

HEALTHCARE. PLEURISY: CLINICAL AND DIAGNOSTIC GUIDELINES, TREATMENT TACTICS, LEGAL PRINCIPLES

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Introduction

Pleurisy is a significant clinical problem, accompanied by an increase in the duration of hospitalization, the need for invasive interventions and the risk of complications. Pleural infections are associated with increased mortality and a significant resource burden on hospitals [1,2].

In the USA, approximately 1.5 million pleural diseases are recorded annually. In 2016 alone, 361,270 hospitalizations with pleural conditions were recorded, which amounted to approximately \$10.1 billion in direct costs. The frequency of hospitalizations with empyema increased from 3.04 to 5.98 per 100 thousand population between 1996–2008 [3-5].

In Ukraine, nationwide registries are limited. However, according to individual clinical series in 2024–2025, large centers report tens to hundreds of cases of acute empyema. For example, a single-center surgical study in 2024 included 107 patients with destructive processes of the lungs and pleura, illustrating the significant clinical burden in large hospitals. During COVID-19, the proportion of empyema in critically ill patients could reach 7.3% [6].

Clinical and diagnostic guidelines for the treatment of pleurisy are based on evidence-based principles. Current evidence-based guidelines for the diagnosis and management of the most common pleural conditions include ultrasound diagnostics, computed tomography, staged treatment tactics, surgical consultations, and pharmacotherapy [7].

The role of interdisciplinary consensus of pulmonologists, thoracic surgeons, and clinical pharmacologists regarding pleurisy in adults is emphasized in Bedawi E., Ricciardi S., Hassan M. et al. Small-caliber drainage under visualization control as an appropriate primary intervention in most cases, avoiding delays [8].

About clinical and diagnostic landmarks of pleurisy when combining invasive intervention methods, improving drainage, reducing the frequency of referrals for surgery, reducing hospitalization is given in Rahman N., Maskell N., West A. et al. [9].

Retrospective analysis of pleural diseases, pleurisy with the formulation of criteria was started as early as 1972 by Light R.W. et al. [10].

However, today the historical study of 1972 does not consider modern scenarios of pleurisy treatment tactics.

Therefore, detailed modern warnings should be taken from newer guidelines and studies [7, 11-15].

Along with clinical and diagnostic guidelines, organizational solutions that ensure continuity of treatment and avoid unjustified drug prescriptions are important in medical practice. To support clinical decisions, an organizational and resource tool based on the ABC/VED analysis method is used [16-29].

The treatment tactics of pleurisy involves the prescription of antibacterial drugs. Given the high cost of some antibacterial drugs and their impact on patients, effective management of drug supplies in healthcare institutions requires a systematic approach. Among drugs with antibacterial action in the treatment of pleurisy, antibiotics occupy a leading place, which provide etiologic control of infection and proven clinical efficacy. Antibiotics are most often used for systemic therapy, since they have predictable pharmacokinetics, a spectrum of activity, and an evidence base for reducing complications and mortality. Other agents (antiseptics, disinfectants, bacteriophages) are used in limited or specific indications. Clinical effectiveness in the treatment of pleurisy allows you to optimize the choice of antibiotics, ensure economic feasibility and justify the organizational and resource component using the ABC/VED analysis method.

The purpose of the study was to summarize clinical and diagnostic guidelines in the treatment of pleurisy. To use an organizational and resource tool to support treatment tactics for pleurisy using the ABC/VED analysis method. To analyze the structure of costs for pharmacotherapy and identify critically necessary items for the continuity of pleurisy treatment. To develop a priority matrix for antibiotic stock management through ABC/VED analysis (allocation of drugs with the greatest contribution to costs and criticality), continuity of procurement, supply and pharmaceutical support considering treatment tactics. To form legal aspects of diagnosis and treatment of pleurisy.

Materials and methods

For the study, data on annual consumption and costs of antibiotics active against intracellular microorganisms were collected in the period 2020–2025.

Clinical and diagnostic guidelines for pleurisy were performed using a complete clinical examination using ultrasound of the pleural cavity, chest radiography, computed tomography, thoracoscopy, videothoracoscopy according to indications.

To perform the VED analysis of antibiotics, a multidisciplinary expert commission was involved, which conducted a questionnaire to determine the priority of drugs in the pharmacotherapy of pleurisy. The commission included doctors of various specialties who have practical experience in the management of patients with pleurisy and the prescription of antibacterial drugs. Additionally, a regulatory analysis was carried out based on the inclusion of relevant drugs in the Protocols for the treatment of intracellular infections, the State Formulary of Medicines, and the National List of Essential Medicines [30-32].

The organizational and resource tool for supporting treatment tactics for pleurisy using the ABC/VED method included ABC analysis and VED

analysis. The ABC analysis method is based on the classification of antibiotics by cost. Category A drugs account for about 70% of the total cost of consumption, category B - about 20%, and category C - only 10%. However, this approach has certain limitations, since it is based solely on financial indicators and does not consider the criticality of continuity of supply, purchases and pharmaceutical support considering treatment tactics.

To overcome this drawback, VED analysis was used, which classifies drugs by their degree of importance: vital, essential, and desirable. The loss of vital drugs can critically affect the effectiveness of medical care, while the shortage of desirable drugs will not lead to significant complications in the work of the institution.

The combination of ABC and VED analyses (ABC-VED matrix) allows to determine priority groups of antibiotics for control and rational use. The ABC-VED methodology contributes to the continuity of purchases, supply, pharmaceutical provision, and to increasing the effectiveness of treatment tactics for pleurisy.

ABC-analysis

Annual costs for individual drugs were arranged in descending order. The total cost of all drugs was calculated, as well as their percentage contribution to total costs. The resulting list was divided into three categories:

- Category A – antibiotics that account for approximately 70% of the total cost of consumption;
- Category B – drugs that account for about 20% of costs;
- Category C – antibiotics with the lowest cost (about 10%).

