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ANALYZING THE DRUG FORMULARY USED AT THANH HOA LUNG HOSPITAL IN 2022

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ABSTRACT

Objectives: *To analyze the structure and ABC/VEN classification of the drug formulary used at Thanh Hoa Lung Hospital in 2022, thereby evaluating the rationality of drug use and providing a scientific basis for developing the hospital's formulary in subsequent years.*

Subjects and methods: *A retrospective, cross-sectional descriptive study was conducted on all drug items used at Thanh Hoa Lung Hospital from January 1 to December 31, 2022.*

Results: *The 2022 formulary included 605 drug items with a total value of 23.16 billion VND. Pharmaceutical (chemical) drugs accounted for 96.52% in quantity and 95.50% in value; domestically produced drugs for 63.95% of value; and generic drugs for 90.09% of value. Single-component drugs accounted for 84.46% in quantity and 72.30% in value, while injectable and infusion drugs represented 60.38% of total value. According to the ABC classification, class A drugs accounted for 14.38% of items but 75.06% of value. In the VEN classification, V and E groups accounted for 87.27% of items and 93.08% of value. In the ABC/VEN matrix, group I represented 49.92% of items and 88.97% of value.*

Conclusions: *The hospital's 2022 formulary was generally appropriate to its disease pattern, emphasizing domestic and generic drugs. Continuous monitoring of high-cost, non-essential (AN) and injectable drugs is recommended to ensure rational, safe, and cost-effective drug use.*

Keywords: Drug formulary, ABC/VEN analysis, Thanh Hoa Lung Hospital.

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1. INTRODUCTION

Medicines play an essential role in disease prevention and treatment. Numerous studies have shown that pharmaceutical expenditures account for approximately 20–40% of healthcare budgets and are frequently wasted due to irrational drug use [1]. Inappropriate drug selection and utilization may increase treatment costs while reducing therapeutic efficacy and patient safety. Drug formulary analysis provides an important basis for evaluating the rationality of medication use and supports the Drug and Therapeutics Committee in developing a formulary that is consistent with the hospital's disease patterns and financial capacity.

Thanh Hoa Lung Hospital is a provincial-level Grade I specialized hospital responsible for the management and treatment of respiratory diseases and pulmonary tuberculosis. The number of hospitalized patients has continued to increase, particularly following the COVID-19 pandemic. Therefore, the current status of drug utilization requires comprehensive investigation, analysis, and evaluation to provide a scientific basis for drug selection and formulary development at the hospital.

This study was conducted to analyze the structure, classification, and rationality of the drug formulary used at Thanh Hoa Lung Hospital in 2022, thereby contributing scientific evidence for the development and optimization of the hospital formulary in subsequent years.

2. SUBJECTS AND METHODS

2.1. Subjects

The study subjects included the drug formulary utilized at Thanh Hoa Lung Hospital during the period from January 1, 2022 to December 31, 2022.

2.2. Methods

- Study design: A retrospective, cross-sectional descriptive study.

- Study indicators:

+ Analysis of the drug formulary structure according to: drug category (chemical medicines and herbal/traditional medicines); pharmacological groups; origin and manufacturer country; nomenclature; composition; and route of administration.

+ Analysis of the drug formulary using ABC classification, VEN classification, and the ABC/VEN matrix to evaluate the rationality of drug utilization.

- Data collection method: Data were retrospectively collected from drug utilization reports, records, and relevant documents related to the drug formulary used at Thanh Hoa Lung Hospital in 2022. Collected data included the number of drug items (NODT) and total drug expenditure, among other relevant parameters.

- Evaluation criteria:

+ The correlation between annual drug consumption and expenditure was assessed using ABC analysis in accordance with Circular No. 21/2013/TT-BYT dated August 8, 2013, on Guidelines for the Operation of Drug and Therapeutics Committees [2]: Group A: 10-20% of total drug items accounting for 75-80% of the total drug budget; Group B: 10-20% of total drug items accounting for 15-20% of the total drug budget; Group C: 60-80% of total drug items accounting for 5-10% of the total drug budget.

+ Prioritization for drug procurement and inventory management under limited financial resources was determined using VEN analysis, in which drugs were categorized into three groups [2]: V (Vital drugs): critically essential drugs used for emergency care or indispensable medications required for hospital healthcare services; E (Essential drugs): essential medications for the treatment of diseases within the hospital disease model; N (Non-essential drugs): drugs commonly used for mild or self-limiting conditions.

