Toileting-related falls at night in hospitalised patients: the role of nocturia.

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MeSH key words: nocturia, falls, night toileting, aged-care

ABSTRACT

Objective(s)

The purpose of this study was to describe the prevalence and characteristics of toileting-related falls in acutely hospitalised older people.

Methods

Retrospective analysis of falls related to night-time toileting in patients 60 years or over in a tertiary hospital during a one year period.

Results

Overall 34% of falls were related to toileting with at least 44% of these falls occurring during the night. Toilet-related falls peaked between 11pm and 1am, a period that coincides with maximum supine-induced diuresis. Almost half of night falls occurred at the bedside. In 80% of night toileting-related falls patients were mobilising without the recommended level of assistance. Half of all patients had no strategies for toileting documented in their care plan.
Conclusion

Findings support screening for nocturia in older in-patients and implementation of strategies to reduce both the need for toileting at night and risk factors for falling.

MAIN TEXT

Introduction

Nocturia, waking at least once during the main sleep period because of the urge to void (5), is seen in up to 93% of men and 77% of women over 70 years of age (6). This symptom was previously considered a hallmark of overactive bladder but has recently been attributed to an interaction of causes, often outside the urinary tract system. Nocturia is a common symptom of systemic disease, frequently seen alongside poorly controlled diabetes, impaired circulation, congestive heart failure, metabolic syndrome, anxiety, autonomic dysfunction, obstructive sleep apnoea, renal and malignant disease (2,7).

Unmanaged nocturia has significant morbidity and is associated with impaired general health (8). In fact, individuals with more than two nocturia episodes per night have double the risk of early death and over 4 times the risk of cardiovascular/cerebrovascular morbidity (2, 9-10). Patients with nocturia have a markedly increased risk of injurious falls compared to people who sleep through the night; OR 2.2 for any fracture and 1.4 for hip fracture (11). In addition, falling is associated with attempts to toilet independently (11). Whilst serious injuries from in-hospital falls occur in only a small percentage of cases, patients who fall are more likely to have a longer hospital stay and display reduced confidence and functional ability on discharge (12).

On both acute and sub-acute aged care wards patients with nocturia present with complex medical issues which can interact. For example, co-existing over/underactive bladder and frailty may be implicated in the aetiology of nocturia (13,14). Although medical costs and hospitalisation days are increased up to threefold for patients with nocturia, even after adjustments for age, sex and known disease risk factors, the symptom is under-reported by patients (15). A recent European study attributed 91,000, 9,000 and 63,000 annual hospital admissions to nocturia in Germany, Sweden and the United Kingdom respectively (16). The same study estimated that 216,000, 19,000 and 130,000 fractures resulted from nocturia in each of the three respective countries. The annual direct cost of healthcare resources to manage nocturia was a substantial economic burden (16).
A key recommendation from the 2017 International Consultation on Incontinence was that further research be performed to clarify the mechanisms, prevalence and incidence of lower urinary tract symptoms in acutely hospitalised older people (1). It was further stated that each of the known causes should be identified. In hospital, lower urinary tract symptoms of urinary urgency, incontinence, frequency and nocturia, are known risk factors for falls among older adults (2-4). Nocturia is not routinely identified on hospital admission. Current clinical guidelines do not stipulate screening for nocturia and other specific nocturnal lower urinary tract symptoms.

The purpose of this study was to describe the prevalence and characteristics of in-hospital toileting-related falls in acutely hospitalised older people. A secondary aim was to identify associations between night toileting and falls.

Methods
Setting & Participants
This study was a retrospective analysis of a 12-month sample of falls incidents that occurred in older patients during hospital admissions in one public institution between July 2016 and June 2017. Included in the analysis were all falls incidents in patients ≥60 years of age that occurred on one of: two acute general medical wards, three sub-acute aged care wards, one transitional care ward and one rehabilitation ward at a tertiary level hospital in Melbourne. Ethical approval was obtained from the hospital Human Research Ethics Committee (QA2018.027).