VED-analysis

The assessment of the criticality of antibiotics was carried out by classifying drugs into three groups: vital (V), necessary (E), and desirable (D). To determine the criticality of antibiotics, the following was conducted:

- a survey of doctors involved in the pharmacotherapy of patients with intracellular infections;
- a normative analysis based on their inclusion in the Protocols for the treatment of intracellular infections, the State Formulary of Medicines and the National List of Essential Medicines.

Group V includes drugs that are critically important for the treatment of patients and must be available at any time. Group E includes drugs whose absence in a short period will not lead to serious complications. Group D includes antibiotics with the least criticality, the absence of which will not have a significant impact on the treatment process. The final distribution of antibiotics by VED categories was discussed by an expert group consisting of physicians, pulmonologists, surgeons, pediatricians, and clinical pharmacists.

ABC-VED matrix analysis

For a comprehensive assessment, cross-analyzing ABC and VED formed an ABC-VED matrix. The resulting combinations allowed us to distinguish three categories:

- Category I – vital and expensive antibiotics (AV, AE, AD, BV, CV);
- Category II – other critically needed drugs of average cost (BE, CE, BD);

- Category III – desirable and less expensive antibiotics (CD).

In this classification, the first letter indicates the category according to ABC analysis, and the second – according to VED analysis. The results obtained allow us to determine the priority groups of antibiotics for controlling their consumption and procurement in medical institutions.

The obtained data were systematized and entered to Microsoft Excel spreadsheet. Statistical analysis was carried out using the built-in statistical functions of Microsoft Excel.

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Results

In clinical practice of pleurisy, there is often a need to quickly determine where antibiotics are mandatory (bacterial pleurisy, empyema), and where pharmacotherapy with a minimal role of antibiotics is leading. Clinical diagnostic guidelines and treatment tactics in this context mean avoiding unjustified prescription, choosing antibiotics with the best benefit-risk-cost ratio, and ensuring continuous access to priority positions through ABC/VED analysis.

Clinical diagnostic guidelines of pleurisy

Intracellular microorganisms are pathogens of a wide range of infectious diseases, which complicates their diagnosis and treatment. Intracellular microorganisms can be involved in the formation of pleurisy, mainly as a complication of "atypical" pneumonia or systemic infections. A feature of these pathogens is the ability to

survive and multiply inside the cells of the macroorganism, which significantly reduces the effectiveness of many traditional antibacterial drugs.

Intracellular (atypical) pathogens of pleurisy: Legionella, Chlamydophila, Coxiella, Brucella

Legionella pneumophila is a common "atypical" cause of pneumonia with exudative, usually small pleural effusion. Diagnosis is based on antigen in urine Polymerase Chain Reaction (PCR) from respiratory material. Requires antibiotics with good intracellular activity (macrolides, fluoroquinolones). When pleurisy complicates to empyema, there is a need to combine with drainage.

Chlamydophila (Chlamydia) pneumoniae - can cause small exudative effusions in pneumonia. Diagnosis

is mainly Polymerase Chain Reaction (PCR). Treatment: doxycycline, macrolides. Constant monitoring of clinical dynamics and volume of effusion.

Coxiella burnetii (tick-borne "Q-fever" infection) is a rare but described cause of pleurisy. Especially against the background of atypical pneumonia or myocarditis. Diagnosis: serology (phase antibodies). Treatment tactics - usually doxycycline. In chronic forms - other schemes according to infection protocols.

Brucella - a rare cause of pleurisy. Diagnosis - serological. Treatment tactics - schemes with doxycycline in combinations.

The clinical and diagnostic landmarks of pleurisy are given in Fig. 1.



Note * Light's criteria (three laboratory signs from pleural fluid and blood that help distinguish exudate (inflammatory, infectious, e.g., pleurisy, empyema) from transudate (due to "breakdown" of fluid metabolism, e.g., heart failure); ** criteria for immediate drainage (pus, pH < 7.20, respiratory failure).

Fig. 1. Clinical and diagnostic guidelines for pleurisy

Gautam J. et al. emphasize that in Chlamydia pneumoniae infections (an intracellular pathogen), pleural effusions are a common concomitant manifestation, with

typical diagnostic difficulties. Treatment involves drugs with intracellular activity (doxycycline, macrolides) [27]. For pleurisy, this has clinically important consequences: diagnostic tests for common extracellular bacteria are often insensitive (pleural fluid culture may be negative), and empirical antibacterial therapy must consider the penetration of the antibiotic into host cells. Rello J. et al. describes the intracellular nature of Legionella, diagnostic approaches, and recommendations for antibiotics with proven intracellular permeability (macrolides, fluoroquinolones) [26].

Treatment tactics for pleurisy

Antibiotic therapy for pleurisy is combined with adequate drainage of the infected pleural cavity. The duration of treatment is usually 2-4 weeks. Switching from parenteral to oral forms of antibiotics is possible after clinical stabilization and a decrease in inflammation.

Principles of antimicrobial stewardship – minimizing unnecessary prescriptions, shorter effective courses, reliance on culture, and de-escalation are integrated into the management algorithm. Therefore, the choice antibiotic therapy requires considering not only the spectrum of action of the drug, but also its ability to penetrate cells and create therapeutic concentrations there.

The group of antibiotics in the treatment of pleurisy includes drugs of various clinical and

pharmacological groups (table 1). Erythromycin (macrolides), doxycycline (tetracyclines), benzylpenicillin (β -lactam antibiotics) and cephalexin (first-generation cephalosporins). Their effectiveness is due to the ability to penetrate target cells and affect intracellular pathogens, such as Chlamydia species *pluralis*, *Legionella species pluralis*, and others.

Organizational and resource support for clinical decisions (ABC/VED methodology)

For further ABC and VED analysis, the following clinical and pharmacological groups of antibiotics were considered (table 1):

- Macrolides: erythromycin, spiramycin;
- Tetracyclines: doxycycline;
- Beta-lactam antibiotics: penicillin G (benzylpenicillin);
- First-generation cephalosporins: cephalexin.

The distribution of these antibiotics by ABC and VED categories allowed us to determine their economic significance and clinical importance, which is the basis for inventory management, continuity of supply, and procurement in healthcare institutions.

