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ANTIBIOTHERAPY CONTROL PROGRAM - FUNCTIONALITY ASSESSMENT

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Abstract. Antibiotic Control Programs were recommended by World Health Organization in order to minimize microbial resistance, provide the best therapy for patients, at the lowest costs for the healthcare institutions. We assessed the functionality of the Antibiotic Control Program in the Emergency County Hospital Braşov, over a period of two years (2004 - 2005). **Method.** This is a prospective descriptive study, based on the consults' data, computed as daily entries into an excel table, by the infectious diseases specialist. **Results.** 670 infectious diseases consults were performed. 89% of the requests for therapy were for prescription of common antibiotics; approval of a restricted antibiotic represented 64% of the requests (p=0,0001). The direct communication between the physicians and the infectious diseases specialist was very good in 60% of the cases. This was significantly better with hematologists (82%) and internists (68%) than with intensivists (51%) or surgeons (51%); p<0,05. The adherence to the recommendations of the infectious diseases specialist was of 88%, 93% in the internal medicine department and 83% in the intensive care unit (p<0,05). The incidence of nosocomial infections was 26%. In 93 of the 124 patients (75%) with nosocomial infections, therapy with a restricted antibiotic was prescribed, but 17 of the patients died (14%). All of these patients benefited from therapy with at least one of the new antibiotics. **Conclusions.** The Antibiotherapy Control Program proved to be functioning successfully, in spite of the implementation difficulties in ICU and surgery. The program did in no way obstruct administration of ACP restricted antibiotics to patients with nosocomial infections.
Keywords: antibiotic restriction, communication, adherence

Introduction

An undisputable connection between antibiotics' prescription and the constantly increasing rate of microbial strains resistant to the most frequently used antibiotics, has already been demonstrated [1-6]. The emergence of microbial resistance to antibiotics in the community [7-9], as well as the fact that, due to globalization, countries no longer have frontiers to stop multi-drug resistant agents, all lead to the necessity for all countries to adhere to general policies for fighting against microbial resistance to antibiotics [10-12].

Since 2001, the World Health Organization has been recommending Antibiotherapy Control Programs (ACP) which: 1) provide optimum antibiotic therapy for patients based on the collaboration between the attending physician and the infectious diseases specialist; 2) minimize microbial resistance to antibiotics by restricting access to new antibiotics, yet without preventing timely administration of the latter in severe conditions, such as septic shock, meningitis, necrotizing fasciitis, nosocomial infections; 3) provide the best therapy for patients, at

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the lowest costs for the healthcare institutions.

The efficiency of antibiotherapy control programs is currently under assessment, worldwide. The most appropriate means of implementation of such programs are still to be determined. The large majority of the studies published to date prove the efficiency of these programs in minimizing the microbial resistance to antibiotics, in reducing the length of hospital stay and in cutting costs [13 -16] etc. The successful outcomes of antibiotherapy control programs depends on their functionality [17,18] within the given material and psychological conditions particular to each hospital.

Using the model of the microbial resistance control policies in use at the New York Presbyterian Hospital (NYPH), an Antibiotherapy Control Program (ACP) was implemented at the Clinic Emergency County Hospital Braşov in October 2003. The ACP is based on consult of the patient by the infectious diseases specialist, whenever the attending physician decides that a patient requires treatment with new antibiotics [19].

The purpose of this study is to assess the functionality of the Antibiotherapy Control Program in the Emergency County Hospital in Braşov, by comparison with hospitals in other European countries and to define functionality particularities in conditions specific to Romania.

Material and Method.

As of 01.01.2004, the Antibiotherapy Control Program was implemented in the Emergency County Hospital in Braşov. The results of the Program have been surveyed over a period of two years (1.01.2004 - 31.12.2005).

The Antibiotherapy Control Program observed the following protocol [19]:

A number of antibiotics have been restricted upon agreement. Prescription of these antibiotics requires consult with the infectious diseases specialist within 24 hours of the beginning of treatment. The hospital manager requires the attending physicians to fill out forms called "ACP charts" in order to have the prescribed new antibiotics released by the hospital pharmacy. The "ACP chart" contains data concerning: clinical diagnosis, prior antibiotherapy, arguments for the prescription of new antibiotics, doses and estimated duration of the treatment. The ACP chart is to be forwarded to the hospital pharmacy, which then immediately dispenses the required antibiotic. In the absence of the "ACP chart", the pharmacy denies release of the antibiotics included in the restricted list.

