

ANALYSIS OF THE STRUCTURE OF THE LIST OF ANTIBIOTICS USED IN PHONG DIEN DISTRICT HEALTH CENTER IN 2019

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ABSTRACT

Background: Antibiotics administered incorrectly may result in detrimental consequences, such as prolonging treatment duration, causing adverse effects, or even increasing mortality. Similar to surrounding underprivileged urban medical institutions, the Drug and Therapeutics Committee (DTC) at Phong Dien district's health center (PDHC) is still struggling to attain rationality in keeping track of and evaluating hospital medication formularies. It is commonly believed that these lists directly impact the DTC's decisions on drug selection, distribution, and order for supply, as well as other inventory issues such as assuring quality and minimizing extra expenses. **Objectives:** The research aimed to examine the characteristics of the antibiotics list utilized at PDHC in 2019. **Methods:** From January to December 2019, we investigated 99 different

medicines from 8 different antibiotic families in retrospective research. The acquired data were analyzed statistically using descriptive analysis. **Results:** Foreign medications accounted for 19.3% of pharmaceutical expenditure, whereas domestic medicine accounted for 80.7%. Regarding route of administration, ratios of oral medicines dominated others in quantity and cost (67.67% and 82.73%, respectively). It also revealed that 97.27% of the inventory budget was spent on generic medications compared to under 3% of brand-name ones. Additionally, single-component products (78.79% of items and 71.65% of total expense) were used more often than those with multi-components. β -lactam was the most widely utilized group among the 8 studied groups, which accounted for 72.61% of the monetary allocation. **Conclusion:** The results of this study showed that the use of antibiotics at the center was relatively adequate and followed the principle of drug consumption by the Ministry of Health (MOH) in drug utilization and prescription of antibiotics.

Keywords: structure of the drug list, antibiotics.

I. INTRODUCTION

Nowadays, more and more antibiotics are found, while the use of antibiotics in clinical treatment remains with lots of mistakes and drawbacks. Antibiotic abuse occurs more and more often. All of that led to widespread antibiotic resistance, which has raised a major threat to public healthcare in many countries [1]. Based on the statistical data from European Medicines Agency (EMA), there are approximately 25,000 deaths caused by multidrug-resistant bacterial infections and financial burdens by antibiotic resistance have reached 1.5 billion Euros per year [9] and especially each year in the United States, at least 2 million people become infected with bacteria that are resistant to antibiotics and at least 23,000 people die as a result [10]. For developing countries including Vietnam, an antibiotic is an important group of medicine since infectious diseases are listed among the leading causes of incidence and death [5]. Stable supply as well as safe and effective utilization of antibiotics have a huge influence on the quality of medical examination and treatment service and have become the most concerning issue in public healthcare these days. Also, ensuring prompt and adequate medicine supply as well as the proper use of drugs is the key mission of the Faculty of Pharmacy in each hospital [2], [3]. For this mission, hospital pharmacy should be strengthened, where the application of science and technology innovations into organizing, managing, and implementing is considered an apparent requirement [6]. Located 16 km from the center of Can Tho City, the Phong Dien district health center is a business unit belonging to the Department of Health in Can Tho City. Its infrastructure condition remains with lots of difficulties and a limited number of medicines used in this health center affect the decision on drug selection, distribution and order for drug supply of the Drug and Therapeutics Committee and other inventory problems, such as drug quality and unexpected cost arises. That is the reason why we conducted this research.

II. MATERIALS AND METHODS

2.1. Materials

2.1.1. Study subjects: the list of drugs at Phong Dien district health center in 2019.

2.1.2. Time for research: from 1st January to 31st December 2019.

2.1.3. Research location: Phong Dien district health center, Can Tho city.

2.2. Research methods

2.2.1. Research design: a retrospective cross-sectional study.

2.2.2. Data collection

Annual consumption data and associated expenditures on individual regimens for each year between January and December 2019 were retrieved from the center's electronic health commodities information system and manual records. Invoices were recorded for every purchase and sale transaction of the pharmacy department.