Information from the incident reports (date, time and location of fall, activity when fall occurred, presence of injury) was supplemented with linked administrative data (age, gender, admission date, principal diagnosis, comorbid conditions, prior falls history) and data retrieved from patient electronic medical records (mobility status at time of fall, falls risk assessment and management plan (FRAMP), medications). Relevant information from medical records was extracted when incident reports were poorly completed.

The content of all incident reports was reviewed by one author (GR) to ensure classification as a fall was appropriate, before being extracted and coded as i) related to toileting or not and ii) occurring at night versus during the day. For the purpose of this study, toileting referred to all activities intended to address elimination needs: rising from bed or chair, walking to bathroom/commode/urinal, stand-to-sit on toilet, sit-to-stand from toilet, walking from the bathroom and returning to bed or chair. The period between 9.00pm and 6.59am was defined as night-time. This period was chosen to reflect end of visiting hours and the usual practice of when patients are settled for the night. Injuries...
resulting from falls were classified as mild (i.e. lacerations, bruising, skin tears) or moderate (i.e. requiring acute investigation and management).

### Statistical Analysis

Data was analyzed using the statistical program SPSS Version 24. The prevalence of falls and falls injuries related to night-time toileting were calculated as the proportion of patients with the variable of interest divided by the number of all patients in the sample and expressed as a percentage. Descriptive statistics were used to describe the features of night-time toileting-related falls. Specifically, the mean and standard deviation (or median and IQR) was used for continuous variables such as age, and frequencies and percentages for categorical variables such as fall location.

The Mann Whitney U Test was employed to determine whether there were differences in median age between those who fell at different times and between those whose fall was or was not associated with toileting. Binary Logistic Regression was utilised to determine if any of the 5 most common admission diagnoses associated with night-time, toileting-related falls were predictive of this event when compared to other falls. Fisher’s Exact Test was used to evaluate the association between categorical variables (e.g. presence of a comorbid condition) and nocturnal, toileting-related falls.

### Results

Over the 12-month period, a total of 409 incidents were recorded as falls in the hospital incident reporting system for older people across the seven medical and aged-care wards. Following content analysis of the incident descriptions and medical record review (where required), 402 valid falls were analysed.

#### Prevalence of Night-Time Toileting Related Falls

A total of 59 falls were related to toileting at night (Figure 1). This equates to 15% of all fall incidents and 44% of all falls related to toileting. Overall, a significantly greater proportion of falls occurring at night were related to toileting (47%) compared to falls during the day (28%), p<0.001.

#### Patient Age and Gender

The median age of patients who fell was 82 years (IQR 74-87 years). No statistically significant difference in median age was observed when comparing age by time of fall (i.e. night versus day),
p=0.87, whether the fall was related to toileting (p=0.347) or more specifically related to night-time toileting (p=0.24). Fifty eight percent of falls related to night-time toileting involved male patients.

Timing of Fall

Overnight falls accounted for 32% (n=127) of all incidents. For any given hour overnight, the most falls occurred between 23:00-23:59hrs (n=18), followed by 5:00-5:59hrs (n=15). Half of all toilet-related falls occurred between ward bed time (estimated to be 21.00hrs) and 01.00 hrs (n= 29/59). Toilet-related falls peaked between 23:00hrs and 0:59hrs (n=18/59), with the next most problematic time periods being 02.00-03.00hrs and 04.00-05.00hrs (n=7 respectively).

Location and Activity when Fall Occurred

Falls related to night-time toileting most commonly occurred bedside (46%), followed by the bathroom (27%) and the middle of the room (20%). As can be seen from Table 1, 80% of falls related to toileting at night occurred in the early stages of mobilising. That is, 44% occurred when patients were getting out of their bed or chair to use the toilet/commode/urinal and 36% on commencing ambulation to the toilet.

