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# Overview of lower urinary tract symptoms post-trauma intensive care unit admission

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## Abstract

**Background:** The study was undertaken to assess the incidence of lower urinary tract symptoms (LUTS) after short-term indwelling urethral catheter (IUC) in polytrauma patients admitted to a level one trauma unit using core lower urinary tract symptom score (CLSS). Data of patients admitted between January 2013 and December 2015 and meeting the study criteria were retrieved from the hospital informatics system. Chart review was done, and patients were subsequently interviewed telephonically.

**Results:** Ninety-four respondents comprising of 81.9% males and 18.1% females out of the 221 eligible patients were contacted. The most common LUTS reported was urethral pain, and 90% had mild to moderate symptoms. No severe LUTS were identified. There was a positive correlation between the duration of IUC and LUTS, but there was no statistically significant association between age and LUTS in our study population.

**Conclusion:** Short-term duration of IUC in the trauma ICU patient is associated with predominantly mild irritative LUTS which are mostly self-limiting and may not need further investigations and management. CLSS was found to be a useful screening tool. Further studies are needed to confirm findings in our study.

**Keywords:** Urethral catheterisation (UC), Indwelling urethral catheter (IUC), Urethral catheter complications, Core lower urinary tract symptoms score, Intensive care unit

## 1 Background

Since the invention in the 1930s, Foley's catheter has gained universal usage as demonstrated by the fact that between 16 and 25% of hospitalised patients have an indwelling urethral catheter (IUC) inserted during their hospital stay [1]. The use of a urethral catheter is associated with numerous complications, both infectious and non-infectious [2] all of which present with lower urinary tract symptoms and an associated decrease in the quality of life. Catheter-associated urinary tract infection (CAUTI) has received much clinical significance as the commonest complication of urinary catheterisation, as well as the most common cause of infections in hospitals and other health care facilities [3], especially in

post-surgical patients, while iatrogenic trauma from poor technique of placement is also common as a reason for litigation [4].

Non-infectious complications of IUC such as bleeding, urethritis, urethrocutaneous fistula, bladder neck incompetence, sphincter erosion, bladder calculi, bladder cancer and allergy (Latex), encrustation and deterioration of upper tract due to obstruction have also been documented [5, 6].

Injury remains a leading cause of morbidity and mortality around the world, and trauma systems have been shown to improve outcomes for severely injured patients [7]. Trauma patients represent a unique patient population due to the sudden derangement of organ function. Eight-six per cent of trauma admissions in one study were diagnosed with organ dysfunction (systemic inflammatory response syndrome at the time of admission) [8]. This in addition to other procedures, such as intubation

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and the presence of IUC increases susceptibility to both infectious and non-infectious complications.

There is a paucity of information in the literature on complications of post-urethral catheterisation in the trauma population, in patients presenting without any prior injury to the lower urinary tract (LUT). In the present study, we investigated the incidence of lower urinary tract symptoms (LUTS) in trauma patients admitted to a level one trauma unit ICU after IUC using the core lower urinary tract symptom score (CLSS).

## 2 Methods

The study was approved by the Biomedical Research Ethics Committee (BREC) of the author's institution (BE 263/15), as well as the Provincial Health Research Committee of the Department of Health. A urinary catheter may be in situ for a short term (1–14 days), medium term (2–6 weeks) or medium to long term (6 weeks–3 months), and it may be inserted via either the transurethral or the suprapubic route [9]. Trauma ICU patients are routinely managed with a TUC, unless requiring a suprapubic catheter.

The study included contactable respondents who were admitted into the trauma intensive care unit between January 2013 and December 2015 and had an indwelling TUC. Chart review of patients meeting the inclusion criteria was performed using the Sorian® (Siemens, Germany) and Meditech™ (Meditech, Boston MA) hospital information system (BREC Class Approval BE207-09). Sample determination: All patients in the trauma ICU registry meeting inclusion criteria were eligible for attempted telephonic follow-up.

Contactable consecutive patients meeting the above criteria were subsequently interviewed telephonically using the CLSS questionnaire (“Appendix” section). Patients aged more than 40 years were excluded from the study due to potential age-related effect on LUTS.

The unit operates a strict IUC protocol. An all-silicone catheter is inserted by the on-call registrar at admission and it is changed every 4 weeks or earlier, should there be an indication, such as CAUTI. CAUTI has been found to be lower when there is a routine change of catheter [10]. Further exclusion criteria included accidental IUC removal, patients who had suprapubic catheters as well as

permanent IUC. Prior to commencing the study arrangement was made with the Urology Department for referral for further evaluation of any patients who were identified with bothersome LUTS at the telephonic follow-up part of the study.

