

ANTIBIOTHERAPY IN HOSPITAL – BETWEEN THE EFFICIENCY AND QUALITY OF MEDICAL SERVICES. THE ROLE OF THE DRUG COMMITTEE

LUCIA DAINA^{1*}, GHEORGHE CARP¹, CORINA NEAMȚU², ALINA VENTER¹, PETRU ARMEAN³

¹University of Oradea, Faculty of Medicine and Pharmacy, 10, 1 Decembrie Square, Oradea, Romania

²Clinical County Emergency Hospital Oradea, 37, Republicii Street, Oradea, Romania

³University of Medicine and Pharmacy "Carol Davila", 6, Traian Vuia Street, Bucharest, Romania

*corresponding author: lucidaina@gmail.com

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Abstract

This study represents an analysis regarding the role of the Drug Committee in controlling the intake of injectable antibiotics at hospital level. Prescribing excess antibiotics (sometimes unwarranted), not implementing antibioprophylactic and antibiotherapy protocols at the level of some hospital wards followed by increased costs represent some of the most poignant problems faced by hospital management. The intervention of the Drug Committee after an increase of 63.7% in prescribed antibiotics in May compared to January 2013 led to a decrease in injectable antibiotic prescriptions. Analysing the first two semesters of 2013 comparatively, the median value of antibiotic intake/patient has been reduced by 14.9% in the second semester compared to the first semester, while the quantitative intake of injectable antibiotics has also decreased by 5.4% in the second semester compared to the first semester. Even though there has been a reduction in the antibiotic intake at hospital level, there were no reported increases of nosocomial infections. Also, the second semester brought a decrease in the medium hospitalization time by 5.93% compared to the first semester. The responsible use of antibiotherapy at hospital level can be achieved through careful monitoring of qualitative indicators and responsabilizing doctors in regards to respecting therapeutic protocols.

Rezumat

Studiul de față reprezintă o analiză cu privire la rolul Comisiei Medicamentului în controlul consumului de antibiotice injectabile la nivelul spitalului. Prescrierea de antibiotice în exces, nejustificată uneori, neimplementarea protocoalelor de antibiopprofilaxie și antibioterapie la nivelul unor secții ale spitalului, urmate de costuri crescute, reprezintă una dintre cele mai spinoase probleme cu care se confruntă conducerea unui spital. Intervenția Comisiei Medicamentului după ce s-a constatat o creștere cu 63,7% a valorii antibioticelor prescrise în luna mai față de luna ianuarie 2013, a dus la o scădere a prescrierii de antibiotice injectabile. Analizând comparativ semestrul I cu semestrul II, 2013, s-a redus valoarea consumului mediu de antibiotice/bolnav tratat cu 14,9% în semestrul II față de semestrul I, și a scăzut consumul cantitativ de antibiotice injectabile cu 5,4% în semestrul II față de semestrul I. Cu toate că s-a redus consumul de antibiotice la nivelul spitalului, nu s-au înregistrat creșteri ale raportărilor de infecții nosocomiale. Deasemenea, în semestrul II a scăzut durata medie de spitalizare cu 5,93% față de semestrul I. Utilizarea responsabilă a antibioterapiei la nivelul spitalului poate fi realizată prin monitorizarea atentă a indicatorilor calitativi și prin responsabilizarea medicilor curanți în ceea ce privește respectarea protocoalelor terapeutice.

Keywords: Drug Committee, Injectable Antibiotics, Hospital, Costs, Intake

Introduction

The Drug Committee is the dynamic structure which constitutes the liaison between management, the medical body, the pharmacy, the financial office and the acquisitions office [8]. One of the complex attributions it is tasked with represents the monitoring of drug intake within hospital wards and complying with allocated budgets as well as monitoring the antibiotic intake [8].

National data regarding antibiotic intake at hospital level is relatively scarce, and for this reason a comparative analysis of this intake is limited [11].

The conclusions of the Rapport regarding Antibiotic Intake, Bacterial Resistance and Nosocomial Infections in Romania published in 2012 [5] mention excessive antibiotic intake, focusing on the wrong usage of antibiotics on a wide scale and the excessive intake reflected in a very high level of bacterial resistance [5-7, 9]. The probability that committed patients may receive an antibiotic is very high [1], estimating that 50% of antibiotic intake within hospitals may be unwarranted [4, 10, 12]. Respecting antibioprophylactic protocols, using hospital policies and guides regarding antibiotics

based on evidence, restrictive measures and consultations with infectious disease specialists, microbiologists and pharmacists are of the highest importance in establishing more adequate practices of antibiotic prescription, a decrease in surgical infections and the prevention of antibiotic resistance and cost increase. [2-4].

