

# Intermittent versus indwelling catheters for older patients with hip fractures

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## Summary

- Nursing staff identified postoperative urinary tract infection (UTI) in patients with hip fracture as an increasing problem. A quality improvement project was carried out to investigate the problem and to reduce the incidence.
- The aim of the study was to describe the occurrence of UTI among patients with hip fracture before and after surgery, to assess whether the decision to use intermittent catheters instead of indwelling catheters was adopted and to test the hypothesis that hospital stay is significantly longer for patients with UTI than for those without infection.
- One hundred and forty-four patients were investigated for bacteriuria before the first catheterization and 1 week after the last catheterization.
- Positive urine cultures on admission to hospital were found in 38% of patients. Among those free from bacteria on admission, 61% had a positive urine culture after indwelling catheterization compared with 32% in the group treated with intermittent catheterization.
- A significantly longer hospital stay ( $P \leq 0.05$ ) was found among patients with UTI. The reason for using an indwelling catheter was not found in any medical or nursing documentation for 29% of the patients.

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- The study points to the necessity for systematic assessment to detect and prevent UTI among older patients with hip fracture.

*Keywords:* hip fracture, indwelling catheter, intermittent catheter, nursing quality improvement, urinary tract infection.

## Introduction

Hip fracture is a leading traumatic event in older people and is treated by surgery. Dolk (1989) found in his study of hip fracture patients that 38% had positive urinary cultures on admission to hospital. Urinary tract infection (UTI) is the most common infection in older people and patients with diabetes are reported as being prone to develop UTI (Bonadio *et al.*, 1999). Urinary retention is reported to occur in almost half of all patients undergoing hip surgery and bladder catheterization is, therefore, a common clinical routine. The use of an indwelling catheter has been investigated in several studies with regard to the risk of developing UTI (Dolk, 1989; Ochs, 1990; Willis, 1995). Prophylactic use of an indwelling catheter inserted at the time of surgery and retained for 24 hours postoperatively was found not to affect the incidence of UTI. However, use of a catheter for more than 48 hours was associated with an increase in UTI (Carpinello *et al.*, 1988; Michelson *et al.*, 1988). Dolk (1989) concluded that there is a strong connection between indwelling catheters and UTI and he stressed the need to remove the catheter as early as possible if it must be used. The use of intermittent catheterization has been found to affect the incidence of UTI, with lower frequency compared with the use of indwelling catheters (Skelly *et al.*, 1992).

The starting point of this project, carried out in an orthopaedic unit in a hospital in Sweden, was that the rate of postoperative UTI in patients with hip fractures was identified by nursing staff as being too high and also as increasing. Screening of bacteriuria was not routine on admission of the patients to hospital, and so no data were available on the rate of bacteriuria on admission. Most patients on the ward routinely had an indwelling catheter preoperatively and kept it for 3–5 days postoperatively. The nurses decided to focus on these problems in a quality-improvement project, where the Dynamic Standard Setting System (DySSy) developed by Kitson (1986, 1989) was used.

The quality improvement process, which followed all the steps of the DySSy, will not be reported in this paper. However, the process included a great number of discussions and collaboration between physicians and

nurses who met the patients in the treatment process from the emergency room to the operating theatre, postoperative recovery room and finally on the orthopaedic ward. It also included comprehensive evaluation and training efforts by staff concerning the performance of aseptic catheterization, as well as creation of information pamphlets for patients and staff. After discussions among the team of nurses and physicians it was decided to stop routine preoperative catheterization with an indwelling catheter. Instead, intermittent catheterization should be performed when catheterization was judged to be necessary. This paper reports the evaluation of this quality improvement initiative.

## AIMS

The aims of the study were threefold:

- 1 To describe the occurrence of UTI among older patients with hip fracture before and after surgery;
- 2 To assess whether the decision to use intermittent catheters instead of indwelling catheters was followed;
- 3 To test the hypothesis that hospital stay is significantly longer for patients with UTI than for those without infection.

## Method

### STUDY GROUP

The study was carried out during a period of two and a half years in one orthopaedic ward at a central hospital in a medium-sized Swedish city. The sample consisted of 144 patients admitted to the hospital with traumatic hip fracture. The inclusion criteria were patients with either cervical or trochanter hip fracture coming from their own home or living in residential accommodation. Patients with ongoing antibiotic therapy and indwelling catheterization before admission were excluded. Those fulfilling the inclusion criteria were selected consecutively by nurses on the ward. The average age for the total group was 84 years ( $SD \pm 10.17$ ). Of the 144 patients, 105 (73%) were females and 39 (27%) were males. Twenty-eight of the patients (19%) had diabetes.

