	11849500	17505000	48% increase

examination gloves, garbage bags, surgical gloves, paper towels, oxygenators, micro-sets, disposable gowns, and disposable sheets; among them, sterilized gas had the highest average price increase. Checking the stock of the warehouse showed that the growth of the cost of the consumables was due to the lack of stock in the warehouse from previous years, and the recent purchase at a high price was affected by inflation. Also, the lowest growth in the average price of oxygenator items was due to the existence of sufficient stock and cheap purchases in the past years.

The results showed that the consumption of micro-set and surgical gloves has increased in 2018 compared to 2017. According to the head of the hospital, the increase in micro-sets is due to the failure of some syringe pumps which has caused an increase in the consumption of micro-sets. Also, the non-implementation of the ministerial law regarding the 5-day replacement of each micro-set is thought be the reason for this increase in consumption. One of the reasons for the increase in the use of surgical gloves is the lack of examination gloves and the use of surgical gloves instead of them although the price of surgical gloves is many times higher than that of examination gloves, and this improper use has increased the consumption and costs of the hospital.

The results showed that the cost of ten items has increased for all products except gloves, disposable guns and oxygenator compared to 2017. The main reasons for the increase in costs were sudden inflation, increase in the price of items, and lack of sufficient stock in the warehouse. The consumption of disposable patient clothes has significantly decreased due to the launch of a laundry in 2018, and it has reduced the cost despite the increase in its price.

The findings indicated that the largest amount of 5 cc syringes was consumed by the emergency department of the hospital. Nemazi hospital's emergency room includes six sub-units which spent more money in 2018 despite the significant decrease in consumption in 2018 compared to 2017. The reason was the noticeable increase in the price of consumer items.

The highest amount of 10cc syringe was used in the emergency department. Also, the consumption and cost of syringes increased. The reason for the increased consumption and cost of the 10cc syringe is related to the lack of access to syringes with a lower capacity. Also, the use of 10cc syringes in the dialysis center has significantly decreased, which has reduced the cost of use even in spite of the price increase.

The highest consumption of gowns was observed in the general ICU department, which had a significant decrease in consumption and cost compared to the previous year. The reason for the mentioned decrease was the establishment of the hospital laundry.

The highest consumption of examination gloves was in the emergency department, which in 2018 compared to 2017 had a favorable decrease in consumption, but its cost was almost the same as the previous year. Also, the lowest consumption of examination gloves occurred in the bone marrow transplant department in 2018, which decreased

consumption compared to the previous year with an increase in cost, and the reason for this was the higher price increase than the decrease in consumption.

Finally, the greatest increase in the cost of consumable items was related to the laboratory, and the main reason was the increase in the consumption of examination gloves. Also, the largest cost reduction was related to the central ICU, which has a favorable reduction in the total consumption of items, especially single-use items, and as a result, the total cost.

According to the results of the current study, despite the fact that consumption has decreased in most of the consumer items in 2018 compared to 2017, their costs have increased by 45% due to significant inflation and lack of planning to improve the inventory. Manjounat et al. (2016) showed in their study that the cost of consumables and manpower included more than 70% of the hospital costs, and paying attention to their cost estimation and cost control and optimization methods is one of the main hospital cost control policies (28). The absence of an effective monitoring system to control the consumption of high-use items and other consumables in the hospital and the absence of an optimal consumption pattern has caused a significant increase in costs in the hospital. Vazva et al. (2016) showed in their study that developing a pattern and strategy to control costs and prevent excessive consumption and wastage of supplies and equipment led to a 30% reduction in their consumption (29).

Based on the findings of this study, it is recommended that hospital managers should focus on better utilization of hospital resources and prevention of wastage of high-cost consumables such as syringes, sterile gas, and micro-set. Additionally, they should closely monitor and supervise departments with the highest consumable expenditures including emergency department and general ICU.

This research, like other studies, had some limitations. One of the most important limitations was the lack of similar studies at the national or global level for comparison and better discussion of the results. Additionally, another limitation of the study was that the criteria for selecting the list of high-cost and consumption materials were based on the researchers' opinions, and changing these criteria may alter the findings.

Conclusion

Actions such as formulating the consumption pattern according to the product and nature of the sector, setting up a monitoring and control system on consumption in such a way that the beneficiaries do not have the possibility to influence the system, linking the consumption information in the accrual accounting system to the hospital information system, and creating a holding system for the bulk and cheaper purchase of consumer goods in order to control the costs of consumables in hospitals are recommended.

