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ORIGINAL ARTICLE

Demography and burden of care associated with patients readmitted for urinary tract infection☆

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Background: Urinary tract infection (UTI) is one of the most prevalent admission diagnoses in hospital-based clinical practice. Despite its frequency, few data are available regarding its demographics and economic implications.
Purpose: To describe the demography, epidemiology, and burden of care of patients admitted to hospital with UTI and compare these characteristics depending on admission status.
Methods: A retrospective cohort study using an administrative database of patients admitted to Hartford Hospital (September 2011–August 2012) with UTI. Patient demographics, hospital characteristics, and total costs of care were examined.
Results: A total of 2345 unique patients were included. The mean age of the patients was 78 years and 71% were female. Median length of stay and total cost were 5 days and $8326 (interquartile range $5388–$14,179), respectively. A total of 359 patients (16.4%) were readmitted within 30 days, of which 111 patients (5.1%) had UTI on readmission. Only 16.3% of readmitted patients were infected with the same causative pathogen. A significant increase in the incidence of *Enterococcus faecalis* (1.2% vs. 9.3%; $p = 0.046$) occurred upon readmission, whereas occurrence of Enterobacteriaceae infection decreased in the readmission group (50.0% vs. 25.6%; $p = 0.006$), including a lower proportion of *Escherichia coli* (32.5% vs. 11.6%; $p < 0.001$). A higher proportion of readmission pathogens were nonsusceptible, including significant changes to cefazolin (24.4% vs. 63.6%; $p = 0.004$) and cefepime (8.7% vs. 27.6; $p = 0.05$).

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Conclusion: UTI is highly prevalent and is associated with significant utilization of health-care resources among hospitalized patients. These findings, coupled with considerable rates of 30-day readmission, stress the importance of proper diagnosis and treatment.

Introduction

Urinary tract infection (UTI) is one of the most common diagnoses in patients admitted to hospitals. UTI accounts for nearly 1 million emergency department visits and over 100,000 hospital admissions annually in the United States.[1] In addition, UTI is estimated to cost $3.5 billion to the health-care system, a significant financial burden.[2] Despite the sizeable prevalence, data on the demography, uropathogen distribution, and burden of care of patients hospitalized with UTI are scarce. Because of the array of potential causative organisms, hospitalized patients often require use of broad-spectrum antibiotics empirically, generating higher rates of antimicrobial resistance.[3] Furthermore, due to UTI frequency and the aging population, readmissions to hospital are plentiful. Given the evolving health-care reimbursement process linking quality of care to payment in many disease states, it appears paramount to gain an appreciation for the consequences of this resource-demanding infection.

Hospital readmissions in the UTI population may be related to a number of factors, including failure of antimicrobial therapy, reoccurrence of infection, or unplanned or unrelated issues, among others. Because of this complexity, we sought to identify trends and relationships between demographics, epidemiology, and treatment, across admissions of patients readmitted to hospital with UTI. Through the identification of areas of potential improvement and future study in the management of patients with UTI, quality of care and consistency can ultimately be improved.

Methods

Study patients and design

We retrospectively studied the demographic, microbiologic, and economic attributes of patients admitted to Hartford Hospital (CT, USA) with a diagnosis of UTI on admission ($\leq$48 hours). The study included adult patients (aged $>$18 years) identified from an administrative database using International Classification of Diseases 9th Edition Clinical Modification code (ICD-9-CM) 599.0 in the primary or secondary diagnosis field from September 1, 2011 to August 30, 2012. Patients were included in the primary analysis only on their first admission (index admission) during the study period, and any future admissions were excluded from the primary analysis. Patients who died while hospitalized or those who were placed on inpatient hospice care were excluded from the readmission analysis as they were inevitably not at risk for readmission.

The study was approved by the Institutional Review Board of Hartford Hospital. An informed consent waiver was granted as all data were currently in existence and no patient-specific interventions were conducted for the retrospective study. The collection of data was in compliance with the Health Insurance Portability and Accountability Act of 1996.

Data collection

Data collected from the administrative database included patient demographics, and hospital and discharge characteristics. Cost of overall hospitalization and payor mix were retrieved for the economic analysis.

In addition to the administrative data, the medical records (index and readmission visits) of all qualified patients with a UTI-related readmission within 30 days of discharge were assessed for the following key information: comorbid conditions, recent hospitalization, recent antibiotic therapy, causative urinary pathogen, and antibiotic therapy. For purposes of evaluating the potential development of resistance across admissions, we ascertained the causative organism and susceptibility of readmitted patient's UTI on each hospital visit.

End points and definitions

UTI was defined by the presence of either primary or secondary ICD-9-CM code 599.0. The 599.0 code was purposely chosen to be broad, to identify all patients with UTI (regardless of site specificity), because the standards used by coders and billers when deciding to apply a UTI diagnosis are inexact and general in nature. Likewise, in clinical settings, providers may diagnose and treat patients in the absence of classic signs and symptoms of UTI or without knowledge of the site and type of infection.[4] This allowed us to capture those patients billed for UTI to better understand the extent of the demographic and economic implications of the diagnosis on the health-care system.

Hospital readmission was defined as a pair of consecutive hospital admissions to Hartford Hospital, where the time between discharge from the first hospitalization and admission for the second hospitalization was less than or equal to 30 days. No distinction was made in terms of type of readmission, that is, planned versus unplanned.

An initial antibiotic treatment was a course of therapy initiated empirically (before availability of *in vitro* susceptibility reports). We considered an empiric antibiotic to be appropriate if it ultimately possessed *in vitro* activity against the isolated pathogen. At our institution, the preferred empiric antimicrobial agents for community-acquired and health-care-associated UTI are ceftriaxone