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

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

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.

1 Conclusion

2 Findings support screening for nocturia in older in-patients and implementation of strategies to
3 reduce both the need for toileting at night and risk factors for falling.
4

5 MAIN TEXT

6 Introduction

7 Nocturia, waking at least once during the main sleep period because of the urge to void (5), is seen
8 in up to 93% of men and 77% of women over 70 years of age (6). This symptom was previously
9 considered a hallmark of overactive bladder but has recently been attributed to an interaction of
10 causes, often outside the urinary tract system. Nocturia is a common symptom of systemic disease,
11 frequently seen alongside poorly controlled diabetes, impaired circulation, congestive heart failure,
12 metabolic syndrome, anxiety, autonomic dysfunction, obstructive sleep apnoea, renal and malignant
13 disease (2,7).
14

15 Unmanaged nocturia has significant morbidity and is associated with impaired general health (8). In
16 fact, individuals with more than two nocturia episodes per night have double the risk of early death
17 and over 4 times the risk of cardiovascular/cerebrovascular morbidity (2, 9-10). Patients with
18 nocturia have a markedly increased risk of injurious falls compared to people who sleep through the
19 night; OR 2.2 for any fracture and 1.4 for hip fracture (11). In addition, falling is associated with
20 attempts to toilet independently (11). Whilst serious injuries from in-hospital falls occur in only a
21 small percentage of cases, patients who fall are more likely to have a longer hospital stay and
22 display reduced confidence and functional ability on discharge (12).
23

24 On both acute and sub-acute aged care wards patients with nocturia present with complex medical
25 issues which can interact. For example, co-existing over/underactive bladder and frailty may be
26 implicated in the aetiology of nocturia (13,14). Although medical costs and hospitalisation days are
27 increased up to threefold for patients with nocturia, even after adjustments for age, sex and known
28 disease risk factors, the symptom is under-reported by patients (15). A recent European study
29 attributed 91,000, 9,000 and 63,000 annual hospital admissions to nocturia in Germany, Sweden
30 and the United Kingdom respectively (16). The same study estimated that 216,000, 19,000 and
31 130,000 fractures resulted from nocturia in each of the three respective countries. The annual direct
32 cost of healthcare resources to manage nocturia was a substantial economic burden (16).
33

1 A key recommendation from the 2017 International Consultation on Incontinence was that further
2 research be performed to clarify the mechanisms, prevalence and incidence of lower urinary tract
3 symptoms in acutely hospitalised older people (1). It was further stated that each of the known
4 causes should be identified. In hospital, lower urinary tract symptoms of urinary urgency,
5 incontinence, frequency and nocturia, are known risk factors for falls among older adults (2-4).
6 Nocturia is not routinely identified on hospital admission. Current clinical guidelines do not
7 stipulate screening for nocturia and other specific nocturnal lower urinary tract symptoms.

8
9 The purpose of this study was to describe the prevalence and characteristics of in-hospital toileting-
10 related falls in acutely hospitalised older people. A secondary aim was to identify associations
11 between night toileting and falls.

13 Methods

14 Setting & Participants

15 This study was a retrospective analysis of a 12-month sample of falls incidents that occurred in
16 older patients during hospital admissions in one public institution between July 2016 and June
17 2017. Included in the analysis were all falls incidents in patients ≥ 60 years of age that occurred on
18 one of: two acute general medical wards, three sub-acute aged care wards, one transitional care
19 ward and one rehabilitation ward at a tertiary level hospital in Melbourne. Ethical approval was
20 obtained from the hospital Human Research Ethics Committee (QA2018.027).

21
22 Information from the incident reports (date, time and location of fall, activity when fall occurred,
23 presence of injury) was supplemented with linked administrative data (age, gender, admission date,
24 principal diagnosis, comorbid conditions, prior falls history) and data retrieved from patient
25 electronic medical records (mobility status at time of fall, falls risk assessment and management
26 plan (FRAMP), medications). Relevant information from medical records was extracted when
27 incident reports were poorly completed.

28
29 The content of all incident reports was reviewed by one author (GR) to ensure classification as a fall
30 was appropriate, before being extracted and coded as i) related to toileting or not and ii) occurring at
31 night versus during the day. For the purpose of this study, toileting referred to all activities intended
32 to address elimination needs: rising from bed or chair, walking to bathroom/commode/urinal, stand-
33 to-sit on toilet, sit-to-stand from toilet, walking from the bathroom and returning to bed or chair.
34 The period between 9.00pm and 6.59am was defined as night-time. This period was chosen to
35 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

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.

Discussion

This study has established that 34% of falls in older people on acute and sub-acute wards were related to toileting, with at least 44% of these falls occurring during the night when staffing levels are lowest. Furthermore, 80% of night toilet-related falls aligned with patients mobilising without the recommended level of assistance. This may highlight a workforce issues, given that toileting programs in an acute setting require a staff to patient ratio of 1:5, however during the night there may be as few as one nurse or care assistant for each ward (1).

Falls whilst in hospital in Australia have been reported to occur more between the hours of 2.00am and 4.00am than at any other time interval, however in that study patients were not sub-classified according to the reason that they were out of bed (17). The current study noted a peak in toilet-related falls before 1.00am; a finding that is clinically relevant. This period of the night coincides with peak diuresis due to third space clearance and reduced vascular resistance related to the supine position. In this study, the prevalence of comorbid disorders known to increase diuresis was explored. The most common disorders associated with increased urine production in the sample of patients who fell were diabetes mellitus (noted in 42% of night toilet-related falls and in one third of other falls), renal disease and congestive cardiac failure.

