Adherence to Guidelines on Empiric Use of Antibiotics in the Emergency Room

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Abstract
Background: In October 2002, guidelines for empiric antibiotics in emergency room (ER) were introduced.
Aims: To evaluate physician’s compliance with guidelines and their utility in improving patient care.
Methods: Reviewing charts of patients admitted to ER during October 4, 2004 to February 14, 2005 with suspected infection, subsequently hospitalized to internal medicine ward. Along with demographic data, the following parameters were recorded: Initiating antibiotics in ER, according-to-guidelines treatment (ATGT), lag-time between admittance and first antibiotic dose, diagnosis, proper coverage of pathogens by treatment (PCPT), and outcome.
Results: A total of 534 patients were admitted to ER with a suspected infection, 481 (90.1%) of them were managed according to guidelines, and from the 431 patients (80.7%) who received antibiotics, 381 (88.4%) were given ATGT. In 105 cases (19.7%), positive cultures (urine or blood) were obtained: 23.6% and 30.0% of the patients who received ATGT and not-ATGT, and the given antibiotic ensured proper coverage of the pathogen which grew in 73.3% and 46.7% of the cases, respectively. Percentages of good outcome (staying alive) for ATGT, non-ATGT, PCPT, and not-PCPT were 92.1%, 76.0%, 89.0%, and 69.0%, respectively. By multivariate analysis, early ATGT proved to be related to good outcome.
Conclusions: Physicians’ compliance with hospital guidelines to empiric antibiotics in ER was high. Adherence to guidelines was associated with a better outcome. Local susceptibility patterns to antibiotics need to be actively monitored. Prompt administration of antibiotics in the ER is likely to have a favorable outcome on survival, yet larger studies are required to establish this conclusively.

Introduction
Administering the most appropriate antibiotic for patients with serious bacterial infections improves the patient outcome, reduces unnecessary use of antibiotics that may contribute to the development of antimicrobial resistance, and reduces antimicrobial cost [1]. However, at the time that antibiotics need to be administered, the causal microorganism generally has yet to be identified. Therefore, antimicrobial treatment is usually initiated empirically. Timeliness of empiric therapy is also important, especially for critically ill patients, for whom inadequate or delayed therapy has been shown to be associated with adverse outcomes including death [2].

To guide the choice of appropriate empiric antibiotic regimens, recommendations for the most common bacterial infections have been published by various scientific societies. Although these guidelines are evidence based, there is less evidence to support that these guidelines, published by several international committees, are optimal for individual hospitals, where local antimicrobial sensitivity and resistance patterns may differ. Therefore, many hospitals have tried to implement strategies designed to optimize antibiotic use basing themselves largely on the published international guidelines but adapting them to meet local needs [1].

To improve medical therapy and outcome, reduce variability in treatment, and avoid delay in the initiation
of treatment, we introduced in our hospital guidelines for the empiric use of antimicrobials in the emergency room (ER) for patients with a suspected or documented diagnosis of bacterial infection. These guidelines were developed in particular for those patients admitted to the internal medicine wards or intensive care unit (ICU), using the update literature and local epidemiological data. Prior to the guidelines, we had observed that admitted ER patients often waited many hours before receiving their first dose of antibiotic on the ward or in the ICU, and we wished to correct this deficit by encouraging prompt administration of antibiotics in the ER.

The aims of the present study were: (1) to assess the extent of compliance of the ER physicians with the hospital guidelines; (2) to determine whether the hospital guidelines reflect the local bacterial susceptibility patterns; (3) to determine whether adherence to the hospital guidelines actually improves the patient outcome; and (4) to measure how long patients wait to receive their first dose of antibiotic in the ER and to determine whether there is an association between delay in treatment initiation and adverse outcome.

**Patients and Methods**

In this retrospective cohort study, the hospital records of all patients visiting the ER at the Haemek Medical Center, Afula, Israel, from October 4, 2004 to February 14, 2005, and who were subsequently admitted to one of the three internal medicine wards and to the general ICU with a suspected or documented “infectious disease process” (as prospectively categorized by the physician in charge at the ER), were reviewed in our survey. The survey was approved by the local Helsinki Committee.