Fall Injuries

Of the 59 falls related to night-time toileting, 37 (63%) resulted in physical harm: 34 (57%) in mild injuries and 3 (5%) in moderate injuries. The 3 injuries classified as moderate were: a displaced fractured neck of femur, an inferior pubic rami fracture and a lateral rib fracture. The first two necessitated transfer to the acute hospital site for investigation and management. No falls incidents resulted in death. The proportion of night-time falls resulting in injury did not differ significantly from day time falls incidents (p=0.363).

Mobility of Faller

The majority of falls (88%) related to night-time toileting involved patients who had been recommended to have supervision or hands on assistance to mobilise safely (Table 2). Notably, 80% involved patients mobilising without the recommended level of assistance documented by the physiotherapist/nurse in the medical record. Of the 12 patients (20%) who were following mobility advice, 7 had been deemed safe by the physiotherapist/nurse to mobilise independently. The remaining 5 patients were in the presence of nursing staff when they fell.

Completion of Falls Risk Assessment & Management Plan

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For 90% of patients who had a fall related to night-time toileting, a Falls Risk Assessment and Management Plan (FRAMP) had been completed on admission to the ward. The FRAMP (Figure 2) includes three items related to toileting: i) use of the bell before toileting ii) a focus on toileting during nursing rounds and iii) education and prompted toileting when patient was taking diuretics. Of the 48 patients who had a completed FRAMP and who were deemed to require supervision or assistance with mobilising, less than half had documentation stipulating the need to use the call bell for toileting. Only 3 of the 9 patients on diuretic medication had documentation of specific safe toileting education. Close to 50% of patients had no strategies for night toileting documented.

Timing of Fall During Inpatient Admission
Falls related to night-time toileting occurred from the day of admission right through to the day before discharge. The median duration of hospital stay before the incident night-time toilet related fall was 10 days (IQR 4-23) and a median of 11 days (IQR 4-23) for all other falls.

Admission Diagnosis
The most frequent admission diagnoses of the patients involved in the 59 falls related to night-time toileting were: ‘lower limb fracture’ (n=10), ‘unspecified circumstance’ (n=7) ‘delirium or dementia’ (n=5), ‘fall not elsewhere classified’ (n=4) and ‘sepsis and certain infections’ (n=4). Of these diagnoses, only lower limb fracture was associated with a statistically significant increase in the odds of a night-time toileting related fall (OR 3.18, 95% CI 1.41-7.20, p=0.005), compared to all other falls.

In 20 (34.5%) of the night-time toileting related falls, the patient concerned had one or more of the following co-morbidities on admission: cognitive impairment, dementia or Alzheimer’s. Table 3 demonstrates that none of the coded comorbid conditions were associated with a higher risk of a night-time toileting-related fall compared to other falls. Twenty three (39%) of incidents involved patients who had sustained at least one other fall during their inpatient hospital stay.

Diuretics
Of the 59 night-time toileting related falls, 11 (19%) involved patients who were taking diuretics at the time of the fall. Only the medication charts of those that had a night-time fall were reviewed so it is not known how this compares to other falls.
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in up to 84% of Lewy body dementia and white matter lesions respectively (21-22). Evidence supports an increased risk of falls even in the early stages of dementia, and confirms accompanying changes in gait, balance, and fear of falling (23). Thus older patients with dementia are highly likely to have night toileting needs, even in the absence of nocturnal polyuria.

The overwhelming majority of patients in this study who fell during attempts to toilet at night, were not following the recommended mobility advice documented in their medical notes. The study findings indicated that a specific directive to use the call bell to obtain assistance was missing in the falls risk paperwork of at least half of the cases of night toilet-related falling. This may reflect a systems error in that the instruction to patients was not understood, the importance of complying was unrecognised or that patients considered themselves to be more competent than therapy assessments indicated. Alternatively, patients may have been ashamed to ask for help, perceived nurses to be busy and felt their request to be a burden to staff (24). Further work is required to understand why patients at risk of falling while in hospital do not utilise assistance to toilet safely.