+ The ABC/VEN matrix was established by integrating ABC and VEN classifications to further evaluate the rationality of drug utilization.

Method	V	E	N	Level of Importance
A	AV	AE	AN	Most critical drugs
B	BV	BE	BN	Important drugs
C	CV	CE	CN	Less important drugs

In the ABC/VEN matrix, Group I (AV, BV, CV, AE, and AN) comprises high-cost and highly essential drugs that should be prioritized in budget allocation to ensure adequate treatment supply. Group II (BE, CE, and BN) includes essential drugs with moderate expenditure, whereas Group III (CN) consists of low-cost drugs with relatively low clinical importance.

- Research basis and evaluation criteria:

+ The study was conducted based on the hospital disease model (ICD-10 classification), hospital treatment guidelines, and the Ministry of Health's Essential Medicines List.

+ Evaluation criteria included comparisons among ABC categories, VEN categories, and the ABC/VEN matrix, as well as comparisons with the hospital disease model and findings from similar studies.

- Data analysis procedure: Data cleaning and removal of outliers; Entry of cleaned data into Excel spreadsheets according to predefined study variables; Data processing using descriptive statistical methods in accordance with the study objectives; Verification and correction of abnormal values, where applicable.

- Data analysis: ABC and VEN classifications were performed according to the guidelines specified in Circular No. 21/2013/TT-BYT [2]. The ABC/VEN matrix analysis was conducted by integrating the two classification methods.

- Data processing: Data were processed using Microsoft Office Excel 2010.

- Ethical considerations: The study protocol was approved by the Ethics Committee of Vietnam Military Medical University and authorized by the Board of Directors of Thanh Hoa Lung Hospital.

3. RESULTS

3.1. Structure of the Drug formulary used at Thanh Hoa Lung Hospital in 2022

Table 1. Structure of the drug formulary according to pharmacological groups

No.	Pharmacological Group	NODT		TPE	
		No	%	Value (VND)	%
I. Chemical Medicines (by Pharmacological Group)		**584**	**96.52**	**22,104,351.880**	**95.50**
1	Antiparasitic and Anti-infective Agents	125	20.66	11,204,260,185	48.38
2	Respiratory System Agents	74	12.23	4,523,688,417	19.53
3	Cardiovascular Agents	63	10.41	511,105,252	2.21
4	Solutions for Fluid, Electrolyte and Acid–Base Balance and Other Parenteral Solutions	58	9.59	1,635,466,698	7.06
5	Hormones and Endocrine System Agents	47	7.77	741,742,054	3.20
6	Gastrointestinal Agents	43	7.11	977,711,381	4.22
7	Anesthetics, Muscle Relaxants, and Reversal Agents	43	7.11	400,240,259	1.73
8	Hematological Agents	24	3.97	976,401,162	4.22
9	Minerals and Vitamins	22	3.64	233,987,601	1.01
10	Analgesics, Antipyretics, Nonsteroidal Anti-inflammatory Drugs (NSAIDs), and Anti-gout and Musculoskeletal Agents	21	3.47	47,604,691	0.21
11	Antiallergic Agents and Drugs Used in Hypersensitivity Reactions	16	2.64	175,303,226	0.76
12	Antipsychotics and Central Nervous System Agents	16	2.64	79,349,160	0.34
13	Antidotes and Drugs Used in Poisoning	15	2.48	294,569,209	1.27
14	Diuretics	5	0.83	10,358,104	0.05
15	Antineoplastic and Immunomodulating Agents	4	0.66	202,750,200	0.88
16	Oxytocics, Postpartum Hemostatics, and Tocolytics	4	0.66	2,525,400	0.01
17	Dialysis Solutions	1	0.17	95,900,000	0.41
18	Diagnostic Agents	1	0.17	1,117,200	0.004
19	Disinfectants and Antiseptics	1	0.17	169,600	0.001
20	Anticonvulsants and Antiepileptic Drugs	1	0.17	2,081	0
II. Herbal Medicines (Based on Traditional Medicine Theory)		**21**	**3.48**	**1.044.051.408**	**4.50**
1	Heat-Clearing, Detoxifying, Rash-Resolving, and Diuretic Herbs	8	1.32	842,894,298	3.64
2	Sedative, Mind-Calming, and Heart-Nourishing Herbs	5	0.83	102,368,866	0.44
3	Herbs for the Treatment of Lung Disorders	3	0.50	32,573,600	0.14
4	Herbs for Disorders of Yin and Blood	2	0.33	7,981,344	0.03
5	Herbs for Disorders of Yang and Qi	2	0.33	983,220	0.004
6	Laxative, Purgative, Digestive-Enhancing, Stomach-Regulating, and Spleen-Tonifying Herbs	1	0.17	57.250.080	0.25
Total		**605**	**100.00**	**23.158.303.288**	**100.00**