Table 1 below shows the characteristics of the studied antibiotics, including dosage form, composition, manufacturer, and registration certificate.

Table 1. Clinical and pharmacological groups of antibiotics for the treatment of pleurisy.

No.	Name	Dosage form	Composition	Manufacturer	Registration certificate
Macrolides: erythromycin, spiramycin					
1.	Erythromycin (Borshchahivsky CPP)	pills	100 mg	Public Joint Stock Company "Scientific and Production Center "Borshchagov Chemical and Pharmaceutical Plant", Ukraine	UA/3701/01/01 unlimited from 13.05.2020
2.	Zinerit	powder	40 mg/ml	LEO Pharma A/S, Denmark	UA/4359/01/01 unlimited from 17.01.2017
3.	Erythromycin (Vitamins JSC)	pills	100 mg	VITAMINS JSC, Ukraine	UA/8709/01/01 unlimited from 15.06.2018
4.	Doramycine	pills	3 000 000 IU	WORLD MEDICINE ILAC SAN. VE TIG. A.Sh., Turkey	UA/14899/01/01 unlimited from 26.01.2021
5.	Spiracin 3 000 000 IU	pills	3 000 000 IU	Simpex Pharma Pvt. Ltd., India	UA/17331/01/02 04.04.2019 04.04.2025
6.	Spiracin 1 500 000 IU	pills	1 500 000 IU	Simpex Pharma Pvt. Ltd., India	UA/17331/01/01 04.04.2019 04.04.2025
7.	Rovamycin 1 500 000 IU	pills	1 500 000 IU	SANOFI S.R.L., Italy	UA/6053/01/01 unlimited from 03.02.2021
8.	Rovamycin 3 000 000 IU	pills	3 000 000 IU	SANOFI S.R.L., Italy	UA/6053/01/02 unlimited from 03.02.2021
Tetracyclines: doxycycline					
9.	Doxycycline-Darnitsa	capsules	100 mg	PrJSC "Pharmaceutical Firm "Darnitsa", Ukraine	UA/8028/01/01 unlimited from 03.01.2018

No.	Name	Dosage form	Composition	Manufacturer	Registration certificate
10.	Doxycycline hydrochloride	capsules	100 mg	Limited Liability Company "Kharkiv Pharmaceutical Enterprise "Health of the People", Ukraine; Limited Liability Company "PHARMEX GROUP", Ukraine; Limited Liability Company "Pharmaceutical Company "Health", Ukraine	UA/1307/01/01 unlimited from 03.04.2019
11.	Doxycycline-Teva	tablets	100 mg	Merkle GmbH, Germany	UA/3033/02/01 unlimited from 28.04.2021
12.	Unidox Solutab	tablets	100 mg	Astellas Pharma Europe B.V., Netherlands	UA/4694/01/01 unlimited from 29.07.2022
13.	Doxycycline	capsules	100 mg	Public Joint Stock Company "Research and Production Center "Borshchagov Chemical and Pharmaceutical Plant", Ukraine	UA/3292/01/01 unlimited from 17.12.2019
Beta-lactam antibiotics: penicillin G (benzylpenicillin)					
14.	Benzylpenicillin 1 000 000 IU	powder for solution for injection	1 000 000 IU	PJSC "Kyivmedpreparat", Ukraine	UA/3791/01/02 unlimited from 21.04.2015
15.	Benzylpenicillin 500 000 IU	powder for solution for injection	500 000 IU	PJSC "Kyivmedpreparat", Ukraine	UA/3791/01/01 unlimited from 25.02.2020
16.	Penicillin G sodium salt Sandoz	powder for solution for injection	1 000 000 IU	Sandoz GmbH-TechOps, Austria	UA/3977/01/01 unlimited from 17.01.2017
17.	Bicillin-3	powder for suspension for injection	600 000 IU	PJSC "Kyivmedpreparat", Ukraine	UA/3883/01/01 unlimited from 19.08.2015
18.	Bicillin-5	powder for suspension for injection	1 500 000 IU	PJSC "Kyivmedpreparat", Ukraine	UA/3883/01/02 unlimited from 01.09.2015
First-generation cephalosporins: cephalexin					
19.	Cephalexin Alkaloid	powder for oral suspension	250 mg	ALKALOID AD Skopje, Republic of North Macedonia	UA/0264/01/01 unlimited from 16.01.2021
20.	Cephalexin suspension	granules for oral suspension	250 mg	"Hemofarm" AD, Serbia; Hemomont d.o.o., Montenegro	UA/7888/01/01 unlimited from 22.02.2019
21.	Cephalexin capsules	capsules	250 mg	Public Joint Stock Company "Scientific and Production Center "Borshchagov Chemical and Pharmaceutical Plant", Ukraine	UA/6034/01/01 unlimited from 13.05.2017

Table 1 contains information on antibiotics, divided into clinical and pharmacological groups. Includes 21 drugs belonging to four main clinical and pharmacological groups:

1. Macrolides (erythromycin, spiramycin) – 8 drugs available in the form of tablets and powders for the preparation of a solution for external use.

2. Tetracyclines (doxycycline) – 5 drugs in the form of capsules and tablets.

3. Beta-lactam antibiotics (penicillin G, benzylpenicillin) – 5 drugs in the form of powders for the preparation of a solution for injection.

4. First-generation cephalosporins (cephalexin) – 3 drugs in the form of powders for suspension and capsules.

For each drug, its trade name, dosage form, composition of the active substance, manufacturer and registration certificate in Ukraine are indicated. All drugs have valid licenses and registrations, confirming their availability for medical use.

The cost structure, priority of pharmaceutical provision and use in medical institutions according to clinical scenarios are the basis for further analysis and distribution of antibiotics according to ABC-VED categories.

In this article, the analysis of costs and criticality of drugs is considered as an auxiliary management tool that ensures the implementation of clinical algorithms for the treatment of pleurisy. It does not replace the clinic, but strengthens it: it identifies groups of continuity of supply, reduces the risks of treatment delays, and supports a reasonable choice of drug in situations of shortage.