2.2.3. Study contents

We analyzed the structure of the list comprising 99 types of drugs with the information:

- + Origin
- + Dosage form
- + Generic names or brand names.
- + Single or multi-components
- + Classification

2.2.4. Statistical analysis method: The gathered data was interpreted by statistical analysis using Microsoft Excel and SPSS software.

III. RESULTS

3.1. The proportion of antibiotics by origins

Table 1. The proportion of antibiotics by origins

Category	Number of items	Percentage (%)	Cost (VND)	Proportion (%)
Domestic drugs	77	77.78	3,138,776,100	80.70
Foreign drugs	22	22.22	750,713,500	19.30
Total	99	100.00	3,889,489,600	100.00

During establishing the drug list, the center prioritized domestic drugs; therefore, domestic drugs prevailed over foreign ones with a proportion of 77.78% for items and 80.7% for the total cost.

3.2. The proportion of antibiotics by dosage forms

Table 2. The proportion of antibiotics by dosage forms

Category	Number of items	Percentage (%)	Cost (VND)	Proportion (%)
Oral	66	67.67	3,217,710,000	82.73
Injection	18	18.18	536,952,000	13.81
Others	15	15.15	134,827,600	3.46
Total	99	100.00	3,889,489,600	100.00

The number of oral medications made up a significant proportion in quantity and cost (67.67% in quantity; 82.73% in cost). Injection medications took second place and accounted for 18.18% of the items and 13.82% of the cost. The lowest proportion belonged to other dosage forms, including topical medications, eye drops, etc., which only accounted for 15.15% of the quantity and a rather low cost of 3.46%. The above data showed that the medical staff at this center prioritizes oral medications.

3.3. The proportion of antibiotics by generic names and brand names

Table 3. The proportion of antibiotics by generic names and brand names

Category	Number of items	Percentage (%)	Cost (VND)	Proportion (%)
Brandnames	3	3.03	106,048,000	2.73

Category	Number of items	Percentage (%)	Cost (VND)	Proportion (%)
Generic names	96	96.97	3,783,441,600	97.27
Total	99	100.00	3,889,489,600	100.00

The data showed that generic antibiotics covered a high percentage in quantity (96.97%) and cost (97.27%). Brandname antibiotics mostly focused on the combination of Amoxicillin substances and Clavulanic acid or Sulbactam, only made up 3.03% of quantity and 2.73% of the cost. This highlighted an effort to contain healthcare escalation, even cutting down treatment spending, by prescribing generic medicines. Generally, generic ones can be biologically equivalent but much more affordable than pricey brand-name products.

3.4. The proportion of antibiotics by single-component and multi-component

Table 4. The proportion of antibiotics by single-component and multi-component

Category	Number of items	Proportion (%)	Cost (VND)	Proportion (%)
Single-component drugs	78	78.79	2,786,913,600	71.65
Multi-component drugs	21	21.21	1,102,576,000	28.35
Total	99	100.00	3,889,489,600	100.00

In the drug list of Phong Dien district health center, single-component medicines accounted for a large proportion in quantity and cost (78.79% for quantity and 71.65% for cost). In contrast, multi-component medicines only accounted for a small proportion, most of which are combined antibiotics which formula had been standardized and proven of outstanding effectiveness, e.g., amoxicillin and clavulanic acid.