TPE: Total pharmaceutical expenditure

The hospital drug formulary in 2022 consisted of 605 medicines classified into two categories: chemical medicines and herbal/traditional medicines. Among these, chemical medicines accounted for the predominant proportion in both the number of drug items and total drug expenditure, representing approximately 95%.

Table 2. Structure of the drug formulary according to origin, source, nomenclature, composition, and route of administration

Criteria		NODT		TPE	
		No	%	Value (VNĐ)	%
By origin and source	Domestically manufactured medicines	367	60.66	14,810,429,253	63.95
	Imported medicines	238	39.34	8,347,874,035	36.05
Total		**605**	**100.00**	**23,158,303,288**	**100.00**
By nomenclature	Originator brand-name medicines	50	8.56	2,192,048,653	9.91
	Generic medicines	534	91.44	19,922,203,227	90.09
Total		**584**	**100.00**	**22,114,251,880**	**100**
By composition	Single-ingredient medicines	511	84.46	16,743,572,364	72.30
	Fixed-dose combination medicines	94	15.54	6,414,730,924	27.70
Total		**605**	**100,00**	**23,158,303,288**	**100.00**
By route of administration	Injectable and infusion routes	293	48.43	13,982,448,707	60.38
	Oral route	264	43.64	5,768,851,336	24.91
	Other routes	48	7.93	3,407,003,245	14.71
Total		**605**	**100.00**	**23,158,303,288**	**100.00**

In 2022, domestically manufactured drugs, generic drugs, and single-ingredient products accounted for the majority of both the NODT and total drug expenditure at the hospital. Regarding classification by route of administration, injectable/infusion drugs and oral drugs showed comparable proportions in terms of the NODT, accounting for 48.43% and 43.64%, respectively. However, the total drug expenditure for injectable and infusion formulations was 2.42-fold higher than that for oral medications.

3.2. Analysis of the Drug Formulary Used at Thanh Hoa Lung Hospital in 2022 According to ABC and VEN Classification

Table 3. Structure of the drug formulary according to ABC analysis

TT	Class	NODT		TPE	
		No	Percentage (%)	Value(VNĐ)	Percentage (%)
1	A	87	14.38	17,381,934,531	75.06
2	B	86	14.21	3,519,044,577	15.19
3	C	432	71.41	2,257,324,180	9.75
Total		**605**	**100.00**	**23,158,303,288**	**100.00**

Group A drugs accounted for only 14.38% of the total NODT; however, they represented the highest proportion of total drug expenditure at 75.06%. In contrast, Group C drugs constituted the largest proportion of drug items (71.41%) but accounted for the lowest proportion of total drug expenditure, at 9.75%.

Table 4. Structure of the drug formulary according to VEN analysis

TT	Class	NODT		TPE	
		No	Percentage (%)	Value (VNĐ)	Percentage (%)
1	V	281	46.45	18,349,156,776	79.23
2	E	247	40.82	3,206,060,900	13.85
3	N	77	12.73	1,603,085,612	6.92
Total		**605**	**100.00**	**23,158,303,288**	**100.00**

The combined V and E groups accounted for 87.27% of the total NODT and 93.08% of the total drug expenditure within the hospital formulary.

The ABC/VEN matrix analysis was performed to identify the relationship between high-cost drugs and their level of therapeutic priority by classifying medicines into three levels: Group I, comprising the most critical drugs (AV, AE, AN, BV, and CV); Group II, consisting of important drugs (BE, BN, and CE); and Group III, including less important drugs (CN).

