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Management of Cardiovascular Medicines Used at the Regional Diagnostic and Treatment Center of the Western Region of Mongolia

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Abstract

As cardiovascular diseases are the major global health problem, the management of cardiovascular medicines (CVMs) should not be out of attention. We aimed to identify CVMs needing strict management control, used in 2017 and 2018 to investigate if there was a possibility to make savings in the expenditure for CVMs if the proper management was done regarding Class A medicines at the Regional Diagnostic Treatment Center of Khovd aimag in 2018. Aggregate data methods, Always, Better and Control (ABC), Vital, Essential and Non-essential (VEN), and ABC-VEN matrix analyses were used to identify the categories of CVMs, included in the Essential Medicine List of Mongolia for the year 2017 and 2018. Class A medicines represented 23.81% and 30.43% of the total CVMs and consumed the largest proportion of the total budgets at 73% and 71% in 2017 and 2018, respectively. The Category I, which requires strict management control, contains the majority (an average of 59%) of total CVMs and amounting for an average of 78.67% of total expenditures in 2017 and 2018. We conclude that the Regional Diagnostic and Treatment Center could have saved a total of 6,646,500 MNT if the proper management regarding Class A medicines was done in 2018 based on the results of ABC, VEN, and ABC-VEN matrix analyses of 2017.

Keywords: Cardiovascular, Medicine's management, Pharmacoeconomics

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Introduction

Globally, cardiovascular diseases (CVDs) are reported to have caused 31% of all deaths in 2016, which pose a major risk to the health of all populations. In Mongolia, CVDs were the cause of 34.4% of all deaths in 2018 and 32.1% in 2019, respectively.[1-3]

The United Nation Sustainable Development Goals aim to decrease early mortality from non-communicable diseases, including CVDs through prevention, treatment, and promoting mental health and well-being by one-third, by the year 2030.[4] Medicines are very essential in medical treatment and a significant tool to decrease morbidity and mortality.[5,6] Moreover, it is evidently important to manage medicines optimally, given there is a fact that essential medicines constitute 20–40% of health-care budgets in many developing countries.[5,7,8] Hence, this issue is more important in those countries.[9,10]

The purpose of the proper management of medicines is to promote rational use of them, which means to deliver correct choice of medicines based on the patients' clinical needs.[7,11] An appropriate medicine purchase and use may prevent the use of other unnecessary drugs in the patient care.[12] Irrational use of medicines could result in the broad spectrum negative consequences such as the risks of adverse drug reactions, detrimental impact on health-care costs and treatment outcomes.[7,8,11,13]

In the hospitals, a Drug and Therapeutics Committee (DTC) is a responsible body to make decisions on promoting rational use of medicines and is advised by the World Health Organization (WHO) to use aggregate data methods including Always, Better and Control (ABC) and Vital, Essential and Non-essential (VEN) analyses to address management and irrational use of medicines. These analyses require data that do not link with individual patients' information, for instance, clinical record. But involve data such as cost and quantities of medicines used as well as possible use of therapeutically interchangeable alternatives.[5]

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ABC, VEN, and ABC-VEN matrix analyses were used in many studies carried out in the various countries, particularly in low- and middle-income countries to reveal irrational use of medicines and manage medicines efficiently.[8-10,12,14-27] For example, the ABC analysis, which was done at the University hospital of Kenya (2015) revealed irrational use of antibiotic meropenem. In response, the DTC of the hospital implemented measures for rational use of meropenem and other antibiotics. Consequently, meropenem consumption decreased by 62% in 1 year.[7]

Most previous studies that used ABC, VEN, and ABC-VEN matrix analyses investigated the entire hospital formulary list, while only a small number of them evaluated the certain therapeutic class of medicines. Tkachova *et al*.[26] in their study examined the medicines used in acute respiratory virus infections and found out the inconsistency of those medicines with the National Drug Formulary and Clinical Protocol. A study, analyzed the utilization and expenditure for anti-cancer medicines in Kosovo,[27] highlighted the importance of the proper selection and planning process of anticancer medicines with the scarce resources available based on the results of pharmacoeconomic analyses.

However, there has been limited study regarding cardiovascular medicines (CVMs) use and management. Thus, we believe that, our most important contribution is drawing attention to the issue associated with management of CVDs which are great public health problem worldwide and in Mongolia.

