



# Infectious disease consultations and antibiotic usage in a Turkish university hospital

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## KEYWORDS

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## Summary

**Objectives:** The aim of this study was to investigate the various features of infectious disease (ID) consultations and the usage of antibiotics in a Turkish university hospital.  
**Methods:** A total of 395 consultation requests were recorded during a three-year period.

**Results:** The departments most frequently requesting the consultation services of the ID department were Orthopedics (29.6%), Neurology (18.5%), Cardiology (11.8%) and Internal Medicine (10.4%). The main reasons were for diagnosis of unexplained fever (42.3%) and for antibiotic modification according to culture results (18%). Diagnoses made by the ID consultant were pneumonia (16.7%), urinary tract infections (9.3%), bone and joint prosthesis infections (9.1%) and in 15.7% of the investigated patients, no infectious focus was determined. It was recognized that the use of antibiotics had already been initiated in the great majority of patients (67.1%) before the consultation request. While the current therapy was changed in 57.4% of these patients, antibiotics were not necessary for 9.8%.

**Conclusions:** Since the most common diagnoses were respiratory and urinary tract or bone and joint prosthesis infections, the ID specialists should have detailed knowledge of these problems. Usage of antibiotics without ID consultation was prevalent, therefore a continuous educational program is a necessity for healthcare workers in the hospital.

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## Introduction

The role of infectious disease (ID) specialists has recently changed in both community and university

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hospitals. In addition to the usual infectious diseases such as malaria, anthrax, brucellosis or HIV, incidences of nosocomial infections and infections of the immunocompromised patient have risen dramatically. The number of infections caused by new, re-emerging or drug-resistant pathogens is growing day by day, and the increased proportion of hospitalized patients with immunodeficiency has resulted in an increase of severe and invasive infections.<sup>1–4</sup> It has become apparent during the past decades that inclusion of an ID physician in the consultation process can favorably affect antibiotic usage and ID specialists have more recently played a leading role in instituting programs of antibiotic control.<sup>5,6</sup> In our hospital, up until 2003, there were no restriction policies and local guidelines for antibiotic prescription. In this study, we aimed to determine the purposes of consultations and the usage of antibiotics before and after ID consultation.

## Methods

Dokuz Eylül University Hospital is a 750-bed tertiary care university hospital in Izmir, Turkey. There has been an Infectious Diseases and Clinical Microbiology Department here since 1997. This department has an inpatient ward where the more usual infections are treated but also supports the other hospital wards as a consultation service. Four ID specialists perform consultations and the same team tracks patient progress on a daily basis until termination of the infectious problem. Intensive Care Unit (ICU) consultations were not included in the study, because infections in the ICU are followed routinely; during the study period the antimicrobial therapies of these patients were initiated by ID specialists.

A prospective study was designed to investigate the features of ID consultations in our hospital. The study period extended from 1 January 2000 to 31 December 2002. All consultations were recorded on a form, and the name, age, sex, hospital ward, antibiotic use, purpose of consultation and diagnosis of the patient were included.

Appropriate antimicrobial therapy was defined as the use of antibiotics that had in vitro activity against the infecting agents isolated or had clinically proven efficacy and that were given by an appropriate route and at adequate doses. Empiric antibiotic treatment was evaluated according to the patient's clinical condition, possible source of infection, and place of acquisition. We were not able to compare the antibiotics initiated before the consultation request with the recommendations of local guidelines, as no local guidelines for antibiotic

treatment were available in our hospital at the time of study.

## Results

During the study period, a total of 395 consultations were recorded; 121 of them were in the year 2000, 142 were in 2001 and 132 were in 2002. One hundred and sixty-eight patients were female (42.5%) and 227 were male (57.5%). The mean age of the patients was 54.66 (SD:  $\pm 19.29$ , range 12–98).