Table 5. ABC/VEN matrix

Class		NODT		TPE	
		No	Percentage (%)	No	Percentage (%)
A	V	66	75.86	15,126,182,786	87.02
	E	13	14.94	1,191,832,631	6.86
	N	8	9.20	1,063,919,114	6.12
Class		**87**	**100.00**	**17,381,934,531**	**100.00**
B	V	52	60.47	2,084,311,212	59.22
	E	25	29.07	1,071,741,161	30.46
	N	9	10.46	362,992,204	10.32
Class		**86**	**100.00**	**3,519,044,577**	**100.00**
C	V	163	37.73	1,138,662,778	50.44
	E	209	48.38	942,487,108	41.75
	N	60	13.89	176,174,294	7.81
Class		**432**	**100.00**	**2,257,324,180**	**100.00**
Group I: most Important (AV, AN, AE, BV, CV)		302	49.92	20,604,908,521	88.97
Group II: Important (BE, BN, CE)		243	40.17	2,377,220,473	10.27
Group III: Least Important (CN)		60	9.91	176,174,294	0.76
Total		**605**	**100.00**	**23,158,303,288**	**100.00**

AV-group drugs accounted for the largest proportions in both the NODT and total drug expenditure, representing 75.86% and 87.02%, respectively. In contrast, the AN group showed the lowest proportions, accounting for 9.20% of drug items and 6.12% of total drug expenditure.

Table 6. Distribution of Medicines in the AN Subgroup

TT	Medicines	Active ingredients	Value (VNĐ)	%
1	Boganic Forte	Dry extract of Cynara scolymus (Artichoke) EP + Dry extract of Glinus oppositifolius (8:1) + Dry extract of Ipomoea nil	214,900,200	20.19
2	Ad-Liver	Extract of Phyllanthus amarus + Extract of Adenosma caeruleum (Artemisia capillaris is sometimes used if referring to “Nhân trần”) + Extract of Eclipta prostrata	164,420,970	15.45
3	Atiliver (Phyllanthus amarus)	Phyllanthus amarus + Andrographis paniculata + Taraxacum officinale + Eclipta prostrata	140,269,350	13.18
4	Bo gan tieu doc Livsin-94 (Hepatoprotective Supplement)	Phyllanthus amarus + Glycosmis pentaphylla + Eclipta prostrata	136,000,000	12.78
5	Livermarin 140	Silymarin	120,956,640	11.37
6	Singulair® 10 mg (montelukast)	Montelukast (as montelukast sodium)	120,613,366	11.34
7	DHC 10	Dry extract of Phyllanthus amarus (equivalent to 10 g of raw herb) 1000 mg	90,259,200	8.48

TT	Medicines	Active ingredients	Value (VNĐ)	%
8	Chorlatcyn	Dried bile extract 50 mg; Garlic powder 50 mg; Concentrated extract of Cynara scolymus (equivalent to 1000 mg of raw herb) 125 mg; Activated charcoal 25 mg	76,499,388	7.19
Total			**1,063,919,114**	**100.00**

Among the AN-group drugs, there were six herbal/traditional medicines and two chemical medicines. Of these, Boganic Forte accounted for the highest proportion of total drug expenditure (20.19%), followed by Ad-Liver (15.45%) and Atiliver Diệp Hạ Châu (13.18%).

4. DISCUSSION

4.1. Structure of the Drug Formulary

The 2022 drug formulary used at Thanh Hoa Lung Hospital consisted of 605 medicines classified into two categories: chemical medicines and herbal/traditional medicines. The NODT and pharmacological groups of chemical medicines was higher than that reported in studies conducted by Nguyen Thi Thu Hang at Hai Phong Lung Hospital in 2019 (129 drug items and 10 pharmacological groups) [3], Nguyen Thi Nham at Hai Duong Lung Hospital in 2020 (154 drug items and 17 pharmacological groups) [4], and Nguyen Thi Tuyet Nhung at National Lung Hospital in 2017 (397 drug items) [5].

This difference may be attributable to the characteristic disease model of Thanh Hoa Lung Hospital as a respiratory specialty hospital. In 2022, the hospital managed a large number of patients with sequelae and complications related to COVID-19, totaling 9,387 patient visits. The broad and diverse formulary reflects the hospital's efforts to ensure adequate medication availability to meet treatment demands.