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Ethical Approval

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References

1. Tourani S. Study of performance of general Hospitals in Iran university of medical sciences. *Tehran Islamic Azad University*. 1995:1-5.
2. Walley T, Haycox A, Boland A. Pharmacoeconomics. Philadelphia: Elsevier Health Sciences; 2004. p. 11-2 .
3. Khani M, Hoseini H. Expenses of health facilities in rural and urban health care centers in Zanjan. *Research in Medicine*. 2003;27(2):129-37.
4. Taheri T. Assessing the reasons of re admission in Tabriz Medical University Hospitals and proposing an administrative pattern in 2000. *Hospital*. 2000. Persian.
5. Organization WH. The world health report 2000: health systems: improving performance: World Health Organization; 2000.
6. World Health Organization [Internet]. Global Health Observatory (GHO) data. World Health Organization; 2019 [cited 2019]. Available from: https://www.who.int/gho/health_financing/health_expenditure/en/.
7. Report of Challenges for Developing Country in Health Sector. Ministry of health. Tehran: Research Center of Parliament: 2008. Persian.
8. Davari M. Economic challenges of health system in Iran. *Health Inf Manage*. 2012;8(7):915-7. Persian.
9. Sedaghiani E. Hospital Management and

Organization. Tehran: Amin: 1998. Persian.
10. Jacobs P. The economics of health and medical care. 1th ed., New York: Aspen; 1991. Persian.
11. Organization for Economic Cooperation and Development Report, health policy studies. New direction in health care policy. 1983;1:82-8. Persian.
12. Gressani D, Saba J, Fetini H, Rutkowski M, Maeda A, Langenbrunner J. Islamic Republic of Iran health sector review, volume I: main report. The World Bank Group. Human Development Sector, Middle East and North Africa. 2007;1:1575-81.
13. Rechel B. Investing in hospitals of the future. Genova: WHO Regional Office Europe; 2009.
14. Health Economics Unit Reports. Tehran: Ministry of Health and Education Medicine: 2003. Persian.
15. Bahadori Mk. Performance indicators in the medicine and medical equipment. *Journal of Medical Engineering and Laboratory Equipment*. 2007;7(74):4-6.
16. Sadaghiani E. Organization and management of hospital. 2th ed. Tehran: Jahhan rayaneh publication. 2006.
17. Asefzadeh S. Management and Research Hospital. 1th ed. Qazvin: Research deputy. 2005. Persian.
18. Karimi I. Health Economic. Rasht: Gap; 2003. Persian.
19. Nanakar R. Reviews on the role of economic management accounting system in Kashan University of Medical Sciences. *Journal of Homaye Salamat*. 2007;5:30-5.
20. Vatankhah S. A survey on managers attitude oh Social Security organization towards some of the problems of health insurance [Thesis in Persian]. *Tehran: Iran University of Medical Sciences, Faculty of Management and Information Communication*. 1995.
21. Tirgar A, Aghalari Z, Rabiei S. The importance of social issues in medical sciences education. *Medical Education Journal*. 2015;3(1):39-45.
22. Moosazadeh H, Barimani P, Mohammad SD, Eslami A. Developing strategies to improve knowledge-based resistive economy using SWOT model. *International Journal of Resistive Economics*. 2016;4(4):96-108.
23. Sheperd D, Hajiken D, Antoni U. Analysis of hospital costs: guidelines for managers. *Translated by Pourreza Abolghasem Tehran: Research Center of Social Security Organization*. 2003:24-6.
24. Todaro M. Development planning: models and methods. Tehran: Publication of Planning and Budgeting Organization; 1984. Persian.
25. Hatam N. Cost-Efficiency of Teaching Hospitals of Shiraz. Tehran: High research Association of Social security. 2001:276. Persian.
26. Tabibi J, Maleki M, Nourozi T. Computation Cost Price of clinical laboratories services in valiasr hospitals in Tehran in 1387 by using of ABC model. *Journal of Hospital*. 2010;8(3):5-17.
27. Jackson T. Using computerised patient-level costing data for setting DRG weights: the Victorian (Australia) cost weight studies. *Health Policy*. 2001;56(2):149-63. doi: 10.1016/s0168-8510(00)00148-2.
28. Manjunath U, Kumar CS, Kailashnath M. Comparison of cost structure, package rates and financial feasibility for selected surgeries covered under social health insurance schemes: a case study. *Journal of Health Management*. 2016;18(1):134-60. doi: 10.1177/0972063415625514.
29. Vaseva V, Voynov L, Donchev T, Popov R, Mutafchiyski V, Aleksiev L, et al. Outcomes analysis of hospital management model in restricted budget conditions. *Biotechnology & Biotechnological Equipment*. 2016;30(2):411-7. doi: 10.1080/13102818.2015.1134276.