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Original Research Article

Medical Materials Inventory Control Analysis at University Hospital in Turkey

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ABSTRACT

Introduction: Objective of this study was to analyses the annual medical materials expenditure and consumption using inventory control techniques.
Methods: ABC, VED and ABC-VED matrix analysis were utilized to study based on cost and criticality criteria. The study was conducted at 600 bedded a university hospital in Turkey. The data was collected for the financial year 2015.The research data were collected from the administrative and financial records of the hospital. Study data was then transcribed in a MS Excel spreadsheet and analysis was done using the MS Excel statistical functions.
Results: According to the findings obtained from this study, total annual expenditure on 1501 medical materials was 10.247.017 -TL amounting to 14% of total budget. ABC analysis showed 12%, 21% and 67% medical materials as A, B and C category, respectively, accounting for 70%, 20% and 10% of annual medical materials expenditure. VED analysis found out 11%, 68% and 21% items as V, E, and D category, respectively, accounting for 20%, 54% and 26% of annual expenditure. On ABC-VED matrix analysis, 20%, 67% and 13% medical materials were found to be category I, II and III, respectively, accounting for 78%, 17% and 5% of annual medical materials expenditure.
Conclusions: As a result, the management of class I (301 items) vital medical materials requires top managerial control and these materials must be constantly keep in stock for uninterrupted health care service.

Keywords: ABC VED Analysis, Inventory Control Techniques, Hospital.

INTRODUCTION

Around 35-40 % of the annual health care organizations budget is spent on purchasing medical material and supplies. [1-4] This situation requires effective and efficient inventory control management of the medical materials. [5,6] With the advent of medical technology, the hospital medical material expenditure is increasing disproportionately. [7] However, hospital resources are limited, it is essential that the existing resources be appropriately utilized, [8] and health managers must be use scientific inventory control methods of the medical materials. Rational utilization of resources is an important aspect of functioning of hospitals.

Hospitals are provides efficient and quality health service using appropriate inventory management techniques. [9] Effective management of medical stores entails priority setting in purchase and distribution of medical materials. [10] Inventory is one of the major current assets to the hospital organization. However, to sustain the hospital's financial performance, inventory costs can be reduced and increases in stock level can be avoided [11] in hospitals. Inventory control system, as a part of logistics system, provides several

important functions. [12] Inventory control techniques could be effective financial and material management tools to promote discipline in hospital material management in hospitals. [13] Because of these reasons, inventory control of medical materials plays a huge role in hospital management. [14]

Inventory control is universal for achieving the aim of right medical materials in right quantity at right price and at right place. [15] To minimize the inventory investment, the hospital may keep the medical materials inventory low, however, the shortage of essential can be tolerated for a short period. If these essential medical materials are not available for a few days or a week, functioning of the health care organizations can be adversely affected and lack of medical materials may cause serious health problem for patients. [16,17] For this reason, inventory techniques would not only help in efficient and optimum use of scarce financial resources but would also help in avoiding shortage of medical materials and elimination of out-of-stock situations. [18] Thus, inventory system should be developed in a cost effective manner in hospital organizations. [19]

The basic principle of inventory control is ABC based on cost criteria and VED on criticality. [7] Item classification based on ABC and VED analysis is of high importance for strategic supply and inventory control. ABC analysis is a method of classifying drugs and materials according to their relative importance and feasible and efficient technique for inventory management. [1] It supports the stock management and helps to realize potentials. [20] The inventory management can bring out significant improvement not only in patient care but also in the optimal use of resources. [1] Thus, inventory control techniques needs to be made a routine practice in hospital. [18] Effective inventory management is required to balance inventory expenditure against demands for [21] medical materials. There are various approaches for inventory management. Of all the inventory control systems, ABC and VED matrix is most suitable for [22] hospital medical materials stores.

