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Assessment of an intervention aimed at early discontinuation of intravenous antimicrobial therapy in a Brazilian University hospital

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ABSTRACT

Many interventions demonstrate success in adapting the duration of intravenous antibiotic therapy, but few studies have been conducted in developing countries. The aim of this study was to evaluate the effectiveness of an intervention in the induction of early discontinuation of intravenous antimicrobial therapy and/or its switch to oral therapy. The study employed a before–after intervention design that consisted of displaying a message in the computerized prescription on the third day and suspension of the prescription on the fifth day of intravenous antimicrobial therapy. A total of 465 patients were followed during the control period (CP) and 440 in the intervention period (IP). The intravenous therapy was switched to oral therapy for 11 (2.4%) patients during the CP and 25 (5.7%) in the IP ($p = 0.011$), and was discontinued for 82 (17.6%) patients during the CP and 106 (24.1%) in the IP ($p = 0.017$). During the IP there was a significant increase of patients who had their antimicrobial treatment discontinued before the seventh day of intravenous treatment, 37.40% (49/131) in the IP and 16.13% (15/93) in the CP ($p = 0.0005$). The duration of intravenous antimicrobial therapy decreased by one day, but it was not significant ($p = 0.136$). It is concluded that the proposed intervention is effective in promoting the early discontinuation of antimicrobial treatment and/or switch to oral therapy. As long as a computerized system for prescription already exists, it is easy and inexpensive to be implemented, especially in hospitals in developing countries.

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Introduction

Apart from causing therapeutic injury and unnecessary toxicity to the patient, the frequent use of inappropriate antimicrobials found in hospitals[1–5] generates increased costs and has a great impact on bacterial resistance.[6] The implementation of programs aiming to improve the use of antibiotics in hospitals is widely recommended, especially in developing countries.[7] However, problems such as scarcity of financial resources and poor infrastructure, deficiency of specialized training, lack of control over the supply and quality of antibiotics, poor hygiene, overcrowding, and cultural habits of physicians and patients hinder the implementation of these programs in developing countries.[8,9]

In Brazil and other developing countries, the availability and use of antimicrobials are poorly controlled, which further aggravates the problem of bacterial resistance.[10] On the other hand, because the public Unified Health System (SUS – *Sistema Unificado de Saúde*) is universal and free, health authorities are concerned with the proper use of antibiotics.[11–13]

Reassessment of antimicrobial therapy by the third day is a recommended measure in antimicrobial stewardship. At this time, the identification of microorganisms and their susceptibility allow targeted therapy, and clinical evaluation of the patient may lead to discontinuation, change in therapy duration, and/or switch to oral therapy.[14–17] Doctors have often ignored this revaluation due to several factors such as time constraint, change of the physician responsible for the patient during the first days of hospitalization, reluctance to change the empirical therapy in a patient who has shown satisfactory improvement, or even due to poor education.[18]

When correctly recommended, the switch from intravenous to oral therapy reduces the potential for complications due to the use of intravenous devices, the length of hospital stay, and hospital costs with the treatment.[19,20]Among the criteria for switching to oral therapy are improvement of clinical and hemodynamic status, ability to ingest drugs, and normal gastrointestinal function.[21–23]

A wide range of interventions with contributions by clinical pharmacists is described in the literature and demonstrating success in improving the prescription of antibiotics in hospitalized patients, especially in inducing the switch to oral therapy and decreased duration of intravenous therapy.[24–28] However, few studies have been conducted in developing countries and there is relatively little knowledge on effective strategies to improve antimicrobial use in this context.[7] The aim of this study was to evaluate the effectiveness of an easy to implement intervention in the induction of early discontinuation of intravenous antimicrobial therapy and/or its switch to oral therapy.

Methods

The present study adopted the historically controlled prospective model under the *before* and *after* an intervention type. It was conducted at the Clinical Hospital of the Federal University of Uberlândia (HCU, *Hospital de Clínicas de Uberlândia*), a public tertiary teaching hospital, holding 525 beds and entirely dedicated to SUS. The project for this study was approved by the Research Ethics Committee of the Federal University of Uberlândia (UFU, *Universidade Federal de Uberlândia*) under process number 379 467.

The HCU has a computerized prescription system that allows the exchange of information between the physician, clinical pharmacies, and the Hospital Infection Control Commission (CCIH, *Comissão de Controle de Infecção Hospitalar*). Among other functions, the system provides a daily list of patients who are initiating treatment with antimicrobials and only allows the prescription of these drugs when the physician fills in an "antimicrobial request form" in the system, justifying the need for its use.

Data collection and evaluations of the medical prescriptions and "antimicrobial request forms" were carried out by two researchers, a pharmacist and an infectious disease physician at the Hospital Infection Control Service (SCIH, *Serviço de Controle de Infecção Hospitalar*), in the control period (CP) – October and November 2013 – and in the intervention period (IP) – August and September 2014. The same methodology for data collection was used in both periods. All patients who initiated intravenous antibiotics during hospitalization in the 301 beds of the Medical and Surgical wards, in the adult Intensive Care Unit (ICU), and in the Emergency Room were consecutively followed until discharge, death, or for 60 days.

Patients who were already using intravenous antimicrobial on the first day of the study and those who were discharged or died in the first three days of intravenous antimicrobial therapy were excluded from evaluation. Patients who had their intravenous antimicrobial therapy discontinued or switched to oral before the third day of treatment were also excluded.

Intervention

Intervention consisted of messages on the patient's electronic prescription by the third day of intravenous treatment and suspension of antimicrobial prescribing by the fifth day of intravenous treatment. The physicians saw the message only on the fourth day of treatment, upon a new prescription. It pointed to the evaluation of possible appropriateness (targeted therapy), discontinuation of the antimicrobial treatment or switch to oral therapy in case the patient was hemodynamically stable, afebrile, presented clinical and leukocyte count improvement, and was able to ingest and/or absorb the antimicrobial. In case the third day of intravenous antimicrobial therapy occurred over the weekend or holiday, the message was displayed on the following business day.

Suspension of the antimicrobials prescription of by the pharmaceutical researcher was only conducted on the fifth day of treatment with intravenous antimicrobial. The suspension took into account predetermined criteria based on national and international protocols and data available on the local antimicrobial resistance. When necessary, the treating physicians were contacted by telephone for clarification of the patients' condition. To continue prescribing the suspended intravenous antimicrobial, the physician in charge for the patient had to fill in a computerized form justifying the continuation of the treatment. In case the fifth day of the injectable antimicrobial treatment occurred over the