

# Identification of Risk Factors for Altered Mental Status Induced by Urinary Tract Infections

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## Introduction

- Elderly patients with urinary tract infections (UTI) may present with altered mental status (AMS) or delirium; a component of AMS. This may lead to prolonged hospitalizations and increased mortality.<sup>1</sup>
- While there are studies identifying risk factors for UTI in the elderly, there is a paucity of data on risk factors for AMS from UTI. Current literature supports that the most common cause of delirium is concomitant infection, with UTIs contributing up to 15% of cases.<sup>2</sup>
- The mechanism of delirium caused by UTI is unclear and likely multifactorial. Elevated levels of the inflammatory cytokine interleukin 6 (IL-6) are believed to contribute to AMS.<sup>3</sup> Certain European populations produce more IL-6 as a result of genetic polymorphisms.<sup>4</sup>
- Our initiative was to evaluate elderly UTI patients with the hope of identifying risk factors associated with AMS.

## Objective

The objective of this comparative study is to identify risk factors for altered mental status in patients with urinary tract infection.

## Methods

- Theradoc software was used to generate a report that identified patients for inclusion in this retrospective study. Those included were 70 years of age or greater, admitted to AtlantiCare Regional Medical Center (ARMC) between January 1, 2023 and December 31, 2023, and diagnosed with a UTI upon hospital admission.
- Patients were excluded from the study if they had documented AMS at baseline or had a new comorbid diagnosis on admission that could precipitate AMS.
- Ninety-nine total included patients with UTI were separated into two groups: one with new onset AMS and the other without AMS. Data collection included age, sex, body mass index (BMI) and weight, uropathogen species, preadmission level of acuity, and relevant past medical and medication history.
- Chi-square analysis and student t-test were used to assess statistical significance with an alpha set to 0.05. Institutional Review Board approval was obtained for this study.

Variable	Overall (n=99)	AMS (n=29)	No AMS (n=70)
Mean Age – years (SD)*	74.7 (±4.8)	76.4 (±4.9)	74.0 (±4.6)
Female – no. (%)	53 (53.5%)	20 (69.0%)	33 (47.1%)
Avg. BW – kg (SD)	84 (±25)	87.2 (±29.8)	82.7 (±22.8)
Caucasian – no. (%)	73 (73.7%)	24 (82.8%)	49 (70.0%)
Non Caucasian - no. (%)	26 (26.3%)	5 (17.2%)	21 (30.0%)
Obese – no. (%)	35 (35.4%)	11 (37.9%)	24 (34.3%)

Mean Age AMS vs No AMS:  $p=0.023$   
AMS in Caucasian (n=73) 32.8%, Non Caucasian (n=26) 19.2%,  $p=0.189$

## Results

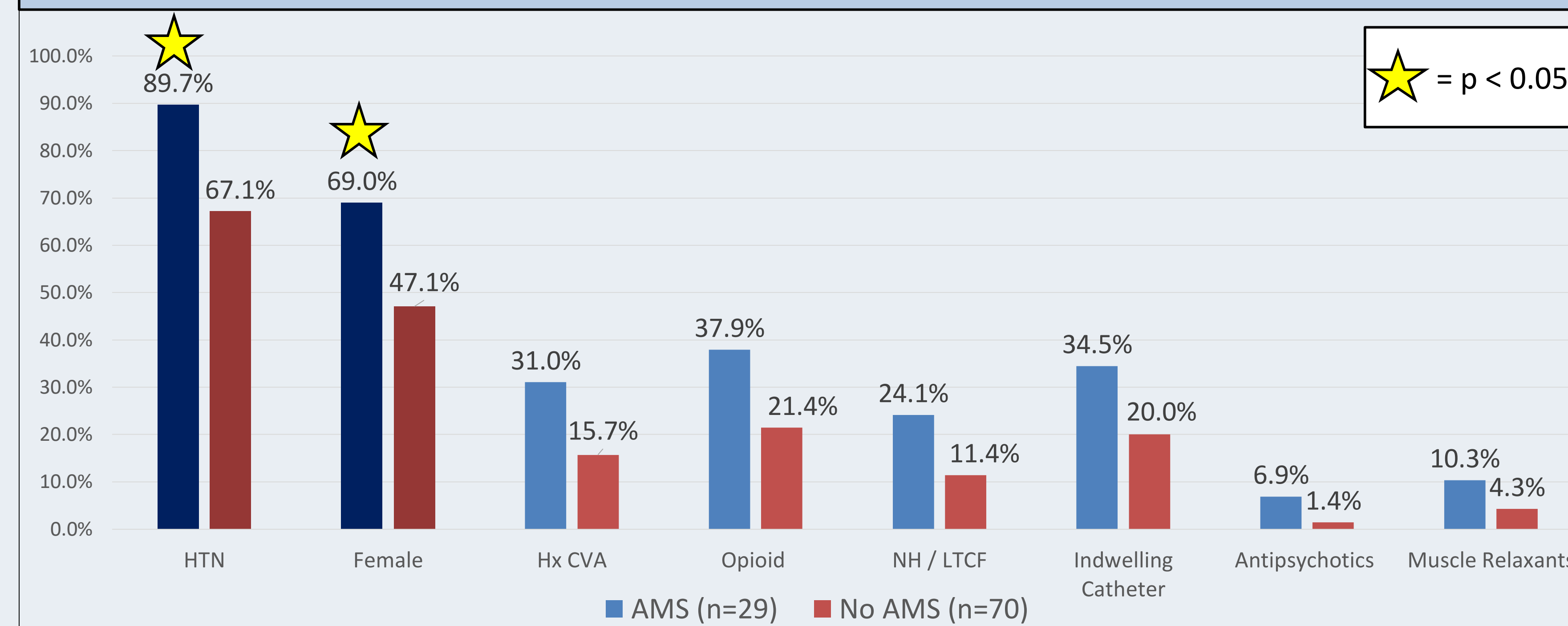
Table 2. Potential Risk Factors for AMS in UTI

