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Analysis of antimicrobial consumption and cost in a teaching hospital

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Summary
Background: The aim of this study is to compare the periods before and after the intervention applied using the ATC/DDD method in order to ascertain the rational use of antibiotics in a newly established hospital.
Method: The appropriateness of the hospital's antibiotic use, consumption rates and the costs were calculated and compared with other hospitals. Based on these data, an intervention has been planned in order to raise the quality of antibiotic use. The periods before and after the intervention were compared. Between 16 May 2011 and 23 May 2012, data were collected from all hospital units by the infectious diseases specialists and a point prevalence survey was conducted. Anatomical therapeutic chemical classification and the defined daily dose (DDD) methodology were used to calculate the antibiotic consumption.
Results: On two specific days in 2011 and 2012, 194 out of 307 patients (63.2%) and 224 out of 412 patients (54.4%) received antibiotic treatment, respectively. In 2011 and 2012, the percentage of appropriate antibiotic use was 51% and 64.3%, respectively. Both in 2011 and 2012, inappropriate antibiotic use was found to be significantly higher in surgical clinics in comparison to the internal diseases clinics and the ICU. This was caused by the high rates of inappropriate perioperative antimicrobial prophylaxis observed in surgical clinics. During both years, approximately one-third of the antibiotics were prescribed for the purposes of perioperative prophylaxis, while 88.5% and 43.7% of these, respectively, were inappropriate and unnecessary. Cephalosporins, fluoroquinolones, combinations of penicillins

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(including β-lactamase inhibitors) and carbapenems were the most frequently prescribed antibiotics during the study periods. The mean total antibiotic consumption was 93.6 DDD/100 bed-days and 63.1 DDD/100 bed-days, respectively. The cost of total antibacterial consumption was € 7901.33 for all the patients (€ 40.72 per infected patient) and € 6500.26 (€ 29.01 per infected patient), respectively.
Conclusion: Each hospital should follow and assess their antibiotic use expressed in DDD in order to compare their antibiotic use with national and international hospitals (WHO, 2009 [14]).

Introduction

The overuse of antimicrobial agents is a global problem. Several studies have demonstrated an overall increase in the rate of antimicrobial drug consumption over time. This widespread use of antimicrobial agents has been associated with increased healthcare costs and the emergence of bacterial resistance to these drugs [1—3]. Antibiotics are among the drugs associated with the highest costs worldwide and account for 20—30% of total drug expenditures [4,5]. The total expenditure on antimicrobials in Turkey in 2010 equaled 13.9% of all drug costs and ranked first in drug expenditures [5]. However, the majority of this consumption is considered to be unnecessary or inappropriate. Inappropriate antibiotic use is regarded as a common problem in Turkey [6].

Through rational antimicrobial use, healthcare costs can be reduced, and the quality of antimicrobial treatment can be improved. According to reports, 20—50% of antimicrobial use in hospitals is questionable or inappropriate [1,3]. These data highlight the importance of surveillance of antimicrobial use. To improve the quality of antimicrobial treatment and to reduce the related costs, several recent initiatives have encouraged hospitals to undertake surveillance of antimicrobial consumption patterns to evaluate the current situation [3,7].

Our aim was to compare antibiotic consumption rates, related costs and the appropriateness of antibiotic use between our hospital and national and international hospitals. In particular, the Anatomical Therapeutic Chemical/Defined Daily Dose (ATC/DDD) method was used to ascertain rational antibiotic use in a newly established hospital. We further aimed to compare the periods before and after an intervention planned to improve the quality of antibiotic use.

Methods

Hospital setting

Diyarbakir Teaching and Research Hospital is a 672 bed tertiary center with six intensive care units (ICUs), 10 medical units and eight surgical units. This center first admitted patients in 2010, and it serves as a referral hospital for Turkey's southeast region.

For the purposes of this study, data were collected from the medical (cardiology, gastroenterology, nephrology, internal medicine, infectious diseases, chest diseases, medical oncology, neurology, dermatology and psychiatry) and surgical (general surgery, cardiovascular surgery, neurosurgery, orthopedics, otorhinolaryngology, plastic surgery, thoracic surgery and urology) departments and the ICUs (anesthesiology and reanimation, neurosurgery, thoracic surgery, chest diseases, general surgery and neurology).

A cross-sectional study was planned to compare the periods before and after an intervention. More specifically, the point prevalence method was used in this study. Three separate teams, each consisting of an infectious diseases specialist and an infection control nurse, underwent training, and all clinics were surveyed by these teams from May 16, 2011, through May 23, 2012. All patients receiving antimicrobial treatment were included in the study, regardless of the indication. Patient files, nursing observation flow sheets and physicians' orders from each clinic were individually inspected for each patient. When necessary, the clinics' physicians and nurses were also consulted. The demographic characteristics, diagnoses, drugs, antimicrobial drug doses and dose ranges, microbiological and biochemical test results and radiological imaging findings of each patient receiving antimicrobial treatment were recorded on a pre-designed, standard form. Furthermore, to determine the duration of