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OLDER ADULTS

Urinary retention in older patients in connection with hip fracture surgery

Rose-Marie Johansson and Lennart Christensson

Aim and objective. The aim of this study was to examine the presence of urinary retention in older patients with hip fracture and to describe what actions nurses performed to detect, prevent and treat urinary retention.
Background. The incidence of urinary retention in patients with hip fracture is described as being as high as 82% before surgery and 56% after. Urinary retention is traditionally treated with an indwelling urethral catheter or intermittent catheterisation. Urinary retention and treatment with an indwelling urethral catheter are associated with high risks.
Design. A prospective, descriptive study.
Methods. The study included 48 patients, 65 years or older who were recovering from hip fracture and receiving hospital care at a geriatric rehabilitation clinic. Six months before the study, a programme for the early detection, prevention and treatment of urinary retention was implemented. The presence of urinary retention, bacteriuria, the patient's cognitive function, use of ultrasound bladder scan and type of treatment whether the patient suffered from urinary retention were examined during the study period.
Results. Urinary retention was found in 18 (38%) of the patients. No patients were examined using ultrasound bladder scan according to the programme, and the mean time of indwelling urethral catheter was three times longer than the programme suggested. The patients who were treated with intermittent catheterisation had had voiding satisfaction earlier and had not had repeated urinary retention compared to patients with indwelling urethral catheter.
Conclusion. In most patients, the programme was not followed and urinary retention was commonly present.
Relevance to clinical practice. There is knowledge on how to reduce the presence of urinary retention, but the great challenge is how to implement this knowledge.

Key words: hip fractures, nurses, nursing, older, urinary retention

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Introduction

Hip fracture is one diagnosis that has become a major problem for older patients, with a significant cause of postfracture disability, morbidity and mortality (Liporace *et al.* 2005). Most patients with a hip fracture have multiple medical problem and an increased risk of developing complications (Schmidt *et al.* 2005). Half of patients with hip fracture are described as having impaired cognitive ability and/or dementia syndrome in connection with surgery (Gruber-Baldini *et al.* 2003) and a third die within one year (Roche *et al.* 2005).

The reported incidence rate of patients with hip fracture and urinary retention (UR) has been as high as 82% before surgery (Skelly 1992) and 56% after surgery (Smith & Albazzaz 1996). UR is defined as the inability or failure to empty the bladder, leaving a postvoid residual urine (PVR) (Gray 2000). There is no generally accepted standard PVR

Authors: *Rose-Marie Johansson*, MSc, RN, Project Manager, Ryhov County Hospital; *Lennart Christensson*, PhD, RN, Associate Professor, Department of Nursing Science, University of Health Sciences, Jönköping, Sweden

Correspondence: Rose-Marie Johansson, Hus B5 plan 2, University Hospital, 551 89 Jönköping, Sweden. Telephone: +4636739137532.
E-mail: Rose-marie.johansson@lj.se

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for older patients with hip fracture, and the amount varies in different studies between 150 ml (Skelly 1992) and 300 ml (Smith & Albazzaz 1996).

Increased risk factors for developing UR are advanced age, spinal anaesthesia (Hung & Becky 2004), acute confusion, immobility (Wu 2005), previous history of bladder problems, enlargement of the prostate, urethral strictures, pain, large amount of intravenous fluids, long duration of surgery (Lamonerie *et al.* 2004), diabetes for more than 15 years and cholinergic medication, analgesics and constipation (Borrie *et al.* 2001).

Pain, discomfort and overflow incontinence are symptoms commonly seen in patients suffering from UR (Baldini *et al.* 2009), but in some cases of acute UR there are no symptoms of voiding difficulties (Pavlin *et al.* 1999). UR can lead to hydroneprosis, pyelonephrites and renal insufficiency, bacteriuria, incontinence (Gray 2000), discomfort, pain, acute confusion, extended stay in hospital (Pavlin *et al.* 1998) and death (Smith & Albazzaz 1996).

Evidence-based nursing actions, including early recognition and treatment of UR, may decrease complications of UR in older patients (Pavlin *et al.* 1999), reduces costs and provides a higher patient satisfaction (Borrie *et al.* 2001, Frederickson *et al.* 2000, Teng *et al.* 2005). Implementing an ultrasound bladder scan programme has been shown to reduce the incidence of catheterisation (Stevens 2005). It should be performed every four–six hours during the first 24 hours (Lewis 1995). Nicolle *et al.* (2008) recommend that nurses develop a protocol for the management of the postoperative UR, including nurse-directed use of intermittent catheterisation (IC) and use of ultrasound bladder scan.