Characteristics no. or mean (% or SD)	AMS (n=29)	No AMS (n=70)	P value
HTN	26 (89.7%)	47 (67.1%)	0.021
Age	76.4 (±4.9)	74.0 (±4.6)	0.023
Female	20 (69%)	33 (47.1%)	0.048
Hx of CVA	9 (31%)	11 (15.7%)	0.084
Nursing home or LTCF	7 (24.1%)	8 (11.4%)	0.108
Indwelling catheter	10 (34.5%)	14 (20%)	0.126
Hx of psychiatric disorder	6 (20.7%)	10 (14.3%)	0.431
CrCl < 30 mL/min	2 (6.9%)	8 (11.4%)	0.496
T2DM	16 (55.2%)	34 (48.6%)	0.550
Chronic UTI	10 (34.5%)	20 (28.6%)	0.560
Hx of liver disease	2 (6.9%)	3 (4.3%)	0.590
Obese	11 (37.9%)	24 (34.3%)	0.730
HLD	18 (62.1%)	41 (58.6%)	0.747
CKD	5 (17.2%)	14 (20%)	0.751

Table 3. Medications with AMS in UTI

Drug Class no. (%)	AMS (n=29)	No AMS (n=70)	P value
Opioids	11 (37.9%)	15 (21.4%)	0.089
Antipsychotics	2 (6.9%)	1 (1.4%)	0.149
Muscle Relaxants	3 (10.3%)	3 (4.3%)	0.250
Hypnotics	3 (10.3%)	4 (5.7%)	0.413
Hydroxyzine	1 (3.4%)	1 (1.4%)	0.516
Benzodiazepines	11 (37.9%)	24 (34.3%)	0.730
GABA Analogs	6 (20.7%)	13 (18.6%)	0.808
Anticholinergics	2 (6.9%)	4 (5.7%)	0.822
Antidepressants	5 (17.2%)	11 (15.7%)	0.851

Figure 1. Identified & Potential Risk Factors for AMS in UTI



## Discussion

- A total of 99 patients met inclusion for this study, with 29 patients in the AMS group and 70 patients in the No AMS group. The average age was 76.4 and 74.0 years in the AMS and non-AMS groups, respectively, which was statistically significant,  $p=0.023$  (Tables 1 and 2).
- Females comprised 69% (n=20) of patients in the AMS group and 47.1% (n=33) in the No AMS group – 38% of females and 20% of males experienced AMS which was statistically significant,  $p=0.048$  (Tables 1 and 2, Figure 1).
- Hypertension was present in 89.7% (n=26) and 67.1% (n=47) of patients in the AMS and No AMS groups, respectively. This was statistically significant,  $p=0.021$  (Table 2 and Figure 1).
- Risk factors in the AMS group that trended towards statistical significance include indwelling catheter ( $p=0.126$ ), admission from a nursing home or long-term care facility ( $p=0.108$ ), and history of CVA ( $p=0.084$ ) (Table 2 and Figure 1).
- For current medications, 37.9% (n=11) and 21.4% (n=15) of patients in the AMS and No AMS groups, respectively, were taking opioids as part of their home medication regimens. This difference is not statistically significant,  $p=0.089$  (Table 3 and Figure 2).
- Approximately 74% (n=73) of the study population were Caucasian and 26% (n=26) were non-Caucasian. Of the Caucasian population, 32.8% (n=24) had AMS, while only 19.2% (n=5) had AMS in the non-Caucasian group. Although this difference is not statistically significant ( $p=0.189$ ), this may be related to increased production of IL-6 in Caucasians as a result of genetic polymorphisms in the IL-6 gene. (Table 1).

## Take Home Points!

- Female gender, older age, and hypertension were identified as significant potential risk factors for AMS in elderly patients with UTI.
- Potential trends noted: Race, indwelling catheters, admission from nursing home or long-term care facility, history of CVA, and taking opioids trended toward statistical significance. Our study population was not powered to assess the clinical implications of these trending potential risk factors, further studies may be warranted.

## Conclusion

Our findings identified female gender, older age, and HTN as risk factors for AMS with UTI in the elderly. Risk factors such as indwelling catheter, admission from a nursing home or LTCF, history of CVA, and outpatient opioid home medications trended toward statistical significance. Future studies with a larger sample size would be pivotal to determine the clinical implications and significance of these potential risk factors.

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