Mongolian health-care system contains state owned, private, and mixed health-care organizations which located in Ulaanbaatar and in the rural regions. There are five Regional Diagnostic and Treatment Center (RDTC) in the four regions: Western, Khangai (mountainous region), and Central along with Eastern and provide the referral level of healthcare.[28] On the report of Mongolian Health Indicator 2018 and 2019, CVDs were the second reason for hospital admission and the highest rate of hospital admission due to CVDs belonged to the Western region at 406.3 in 10,000 population in 2018.[2,3]

RDTCs are health organizations providing medical services to the population of the region, professional methodological advice to some health organizations and organize some training activities. The RDTC of the Western region is located in Khovd Aimag (Administrative unit of Mongolia; province) and provides referral level of healthcare to the patients of western 5 Aimags. As stated by the Mongolian Statistical Information Service, the population of Western region was 412,036 in 2019.[29]

We aimed to identify CVMs needing strict management control, used in 2017 and 2018 by conducting ABC, VEN along with ABC-VEN matrix analyses and to investigate if there was possibility to make savings in the expenditure for CVMs if the proper management regarding Class A medicines was done at the RDTC of Khovd Aimag in 2018.

Materials and Methods

Study Design and Data Collection

Retrospective cross-sectional (ABC) and descriptive retrospective (VEN) designs[8] were used. The annual consumption of and expenditure for the CVMs, included in the 6th, 7th, and 8th Essential Medicine List (EML) of Mongolia were collected for the year 2017 and 2018. The data were collected from the Pharmacy Department of the RDTC of Khovd Aimag.

ABC Analysis

All CVMs used in 2017 and 2018 were listed with their unit cost and annual consumption in an MS Excel spreadsheet for quantitative analysis. The annual expenditure for each CVM was determined by multiplying the unit cost by the annual consumption and the list was rearranged in descending order. Afterward, the percentage of annual CVMs expenditure and cumulative percentage of total expenditure were calculated. Subsequently, the list was divided into three classes: A (Always), B (Better), and C (Control) derived from the cumulative percentage of total expenditure at 70%, 20%, and 10%, respectively.[14-16,19-23,25]

VEN Analysis

The grouping of each CVM into VEN classification was done based on the discussion with the cardiologists of the RDTC of Khovd Aimag. The nature of the classes is proclaimed below.

- -V (Vital medicines) – Potentially lifesaving or crucial to providing basic health services,
- -E (Essential medicines) – Effective against less severe but significant forms of disease but not absolutely vital to providing basic health care and
- -N (Non-essential medicines) – Used for minor illnesses, are of questionable efficacy, or have a comparatively high cost for a marginal therapeutic advantage, and are the least important medicines stocked.[5,7]

ABC-VEN Matrix Analysis

The results of ABC and VEN analyses are matrixed by cross-tabulating to generate three categories, which need different level of managerial control: strict management control for Category I, medium level control for Category II, and minimum control for Category III medicines, respectively.[16,18,25] It is shown below how the subcategories are distributed in the Categories.

Category I
- AV (Costly and Vital)
- AE (Costly and Essential)
- AN (Costly and Non-essential)
- BV (Less costly and Vital)
- CV (Cheap and Vital)

Category II
- BE (Less costly and Essential)
- CE (Cheap and Essential)
- BN (Less costly and Non-essential)

Category III
- CN (Not costly and Non-essential)

Statistical Analyses

The statistical analysis for ABC analysis was done using MS Excel statistical functions as noted in the comprehensive manual for DTCs, which has been developed by the WHO in collaboration with Management Sciences for Health.[5]

Mann–Whitney test was used to calculate the expenditure distribution difference between the pharmacological classes of the CVMs used in 2017 and 2018.

Pearson's Chi-squared test was used to determine the percentage difference between the classes (A, B, C and V, E, N), subcategories and categories (I, II, and III) of the CVMs used in 2017 and 2018.

Statistical significance was determined at a $p \leq 0.05$. Statistical processing was performed using SPSS 25.0 software.

Ethical Statement

Ethical approval was sought from the Institutional Review Board at the Mongolian National University of Medical Sciences. Approval №2019/3-02.

Results

A total 21 and 23 CVMs were used at the RDTC of Khovd Aimag and they accounted for 16,247,496 MNT (Mongolian tugrik – the official currency of Mongolia) and 15,999,360 MNT in 2017 and 2018, respectively [Tables 1 and 2].