Materials and Methods

This retrospective and descriptive observational study based on quantitative research was undertaken at the Clinical County Emergency Hospital in Oradea spanning throughout the year 2013 and using the existent IT system of the hospital. The study was approved by the Ethics Commission of the hospital. The prescription and intake of injectable antibiotics within the hospital was analysed based on specialty types (Intensive Care Unit-ICU, Surgery, Medical) within monthly sessions of the Drug Committee.

Results and Discussion

One of the most important attributions of the Drug Committee is the constant verification of spending/intake for different drugs and their analysis together with a monthly report on the financial situation. Spanning from this attribution, a different intake of injectable antibiotics in wards of the same type or similar specialty, was observed reported to a similar number of beds.

The Clinical County Emergency Hospital in Oradea has 917 beds in its structure of which 6.5% belong to the Intensive Care Unit, 48.7% to the surgical wards and 44.9% to the medical wards.

From the 43613 patients released from hospital in 2013, 23477 patients (53.83%) were administered antibiotics, of which 19726 received injectable antibiotics and 3751 received oral antibiotics (Figure 1).

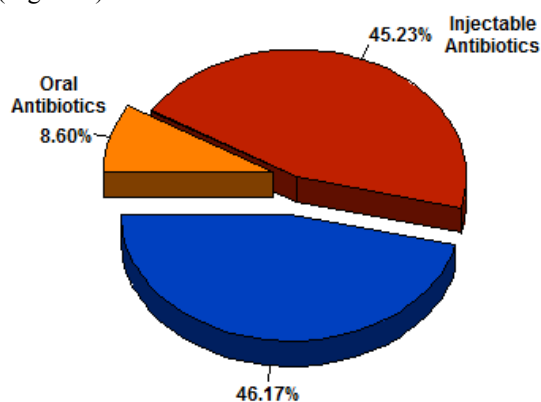


Figure 1.

Percentage of patients with antibiotherapy

Also, 8145 patients suffered modifications over the time of commitment to hospital to their type of

antibiotic and antibiotic intake. The prescription of antibiotics at hospital level (53.83%) is much higher than the national average (49.9%) and the European average of 35% [5]. The parenteral administration is more frequently used in the case of patients from our hospital than the European average (70.9%), this being a characteristic of the medical systems in which doctors have an exacerbated fear regarding patient evolution [5].

Within the Clinical County Emergency Hospital Oradea the injectable antibiotic intake represents almost 15% of the total drug consumption, while oral antibiotics represent only 6.37% of total antibiotic intake and 1.02% of total drug intake. There has been observed a continuous increase of the value of injectable antibiotics, leading to a value in May 2013 of 63.7% higher than in January, considering that the number of treated patients was 0.5% smaller (Figure 2).

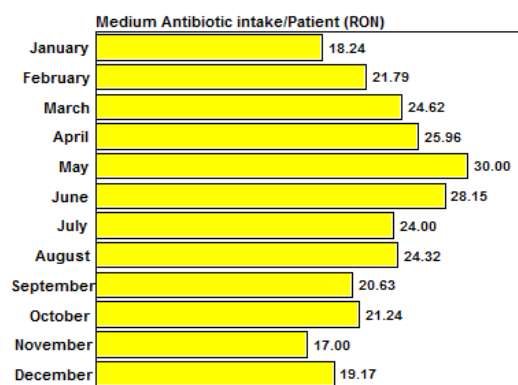


Figure 2.

The hospital-wide evolution of antibiotic intake/patient in 2013

Considering these conditions, the Drug Committee proposed both a qualitative and quantitative analysis of antibiotic intake. The medium intake value of antibiotics/patient was calculated along with the quantity of antibiotics/price classes and specialty types (Intensive Care Unit, Surgery, Medical). The largest increase was found within the Intensive Care Unit (83.2%), followed by the Medical wards (65.9%) and Surgical wards (52.9%) (Figure 3).