The names of the patients who are to be consulted by an ID specialist are listed in a special pharmacy register. Some of the physicians discuss their cases over the telephone with the consulting infectious diseases specialist.

Each day at 2 pm, the infectious diseases specialist collects the list of the patients who started therapy with ACP restricted antibiotics. She examines the patient and fills out the patient's record with conclusions as well as recommendations on the continuation or discontinuation of therapy with the restricted antibiotics prescribed by the attending physician. Even though the infectious diseases consult is mandatory, the ultimate decision belongs to the attending physician, the infectious diseases specialist's role being limited to consultancy.

The ACP functionality assessment is based on the consults' data, computed as daily entries into an excel table, by the infectious diseases specialist. The following data were monitored: patient name, observation record number, clinical department, infection severity degree, (low – non lethal, medium – non lethal, when appropriate antibiotherapy applied, severe – potentially lethal, irrespective of the antibiotherapy applied), presenting complaint: recommendations for antibiotherapy, approval of an ACP restricted antibiotic, establishing diagnosis; type of infectious diseases specialist's intervention: denial of new antibiotic therapy, introduction of antibiotic, change of initial antibiotic therapy, discontinuation of antibiotherapy, recommendations for bacteriology diagnosis and additional laboratory and imagistic diagnosis recommendations, assessment of compliance with recommended therapy, incidence of nosocomial infections; recordings of patient's death during hospitalization.

Statistic analysis.

Performed relying on Chi Square; $p< 0,05$ was considered significant.

Results

670 infectious diseases consults were performed over a period of two years, out of which 248 consults were requested within surgery departments (36%) and 86 consults, in the ICU (13%). The consult requests within the internal diseases departments amounted to 20% of the total consults (230/670 infectious diseases consults). Consults in cardiology, diabetes, nutritional diseases, hematology and in

various other services (nephro-dialysis, oncology, dermatology etc) each represented less than 10% of the consults performed over the two years span by the infectious diseases specialist.

The assessment of ACP functionality revealed the following (Table I):

Aspect surveyed	No. of consults/total number of consults (%)
1. Severity of the disease:	
• light	120/670 (18)
• medium	287/670 (43)
• severe	263/670 (39)
2. The reasons of infectious diseases specialist requested consult:	
• therapy	594/670 (89)
• diagnosis	432/670(64)
• approval of ACP antibiotic	312/670 (46)
3.Initiation of antibiotherapy by the infectious diseases specialist	
• yes	43/670 (6)
• no	627/670 (94)
4. Recommendations for further investigations	
• cultures	201/670 (30)
• analyses	175/670 (26)
• imagistic investigation	116/670 (17)
5. Recommendations on antibiotherapy	
• changes of therapy	251/483 (52)
• denial of ACP request	38/481 (8)
• discontinuation of antibiotic	103/670 (15)
• introducing GP	104/670 (16)
• introducing CP	58/670 (9)
6.Direct communication between attending physician and infectious diseases specialist	
• yes	404/670 (60)
• no	266/670 (40)
7. Compliance with recommendations of the infectious diseases specialist	
• yes	593/670 (88)
• no	77/670 (11)
8. Presence of NI	
• yes	124/484 (26)
• no	360/484 (74)
9. NI patients under therapy with ACP restricted antibiotic/total NI patients	93/124 (75)
10.Patient death, irrespective of cause of death	
• yes	56/484 (12)
• no	428/484 (88)
11. Deceased patients, diagnosed by the infectious diseases specialist with NI/total deceased patients	17/56 (30)
12. Deceased patients, diagnosed by the infectious diseases specialist with NI, under therapy with ACP restricted antibiotics/total deceased NI patients	17/17 (100)

Table 1 Aspects of ACP functionality

The majority of the patients consulted by the infectious diseases specialist (287/670, 43%) suffered from moderately severe diseases. 39% (263/670) of the requests involved severe infections, while the rest of 18% (120 patients) were not very ill.

In 594 cases (89%), the infectious diseases specialist's consult was requested for therapy, while in 432 cases (64%), for diagnostic purposes (in some of the cases, for both purposes) p<0,0001 (Figure 1). 312/670 consults (46%) were requested for approval of antibiotherapy with ACP restricted antibiotics.