The departments requesting most consultations were Orthopedics (29.6%), Neurology (18.5%), Cardiology (11.8%) and Internal Medicine (10.4%). Departments referred to the ID service for consultations are shown in Table 1. The most common purposes for consultation were for diagnosis of unexplained fever (42.3%), antibiotic choice for bacterial pathogens identified in the patients' cultures (18.0%), and diagnosis and treatment of probable bone and joint prosthesis (8.4%) or surgical site infections (8.1%). The most common diagnoses achieved by the ID consultants in the investigated patients were pneumonia (16.7%), urinary tract infections (9.3%), infections of bone or joint prosthesis (9.1%), and surgical site infections (8.9%) while there was no determined infectious focus in 62 patients (15.7%). Of the cases diagnosed as pneumonia, 52 were nosocomial (13.2%) while the remainder were community-acquired cases (3.5%). When the relationship between the purpose of consultation and the diagnosis was considered it was recognized that the purpose and the final diagnosis were similar in most of the patients. The most common purposes of consultations and the diagnoses of these patients are shown in Tables 2 and 3.

It was recognized that microbiological cultures of 289 patients had been performed (73.2%) prior to

**Table 1** Departments referring to the Infectious Diseases service for consultation.

Departments	n (%)
Orthopedics	117 (29.6)
Neurology	73 (18.5)
Cardiology	47 (11.8)
Internal Medicine	41 (10.4)
Neurosurgery	23 (5.8)
Dermatology	18 (4.6)
General Surgery	14 (3.5)
Pulmonary Medicine	13 (3.4)
Ear Nose Throat Surgery	12 (3)
Cardiovascular Surgery	9 (2.4)
Others	28 (7)
Total	395 (100)

**Table 2** Most common purposes of Infectious Diseases service consultations.

Purpose	n (%)
Unexplained fever	167 (42.3)
Antibiotic selection	71 (18.0)
Prosthesis infection	33 (8.4)
Surgical site infection	32 (8.1)
Diarrhea	15 (3.8)
Urinary tract infection	15 (3.8)
CNS <sup>a</sup> infection	14 (3.5)
Soft tissue infection	14 (3.5)
Septic arthritis	7 (1.8)
Osteomyelitis	6 (1.5)
Febrile neutropenia	3 (0.8)

<sup>a</sup> CNS, central nervous system.

the consultations and empirical antibiotic therapy had been initiated in 265 (67.1%) of the patients at this time. The most commonly used antibiotics were ciprofloxacin (86 patients, 21.8% of all patients), ampicillin–sulbactam (64 patients, 16.2%), glycopeptides (46 patients, 11.6%), third-generation cephalosporins (45 patients, 11.4%), cefazolin (33 patients, 8.3%), carbapenems (30 patients, 7.6%) and aminoglycosides (30 patients, 7.6%). Antimicrobial therapy was prescribed as monotherapy in 125 of 265 (47.2%) patients and 140 (52.8%) patients had combined therapy with two or three drugs. Approximately 51% of usage of the antibiotics initiated before the consultation request was in surgical wards and the remainder was in the medical wards. Antibiotics initiated before ID consultations were discontinued in 26 patients (9.8%) since the use of

**Table 3** Most common diagnoses after consultation.

Diagnoses	n (%)
Pneumonia	66 (16.7)
Urinary tract infection	37 (9.3)
Infection of prosthesis	36 (9.1)
Surgical site infection	35 (8.9)
Cellulitis	20 (5)
Osteomyelitis	19 (4.8)
CNS <sup>a</sup> infection	15 (3.8)
Diabetic foot infection	12 (3)
Infective endocarditis	11 (2.8)
Gastroenteritis	8 (2)
Septic arthritis	7 (1.8)
Sepsis	6 (1.5)
Catheter infection	5 (1.3)
Intra-abdominal infection	4 (1)
Bacteremia	4 (1)
Neutropenic fever	3 (0.8)
Fungemia	2 (0.5)
No infection	62 (15.7)
Others	43 (11)

<sup>a</sup> CNS, central nervous system.