Hospital management then solicited the Drug Committee to propose solutions to control antibiotic intake. The following solutions were proposed as a result:

- informing Ward Coordinators (Ward Chief Doctors) regarding antibiotic intake within each ward and discussing these numbers in the Medical Council (which has the chief doctors as its members);
- approval of selected/prescribed antibiotics with high prices or a large action spectrum by the medical director. A favourable notice is given

only to those solicitations which are forwarded together with an antibiogram or, in its absence, a 48-hour approval for the prescribed antibiotic is given, after which, based on the antibiogram result, the therapeutic indication is revised. These decisions are made in real time, with the procedure not delaying proper treatment;

- revising antibioprophylaxis and therapeutic protocols at hospital level, together with their implementation on all hospital wards;
- monthly analysis of drug intake and standardized treatments as per existing medical protocols by the Drug Committee.

Following the committee's recommendations, a reduction in the medium intake value of antibiotics/patient was observed (14.9%) in the second semester compared to the first semester (21.10 RON compared to 24.80 RON). Within Intensive Care Unit wards the reduction was 12.9% (72.74 RON compared to 83.55 RON) while surgical wards presented with a decrease of 11.4% (11.59 RON compared to 13.07 RON) and medical wards with a decrease of 15.7% (11.37 RON compared to 13.49 RON). (Figures 2 and 3).

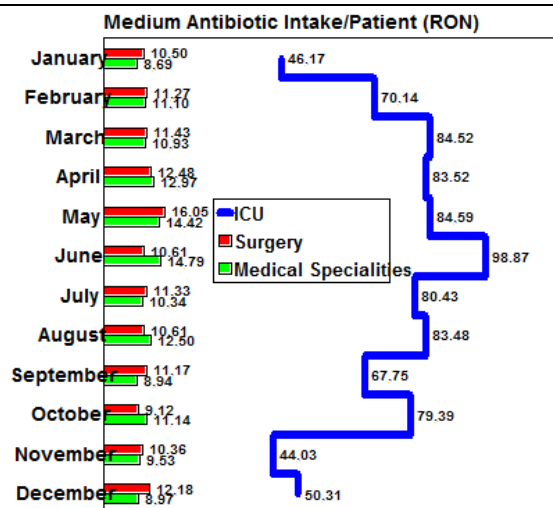


Figure 3.

The evolution of antibiotic intake/patient based on specialty types in 2013 (ICU = intense care unit)

Based on antibiotic subcategories as defined by ESAC-Net, the following intake levels were observed from the total injectable antibiotic intake of the hospital (Table I).

Table I

Proportion of injectable antibiotic intake based on antibiotic subcategories

Antibiotics			%
Cyclines (J01A)			0.04
Tigecycline	Tygacil® 50 mg		0.04
Beta-lactam antibacterials, Penicillins (J01C)			13.30
Beta-lactamase sensitive penicillins	Potasic penicillin	Penicillin 1 mil UI	1.11
Beta-lactamase resistant penicillins	Oxacillin	Oxacillin 1 gr	0.15
Broad spectrum penicillins	Ampicillin	Ampicillin 1 g	8.68
Combined penicillins including beta-lactamase inhibitors	Amoxicillin + Clavulanic Acid	Amoxiplus® 1.2 g	3.34
	Piperacillin +Tazobactam	Piperacillin/tazobactam 4 g/0.5 g	0.03
Other beta-lactams (cephalosporins and carbapenems) (J01D)			78.13
Type II Cephalosporins	Cefuroxime	Cefuroxima 1.5 g	3.91
Type III Cephalosporins	Ceftriaxone	Cefort® 1 g	70.33
	Cefoperazone	Cefozon® 1 g	3.09
	Ceftazidime	Ceftamil® 1 g	0.59
Carbapenems	Meropenem	Loditer® 1 g/meropenem Hospira® 1 g	0.08
	Ertapenem	Invanz® 1 g	0.06
	Imipenem	Imipenem/cilastatin 500 mg/500 mg	0.07
Quinolones (J01M)			2.94
	Ciprofloxacin	Ciprofloxacin/ciprinol® 100 mg/10 mL	2.54
	Moxifloxacin	Avelox® 400 mg/250 mL	0.35
	Levofloxacin	Levofloxacin 5 mg/mL	0.04
Macrolides și lincosamides (J01F)			1.55
Lincosamide	Clindamycin	Clindamycin® 300 mg/2 ml	1.55
Antibacterial Aminoglicosydes (J01G)			3.92
Aminoglicosydes	Gentamicin	Gentamicin 80 mg/2 mL	1.29
	Amikacin	Amikozid® 500 mg/2 mL	2.63
Other Antibacterials (J01)			0.15
Glycopeptide antibacterials	Vancomycin	Vancomycin 1000 mg	0.03
	Teicoplanin	Targocid® 400 mg	0.02
Polymyxins	Colimycin	Colistin® 1 mil	0.04
Other antibacterials	Linezolid	Zyvoxid® 2 mg/mL	0.06

