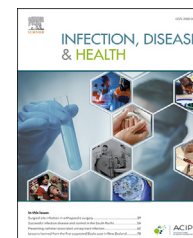




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RESEARCH PAPER

Risk factors associated with urinary tract infections in intensive care patients

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KEYWORDS

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Abstract *Introduction:* Urinary tract infections (UTI) are common in intensive care units (ICU) due to the high prevalence of urinary catheters. We aimed to determine risk factors for urinary tract infection to inform potential interventions to reduce this infection in ICU patients.

Methods: We performed a case-control study to determine risk factors for symptomatic UTIs, compared to asymptomatic bacteriuria and control patients.

Results: We identified 90 patients with symptomatic urinary tract infections and 90 patients with asymptomatic bacteriuria, and 344 control patients without bacteriuria or urinary tract infection between January 2007 and August 2009. A higher proportion of patients with symptomatic UTIs had catheters placed in emergency or the operating theatres than in ICU. The risk of infection increased with increasing APACHE 2 score. The median duration of admission prior to symptomatic UTI was 6 days, and asymptomatic bacteriuria was 9 days.

Discussion: UTIs tended to occur early in the course of ICU admission, and were more common in surgical patients, particularly where the catheter was placed in emergency or the operating room.

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Highlights

- We aimed to determine risk factors for urinary tract infection (UTI) in ICU patients to inform potential interventions.
- We compared 90 cases of UTIs with 90 patients with asymptomatic bacteriuria and 344 uninfected controls.
- UTIs tended to occur early in the course of ICU admission, and were more common in surgical patients
- Risk factors included catheter placement in emergency or the operating room.

Background

Urinary tract infections are relatively common in intensive care, accounting for approximately 20–30% of infections in this setting and occurring at a rate of approximately 9–14 UTIs/1000 catheter days [1–3]. Studies suggest that the risk of UTIs is higher in ICU than elsewhere in the hospital [4]. Previous cohort studies have demonstrated gender, age, medical primary diagnosis and duration of catheterization as risk factors for the development of urinary tract infections [2,5,6]. Interventions to prevent catheter-related UTIs have largely focused on removal of unnecessary catheters, with less evidence found to support the effectiveness of interventions aimed at improving insertion and maintenance [7]. We aimed to describe risk factors for urinary tract infection in the intensive care unit at our hospital to inform future interventions to prevent this common infection.

Methods

The study was performed at The Alfred hospital, a tertiary referral centre in Melbourne, Australia. This hospital provides statewide services for burns, HIV, trauma, heart/lung transplantation, and at the time of the study had a 35 bed ICU. A 3 group case-control-control study was performed [8] (Fig. 1). Cases were defined according to Centers for Disease Control National Healthcare Safety Network (CDC NHSN) criteria for symptomatic UTI current at the time [9]. During the study period, there was active prospective surveillance by infection control staff for infections in ICU. Two control groups without symptomatic UTI were selected; (1) asymptomatic bacteriuria; (2) patients admitted to ICU that do not develop a urinary tract infection or asymptomatic bacteriuria. The ICU control group was matched 4:1 to cases by sex and age (+/–5 years). Cases and controls were identified from microbiological

databases and ICU admission databases. Data were obtained from prospectively maintained databases and the medical record.

Definitions

Symptomatic urinary tract infection was defined according to the NHSN definitions current at the time of the study [9]. Diagnostic criteria were: the presence of at least one symptom (fever, frequency, urgency, dysuria or suprapubic tenderness) with a positive urine culture with $>10^5$ organisms/ml, or two symptoms (as above) with at least one supporting criterion (positive dipstick for leucocyte esterase/nitrite, pyuria, at least two urine cultures with same uropathogen $>10^2$ organisms/ml, $<10^5$ organisms/ml of uropathogen in a patient treated for UTI, physician diagnosis of UTI or commencement of treatment for UTI by physician). Gram stains of urine are not performed at the Alfred Hospital.

Asymptomatic bacteriuria was defined as presence of a urinary catheter with a positive urine culture with $>10^5$ organisms/ml with no fever, urgency, dysuria or suprapubic tenderness, or absence of a urinary catheter with at least two positive urine cultures with $>10^5$ organisms/ml with no fever, urgency, dysuria or suprapubic tenderness. These patients were unmatched.

Immunosuppression included patients with a primary immune disease, those on immunosuppressive medication (including corticosteroids, patients following organ transplantation), patients with haematological malignancies and those with metastatic cancer. Other comorbidities were based on documentation in the medical record and intensive care database.

Selection of controls

ICU controls were patients matched for age (+/–5 years) and sex who did not have a symptomatic urinary tract infection or asymptomatic bacteriuria during the ICU admission. For each case, these controls were selected as the next eligible patients within the following 3 months from a list of admissions to ICU ordered by date of admission.

Statistical considerations

We defined the rates of symptomatic UTI and bacteriuria based on events and the cumulative duration of

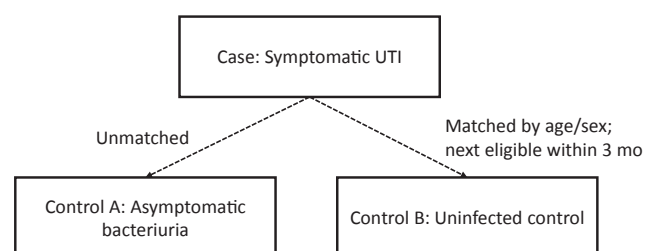


Figure 1 Design of case-control-control study.

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