As indicated in Table 1, CVMs used in 2017 and 2018 are divided into six pharmacological classes based on the EML. The major consumption of total CVMs was antihypertensive medicines in 2017 (33.33%, *n* = 7) and 2018 (30.43%, *n* = 7), followed by antianginal medicines.

According to Table 2, despite antianginal medicines occupied only 23.8% (*n* = 5) and 26.09% (*n* = 6) of the total CVMs in 2017 and 2018, respectively, this class had the highest expenditures across these 2 years accounting for 52.05% (8,456,608 MNT) and 58.92% (9,426,210 MNT) of the total expenditures for CVMs. In contrast, the majority (33.33% in 2017 and 30.43% in 2018) of the CVMs belonged to the antihypertensive medicine class, yet they accounted for the modest portion of the total expenditures at 23.4% and 18.98% in 2017 and 2018, respectively.

There were no statistically significant expenditure distribution differences between the same pharmacological classes in 2017 and 2018.

The ABC analysis showed that the Class A medicines represented 23.81% and 30.43% of the total CVMs and consumed the greatest proportion of the total budgets at 73% (11,806,836 MNT) and 71% (11,407,250 MNT) in 2017 and 2018, respectively. While on the contrary, Class C medicines represented the highest proportions of the CVMs at 42.86% and 39.14% in 2017 and 2018 respectively. However, they accounted for a very little part of total expenditures only at an average of 9%. The results of ABC, VEN, and ABC-VEN matrix analyses of 2017 and 2018 are illustrated in Table 3.

The VEN analysis denoted that the largest part (52.38% in 2017 and 52.17% in 2018) of the CVMs belonged to the Class E and they accounted for 36.36% (5,907,288 MNT) and 36.09% (5,774,410 MNT) of total expenditures in 2017 and 2018, respectively. Whereas, Class V medicines accounted for an average of 43.17% of the total CVMs procured over the 2 years. Surprisingly, Class N medicines constituted only an average of 4.55% of the total CVMs, yet they consumed a noticeable portion of the total budgets at 37.81% and 41.54% in 2017 and 2018, respectively.

The ABC-VEN matrix analysis revealed that the Category I (AV, AE, AN, BV, and CV) contains an average of 59% of total CVMs and

Table 1: The percentage of cardiovascular medicines by pharmacological classification in 2017 and 2018

Pharmacological classification	*2017*		*2018*	
	Generic name	*% of CVMs by class*	*Generic name*	*% of CVMs by class*
Antianginal medicines	*Tab. Isosorbide dinitrate Tab Bisoprolol Tab. Nifedipine *Inj. Nicardipine Inj. Inosine	23.81 (*n*=5)	Tab. Isosorbide dinitrate Tab Bisoprolol Tab. Nifedipine Inj. Nicardipine Inj. Inosine Tab Trimetazidine	26.09 (*n*=6)
Antiarrhythmic medicines	Inj. Amiodarone Inj. Lidocaine Inj. Epinephrine Inj Digoxin	19.05 (*n*=4)	Inj. Amiodarone Inj. Lidocaine Inj. Epinephrine Inj Digoxin Tab Digoxin	21.74 (*n*=5)
Antihypertensive medicine	Tab. Methyldopa Tab Atenolol Tab. Carvedilol Tab Amlodipine Tab. Enalapril Tab Losartan Tab. Valsartan	33.33 (*n*=7)	Tab. Methyldopa Tab Atenolol Tab. Carvedilol Tab Amlodipine Tab. Enalapril Tab Losartan Tab. Valsartan	30.43 (*n*=7)
Medicines used in heart failure	Inj Dopamine Inj Dobutamine	9.52 (*n*=2)	Inj Dopamine Inj Dobutamine	8.69 (*n*=2)
Anti-platelet medicines	Tab Acetylsalicylic acid	4.77 (*n*=1)	Tab Acetylsalicylic acid	4.36 (*n*=1)
Lipid – lowering agents	Tab Atorvastatin Tab Rosuvastatin	9.52 (*n*=2)	Tab Atorvastatin Tab Rosuvastatin	8.69 (*n*=2)
Total	100 (*n*=21)		100 (*n*=23)	

*Inj.: Injection, *Tab.: Tablets. CVMs: Cardiovascular medicines

Table 2: The expenditures for cardiovascular medicines by pharmacological classification in 2017 and 2018