## DATA COLLECTION

All patients were operated on within 24 hours of admission. Data collection regarding catheterization procedure, such as the use of indwelling catheter or intermittent catheterization, and total number of hospital days were collected from medical and nursing records. In addition, checklists were used to note when different types of catheterization were performed, by whom it was ordered, and the duration of treatment with an indwelling catheter. After a medical decision was made about the type of catheterization the nurse informed the patient. Testing for bacteriuria was carried out with a laboratory test before the first catheterization and 1 week after the last catheterization. Bacteriuria was defined as growth of  $\geq 10^5$  bacteria/ml. All tests were carried out at the same laboratory.

## DATA ANALYSIS

Differences between subgroups of patients were tested for statistical significance by independent groups *t*-tests (two-tailed probability) and one-way analysis of variances [Statistical Package for the Social Science (SPSS), Norusis, 1993]. Statistical significance was assumed at  $P \leq 0.05$ .

## ETHICS

The project was a part of continuous quality improvement work at the clinic, which was evaluated systematically. Data collection did not involve any measure judged as being threatening for patients' anonymity or privacy. Therefore, authorization to carry out the study was judged to require only permission from the clinical director and informed consent from the patients.

## Results

The findings showed that 38% ( $n = 55$ ) of the entire group ( $n = 144$ ) of patients had a positive preoperative urine culture on admission to hospital and there was a predominance of women (93%) in this group. There was no significant difference in average age or frequency of diabetes between patients who had UTI before admission compared with those with negative bacteriuria before admission (Table 1).

No further statistical analysis was carried out concerning the frequency of UTI related to diabetes in the different groups because of the small number of patients who had diabetes ( $n = 28$ ).

Figure 1 shows that out of the 89 patients who were free from UTI on admission, most (71%) were treated

**Table 1** Numbers and percentage of patients with and without urinary tract infection (UTI) in relation to sex and age for the different groups

	UTI at admission <i>n</i> = 55	Non-UTI at admission <i>n</i> = 89	<i>t</i> -Value <sup>a</sup>
Sex			
Men	4 (7.3%)	35 (39.3%)	
Women	51 (92.7%)	54 (60.7%)	
Age			
Mean (SD)	83.5 ± 10.1	84.2 ± 10.2	0.097
Diabetes	10 (18%)	18 (20%)	

<sup>a</sup>Student's *t*-test between independent group means (two-tailed probability).

with an intermittent catheter in line with the recommendation in the quality-improvement project to reduce the risk of infections. In this group, 32% developed UTI during their hospital stay. In spite of the recommendation, 29% of patients who were free from UTI on admission were treated with an indwelling catheter. Data were missing for eight patients in this group regarding tests for bacteriuria. Of the 18 patients who had an indwelling catheter 61% had positive urine culture.