these antibiotics was unnecessary, and they were changed in 152 (57.4%) patients as they were found to be inappropriate or broader spectrum than necessary. Antibiotic modifications were more common in the surgical clinics (60.5%) than in the medical wards and the leading department was Orthopedics (39.4%). Details of antibiotic therapy are shown in Table 4. After the ID consultant's evaluation, the ratios of commonly used antibiotics were changed as follows: glycopeptides in 67 patients (17.0% of all patients), ciprofloxacin in 62 patients (15.7%), ampicillin–sulbactam in 27 patients (6.8%), third-generation cephalosporins in 30 patients (7.6%), cefazolin in one patient (0.2%), carbapenems in 16 patients (4.0%), and aminoglycosides in 42 patients (10.6%). Antibiotic use before and after consultation are given in Table 5.

## Discussion

Recently, the role of ID specialists has expanded in line with the increased proportion of immunodeficient and elderly patients in the hospital and the consequent increase in nosocomial infections. Non-specialist physicians can treat some infections, such as community-acquired pneumonia or urinary tract infections with certain algorithms, but most hospitalized patients have complex illnesses for which algorithms and guidelines are not available. Although many physicians are capable of diagnosing a great many infections, ID specialists are trained in making difficult diagnoses in the shortest possible time and with the smallest number of resources. ID specialists are frequently asked to assist in the care of patients presenting with atypical manifestations of common illnesses, fever of unknown origin, or progressive clinical deterioration despite aggressive medical care.<sup>5</sup> An experienced ID specialist can often decrease the use of expensive diagnostic tests, use outpatient antibiotic treatment and switch intravenous therapy to appropriate oral agents as early as possible.<sup>5–7</sup> Consultation by an ID practitioner for the care of bacteremia was found to reduce morbidity and mortality as well as reduce the total cost of care.<sup>6,8</sup>

In our country, Infectious Diseases and Clinical Microbiology is a specialty and Infectious Diseases and Clinical Microbiology specialists follow patients with traditional infections such as brucellosis, typhoid fever, malaria, and anthrax and have their own clinical microbiology laboratories. Additionally, ID specialists manage the infectious disease treatment of patients hospitalized in other hospital wards. Until February 2003, there was no antibiotic restriction policy in our hospital and every physician

**Table 4** Antimicrobial therapy modifications after consultations.

	Antibiotic modification				Total
	Changed <i>n</i> (%)	Not changed <i>n</i> (%)	Stopped <i>n</i> (%)	Initiated <i>n</i> (%)	
Previous antibiotic usage					
Yes	152 (57.4) <sup>*</sup>	87 (32.8) <sup>*</sup>	26 (9.8) <sup>*</sup>	0	265 (100)
No	0	47 (36) <sup>*</sup>	0	83 (64) <sup>*</sup>	130 (100)
Total	152	134	26	83	395

<sup>\*</sup> Row percentages.

could prescribe any antibiotic; misuse or overuse of antibiotics was common. Following the implementation of the restriction policy in 2003, prescription of broad-spectrum antimicrobial agents (such as carbapenems, glycopeptides, quinolones and some beta-lactam–beta-lactamase inhibitor combinations like piperacillin–tazobactam) was placed under the control of ID physicians. For this reason, the present article is of importance to demonstrate antibiotic usage without any restriction in a tertiary care hospital.

During the study period, it was determined that consultations were mainly requested by the Orthopedics, Neurology and Internal Medicine Departments, and that a patient's progress was followed until the end of antibiotic therapy or until the infectious problem had been solved. In some studies, authors have reported that an average of one or two follow-up visits after the first consultation may be optimal.<sup>1,9</sup> But we believe that more follow-up visits would be beneficial in order to allow full collaboration with physicians, especially with surgeons, to prevent inappropriate antibiotic usage and to ensure that all patients are followed until the infectious problems are solved.