Among the 20 pharmacological groups of chemical medicines, antiparasitic and anti-infective agents accounted for the highest proportions in both the NODT and total drug expenditure (20.66% and 48.38%, respectively). This finding is consistent with the hospital's treatment demands, as the disease model includes a high prevalence of pulmonary tuberculosis, pneumonia, and bronchitis caused by various etiologies, including infectious diseases. However, these proportions were lower than those reported in studies conducted at hospitals with similar specialties, including Nguyen Thi Thu Hang at Hai Phong Lung Hospital [3] (58.6% of total drug expenditure) and Nguyen Thi Nham at Hai Duong Lung Hospital [4] (64.3% of total drug expenditure). Despite the specific characteristics of a pulmonary specialty hospital, the large number of anti-infective drug items (125 items) and their substantial expenditure (more than VND 11.2 billion, accounting for 48.38% of total drug expenditure) raise concerns regarding potential antibiotic overuse. Further studies are therefore necessary to identify strategies for reducing both the proportion and expenditure of antibiotics, thereby aligning drug utilization with the hospital's specialty profile and contributing to efforts against antimicrobial resistance.

Domestically manufactured drugs accounted for 60.66% of the total NODT and 63.95% of total drug expenditure. These proportions were higher than those reported by Nguyen Thi Tuyet Nhung at National Lung Hospital in 2017 [5] (26.70% of drug items and 7.62% of total drug expenditure), Nguyen Thi Thu Hang at Hai Phong Lung Hospital in 2019 [3] (53.5% and 10.7%, respectively), and Nguyen Thi Nham at Hai Duong Lung Hospital in 2020 [4] (46.8% and 12.3%, respectively). These findings indicate that Thanh Hoa Lung Hospital has implemented important policies and orientations prioritizing the use of domestically manufactured medicines in accordance with Circular No. 21/2013/TT-BYT issued by the Ministry of Health [2], thereby supporting the national campaign "Vietnamese People Prioritize Vietnamese Medicines" [6].

The use of generic medicines is considered an effective approach to reducing treatment costs. Circular No. 21/2013/TT-BYT of the Ministry of Health [2] recommends prioritizing generic medicines or international nonproprietary name (INN) medicines while limiting the use of brand-name originator drugs. Among 584 chemical medicine items, 534 were generic products, accounting for 91.44% of the total NODT and 90.09% of total drug expenditure. These proportions comply with regulations of the Ministry of Health and Vietnam Social Security applicable to Grade I hospitals under provincial Departments of Health, which stipulate that expenditure on originator brand-name drugs should not exceed 25% of total pharmaceutical expenditure [7]. The findings were comparable to those reported by Nguyen Thi Thu

Hang at Hai Phong Lung Hospital in 2019 (91.5%) [3] and Nguyen Thi Nham at Hai Duong Lung Hospital in 2020 (89.0%) [4], although the proportion of total drug expenditure at the present hospital was higher than that of the comparison hospitals (approximately 85% in both studies). These results demonstrate appropriate implementation of Ministry of Health policies and the program "Vietnamese People Prioritize Vietnamese Medicines." To maintain this proportion in subsequent years, the hospital should prioritize suppliers providing high-quality domestically manufactured generic medicines with proven efficacy. In addition, periodic evaluation of the clinical effectiveness of generic substitutes compared with originator drugs should be conducted to provide scientific evidence for formulary adjustments, thereby reducing treatment costs and optimizing the hospital budget.

The 2022 formulary of Thanh Hoa Lung Hospital prioritized single-ingredient medicines (84.46% of drug items and 72.30% of total drug expenditure) over fixed-dose combination products. However, these proportions were lower than those reported by Nguyen Thi Thu Hang at Hai Phong Lung Hospital in 2019 (90.7% of drug items and 74.9% of total drug expenditure) [3], Nguyen Thi Nham at Hai Duong Lung Hospital in 2020 (90.9% and 90.7%, respectively) [4], and Nguyen Thi Tuyet Nhung at National Lung Hospital in 2017 (94.62% of total drug expenditure) [5]. Although positive progress has been achieved in increasing the proportion of single-ingredient medicines in accordance with Circular No. 21/2013/TT-BYT [2], the hospital should continue implementing measures to reduce the proportion of combination medicines in future formularies. Such measures may include establishing a list of combination medicines requiring periodic cost–benefit evaluation and prioritizing substitution with single-ingredient medicines where appropriate, thereby minimizing the use of unnecessary combination products and reducing treatment costs.