The treatment of acute UR can be addressed in two parts: drainage of the bladder and finding and treating the underlying cause (Baldini *et al.* 2009). When UR occurs in connection with surgery, the literature recommends IC (Burman 2006, Moore *et al.* 2002). A randomised study showed that patients with hip fracture and UR who were treated with IC returned voiding satisfaction four days earlier than did those who were treated with indwelling urethral catheter (IUC) (Skelly 1992).

Urethral catheterisation is connected with risk of complications such as urinary tract infection (UTI), trauma, urethral perforation, stricture, bleeding, fistula and increases in discomfort. When an IUC is used, there is an increased risk of pressure ulcers in the urethra or the bladder, stricture formation, encrustation and carcinoma of the bladder (Lowthian 1998, Pomfret 2000), leakage of urine, discomfort, pain and inflammation of the urinary tract, causing difficulties for women to sit (Doherty & Winder 2000a). These problems may lead to passivity, resignation and a bedridden state. A study including patients treated with IUC showed that 42% of the patients reported discomfort and 48% reported pain, while 61% noted that it restricted their activities of daily living (Saint *et al.* 2002). Patients who have had an IUC may develop continued UR after finishing the IUC treatment. UR has been seen 7–48 hours after catheter removal (Wyman 1987).

UTI appears to be the most common complication in patients with urinary catheters (Simpson 2001) and can lead to urosepsis and septicaemia (Newman 2008). Once a catheter enters the bladder, the incidence of bacteriuria rises by about 3–7% per day (Nicolle *et al.* 2008). Approximately 25% of patients with hip fracture are stricken by UTI (Hedström *et al.* 1999). Patients with hip fracture who are treated for UTI have been shown to have a prolonged hospital stay, on average five days (Hedström *et al.* 1999, Johansson *et al.* 2002).

In 2005, an evidence-based programme for patients with hip fracture was implemented at a geriatric rehabilitation clinic. The programme contained routines for detecting, preventing and treating UR in patients with hip fracture. Ultrasound bladder scan was to be performed within the first hour after the patient arrived at the hospital, and repeated controls were to be performed at 4–6-hour intervals until the risk of UR had been eliminated. If the urine volume measured using ultrasound bladder scan was more than 400 ml and the patient was unable to pass urine, the prescribed treatment was to be catheterisation (IC or IUC). When IUC was used, the catheter was to be removed within 24 hours postoperatively, and the patient was to subsequently be managed with scheduled IC if catheterisation was necessary. To implement the programme, the registered nurses and assistant nurses received a two-hour education, and the recommendations were published on the local website. This study was performed six months later, and the aim was to examine the presence of UR in older patients with hip fracture and to describe what actions nurses performed to detect, prevent and treat UR.

Method

A prospective descriptive study including patients with hip fracture during hospital care.

Sample and setting

The setting of this study was a geriatric rehabilitation ward in southern Sweden. The ward had 28 beds and the nursing staff included 24 registered and 22 assistant nurses. Criteria for a patient's inclusion were hip fracture and being aged

65 or older. At this hospital, patients with hip fracture receive hospital care at the geriatric rehabilitation clinic from the first day. Exclusion criteria were ongoing IUC treatment at the time of admission. Patients who fulfilled the inclusion criteria were asked to participate in the study and those who consented were included. In patients with dementia syndrome, or when the registered nurse assessed a patient as having cognitive inability, the next of kin was asked. From October 2005–January 2006, 52 patients fulfilled the inclusion criteria, and four of these did not wish to participate. Consequently, data from 48 patients were included in the study.

Data collection

Demographic and medical data including sex, age, present diseases, type of fracture, type of anaesthesia, presence of UR, length of hospital stay, performed ultrasound bladder scan, type of catheter and number of UR (occasion 1–20) were collected from the medical and nursing records by one of the authors, R-MJ. A measurement of 400 ml was used to define UR, which is in concordance with the recommendations used at the hospital where the study was performed. To examine the incidence of bacteriuria, cultures of the patients' urine samples were collected upon their admission to hospital and between the seventh and 10th days after surgery. The urine samples were collected by the nursing staff. Urine was obtained from a clean voided midstream specimen. Each specimen underwent quantitative urine culture using standard laboratory techniques. Bacteriuria was defined as 10^5 CFU/ml (Smittskyddsinstitutet 2000). Cultures such as 'mixed growth' were regarded as failed samples and were excluded.

