Research Article

ABC and VED Analysis of Imam Reza Educational Hospital Pharmacy

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Abstract

The ABC and VED (i.e. vital, essential, desirable) analysis of the pharmacy of Imam Reza Educational Hospital was carried out to determine the categories of medicines, which necessitate strict control. The annual consumption and cost of each item of medicine for the year 2016 were analyzed and cost control programs, i.e. ABC, VED, and ABC-VED matrix analysis, were used. The drug formulary of the pharmacy included 597 items. The annual drug expenditure on items issued was 13 108,365,188 Rials. The ABC analysis showed that 5.7%, 11.2%, and 83.1% of items belonged to category A, B, and C, respectively, conforming 74.873%, 20.089%, and 5.038% of ADE of the pharmacy. The VED analysis revealed 10.55%, 19.43%, and 70.02% of items as V, E, and D category items, respectively, conforming 23.20%, 47.91%, and 28.89% of ADE of the pharmacy. On ABC-VED matrix analysis, 15.24%, 20.44%, and 63.32% of items were defined to be category I, II, and III items, respectively, conforming 83.76%, 13.54%, and 2.70% of ADE of the pharmacy. In conclusion, scientific inventory management tools are needed to be applied on a routine basis for efficient management of pharmacy stores, as they contribute improvement in patient care and judicious use of resources.

Keywords: ABC-VED Analysis, Inventory Tools, Economic Analysis, Pharmacy

1. Background

The pharmaceutical system is one of the most important and vital parts of the health system of each country. The evaluation of the pharmaceutical system of countries is performed based on various models that are commonly used by international organizations, such as the World Health Organization, the World Bank, as well as models used in the European Union countries, etc. However, countries, in which the evaluation of the pharmaceutical system is part of their ongoing programs, have their own models.

The proper prescription and the rational use of medications are important factors in providing the health security of a society. Pharmaceutical drug consumption in the past decade has been rising unreasonably in Iran and has caused drug problems, including lack or shortage of some pharmaceutical drug items. In terms of the consumption of pharmaceutical drugs and per capita consumption, Iran is among the top countries (1, 2).

About one-third of the annual budget of hospitals is spent on purchasing consumable items, including medications (3, 4). Pharmacies are one of the most widely used parts of hospitals and are one of the few parts, where high

amounts of money are recurrently spent for the purchase of products. The inventory of some medications might often become out-of-stock or expire before they are consumed. The lack or shortage of medications in the pharmacy can result in poor service to the patients and undermine the credibility the pharmacy (5). This issue requires planning, designing, and organizing of the pharmacy in a way that leads to effective and efficient clinical services (6).

The aim of the hospital support setting is to assure that the stock or supply of the required items is adequate and based on an established program. A scientific evaluation is required to determine the ordering time, order quantity, and the amount of available stock to minimize the costs to the minimum possible amount and to prevent the fluctuation of supply and demand (7).

Inventory control emphasizes on the reduction of cost and the increase in efficiency (8). It is unnecessary and impossible to monitor all consumable items in the health system. Highly consumed and highly-priced drug items, that can have the most clinical and economic impact, have the utmost priority. At all stages, the evaluation of the most expensive pharmaceutical items, which account for a major part of the allocated budget, is essential. ABC analysis is an important and universal method for evaluating items that

require the highest amount of control (9-13).

ABC analysis is a method for classifying items based on their importance. It is also defined as the "separation of the vital few from the trivial many". A small number of drugs on the list of pharmaceutical drugs have the highest amount of consumption and at the same time are the most expensive drugs as well. This analysis is based on the Pareto principle, according to which goods can be classified to three groups of always (A), better (B), and control (C) based on their importance. Group A includes important items in terms of price value and accounts for 70% to 80% of the cumulative value (cost) of the annual budget of the pharmacy (10% to 15% of total items). Group B items have a moderate price value and form approximately 15% to 20% of the cumulative value (cost) of annual budget allocated for the purchase of drugs and consumables (20% to 25% of total items). Group C includes consumable items with lowest price value, which account for only 5% to 10% of the total cumulative cost of drugs and consumable items (65% to 70% of total items) (8-16).