Regarding routes of administration, injectable and infusion medicines accounted for the highest proportions in both the NODT and total drug expenditure (48.43% and 60.38%, respectively). However, these proportions were lower than those reported by Nguyen Thi Thu Hang at Hai Phong Lung Hospital in 2019 [3] (53.5% and 67.7%, respectively) and Nguyen Thi Nham at Hai Duong Lung Hospital in 2020 [4] (61.0% and 78.4%, respectively). These findings indicate certain achievements by the hospital in reducing the use of injectable formulations. The results are consistent with the characteristics of a provincial tertiary pulmonary specialty hospital managing a large number of critically ill and emergency patients. Nevertheless, in subsequent years, the hospital should further evaluate the potential overuse of injectable medicines and promote substitution with oral formulations or other dosage forms whenever clinically appropriate. In addition, specific indications and clinical criteria for injectable medicines should be strengthened to minimize inappropriate use, reduce treatment costs, and limit medication-related risks to patients.

4.2. Drug Formulary Structure According to ABC, VEN, and ABC/VEN Matrix Analysis

According to ABC analysis, the proportions of Groups A, B, and C in the hospital formulary were consistent with recommendations of the Ministry of Health [2] and similar to those reported at Hai Phong Lung Hospital in 2019 [3] and Hai Duong Lung Hospital in 2020 [4].

According to VEN analysis, the combined V and E groups accounted for 87.27% of drug items and 93.08% of total drug expenditure (Group V: 46.46% of drug items and 79.23% of total drug expenditure; Group E: 40.82% and 13.85%, respectively). These findings indicate that the hospital appropriately prioritized the procurement of vital and essential medicines and allocated the majority of its pharmaceutical budget to these categories.

ABC/VEN matrix analysis demonstrated that the most critical drug group accounted for 49.92% of drug items and 88.97% of total drug expenditure. Although the less important drug group represented only 0.76% of total drug expenditure (more than VND 176 million), it still included 60 drug items, accounting for 9.91% of the formulary. Therefore, the hospital should organize annual reviews of less important drugs and consider removing medicines that are infrequently used or no longer clinically appropriate.

The AV group accounted for the highest proportion of total drug expenditure (87.02%), followed by the AE group (6.86%) and the AN group (6.12%). These findings differed from those reported by Dang Tung Quan at Hung Yen Tuberculosis and Lung Disease Hospital in 2021 [8], where the AE group accounted for 71.32% of total drug expenditure, the AV group for 26.16%, and the AN group for 2.52%. Nevertheless, in both studies, the combined AV and AE groups represented more than 90% of total drug expenditure (93.14% and 97.48%, respectively), indicating that these two groups constituted the

major portion of pharmaceutical expenditure. Prioritizing the procurement and storage of medicines within these groups is therefore critically important to ensure adequate healthcare services.

The AN group showed the lowest proportions, accounting for only 9.20% of drug items and 6.12% of total drug expenditure; however, this proportion remains considerable for a potentially removable category. Specifically, the AN group included eight medicines, six of which were herbal/traditional medicines belonging to the categories of heat-clearing, detoxifying, rash-relieving, and diuretic agents. Although the hospital has minimized expenditure on AN-group drugs due to the relatively low unit costs of herbal medicines, their use should continue to be closely monitored and gradually reduced where appropriate. The hospital should evaluate the necessity of these medicines based on clinical criteria, therapeutic effectiveness, and cost considerations, and establish reassessment thresholds. For example, medicines used fewer than 10 times annually and lacking evidence of superior clinical benefit could be proposed for removal from the formulary. Such measures may help ensure adequate treatment while reducing unnecessary healthcare expenditure.

5. CONCLUSIONS

Overall, the 2022 drug formulary of Thanh Hoa Lung Hospital was generally consistent with the hospital's respiratory disease model, with prioritization of domestically manufactured medicines and generic drugs, as well as a high proportion of single-ingredient products.

However, the hospital should strengthen monitoring of antibiotic use; encourage substitution of injectable formulations with oral formulations whenever clinically appropriate; continue prioritizing domestically manufactured and generic medicines in conjunction with periodic evaluations of clinical efficacy and quality; and regularly review the ABC/VEN matrix and update the formulary. These measures, combined with prescriber education and prescription feedback activities, may contribute to safer, more rational, and more cost-effective drug utilization.

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