Andriy Solomennyi et al /J. Pharm. Sci. & Res. Vol. 11(5), 2019, 1733-1741

ISSN:0975-1459
Journal of Pharmaceutical Sciences and Research
www.jpsr.pharmainfo.in

Organizational and Economic Justification of Medicamental Provision of the Injured Soldiers with Thoracoabdominal Trauma

Andriy Solomennyi,
Candidate of Pharmaceutical Sciences, ORCID iD: 0000-0002-9562-8321, *Department of Military Pharmacy of Ukrainian Military Medical Academy, 45/1, Moscovska Str., Kyiv, Ukraine*

Oleksandr Dobrovolnyi,
Candidate of Pharmaceutical sciences, ORCID iD: 0000-0002-9835-3909, *Department of Military Pharmacy of the Ukrainian Military Medical Academy 45/1, Moscovska Str., Kyiv, Ukraine*

Natalia Takhtaulova,
Candidate of Pharmaceutical Sciences, ORCID iD: 0000-0003-3705-8110, *Department of Military Pharmacy of the Ukrainian Military Medical Academy 45/1, Moscovska Str., Kyiv, Ukraine*

Mariia Bilous,
candidate of Pharmaceutical sciences, ORCID iD: 0000-0002-4370-8813, *Department of Military Pharmacy of the Ukrainian Military Medical Academy 45/1, Moscovska Str., Kyiv, Ukraine*

Abstract.

The research is devoted to the improvement of medical provision of the injured soldiers with thoracoabdominal trauma by means of organizational and economic foundation of the system of medical support, the creation of a formulation list and the development of a methodology for the regulation of medicines, taking into account the needs of the health facilities of the Armed Forces of Ukraine. The scientific novelty of the results of the study is that for the first time in Ukraine approaches to improving the system of medical provision of injured soldiers with thoraco-abdominal trauma through comprehensive organizational and economic research were investigated and scientifically justified; cost-effectiveness research of medicinal products was conducted for the medical support of injured soldiers with thoracoabdominal trauma; the method of formation of a formular list of medicines was created for the medical provision of thoracoabdominal trauma on the basis of expert evaluation in the military medical service; formulated lists of medicines for the medical support of the injured soldiers with thoracoabdominal trauma in the conditions of military medical establishments were developed and proposed; the methodology of valuation of medicines for the medical provision of the injured soldiers with thoracoabdominal trauma was developed. The results of the provided research allow calculating and justifying the norm of medicines for the provision of specialized medical care to the injured soldiers with thoracoabdominal trauma.

Keywords: cost-effectiveness, expert evaluation, medical supplies, pharmaceuticals, thoracoabdominal trauma.

INTRODUCTION

The effectiveness of providing quality medical care to citizens of Ukraine and military personnel is getting not only economic but also social value. The inappropriate use of resources and budget deficits affect negatively the procurement of essential medicines and the provision of medical services in the field of civil and military medicine. It undoubtedly leads to a decrease in the quality and effectiveness of treatment, especially among those suffering from polytraumatic injuries.

Today in Ukraine, in the prevailing socio-economic and military-political conditions, there were problems with ensuring the availability and quality of medical supplies, requiring a revision of existing supply norms with the practical implementation of them in military medicine, as well as the establishment of a clear and well-established system of medical provision (MP) for the injured soldiers.

Therefore, very important aspects of the military medical service are the need of development approaches and principles of improving health care by improving the provision of medicines, developing Formulary drug list in terms of military medical institutions, the establishment of appropriate norms of drugs for MP of injured soldiers with thoracoabdominal trauma (TAT).

The scientific novelty of the topic is that for the first time in Ukraine approaches to improve the system of medical maintenance of injured TAT soldiers were studied and justified through complex organizational and economic research.

The development of a methodology for conducting pharmacoeconomic studies in the field of effective drug delivery has been widely considered in the works of many national scientists: Volokh D. S. (1991), Gromovik B. P. (2006), Gudzenko O. P. (2004), Zalisska O. M. (2004), Mnushko Z. M. (1990), Nemchenko A. S. (1992), Shmatenko A. P. (2011) and others. At the same time, at present, there has not been comprehensive research conducted on the organizational and economic justification of the MP of the injured soldiers with the TAT, which determines the relevance of this work and the choice of the main directions and methods of research.

That is why the purpose of our study is to improve the MP of injured soldiers with TAT. To solve this goal, the following research objectives are defined as follows:

- to develop a methodology for carrying out expert evaluation for the formation of formular lists of medicines;
- to conduct a pharmacoeconomic analysis of the main treatment regimes in order to determine the list of drugs for the MP of injured soldiers with TAT;

- to formulate lists of medicines, to develop a methodology for the regulation of medicines for the system of MP of injured soldiers with TAT.

MATERIALS AND METHODS

One of the critical problems of the modern military medical service is the search for ways to improve the material and technical support of the medical diagnostic process in accordance with the existing needs of medical institutions. Taking into account the limited funding available for health facilities, the system of rational use of drugs should be considered as the most effective way of optimizing [1].

