



# Management and Prevention of Nosocomial Urinary Tract Infections

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## Abstract

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**BACKGROUND:** Nosocomial infections are the leading cause of mortality, due to acquired nosocomial infections. Nosocomial urinary tract infections occur during or after hospitalization in patients who did not have an incubation phase of the infection at the time of admission to the hospital.

**AIM:** In this study, we aim to define and manage nosocomial urinary tract infections in intensive care at University Hospital Center "Mother Teresa" Tirana.

**MATERIALS AND METHODS:** 1350 patients were included in the study, of which 115 patients resulted in nosocomial nosocomial infections. The mean age of patients was  $62 \pm 16.6$  years.

**RESULTS:** Out of 1350 patients hospitalized in the Intensive Care during the period October 2019 - December 2020, 4% of patients result in urinary tract infections or 45% of the total for 115 cases of nosocomial infections. We see that men have a higher percentage than women of being affected by urinary tract infections, it is significant ( $p < 0.001$ ). The etiological cause of nosocomial urinary tract infections was *Escherichia coli* in 61.5% of cases. For nosocomial urinary tract infections, patients are monitored for fever, examination of urine complete, and uroculture. The mean hospital stay for patients without nosocomial infection of the urinary tract was 4 days, while that of those with urinary tract infection was  $18.49 \pm 27.68$  (from 5 to 180 days). In comparison to the mean mentioned above, it is significant ( $p < 0.0001$ ).

**CONCLUSIONS:** Nosocomial urinary tract infections are common in patients admitted to intensive care. Key recommendations should be given on diagnostic strategies, testing, selection of antibiotics as well as duration of treatment. We also need to collect data on how to prevent nosocomial infections in general and nosocomial urinary tract infections in particular.

## Introduction

Most urinary tract infections in hospitalized patients are the result of the use of drainage equipment, such as urinary catheters [1], [2], [3], [4]. Catheter-associated nosocomial urinary infections continue to account for the majority of hospital-acquired infections. However, data show that up to 50% of hospitalized patients who have received a stable catheter do not have an evidence-based criterion documentation for the admission decision [4], [5], [6]. Nosocomial urinary tract infections acquired in intensive care account for up to 40% of all hospital-acquired infections. Accompanying morbidity and mortality are a major outflow of hospital resources. About 80% of acquired infections are associated with urinary catheters [7], [8], [9], [10], [11]. Urinary tract infections are caused by pathogenic microbes such as *Escherichia coli*, *Klebsiella*, *Proteus*, *Enterococcus*, *Enterobacter*, *Pseudomonas* [5], [12]. Urinary catheterization is the primary condition for the onset of most urinary tract infections. Concomitant infections are generally benign and in some cases, the infection disappears with catheter removal. However, urinary tract infections can lead to bacteremia; this is estimated at 18–20% of bacteremia in hospitals. Catheter retention time should be reduced to a minimum. The latest guidelines emphasize the prevention of infections by limiting the use of the catheter and the

duration of use, to reduce the number of urinary tract infections received by the hospital [6], [7], [8], [13], [14]. Improving compliance in hand hygiene, with proper use of alcohol-based hand rubs, can reduce the rate of nosocomial infection by up to 40% [7], [8], [9], [10], [14], [15].

## Materials and Methods

In this prospective study that included 1350, we aim to determine the incidence of urinary tract infections in Intensive Care at University Hospital Center "Mother Teresa" Tirana. In this study, 1350 patients admitted to the Intensive Care during the period October 2019 - December 2020 were taken, of which 115 patients resulted in nosocomial infections.

The study data were based on clinical records, various reports, staff publications at home and abroad, records of nursing staff and communication with intensive care physicians. Data collected for this study include the presence of nosocomial urinary tract infections. Patients with nosocomial urinary tract infections are monitored for fever, complete urine, and uroculture.

Statistical analysis was performed through the statistical package SPSS 12.0 and  $p < 0.05$  indicate a significant difference. Data were presented through graphs and tables.