Pharmacological classification	*2017*		*2018*		*P value*
	n (%) of CVMs by class	*Expenditure MNT (%)*	*n (%) of CVMs by class*	*Expenditure MNT (%)*	
Antianginal medicines	5 (23.81)	8,456,608 (52.05)	6 (26.09)	9,426,210 (58.92)	0.715
Antiarrhythmic medicines	4 (19.05)	1,066,100 (6.56)	5 (21.74)	1,157,800 (7.24)	0.806
Antihypertensive medicine	7 (33.33)	3,801,488 (23.4)	7 (30.43)	3,036,850 (18.98)	0.949
Medicines used in heart failure	2 (9.52)	2,365,000 (14.56)	2 (8.69)	1,496,000 (9.35)	1
Anti-platelet medicines	1 (4.77)	75,000 (0.46)	1 (4.36)	240,000 (1.5)	0.317
Lipid – lowering agents	2 (9.52)	483,300 (2.97)	2 (8.69)	642,500 (4.01)	0.439
Total	21 (100)	16,247,496 (100)	23 (100)	15,999,360 (100)	0.751

CVMs: Cardiovascular medicines, MNT: Mongolian tugrik – Mongolian official currency

consumed the largest proportion of the budgets at an average of 78.66% over the 2 years. No medicine was classified as Category III medicine in 2017 and 2018.

As shown in Table 3, there were no statistically significant differences between the classes (A, B, C and V, E, N), subcategories and categories (I, II and III) in 2017 and 2018 as p> 0.05 (0.866, 0.997, 0.999, and 0.802).

Table 4 demonstrated the percentages of total expenditure for the Category I medicines. As mentioned by this table, the five medicines: Injection (Inj.) Inosine, Inj. Dobutamine, Tablets (Tab.) Amlodipine, Tab. Bisoprolol, Tab. Losartan were classified as Class A medicines in 2017. Out of these five medicines, the 4: Inj. Inosine, Inj. Dobutamine, Tab. Amlodipine, and Bisoprolol were re-classified as Class A medicines in 2018. Those four medicines collectively accounted for 66.98% and 60.8% of the total expenditures for CVMs in 2017 and 2018, respectively.

Discussion

ABC, VEN, and ABC-VEN matrix analyses are powerful tools to find out the medicines needing strict management control to spend the budget properly. These analyses are recommended by the WHO to be carried out annually in the hospital settings to reveal the medicine use problems.[5]

We analyzed the expenditures for CVMs by pharmacological classes to assess broad problem area in CVMs use. There was the notable difference between the number of and expenditure for the antianginal medicines and it could be correlated with irrational use of them. This finding suggest whether large consumption or high cost of those medicines. As revealed by the further analysis, Inj. Inosine as antianginal medicine, was responsible for the increase in expenditure for this group of medicines, since Inj. Inosine accounted for 37.81% and 41.54% of the total expenditures in 2017 and 2018, respectively [Table 4].

Table 3: ABC, VEN, and ABC-VEN matrix analyses at the Regional Diagnostic and Treatment Center of Khovd Aimag for the year 2017 and 2018

Year	*2017*		*2018*		χ^2 *statistics*	*P value*
Category	*% of total CVMs*	*% of total CVMs expenditure (MNT)*	*% of total CVMs*	*% of total CVMs expenditure (MNT)*		
ABC classification					0.243	0.866
A	23.81	73 (11,806,836)	30.43	71 (11,407,250)		
B	33.33	19 (3,087,700)	30.43	19 (3,026,410)		
C	42.86	8 (1,352,960)	39.14	10 (1,565,700)		
VEN classification					0.005	0.997
V	42.86	25.83 (4,197,008)	43.48	22.37 (3,578,450)		
E	52.38	36.36 (5,907,288)	52.17	36.09 (5,774,410)		
N	4.76	37.81 (6,143,200)	4.35	41.54 (6,646,500)		
ABC-VEN matrix					0.310	0.999
AV	9.52	19.73 (3,205,608)	13.04	15.1 (2,416,250)		
AE	9.52	15.13 (2,458,028)	13.04	14.65 (2,344,500)		
AN	4.76	37.81 (6,143,200)	4.35	41.54 (6,646,500)		
BV	4.76	2.35 (382,500)	4.35	2.48 (396,000)		
CV	28.58	3.75 (608,900)	26.09	4.79 (766,200)		
BE	28.58	16.65 (2,705,200)	26.09	16.44 (2,630,410)		
CE	14.28	4.58 (744,060)	13.04	5 (799,500)		
BN	0	0	0	0 (0)		
CN	0	0	0	0 (0)		
ABC-VEN matrix classification					0.06	0.802
Category I	57.14	78.77 (12,798,236)	60.87	78.56 (12,569,450)		
Category II	42.86	21.23 (3,449,262)	39.13	21.44 (3,429,910)		
Category III	0	0	0	0 (0)		
Total	100	100 (16,247,496)	100	100 (15,999,360)		