Patients admitted to aged care wards are not routinely screened for nocturia, meaning that ward staff may be unaware of underlying aetiology requiring further investigation and specific intervention. Treatments that target the underlying causes of night voiding can decrease toileting episodes and bladder-related awakening, however only 50% of patients in this study had documentation of strategies to optimise safety during night toileting. In community-dwelling individuals reducing nocturia by one episode per night has been shown to increase safety, improve sleep, reduce daytime fatigue and support independence (25). This knowledge–practice gap suggests that nocturia may be the single biggest potentially modifiable risk factor in older people at risk of falling during the night. Future work should translate nocturia management algorithms to the hospital ward context (26).

This study utilised hospital administrative data alongside institutional risk and event documentation. This methodology was retrospective and may be an under-representation of actual fall events and provide an incomplete description of implicated factors. Further work should explore the impact of factors such as room occupancy, timing of nursing staff breaks, concurrent urinary tract infection or delirium on toilet-related falls during the night. Despite this, the findings suggest there may be value in screening for nocturia in older in-patients in order that the need for night toileting can be reduced. Strategies to achieve this goal warrant clarification but may include: processes around the use of call bells, improved staff knowledge and understanding of nLUTS, attention to patient health literacy, routine in-patient treatment of urinary dysfunction and reduction of nocturnal urine
There is a dire need for a comprehensive diagnostic process to identify underlying causes in hospitalised older patients with both incident and pre-existing nocturia. This must be followed by the development of a robust intervention algorithm and a formally evaluated implementation process.

**Conclusion**

Falls related to toileting attempts while in hospital are just as common at night as in the day; however, the volume of urine and the related sense of urgency to void is likely to be considerably greater during the night. Nocturia-related falls were most common within a few hours of sleep, a period known to be associated with an increased risk of gait and balance disturbance, cognitive compromise and peak diuresis. Identifying patients with nocturia on admission to hospital creates the opportunity to modify night toileting-related risk factors for falling.

**Impact Statement**

Despite over 75% of men and women over 70 years of age waking to void during the night (called nocturia), the impact of night toileting on falls risk is under-recognised. Screening for nocturia and treating underlying causes may be a modifiable way to reduce falls risk in older hospitalised patients and warrants further study.

**References**


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Table 1: Activity coinciding with nocturnal falls

<table>
<thead>
<tr>
<th>Activity</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting up from bed/chair</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Getting out of bed to toilet</td>
<td>19</td>
<td>32.2</td>
</tr>
<tr>
<td>Standing up from chair to toilet</td>
<td>3</td>
<td>5.1</td>
</tr>
<tr>
<td>Standing from bed to use urinal</td>
<td>2</td>
<td>3.4</td>
</tr>
<tr>
<td>Transferring from bed to commode</td>
<td>2</td>
<td>3.4</td>
</tr>
<tr>
<td>Ambulating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambulating to toilet</td>
<td>21</td>
<td>35.6</td>
</tr>
<tr>
<td>Ambulating from toilet</td>
<td>6</td>
<td>10.2</td>
</tr>
<tr>
<td>Toileting process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sitting down on toilet</td>
<td>1</td>
<td>1.7</td>
</tr>
<tr>
<td>Standing from toilet</td>
<td>4</td>
<td>6.8</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
<td>98.3</td>
</tr>
</tbody>
</table>
Table 2: Mobility of Faller

<table>
<thead>
<tr>
<th>Level of Assistance</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent</td>
<td>7</td>
<td>11.9</td>
</tr>
<tr>
<td>Supervision</td>
<td>19</td>
<td>32.2</td>
</tr>
<tr>
<td>Assist x 1</td>
<td>29</td>
<td>49.2</td>
</tr>
<tr>
<td>Assist x 2</td>
<td>4</td>
<td>6.8</td>
</tr>
<tr>
<td>Total</td>
<td>59</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 3: Association between comorbid conditions and nocturnal, toileting-related falls