The subject of the study was the MP of injured soldiers with TAT. The basis for receiving data was the clinical material of the primary medical documentation of 137 victims of TAT with various severity levels, which were treated in the clinics of urgent, abdominal and thoracic surgery of the National Military Medical Clinical Center, in the clinic of thoracoabdominal surgery of the Military Medical Clinical Center of the Western Region and the Department of Police Crime of Kyiv City Clinical Hospital for Emergency Care in the period from 2006 to 2016. The selection of the victims was conducted in accordance with the principle of randomization, in compliance with existing ethical norms and standards. The sample included both males and females affected. The vast majority of injured were men (68.62%). The men's age range ranged from 16 to 56 years old (the average age is 31 ± 9.15 years), and women are 16 to 59 years old (mean age is 29 ± 8.38 years). Analysis of the distribution of victims with TAT, depending on gender and age, showed that the largest proportion of this type of injury fell into the age range of 20-30 years. The victims of the TAT were not included in the research group of the victims who died.

The methodological basis of the research is the set of normative legal acts, official information databases and clinical material data: primary medical documentation of 137 victims with TAT (medical cards of the patients, letters of medical appointments, accompanying leaflets of the ambulance station, letters of appointments by doctors of narcotic and psychotropic drugs and the fulfillment of these appointments) [4, 8, 10]; treatment regimens in terms of their therapeutic efficacy [2]; State Form of Medicines [5]; State Register of Medicinal Products of Ukraine [7]; the register of wholesale and retail prices for medicines [6]; Lists of medicines: WHO model list of essential medicines (18th revision) [11, 12].

The choice of the best methods is based on the complex of mathematical and statistical methods of various levels of complexity, which are used in the world practice of forecasting the consumption of medicines. In the course of the research, the following methods were used: systematic review and bibliographic - to determine and generalize the state of MP and rational use of drugs in the provision of medical care to the injured soldiers from the TAT; retrospective documentary - for collecting, separating and statistical processing of data of primary medical documentation; expert evaluation - for justification and verification of indicators of efficiency and safety for medicinal products in the process of formation of an optimal list of medicines; Pharmacoeconomic - to determine the optimal treatment tactics using medicinal products on the basis of therapeutic and economic indicators with different TAT combinations; estimation of direct and indirect costs of TAT treatment at various degrees of severity; statistical - for complex search of ways of the task realization, account of interconnections and interactions between elements of research with subsequent calculations of results of researches with the help of software (correlation analysis); ABC analysis - to assess the rationality of budget use for the procurement of clinically relevant drugs, taking into account the retrospective assessment of the frequency of drug use; cluster - to determine formulas and construct a methodology for assessing the competence of experts; normative - for the establishment of a fixed system of norms of medicines in a certain period of time.

RESULTS AND DISCUSSION

Conducting expert evaluation. Due to the absence of separate lists of medicines and protocols for the provision of specialized medical care to the injured soldiers from the TAT, and in order to create a formulation list, we used the method of expert evaluation of medicines. The method is based on the optimization of the use of drugs in health care institutions and unification of treatment based on the intuitive analysis by the expert of medicines in the scheme of MP of the victim with TAT in combination with quantitative methods of evaluation and statistical treatment of the results [3].

Stage I. Formation of a questionnaire No. 1. The choice of pharmacotherapeutic groups of drugs for analysis is based on the bibliographic method by processing sources of scientific information on MP, as well as by means of a retrospective documentary analysis method by processing the sources of primary medical documentation of the injured soldiers from the TAT. The selection of drugs and their release forms from each pharmacotherapeutic group is carried out in conjunction with doctors-specialists who have clinical experience in the treatment of the affected range. As a result, a list of medicines for the questionnaire No. 1 was formed. The questionnaire contains instructions for describing the sequence and methodology for filling in the questionnaire, as well as a list of pharmacotherapeutic groups, a list of drug names and their form of release.

Stage II. Formation of an expert group. As experts, experts from the healthcare facilities of the Ministry of Defense of Ukraine and other specialists of the healthcare system were selected as experts. The reasons for the selection of experts are practical experience and appropriate level of qualification, which are directly related to the determined pathology.

A detailed analysis of a number of papers showed that the choice of the number of experts in the working group should be considered as a multi-stage process. The number of experts is recommended to be at least7 and not more than 20 persons, and in some cases not less than 10 and not more than 30, since their very

small number leads to uncertainty of the group assessment, and too much - to the complexity in the organization of expert surveys.

To determine the number of experts in the working group, the probability theory and elements of mathematical statistics are used. It is quite laborious, but at the same time, it is correct approach. The approach is based on the analogy between selective observations (samples) that take place in statistical surveys and estimates (points or ranks) giving experts a certain factor in expert analysis.

Average sample error (μ) is the mean square deviation of all possible values of the sample average from its mathematical expectation. Then (μ^2) is the variance of possible values of the sample average. In course of mathematical statistics, it is determined that the value (μ^2) is n times less than the dispersion (σ^2) in a normally distributed general population, where n is the sample size.