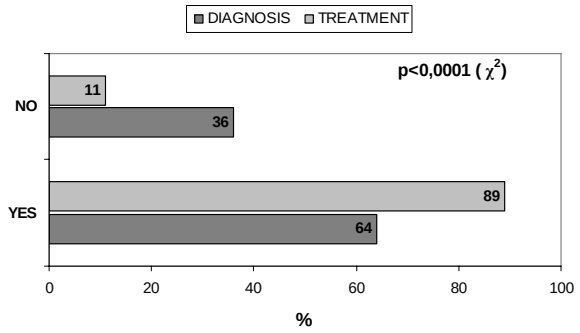

Figure 1. Reasons for infectious diseases consult requests

In 89% of the therapy requests, the attending physician requested recommendation of common antibiotics; the requests for approval of an ACP restricted antibiotic represented 64% of the requests (p=0,0001). (Figure 2)

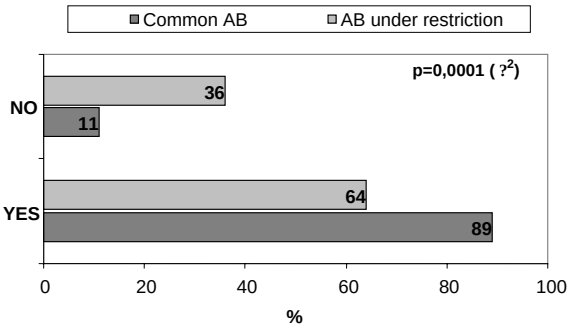

Figure 2. Consult of the infectious diseases specialist requested for antibiotherapy recommendations.
Note: AB – antibiotics

At the time of the infectious diseases consult, 94% of the patients were already under treatment with antibiotics; thus, the infectious diseases specialist initiated therapy in only 43 (6%) of the 670 patients consulted over a period of 2 years.

Recommendations for additional bacteriologic diagnosis were made in 201 patients (30%), for additional laboratory tests in 175 patients (26%) and for imagistic investigation in 116 patients (17%).

Changes in antibiotherapy were registered in 483 cases out of the total of 670 consults provided by the infectious diseases specialist. In 251 cases (52%), the infectious diseases specialist recommended change of antibiotherapy (type of antibiotic, doses or rhythm of administration). The infectious diseases specialist declared therapy with ACP restricted antibiotics as unnecessary in 38 out of the 481 patients already receiving antibiotic treatment (8%). She recommended discontinuation of antibiotherapy in 103 out of 670 patients (15%), treatment with Glycopeptides in 104 (16%) patients and Carbapenems in 58 (9%) of them.

Direct communication between the attending physician and the infectious diseases specialist was very good in 404 cases (60%). This was significantly better with hematologists (82%) compared to physicians in ICU (51%) or surgery (51%); p< 0,05 (Figure 3)

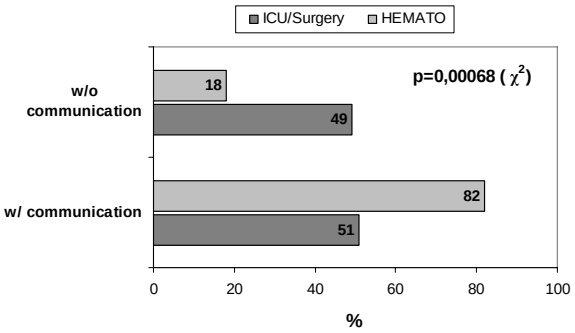

Figure 3. Comparative communication with the infectious diseases specialist: ICU/ Surgery and Hematology departments

Note: ICU – intensive care unit; Hemato – hematology; w/o – without; w – with

Direct communication was also significantly better with internal medicine specialists (68%) compared to communication with specialists in ICU (51%), or surgery (51%) (Figure 4), p< 0,05.

