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- XI НАЦИОНАЛЬНЫЙ КОНГРЕСС С МЕЖДУНАРОДНЫМ УЧАСТИЕМ «РАЗВИТИЕ ФАРМАКОЭКОНОМИКИ И ФАРМАКОЭПИДЕМИОЛОГИИ В РОССИЙСКОЙ ФЕДЕРАЦИИ» – «ФАРМАКОЭКОНОМИКА 2017» 27-28 МАРТА 2017г., ЕКАТЕРИНБУРГ

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ATC/DDD METHODOLOGY FOR FORECASTING THE NEED FOR ANTIBACTERIAL DRUGS FOR THE TREATMENT OF PANCREONECROSIS

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Summary: *This article presents the results of the ATC/DDD analysis of the use of antibacterial drugs for the treatment of patients with pancreonecrosis in a hospital environment. The publication contains the necessary procedures for conducting research and main research results.*

Keywords: *ATC/DDD methodology, antibacterial therapy, pancreonecrosis, hospital expenses.*

Introduction. Patients with acute pancreatitis (AP) traditionally occupy third place after acute cholecystitis and appendicitis in the structure of main nosological forms. The growth of AP morbidity goes ahead of all other urgent abdominal diseases and according to the world statistics, ranges from 200 to 800 patients per 1 million population per year [1.2]. The development of AP in 20-25% of cases is destructive, and precisely this part of patients ensures high general and postoperative lethality. AP is pluricausal disease and determination of its development can be verified at 75-80% of patients [3].

Patients with pancreonecrosis, along with a hospital treatment, must receive antibiotic therapy (ABT) which a mandatory part of the treatment in the postoperative period. The selection of antibiotic therapy depends on the level of purulent-septic complications (PSC), antibiotic resistance, course and dose of antimicrobial drugs (AMD), and basic consumer properties.

Department of abdominal surgery GAUZ "Republican Clinical Hospital Ministry of health of the Republic of Tatarstan" (RCH MH RT) is a major regional treatment base for patients with pancreonecrosis. According to the statistics of GAUZ Republican Clinical Hospital of the MH of RT death rate from 2009 to 2014, also tends to increase, despite the decline in the number of hospitalized patients. This fact is explained by the increase in the number of surgical interventions and frequent development of early postoperative complications (fig. 1).

Despite the strained dynamics of the main indicators of acute destructive pancreatitis (ADP) for the past 5 years, the volume of funding for "medicines" in GAUZ RCH MH RT was reduced 3 times (fig. 2.).

International Association of pancreatologists has developed "The guidelines for surgical treatment of AP" in 2002. According to the second principle of the proposed elevens, the usage of broad-spectrum antibiotics reduces the frequency of infectious complications in patients with acute necrotising pancreatitis confirmed by CT, but may not increase survival.

According to the results of previous XYZ-analysis some antibacterial drugs, like Meronem, Ceftazidime, Amoxiclav, Vancomycin, Tienam, Amikacin, Metronidazole and others procured by medical organizations of RT have uneven, stochastic nature of consumption. It requires a search for evidence-based decisions about making forecasts of drug needs [4]. Due to the fact that, the forecast is not possible to implement at the regional level, it is proposed to do the calculation of needs at the level of the medical departments of health-care centres.

The purpose of the study is forecasting the needs of health-care centres in antibacterial drugs for treatment of patients with pancreonecrosis.

Material and methods. ATC/DDD methodology was used to calculate the need of antibacterial drugs at the medical departments of health-care centers as a standard research in drug statistics. DDD (Defined Daily Dose) - adopted by the average daily dose of the drug, used for the main indication in adults (with body weight 70 kg) [5].

The prescriptions were used as main source of information: 1150 case histories of patients with acute pancreatitis, 375 case histories of patients with pancreonecrosis, who received specialized medical assistance in a hospital during the period from 2009 to 2013 in the department of abdominal surgery in