As cognitive impairment is a common phenomenon in patients with hip fracture and may complicate the situation, the Mini Mental State Examination (MMSE) (Folstein *et al.* 1975) was used to assess the patients' cognitive status. Cognitive disorders are indicated by scores below 24 points (maximum score 30) (Cockrell & Folstein 1988, Folstein *et al.* 1975). We assumed that it was not possible to perform the MMSE test directly before or after surgery because the patients were affected both psychologically and physically by the accident, surgery and pain. The test was performed by one of the authors, R-MJ, 3–5 days after surgery.

Ethical considerations

This study was conducted in accordance with the ethical guidelines for nursing research in the Nordic countries (Norther nurses federation (NNF) (2003). The patients, or their next of kin, received oral and written information about the aims of the study and what participation would mean and were informed that they could withdraw participation whenever they wanted to without giving any explanation. Confidentiality of the collected data was maintained throughout the study. Permission to conduct the study was received from the clinic's business manager, and the staffs were verbally informed about the study. According to the Research Ethics Committee, Faculty of Health Sciences, Linköping University, no ethical application is needed as the study describes the results of ordinary clinical work, and no specific intervention was implemented.

Statistics

Descriptive statistics such as frequency, percentage, arithmetic mean, standard deviation and range were used. Significant differences between subgroups were determined using the chi-square test, Fisher's exact test and *t*-test. Differences were considered statistically significant at $p < 0{\cdot}05$ level. The statistical program used was SPSS version 15.0 (SPSS Inc., Chicago, IL, USA).

Results

Characteristics of the study group

A total of 48 patients with hip fracture of whom three-fourths were women were included in the study. The characteristics of the patients are described in Table 1. Upon admission to hospital, no patients had a UR diagnosis. Correct urine sample collection was performed in 30 (63%) patients at the time of entering hospital, of whom 13 (43%) had bacteriuria. Of these, 12 were women and one was a man

Table 1 Characteristics of the study group (n = 48)

Variables	Data
Age: mean (SD) years	83 (7)
Gender: *n* (%)	
Female	36 (75)
Male	12 (25)
Diagnosed: *n* (%)	
Diabetes mellitus	9 (19)
Senile dementia	11 (23)
MMSE: points mean (SD)	18 (SD 11)
Type of fracture: *n* (%)	
Cervical hip fracture	26 (54)
Trochanter hip fracture	22 (46)
Hospital stay: mean (SD) days	17 (SD 6)

SD, standard deviations; MMSE, Mini Mental State Examination.

(p = 0·047). The age of the included patients varied between 69–98. According to the MMSE (<24 points), 27 (56%) patients had cognitive impairment. The MMSE score ranged between 0–29 points. Spinal anaesthesia was used in 46 patients and general narcosis in the remaining two. The hospital stay ranged between 5–31 days.

Urinary retention

The staff identified 18 (38%) patients with UR. Mean PVR was 689 ml (SD 243), and the amount ranged between 478–1300 ml urine. UR was identified before surgery in eight patients, after surgery in four and both before and after surgery in six. In 10 patients, the staff identified repeated UR on 2–20 occasions (OC2–OC20). There was no significant difference according to age, sex, presence of bacteriuria, presence of diabetes or senile dementia and cognitive impairment between patients stricken with UR compared to patients who were not.

Actions to detect, prevent and treat UR

In 12 (25%) patients, ultrasound bladder scan was performed within one hour after admission. No patients (n = 48) were repeatedly examined using ultrasound bladder scan as described in the routine programme. On the day of surgery, 40 patients were treated with IUC. The indication in nine of these patients was UR, in one expected bleeding and in two an inappropriate indication was used: the smell of UTI and constant urine dripping. In 28 patients, the indication was unknown as no documentation was found. Thirty-four (85%) patients were treated with IUC for more than 24 hours. The mean time of treatment with IUC (n = 40) was 66 hours (SD 48) with a range between 18–183.

Seven to 10 days after surgery, urine cultures were examined in 35 (75%) of the patients (n = 48). Fourteen of these patients (37%) had bacteriuria. and all had been treated with IUC for more than 24 hours. The mean hospital stay was 19 days in patients treated with IUC and stricken with bacteriuria, 7–10 days after surgery (n = 14), compared with 16 days in those treated with IUC but without bacteriuria. Patients with cognitive impairment (MMSE < 24) and who were treated with IUC retained the catheter longer compared to patients with MMSE 24 or more and bacteriuria 7–10 days after surgery was more common (Table 2).