The adherence to the recommendations of the infectious diseases specialist was of 88% (593/670 cases). The only significant difference was registered in the internal medicine department (93% adherence) and the ICU (83% adherence), p<0,05, (Figure 5)

Nosocomial infections (NI) were registered in only 484 patients out of the 670 patients examined by the infectious diseases specialist over the two surveyed years. 124 NI were declared out of 484

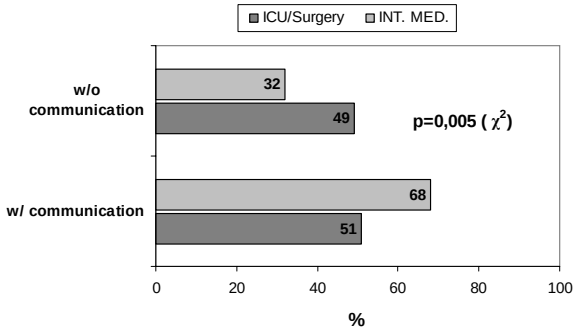

Figure 4. Comparative communication with the infectious diseases specialist: ICU/ Surgery and internal diseases services

Note: ICU – intensive care unit; INT.MED – Internal Medicine; w/o – without; w – with

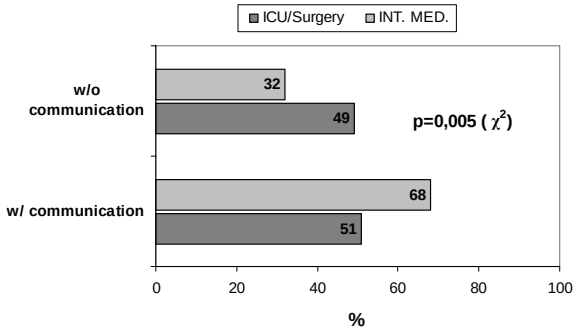

Figure 5. Adherence to recommendations of the infectious diseases specialist

Note: INT.MED – Internal Medicine; ICU – intensive care unit; w/o – without; w – with

consults performed. The incidence was of 26% in the patients for whom infectious diseases consult was requested. In 93 of the 124 patients (75%) diagnosed with NI by the infectious diseases specialist, therapy with an ACP restricted antibiotic was prescribed either by the infectious diseases specialist or by the attending physician.

The cases of death during hospitalization, irrespective of their cause, amount to 56 (12%) of the 484 patients surveyed. Of the 56 deceased patients, 17 (30%) had NI, even though there is no confirmation of this being the cause of death. Of the 124 patients with NI, 17 (14%) died. All of these patients benefited from therapy with at least one of the new antibiotics. The death rate was 3.5 in the patients suffering from NI, examined by the infectious diseases specialist.

Discussion:

Consequently to the decision of employing an infectious diseases specialist and introducing an ACP in the hospital, the infectious diseases specialist was requested to perform consults. 36% of the consults were in surgery departments and 13% in the hospital ICU. We would have expected a larger number of consults in the surgical departments and in the ICU, where nosocomial infections are more frequent and require new antibiotic treatment. An even higher reluctance to call in the infectious diseases specialist for consult was encountered in surgical departments and ICUs in other countries; the outcomes of similar studies reveal the following data: according to Lo's study [20], only 17% of the infectious diseases consults were performed in surgical departments and 5% in ICUs, while according to the study published by Tenenbaum [18], 20-35% of the consults were requested in surgery departments. The latter makes an appeal to the American Infectious Diseases Society to fight against the practice of depriving the patient of infectious diseases consults. The higher number of infectious diseases consults in the ICU revealed by our study by comparison with the Lo study, is probably related to the ACP itself, as to the regulations deeming the infectious diseases specialist's consult mandatory within the first 24 hours following introduction of a new antibiotic restricted by ACP.

The outcome of our study shows that the infectious diseases specialist was asked for consult mainly for recommendations concerning therapy with common, unrestricted antibiotics (89%). Therefore, we conclude that therapy restriction was not the main reason for consult requests. Our interpretation of the data is that physicians in other specialties perceived the infectious diseases specialist's consult as genuinely helpful. More than half of the 670 consults (64%) were beneficial for the patients in terms of recommendations for additional investigations in order to improve diagnosis.

Immediate initiation of antibiotherapy by the attending physician upon admittance of the patient, as was the case in 94% of the patients, and in the absence of culture data (as shown by a previous study, which proved an extremely low percentage of blood culture positivity – 7% in 3 years [21]), lead to therapeutic predicaments and to the necessity of requesting infectious diseases consults.

Change of therapy, in 52% of the cases (different choice of antibiotic, different doses or rhythm of administration), was the infectious diseases specialist's most frequent recommendation. Thus, the consults also represented indirect means of educating the

medical staff in antibiotics prescription.