The most utilized antibiotic was Cefort[®], representing 70.33% of the total antibiotics, followed by Ampicillin (8.68%), Cefuroxime (3.91%) and Amoxiplus[®] (3.34%). The unit price of these antibiotics does not go over 5 RON/therapeutic unit and the four types of

antibiotics mentioned above represent 87.26% from the total injectable antibiotics prescribed. The quantitative analysis of prescribed injectable antibiotics at the hospital level shows a decrease in the second half of the year (Table II).

Table II

Quantitative antibiotic intake (therapeutic units) based on unit price intervals and semesters in 2013

	≤ 50 RON	50.01-100 RON	> 100 RON	Total
Total				
Semester I	152.539	1.535	1.019	155.093
Semester II	145.196	1.148	18	146.762
Intensive Care Unit				
Semester I	23.075	900	92	24.567
Semester II	24.176	824	95	25.295
Surgical ward				
Semester I	84.001	249	56	84.506
Semester II	79.794	193	3	80.060
Medical ward				
Semester I	45.463	386	71	46.020
Semester II	41.226	131	0	41.407

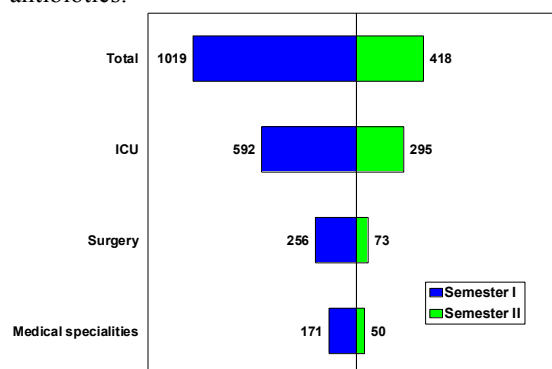
As a quantity, the antibiotic intake decreased by 5.4% in the second semester compared to the first semester, with the greatest reduction observed in the medical units (10%) followed by the surgical units (5.3%). The Intensive Care Unit quantities encountered a slight increase in antibiotic usage of 3%. Within these units, the quantitative intake of expensive antibiotics (unit price > 100 RON) decreased by 50.2% in the second semester compared to the first semester, while within the surgical units the drop was of 71.5% coupled with a 70.8% drop within medical units (Figure 4).

From the total therapeutic units of expensive antibiotics, the most utilized was Invanz[®] 1 g with 32.2% followed by Avelox[®] i.v. 400 mg (25.8%) and Targocid[®] 400 mg (25.1%).

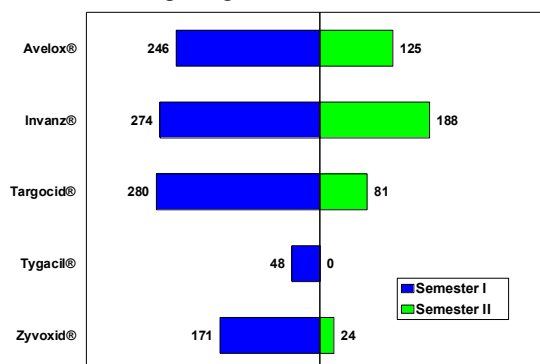
Compared to the first semester, the second semester presented with a 59% drop in the intake of expensive antibiotics, especially Tygacil[®], which was no longer used, and Zyvoxid[®], which dropped by 86% (Figure 5). These two antibiotics have a unit price between 170-200 RON. We need to state that both tigecycline and linezolid were available to the medical body with stocks in the hospital pharmacy, but they were no longer solicited as therapeutic alternatives. The definition of “expensive antibiotic” refers strictly to the unit price and does not suggest the idea of exclusion from therapy. The message conveyed is of a responsible coordination of antibiotic treatment regardless of unit price.

One of the most difficult problems encountered in hospitals is represented by nosocomial infections, which are a true barometer of manifesting microbial resistance to antibiotics. If in the past these were generated by germs which developed resistance to

more common antibiotics, lately we can identify that nosocomial infections spring from germs which developed resistance to broad spectrum antibiotics.