CVMs: Cardiovascular medicines, MNT: Mongolian tugrik – Mongolian official currency, ABC: Always, better and control, VEN: Vital, essential and non-essential

Table 4: The percentage of total cardiovascular medicines expenditure for the Category I medicines in 2017 and 2018

2017			*2018*		
Sub category	*Generic name*	*% of total CVMs expenditure*	*Sub category*	*Generic name*	*% of total CVMs expenditure*
AN	Inj. Inosine	37.81	AN	Inj. Inosine	41.54
AV	Inj. Dobutamine	13.54	AE	Tab. Amlodipine	7.43
AE	Tab. Amlodipine	9.44	AV	Inj. Dobutamine	6.88
AV	Tab. Bisoprolol	6.19	AV	Tab. Bisoprolol	4.95
AE	Tab. Losartan	5.69	AE	Inj. Nicardipine	3.85
BV	Inj. Epinephrine	2.35	AE	Tab. Trimetazidine	3.37
CV	Inj. Dopamine	1.02	AV	Inj. Epinephrine	3.28
CV	Tab. Rosuvastatin	0.89	BV	Inj. Dopamine	2.47
CV	Tab. Atenolol	0.83	CV	Tab. Acetylsalicylic acid	1.5
CV	Tab. Acetylsalicylic acid	0.46	CV	Tab. Atenolol	1.37
CV	Inj. Amiodarone	0.34	CV	Tab. Rosuvastatin	1.08
CV	Inj. Digoxin	0.21	CV	Inj. Digoxin	0.36
			CV	Inj. Amiodarone	0.33
			CV	Tab. Digoxin	0.15
	Total	78.77		Total	78.56

CVMs: Cardiovascular medicines

As reported by the ABC analysis, Class A medicines represented 23.81% (2017) and 30.43% (2018) of total CVMs and accounted for the highest percentages (73% in 2017 and 71% in 2018) of total expenditures. These percentages were higher than that of reported in the similar studies conducted in Kenya,[8] India,[14,21] Mongolia,[17] and Ethiopia.[23] The comparison with those studies is shown in Table 5. The differences might be occurred because of the divergences between the study settings and the medicines examined.

Class A medicines require stringent monitoring in terms of rational use, stock status, and shelf life, since they consume the largest part of the total budget. Furthermore, considering alternate those medicines with less costly, yet same therapeutic class medicines could result in saving money.[7,8]

As noted earlier, there were four medicines (Inj. Dobutamine, Tab. Amlodipine, Tab. Bisoprolol, and Inj. Inosine), classified as Class A medicines in 2017 and re-classified as the same Class in 2018 [Table 4]. The likelihood of the consumption of Inj. Dobutamine, Tab. Amlodipine, and Tab. Bisoprolol is high, given these medicines are included in the clinical guidelines for myocardial infarction as well as hypertension.[30,31] Moreover, the Health Indicator of Mongolia declared that the hospital admission due to CVDs was highest in the Western region of the country in 2018.[2]

We checked if there was the possibility of using cheaper alternatives for these three medicines.

According to the "Clinical guideline for Acute myocardial infarction," which is currently used in Mongolia, Inj. Dobutamine is the initial therapy for patients with predominant low cardiac output and is administered for the patients when the systolic blood pressure <90 mmHg and with no sign of shock.[30] Hence, this medicine cannot be substituted. Likewise, Tab. Amlodipine, as a Calcium channel inhibitor and one of the first choice medications for the hypertensive patients, should not be replaced as mentioned in the "Clinical guideline for Hypertension".[31]

As stated in the same guideline, beta-blockers are the second choice drugs and Tab. Atenolol and Tab. Carvedilol are could be the substitutes for Tab. Bisoprolol in Hypertension management.[31] However, Tab. Bisoprolol is also used as an antianginal medicine and included in the clinical guidelines for other CVDs: Ischemic heart disease and Heart failure.[32,33] For this reason, this medicine is not obliged to be interchanged as well.