With the sample size n = 30, the formula (1) is used:

$$\mu = \sqrt{\frac{\delta^2}{n}}, \qquad (1)$$

After transforming the expression (2) and replacing the sample size (n) with the number of experts (m) in the working group, the formula (3) is obtained accordingly:

$$m = \frac{\delta^2}{\mu^2}, \qquad (2)$$

The recommended numerical values of the number of experts in the working group derived from the formula (1) for a number of typical values of the ratio (μ^2 / σ^2), which is used in practice, are given in table. 1

Table 1: Recommended quantitative composition of experts of the working group

μ^2 / σ^2	0,05	0,06	0,07	0,075	0,08	0,09	0,10	0,15	0,20	0,25
n	21	18	16	15	14	12	11	8	6	5

We calculate dispersion of possible values of the sample mean value (μ^2): μ^2 = 8.159. We calculate the dispersion (σ^2): σ^2 = 0.522. By formula (3) we set the value m: m = 0,0639.

Since the following expression ($0{,}05 \le \mu^2 / \sigma^2 \le 0{,}10$) is the most widely used in the practice of calculations, we find that the most acceptable number of experts in the group should be in the range of 11 to 21 people. Since in our case the value of μ^2 / σ^2 = 0.0639, then according to table. 1 n = 17. Therefore, it should be assumed that the required number of experts is equal to 17 persons.

The theoretical and the recommended limit values for determining the quantitative composition of the experts of the working group are practically the same as those obtained on the basis of practical activity. Thus, we can assume that the proposed approach to assessing the limit values of the expert group of the working group is fairly correct.

Stage III. Expert evaluation of medicines by questionnaire № 1. Experts' interviews were conducted through an individual on-line survey. To assess the level of competence of experts, a methodology has been developed which takes into account the following indicators: general experience of the expert in the specialty, level of education, degree of familiarity with the questionnaire, qualification category.

According to the experts, the following structure was obtained: the total number of questionnaires (doctors-specialists of the surgical profile) - 30 persons (100%); work experience in the specialty: 1-10 years - 14 persons (46,67%), 11-20 years - 12 persons (40%), 21-30 years - 2 persons (6,67%), 31 and more years - 2 persons (6.67%); work experience on the treatment of a specified contingent of victims: 1-10 years - 15 people (50%), 11-20 years - 11 people (36,67%), 21-30 years - 3 persons (10%), 31 and more years - 1 person (3.33%); Qualification category by specialty: without category - 6 persons (20%), II categories - 10 persons (33.33%), I category - 6 persons (20%), the highest category - 8 persons (26.67%); Degree: Ph.D. - 11 persons (36,67%), Doctor of Science - 3 persons (10%); Academic rank, among them: senior lecturer (researcher) - 1 person (3,33%), associate professor - 1 person (3,33%), professor - 3 persons (10%); use of information sources about new drugs: specialized and scientific literature - 30 people (100%), own research, observation, intuition, colleagues' advice - 27 people (90%), information from Internet sources - 26 people (86.67%), courses for advanced training, seminars, conferences - 24 persons (80%), information from a medical or pharmaceutical representative - 21 persons (70%).

Competence of Experts (C_i) (competence) calculated according to the formula (3) [9]:

$$C_i = \frac{5N + 3P + Q + S}{5}, \qquad (3)$$

where N - coefficient of latitude for the use of the nomenclature of medicinal products (nomenclature);

P - coefficient of informative expert (professional);

Q - coefficient of qualification of an expert (qualification);

S - coefficient of scientific level of the expert (science).

The coefficient of use of the nomenclature of medicinal products (N) according to the data of the question card No. 1 is calculated by the formula (4) and (5):

Utilization Rate of nomenclature of medicinal Products (N) in accordance with the data of the questionnaire No. 1 calculated by formula (4) and (5):

$$N = \frac{U_l + O_u + N_i}{N_u}, \qquad (4)$$

$$N_u = T_n - U_l, \qquad (5)$$

where U_l – the total number of drugs used by an expert in the treatment of a specified pathology (used list);

O_u – the amount of drugs most often used by an expert in the treatment of a specified pathology (often used);

N_i – the number of drugs not included in the list but used by an expert in the treatment of a specified pathology (not included);

N_u – the amount of drugs not used by an expert in the treatment of a specified pathology (not used);

T_n – the total number of medical products of a definite list proposed for use in the treatment of a specified pathology (total number).

Expert informativity (P), which determines the degree of professional knowledge and their informational content, is calculated by the formula (6):

$$P = P_1 + P_2 + P_3 + P_4 + P_5, \quad (6)$$

where P_1 – indicator of obtaining information from specialized and scientific literature (3 points);

P_2 – an indicator of obtaining information at advanced training courses, seminars, conferences (3 points);

P_3 – an indicator for obtaining information for conducting own research, observations, intuition, and advice from colleagues (2 points);

P_4 – indicator for obtaining information from a medical or pharmaceutical representative (1 point);

P_5 – indicator of obtaining information from Internet sources (1 point).

