

**Original article**

**Drug Inventory control analysis in a Primary level Health care facility in Rural Tamil Nadu, India**

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**Abstract**

**Introduction:** Almost one-third of hospital budget is spent in buying supplies including medicines. The cost and need of these medicines vary widely depending on the level of health care and the population catered. Effective and scientific drug inventory management techniques are necessary for efficient health care delivery.

**Objectives:** To categorise the drugs based on cost and criticality aspects and identify those which require stringent managerial control.

**Methods:** The data related to annual consumption and annual drug expenditure (ADE) incurred on each drug during the year 2012 in a primary level health care facility in Kancheepuram District, Tamil Nadu was collected. The drugs were categorised based on ABC, VED analysis using Microsoft Office Excel version 2007.

**Results :** A total of 84 drugs used in the hospital were included in the analysis. The ADE on these 84 items, for the year 2012 was, Rs.3,22,697.10. ABC analysis showed, 15 items (17.9%) in Category A, 17 (20.2%) in Category B and 52 (61.9%) in Category C consumed 70.6%, 19.47% and 9.9% of the total ADE. VED analysis revealed 25 vital items (29.8%), 31 essential items (36.9%) and 28 desirable items (33.3%) consuming 29.3%, 44.2% and 26.5% of the ADE respectively. On ABC-VED matrix analysis, 42.8%, 36.9% and 20.2% items were categorised under Category I, II and III respectively accounting for 78.4%, 17.1% and 4.5% of ADE.

**Conclusions :** This analysis allowed for categorisation of drugs based on cost and criticality factors and identifies level of managerial control required.

**Keywords:** Drug Inventory control, ABC analysis, VED analysis

**Introduction**

Inventory is the stock of any item or resource used in an organization. It can be described in financial terms as the sum total value of raw materials; semi processed and finished goods at any given time<sup>1</sup>. Inventory requirement differs with the type of organisation. In a hospital, this includes the drugs and all other raw materials or finished products involved in diagnostic and therapeutic services for the patients. In hospital about one-third of the annual expenditure is spent in buying those supplies including drugs<sup>2,3</sup>. Hospitals as in any other organisation require an effective inventory management for maintaining a balance between inventory investment and demands for supplies. The basic issue involved in inventory management is to ensure that adequate amount of raw materials are available to meet the demand of the organisation, while at the same time ensuring that too much inventory is not accumulated and also there are no stock-outs in the organisation<sup>4</sup>.

In any hospital, high quantities of inventory in form of large number of costly drugs and supplies would be detrimental to profitability and efficient performance of the hospital due to blocking of cash in form of idle stores,

requirement of large storage space for medical stores, substantial handling and transportation charges, pilferage and cost of expired medical stores<sup>4</sup>. The ultimate aim of inventory control in a health care setting is to ensure that adequate and optimal essential items are properly stored, controlled, are easily retrievable and distributed to points of uses so that patient care does not suffer due to lack of these essential medical supplies. In short, the objective of inventory management is to have the appropriate amounts of materials in the right place, at the right time and at low cost<sup>5</sup>.

Literature search provides sufficient insights into inventory management techniques in tertiary care hospitals. But there is paucity of similar studies conducted in primary level health care centres which cater to the majority of the population, especially in developing countries. It is highly essential that primary health care systems in limited resource settings have effective inventory management techniques in place to provide acceptable and affordable health care. This study was an initial attempt in drug inventory analysis in a primary level health care centre in Kancheepuram district in Tamil Nadu, India. The health centre followed a weekly drug indenting policy depending on the quantity of drugs dispensed over the week which resulted in occasional shortages of essential drugs as well as overstocking of few less used drugs. The objectives of the study were (i) to analyse the annual consumption of the drugs and the expenditure incurred on them during the year 2012 and (ii) to evolve a priority system of drug inventory control based on ABC, VED and ABC-VED matrix analysis.

### **Materials and Methods**

This study was undertaken in a Rural Health care centre providing primary level care in Kancheepuram district of Tamil Nadu state in India and caters a population of 18000. All the drugs

expended during the period January 2012 to December 2012 were included in the study.

The data related to annual consumption of each drug and annual drug expenditure (ADE) incurred on each drug was entered in Microsoft (MS) Office Excel for Windows, version 2007 and statistical analysis was performed using MS Excel statistical functions.

For ABC Analysis, the consumption cost of each medicine/ drug was worked out for the whole year. All the drugs were arranged in descending value of their annual cost, the most expensive being at the top and the least expensive being at the bottom. The cumulative cost was then calculated. The drugs were then classified into 3 groups, A (items which consume 70% of total annual cost), B (items which consume the next 20% of the total annual cost) and C (items which consume the remaining 10% of the total annual cost) based on Pareto's principle<sup>6</sup>.

VED analysis is based on the criticality of an item in service delivery. "V" is for vital items without which the hospital cannot function, "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 of the hospital<sup>6</sup>. For VED analysis, the list of drugs was distributed to a panel of 10 medical personnel comprising physician, surgeon, obstetrician, paediatrician, orthopaedician, anaesthetist and four medical officers with adequate experience in delivering health care at primary level. They were asked to classify the drugs into vital, essential and desirable. The drugs were categorised into a particular group if more than 50% of the members of the panel concurred.

The data was coupled into ABC and VED matrix which again divides the drugs into 3 categories, as follows,

Category I: AV+BV+CV+AE+AD

Category II: BE+CE+BD

Category III: CD

**Category I:** All the vital and costly items, whose shortage may adversely affect the functioning of the hospital and over stocking, may lead to financial loss to the hospital.

**Category II:** Essential but less costly; can have less stringent controls

**Category III:** Stores and medicines which are desirable but would not affect the functioning of the hospital even if unavailable for a long time<sup>4</sup>.