ABC analysis

Table 2 presents the distribution of antibiotics by ABC categories based on their cost and share in total costs. Antibiotics are divided into three categories depending on their share in total costs for medicines:

Table 2. ABC analysis of antibiotics for the treatment of pleurisy.

No.	Name of the medicinal product	Dosage form	Cost, UAH	Specific gravity (%)	Category ABC
1.	Doramycine	pills	297,72	12,21	A
2.	Rovamycin 3 000 000 IU	pills	288,37	11,83	A
3.	Unidox Solutab	tablets	255,60	10,49	A
4.	Spiracin 3 000 000 IU	pills	240,90	9,88	A
5.	Zinerit	powder	150,00	6,15	A
6.	Bicillin-5	powder for suspension for injection	137,90	5,66	A
7.	Cephalexin Alkaloid	powder for oral suspension	124,40	5,10	A
8.	Rovamycin 1 500 000 IU	pills	122,85	5,04	A
9.	Doxycycline-Teva	tablets	120,90	4,96	A
Total by category A			1738,64	71,33	
10.	Spiracin 1 500 000 IU	pills	120,80	4,96	B
11.	Cephalexin suspension	granules for oral suspension	120,30	4,94	B
12.	Bicillin-3	powder for suspension for injection	108,00	4,43	B
13.	Cephalexin capsules	capsules	100,50	4,12	B
Total by category B			449,6	18,44	
Total by categories AB:			2188,24	89,77	
14.	Erythromycin (Borshchahivsky CPP)	pills	65,00	2,67	C
15.	Doxycycline-Darnitsa	capsules	48,30	1,98	C
16.	Erythromycin (Vitamins JSC)	pills	38,90	1,60	C
17.	Doxycycline	capsules	30,16	1,24	C
18.	Penicillin G sodium salt Sandoz	powder for solution for injection	22,90	0,94	C
19.	Doxycycline hydrochloride	capsules	21,85	0,90	C
20.	Benzylpenicillin 1 000 000 IU	powder for solution for injection	13,85	0,57	C
21.	Benzylpenicillin 500 000 IU	powder for solution for injection	8,40	0,34	C
Total by category C:			249,36	10,23	
Total by categories ABC:			2437,6	100,00	

Table 2 contains information about drugs divided into three categories (A, B, C) depending on their cost and share in total expenditures. Here is the analysis of the data by categories:

1. Category A (highest expenditures):

- Category A includes drugs that make up 70% of the total cost of consumption. These are the most expensive antibiotics.

- Category B covers drugs that account for 20% of costs.

- Category C includes drugs with the lowest specific weight, up to 10% of the total cost.

This classification allows a clear assessment of the impact of each group of antibiotics on total costs and simplifies the analysis of drug costs.

- This category includes the most expensive drugs, accounting for 71.33% of total expenditures (1 738.64 UAH).

- Category A drugs include such medications as Doramycine (297.72 UAH), Rovamycin 3 000 000 IU (288.37 UAH), Unidox Solutab (255.60 UAH), Spiracin 3 000 000 IU (240.90 UAH), and others.

- These drugs have high costs and are widely used, which determines their high share in total expenditures.

2. *Category B (medium expenditures):*

- Drugs in this category account for 18.44% of total expenditures (449.6 UAH).
- They are slightly cheaper than Category A drugs but still play a significant role in treatment. Examples in this group include Spiracin 1 500 000 IU (120.80 UAH) and Cephalexin suspension (120.30 UAH).

3. *Category C (lowest expenditures):*

- Drugs in this category account for only 10.23% of total expenditures (249.36 UAH).
- These are the least expensive medications. For example, Erythromycin (Borshchahivsky CPP) (65.00 UAH), Doxycycline-Darnitsa (48.30 UAH), and Erythromycin (Vitamins JSC) (38.90 UAH).
- These drugs are less costly, making them more accessible, but they have the smallest share in total expenditures.

The total cost of all antibiotics is 2 437.60 UAH, which includes expenditures on drugs from all three categories (A, B, C).

VED analysis

For further research and VED analysis of antibiotics, a multidisciplinary committee was surveyed to determine the priority of drugs for pharmacotherapy. This survey included doctors of various specialties who have experience in the treatment of pleurisy and the prescription of antibiotics. Normative analysis data were also used based on their inclusion in the treatment protocols for intracellular infections, the State Formulary of Medicines, and the National List of Essential Medicines. According to the survey results, doctors classified antibiotics into VED categories:

- V (Vital) – drugs that are critically important for therapy and are used in severe or potentially life-threatening conditions;
- E (Essential) – drugs that are used to treat most diseases, but are not mandatory for the treatment of every case;
- D (Desirable) – drugs that are rarely used and are less important compared to other drugs.

The data obtained because of this analysis are the basis for prioritizing the use of antibiotics in practice and optimizing pharmacotherapy (table 3)

Table 3. VED- analysis of antibiotics for the treatment of pleurisy.

No.	Name of the medicinal product	Dosage form	VED category
1.	Doxycycline	capsules	V
2.	Doxycycline-Darnitsa	capsules	V
3.	Doxycycline-Teva	tablets	V
4.	Doxycycline hydrochloride	capsules	V
5.	Erythromycin (Vitamins JSC)	pills	V
6.	Erythromycin (Borshchahivsky CPP)	pills	V
7.	Cephalexin capsules	capsules	V
8.	Unidox Solutab	tablets	V
9.	Benzylpenicillin 1 000 000 IU	powder for solution for injection	E
10.	Benzylpenicillin 500 000 IU	powder for solution for injection	E
11.	Bicillin-3	powder for suspension for injection	E
12.	Bicillin-5	powder for suspension for injection	E
13.	Penicillin G sodium salt Sandoz	powder for solution for injection	E
14.	Cephalexin suspension	granules for oral suspension	E
15.	Cephalexin Alkaloid	powder for oral suspension	E
16.	Doramycine	pills	D
17.	Zinerit	powder	D
18.	Rovamycin 1 500 000 IU	pills	D
19.	Rovamycin 3 000 000 IU	pills	D
20.	Spiracin 3 000 000 IU	pills	D
21.	Spiracin 1 500 000 IU	pills	D

Table 3 presents antibiotics, distributed by VED categories:

Category V (Vital): Doxycycline, Doxycycline-Darnitsa, Doxycycline-Teva, Doxycycline hydrochloride, Erythromycin (Vitamins JSC), Erythromycin (Borshchahivsky CPP), Cephalexin capsules, Unidox Solutab.