Thus, the expert's informativeness rate can range from 1 to 10 points.

The coefficient of expert qualification (Q), which determines the level of experience gained by an expert in the course of his professional activity, including the experience of medical and preventive work with a specified range of victims, is calculated according to the formula (7):

$$Q = \frac{2E_W + E_T}{3}, \quad (7)$$

where E_W – the experience of an expert with a specified contingent of victims (work experience);

E_T – general experience of work of an expert on a specialty (total experience).

The scientific-level expert's (S) coefficient determines the qualification and scientific level of the expert and is calculated by the formula (8):

$$S = S_1 + S_2 + S_3, \quad (8)$$

where S_1 – qualification category;

S_2 – scientific degree;

S_3 – academic status.

Assessment of scientific level is carried out in points, according to data in tab. 2

The next step is to determine the average competence of experts. The average expert competence rating for the whole group is calculated in comparison with the general tendency of the indicators in the group of experts. The higher the percentage of experts is with a coefficient of qualification above the average, it should be considered that this group of experts has rather high qualifications, and therefore has a sufficiently powerful information potential, which definitely determines the quality of expert assessment.

Table 2: Scientific level expert evaluation

Level of Expert		Score in points
Qualifying category (S_1)	Uncategorized	1
	2nd category	2
	1st Category	3
	Higher category	4
Scientific degree (S_2)	PhD	3
	Doctor of Science	6
Academic Rank (S_3)	Senior Lecturer (research scientist)	2
	Associate professor	4
	Professor	6

Table 3 determines the total sample under examination, where i is the serial number of the expert, C_i is the value of the competence of the i-th expert.

The average competence of experts (C_{cp}) for the whole group is calculated by the formula (9). C_{cp} = 9,703.

$$C_{cp} = \frac{\sum_{i=1}^{n} C_i}{n}, \quad (9)$$

where C_{cp} – average competence of experts;

C_i – Competence of the i-th expert, which is evaluated in points;

n – number of experts;

i – serial number of the expert.

Conclusion: the coefficient of qualification level of 53.33% experts is higher than the average and is within the range of 9,703 - 15,344. Thus, more than half of the experts have rather high qualification characteristics, that is, they have enough powerful information potential, which definitely determines the quality of expert assessment.

Table 3. Sample range (competence of experts)

i	1	2	3	4	5	6	7	8	9	10
C_i	6,559	3,994	14,998	4,419	10,272	10,100	9,3204	8,308	10,492	14,370
i	11	12	13	14	15	16	17	18	19	20
C_i	15,344	9,3618	10,440	9,171	8,578	4,825	10,343	11,508	7,464	10,003
i	21	22	23	24	25	26	27	28	29	30
C_i	6,666	14,576	11,175	10,876	9,634	9,385	10,571	11,011	6,059	11,256

Table 4: Estimates for the degree of consistency of expert opinions

Number of objects being analyzed	Expert Evaluation						
	n_1	n_2	n_3	n_4	n_5	…	n_{30}
m_1	13,5	13,5	13,5	13,5	13,5	…	13,5
m_2	3,5	18,5	3,5	18,5	18,5	…	3,5
m_3	28	13	13	13	13	…	28
m_4	20,5	5,5	20,5	20,5	20,5	…	5,5
…	…	…	…	…	…	…	…
m_{267}	15	15	15	15	15	…	15
Sum of ranks	3632	3047	4202	3347	4037	…	3542
Deviation from the arithmetic mean (S_j)	-506,5	-3047	4202	3347	4037	…	-596,5
Square deviation from the arithmetic mean (S_j^2)	256542,25	1191372,25	4032,35	626472,25	10302,25	…	355812,25

The degree of consistency of expert opinions was calculated using the coefficient of concordation (*W*) (the total coefficient of rank correlation for the group of experts), which was proposed by Kendal, using the formula (10):

$$W = \frac{\sum_{i=1}^{m}\left\{\sum_{j=1}^{n} x_{ij} - \frac{1}{2}n(m+1)\right\}^2}{\frac{1}{12}n^2(m^3-m) - n\sum_{j=1}^{n}\frac{1}{12}\sum_{tj}\left(t_j^3 - t_j\right)}, \qquad (10)$$

where n – number of experts;

m – number of objects (drugs);

x_{ij} – rank awarded by the j-th expert of the i-th object (drug);

t_j – number of identical ranks in the j-th row.

To verify the significance of the coefficient of concordation χ^2 -criterion is used according to the formula (11):

$$\chi^2 = \frac{\sum_{i=1}^{m}\left\{\sum_{j=1}^{n} x_{ij} - \frac{1}{2}n(m+1)\right\}^2}{\frac{1}{2}nm(m+1) - \frac{1}{m-1}\sum_{i=1}^{n}\frac{1}{12}\sum_{tj}\left(t_j^3 - t_j\right)}, \qquad (11)$$

where n – number of experts;

m – number of objects (drugs);

x_{ij} – rank awarded by the j-th expert of the i-th object (drug);

t_j – number of identical ranks in the j-th row.