MATERIAL AND METHODS

The study was conducted at 600 bedded a university hospital in Turkey. This study data was collected for financial year 2015. ABC, VED and ABC-VED matrix analysis techniques were utilized to study the medical materials expenditure at the hospital. This inventory control techniques is most suitable for medical stores and most preferred. The annual consumption and expenditure incurred on each was obtained from the hospital stock records. The data were then transcribed in a Windows Excel Spreadsheet. The statistical analysis was carried out using the MS Excel statistical functions. ABC, VED and ABC- VED matrix analysis were done using following parameters and procedures:

ABC Analysis

In this study, ABC cost analysis was conducted of 1.501 hospital medical materials. The annual expenditure of medical materials was arranged descending order. Then, the cumulative percentage of expenditure and the cumulative percentage of number of medical materials were calculated. Medical materials classified accounting for 70% of the cumulative cost were labelled as category "A", medical materials accounting for 20% of cumulative cost as category "B", and 10% of cumulative cost as category "C." [7]

VED Analysis

VED analysis was conducted based on the criticality of an item in healthcare service. "V" is for vital items without which the hospital cannot health care service, "E" for essential items without which a hospital can function but may affect the quality of the services and "D" for desirable items, unavailability of which will not interfere with the functioning [7] of the hospital. The VED status of each item was discussed with the department of hospital materials managers and specialists.

ABC-VED Matrix Analysis

ABC-VED analysis is useful for medical materials need highest attention and strict control for effective and optimal use of funds and prevent stock-out situations of items store. The ABC-VED matrix formulated by cross-tabulating the ABC and VED analysis. From the resultant combination, three categories were classified (I, II and III). As follows; [7]

Category I: AV+BV+CV+AE+AD
Category II: BE+CE+BD
Category III: CD

RESULT AND DISCUSSION

The medical materials store inventory of the hospital consisted of total 1501 items. The total annual medical materials expenditure was 10.247.017-TL. On ABC analysis, 12% (181), 21% (309) and 67% (1.011) items were found to be A, B and C category items, respectively, amounting for 70% (7.165.394-TL), 20% (2.055.329-TL) and 10% (1.026.295) of annual total expenditure (Table 1). Figure 1 gives findings of the ABC analysis in which the percentage cost of individual items with respect to annual expenditure has been shown.

Table 1: ABC Analysis of Medical Materials

ABC Category	Number of Items	% of Items	Annual Expenditure (TL)	% of Annual Expenditure
A	181	12.06	7.165.393,67	69.93
B	309	20.59	2.055.328,59	20.06
C	1011	67.36	1.026.294,75	10.02
Total	**1501**	**100.00**	**10.247.017,01**	**100.00**

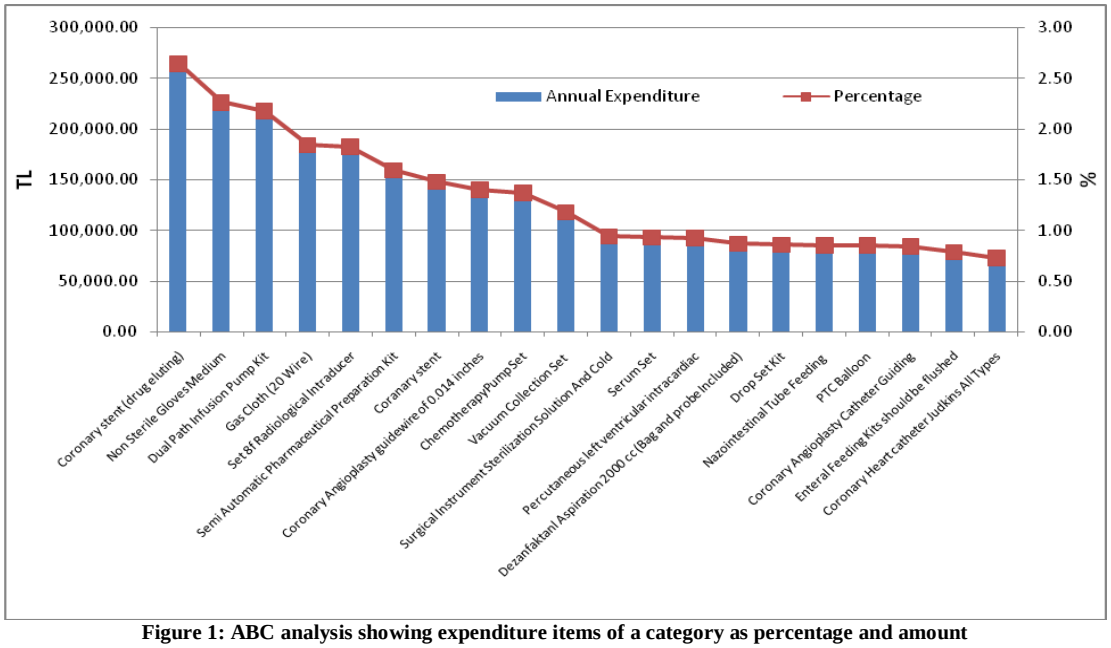

Figure 1: ABC analysis showing expenditure items of a category as percentage and amount