Category E (Essential): Benzylpenicillin 1,000,000 IU, Benzylpenicillin 500,000 IU, Bicillin-3,

Bicillin-5, Penicillin G sodium salt Sandoz, Cephalexin suspension, Cephalexin Alkaloid.

Category D (Desirable): Doramycine, Zinerit, Rovamycin 1,500,000 IU, Rovamycin 3,000,000 IU, Spiracin 3,000,000 IU, Spiracin 1,500,000 IU.

This division of drugs into categories allows you to optimize pharmacotherapy by identifying the most important drugs for the treatment of patients with pleurisy.

The specific weight of each category and the list of drugs in it are shown in Fig. 1.

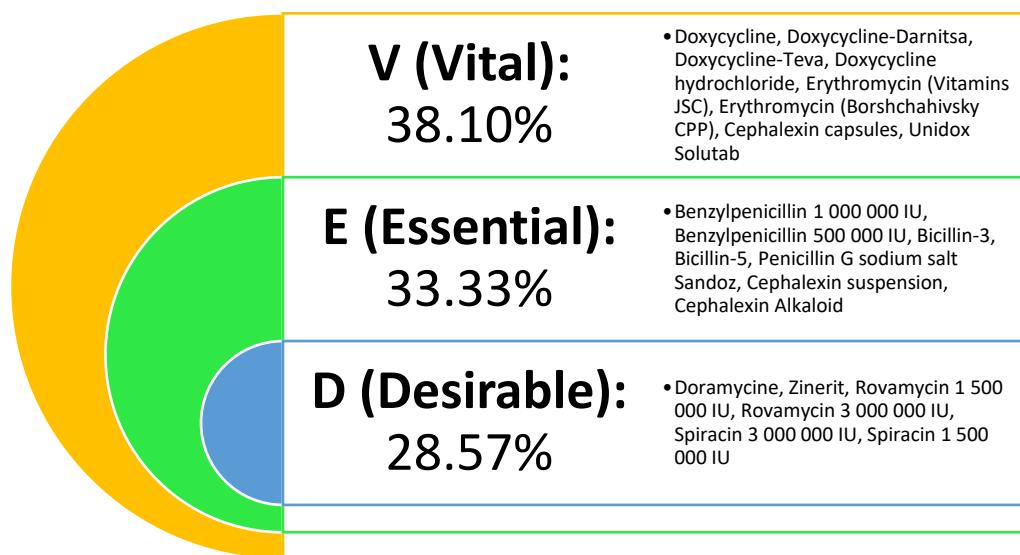


Fig. 2. Distribution according to the results of VED analysis of the studied antibiotics for the treatment of pleurisy considering clinical scenarios for the treatment of pleurisy (Fig. 3).

Matrix of priorities for antibiotic stock management, obtained by ABC/VED analysis

Based on the ABC/VED analysis, a matrix of priorities for antibiotic stock management was developed,

Drug categories	Number of drugs	V		Number of drugs	E		Number of drugs	D			
		Prescription of drugs			Prescription of drugs			Prescription of drugs			
		UAH	%		UAH	%		UAH	%		
A	2	376,50	15,44	2	262,3	10,76	5	1099,84	45,12		
B	1	100,50	4,12	2	228,3	9,37	1	120,80	4,97		
C	5	204,21	8,37	3	45,15	1,85	-	-	-		
Together:	8	681,21	27,93	7	535,75	21,98	6	1220,64	50,09		

Fig. 3. Priority matrix for antibiotic stock management through ABC/VED analysis of antibiotics for the treatment of pleurisy.

The conducted studies (Table 4) show that:

- For category A, the share of costs fell on groups A/V — 15.44%, A/E — 10.76% and A/D — 45.12%. This category included drugs such as Unidox Solutab, Bicillin-5, Doramycine.
- Category B was characterized by B/V — 4.12%, B/E —

9.37% and B/D — 4.97%. Cephalexin capsules, Cephalexin suspension were included in this category.

- Category C demonstrated shares of C/V — 8.37%, C/E — 1.85%, costs for C/D were not recorded. Examples of drugs in this group are Erythromycin (Borshchahivsky CPP), Penicillin G sodium salt Sandoz.

Table 4. ABC/VED analysis of antibiotics for the treatment of pleurisy (examples of drugs).

	V	E	D
A	Unidox Solutab Doxycycline-Teva	Bicillin-5 Cephalexin Alkaloid	Doramycine Rovamycin 3 000 000 IU Spiracin 3 000 000 IU Zinerit Rovamycin 1 500 000 IU
B	Cephalexin capsules	Cephalexin suspension Bicillin-3	Spiracin 1 500 000 IU
C	Erythromycin (Borshchahivsky CPP) Doxycycline-Darnitsa Erythromycin (Vitamins JSC) Doxycycline Doxycycline hydrochloride	Penicillin G sodium salt Sandoz Benzylpenicillin 1 000 000 IU Benzylpenicillin 500 000 IU	-

The share of antibiotic costs by VED category is shown in Fig. 4, which illustrates the distribution of

priority and economic burden of drugs in the clinical practice of treating pleurisy.