Definitions of various aspects of LUTS used in the study were based on the international continence society definitions of LUTS [11].

## 3 Results

Of the 221 patients eligible for the study, 94 (42.5%) were successfully contacted. One hundred and twenty-seven patients could not be included in the study due to incomplete data entry during the admission process, wrong telephone numbers, persistent voicemail and refusal to participate in the study. Only one patient declined consent. There were 77 males (89.1%) and 17 females (18.1%) included in the follow-up study. The mean age was 29.11 years (SD 6.029), and the mean duration of ICU was 15.80 days (SD 13.37). Descriptive analysis of results is given in Table 1. The mean CLSS for the study was 3.52 (SD 1.46).

The most common symptom identified in the post-IUC group was urethral pain, which was reported by almost 90% of the respondents. Urethral pain was described as pain and discomfort on micturition by respondents. Urgency was also reported by about 80% of the respondents, and another 74.5% reported some form of frequency. The trend was similar to nocturia where 20.2% reported mild symptoms and only 1.1% had moderate symptoms. Most respondents attributed both frequency and nocturia to their fluid intake as a self-reported reason for these symptoms.

Although approximately 80% reported some form of urgency, only 25% of the respondents reported associated mild urge incontinence (UI), whereas 1% reported moderate UI. On the other hand, only 3.2% reported rarely experiencing stress incontinence and another 7.4% also complained of occasional poor stream. Both types of incontinence were more common in the female sex. When compared to the number of participants that reported the presence of urethral pain, only 30.1% complained of mild bladder pain or discomfort (Table 2).

**Table 1 Selection criteria**

Inclusion criteria	Exclusion criteria
Ages within 18–40	Patient above 40 years at the time of study
Admitted to trauma ICU with at least 7 days of urethral catheterisation	Participants who refused to give consent
No initial trauma or anomaly of the urogenital system on admission	Patients with long-term urinary catheter at the time of the study
Patient still alive without neurological deficit after discharge	Significant neurological dysfunction on discharge from TICU

**Table 2 Demographics and prevalence of lower urinary tract symptoms**

Variable	Frequency	Percentage (%)
<i>Gender</i>		
Male	77	81.9
Female	17	18.1
<i>Ages</i>		
18–29	45	47.9
30–35	24	25.5
36–40	25	26.6
<i>Frequency</i>		
0 (never)	24	25.5
1 (mild)	62	66.0
2 (moderate)	8	8.5
3 (severe)	0	0
<i>Nocturia</i>		
0 (never)	74	78.7
1 (mild)	19	20.2
2 (moderate)	1	1.1
3 (severe)	0	0
<i>Urgency</i>		
0 (never)	20	21.3
1 (mild)	67	71.3
2 (moderate)	7	7.4
3 (severe)	0	0
<i>Urge incontinence (UI)</i>		
0 (never)	68	72.3
1 (mild)	25	26.6
2 (moderate)	1	1.1
3 (severe)	0	0
<i>Stress incontinence (SI)</i>		
0 (never)	91	98.6
1 (mild)	3	3.2
2 (moderate)	0	0
3 (severe)	0	0
<i>Poor stream</i>		
0 (never)	87	92.6
1 (mild)	7	7.4
2 (moderate)	0	0
3 (severe)	0	0
<i>Straining</i>		
0 (never)	92	97.9
1 (mild)	2	2.1
2 (moderate)	0	0
3 (severe)	0	0
<i>Incomplete emptying</i>		
0 (never)	76	80.9
1 (mild)	18	19.1
2 (moderate)	0	0
3 (severe)	0	0
<i>Bladder pain</i>		
0 (never)	65	69.5

**Table 2 (continued)**

Variable	Frequency	Percentage (%)
1 (mild)	29	30.1
2 (moderate)	0	0
3 (severe)	0	0
<i>Urethral pain</i>		
0 (never)	9	9.6
1 (mild)	57	60.6
2 (moderate)	28	29.8
3 (severe)	0	0
<i>QOL</i>		
0 (delighted)	8	8.5
1 (pleased)	72	76.6
2 (mostly satisfied)	12	12.8
3 (mixed)	2	2.1

The majority of the symptoms were transient and had resolved at the time of the study mostly lasting for up to 10–14 days post-hospital discharge. One respondent had a further evaluation of the LUTS by way of urine culture and sensitivity and was prescribed a course of antibiotics for suspected UTI at his local hospital. No further intervention was carried out.