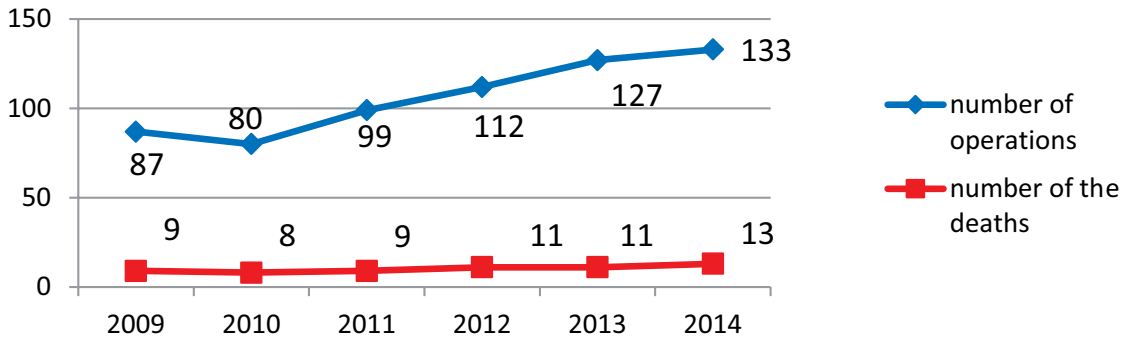

Figure 1. - Comparison of the number of operations and deaths diagnosed with acute destructive pancreatitis (ADP) in RCH MH RT in 2009-2014 years.

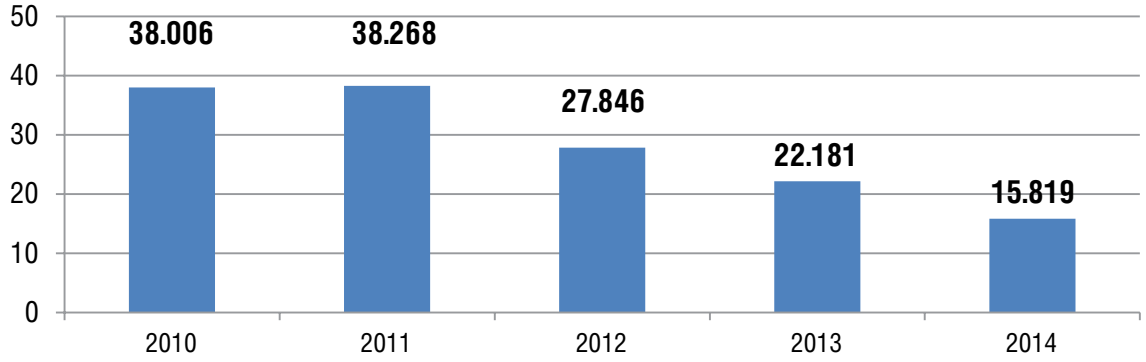

Figure 2.- Fnancing amount for "medicines" budget of GAUZ RCH MH RT, mln. rubles in 2010-2014 years.

GAUZ RCH MH RT, and medical histories of 102 patients with pancreonecrosis from Medical-Forensic Office MH RT. All cases that fit the criteria of inclusion (the diagnosis of "destructive pancreatitis") were analysed.

Results and discussion. The studies were conducted according to the following algorithm:

1. The search of DDD values for each antibacterial drug is based on Anatomical Therapeutic Chemical Classification and pharmaceutical form. DDD values for antibacterial drugs were taken in Russian clinical recommendations for diagnosis and treatment of acute pancreatitis;
2. Calculation of the prescription frequency for each antibacterial drug (m) was based on analysis of case histories of patients with pancreonecrosis;
3. Calculation of the average length of treatment for patient (t_i) in the current period;
4. Calculation of the need for treatment of one patient is made using the formula:

$$P_i = DDD_i \cdot t_i \cdot m$$

where P_i- is a need in antibacterial drug "i" per patient in physical terms (grams),

t_i-the average duration of treatment per patient during the accounting period (days),

m- Frequency of prescription for antibacterial drug "i".

5. prediction of the number of patients for each period by trend extrapolation;
6. calculation of need of antibacterial drug "i" per year:

$$P_{i\tilde{a}} = P_i \cdot N$$

where P_i- is a need in drug "i" per patient in physical terms (grams),

N is the number of patients in the accounting period.

The results of the calculations of the algorithm are presented in table 1.

Received natural indicators (g) were transferred to the number of antibacterial drugs packages, registered at the regional pharmaceutical market according to international generic names (INN) with the dosage and pack size. It was made for easy use of results forecast needs. The cost of antibacterial drugs is calculated for treating of patients with pancreonecrosis in the Department of abdominal surgery of GAUZ RCH MH RT for justifying the necessary budgetary allocations for health-care centers under the article "Drugs". Table 2 presents the minimum value of antibacterial drugs prices for the year for each INN.