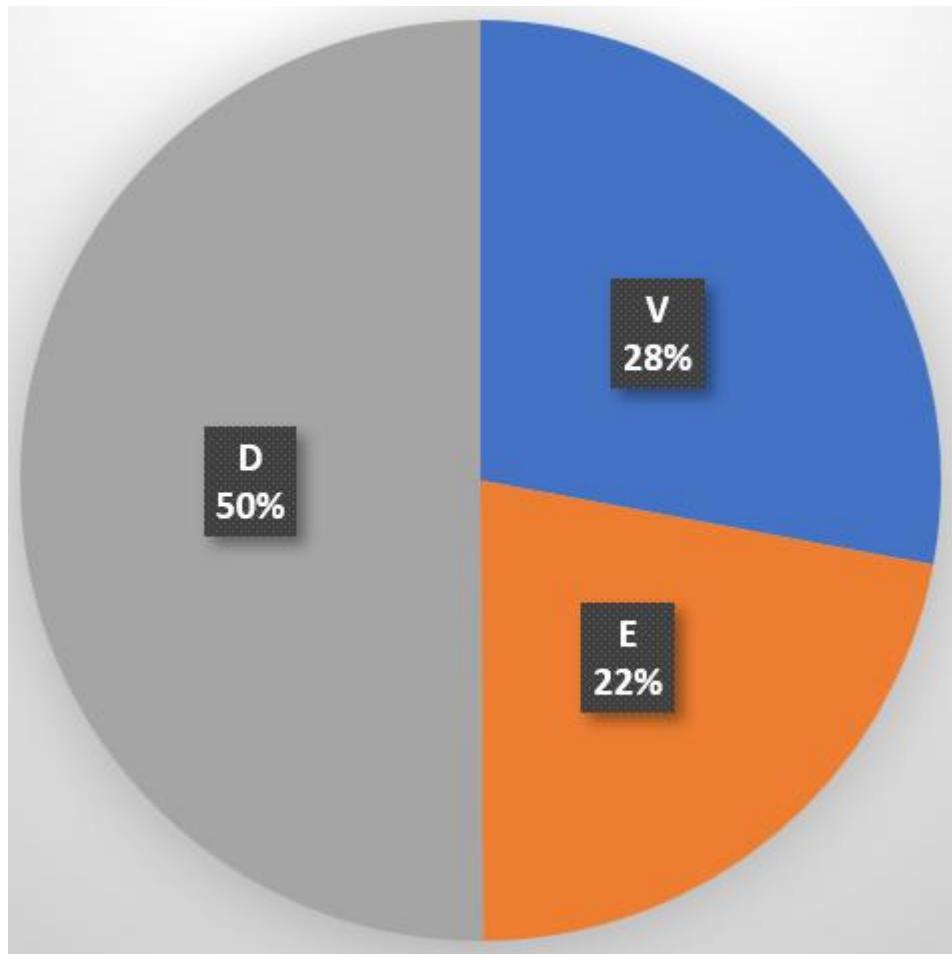


Fig. 4. Share of antibiotic costs in VED categories.

The combination of clinical and diagnostic guidelines, treatment tactics, priority matrix for inventory management, procurement, supply, pharmaceutical support allows to reduce unjustified prescriptions, minimize supply disruptions at critical points of treatment and support the decisions of formulary and procurement committees. ABC/VED here acts as an organizational and resource tool to support treatment tactics for pleurisy.

Legal principles of diagnosis and treatment of pleurisy

Legal support for the diagnosis and treatment of pleurisy is based on the principles of legality, evidence-based medicine, patient safety, professional responsibility of medical professionals and respect for human rights in the field of health care. The use of medical interventions for pleurisy requires not only clinical feasibility, but also strict adherence to regulatory requirements, information procedures, documentation, traceability, and ethical standards.

Informed consent and risk communication

The patient must receive complete, understandable information about the purpose, methods, possible alternatives, expected results, typical risks (pneumothorax, bleeding, infectious complications, pain

syndrome, bronchopleural fistula), as well as about possible complications of anesthesia.

The consent is drawn up in writing in the presence of the medical professional performing the procedure. In urgent situations, a simplified form is allowed with subsequent expanded information.

For minors or persons with limited legal capacity, written consent of a legal representative is required, considering the patient's interests.

Clinical indications and standards of medical care
Medical interventions (puncture, drainage, antibiotic therapy, surgical treatment) are performed in accordance with national protocols and standards of medical care.

Doctors performing manipulations must have appropriate qualifications, certification, and proven competence.

The medical institution is obliged to ensure the availability of certified equipment, a sterility control system, metrological supervision, as well as algorithms for responding to complications.

Laboratory diagnostics and sample circulation
Pleural fluid collection, labeling, transportation, and storage are carried out in accordance with the Standard Operating Procedure.

Protocols must indicate the purpose of the procedure, responsible persons, a list of materials, stages

of implementation, critical control points, quality and safety requirements, and references to current regulations.

Clinical diagnostic decisions are made only based on validated methods, in particular, polymerase chain reaction (PCR) or other nucleic acid amplification tests.

The laboratory conducting the study must have a license, accreditation and relevant documents confirming the traceability of each sample.

Before performing invasive and diagnostic interventions for pleurisy, it is important to ensure not only clinical feasibility, but also strict compliance with legal requirements that guarantee the safety, legality, and

traceability of medical actions. All stages of treatment – from obtaining informed consent to documenting results and quality control – are regulated by regulatory and legal acts in the field of health care.

Compliance with these requirements minimizes the risks of legal liability, protects the rights of the patient, and creates conditions for the proper organization of processes in a medical institution.

Below is a summary of the key legal requirements for performing procedures for pleurisy, covering all stages of providing medical care – from diagnosis to treatment.

Table 4. Legal requirements for performing procedures for pleurisy

Stage of medical care	Basic legal requirements	Documentary evidence
Obtaining informed consent	Written information to the patient about the purpose, risks, alternatives, consequences of refusal; consent of the legal representative in the case of minors or persons with limited legal capacity	Informed consent form, medical record
Performing puncture or drainage of the pleural cavity	Performance according to clinical indications, availability of certified equipment, doctor's qualifications, ensuring asepsis and antiseptics	Procedure protocol, sterility log, equipment certificates
Laboratory diagnostics of pleural fluid	Adherence to standard operating procedures, laboratory licensing, preservation of the chain of custody	Laboratory SOP, accreditation documents, sample collection log
Use of antibiotics and medical devices	Use of registered drugs and certified products; documentation of off-label use	Registration certificate, pharmacotherapeutic protocol, form entry
Infection control	Adherence to the rules of asepsis, use of personal protective equipment, waste disposal in accordance with the legislation	Disinfection report, infection control log, safety protocols
Radiation safety	Reasonability of the appointment of X-ray examinations, adherence to the ALARA principle, fixation of the dose load	Study justification protocol, dosimetry log
Protection of personal data	Limitation of access to medical information, protected data transmission channels, informing the patient about the processing of personal data	Consent to data processing, internal institution confidentiality policy
Incident management	Registration of complications, internal audit, corrective actions and updating of procedures	Incident log, clinical and legal analysis reports, audit reports

The analysis of the presented provisions shows that the legal support for the processes of diagnosis and treatment of pleurisy is systemic and multi-level. It covers both the clinical and organizational and documentation components, forming a holistic mechanism of safety and responsibility in medical practice.