Based on the scholarly literatures, Inosine might be useful and safe medication for improving outcome after spinal cord injury and in early Parkinson disease.[34-36] However, we could not find the publications, supporting the utilization of Inosine in CVDs. Furthermore, this medicine is not included in the clinical guidelines for CVDs, 21st WHO EML as well as current 8th EML of Mongolia. Accordingly, these facts suggest that the use of Inj. Inosine as a CVM was irrational at the RDTC of Khovd Aimag. Yet, this medicine constituted the considerable portions of total CVMs' expenditures at 37.81% in 2017 and 41.54% in 2018. In this respect, we could say that, if the ABC, VEN, and ABC-VEN matrix analyses were conducted in 2017 and the effort was put on the results of those analyses before the CVMs' purchase of 2018, the hospital would not have purchased Inj. Inosine in 2018. As a result, 6,646,500 MNT (41.54% of total expenditure for CVMs in 2018) could have been saved.

As shown previously, the proportion of Class E medicines was higher (52.38% in 2017 and 52.17% in 2018) than that of Classes V and N medicines. As illustrated in Table 5, Kivoto *et al*.,[8] Pund *et al*.,[21] and Taddele *et al*.[23] reported the comparable results. Conversely, the percentages of Classes V and N medicines were higher than that of Class E medicines in Lkhagvasuren *et al*.[17] and Anand *et al*.[14] studies, respectively. The differences could be due to the various factors including the study settings, the level of health service et cetera.

Classes V and E medicines should always be available at any time, at any health setting due to their clinical significance for the continuity of patient care, especially when the budget for medicines is scarce.[24,25] Therefore, those medicines need topmost management control regarding their availability and should be ordered precedently than Class N medicines, which could be under the minimum managerial control.[9,19,20]

The present study denoted that the Category I (AV, AE, AN, BV, and CV), which requires strict management control constituted 57.14% and 60.87% of total CVMs and consumed the largest proportions of total budgets at 78.77% and 78.56% in 2017 and 2018, respectively. The Category I medicines are costly or vital. The precise effort should be placed on this category medicine. The unavailability of those medicines is unacceptable, thus the safety stock and shelf life of them should always be monitored accurately.[16,18,20]

The Category II (BE, CE, and BN) contained the noticeable parts (42.86% and 39.13%) of total CVMs and constituted 21.23% and 21.44% of total expenditures in 2017 and 2018, respectively. This category medicines require middle level managerial control, though they are indispensable in patient care.[23] The comparison with the previous studies is shown in Table 5.

No medicine used at the RDTC of Khovd Aimag in 2017 and 2018 was classified as Category III (CN), which is known as a low priority level in management control.

Limitations of the Study

Our study setting was the RDTC of the Western region of Mongolia. Therefore, the study findings may not be generalizable to the other RDTCs of the Khangai, Central and East regions of Mongolia due to the difference between the regions regarding morbidity and mortality indicators and et cetera.

Table 5: Comparison with the previous studies (The percentage of the classes)

Category	*Present study*	*Kivoto et al.*[8]	*Anand et al.*[14]	*Lkhagvasuren et al.*[17]	*Pund et al.*[21]	*Taddele et al.*[23]
A	27.12*	13.7*	18.6	17.7*	16.8	15.14*
B	31.88*	16.5*	24	21.8*	21.8	22.47*
C	41*	69.8*	57.4	60.5*	61.4	62.39*
V	43.17*	22.8*	13.2	68.8*	35.3	31.19*
E	52.28*	53.3*	38.8	24.97*	50.4	67.43*
N	4.55*	23.9*	48	6.23*	14.3	1.38*
I	59*	31*	28.68	77*	47.9	39.91*
II	41*	47.7*	41.09	20.9*	43.7	59.17*
III	0	21.3*	30.23	2.1*	8.4	0.92*

*The average numbers in the studies which carried out for more than 2 years

Conclusion

By conducting the ABC-VEN matrix analysis, we revealed irrational use of some medicine which consumed the considerable proportion of the total expenditures but non-essential in CVDs treatment. Therefore, the RDTC of the Western region of Mongolia has to establish the planning and procurement of the CVMs based on the results of the ABC, VEN, and ABC-VEN matrix analyses.

Conflict of Interest

The authors declare no potential conflicts of interest with respect to research, authorship, and/or publication of this article.

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