Calculations of the degree of consistency of expert opinions are presented in table. 4.

Concordance factor (*W*):

$$W = \frac{8902207{,}5}{\frac{1}{12}(267*267)*(30*30*30-30) - 267*291075} = 0{,}1079$$

$\chi^2_{ex} = n(m-1)W = 835{,}462$; $\chi^2_{tab} = 42{,}55697$

Provided if $\chi^2_{ex} > \chi^2_{tab}$, then the coefficient of concordation is probable.

As you know, the coefficient of concordation should fluctuate in the range $0 < W < 1$. Since in our case W = 0,1079, this equation is true. The data obtained are considered reliable and can be used in future work. The hypothesis about the presence of consistency of experts` judgments is accepted. Verification of the consistency of experts` judgments for each expert (tabular value: 0.4461) revealed that the expert opinions were agreed. It was established that with maximum consistency of expert opinions (n = 20; W = 0,1615; χ^2 = 745,6938), the maximum range of drugs used by experts for the MP of victims with TAT was 243.

Thus, based on the results obtained, it was found out that the optimal number of experts according to our study is 20 people.

IV stage. Formation of the questionnaire No. 2. The choice of medicinal products after the initial assessment was carried out using the ABC analysis. The ranking of drugs is based on the frequency of the expert's choice of the respective medical product. Drugs are classified according to the principle: class A - drugs with a growing amount of up to 80%, class B - from 80 to 95%, class C - more than 95%. In addition, Class C was removed from further research, since these medicines have a specific weight of an expert's choice of less than 0.2%. Thus, a list of medicines in the amount of 186 preparations for the questionnaire No. 2 was formed. The card contains the information necessary to ensure a clear and uniform understanding by experts the nature of the determination for importance degree of the criteria: “effectiveness”, “safety” and “perspective”. The “effectiveness” criterion is defined as the sum of positive effects that characterize the degree of positive influence of drugs on the course of the disease and allow the patient to recover more quickly. The “safety” criterion refers to the characterization of medicinal products, based on a comparative assessment of the benefits of its use and the potential harm that can be inflicted on the patient in the use of medicinal products. The “perspective” criterion includes the priority development, successful and reliable further use of medicines. The ranking of medicines by degree of significance to the defined criteria is carried out on a five-point scale. Assessment of the “effectiveness” criterion: 5 points - highly effective medication, 4 points - effective, 3 points - medium-effective, 2 points – minor

efficiency, 1 point - ineffective. The criteria of "safety" and "perspective" are similarly estimated from 1 to 5 points. The outlined method requires an expert to maximize concentration and use of his theoretical knowledge and practical experience gained.

V stage. Expert evaluation of medicines by questionnaire No. 2. Expert interviews were conducted through an individual on-line survey. The contact form of the survey is characterized as an individual distribution. Determination of expert competence and consensus of expert opinions was carried out according to the methodology outlined during the third stage of expert evaluation. In the expert survey on the questionnaire No. 2 experts were taken in the number $n = 20$. As a result of processing data of questionnaires No. 2, the coefficient of concordation was $W = 0.62$ (for non-severe injury), $W = 0.54$ (for severe trauma), $W = 0.47$ (for extremely serious trauma), confirming the reliability of data and the consistency of the statements of experts by the survey.

VI stage. Assessment of the completed questionnaire. According to the data processing of the questionnaire No. 2, the lists of medicinal products used in the medical treatment of the victims with TAT have been formed. These lists make it possible to formulate schemes of pharmacotherapy and lists of medicines for the treatment of patients with TAT in severity (non-severe, severe, extremely difficult) [13, 14]. The received schemes take into account the single dose, the multiplicity of appointments per day and the course of treatment for each selected drug expert.

Thus, based on the specified parameters for each drug (efficacy, safety and future use prospects), a list of drugs for further analysis has been developed.

Frequency analysis of drug appointments. The cost of medical care for victims of TAT depends on both the cost of drugs and their number of prescriptions. We consider the general MP for victims with TAT. It was revealed that the average daily amount of drugs prescribed for TAT for 1-2 days (shock period) treatment on average is 12 articles (although in some cases the prescription of 27 drugs for 2 days) with a gradual decrease to 2-3 drugs of 10-day, as depicted in fig. During this period, the crisis pathological conditions in the traumatized organism are overcome. Also, the prescription is marked during the period of dangerous occurrence of early complications for the most expensive medications.

The figure represents the daily average number of prescribed drugs per TAT sufferer during treatment. The process of MP is described by the trend line in the form of the equation $y = -0{,}0002x^4 + 0{,}011x^3 - 0{,}1647x^2 - 0{,}4783x + 18{,}344$ with the reliability of $R^2 = 0{,}97$.

The next step is to consider the total number of drug appointments of the selected number of TAT sufferers for each pharmacotherapeutic group.