The following demographic and clinical data were recorded: age, severity of illness (Charlson score), positive cultures, presence of catheter, time admitted to ER, clinical diagnosis, whether antibiotic treatment was initiated in the ER prior to hospitalization and if so, time of first antibiotic dose and name of antibiotic, and adherence to therapy guidelines. Adherence to guidelines was defined as the use of antimicrobial that was prescribed empirically in accordance with the clinical diagnosis and guideline recommendations at admission, and, in the case of a suspected viral infection or fever without a known or suspected focus of infection, the absence of antibiotic prescribing. Conversely, failure of adherence was defined as the prescribing of antibiotics not in accordance with the diagnosis and guidelines, or antibiotic prescribing in those patients with a suspected viral disease or non-infective process. Two members of the Infectious Diseases (ID) Unit at Haemek Medical Center independently reviewed the medical records of each patient to evaluate the level of adherence to guidelines of the attending ER physician. However, for the purpose of the study, the initial diagnosis of infection by the ER physician was accepted as is and was not reassessed. Blood cultures were taken from all patients and urine cultures were taken when urinary tract infection (UTI) was suspected. In those cases where a positive culture was obtained, the following additional information was recorded: species identification of bacteria cultured and in vitro susceptibility of bacteria to empiric therapy, or in other words, proper coverage of pathogen by treatment (PCPT) by the given therapy. In vitro susceptibility was determined using routine accepted methods according to the American Clinical Laboratory Standards Institute (CLSI) standards. The given treatment was defined as non-PCPT when the cultured bacterium was in vitro intermediate or resistant.

Patients’ outcome (survival at discharge or mortality while being hospitalized) was also recorded. Patients who died within 24 h from hospitalization were not included in the survey.

**Statistical Analysis**

Data analysis was performed using the SPSS 11.5 statistical package.

The association between categorical variables was examined using the Chi-square test.

Continuous variables were analyzed by Mann-Whitney test. A p-value of < 0.05 was considered to be statistically significant. All parameters on both groups (positive and negative outcomes) were compared using a univariate analysis. To neutralize possible confounders, all significantly different variables in the univariate analysis were included in a multivariate analysis, where positive outcome was the dependent variable.

**Results**

Between October 4, 2004 and February 14, 2005, 9,383 patients visited the ER of the Emek Medical Center in Afula; 3,583 (38%) were hospitalized. 534 of them (14.9%) were diagnosed as having a “suspected infectious disease process” and the medical records of these patients were reviewed. Figure 1 describes the guidelines for empiric antibiotic treatment in use at the ER, which were designed by the ID unit. Figures 2 and 3 summarize the study design, results, and outcome. The compliance of the ER physicians with hospital guidelines was high (Figure 2). A second purpose of the survey was to determine whether the choice of empiric antibiotic recommended in the hospital guidelines reflects in fact the local bacterial susceptibility patterns in patients with bacterial infections. Table 1 summarizes the pathogens grown in the 122 positive blood and urine cultures, and its susceptibility rates to empirically given antibiotic treatment. Bacteremia was found in 37 patients and bacteriuria in 85 (14 patients had both bacteremia and bacteriuria). *Escherichia coli* was the most frequent pathogen in both blood and urine cultures. Empiric antimicrobial therapy was given to 105 of 108 patients with positive cultures (Figure 3). Three patients were given antimicrobial therapy after the culture results were received. In 69 patients (65.7%), who received according-to-guidelines treatment (ATGT), the microorganism was in vitro susceptible to the given empiric therapy (PCPT).

The results showed a trend on the influence of PCPT on patient outcome (Figure 3); however, this trend was not significant when possible confounders (significantly different in the univariate analysis) were neutralized in the multivariate analysis. Among 105 patients, 9 (13.0%)