## Results

In this study, 1350 patients admitted to Intensive Care during the period October 2019 - December 2020, of which 115 patients resulted in nosocomial infections (nosocomial urinary tract infections, nosocomial respiratory infections, nosocomial surgical infections, and nosocomial blood infections). Out of 1350 patients hospitalized in intensive care, 4% of them result in urinary tract infections or 45% of patients out of a total of 115 cases with nosocomial infections. The mean age of patients was  $62 \pm 16.6$  years. Out of 1350 patients admitted to intensive care, 52 patients or 4% of them result in nosocomial urinary tract infections Figure 1.

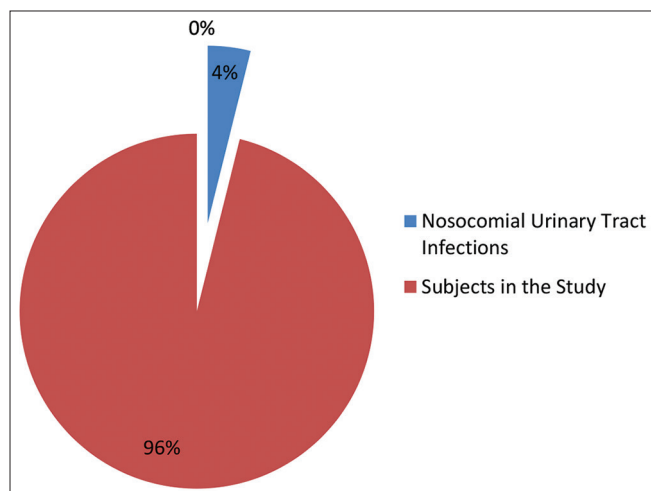


Figure 1: Subjects in the study and the percentage of nosocomial urinary tract infections

Of the 115 cases of nosocomial infections,

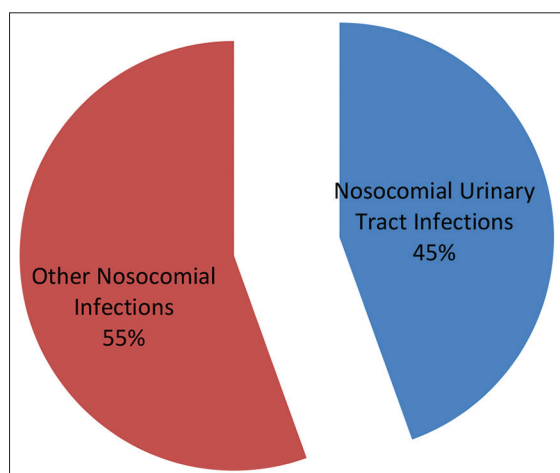


Figure 2: Incidence of urinary tract infections in relation to other nosocomial infections

52 patients or 45% of them had nosocomial urinary tract infections and 55% of patients had other nosocomial infections (nosocomial respiratory infections, nosocomial surgical infections, and nosocomial blood infections) Figure 2.

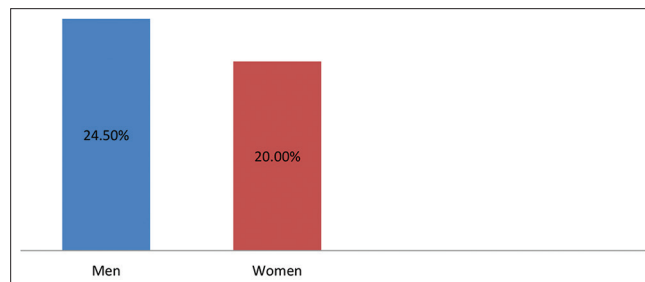


Figure 3: Report of men and women on urinary tract infections

We see that the incidence of nosocomial urinary tract infections had a higher percentage in men in 24.5% of cases (total for 115 patients or 56.4% of cases) than in women in 20% of cases (in total for 115 patients or 46.3% of cases) where ( $p < 0.001$ ) Figure 3 and Table 1.