The obtained data indicate that infusion therapy is widely used from the first day of medical care to the victim. The largest number of prescriptions of infusion drug solutions takes up to 7-8 days in order to counteract the development of early manifestations of the pathological process TAT. Peak values should be considered as the period of initiation of the general response of the organism. A group of hemostatic drugs is prescribed from the first day, and the second day there is a peak with a gradual decrease to 8 days. Transfusion therapy is used in 1-2 days in order to eliminate the effects of massive bleeding. Antibacterial pharmacotherapy has a fairly wide arsenal of drug use. The largest array of antibiotics is from the groups of β-lactam penicillins, cephalosporins and other antibacterial agents. The most massive use of antibacterial drugs is observed in the early days in order to prevent infection and prevent the development of septic lesions (up to 10 days).

Thus, it has been established that among all groups of drugs the group of antibacterial agents in the number of drugs is the most numerous and intended for all victims of TAT.

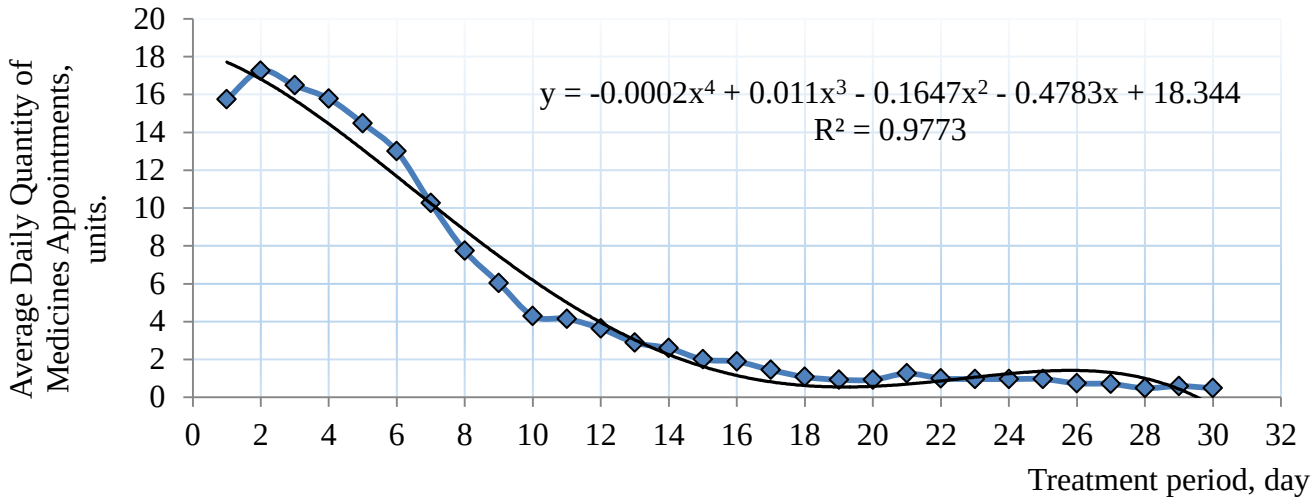

Fig. Quantitative dynamics for daily use of medicinal products

Pharmacoeconomic study of medical diagnostic process. In the framework of the pharmacoeconomic analysis, the frequency of drug prescriptions in the pharmacotherapy regimens, as well as "the cost of the disease" and "cost-effectiveness" were analysed.

Analysis of "the cost of the disease" used a methodological approach based on the assessment of real clinical practice (direct medical expenses, costs for diagnostic and medical services, for medicines, for maintenance in a medical institution, for payment for disability days on the sheets of disability and production losses in connection with lack of workplace, etc.). In the course of the analysis, the cost indicators of MP are determined depending on the severity of the victim, the length of stay in the hospital and the various combinations of TAT.

In the course of the analysis four phases of the structure of MP of the injured soldiers with TAT were defined in economic terms: 1-5 days - the phase of maximum expenses (intensive therapy), where 1-2 days is the peak period; 6-13 days - phase of main expenses (stabilization therapy); 14-20 days - phase of minimal expenses (maintenance therapy); from 21 days - the phase of rehabilitation costs (rehabilitation therapy).

The final stage of the formation of the form list was a study carried out using "the cost-effectiveness" method. The efficiency indicator was determined according to the results of the expert evaluation, its quantitative dimension was within $0 \le Ef \le 1$. After calculating preparations with a coefficient of cost efficiency over 800 excluded from the optimal list of drugs.

Consequently, in accordance with the developed research algorithm, a formulated list of medicines was developed, which, depending on the needs and conditions of the military medical service, can be corrected. Conducting a complex of research of the medical-diagnostic process TAT allowed to reduce the nomenclature of medicinal products for the MP of injured soldiers with TAT and to formulate a list of 89 drugs for INN.

Justification for the norm of medical support. The practical implementation of the establishment of the formulation lists of medicines for the MP of victims with TAT is a method of valuation of medicines for the provision of specialized medical care to injured servicemen at the level of the Military Medical Clinical Centers of the Armed Forces of Ukraine. The basis for calculation of the norms of medicines includes the following factors: sanitary losses, clear idea of the optimal list of drugs, assessment of the severity of the victims of TAT, normative indicators of the provision of medical care (types and levels of medical care) received during the study, the MP of injured soldiers with TAT.

