



Risk factors for urinary tract infections in geriatric hospitals

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SUMMARY

Background: Urinary tract infection (UTI) is the most frequent nosocomial infection in geriatric units. An understanding of risk factors for infection may help to identify prevention strategies.

Aim: Identification of the risk factors for UTI in elderly patients.

Methods: Retrospective analysis of three prospective cohorts. All hospitalized patients present in, or admitted to, a geriatric unit from June 1st to June 28th, for the years 2009, 2012, and 2015 were included and followed until discharge or until June 30th of the year concerned. For each patient, type and dates of stay, type and dates of catheter, risk factors, and nosocomial UTI (NUTI) data were collected. Univariate and multivariate (Cox model) analyses were made using SPSS software.

Findings: A total of 4669 patients were included and were followed for a total of 83,068 days. There were 189 NUTIs (4.0% patients). NUTIs were significantly more frequent among female patients, in rehabilitation units, in immunosuppressed patients, among those with acute retention, post-void residual, history of urinary tract infection in the previous six months, and in case of dependency. NUTIs were significantly more frequent among those who had a catheter (Z-test, $P < 0.001$). NUTIs were more frequent among patients with intermittent, indwelling, or suprapubic catheters. They were also more frequent in acute/subacute care or rehabilitation units, in women, in immunosuppressed patients, and in those with a history of previous UTI; they were less frequent in dementia patients.

Conclusion: The occurrence of NUTI is an important issue in both catheterized and non-catheterized patients; prevention programmes should be widened to include non-catheterized patients.

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Introduction

Urinary tract infection (UTI) is the most frequent nosocomial infection in geriatric units [1–3]. Although this infection is mostly benign, it may be accompanied by complications such as bacteraemia, and may lead to development of renal

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insufficiency. These complications, together with the high frequency of UTI, make prevention an important topic [4]. This has been addressed by prevention guidelines that are centred on catheter use, yet such infections are also observed in non-catheterized patients [5,6]. Epidemiology and risk factors for nosocomial urinary tract infection (NUTI) have been widely described for catheter-associated NUTI but less so for patients without a catheter [6–8]. In the geriatric units of the university hospitals of Lyon (France), a multidisciplinary working group (UTIC Group) implemented and evaluated corrective measures from 2009 to 2015 with an aim to reduce the incidence of NUTI. Each step of this multimodal programme was evaluated by a cohort study that used the same method [9]. More than 1500 patients were included in each study; the three cohorts included patients with and without urinary catheters. A database of these patients was created that contained details of a large panel of potential risk factors. The database was analysed with the aim of improving knowledge about factors associated with NUTI patients both with and without urinary catheter admitted to a geriatric hospital.

Methods

Geriatric units of six different hospitals were included: three were part of a geriatric hospital with acute care, sub-acute care/rehabilitation, and long-stay units, and three were in general hospitals. The total number of beds was ~1200. Similar studies were conducted in 2009, 2012, and 2015. Each study was a prospective cohort study, and all hospitalized patients, present in or admitted to a participating unit from June 1st to June 28th were included. They were followed until discharge or until June 30th of the year concerned. The studies focused on clinical NUTI, excluding asymptomatic bacteriuria; UTI was defined according to the 2007 French ministry of health guidelines (http://www.sante-sports.gouv.fr/IMG/pdf/rapport_vcourte.pdf), adapted from the definition of the US Centers for Disease Control and Prevention. UTIs were considered to be nosocomial if they developed at least 48 h after hospitalization in a geriatric unit taking part in the study.

Care-related risk factors were defined according to the literature [10–13]. These included type of stay (acute care, rehabilitation, or long stay), type of urinary catheterization (indwelling, intermittent, or suprapubic), presence of nephrostomy, and use of condoms and nappies. The dates when all such risk factors applied were recorded for each case. Intermittent catheterization was only taken into account if it was used before the onset of infection (occasional catheterization for microbiological testing was excluded). All patient-related risk factors reported in the literature were also collected [14–17]. These were gender, level of functional dependency measured with a simplified activities of daily living (ADL) score (from 0 for independent patients to 6 for fully dependent patients), dementia (clinical definition), diabetes (treated with insulin/hypoglycaemic drugs or diet-controlled), urinary incontinence (clinical definition), acute urinary retention episode in the last month, bladder dysfunction (with neurologic evaluation), post-voiding residual >300 mL, history of UTI (previous six months), and immunodeficiency (leucopenia, cancer, or immunosuppressive treatment) [18]. The following data on cases of NUTI were collected: type of infection

(cystitis, pyelonephritis), causative micro-organisms, and antibiotic susceptibilities.

Teaching sessions for physicians in charge of data collection were organized in each hospital by two investigators (R.G. and S.G.), with the aim improving consistency and accuracy of identification of NUTI and risk factors. The study was advertised on posters in the different geriatric units. According to French regulations at the time of the study, this type of non-interventional study did not require ethics committee approval if the data were anonymous and if the hospital was registered with the national data protection authority.

For each patient included, data were collected using a case report form that was completed by physicians and nurses. Compliance was verified by the infection control team. Data were entered into a database using Epi Info Version 3.1 (Centers for Disease Control and Prevention, Atlanta, GA, USA) and statistical analyses performed using Statistical Package for the Social Sciences Version 17 (IBM Corp., Armonk, NY, USA).

Univariate analyses were performed to measure the effects of the risk factors on NUTI frequency. The following tests were used for comparisons: Fisher's exact test, or Mantel–Haenszel χ^2 -test for discontinuous variables (or Yates' modified χ^2 for small numbers), Z-test for incidence, and analysis of variance for continuous variables. Multivariate analysis using a Cox model was performed, considering follow-up duration before NUTI. A backward elimination Cox model was used, with inclusion of all risk factors and elimination at $P > 0.10$.

Results

A total of 4669 patients were included: 1510 in 2009, 1547 in 2012, and 1612 in 2015. The mean age of patients was 85.4 years (SD: 7.2); women were older than men (mean: 86.4 versus 83.4 years; $P < 0.001$). The patients were followed for a total of 83,068 days (mean: 17.8). The 4045 patients without catheter were followed for a total of 73,134 days (mean: 18.1). The total number of NUTIs was 189 (4.0% of patients), and 59.8% of these ($N = 113$) were observed among the 4045 patients without catheters (2.8% of patients).

Nosocomial urinary infection rates were significantly different according to type of hospitalization (Table I); NUTIs were significantly more frequent in rehabilitation and mixed rehabilitation units than in other units (5.3% versus 3.2%; $P < 0.001$). NUTIs were significantly more frequent among female patients, among immunosuppressed patients, in cases of acute retention, post-void residual, history of urinary tract infection in the previous six months, higher dependency (activities of daily living score >4) patients, and in patients with UTI at inclusion (Table I). Having UTI in the previous six months was significantly more frequent among immunosuppressed patients, in cases of acute retention, those with post-void residual or incontinence, and in high-dependency patients. Those with UTI in the previous six months were not significantly older than those who did not have such infection ($P = 0.3$). The incidence of NUTI was significantly greater in cases of catheterization (suprapubic, indwelling, or intermittent catheter) than without catheter ($P < 0.001$). The highest incidence of NUTI was observed in patients with intermittent catheters. There was a significant difference in the incidence

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