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Original article

Compliance with carbapenem guidelines in a university hospital

Évaluation du bon usage des carbapénèmes dans un centre hospitalier universitaire

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Abstract

Objective. – We aimed to evaluate carbapenem prescription compliance with guidelines for nosocomial and community-acquired infections.

Patients and methods. – We conducted a prospective study over a four-month period at our university hospital. We included all adult and pediatric hospitalized patients who had received at least one dose of carbapenem. Data was collected from patients' medical records (hard copy and computerized data; CristalLink software). Compliance with guidelines was assessed by two infectious disease specialists. Assessment criteria included indication, antibiotic choice, dosage, and treatment duration.

Results. – We included 152 patients in the study (65.4% of men). Carbapenem prescription was appropriate for 76.3% of prescriptions. The use of carbapenems was considered appropriate for 73.9% of empirical prescriptions and for 77.8% of documented prescriptions. Non-compliance with guidelines was mainly due to prescriptions for community-acquired infections. Antibiotic de-escalation could not be initiated in 40.3% of patients and was only initiated in 51.7% of patients for whom it could be considered. Although the average treatment duration was 7.5 days, 23.7% of patients received carbapenems for more than 10 days.

Conclusion. – These results highlight the need for a strong carbapenem stewardship program in our hospital.

Keywords: Carbapenems; Carbapenemases; Extended-spectrum beta-lactamase-producing Enterobacteriaceae

Résumé

Objectif. – Évaluer la conformité des prescriptions d'antibiotiques de la classe des carbapénèmes vis-à-vis des référentiels de prise en charge des infections nosocomiales et communautaires en milieu hospitalier.

Patients et méthodes. – Cette enquête prospective concernait tous les patients, adultes et enfants, hospitalisés dans notre établissement hospitalier et ayant reçu au moins une dose de carbapénème au cours de leur séjour, sur une période de quatre mois. Le recueil des données était réalisé à partir des dossiers patients sous format papier et informatisé (logiciel CristalLink). La conformité des prescriptions par rapport aux référentiels était évaluée par deux médecins infectiologues sur la base des critères suivants : indication, choix et modalités du traitement antibiotique.

Résultats. – Cent cinquante-deux patients ont été inclus dans l'étude, dont 65,4 % d'hommes. La décision d'instaurer une antibiothérapie par carbapénème était justifiée dans 76,3 % des cas. La prise en charge par carbapénème a été jugée conforme pour 73,9 % des prescriptions empiriques et pour 77,8 % des prescriptions documentées. La non-conformité de la prise en charge des infections par carbapénème était principalement liée à des prescriptions réalisées pour des infections communautaires. Une désescalade n'était pas envisageable chez 40,3 % des patients. Parmi les prescriptions pour lesquelles une désescalade pouvait être envisagée, elle n'a été réalisée que chez 51,7 % des patients. Malgré une durée moyenne de prescription de 7,5 jours, 23,7 % des patients ont reçu plus de 10 jours de traitement.

Conclusion. – Ces résultats imposent de renforcer le contrôle et d'améliorer la conformité des prescriptions de carbapénèmes.

Mots clés : Carbapénèmes ; Carbapénèmases ; Entérobactéries productrices de bêta-lactamases à spectre étendu

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1. Introduction

Carbapenems (CBPs) are a class of beta-lactam antibiotics. They originally derive from thienamycin. CBPs were first marketed in the 1980s. Three CBPs are still currently marketed; they are used for severe infections. Imipenem was the first CBP to be marketed and is now the most frequently prescribed CBP in France. Meropenem was marketed 10 years later and is mostly prescribed in other European countries and in North America. Ertapenem and doripenem were both marketed in the 2000s and are rarely used. Doripenem stopped to be marketed in August 2014. Gauzit et al. and Wolff et al. studied the main characteristics of CBPs, with a focus on their similarities and differences, and issued recommendations on a proper use of CBPs [1,2].