Up to 80% of patients with nocturia have nocturnal polyuria, reflecting a disorder of solute or free water excretion, systemic illness, injury-related oedema or resulting from an acute condition (7,9). In addition, nocturnal polyuria is induced by deterioration of the sleep-wake cycle and sleep disruption from any cause (18). Moreover waking after a short time asleep is associated with known falls risk factors such as confusion, impaired standing balance and shorter step length when walking (19). In older people lower urinary tract symptoms, particularly a reduced bladder capacity (with or without impaired contractility) is common. Individuals with nocturia may thus have an increase in early night diuresis occurring at the same time as urinary urgency and peak vulnerability to balance and gait disturbance. This study also noted that up to 20% of patients who fell had an International Classification of Disease code for urinary tract infection; a symptom associated with urinary frequency.

Almost one quarter of patients who fell had been coded as having dementia, a finding in agreement with an earlier study that showed dementia as an independent predictor of recurrent falls in elderly hospitalised patients (20). The prevalence of dementia did not differ significantly between individuals who fell while attempting to toilet at night and other patients who fell. Lower urinary tract function is known to be altered in patients with dementia, with severe nocturia being reported

1 in up to 84% of Lewy body dementia and white matter lesions respectively (21-22). Evidence
2 supports an increased risk of falls even in the early stages of dementia, and confirms accompanying
3 changes in gait, balance, and fear of falling (23). Thus older patients with dementia are highly likely
4 to have night toileting needs, even in the absence of nocturnal polyuria.

5
6 The overwhelming majority of patients in this study who fell during attempts to toilet at night, were
7 not following the recommended mobility advice documented in their medical notes. The study
8 findings indicated that a specific directive to use the call bell to obtain assistance was missing in the
9 falls risk paperwork of at least half of the cases of night toilet-related falling. This may reflect a
10 systems error in that the instruction to patients was not understood, the importance of complying
11 was unrecognised or that patients considered themselves to be more competent than therapy
12 assessments indicated. Alternatively, patients may have been ashamed to ask for help, perceived
13 nurses to be busy and felt their request to be a burden to staff (24). Further work is required to
14 understand why patients at risk of falling while in hospital do not utilise assistance to toilet safely.

15
16 Patients admitted to aged care wards are not routinely screened for nocturia, meaning that ward staff
17 may be unaware of underlying aetiology requiring further investigation and specific intervention.
18 Treatments that target the underlying causes of night voiding can decrease toileting episodes and
19 bladder-related awakening, however only 50% of patients in this study had documentation of
20 strategies to optimise safety during night toileting. In community-dwelling individuals reducing
21 nocturia by one episode per night has been shown to increase safety, improve sleep, reduce daytime
22 fatigue and support independence (25). This knowledge –practice gap suggests that nocturia may be
23 the single biggest potentially modifiable risk factor in older people at risk of falling during the
24 night. Future work should translate nocturia management algorithms to the hospital ward context
25 (26).

26
27 This study utilised hospital administrative data alongside institutional risk and event documentation.
28 This methodology was retrospective and may be an under-representation of actual fall events and
29 provide an incomplete description of implicated factors. Further work should explore the impact of
30 factors such as room occupancy, timing of nursing staff breaks, concurrent urinary tract infection or
31 delirium on toilet-related falls during the night. Despite this, the findings suggest there may be
32 value in screening for nocturia in older in-patients in order that the need for night toileting can be
33 reduced. Strategies to achieve this goal warrant clarification but may include: processes around the
34 use of call bells, improved staff knowledge and understanding of nLUTS, attention to patient health
35 literacy, routine in-patient treatment of urinary dysfunction and reduction of nocturnal urine

1 volume. There is a dire need for a comprehensive diagnostic process to identify underlying causes
2 in hospitalised older patients with both incident and pre-existing nocturia. This must be followed by
3 the development of a robust intervention algorithm and a formally evaluated implementation
4 process.

8 Conclusion

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

16 Impact Statement

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

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Table 1: Activity coinciding with nocturnal falls

	Activity	Frequency	Percent
Getting up from bed/chair	Getting out of bed to toilet	19	32.2
	Standing up from chair to toilet	3	5.1
	Standing from bed to use urinal	2	3.4
	Transferring from bed to commode	2	3.4
Ambulating	Ambulating to toilet	21	35.6
	Ambulating from toilet	6	10.2
Toileting process	Sitting down on toilet	1	1.7
	Standing from toilet	4	6.8
	Total	58	98.3

Table 2: Mobility of Faller

Level of Assistance	Frequency	Percent
Independent	7	11.9
Supervision	19	32.2
Assist x 1	29	49.2
Assist x 2	4	6.8
Total	59	100.0

Table 3: Association between comorbid conditions and nocturnal, toileting-related falls

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

* 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

Figure 2: FRAMP Strategies for Urinary Frequency, Urgency or Incontinence

☐ Bowel or urinary frequency, urgency or incontinence	☐ Encourage use of call bell for toileting.
	☐ Focus on toileting during Patient Safety rounding.
Details: _____ _____ _____	☐ If patient on diuretics, educate and anticipate toileting.
	☐ Other: _____

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