**Figure 4.**

Quantitative antibiotic intake priced > 100 RON/unit/patient based on specialty types in 2013, comparing the two semesters

**Figure 5.**

Therapeutic unit intake based on antibiotic types priced > 100 RON/unit/patient in 2013, comparing the two semesters

This aspect is an extra warning sign which warrants a greater responsibility in initializing and conducting antibiotic treatments. Although we are aware of the general tendency to under-report such

infections and our hospital uses a great percentage of antibiotics with a high resistance risk, our statistics for 2013 show a number of 102 declared patients affected by nosocomial infections (Table III).

Table III

Hospital-wide number of reported nosocomial infection cases in 2013

Wards	Total No. of Nosocomial Infections	Percentage	Nosocomial Infections Sem. I	Nosocomial Infections Sem. II
ICU	40	39.2%	23	17
Surgery	44	43.1%	27	17
Medical	18	17.7%	15	3
Total	102	100%	65	37

The decrease in reported cases in the second half of the year, during a period when monitoring antibiotic intake and treatment schemes was extremely thorough is considered to be encouraging.

From this perspective we perceive another important indicator, the duration of a patient's hospitalization. If in the first semester this (average) was 5.9 days, in the second semester the number has dropped to 5.55 days, which represents a 5.93% decrease. The therapeutic (drug) approach which was particularly anti-infections was not the only action strategy proposed by the Drug Committee. Together with the implementation of a responsible antibiotic administration strategy, the committee was also involved in creating a list of sanitary materials capable of sustaining the therapeutic act and contribute to the reasonable recovery time of patients. Assuring disposable sanitary materials in appropriate quantities represents one of the priorities of the Drug Committee.

The complete administration of the different facets of antibiotherapy also includes the laboratory for medical analysis. In this regard we can underline the harmonization of the list of hospital antibiotics with the solicitations for the antibiogram discs already available.

From the total patients with injectable antibiotherapy, 4149 patients (21.03%) have undergone an antibiogram of which 3883 for surgical pathology and 266 for medical pathology. In the first semester there were antibiograms undertaken for 20.37% of antibiotherapy patients, while in the second semester the number was 21.69%, sporting a 7.35% increase in the number of antibiograms. Within the same context we need to underline the fact that in the first semester of the year 2013 20.27% of patients changed their antibiotics class during the time of hospitalization while in the second semester this percentage dropped to 17.13%.

There were no reported aggravations of hospitalized cases, the number of codifications with a sepsis diagnosis dropping from 4.5% in the first semester to 3.41% in the second semester.

Rethinking antibiotic therapy and doubling it through a good stock of sanitary materials and a state-of-the-art medical laboratory will most assuredly contribute to the increased efficiency of the medical act.

As a result of the undertaken analysis, a number of recommendations for the Drug Committee were made at the beginning of 2014, as follows:

- establishing the necessary annual qualitative and quantitative antibiotic stock at hospital level so that there is an improved administration of hospital funding and a better prevention of polypragmasia and antibiotic resistance;
- monitoring prescriptions and updating recommendations for better prescriptions;
- following the therapeutic progresses and periodic modification of the drug list at the proposal of the medical body;
- using the solicitation form for introducing new selected antibiotics into therapy (generally expensive antibiotics);
- working together with the hospital laboratory for correlating acquired antibiogram discs with the antibiotic list;
- considering the hospital's financial resources in any undertaken actions.

Conclusions

Antibiotic intake at hospital level is much higher compared to the national average (49.9%) and the European average (35%).

Parenteral administration is more frequently used in the case of hospitalized patients in our hospital (84.02%) than the European average (70.9%).

The monthly analysis of antibiotic intake undertaken by the Drug Committee shows a continued increase in the number of injectable antibiotics, leading to the value corresponding to the month of May being 63.7% larger than the value observed in January, keeping in mind that the number of treated patients was 0.5% smaller.

Following Committee recommendations, the medium intake value of antibiotics/patient dropped by 14.9% in the second semester compared to the

first semester. As a quantity (therapeutic units), antibiotic intake decreased by 5.4% in the second semester compared to the first semester. Reducing antibiotic intake did not lead to a decrease in the quality of medical care or to an aggravation of the state of patients health; in the second semester of 2013 a smaller number of reported nosocomial infections was encountered (56.92%) together with a shorter medium hospitalization period (5.93%). The constant verification of spending/intake for drugs and their analysis by the Drug Committee as well as immediate intervention when a deficiency is noted is of vital importance. Permanent monitoring of antibiotic intake at hospital level will lead to more adequate prescription practices as well as the prevention of antibiotic resistance and a decrease in costs.

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