Table 1: Report men and women on urinary tract infections

Gender	Urinary tract infections		Total
	No	Yes	
Men			
Cases	36	29	65
Percentage total	31.8	24.5	56.4
Women			
Cases	27	23	50
Percentage total	23.6	20.0	43.6
Total			
Cases	63	52	115
Percentage total	55	45	100.0

The etiologic cause of nosocomial urinary tract infections was *E. coli* in 32 patients or 61.5% of cases, followed by *Staphylococcus epidermidis* in 10 patients or 19.23% of cases Figure 4 and Table 2.

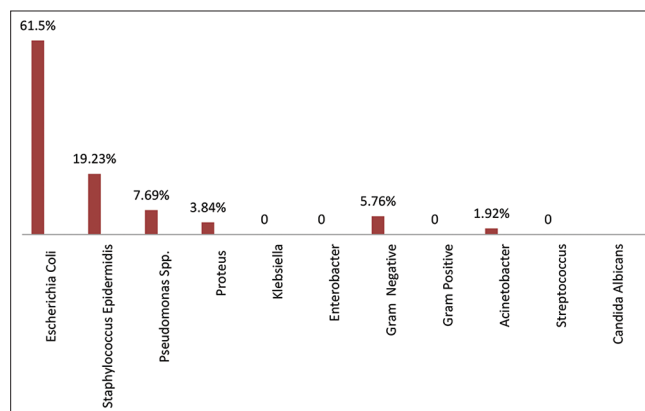


Figure 4: Microbial cause of urinary tract infections

The incidence of nosocomial urinary tract infection was higher in neurology service patients in 51.9% of cases compared to those of the surgery service in 48.1% of non-significant cases ( $p = 0.886$ ). The average hospital stay for patients without nosocomial tract infections was 4 days, while that of those with urinary tract infection was  $18.49 \pm 27.68$  (from 5 to 180 days). Most often the stay was 8–14 days for both the surgery service and the neurology service. The comparison of the mean mentioned above is significant ( $p < 0.0001$ ) Figure 5 and Table 3.

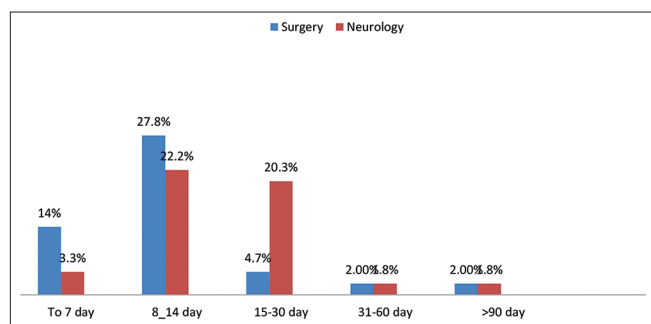


Figure 5: Day hospital stay of patients with urinary tract infections

Table 2: Microbial Cause

Microbial cause	Cases (%)
<i>Escherichia coli</i>	32 (61.5)
<i>Staphylococcus epidermidis</i>	10 (19.23)
<i>Pseudomonas spp.</i>	4 (7.69)
<i>Proteus</i>	2 (3.84)
<i>Klebsiella</i>	-
<i>Enterobacter</i>	-
Gram negative	3 (5.76)
Gram positive	-
<i>Acinetobacter</i>	1 (1.92)
<i>Streptococcus</i>	-
<i>Candida albicans</i>	-
Total cases of nosocomial urinary tract infections	52 (100)

## Discussion

Nosocomial urinary tract infections are the most common infections [7], [8], [9]. Urinary catheterization is the primary condition for the onset of most urinary tract infections, so the rules of asepsis should be strictly enforced by the responsible health personnel. Concomitant infections are generally benign and in some cases, the infection disappears with catheter removal. Catheter retention time should be reduced to a minimum [8], [9], [10].