Table 1 – Forecast for the need of antibacterial drugs, calculated with ATC/DDD methodology

Antibacterial drugs	DDD, g	Frequency of prescription (m)	The need for treatment for one patient (Pi), g	P per year, g
Amikacin vial 1.0	1	0,11	0,77	80,85
Amoxiclav vial 1.0	3	0,01	0,15	15,75
Vancomycin vial 1.0	2	0,13	3,64	382,2
Gentamicin vial 0.24	0,48	0,009	0,0173	1,8144
Meronem, vial 1.0	3	0,2	6	630
Metronidazole 0.005/ml100ml	1	0,09	0,63	66,15
Sulperazone, vial 2.0	6	0,23	12,42	1304,1
Tienam vial 1.0 (500mg/500 mg)	3	0,07	2,1	220,5
Cefazolin, vial 1.0	2	0,04	0,32	33,6
Cefixime 100 mg/5 ml 25 g	2	0,009	0,054	5,67
Cefoperazone, vial 1.0	6	0,07	1,26	132,3
Cefotaxime, vial 1.0	2	0,02	0,24	25,2
Ceftazidime, vial 2.0	4	0,07	3,08	323,4
Ceftriaxone vial 1.0	2	0,48	8,64	907,2
Ciprofloxacin vial 0.2	0,8	0,25	2,4	252

Conclusions:

1. The results of the study showed that the most cost-intensive drugs for hospital treatment in patients with pancreonecrosis are Meronem (meropenem), Tienam (imipenem + cilastatin), Sulperazone (cefoperazone+sulbactam).
2. Antibacterial drugs need prognosisCalculated during the ATC/DDD-analysis, indicates a significant dominance by volume in natural terms (g) of Sulperazone and Ceftriaxone.

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Table 2 – Minimal forecasted cost of treatment of patients with diagnosis destructive pancreatitis in the Department of abdominal surgery of RCH MH RT in Kazan

INN of antibacterial drug, DF	Trade name, dosage form, pack size	Manufacturer	A need of antibacterial drugs, in packages	Price per package, Rub.	Price per year, rub.
Amikacin	Amikacin 0.5 n50 vial powder for i.v, i.m.	Sintez AKOMPii, OJSC ("Sintez")	16,17	1129,37	18261,9129
Amoxicillin + [clavulanic acid]	Amoxiclav Powder for Solution for Injection 1000mg/200mg vial N5	Lek d.d./Sandoz GmbH	3,15	742,2	2337,93
Vancomycin	Vancomycin 1.0 N1 vial powder for solution for infusion. Krasfarma.	Krasfarma OJSC	382,2	194,04	74162,088
Gentamicin	Gentamicin 0.08/2 ml 2 ml N10 amp solution for i.v, i.m.	Krka d.d., Novo mesto, JSC	22,68	94,16	2135,5488
Meropenem	Meronem 1.0 N10 vial i.v.	Sumitomo Dainippon Pharma Co., Ltd. / astr	63	15273,39	962223,57
Metronidazole	Metronidazole (vial 500 mg - 100 ml)	Eskom Research and Production Company	132,3	12,29	1625,967
Cefoperazone+sulbactam	Sulperazone 2.0 vial powder for solution for i.v, i.m.	Pfizer İlaçları Ltd.Şti.	652,05	174,02	113469,741
Imipenem + cilastatin	Tienam powder for solution for infusion 500 mg/500 mg vials 20 ml (10), plastic contour packaging (pallets) - plastic trays covered with a polyethylene film	Pack.own. -Merck Sharp & Dohme b.v.- Netherlands; man. -Neopharmed s.r.l. - Italy	22,05	5 924,61	130637,6505
Cefazolin	Cefazolin 1000 vial powder for i.v, i.m. / Biosintez fabric	Biosintez OJSC	33,6	11,66	391,776
Cefixime	Ixime Lupin. powder for oral suspension 100 mg/5 ml vial. 25 g. (strawberry)	Lupin Ltd.	0,22	423,35	93,137
Cefoperazone	Cefoperazone-vial 1.0 N1 vial, powder for solution for i.v, i.m.	North China Pharmaceutical Corporation co., Ltd.	132,3	36,74	4860,702
Cefotaxime	Cefotaxime-LEKSVM powder For preparing solution for i.v, i.m. vial 1000 N1	Roz/Protek-svm	25,2	13,39	337,428
Ceftazidime	Ceftazidime vial N1 1.0 powder for solution for i.v, i.m.	Krasfarma OJSC	323,4	50,6	16364,04
Ceftriaxone	Ceftriaxone 1.0 vial for i.v, i.m.	Krasfarma OJSC	907,2	15,73	14270,256
Ciprofloxacin	Ciprofloxacin 0.002/ml 100 ml vial for infus.	Ahlcon Parenterals (India) Ltd	1260	16,61	20928,6