CBPs have increasingly been prescribed in hospital settings over the past years. This is due to the significant increase in the incidence of extended-spectrum beta-lactamases (ESBLs) – more than 200 ESBLs have so far been reported [1] – and to the many comorbidities presented by patients. Excessive CBP prescriptions increase antibiotic selective pressure and contribute to the emergence of multidrug-resistant bacteria. This may lead to patients being infected or colonized by these bacteria. The prevalence of carbapenem-resistant Enterobacteriaceae in France is low but a substantial increase in the number of reported cases has been observed over the past few years [3–5]. The first case of carbapenemase-producing Enterobacteriaceae was reported in 2005 and, in 2014, the French National Institute for Public Health Surveillance (French acronym InVS) reported 913 cases as well as a regional spread of carbapenem-resistant *Acinetobacter baumannii* cases [5,6]. Increased resistance to CBPs in healthcare facilities results in a lack of therapeutic strategies for critically ill patients. Those patients therefore have a poor prognosis as there is currently no new antibiotics [1,7,8].

In line with the 2002 memorandum and driven by the desire to improve the use of antibiotics in our university hospital, we set up an Anti-Infective Drugs Advisory Committee [9]. The members of the Committee are charged with encouraging and coordinating antibiotic stewardship in the hospital. They decided to evaluate the use of CBPs building on the French Infectious Diseases Society's (French acronym SPILF) Professional Practice Evaluation (EPP) model.

The aim of our study was to evaluate, in our hospital, compliance with guidelines for CBP prescriptions.

2. Methods

2.1. Study protocol

We conducted a prospective study in all pediatric and adult wards of a university hospital (2200 beds). The study took place over a four-month period (January 1st to April 30th, 2012).

2.2. Study population

We identified relevant patients through the hospital's prescription software or through the database of the hospital's computerized pharmacy for the intensive care units (ICU). We included all pediatric and adult hospitalized patients who received at least one dose of CBP.

2.3. Data collection and treatment evaluation

A medical investigator collected the data using the same survey form as the one used for the SPA-Carb survey [10]. We used the same method and collected clinical data from patients' records – hard copies and computerized data – (CristalLink software, Regional Center for Hospital Data Processing – Alpes, Grenoble, France) as well as from prescribers' anamnesis. Collected data included demographic data, hospitalization ward, medical history in the three months prior to hospitalization (any other hospitalization or antibiotics received), antibiotics prescribed from admission to the first dose of CBP received.

With regard to CBP treatment, we recorded the prescribed CBP (agent, dosing regimen, route of administration, and treatment duration), the type and site of infection, the prescription type (empirical or documented), the reasons for the antibiotic choice and/or for treatment discontinuation, and any written notes (indication, re-evaluation 48–72 hours and then 7–10 days after initiation, expected treatment duration). Prescription choice was based on the criteria indicated in the 5th appendix of the SPA-Carb guide.

Two infectious disease specialists reviewed the patients' data collection forms. They evaluated CBP prescription compliance with the agents' marketing authorizations and local guidelines.

Treatment compliance was assessed based on the following criteria:

- relevance of CBP prescription in terms of indication;
- choice of a CBP before receiving the result of the drug susceptibility testing (empirical prescription);
- choice of a CBP after receiving the result of the drug susceptibility testing (documented prescription);
- was antibiotic de-escalation initiated whenever possible?
- treatment modalities: route of administration, dosing regimen, and treatment duration.

2.4. Analysis methods

Statistical analyses were performed with the Statview 6.0 software. We performed a descriptive analysis of the whole study population and focused on socio-demographic and clinical variables. Prescription compliance was assessed as a percentage and an exact 95% confidence interval.

3. Results

3.1. Population characteristics

We included 152 patients during the study period (an average of 38 patients per month). A single patient could be treated with several prescriptions. We analyzed 156 prescriptions made in 10