Approval/denial of an ACP restricted antibiotic occurred in only 8% of the cases; antibiotic therapy discontinuation was recommended in fewer cases than expected (in 15% of the consulted patients). In our opinion, this may be explained by the absence of a bacteriology diagnosis: either the samples for bacteriological diagnosis were not taken before the initiation of antibiotherapy, or the cultures tested negative (due to well-known laboratory deficiencies). Therefore, in most cases, discontinuation of antibiotherapy, without sufficient arguments, or the de-escalation of therapy, were also considered to be a risk by the infectious diseases specialist.

Direct communication is essential for the proper functioning of the Antibiotherapy Control Programs. This relies on the trust acquired over time by the infectious diseases specialist in his relationship with his colleagues in other specialties. It also greatly depends on the degree of interest that the attending physicians take in their patients, on their availability, their frustration when faced with a restrictive program. Differences have been revealed [20] between private hospitals and public health care units, where communication and compliance with recommendations are concerned, all in favor of private hospitals. It appears that attending physicians prefer antibiotherapy restrictions by means of a digital or hand written form over consult by the infectious diseases specialists, according to a study conducted in a clinical health care facility in Oklahoma [16] or according to the ACP efficiency assessment conducted in the University Medical Center in Leiden [15].

According to the present study, communication was significantly better with internists and hematologists, compared to communication with ICU and surgery medical staffs. Communication was achieved either by face to face or telephone discussion of the case submitted for consult to the infectious diseases specialist. Significant differences of communication were registered between the various departments: 17% between internal medicine and ICU ($p< 0,05$) or internal medicine and surgery ($p<0,001$), 31% between hematology and ICU/surgery.

Adherence to the recommendations of the infectious diseases specialist was high in our survey, compared to other surveys: 88% vs. 46% in [18] or 80% in [20]. As for direct communication, adherence to recommendations was significantly higher in internal medicine departments (93%) compared to the ICU (83%), $p<0,05$. Similar difficulties concerning communication and improvement of adherence to recommendations were revealed by other surveys as well: [22,23]; the surgery departments, under the influence or even supervision of IC specialists, have the same approach to consulting infectious diseases specialists. According to Lo's survey, not even inverted telephone communication of the infectious diseases specialist's recommendations to the attending physician, or an accrued concern for explicit wording of the notes in the patient records, have proved efficient to improve adherence to the recommendations of the infectious diseases specialist. ICUs continue to be closed for the infectious diseases specialists, even after 20 years, as shown by a survey conducted in a health care facility in Virginia. [18]

The survey we have conducted does not assess ACP efficiency in microbial resistance. The positive impact of antibiotherapy control programs over bacterial resistance was surveyed by others. [23,24].

The incidence rate of nosocomial infections was very high in the patients examined by the infectious diseases specialists (26%). The prevalence rate of NI in the surveyed hospital, as reported by the NI Prevention and Control Team, was of 0,12% in 2004 and of 0,15% in 2005. NI prevalence in other countries is of 7-10%. High rate of NI in examined patients determined the prescription of new antibiotics in 75% of those diagnosed with NI. In 100% of the deaths of patients with NI, one or more antibiotics under restriction were prescribed or approved for prescription. Nosocomiality in patients examined by the infectious diseases specialists also accounts for the mortality rate of 3,5%, 1,8 times higher than the total mortality rate of the surveyed healthcare facility (1.91 in 2005).

Conclusions

1. The ACP and ID consults conferred the opportunity to identify the problems in antibiotic treatment practice and to educate the medical staff in antibiotics' prescription.

2. The requested approval of ACP restricted antibiotics was not the main reason of the ID consult. The Antibiotic Control Program did in no way obstruct administration of ACP restricted antibiotics to patients diagnosed with nosocomial infections. However, the death of the patients could not be prevented by the use of such antibiotics.

3. Communication and adherence to the rec-

ommendations of the infectious diseases specialist were very good, similar to the data revealed by international studies.

The ICU experienced difficulties in accepting the restrictive rules enforced by the ACP; communication and adherence to recommendations were significantly lower than in other services. Adjustment of the Antibiotic Control Program to the mentality of the medical community in our country, either by limiting antibiotherapy restrictions to the use of a handwritten or digital form, or by increasing the role of the chiefs of staff in the prescription of these antibiotics, may be beneficial to enhance the efficiency of the program in ICU and surgery.

4. The Antibiotherapy Control Program proved to be functioning successfully, in spite of the various implementation difficulties.

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