The restriction of ABC analysis is that it is only based on the financial value and the rate of use of medicines; whereas, in a hospital, a drug with low price and low consumption may be vital, and if not available, it can lead to major problems in providing services. As a result, their importance can not be ignored merely because they are not in group A. Therefore, another parameter is considered for this issue (11).

The VED analysis is based on the critical value and cost of the shortage of items. Based on their importance, items are categorized to three categories of vital, essential, and desirable. The provision of services to the patients will encounter serious constraints in the event of shortage of vital medicines, even for a very short period of time. If the essential drugs are not available for more than a few days to a week, the hospital's function will be negatively affected. The shortage of desirable drugs (non-essential) will not affect the overall functioning of the hospital, even if the shortage of drugs is prolonged (9, 11, 17).

A combination of ABC and VED (ABC to VED Matrix) analyses can effectively have a significant control over the supply of pharmaceutical needs. The first category (category I) includes all vital and expensive drugs (AV, BV, CV, AE, and AD). The second category (category II) includes the other items in groups E and B (BE, CE, BD). The third category (category III) includes desirable and cheaper drugs (CD) (17).

In the present study, ABC and VED analyses and ABC-VED matrices of Imam Reza Hospital Pharmacy were carried out during the last twelve months of the year 2016 to identify drug categories requiring precise and stringent management control.

2. Objectives

The main objectives of this study consisted of the analysis of the consumption of items of pharmacy and the annual expenditure incurred on them for year 2016, and the establishment of a prioritization and inventory control system based on ABC, VED, and the ABC-VED matrix, and the identification of items that require more accurate supervisory monitoring.

3. Methods

The overall sales of each pharmaceutical item during the year 2016, were individually sorted in descending order after being extracted from the hospital integration system (HIS). The data were entered in the pages of MS Excel 2007 program. Statistical analysis was conducted using the statistical operators of the program.

3.1. ABC Analysis

The list of medications and consumables extracted from the system was sorted out in descending order based on their monetary value. The cumulative expenditure of all items was calculated individually. The cumulative percentage of sales and costs were also calculated. This list was then categorized to three subdivisions: A, B and C categories, based on the cumulative cost percentages. Group A, B, and C accounted for up to 75%, 20%, and 5% of cumulative cost percentage.

3.2. VED Analysis

VED analysis was performed by categorizing the drugs to three categories: Vital (V), essential (E), and desirable (D). The drugs that are critically needed for saving the lives of patients and should be available in the hospital at all times were placed in category V. Drugs that are less vitally important, yet are essential and necessary in the wards, were placed in category E. Other drugs, with the least critical importance, the shortage of which does not have a significant effect on the health of the patients, were placed in category D. The VED status of the drugs was discussed and approved by a group of physicians, surgeons, pharmacists, and clinical pharmacists at the Drug-Treatment Committee of the hospital.

3.3. ABC-VED Matrix Analysis

The ABC-VED matrix was designed by cross-tabulating of ABC and VED analyses. From the resultant combination, the three categories were classified as first, second, and

third categories (I, II, III). The first category (category I) includes subgroups of AV, AE, AD, BV, and CV drugs. The subgroups BE, CE, and BD make up the second category (category II), and the subgroup CD forms the third category (category III). In these subgroups, the first letter indicates its status in the ABC analysis and the second letter denotes the status of the item in the VED analysis.

4. Results

The drug formulary of the hospital included 597 inventory items. The total revenue from the sale of these items during the annual period from January 1, 2016, to December 31, 2016, was 13,108,365,188 Iranian Rials.

4.1. ABC Analysis

According to ABC analysis, 5.7% of items (34 cases) were placed in group A, 11.2% of items (67 cases) were placed in group B, and 83.1% of items (496 cases) were placed in group C. Group A accounted for 74.873% of the annual drug expenditure (ADE) (amounting to 9,814,623,150 Rials), group B accounted for 20.089% of ADE (amounting to 2,633,379,500 Rials), and group C accounted for 5.038% of ADE (amounting to 660,362,538 Rials). Results are shown in Table 1.