<table>
<thead>
<tr>
<th>Comorbid Condition</th>
<th>Presence of Comorbid Condition</th>
<th>Night-time toileting related fallers (n=58)</th>
<th>Other Fallers (n=332)*</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible increased 24 hour Diuresis</td>
<td>Diabetes Mellitus</td>
<td>25 (42.4%)</td>
<td>111 (33.4%)</td>
<td>0.19</td>
</tr>
<tr>
<td>Possible increased Nocturnal Diuresis</td>
<td>Diabetes Insipidus</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>----</td>
</tr>
<tr>
<td>Possible increased Nocturnal Diuresis</td>
<td>CCF</td>
<td>7 (11.9%)</td>
<td>39 (11.7%)</td>
<td>1.00</td>
</tr>
<tr>
<td>Possible increased Nocturnal Diuresis</td>
<td>Lower Limb Oedema</td>
<td>1 (1.7%)</td>
<td>5 (1.5%)</td>
<td>1.00</td>
</tr>
<tr>
<td>Possible increased Nocturnal Diuresis</td>
<td>Renal Disease</td>
<td>12 (20.3%)</td>
<td>75 (22.6%)</td>
<td>0.87</td>
</tr>
<tr>
<td>Possible increased Nocturnal Diuresis</td>
<td>Hepatic Disease</td>
<td>1 (1.7%)</td>
<td>4 (1.2%)</td>
<td>0.56</td>
</tr>
<tr>
<td>Possible increased Nocturnal Diuresis</td>
<td>OSA</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>----</td>
</tr>
<tr>
<td>Bladder Storage Dysfunction</td>
<td>BPH</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
<td>----</td>
</tr>
<tr>
<td>Bladder Storage Dysfunction</td>
<td>OAB</td>
<td>1 (1.7%)</td>
<td>1 (0.3%)</td>
<td>0.28</td>
</tr>
<tr>
<td>Bladder Storage Dysfunction</td>
<td>UTI</td>
<td>11 (18.6%)</td>
<td>69 (20.8%)</td>
<td>0.86</td>
</tr>
<tr>
<td>Falls History of Falls</td>
<td>History of Falls</td>
<td>5 (8.5%)</td>
<td>19 (5.7%)</td>
<td>0.38</td>
</tr>
<tr>
<td>Cognitive Impairment Alzheimer’s</td>
<td>Alzheimer’s</td>
<td>1 (1.7%)</td>
<td>16 (4.8%)</td>
<td>0.49</td>
</tr>
<tr>
<td>Cognitive Impairment Cognitive Impairment</td>
<td>Cognitive Impairment</td>
<td>5 (8.5%)</td>
<td>30 (9.0%)</td>
<td>1.01</td>
</tr>
<tr>
<td>Cognitive Impairment Dementia</td>
<td>Dementia</td>
<td>14 (23.7%)</td>
<td>73 (22%)</td>
<td>0.74</td>
</tr>
</tbody>
</table>

* Association with toileting unable to be determined for 17 falls, 6 of these did not occur at night, hence n= 326 +6
Figure 1: Prevalence of Nocturnal Toileting-Related Falls

- 402 Inpatient Falls
  - 135 Falls Associated with Toileting
    - 59 Nocturnal Falls Associated with Toileting
    - 76 Diurnal Falls Associated with Toileting
  - 250 Falls not Associated with Toileting
    - 57 Nocturnal Falls not Associated with Toileting
    - 193 Diurnal Falls not Associated with Toileting
  - 17 Falls unable to be determined whether Associated with Toileting
Figure 2: FRAMP Strategies for Urinary Frequency, Urgency or Incontinence

<table>
<thead>
<tr>
<th>○ Bowel or urinary frequency, urgency or incontinence</th>
<th>○ Encourage use of call bell for toileting.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>○ Focus on toileting during Patient Safety rounding.</td>
</tr>
<tr>
<td>Details:</td>
<td>○ It patient on diuretics, educate and anticipate toileting.</td>
</tr>
<tr>
<td></td>
<td>○ Other: ____________________________________</td>
</tr>
</tbody>
</table>
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