The norm (N_{ji}) (norm) of the *i*-th drug from the list of medicines for the MP of the *j*-th victim's serviceman with TAT (for 100 sanitary losses with varying degrees of severity TAT) is calculated by the formula (12):

$$N_{ji} = S_n Q_{nj} d_{nj} + S_h Q_{hj} d_{hj} + S_v Q_{vj} d_{vj} \qquad (12)$$

where S_n – the percentage of sanitary losses of *j*-th victims with non-drain TAT (sanitary losses);

Q_{nj} – the average daily need for the *i*-th drug for the MP of the victims with a non-drain TAT (quantity);

d_{nj} – average duration of the course of treatment for the *i*-th drug for the MP of the victims with non-drained TAT (duration);

S_h – the percentage of sanitary losses *j*-affected by severe TAT;

Q_{hj} – the average daily need for the *i*-th drug for the MP of victims with severe TAT;

d_{hj} – average duration of the course of treatment for the *i*-th drug for the MP of victims with severe TAT;

S_v – the percentage of sanitary losses *j*-affected by the extremely difficult TAT;

Q_{vj} – average daily need for the *i*-th drug for the MP of victims with extremely difficult TAT;

d_{vj} – average duration of the course of treatment for the *i*-th drug for the MP of victims with extremely difficult TAT.

The norm of the *i*-th drug for 10 beds of the special department (N_{10}) from the list of medicines for the MP of the *j*-th victim soldier with TAT is calculated by the formula (13):

$$N_{10} = \frac{V \times N_{ji}}{10}, \qquad (13)$$

where V - bed capacity of 1 bed of a specialized branch during the year;

N_{ji} – the norm of the *i*-th drug from the list of medicines for the MP of the *j*-th victim's soldier with TAT.

The bed capacity of 1 bed of the profile compartment (V) (volume) during the year is calculated by the formula (14):

$$V = \frac{365}{D_n \times S_n + D_h \times S_h + D_v \times S_v} \times 100\%, \qquad (14)$$

where D_n – the number of days staying in the in-patient treatment of the *j*-th victim with non-drain TAT;

S_n – the percentage of sanitary losses of *j*-th victims with non-drain TAT;

D_h – the number of days staying in the in-patient treatment of the *j*-th victim with severe TAT;

S_h – the percentage of sanitary losses *j*-affected by severe TAT;

D_v – the number of days staying in the in-patient treatment of the *j*-th victim with a very severe TAT;

S_v – the percentage of sanitary losses *j*-affected by the extremely difficult TAT;

365 – number of nights per year.

The norm of the *i*-th drug for 1 specialist specialist's specialist unit (N_{sp}) from the list of medicines for the MP of the *j*-th victim's serviceman with TAT is calculated by the formula (15):

$$N_{sp} = \frac{N_{10} \times P_{sp}}{P_{dp}}, \quad (15)$$

where N_{10} – the norm of the *i*-th drug for 10 beds of a specialized section from the list of medicines for the MP of the *j*-th victim soldier with TAT;

P_{sp} – number of specialist doctors in one profile department (specialist);

P_{dp} – the number of beds in the profile branch (department).

On the example of the rationing of the drug "Reopoliglyukin" (solution for infusion 400 ml in a bottle), there are calculations of the norm of the drug for 100 injured soldiers with varying degrees of severity, the norm of the drug for 10 beds of the profile department and the rules of the drug for 1 specialist specialist department.

According to the results of the research, the following indicators were established: S_n = 29,19; Q_{nj} = 0.7; D_{nj} = 3; S_h = 52.55; Q_{hj} = 1; D_{hj} = 4; S_v = 18.24; Q_{vj} = 1.2; D_{vj} = 5. The norm of the drug for 100 injured soldiers with varying degrees of severity is calculated by the formula (12). N_{ji} = 142.1 l. for 100 victims. According to the form of release of the drug, the number of vials is 142.1 / 0.4 = 335.25 per 100 victims. Accordingly, the rate of the drug per victim is about 4 vials of solution for infusion of reopolyglucin (400 ml).

The norm of the drug for 10 beds of the profile department is calculated by the formula (13, 14). According to the results of the conducted research, the following indicators were established: D_n = 12; D_h = 19; D_v = 45; V = 16.82 beds, then N_{10} = 597.11. Consequently, the norm of the drug for 10 beds of the special department is 597 bottles.

If it is necessary to determine the norm of the drug per 1 doctor-specialist within specialized department, the calculation is carried out according to the formula (15). Under the condition of full-time staffing, 4 doctors-specialists for 20 beds of the special department are determined: N_{sp} = 119,42. Thus, the norm of the drug for 1 specialist doctor specialist unit is 119 vials.

Calculation of the norm of other drugs is carried out similarly to the corresponding formulas (12-15).