The key conditions for compliance with legal requirements are the availability of approved standard operating procedures, documentary recording of each stage of medical intervention, proper communication with the patient and ensuring the confidentiality of medical information.

The systematization of these requirements contributes to improving the quality of medical care, legal protection of doctors and patients, and forms the basis for transparency and accountability in the field of healthcare.

Use of antibiotics and medical devices

Drugs and drainage systems must have a valid registration certificate. The use of antibiotics outside the instructions (off-label) is allowed only after the decision of the multidisciplinary commission, with reflection in the formulary and written consent of the patient.

It is necessary to ensure proper storage of drugs and products with recording of the batch number, date of receipt, expiration date, and disposal conditions.

Antimicrobial stewardship

Cultures are performed before the start of antibiotic therapy, if clinically possible.

The prescription of antibiotics should be based on the results of microbiological examination, with subsequent de-escalation according to sensitivity.

The duration of the course, dosage, and transition from parenteral to oral form should be justified and documented.

Infection control and personnel safety
Aseptic conditions are mandatory when performing punctures and drainage.
Personal protective equipment (gloves, masks, goggles, gowns) is used.
Pleural fluid is classified as a potentially hazardous biological material; therefore, all instruments are disinfected after use.
Personnel are subject to vaccination according to the requirements of the healthcare facility.

Radiation safety

When performing X-ray or computed tomography examinations, the ALARA (As Low as Reasonably Achievable) principle is followed - as low radiation as is reasonably achievable without loss of diagnostic accuracy.

The purpose of the examinations should be clinically justified, especially in pregnant women.

Personal data protection and confidentiality

Medical information about the patient belongs to the category of personal data and is subject to protection in accordance with the legislation of Ukraine.

Data transmission within the framework of consultations, telemedical consultations or research is carried out only through protected communication channels.

The patient must be informed about the purpose of processing his data, the right to access, correct and restrict use.

Quality and incident management

Each case of complication (pneumothorax, bleeding, infection of the drainage channel, delay in diagnosis) is subject to clinical and legal analysis.

The results of the analysis are used to update standard operating procedures and improve the quality of care.

Table 5. Basic legal principles in the diagnosis and treatment of pleurisy.

Principle	Content
Legality	Implementation of all procedures within the framework of the current legislation of Ukraine
Safety	Prioritizing patient safety over economic or administrative considerations
Awareness	Mandatory explanation of risks, benefits and alternative treatment options
Confidentiality	Protection of personal medical data and restriction of access to it
Professional responsibility	Compliance with standards of professional ethics, competence and qualifications
Traceability	Full registration of medical actions, samples, drugs and equipment
Ethics	Decision-making in accordance with the moral and ethical principles of medicine

The analysis of the presented principles shows that the legal regulation in the field of providing medical care for pleurisy is aimed at combining three key aspects – legality, professional responsibility, and ethics.

The institution must have an internal audit system for the quality and safety of medical interventions.

Ethical and palliative aspects in malignant forms of pleurisy

Decisions on repeated punctures, pleurodesis or prolonged drainage are made together with the patient and his family, considering the clinical condition and treatment goals.

Every action should be aimed at preserving the quality of life, reducing suffering, and respecting the dignity of the patient.

Clinical research and innovative medical technologies

Patients can be involved in clinical research only after approval by the ethics committee and registration of the protocol.

The patient has the right to refuse to participate in the study without any consequences for receiving standard medical care.

Legal principles in the field of diagnosis and treatment of pleurisy form the ethical, legal, and professional basis for the activities of medical professionals. They determine the limits of responsibility, guarantee the protection of patient rights, and ensure a balance between clinical feasibility and legal validity of medical interventions. Compliance with these principles is a prerequisite for providing high-quality, safe, and legal medical care that meets international standards and national legislation.

Table 5 summarizes the key legal principles that regulate the actions of medical professionals during diagnosis, treatment, documentation, and communication with patients, as well as ensuring quality control and ethics of medical practice in pleurisy.

creates the basis for the patient's voluntary participation in clinical decision-making.

Confidentiality and traceability are the key to protecting personal data and medical documentation, while professional responsibility and ethics form trust between the doctor and the patient.

The implementation of these principles in daily clinical practice contributes to improving the legal culture of medical personnel, ensures compliance with patients' rights and reduces the risks of medical and legal conflicts in the process of treating pleurisy.

The introduction of legal aspects into the system of diagnostics and treatment of pleurisy ensures not only clinical effectiveness, but also legal protection of the patient and medical staff, increases the quality and transparency of medical care, and contributes to the harmonization of Ukrainian practice with European standards of medical law.

Conclusions

Clinical and diagnostic guidelines in the management of pleurisy should be accompanied by transparent and rational resource provision. The combination of cost analysis and criticality of drugs according to the ABC/VED method increases resistance to supply disruptions, ensures a balance between clinical necessity and economic feasibility, and contributes to the implementation of coordinated interdisciplinary clinical decisions.

The analysis of the distribution of antibiotics by categories A, B, C, and the VED system showed that most costs are accounted for by category A drugs. This group includes first-line drugs for the treatment of intracellular infections, which have proven efficacy and are vital in the treatment of pleurisy, in particular Doramycine, Rovamycin 3,000,000 IU, Unidox Solutab. Their use determines the main contribution to positive clinical outcomes, but at the same time forms the greatest financial burden.