The most common purposes of consultations in our study were diagnosis of unexplained fever (42.3%), antibiotic selection for bacterial pathogens identified (18.0%), diagnosis and therapy of probable bone and joint prosthesis (8.4%) and surgical site infections (8.1%). When the relationship between the purposes of consultations and the diagnoses of ID consultants was considered it was recognized that the purposes were a close fit with the diagnosis. In a study by Yinnon,<sup>1</sup> the most com-

mon purpose of consultations was antibiotic prescription (58%), which was similar to the result found by Manian and McKinsey (36%).<sup>10</sup> As there was no policy of antibiotic restriction until 2003 in our hospital, antibiotic prescription was not the most common purpose.

Sexton et al.,<sup>2</sup> found that microbiological diagnoses had been established at the time of consultation for 41% of patients. In a literature review of publications in English, we could find no other data concerning the numbers of microbiological cultures performed before consultation requests. In another study, it was determined that 16% of consultations were requested after significant laboratory results but the author did not mention the kinds of laboratory tests performed.<sup>1</sup> In our study, it was determined that microbiological cultures were performed in the majority of patients (73.2%) before the consultation. In most cases, clinicians have initiated the use of antibiotics empirically without considering the culture results and they have requested ID consultation in the case of protracted infections, treatment failure or development of complications. This situation has resulted in the delay of therapy and potential cost increases. Our study was not intended to perform an economic cost analysis so no data on cost savings are presented.

In our study, it was found that antimicrobial therapy was initiated in 265 of the patients (67.1%) before the consultation. It was noted that 67.2% of antimicrobial agents had been used inappropriately. Of the antibiotics initiated, 9.8% were found to have been unnecessary and were stopped, and the therapy was changed in 57.4% of patients because of suboptimal or incorrect antimicrobial

**Table 5** Most common antibiotics used before and after consultations.

Antibiotics	Before ID consultation <i>n</i> (%)	After ID consultation <i>n</i> (%)
Ciprofloxacin	86 (21.8)	62 (15.7)
Ampicillin–sulbactam	64 (16.2)	27 (6.8)
Glycopeptides	46 (11.6)	67 (17.0)
Third-generation cephalosporins	45 (11.4)	30 (7.6)
Cefazolin	33 (8.3)	1 (0.2)
Carbapenems	30 (7.6)	16 (4.0)
Aminoglycosides	30 (7.6)	42 (10.6)

usage. Regarding all consultations, therapy was changed or discontinued in 178 (45.1%) of the patients. Inappropriate usage of antibiotics was more frequent in the surgical wards. In our hospital, the level of incorrect antibiotic use was similar to that reported in other studies. For example, Yinnon<sup>1</sup> found that in 46% of consultations, a change of initial therapy or discontinuation of antibiotics was recommended. Wilkins et al.<sup>11</sup> found that for 41% of patients, the antibiotic therapy being received at the time of consultation was judged to be suboptimal. In a study performed by Sexton et al.,<sup>2</sup> a change in therapy was shown for 59–66% of their consultations. Byl et al.<sup>8</sup> showed that the proportion of appropriately treated patients was significantly higher for the group cared for by the ID specialists than for those cared for by other physicians. When the antibiotics used before and after ID consultation were taken into consideration, it was seen that there was an increase in the use of glycopeptides and aminoglycosides while the use of ciprofloxacin, ampicillin–sulbactam, carbapenem, ceftazidime, and third-generation cephalosporins was decreased. This increase in glycopeptide use was thought to be due to orthopedic infections caused by methicillin-resistant *Staphylococcus aureus*.

In conclusion, management of nosocomial infections, infections of the immunocompromised or elderly patients and infections due to multi-drug resistant pathogens is complex and difficult. Solution of these problems and the formation of the most effective, rational and cost-saving treatments could be made possible by the inclusion of ID specialists in treatment, as he or she has detailed knowledge of infectious diseases and their pathogens.

*Conflict of interest:* No conflict of interest to declare.

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