The Chi-squared test was used to determine the age effect on LUTS presentation in the study, but no significant association was identified; however, the Pearson test showed a positive correlation (0.375) between the duration of IUC and the presence of LUTS.

Aside from urethral pain, the rest of the voiding LUTS were minimally reported in the study. Respondents who experienced mild straining and poor stream were 2.1% and 7.4%, respectively, but they had partly attributed their symptoms to the urethral pain. A further 19.1% also reported a sensation of incomplete emptying, which in some cases was difficult to differentiate from bladder pain. Some respondents explained this as possibly due to their initial injury, especially in the case of those with injury to the abdomen.

The majority of the respondents (76.6%) in our study were pleased with their QOL as far as their LUTS were concerned after a short-term IUC, 12.8% mostly satisfied and a further 8.5% were delighted.

#### 4 Discussion

This study highlights the incidence of LUTS after a short-term IUC in the trauma population admitted to an ICU, of which the most predominant symptoms were urethral pain (dysuria) and urgency.

LUTS is assessed using standardised questionnaires such as International Prostate Symptom Score (IPSS), Overactive Bladder Symptom Score (OABSS), Quality of

Life (QOL) index, the International Continence Society (ICS)-male and the short form of the ICS-male, among others [12, 13]. This, however, does not cover all aspects of LUTS because of the disease-specific nature of these questionnaires and as such does not make it an appropriate screening tool for LUTS [12–14]. The core lower urinary tract symptom score (CLSS) questionnaire was developed by Homma et al. to address these challenges. It addresses 10 important symptoms selected from 25 symptoms defined by the ICS standardization committee [12, 15]. Its validity and reproducibility have been confirmed in studies, and it is an appropriate initial assessment tool for LUTS [12]. CLSS compared to IPSS and other standardised questionnaires was found to be more comprehensive [14].

In the general population, voiding symptoms are more common in men, whereas storage symptoms are more common in women, but the prevalence of LUTS does not differ by race [16]. LUTS is also more common in the older adult population [16]. The age groups between 18 and 29 years formed almost 50% of the study population, as seen in other studies and sex difference also demonstrated a male dominance [17]. However, sex alone may not fully determine the severity of LUTS post-discharge from ICU. Other factors such as injury severity score and complications like critical illness neuropathy and myopathy, or pelvic pain from pelvic fracture, diabetes mellitus, and also human immune virus infection may all have an impact on LUT functions [18, 19]. These were unaccounted for in this study. There was no significant statistical association between age and the presence of LUTS in our study; however, one previous study found a prevalence of 61.4% LUTS among adult population 18 years and above, but this study and other similar studies included elderly participants above 40 years and LUTS was also found to increase with ageing [11, 20, 21]. In the trauma patient population, the commonest LUTS from our study was urethral pain (dysuria). This in contrast to other studies in a different patient population found urethral pain only in one-fifth of study population [14]. Pain and other irritative symptoms such as frequency, nocturia, urgency and urge incontinence are usually due to up regulation of C unmyelinated fibres as a result of an inflammatory response to the presence of IUC and other noxious stimuli such as infection [22–24]. It is unclear whether the physiological changes seen in trauma patients have a negative impact on the functional integrity of the urothelium. Considering the physiological derangement associated with trauma, one would have anticipated a higher number of LUTS reported in the trauma population, but our results showed otherwise.

Female participants were more likely to present with associated urge incontinence than their male counterparts. The reasons for this observation may not be readily evident from our study; however, in another study, 45% of healthy female volunteers were excluded from a study due to some degree of urinary incontinence [24]. In a systematic review and meta-analysis to determine the frequency of non-infectious complications of IUC, the incidence of urethral stricture or erosion after short-term IUC was 3.4% [25]. The current study revealed a very low incidence of obstructive LUTS.

Prolonged duration of IUC is associated with an increased incidence of LUTS as evident in other studies [26, 27]. The adherence to urinary catheter policies, on the other hand, is shown to be associated with a decrease in complications as a result of a decrease in IUC duration [28–30].

It is unclear the impact of these early symptoms on the development of LUTS later on in life as the individual advances in age. This is a subject for further research. The frequency of change of IUC is also a subject of debate but the authors institution performs IUC change every 4 weeks or earlier when there is an indication, such as UTI being diagnosed.