4.2. VED Analysis

The findings of the VED analysis of the current study are presented in Table 2. Overall, 10.55% of items (63 cases) were placed in group V, 19.43% of items (116 cases) were placed in group E, and 70.02% of items (418 cases) were placed in group D. Group V accounted for 23.20% of ADE (amounting to 3,041,618,250 Rials), group E accounted for 47.91% of ADE (amounting to 6,280,220,845 Rials), and group D accounted for 28.89% of ADE (amounting to 3,786,526,093 Rials).

Table 1. ABC Analysis Results[a]

Group	Percentage	Running Total Percent
A	5.7	74.87
B	11.2	20.08
C	83.1	5.03

[a]The list of medications and consumables was sorted out in descending order based on their monetary value and categorized into 3 subdivisions: A, B and C categories based on the cumulative cost percentages.

Table 2. VED Analysis Results

Group	Percentage	Running Total Percent
V	10.55	23.20
E	19.43	47.91
D	70.02	28.89

Abbreviations: D, desirable, E, essential; V, vital.

Table 3. ABC-VED Matrix Categorization[a]

Group	Sub Group	Percentage	Running Total Percent
Category I	AV, BV, CV, AE, AD	15.24	83.76
Category II	BE, CE, BD	20.44	13.54
Category III	CD	63.32	2.70

Abbreviations: D, desirable, E, essential; V, vital.
[a]The ABC-VED matrix was designed by cross-tabulating of ABC and VED analyses. In these subgroups, the first letter indicates its status in the ABC analysis and the second letter denotes the status of the item in the VED analysis.

4.3. ABC-VED Matrix

In Table 3, it was shown that in the combination matrix of ABC-VED, items are categorized in specific subgroups.

In Table 4, the analysis of the ABC-VED matrix is shown. The nine subgroups shown in Table 3 were studied using this analysis.

According to the combinational ABC-VED analysis, 15.24% of all items (91 cases) were placed in category I, 20.44% of all items (122 cases) were placed in category II, and 63.32% of all items (384 cases) were placed in category III. Category I accounted for 83.76% of ADE (amounting to 10,980,428,750 Rials), category II accounted for 13.54% of ADE (amounting to 1,774,789,145 Rials), and category III accounted for 2.70% of ADE (amounting to 293,353,147 Rials). The results are shown in Table 3.

5. Discussion

The provision of treatment in hospitals is susceptible to timely availability of means and resources, including medications. In case of medications, along with the factor of vitality, the cost factor should also be considered. As the study shows, 34 items of the medications of the Imam Reza Hospital Pharmacy (5.7% of all items) accounted for about 75% of the ADE, 67 items of the medications (11.2% of the total) accounted for about 20% of the ADE of the pharmacy, and 496 of the medications (83.1% of total items) accounted for about 5% of ADE of the pharmacy, in the year 2016. Group A, which contains only 34 pharmaceutical items and accounts for 75% of ADE, requires strong monitoring, given that it includes a few yet expensive items. It was also found that not all items in this group were vital

Table 4. ABC-VED Matrix Analysis

ABC-VED	Vital		Essential		Desirable	
	No. (%)	RTP	No. (%)	RTP	No. (%)	RTP
A	6 (9.52)	14.31	19 (16.38)	41.04	9 (2.15)	19.52
B	26 (41.72)	7.94	16 (13.79)	5.48	25 (5.98)	6.68
C	31 (49.21)	0.95	81 (69.83)	1.39	384 (91.87)	2.69
Total	63 (10.55)	23.20	116 (19.43)	47.91	418 (70.02)	28.89

Abbreviations: D, desirable, E, essential; RTP, running total percent; V, vital.

or essential, and it included some desirable drugs as well. Categorizing with the ABC-VED matrix model helps identify the items that require more precise control.

The current study showed that if ABC analysis was used alone, it would well be able to control 34 items of group A, which includes 75% of ADE, yet it cannot be used to control the vital items available in groups B and C (57 items or 9.55% of all items). The results of this study are comparable with the results of other studies conducted in India (Table 5) (8, 17-20).

