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Implementation of a simple innovative system for postprescription antibiotic review based on computerized tools with shared access

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SUMMARY

Background: Controlling antibiotic use in healthcare establishments limits their consumption and the emergence of bacterial resistance.
Aim: To evaluate the efficiency of an innovative antibiotic stewardship strategy implemented over three years in a university hospital.
Methods: An antimicrobial multi-disciplinary team (AMT) [pharmacist, microbiologist and infectious disease specialist (IDS)] conducted a postprescription review. Specific coding of targeted antibiotics (including broad-spectrum β-lactams, glycopeptides, lipopeptides, fluoroquinolones and carbapenems) in the computerized physician order entry allowed recording of all new prescriptions. The data [patient, antibiotic(s), prescription start date, etc.] were registered on an AMT spreadsheet with shared access, where the microbiologist's opinion on the drug choice, based on available microbiology results, was entered. When the microbiologist and pharmacist did not approve the antibiotic prescribed, a same-day alert was generated and sent to the IDS. That alert led the IDS to re-evaluate the treatment.
Findings: From 2012 to 2014, 2106 targeted antibiotic prescriptions were reviewed. Among them, 389 (18.5%) generated an alert and 293 (13.9%) were re-evaluated by the IDS. Recommendations (mostly de-escalation or discontinuation) were necessary for 136 (46.4%) and the prescribers' acceptance rate was 97%. The estimated intervention time was <30 min/day for each AMT member. This system allowed correct use of targeted antibiotics for 91.8% of prescriptions, but had no significant impact on targeted antibiotic consumption.
Conclusion: This computerized, shared access, antibiotic stewardship strategy seems to be time saving, and effectively limited misuse of broad-spectrum antibiotics.
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Introduction

Excessive and inappropriate use of antibiotics has been identified as a leading cause of the emergence of bacterial resistance.[1] In France, multi-drug-resistant bacteria are responsible for more than 150,000 infections and 12,500 deaths each year.[2] Antimicrobial stewardship has been defined as the optimal selection, dose and duration of antimicrobial treatments that achieve the best clinical outcomes for treatment or prevention of infection, with minimal toxicity for the patient and minimal impact on subsequent resistance.[3]

In healthcare facilities, different stewardship programmes are used to improve the quality of antibiotic prescriptions.[4,5] Ideally, a multi-disciplinary team, composed of an infectious disease specialist (IDS), a microbiologist and a pharmacist, should provide support for better antimicrobial use.[6] As antibiotics are prescribed to 25% of patients in acute care institutions,[7] control of all antibiotic prescriptions is unrealistic unless advanced computerized systems generate automatic alerts.[8] Even then, it can be time consuming and most interventions have focused on specific antibiotic classes. Many previous interventions targeted broad-spectrum antibiotics, with the important aim of preserving their efficacy for infections caused by micro-organisms with few remaining therapeutic options [e.g. extended-spectrum β-lactamase (ESBL)- or carbapenemase-producing Enterobacteriaceae and meticillin-resistant *Staphylococcus aureus* (MRSA)].[9,10] Focusing the stewardship strategy on those antibiotics has many potential benefits, including reduction in rates of antibiotic resistance, avoidance of adverse events such as *Clostridium difficile* infection, reduction in costs and improved clinical outcomes.

In 2012, an antimicrobial multi-disciplinary team (AMT), comprised of a pharmacist, a microbiologist and an IDS, was established at the authors' hospital using a back-end (or postprescription) approach to stewardship. Antibiotic orders were reviewed by the AMT taking account of microbiological results and patients' medical charts. The approach focused on antibiotic de-escalation,[4,11] but it also allowed detection of prescription errors or prescription of ineffective antibiotics. The AMT used a computerized spreadsheet, with shared access, managed by the pharmacist who sends alerts to the IDS to review antibiotic treatment. To the authors' knowledge, such a simple time-saving tool, aimed at limiting bedside interventions, has not been described previously.

This study was undertaken three years after implementation to evaluate the impact of the hospital's stewardship programme on the prescription and consumption of targeted broad-spectrum antibiotics, and to assess the time commitment required of each AMT member.

Methods

Hospital setting

The study hospital is a disability referral centre for many patients with spinal cord injuries. These patients are subject to high antimicrobial exposure because they have a high rate of infections, especially urinary tract infections; they are also at increased risk of infection with multi-drug-resistant bacteria.[12–14] The hospital has 255 acute care beds (including intensive care) and 108 beds for rehabilitation, with approximately 8400 admissions annually. Average hospital stays are 6.9 days for acute care and 36.5 days for rehabilitation. Microbiological results are available for prescribers on a laboratory results server. All drugs are prescribed through a computerized physician order entry (CPOE) system (Phedra, S.I.B., Rennes, France). Resident junior doctors write most of the antibiotic prescriptions.

An anti-infective drug committee is responsible for monitoring antibiotic consumption, and promotes appropriate antimicrobial use through measures such as writing guidelines and providing educational sessions for prescribers. Microbiologists and pharmacists can advise on antimicrobial prescribing, but are not allowed to prescribe antibiotics and have no time specifically dedicated to antibiotic stewardship. Half of an IDS's working time is dedicated specifically to advising on and reviewing antibiotic prescriptions in all clinical departments; the IDS is the only AMT member to have access to patients' medical records.

Targeted antimicrobials

The list of targeted antimicrobials is given in Table A (see online supplementary material). Broadly, these are broad-spectrum antibiotics and antibiotics used to treat multi-drug-resistant Gram-positive and Gram-negative bacteria.

Computerized tool

In December 2011, the CPOE parameter setting for targeted antibiotics was changed. This modification made it mandatory for the prescriber to record, in a specific window, the indication of the antibiotic chosen on Day 1, and track its re-evaluation after Day 3, using a specific icon next to the prescribed medication. A specific computerized query was created that allowed daily extraction of all new targeted antibiotic prescriptions from the CPOE; these data were then imported into an Excel spreadsheet that could be accessed by all AMT members.

Prescriptions recorded

All prescriptions for therapeutic antibiotics lasting for at least one day in adult patients in four of the hospital's six departments (orthopaedic surgery, infectious diseases, medical nutrition, and the intensive care and rehabilitation units) were assessed; prescriptions for surgical or medical prophylaxis were excluded.

Data collection

From January 2012 to December 2014, the pharmacist recorded the following information for Day 1 on the spreadsheet: (1) patient's characteristics: name, age, weight; (2) hospital department; (3) antibiotic: name, posology, date of first administration, administration route; and (4) CPOE indication. The pharmacist first analysed the prescribed doses considering patient's weight and age, and also checked potential serious drug interactions. A message was sent to the prescriber via the CPOE when treatment was inconsistent with the Summary of Product Characteristics.

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