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Risk factors for catheter-associated urinary tract infection in Italian elderly



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Key Words:

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Background: Catheter-associated urinary tract infections (CAUTIs) are the most common cause of hospital-acquired infections, especially in elderly patients. Data on CAUTIs in older persons in acute care settings are lacking, however. This study aimed to describe the epidemiology of CAUTIs and related outcomes (ie, length of stay and mortality), in patients admitted to an acute geriatric care hospital in central Italy.

Methods: A CAUTI surveillance program was implemented from October 2011 to April 2012, according to the Centers for Disease Control and Prevention's National Healthcare Safety Network methodology.

Results: A total of 2773 patients aged ≥ 65 years were included in the study, and 483 catheterized patients were monitored for the risk of CAUTI. The catheterization rate was 16.7% (95% confidence interval [CI], 15.3%–18.2%), and the overall CAUTI incidence rate was 14.7/1000 device-days (95% CI, 11.7–18.3/1000). Mortality was significantly higher in catheterized patients with a CAUTI compared with non-catheterized patients (19.2% vs 10.5%; $P < .05$). Female sex (odds ratio [OR], 1.31; 95% CI, 1.06–1.67), increasing age (≥ 90 years: OR, 2.76; 95% CI, 2.00–3.83), and longer hospital stay before catheter insertion (≥ 15 days: OR, 2.90; 95% CI, 2.20–3.83) were independent risk factors for catheterization; increasing age (> 90 years: OR, 2.75; 95% CI, 1.03–7.35), and duration of hospital stay before catheter insertion (OR, 2.41; 95% CI, 1.12–5.51) were associated with CAUTIs.

Conclusions: These results underscore the importance of the proper choice of patients for catheterization, particularly in individuals aged > 90 years.

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Catheter-associated urinary tract infections (CAUTIs) remain the most common hospital-acquired infection (HAI) worldwide, accounting for more than 1 million cases in the United States and Europe annually.¹ They are particularly frequent in elderly patients because of the presence of additional CAUTI risk factors, such as advanced age, urinary function abnormalities, presence of chronic

diseases, and immune dysfunction, as well as reports of inappropriate utilization of indwelling urinary catheters in this population.^{2,3} Moreover, urinary catheterization is often performed without a specific medical indication, as a result, this procedure affects approximately 25% of patients aged 70–85 years and 33% of those aged 85 years and older.⁴

CAUTIs represent a considerable problem for hospitalized elderly patients, given the increased morbidity, mortality, costs for health care services, and negative impact on quality of life, which often is already compromised. The majority of studies reported in the literature were conducted in long-term care facilities not in acute geriatric care hospitals.⁵ The purpose of the present study was to examine the epidemiology of CAUTIs in patients admitted to an acute geriatric care hospital in central Italy.

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DV and SD conceived the study and contributed to data acquisition. EPR and PB assisted with study design. IP helped prepare and edit the manuscript. LP and PB performed statistical analyses. EPR supervised the project.

Conflicts of interest: None to report.

Table 1

Population baseline characteristics of noncatheterized patients, catheterized patients, and catheterized patients with and without CAUTI (*P* values < .05 are reported in the text)

Characteristic	Noncatheterized patients (n = 2290)	Catheterized patients (n = 483)	Catheterized patients with CAUTI (n = 78)	Catheterized patients without CAUTI (n = 405)
Male sex, n (%)	1136 (49.6)	186 (38.5)	24 (30.8)	162 (40.0)
Age, y, mean ± SD	82.7 ± 7.7	85.4 ± 8.5	86.4 ± 12.5	84.2 ± 12.2
Hospitalization, d, mean ± SD	10.6 ± 10.7	15.7 ± 20.8	21.7 ± 18.8	14.5 ± 21.0
Medical ward, n (%)	1748 (76.3)	402 (83.2)	72 (92.3)	330 (81.5)
Catheterization-days, mean ± SD	—	11.0 ± 10.0	16.3 ± 11.1	9.9 ± 9.5
Mortality, % (n/N)	10.5 (241/2290)	12.6 (61/483)	19.2 (15/78)	11.3 (46/405)

Table 2

Differences in characteristics of patients admitted to medical wards and those admitted to surgical wards

Ward	Cumulative infection rate, n (%)	Catheterization rate, % of patient-days (95% CI)	CAUTI rate per 1000 catheter-days (95% CI)
Medical (n = 401)	72 (17.9)	17.8 (16.2-19.4)	14.9 (11.7-18.8)
Surgical (n = 82)	6 (7.3)	9.9 (7.1-13.1)	13.3 (4.9-28.7)
Total	78 (16.1)	16.7 (15.3-18.2)	14.7 (11.7-18.3)

METHODS

Setting

The “U. Sestili” hospital, part of the Italian National Institute of Health and Science on Aging, is an acute geriatric care hospital located in central Italy. Eleven wards, categorized as medical (8 wards) and surgical (3 wards), were included in the surveillance program.