### Results

A total of 84 drugs used in the hospital were included in the analysis. The ADE on these 84 items, for the year 2012 was, Rs.3,22,697.10. The details of ABC, VED and ABC-VED matrix analysis are presented in Tables 1 and 2.

**Table 1: ABC, VED analysis and ABC-VED matrix of drug store of the health facility**

Class	Number of items (n=84)	% of number of items	Annual Drug Expenditure in Indian rupee	% of Annual Drug Expenditure
<b>A B C analysis</b>				
A	15	17.9%	2,27,930.74	70.63%
B	17	20.2%	62,829.24	19.47%
C	52	61.9%	31,937.12	9.9%
<b>V E D analysis</b>				
V	25	29.8%	94,713.38	29.3%
E	31	36.9%	1,42,526.22	44.2%
D	28	33.3%	85457.5	26.5%
<b>Classification based on ABC-VED matrix analysis</b>				
Category I	36	42.8%	2,53,026	78.4%
Category II	31	36.9%	55,234	17.1%
Category III	17	20.2%	14,437.1	4.5%

### Discussion

The drug formulary the health centre consisted of 84 items. The total annual drug expenditure on these 84 items

was INR 3, 22,697.10. The aim of hospitals is to provide timely and efficient medical care services. Drug Inventory control is an important element of Health care management, and is an essential activity to achieve efficient patient care in a hospital. The regular availability of the necessary medicines is the topmost priority for any hospital. Each hospital has to evolve its own drug inventory analysis system depending on the population and the health care problems it caters. To avoid stock-outs as well as excess stocks, cost and criticality of the drugs are two important factors which have to be taken into account in drug inventory analysis<sup>7</sup>. ABC analysis and VED analysis which assess the cost and criticality respectively have been used in this study.

An ABC-VED matrix helped us identify 36 drugs (42.8%), which consume 78.4% of total annual drug expenditure under Category I and require stringent control.

#### **ABC analysis**

In our study, 15 items (17.9%) in Category A consume 70%, 17 items (20.2%) in Category B consume 19.47% and 52 items (61.9%) in Category C consume 9.9% of the total ADE. Considering ABC analysis alone will enable us to ensure adequate control over 17.9% of items which consume 70% of total annual drug inventory cost. But this analysis does not take into account the vital items in B and C categories.

#### **VED analysis**

VED analysis of the drug inventory in our study shows that, 25 items (29.8%) in vital category consume 29.3%, 31 items (36.9%) in essential category consume 44.2% and 28 items (33.3%) in desirable category consume 26.5% of the annual drug expenditure. When VED analysis is considered alone, the 4 desirable items included in category A and consume considerable cost are ignored

**Table 2: ABC-VED Matrix**

	V	E	D	Total
<b>A</b>	4	7	4	15
<b>B</b>	5	5	7	17
<b>C</b>	16	19	17	52
<b>Total</b>	25	31	28	84

**Table 3: Comparison of ABC, VED and ABC-VED matrix analysis of different studies\***

Category	Gupta et al <sup>6</sup>	Mahatme et al <sup>8</sup>	Junita et al <sup>9</sup>	Khurana et al <sup>7</sup>	Devnani et al <sup>10</sup>	Present study
<b>A</b>	14.6	14.5	7.74	3.45	13.78	<b>17.9</b>
<b>B</b>	22.4	18.2	11.01	6.9	21.85	<b>20.2</b>
<b>C</b>	63	67.3	81.25	89.65	64.37	<b>61.9</b>
<b>V</b>	7.4	24.2	6.6	32.41	12.11	<b>29.8</b>
<b>E</b>	49.2	68.5	33.6	61.38	59.38	<b>36.9</b>
<b>D</b>	43.4	7.3	59.8	6.2	28.51	<b>33.3</b>
<b>I</b>	20.9	31.5	11.9	33.8	22.09	<b>42.8</b>
<b>II</b>	48.9	68.5	37.8	60	54.63	<b>36.9</b>
<b>III</b>	30.2	–	50.3	6.2	23.28	<b>20.2</b>

An ABC-VED matrix provides a balanced classification of the drug inventory into 3 categories based on both cost and criticality of the items. In the present study, 36 items (42.8%) consuming 78.4% of the ADE belong to Category I, 31 items (36.9%) consuming 17.1% of the ADE belong to Category II and 17 items (20.2%) consuming 4.5% of the ADE belong to Category III. ABC-VED matrix enables us to apply stringent managerial control measures to the 36 items in Category I which are either expensive or vital. These drugs should always be maintained in stock since they are either vital or essential. But

considering the high cost of these drugs, a low buffer stock should be maintained and strict control should be exerted on the prescription and utilization of these drugs. Category II drugs can be controlled by the middle level management and Category III drugs can be controlled by lower managerial level. Appropriate ordering techniques should be employed for the different categories. Comparing our results with similar studies revealed considerable differences (Table 3). The differences could most probably be due to the fact all these hospitals were providing tertiary level care or speciality care. The studies by

Mahatme et al, Gupta et al, Junita et al, Devnani et al was done in tertiary care hospital and Khurana et al analysed the inventory control techniques in a neuropsychiatry hospital<sup>6,7,8,9,10</sup>. No such literature was available to compare the inventory analysis techniques in primary level health care settings. There is a need for adoption of such scientific techniques of inventory control at all levels of health care and published data regarding the same.

### **Conclusions**

The drug inventory analysis enabled their classification into categories based on their priority and assignment to appropriate managerial levels. This analysis is hoped to promote effective management of drug inventory with minimal monetary resources while maintaining required safety stocks of high priority drugs and reduce frequency of drug supply shortage. An efficient inventory management system at a primary health care level will contribute to provision of uncompromised patient care.

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