No patients treated with IC on the first occasion of UR (OC1) (n = 5) suffered from repeated UR, compared to nine patients who were treated with IUC (n = 13). At UR OC1, all five patients treated with IC returned voiding satisfaction within one day after surgery compared to those who were treated with IUC, of whom nine returned voiding satisfaction within 2–10 days after surgery and four did not return voiding satisfaction during their hospital stay (Table 3). In four patients with UR, the IUC treatment continued after they left the hospital.

Table 2 Cognitive impairment in relation to UR, bacteriuria at arrival, presence of IUC, repeated UR and bacteriuria 7–10 days after surgery in patients with hip fracture during hospital care

Variables	MMSE < 24 n = 27	MMSE ≥ 24 n = 21	p-value
UR	9	9	0·310[#]
Bacteriuria at arrival*	8	5	0·231[#]
IUC	26	14	0·009[#]
Removed IUC themselves	5	0	0·000[##]
The mean time of treatment with IUC: hour	74	52	0·206[###]
Repeated UR	7	3	0·077[#]
Bacteriuria 7–10 days after surgery[†]	12	2	0·003[#]

MMSE, Mini Mental State Examination; IUC, indwelling urethral catheter; UR, urinary retention.
[#]Chi-square test; [##]Fishers exact test; [###]t-test.
*Urine sample in 30 of 48 patients.
[†]Urine sample in 35 of 48 patients.

Discussion

The main results of this study showed that nurses' actions were not in compliance with the stipulated routines, and 18 (38%) patients were identified as having UR with a PVR

Table 3 Patients with hip fracture at the first occasion they were identified as having UR (n = 18) and type of treatment in relation to age, gender, presence of senile dementia, MMSE score, number of repeated UR, voiding satisfaction <24 hours and bacteriuria 7–10 days after surgery

Variables	IC n = 5	IUC n = 13	p-value
Age: mean years	83	86	0·526[###]
Gender: n			
Female	4	9	
Male	1	4	0·567[#]
Senile dementia: n	0	4	0·234[##]
MMSE: points, n (SD)	26 (SD 3)	16 (SD 13)	0·006[##]
Repeated UR: n	0	9	0·007[#]
Voiding satisfaction <24 hours: n	5	0	0·000[##]
Bacteriuria 7–10 days after surgery: n	0	5	0·126[##]

UR, urinary retention; IC, intermittent catheterisation; IUC, indwelling urethral catheter; MMSE, Mini Mental State Examination.
[#]Chi-square test, [##]Fishers exact test, [###]t-test.

volume at UR OC1 varying between 478–1300 ml. Ten patients suffered from repeated UR OC 2–20. A urine bladder volume > 500 ml has been described as being associated with a greater risk of repeated UR, decreased function and lifelong damage to the bladder, compared to a volume of < 500 ml (Tammela *et al.* 1986).

Identifying risks and avoiding problems during a patient's hospital stay are important issues for nurses, who should play an active role in screening patients who are at risk (Ringdal *et al.* 2003). If the nurses had followed the routines, the patients with UR may have been diagnosed earlier, the amount of PVR may have been lower at OC1 and fewer patients may have suffered from repeated UR. Management with ultrasound bladder scan of postoperative UR reduced unnecessary catheterisation and UTI rates (Baldini *et al.* 2009, Lee *et al.* 2006). Pedersen *et al.* (2008) showed that a compressive hip fracture programme with a new UR regime with ultrasound bladder scan controls significant reduced UTIs (Pedersen *et al.* 2008). Lee *et al.* (2006) came to the conclusion in their study that a bladder ultrasound programme was successful and could be used to manage patient with urination disorder at neurosurgical units (Lee *et al.* 2006).

In this study, 36 of 40 patients were treated with IUC longer than 24 hours and the 14 patients who had bacteriuria, 7–10 days after surgery, had all been treated with IUC for more than 24 hours. Shorter postoperative duration of catheterisation (< 24) has been shown to give fewer UTI (Phipps *et al.* 2009). In a study of hospitalised older medical patients without a specific medical indication, IUC was associated with fourfold greater risk of death during hospitalisation and a twofold greater risk of death within 90 days of discharge (Holroyd-Leduc *et al.* 2007). Notable is that studies have shown that it happens that staff forget to remove a urethral catheter that is no longer needed (Saint *et al.* 2005).

UTI has been estimated to cause one death in every thousand episodes of catheterisation (Stamm 1991). March *et al.* (2000) showed that the use of an IUC in patients with hip fracture was more associated with significantly increased mortality even after adjusting for age, nursing home status and cognitive function (March *et al.* 2000). The first step in reducing catheter-associated UTI and other complications is to avoid unnecessary catheterisation; the second is to remove the catheter as soon as possible (Burman 2006, Gokula *et al.* 2004).