Category B includes antibiotics that are used less frequently, mainly in cases of resistance or intolerance to first-line drugs. These include Spiracin 1,500,000 IU, Cephalexin suspension, Bicillin-3. The costs of these drugs remain significant, but their use is more selective and targeted.

Category C drugs account for a minimal share of total costs. They have an auxiliary or reserve value in therapy, for example, Erythromycin (Borshchahivsky CPP), Doxycycline-Darnitsa, Erythromycin (Vitamins JSC). Their use is limited to individual clinical cases when standard therapy is ineffective or contraindicated.

According to the results of the VED classification, it was found that the largest share of costs falls on group E (essential), which includes Benzylpenicillin 1,000,000 IU, Benzylpenicillin 500,000 IU, Bicillin-3, Bicillin-5, Penicillin G sodium salt Sandoz, Cephalexin suspension, Cephalexin Alkaloid. The drugs of this group are important for supporting antibacterial therapy of pleurisy, are used to expand the therapeutic spectrum, correct treatment for concomitant infections and prevent complications.

Group V (vital) includes vital drugs, without which it is impossible to ensure the full effectiveness of pleurisy treatment. It includes Doxycycline, Doxycycline-

Darnitsa, Doxycycline-Teva, Doxycycline hydrochloride, Erythromycin (Vitamins JSC), Erythromycin (Borshchahivsky CPP), Cephalexin capsules, Unidox Solutab. They form the basis of antibacterial therapy and must be guaranteed to be available in medical institutions.

Group D (desirable) includes drugs used in specific clinical situations, in resistant or atypical forms of infections, as well as in case of need to intensify the main treatment. It includes Doramycine, Zinerit, Rovamycine 1,500,000 IU, Rovamycine 3,000,000 IU, Spiracin 3,000,000 IU, Spiracin 1,500,000 IU.

ABC/VED matrix analysis allowed us to clarify the structure of expenses and identify the most significant positions in the budget load. In category A, the largest share of expenses fell on groups A/V – 15.44%, A/E – 10.76% and A/D – 45.12%. This category included Unidox Solutab, Bicillin-5, Doramycine – drugs of high clinical significance that determine the effectiveness of therapy and require stable supply.

Category B had indicators B/V – 4.12%, B/E – 9.37% and B/D – 4.97%. It includes Cephalexin capsules, Cephalexin suspension, which are more often used in medium-intensity therapy and can be used as alternative drugs of choice.

Category C was characterized by shares of C/V – 8.37%, C/E – 1.85%, while expenses in the direction of C/D were not recorded. It includes Erythromycin (Borshchahivsky CPP), Penicillin G sodium salt Sandoz, which are mainly used as auxiliary or reserve drugs and have a minimal impact on the overall cost structure.

The results obtained have practical significance for the formation of a sound policy of drug supply, optimization of purchases and regulation of the use of antibiotics. They allow to determine the priorities of rational allocation of resources, guarantee the availability of critically important drugs, minimize the inappropriate prescription of antibiotics, and reduce costs without losing the effectiveness of treatment. This approach increases the transparency of decision-making, contributes to improving the quality of medical care and forms an evidence-based basis for pharmacoeconomic planning in the clinical practice of treating pleurisy.

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Healthcare. Pleurisy: clinical and diagnostic guidelines, treatment tactics, legal principles

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Introduction. The study is devoted to clinical diagnostic criteria, treatment tactics, and legal aspects of pleurisy management. Along with clinical diagnostic approaches, emphasis is placed on organizational solutions that guarantee continuity of treatment and prevent unjustified prescription of antibacterial drugs. To support clinical

decision-making, the organizational and resource tool ABC/VED-analysis was used. **Objective.** To form a transparent, evidence-based approach to the treatment of pleurisy that integrates clinical diagnostic guidelines, legal principles, and resource planning (ABC/VED). To analyze the structure of costs for pharmacotherapy, to identify critically necessary items for continuity of treatment and to develop a prioritization matrix for antibiotic stock management. **Methods.** Descriptive-analytical approach with synthesis of modern clinical guidelines and practical algorithms (diagnosis, drainage, antibacterial and intrapleural therapy, surgery), supplemented by ABC/VED analysis of the nomenclature of antibacterial drugs in the context of pleural infection and legal audit of clinical procedures. **Results.** Clinical-diagnostic guidelines and treatment tactics of pleurisy with the use of antibiotics were outlined. ABC/VED analysis of organizational and resource support was conducted and clinical-pharmacological groups of antibiotics were studied. It was established that the highest costs are incurred by category A drugs (Doramycine, Rovamycin, Unidox Solutab), which are vital and have the highest level of consumption. Category B antibiotics (Spiracin, Cephalexin suspension, Bicillin-3) provide a moderate resource load, while category C (Erythromycin, Doxycycline-Darnitsa) has a minimal economic impact. According to the VED classification, group E costs (Benzylpenicillin, Bicillin-3, Bicillin-5, Penicillin G sodium salt, Cephalexin) dominate, which emphasizes their importance in supporting therapy. Group V includes vital drugs (Doxycycline, Erythromycin, Cephalexin capsules, Unidox Solutab), and group D is formed by reserve drugs (Doramycine, Zinerit, Rovamycin, Spiracin). Matrix analysis confirmed that the greatest resource burden characterizes category A (A/V, A/E, A/D). The results obtained made it possible to classify antibiotics by clinical significance and determine priorities for rationalizing costs. Additionally, legal principles for the diagnosis and treatment of pleurisy, based on the principles of legality, evidence, safety and protection of patients' rights, were formulated.

Conclusions. The proposed evidence-based approach synchronizes clinical algorithms for pleurisy management with organizational and resource support (ABC/VED), increasing treatment effectiveness, reducing excessive use of antibiotics, and ensuring the stability of the supply of life-saving drugs. The role of legal principles (informed consent, infection control, documentation, data protection) in the safe and high-quality provision of care is emphasized.

Keywords: pleurisy; clinical diagnostic criteria; antibacterial therapy; ABC/VED analysis; inventory management; legal principles; healthcare.

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