Data collection

An active surveillance program was carried out between October 2011 and April 2012. As agreed to by the CAUTI working group, the program was structured as follows. An HAI referent (physician or nurse), was identified for each ward participating in the program. Patients aged ≥65 years and requiring urethral catheterization for at least 48 hours were included in the surveillance program. All patients aged <65 years, catheterized for less than 48 hours, or already catheterized on admission to the ward, or patients admitted for day surgery or to day hospital were excluded from the study. The data collected for each monitored patient were: sex, date of birth, date of admission, date of catheter insertion, place of catheter insertion, presence of clinical signs and symptoms of urinary infection, date of catheter removal, date of discharge, and outcome at discharge. The definition of CAUTI was in agreement with that of the Centers for Disease Control and Prevention’s National Healthcare Safety Network.⁶ A case-control approach was used to study factors potentially associated with urinary catheterization and infection, including sex, age, ward of admission, and duration of catheterization and of hospitalization.

Statistical analysis

The incidence of CAUTIs was calculated as the number of first episodes per 1000 catheter-days. The device utilization ratio was obtained by dividing the total number of catheter-days by the total number of hospital-days/100. Bivariate analyses were performed to analyze the distribution of variables (ie, sex, age, length of hospital stay, type of ward, and catheter-days) in the sample, using the χ^2 , Mann-Whitney, or *t* test, as appropriate. Separate bivariate analyses of the risk of catheterization and of CAUTI onset were performed. Multiple logistic regression models were developed to evaluate

which factors were independently associated with the outcomes (ie, urinary catheterization and CAUTI onset). The significance level for variables to enter the multiple logistic regression models was set at ≤0.2, and that for removing them from the model was set at ≤0.4. The level of significance was set at *P* < .05. Data were analyzed with Stata 9.0.⁷

RESULTS

During the CAUTI surveillance period, a total of 2773 patients admitted to the acute geriatric care hospital were enrolled in the study, and 483 catheterized patients aged ≥65 years were monitored for CAUTI incidence. These 483 patients included 186 males (38.5%) and 297 females (61.5%), mean age 85.4 ± 8.5 years, of whom 401 (83%) were admitted to medical wards and the other 82 (17%) were admitted to surgical wards. The mean duration of hospitalization was 15.7 ± 20.8 days (Table 1). Female sex was more prevalent, mean age was older, and hospitalization was longer in the catheterized patients compared with the noncatheterized patients (*P* < .05). There was no statistically significant difference in mortality between catheterized and noncatheterized patients (12.6% vs 10.5%) or between catheterized patients with CAUTI and without CAUTI (19.2% vs 11.3%; *P* = .07); however, mortality was significantly higher in catheterized patients with CAUTI compared with noncatheterized patients (19.2% vs 10.5%; *P* < .05).

Overall, the catheterization rate was 16.7 per 100 patient-days (95% confidence interval [CI], 15.3-18.2), ranging from 9.9 per 100 patient-days (95% CI, 7.1-13.1) in surgical wards to 17.8 per 100 patient-days (95% CI, 16.2-19.4) in the medical wards. Among the surgical wards, the highest catheterization rate was detected in urology patients (14.4 per 100 patient-days; 95% CI, 8.2-23.2). Among the medical wards, the highest catheterization rate was in the cardiology ward (34.8 per 100 patient-days; 95% CI, 29.9-40.3). In bivariate analysis, the following factors were associated with urethral catheterization: female sex (*P* ≤ .01), older age (>80 years; *P* ≤ .01), duration of hospitalization (>8 days; *P* ≤ .01), and admission to a medical ward (*P* = .01).

The overall CAUTI rate was 14.7 per 1000 catheter-days (95% CI, 11.7-18.3). In the surgical wards, the highest CAUTI rate was detected in the urology ward (31.3 per 1000 catheter-days; 95% CI, 10.2-71.4), whereas among the medical wards, the highest CAUTI rate was detected in the rehabilitation ward (25.9 per 1000 catheter-days; 95% CI, 9.5-55.4).

Table 2 shows the differences in CAUTI and catheterization rates between the medical and surgical wards during the surveillance period. During this period, 78 CAUTIs were recorded, including 54 cases in women and 24 cases in men (cumulative rate, 18.2% vs 12.9%; *P* > .05). Bivariate analysis revealed associations between CAUTI and age >80 years (*P* = .01), prolonged duration of hospital stay (>15 days; *P* < .01), and admission to a medical ward (Table 2; *P* = .02), but no correlation between CAUTI and duration of catheterization (*P* > .05, Mann-Whitney test). No statistically significant difference in CAUTI or catheterization rate was detected between

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