More than 50% of the patients in this study had reduced cognitive status three–five days after surgery, and these patients were more often treated with IUC and had a higher incidence of bacteriuria 7–10 days after surgery compared to those with no cognitive problems. Five patients had removed the IUC themselves, and all had impaired cognitive ability. Extracting the IUC in this way is a trauma and can injure the urinary tube, as the IUC is fixed inside the bladder with a fluid-filled bladder of about 10–15 ml. This indicates that the staff needs to be more observant when IUC is used in patients with reduced cognitive function and this method should be discussed more critically.

In this study, 18 patients were identified as having UR. Five were treated with IC and 13 with IUC at UR OC1. The patients who were treated with IC had no repeated UR or bacteriuria 7–10 days after surgery and voiding satisfaction resumed earlier compared to patients who were treated with IUC. This result is in concordance with Skelly (1992), who have shown that hip fracture patients with UR who were treated with IC return voiding satisfaction four days earlier than those who were treated with IUC. It is suggested that patients who develop UR should be managed with IC, because overnight IUC appeared to bestow no additional benefits (Hung & Becky 2004).

On discharge, IUC treatment was continued in four patients with UR. Wald *et al.* (2005) have described an association between extended IUC use and poor outcomes in older patients sustaining hip fracture. Extended IUC was associated with 58% higher odds of rehospitalisation for UTI, 22% higher odds for rehospitalisation for sepsis, 7% lower odds of discharge to home at 30 days and 31% higher odds of 30-day mortality. Further, the same study showed that being treated with IUC on discharge was more associated between the wards and hospital characteristics than with a patient's age, illness, individual problems and needs (Wald *et al.* 2005).

As patients who are treated with IUC run a high risk of complications, it is important to develop methods that facilitate a patient's ability to empty his/her bladder in connection with surgery. Kulacu (2001) found that nine of 10 patients who had initial difficulties voiding urine following surgery managed to void after simple interventions such as early mobilisation, providing privacy and applying a bag containing warm water over the suprapubic region (Kulacu 2001).

This study has several limitations. The incidence of UR observed in this study was 38%, and the true prevalence of UR is probably underestimated. All patients included in the study were not examined using ultrasound bladder scan, and 28 patients received IUC based on unclear indication. Even after a comprehensive search of the literature, it remains unclear what level of PVR should be defined as a risk and consequently be treated. In other studies, a lower amount of PVR has been used as definition, such as 150 ml (Skelly 1992) and 300 ml (Smith & Albazzaz 1996). Ultrasound bladder

scan and urine culture were performed as a part of the everyday clinical work. The measurements were taken by the staff working at the time, and the performance method may not have always been optimal. Another limitation is using data from the patients' records. What is written in a patient's record may not be the same as the action that was actually performed. There may also have been measures carried out that were not documented in the medical or nurses' records.

The fact that urine culture was collected in just 30 (65%) of the patients at time of arrival and in 35 (75%) 7–10 days later decreases the reliability of this study. Staff failure to follow the instructions was the main reason for these missing data. There may also be sources of error in the urine reproductive responses. Obtaining a clean urine sample in this older population can be difficult. Problems of incontinence are common in this group of patients and an incubation period of four hours can be difficult to keep, whereas a too-short incubation period can lead to missed bacteriuria. It can also be difficult to get a mid-stream specimen of urine from a patient with impaired cognitive ability and difficulty in communicating and bacteriuria can thus develop because of contamination.

A final limitation of this study is that the examination of cognitive function was not performed in connection with the time at which UR was diagnosed, but rather 3–5 days after surgery. Cognitive ability can be affected by temporary acute confusion and, therefore, the result may only represent that day on which the test was performed. The variation of 3–5 days was attributed to the reduced ability to perform tests on Saturdays and Sundays. Inappropriate management of UR may be responsible for bladder over distension and catheter-related complications. To minimise these risks, this study proposes an evidenced-based approach for the prevention and management of UR.

Conclusion

Thirty-six per cent of the patients in this study had UR and were exposed to great risk of damaging their bladders, and four patients with UR were still being treated with IUC on discharge. Although evidence-based routines had been implemented the nurses did not execute all the recommended measures. Today, there is knowledge on how to reduce the presence of UR, but the great challenge is how to implement this knowledge.

Relevance to clinical practice

There is knowledge on how to reduce the presence of UR, but the great challenge is how to implement this knowledge.

Contributions

Study design: R-MJ, LC; data collection and analysis: R-MJ and manuscript preparation: R-MJ, LC.

Conflict of interest

None.

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