## 5 Limitations

This study is limited by sample size and the single-centre nature of the study. The retrospective telephonic follow-up can be associated with recall bias and subjectivity, whereas a self-administered questionnaire may have been more reliable, albeit not practical in the local environment. In addition, some complications may not have yet become apparent in the brief follow-up period and may have been missed in this study. One such potential complication is CAUTI, occurring post-ICU discharge; however, routine urine cultures of all IUC patients are taken weekly in the ICU as part of screening for sepsis and the published CAUTI rate in the unit is low [31]. The CLSS fails to address the new concept of LUTS; post-micturition LUTS, which is the third category of LUTS along storage and voiding LUTS.

## 6 Conclusion

Despite the limitations of our study, LUTS post-ICU-admission in trauma patients admitted to a dedicated trauma ICU are predominantly mild without significant bother and may not need further follow-up. The CLSS is a valid option for evaluation of LUTS but further prospective multi-institutional studies are needed to determine the true burden of LUTS in these patients and other patients populations.

**Abbreviations**

BREC: Biomedical Research Ethics Committee; CAUTI: catheter-associated urinary tract infection; CLSS: core lower urinary tract symptom score; FC: foleys catheter; IALCH: Inkosi Albert Luthuli Central Hospital; IUC: indwelling urethral catheter; ICU: intensive care unit; LUT: lower urinary tract; TICU: trauma intensive care unit; TUC: transurethral catheter; UC: urethral catheterisation.

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**Author's contributions**

EOS (corresponding author): Had complete access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: EOS, TCH and RS. Acquisition of data: EOS and TCH. Analysis and interpretation of data: BT. Drafting of the manuscript: EOS, TCH and RS. Critical revision of the manuscript for important intellectual: TCH and RS. Content: EOS, TCH, RS and BT. Statistical analysis: BT. Study supervision: TCH and RS. The manuscript was read, and its contents approved by all authors prior to submission.

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**Availability of data and materials**

All data generated or analysed during this study are included in this published article.

**Competing interest**

The authors declare that they have no competing interests.

**Consent for publication**

Not applicable.

**Ethics approval and consent to participate**

The study was approved by the Biomedical Research Ethics Committee of University of Kwazulu Natal, South Africa, on the 1st September 2015 with a reference; BE263/16. The Committee was chaired by Prof Tsoka-Gwegweni.

**Informed consent**

An informed consent was obtained from all participants prior to participation in the study.

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## Appendix

### DATA COLLECTION SHEET

The following information will be obtained from the Hospital Records (BE207-09)

#### **Personal information**

1.1 Hospital Number:

1.2 Age (yrs.): 18-29 ( ) 30 - 34 ( ) 35-40 ( )

1.3 Sex Male ( ) Female ( )

#### **2.0 Medical History**

2.1 Source of Referral: From scene ( ) Inter hospital transfer ( )

2.3 Catheter days: 7-14 ( ) 15-21 ( ) 22-28 ( ) 29- 35 ( ) > 36days

**The following information will be obtained by telephonic interview (English only) after confirming the data obtained from the chart review and obtaining consent.**

### CORE LOWER URINARY TRACT SYMPTOM SCORE QUESTIONNAIRE

How many times do you typically urinate?

1 From waking in the morning until sleeping at night?	0	1	2	3
	≤7	8 – 9	10 – 14	≥15

2 From sleeping at night until waking in the morning?	0	1	2	3
	No	2-3	3-4	≥4

How often do you have the following symptoms?	Never	Rarely	Sometimes	Often
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3 A sudden strong desire to urinate, which is difficult to postpone	0	1	2	3
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4 Leaking of urine because you cannot hold it	0	1	2	3
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5 Leaking of urine, when you cough, sneeze, or strain	0	1	2	3
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6 Slow urinary stream	0	1	2	3
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7 Need to strain when urinating	0	1	2	3
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8 Feeling of incomplete emptying of the bladder after urination	0	1	2	3
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9 Pain in the bladder	0	1	2	3
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10 Pain in the urethra	0	1	2	3
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Total score:

If you were to spend the rest of your life with your urinary condition just the way it is now, how would you feel about that?

[Delighted]	[Pleased]	[Mostly satisfied]	[Mixed, equally satisfied and dissatisfied]	[Mostly dissatisfied]	[Unhappy]	[Terrible]
0	1	2	3	4	5	6

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