If the VED analysis is considered alone, the ideal control of essential and vital items (i.e. a total of 179 drugs, which includes 71.11% of ADE) is practical. However, in category A, there are nine drugs from category D, which account for 19.52% of the ADE of the pharmacy, and therefore, completely ignoring the D group is illogical and unreasonable. Comparing this study with similar studies conducted in India (8, 17-20) indicates a significant difference in the percentage of the number of drugs in the vital, essential and desirable groups among all the studies conducted, and the reason for this can be the difference in the type of services provided at different hospitals, depending on the specialized services available at the hospitals.

By combining the ABC and VED analyses, the resulting matrix provides the possibility of focusing on 91 items (15.24% of the total items), which accounts for 83.76% of the ADE. The precise control of these items is essential because they are either expensive or vital (all items in group A and all vital drugs (V) from groups B and C). Subgroups of AV, AE, and BV of category I include 51 items of expensive drugs (63.29% of the ADE of the pharmacy), which with regard to their vital or essential nature, it is unacceptable for these drugs to become out-of-stock. In order to prevent the locking of capital because of these items, the existence of a low volume stock, along with the establishment of a strict method for monitoring the level of consumption and storage available, is required. A two-bin order procedure should be followed for these items to eliminate the risk of drug shortages. Subgroup CV items (31 drug items and 5.19% of total items) are drugs with low financial value

and a high critical value and 0.95% of the total ADE. Since this figure is insignificant, these items can be purchased and stored annually.

Subgroup AD items (nine drug items and 1.51% of total items) account for 19.52% of the ADE. These items must be controlled for economic order quality and their order should be made after a detailed study of the demand. The logical use of items in this subgroup and even removing them from the list, if possible, can bring significant savings without significantly affecting patient care.

The items in category II (122 drug items and 20.44% of total items) account for 13.54% of the ADE. These items may be ordered once or twice a year, and as a result, there would be savings on ordering costs and managerial issues, with modest maintenance costs, without blocking significant capital.

The items in category III (384 drug items and 63.32% of total items) account for 2.70% of the ADE. These items may be ordered once or twice a year and as a result with modest maintenance costs and without blocking significant capital, there would be considerable savings in the ordering expenses.

5.1. Conclusion

During year 2016, the annual drug expenditure (ADE) of Imam Reza Hospital Pharmacy was 13,108,365,188 Iranian Rials. As a result, the implementation of a scientific inventory management tool for the efficient and effective management of the pharmacy, efficient prioritization, decision-making in the purchase and distribution of special items, and careful monitoring of groups with a high degree of importance is necessary. ABC, VED, and ABC-VED matrix analyses can be used to identify drugs that require precise control for the optimal use of financial resources and the elimination of out-of-stock conditions at the pharmacy. According to the results of the current study, among commonly used inventory control systems, implementing ABC-VED analysis is currently the best possible option, which gives the best supervisory control on pharmacy items.

Table 5. Comparison of Different Studies Conducted in India with the Current Study[a]

Group	Our Study	TCTRH Study (18)	GMCH Study, Goa (17)	AFI Study (20)	GMCH Study, Nagpur (8)	CGHS Study (19)
A	5.7	13.78	12.93	14.46	10.76	17.81
B	11.2	21.85	19.54	22.46	20.63	22.60
C	83.1	63.37	67.53	63.08	68.61	59.59
V	10.55	12.11	12.36	7.39	23.76	5.14
E	19.43	59.38	47.12	49.23	38.12	58.90
D	70.02	28.51	40.52	43.38	38.12	35.96
I	15.24	22.09	22.99	20.92	29.15	21.58
II	20.44	54.63	41.67	48.92	41.26	56.16
III	63.32	23.28	35.35	30.16	29.59	22.26

[a]Values are expressed as percentage.

Footnotes

Conflict of Interests: The authors declare that they had no competing interests.

Ethical Approval: The current research studied documents of a hospital's pharmacy, so there was no ethical approval for the article.

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