3.5. The classification of antibiotics

Table 5. The classification of antibiotics

Group of antibiotic	Number of API*	Number of brand names and generic names	Quantity	Cost (VND)	Cost ratio (%)
β-lactam	16	53	1,529,800	2,824,157,000	72.61
Nitroimidazole	2	8	126,500	109,710,000	2.82
Quinolone	4	13	224,500	235,224,600	6.05
Aminoglycoside	3	7	21,700	75,938,000	1.95
Macrolide	5	14	390,500	605,755,000	15.57
Phenicol	1	1	1,000	2,205,000	0.06
Lincosamide	1	1	20,000	24,000,000	0.62
Sulfamide	2	2	40,000	12,500,000	0.32
Total	34	99	2,354,000	3,889,489,600	100.00

(*API: Active Pharma Ingredient)

Based on the data in the drug list shared by the center, the total cost of all drugs was 19,959,033,399 VND and the total cost of antibiotics was 3,889,489,600 VND, which accounted for 19.49% of the total cost of all drugs used in the center. All groups of antibiotics were used, in which the β-lactam group, leading in the numbers of the brand names drugs and the prescribed quantity, made up the largest proportion in cost (72.61%). Nitroimidazole, Quinolone, Aminoglycoside, and Macrolide were distributed in much smaller quantities as well as proportions compared to the β-lactam group. Other groups, including Phenicol, Lincosamide, and Sulfamide, with quite small quantities, only covered

the lowest proportions. The lowest proportion went to the Phenicol group, at only 0.06% of the cost, with only one API and one brand name.

IV. DISCUSSION

4.1. The proportion of antibiotics by origins

Giving priority to domestic drugs is one of MOH's principles in drug utilization in healthcare centers [4]. Specifically, it can be seen from the statistical data in Phong Dien district health center that the major proportion belonged to domestic drugs, 80.70% for cost and 77.78% for items, in compliance with the principles of MOH. The use of domestic drugs not only helps reduce treatment costs but also promotes domestic pharmaceutical industries.

4.2. The proportion of antibiotics by dosage forms

There was a variety range of dosage forms of antibiotics used in the center, e.g., oral medications, injections, eye drops, topical medications, etc., in which oral medications contributed the highest proportion in both quantity and cost: 67.67% for quantity and 82.73% for cost. Injections took second place and accounted for 18.18% of items and 13.81% of the cost. Other dosage forms only shared relatively small proportions in cost ratio, at 3.46%. Oral administration has numerous advantages, e.g., user-friendlier, less expensive, and safer than injection administration [1]. This drug list structure is relatively adaptable to the small to a medium-sized pattern of diseases in Phong Dien District Health Center.

4.3. The proportion of antibiotics by generic names and brand names

In accordance with Circular 21/2013/TT-BYT by MOH, generic names or those drugs under the international nonproprietary name (INN) should be the number one priority, and the use of brand-name drugs or those drugs originating from a specific manufacturer should be limited [4]. In comparison with brand-name drugs, at a more reasonable price, generic drugs are commonly recommended in treatment to reduce cost. In fact, most hospitals now demand a higher priority for generic medicines, except for some specific drugs imported from developed countries.

Based on the obtained data, most of the drugs used in Phong Dien District Health Center in 2019 belonged to the generic group, accounting for 96.97% of the quantity and 97.27% of the total cost. This result is relatively similar to other studies in several hospitals, e.g., in Binh Duong General Hospital in 2015, generic drugs made up 95.7% of quantity and 88.9% of cost [8], in Ba Ria General Hospital in 2015, and drug names made up of 82.1% for quantity and 73.54% for cost [7]. The frequent use of generic drugs have helped cut down on treatment cost for patients and the national public healthcare budget.

4.4. The proportion of antibiotics by single-component and multi-component

Most of the antibiotics used in Phong Dien District Health Center in 2019 were single-component drugs, accounting for a great proportion in quantity (77.78%) and cost (80.7%). Hence, the hospital complied with the MOH principle in giving single-component drugs a priority [4]. Multi-component drugs comprise only a smaller percentage, 19.3% for cost and 22.22% for items. All the combined drugs or APIs in combined drugs belonged to the primary drug list used in health centers within the scope of social health insurance coverage; the cost for drugs is assumed to be paid by the social health insurance budget.