Table 3: Hospital Stay

Service	Day hospital stay					Total
	To 7	8-14	15-30	31-60	>90	
Neurology						
Cases	2	12	11	1	1	27
Percentage of total	3.3	22.2	20.3	1.8	1.8	51.9
Surgery						
Cases	7	14	2	1	1	25
Percentage of total	14	27.8	4.7	2.0	2.0	48.1
Total						
Cases	9	26	13	2	2	52
Percentage of total	17.3	50	25	3.8	3.8	100.0

We see that in our study, out of 115 patients, 52 (45%) of them resulted in positive culture or 4% in total patients (1350) resulted in urinary nosocomial infections and the etiological cause of nosocomial urinary tract infections was *E. coli* in 32 patients or 61.5% of cases, followed by *Staphylococcus epidermidis* in 10 patients or 19.23% of cases.

The incidence of nosocomial urinary tract infections was higher non-significant ( $p = 0.886$ ) in patients of the neurology service compared to those of the surgery service. The average hospital stay for patients without nosocomial tract infections was 4 days, while that of those with urinary tract infections was  $18.49 \pm 27.68$  (from 5 to 180 days). The comparison of

the mean mentioned above is significant ( $p < 0.0001$ ). Most often the stay was 8–14 days for both the surgery service and the neurology service.

By gender from nosocomial urinary tract infections, we have 29 males or 55.7% and 23 females or 44.3%. We see that men have a higher percentage than women of urinary tract infections ( $p < 0.001$ ).

Hospital-acquired urinary tract infections are the most common infections and account for about 40% of the total number of these infections. About 80% of acquired infections are associated with urinary catheterization [7], [8], [9], [10].

Urinary catheterization is the primary condition for the onset of most urinary tract infections. However, urinary tract infections can lead to bacteremia, this is estimated at 18–20% of bacteremias in hospitals. Catheter retention time should be reduced to a minimum. The latest guidelines emphasize infection prevention by limiting catheter use and duration of use, to reduce the number of hospital-acquired urinary tract infections [6], [7], [8], [13], [14].

## Conclusions

Nosocomial infections are common in patients admitted to intensive care. The reasons for the presence of nosocomial infections are non-compliance with the rules of asepsis. Medical staff plays an important role in the dynamic follow-up of patients admitted to intensive care. Implementing the necessary nursing care will affect the reduction of infections, length of stay, cost, morbidity, and mortality in patients admitted to the intensive care unit and beyond. However, more studies need to be conducted to plan long-term strategies for the prevention and management of nosocomial infections.

- In patients studied nosocomial infections, the most common was urinary 4% of cases, followed by other nosocomial infections;
- The incidence of nosocomial infections diseases in Intensive Care has resulted in a positive correlation with increasing age;
- In nosocomial urinary tract infections, there is a higher frequency of *E. coli* in 61.5% of cases and *Staphylococcus epidermidis* in 19.23% of cases;
- No significant relationship was found between the type of nosocomial infection and gender
- The average daily stay results in patients with nosocomial infections much increased compared to patients of the same category without nosocomial infections
- In nosocomial infections, 55.7% of men and 44.3% of women are more often affected.

Recommendations for Health Personnel [1], [3], [9], [11], [13], [14].

- All catheterizations performed by the nurse should be aseptic procedures
- The nurse should disinfect the hands and wear a clean, non-sterile pair of gloves before manipulating the patient's catheter and should disinfect the hands after removing the gloves
- Patients caring for patients and patients who manage the catheter themselves should wash their hands before and after catheter manipulation
- The nurse should use lubricating solution for the catheter
- The nurse should clean meatus daily with soap and water
- The nurse should periodically empty the urinary drainage bag to ensure urine flow and to prevent urinary reflux
- The nurse should change the catheter only when clinically necessary or in accordance with the manufacturer's recommendations.

## Ethical Approval

The study was approved by Intensive Care at University Hospital Center "Mother Teresa" Tirana, Albania in October 2019 - December 2020. Patients participated voluntarily in the study after being informed in advance about the purpose of the study. Patients were given anonymity and each gave verbal consent to participate in the study.

## Contributions

All authors worked equally well in this study. All authors have approved the final manuscript.

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