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Short communication

Hospital-acquired infections documented by repeated annual prevalence surveys over 15 years

Évolution des infections nosocomiales mesurée par enquêtes de prévalence annuelles sur 15 ans

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Abstract

Objective. – To estimate the benefits of iterative prevalence surveys in detecting trends of hospital-acquired infections (HAIs).

Methods. – On the basis of the French protocol for national prevalence studies, HAI data of 15 consecutive annual surveys performed at the same period by the same group of investigators was gathered in a single database to describe the trend of HAIs in a University Hospital over a 15-year period.

Results. – A total of 20,401 patients were included. Overall, the prevalence of patients presenting with at least one HAI acquired in our University Hospital was 5.1% [95% CI, 4.8–5.4%]. The prevalence of HAIs and antimicrobial drug use significantly decreased over time ($P < 0.01$).

Conclusion. – Despite limitations, repeated prevalence surveys can be a useful tool for promoting control measures to better prevent HAIs.

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Keywords: Hospital-acquired infection; Prevalence study; Survey

Résumé

Objectif. – Évaluer l'intérêt d'enquêtes de prévalence répétées dans le temps pour suivre l'épidémiologie des infections nosocomiales (IN) à l'échelle d'un établissement.

Méthodes. – Les données de 15 années de surveillance, réalisées chaque année selon le protocole national d'enquêtes de prévalence par le même groupe d'enquêteurs, ont été regroupées dans une base de données afin de décrire les tendances des infections nosocomiales d'un centre hospitalo-universitaire.

Résultats. – Au total, 20 401 patients ont été inclus dans l'étude. La prévalence des patients ayant au moins une IN acquise dans notre établissement était de 5,1 % [IC à 95 %, 4,8–5,4 %]. La prévalence des IN et de l'utilisation des anti-infectieux a diminué significativement au cours du temps ($p < 0,01$).

Conclusion. – Malgré quelques limites, les enquêtes de prévalence répétées dans le temps peuvent être un outil intéressant pour suivre les efforts visant à mieux prévenir les infections nosocomiales.

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Mots clés : Infection nosocomiale ; Enquête de prévalence ; Surveillance

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1. Introduction

Hospital-acquired infections (HAIs) are a major public health concern worldwide. Surveillance activities are important for monitoring effort in infection control. However, incidence surveys are time-consuming, labor-intensive and expensive [1]. Prevalence surveys, although only providing a snapshot of the frequency of HAIs, represent a cost-effective alternative to prospective incidence studies, notably at the facility level. The French surveillance program [2] includes national prevalence surveys that are repeated every 5–6 years (1996, 2001, 2006 and 2012). In the University Hospital of Saint-Étienne, France, prevalence surveys were performed each year by the same investigator team. The aim of this work was to evaluate the infection control effort of this long-term surveillance by yearly prevalence surveys through the dynamic evolution of HAIs and to describe the trend of antimicrobial drug usage over a 15-year period (1998–2012).

2. Methods

2.1. Study design and setting

In our hospital, a regional referral center with 1600 beds, a prevalence survey of HAIs [3] is performed in April/May of each year on a routine workday by the same investigator team including practitioners and nurses working in the field of microbiology, hygiene, occupational health, pharmacy and infection control. The methodology was previously described [4]. The definitions used for the characterization of HAIs were those proposed by the French Technical Committee for Nosocomial Infection (French acronym CCLIN) [3].

2.2. Data sources/measurement

The study included the 15 consecutive surveys conducted in April/May of each year from 1998 to 2012. The variables recorded were age, sex, hospitalization in the intensive care unit, surgery the month preceding the survey, peripheral or central venous catheter, urinary catheter, mechanical ventilation, antimicrobial drug use and indications, presence/type/site of HAIs and microorganisms responsible for these infections. Colonizations of the urinary tract were excluded [3] and HAIs were recorded according to their origin: acquired in our hospital represented with the variable “HAIs” in the table, or imported from another hospital.

2.3. Data analysis and statistical methods

Statistical analysis was performed using SPSS (20.0, Chicago, Illinois). Data was first described, and results of com-

parison tests were considered significant with a P value < 0.05 . Trends of HAIs acquired in our hospital were analyzed using a logistic regression adjusted on age, sex, presence of medical device, surgery and admission unit. Patients admitted to long stay units were excluded from the model thus ensuring the independence of individuals. Independent variables associated with HAIs with a P value < 0.15 in univariate analysis were included in the multivariate model using the backward method. Finally, a P value < 0.05 was considered significant. Trends of methicillin resistant *Staphylococcus aureus* (MRSA) infections and antimicrobial use were analyzed using the same method.

3. Results

A total of 20,401 patients were included in the 15 consecutive prevalence surveys. The characteristics of patients included in each survey are detailed in Table 1. The demographics of patients, the recent surgery history and the proportion of admission to the intensive care unit were stable over the study period.

A total of 1389 HAIs were recorded among 1293 patients. The prevalence of patients presenting with at least one infection acquired in the University Hospital of Saint-Étienne and in another hospital was 5.1% [95% CI, 4.8–5.4] and 1.4% [95% CI, 1.3–1.6], respectively. The trend of HAIs acquired in other facilities did not change over the study period.

Overall, 1133 HAIs acquired in our hospital were recorded among 1039 patients. Urinary tract infections were the most prevalent HAIs (20%), followed by surgical site (19%) and pulmonary tract infections (15%). The prevalence of HAIs acquired in our hospital gradually decreased from 6.6% in 1998 to 4.4% in 2012 ($P < 0.01$). In multivariate analysis and after excluding patients admitted to long stay units, significant risk factors for HAI acquired in our hospital were male sex ($OR = 1.15$, [95% CI, 1.02–1.35]), age > 45 years (46–65 years ($OR = 1.86$, [95% CI, 1.45–2.40]); 66–85 years ($OR = 2.43$, [95% CI, 1.93–3.08]); > 85 years ($OR = 3.45$, [95% CI, 2.63–4.54]), hospitalization in an intensive care unit ($OR = 1.31$, [95% CI, 1.01–1.84]), surgery in the month preceding the prevalence survey ($OR = 1.89$, [95% CI, 1.63–2.13]), presence of a central venous catheter ($OR = 3.54$, [95% CI, 2.92–4.27]), mechanical ventilation ($OR = 1.35$, [95% CI, 1.01–1.85]), and urinary catheter ($OR = 1.92$ [95% CI, 1.62–2.26]). The trend of HAIs significantly decreased over the years with a year-to-year OR of 0.93 (year reference: 1998) [95% CI, 0.90–0.95]. The prevalence of patients infected with MRSA decreased from 0.8% in 1998 (12 patients) to 0.3% in 2012 (5 patients) with an OR of 0.89 [95% CI, 0.85–0.94] ($P < 0.01$).

At the time of the prevalence surveys, 4126 patients (20.2% [95% CI, 19.7–20.8]) received an antimicrobial treatment. The use of antimicrobial drugs for HAIs decreased significantly (year to year OR : 0.97 [95% CI, 0.95–0.98], $P < 0.01$).

4. Discussion

This work is one of the longest studies investigating the value of repeated prevalence studies as an epidemiological tool for analyzing the burden of hospital-acquired infections over time. It provided arguments for a downward trend of HAIs in our

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