Norms, calculated in this way, based on the data of the structure and MP of victims with TAT, are theoretical and will coincide with real costs, provided that the need for funds for the purchase of medicines is realized at 100 percent.

CONCLUSIONS

The research presents the theoretical substantiation and practical solution of the scientific problem for improving the results of MP of the injured soldiers with TAT.

1. A comprehensive expert assessment methodology has been developed for the creation of a formulation list based on the questioning of doctors-specialists according to the specified parameters for each drug (effectiveness, safety and future use prospects), approaches to assess the qualitative composition and the limit values of the quantitative indicator of the working group experts ($11 \le n \le 28$) and their optimal value (n = 20) is established.

2. On the basis of the "cost of the disease" method, a method for assessing the cost of providing the treatment process for victims of TAT has been worked out. The method of conducting pharmacoeconomic analysis based on the cost-effectiveness method for the determination of cost-effective drugs is justified. On the basis of the expert assessment method, the efficiency indicators of each medicinal product (within $0 \le Ef \le 1$) were calculated and the most cost-effective drugs included in the formulation list were determined.

3. As a result of the complex study, the optimization of the formulation list for the MP of victims with TAT was conducted. According to the results of the research of the treatment and diagnostic process of the injured soldiers with TAT, an optimal form list in the amount of 89 medicines for the INN was selected. The method of valuation of medicines per one injured soldier with TAT, for 10 beds of the special department, the bed capacity of 1 bed of the profile branch, the norm of the preparation for 1 specialist doctor of the special department was developed.

REFERENCES

1. Brahma D., Marak M. & Wahlang J. (2012) Rational Use of Drugs and Irrational Drug Combinations. *The Internet Journal of* Pharmacology. Vol. 10., № 1. Retrieved from http://ispub.com/ijpharm/10/1/14081.Cochrane Library (2019). *Cochrane Reviews*. Retrieved from://www.cochranelibrary.com.
2. Ministry of Defense of Ukraine (2006) *Methodology for determining the integral rating assessment of military hospitals of the Ministry of Defense of Ukraine.* Kiyv: Research Institute of Problems of Military Medicine of the Armed Forces of Ukraine.
3. Ministry of Health (2010, October 28). *On Approval of Methodological Recommendations on Monitoring and Evaluation of the Efficiency of the Formular System at the Stage of its Implementation.* Retrieved from https://zakon.rada.gov.ua/rada/show/v0918282-10.
4. Ministry of Health (2018, May 10). *On approval of the tenth issue of the State Form of Medicines and ensuring its availability*. Retrieved from http://moz.gov.ua/article/ministry-mandates/nakaz-moz-ukraini-vid-10052018--868-pro-zatverdzhennja-desjatogo-vipusku-derzhavnogo-formuljara-likarskih-zasobiv-ta-zabezpechennja-jogo-dostupnosti.
5. Ministry of Health (2019). *Register of wholesale and retail prices for medicines.* Retrieved from http://moz.gov.ua/reestr-optovo-vidpusknih-cin-na-likarski-zasobi.
6. Ministry of Health (2019). *State Register of Drugs of Ukraine.* Retrieved from http://www.drlz.com.ua.
7. Shmatenko O. P., Prytula R. L., Prikhodko T. V., Solomennyi A. M. & Semenchenko G. B. (2012). *The procedure of licensing and circulation of narcotic drugs, psychotropic substances and precursors in the medical service of the Armed Forces of Ukraine: A manual for students of medical and pharmaceutical higher education institutions of III-IV accreditation levels*. Ch. 1. Kiyv: UMMA.
8. Solomennyi A. M. & Shmatenko O. P. (2013). *Method of formation of formular and insurance lists of medicinal products for the medical provision of thoracoabdominal trauma on the basis of expert evaluation in the military medical service.* Certificate of registration of copyright for the product № 52611.
9. Solomennyi A. M. (2014). *Card of primary medical documentation and key for data processing of primary medical records of victims with thoraco-abdominal trauma.* Certificate of registration of copyright for the product № 54249.
10. World Health Organization (2015). *WHO Drug Information*. Retrieved from https://www.who.int/medicines/publications/druginformation/en.

11. World Health Organization (2017, March). *WHO Model List of Essential Medicines (20th list).* Retrieved from https://apps.who.int/iris/bitstream/handle/10665/273826/EML-20-eng.pdf?ua=1.
12. Zarutsky Ya. L., Denisenko V. M., Zhovtonozhko O. I. … Savitsky O.F. *Method of anatomical evaluation of polytrauma.* (Patent № 61359). Retrieved from http://uapatents.com/6-61359-sposib-anatomichno-ocinki-politravm.html.
13. Zarutsky Ya. L., Denisenko V. M., Zhovtonozhko O. I. … Savitsky O.F. *Method of anatomical and functional evaluation of polytrauma.* (Patent № 61897). Retrieved from http://uapatents.com/4-61897-sposib-anatomo-funkcionalno-ocinki-politravm.html.