The findings of the VED analysis are shown in Table 2. On VED analysis, 165 (11%), 1.025(68%) and 311 (21%) items were found to be V, E and D category items, respectively, amounting for TL 2.025.654 (20%), TL 5.562.325 (54%) and TL 2.659.038 (26%) of the expenditure of the medical materials (Table 2).

Table 2: VED Analysis of Medical Materials

VED Category	Number of Items	% of Items	Annual Expenditure (TL)	% of Annual Expenditure
V	165	10.99	2.025.654,25	19.77
E	1025	68.29	5.562.325,17	54.28
D	311	20.72	2.659.037,59	25.95
Total	**1.501**	**100.00**	**10.247.017,01**	**100.00**

The research findings of the ABC-VED analysis are shown in Table 3. The medical materials were allocated to nine different subcategories (AV, AE, AD, BV,

BE, BD, CV, CE and CD) using ABC-VED matrix analysis. These nine were further grouped into three main categories (I, II and III).

Table 3: ABC-VED Analysis of Medical Materials

ABC-VED Matrix	V			E			D			Total number of Items	Total Annual Expenditure (TL)	Percentage of Items
	Combined Category	Number of Item	Annual Expenditure (TL)	Combined Category	Number of Items	Annual Expenditure (TL)	Combined Category	Number of Items	Annual Expenditure (TL)			
A	AV	45	1.203.411	AE	95	3.993.239	AD	41	1.968.743	181	7.165.394	69,93
B	BV	85	736.352	BE	143	1.163.670	BD	81	155.306	309	2.055.329	20,06
C	CV	35	85.891	CE	787	405.416	CD	189	534.988	1.011	1.026.295	10,02
Total		**165**	**2.025.655**		**1.025**	**5.562.325**		**311**	**2.659.037**	**1.501**	**10.247.017**	**100,00**

Table 4: ABC-VED Matrix Analysis of Medical Materials

Category	Number of Items	% of Items	Annual Expenditure (TL)	% of Annual Expenditure
I (AV+AE+AD+BV+CV)	301	20,05	7.987.637,51	77,95
II (BE+CE+BD)	1.011	67,36	1.724.391,99	16,83
III (CD)	189	12,59	534.987,51	5,22
Total	**1.501**	**100,00**	**10.247.017,01**	**100,00**

There were 301 (20%) items in category I, 1.011 (67%) in category II and 189 (13%) in category III, amounting for TL 7.987.638 (78%), TL 1.724.392-TL (17%) and TL 534.988 (5%) of expenditure of the medical materials respectively (Table 4).

The management of class I (301 items) vital medical materials would help in keeping a check on the annual budget and their availability. Category I medical materials are either vital or expensive, and should be managed with the greatest attention. The consumption and its effect on the stock level should be monitored continuously, and the safety stock must be kept low to reduce carrying cost. These materials should always be available in stock since they are very important. Low safety stock should be maintained to prevent the locking up of capital by these materials. A strict control is necessary for category I medical materials, because all the vital and costly items. The management of class II (1.011 items) could help in providing all the essential medical materials. Category II consists of essential medical materials. These materials can receive a little less priority, but their consumption must also be watched with moderate control. Category III (189 items) consists of medical materials is desirable and cheap which are lowest in the hierarchy of priority. Thus these materials should be purchased periodically.

CONCLUSION

Medical inventory control and materials management in university hospital is very essential. Because hospital resources are limited, this situation requires effective and efficient management of the existing resources. As shown in this study, ABC-VED and VED matrix analysis provides an important management tool for the effective and efficient management of the medical store department in hospital. Owing to this analysis, inventory costs can be reducing in university hospital. As a result, the management of class I (301 items) vital medical materials requires top managerial control and these materials must be constantly keep in stock for uninterrupted health care service. Category 2 and category 3 medical materials should middle and lower managerial control respectively.

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