4.5. The proportion of antibiotics by API groups

Nevertheless, it can be obtained from the analytical data that all the groups of antibiotics were used, in which β -lactams took the first place in the number of brand-name drugs and a number of drugs prescribed, which accounted for the largest cost percentage (72.61%).

The second place in the cost ratio went to Macrolide antibiotics (15.57%), in which Spiramycin is the most commonly used in oral administration. Since this antibiotic showed high efficacy against intracellular bacteria, it is often prescribed in some bacterial infections, e.g., pharyngitis, mouth infection, acute sinusitis, etc.

Ranking after β -lactam and Macrolide antibiotics, Quinolone antibiotics accounted for 6.05% of the cost, and Ciprofloxacin is a typical example. This is a wide active spectrum on both Gram-positive and Gram-negative bacteria; however, inadequate use of this antibiotic may lead to the development of antibiotic-resistant bacteria. As a result, monotherapy takes precedence over adjuvant therapy in the battle against antibiotic resistance.

The prescribed quantity of Nitroimidazole and Aminoglycoside antibiotics was small and only distributed a much lower proportion of the cost. Other groups, namely Phenicol, Lincosamide, and Sulfamide, with a limited number of brand names and small prescribed quantities, possessed a quite low-cost ratio. There was only one API and one brand name of Phenicol antibiotic, which only accounted for 0.06% of the total cost. The fact that Tetracycline antibiotics were not present in the drug list might have resulted from the pattern of diseases in Phong Dien District Health Center, where most of the infectious bacteria had developed resistance to this antibiotic group. Besides, Carbapenem antibiotics were not included in the drug list of this health center because this group is mainly used in serious cases, and most of these cases would be transferred to higher-level hospitals.

V. CONCLUSIONS

In this study, we successfully analyzed the list of antibiotics used in Phong Dien District Health Center. β -lactam was the most popular group. Domestic drugs have a higher priority than foreign drugs. Oral medications and generic medicines were the first choice. Single-component drugs were prescribed at a much higher frequency compared to multi-component drugs. This study showed that the use of antibiotics at the center was relatively adequate and followed the principle of drug consumption by the Ministry of Health (MOH) in drug utilization and prescription of antibiotics.

REFERENCES

1. Anh Dat Nguyen (2016), *A guideline on empirical antibiotic treatment*, Science and Technology Publishing House, Hanoi.
2. Ministry of Health (2001), *Hospital Pharmacy*, Medical Publishing House, Hanoi.
3. Ministry of Health (2007), *Treating Affairs, Assessment of medical examination and treatment service in 2007*, Conference on review of medical treatment service in 2006 and implementation of action scheme for 2007, Hanoi.
4. Ministry of Health (2013), *Circular 21/2013/TT-BYT dated August 8th 2013, Prescribing organization and operation of the drug and treatment council in hospitals*, Hanoi.
5. Ministry of Health (2015), *Promulgated with the Decision No. 708/QĐ-BYT dated March 2nd 2015, Guideline on antibiotic therapy*, Hanoi.

6. Cuong Quoc Truong (2008), *Strengthening the governmental management in Pharmacy in the context of regional and international integration*, Report in the specialty conference.
7. Hoang Nguyen Truong Thi Minh (2015), Analysis of the structure of the drug list in Ba Ria General Hospital – Ba Ria Province in 2015, *Postgraduate education junior thesis*, Hanoi University of Pharmacy.
8. Yen Hai Nguyen (2015), Analysis of the structure of the drug list in Binh Duong General Hospital in 2015, *Postgraduate education junior thesis*, Hanoi University of Pharmacy.
9. Agency European Medicines (2017), *Antimicrobial resistance*, Retrieved, 20/8/2017 from:http://www.ema.europa.eu/ema/index.jsp?curl=pages/special_topics/general/general_content_000439.jsp&mid=WC0b01ac0580a7815d; 2017.
10. Marilyn Bulloch (2016), *Latest Advancements in Antimicrobial Therapy*, www.pharmacytimes.com.

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