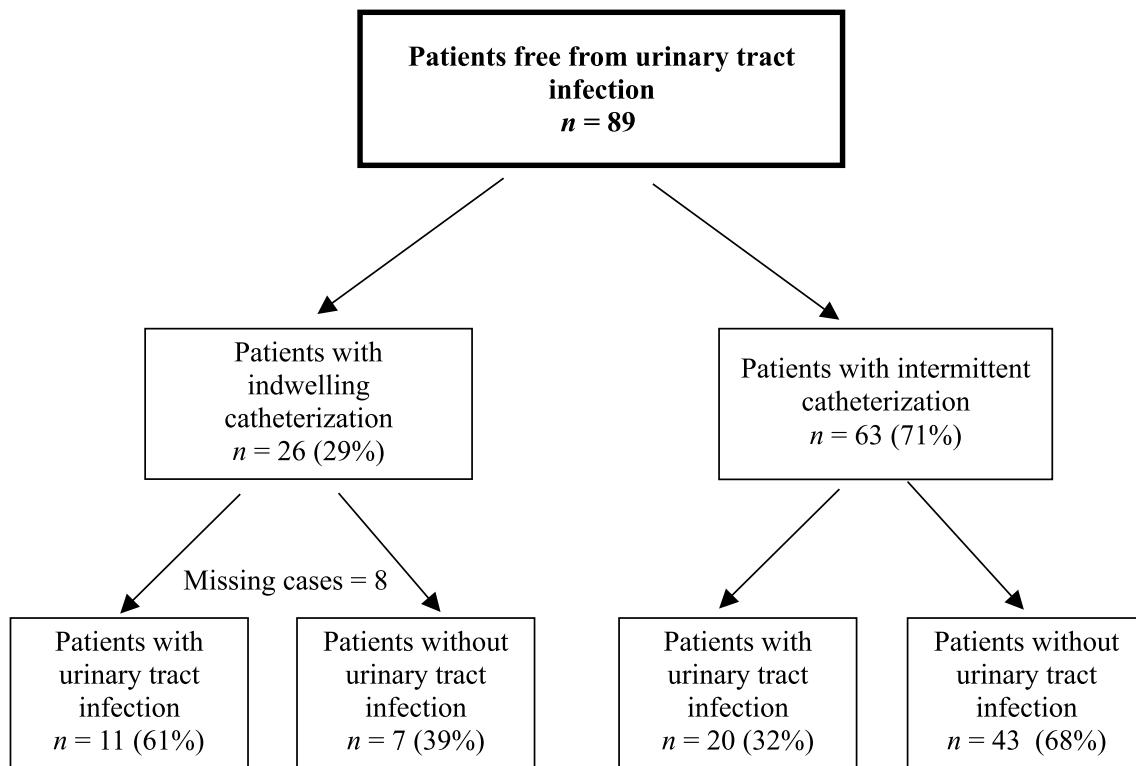
In 65% of the 26 patients who had an indwelling catheter, the nurses had carried this out without a written order from a physician. In only two cases the reason behind treatment with an indwelling catheter could be found in the patients' records.

The various organisms cultured in the urine were dominated by *Escherichia coli* in 45% and mixed growth in 17%. Furthermore, bacteria included *Klebsiella*, *Streptococcus epidermidis*, *Proteus mirabilis* and *Staphylococcus epidermidis*, but <10% for each organism.

The mean duration of hospital stay for the entire group was 15 days ( $SD \pm 10.3$ ). The comparison between groups (Table 2) showed that patients who contracted UTI during hospital stay and those with bacteriuria before admission had the longest stay in hospital. Furthermore, patients without UTI during their hospitalization spent significantly fewer days in hospital compared with those with UTI ( $F = 2.93$ ,  $P < 0.05$ ).

## Discussion

The study was a part of a quality improvement project aimed at describing the occurrence of UTI among older patients with hip fracture before and after surgery. The purpose was also to assess whether the decision about the use of intermittent catheters instead of indwelling catheters was followed and to test the hypothesis that hospital

**Figure 1** Flow chart of urinary tract infection related to intermittent and indwelling catheterization.

Category of patients	Days in hospital	F <sup>a</sup>
Patients with UTI at admission (n = 55)	18.0 (12.0)	
Patients with indwelling catheterization, non-UTI (n = 7)	14 (8.2)	
Patients with indwelling catheterization, contracted UTI (n = 11)	16.5 (10.3)	
Patient with IC, contracted UTI (n = 20)	18.9 (13.8)	
Patients with IC, non-UTI (n = 43)	13.2 (6.1)	2.93*

<sup>a</sup>One-way analysis of variance.

\*P ≤ 0.05.

IC = Intermittent catheterization.

stay is significantly longer for patients with UTI than for those without infection.

This study confirms previous findings of a high frequency of preadmission bacteriuria in older people with hip fracture (38%) and the predominance in women (Dolk, 1989; Johnstone *et al.*, 1995). Culture of *E. coli* bacteria was most common in our study, which is in line with findings by others, including Stacy *et al.* (1996). As bacteriuria in older people is very often 'silent' (Childs & Egan, 1996; Barnett & Stephens, 1997; Nicolle, 1997) and UTI is considered to increase the risk of wound infection (Bergogne-Berezin, 1995; Johnstone *et al.*, 1995; Stacy

**Table 2** Comparison between groups (mean and SD). Urinary tract infection (UTI) and non-UTI, related to days in hospital stay

*et al.*, 1996), our results demonstrate the need for careful preoperative assessment and treatment of UTI.

The findings also highlight the importance of early prevention and assessment of UTI by nurses in homecare of older people. UTI might be prevented by nursing interventions, such as helping people with adequate intake of fluid, personal hygiene and elimination routines, as well as teaching about the relationship between UTI and these factors. Professional nursing assessment should, among other things, be focused on signs and symptoms which could be connected with an evolving UTI. Sernbo & Johnell (1993) found that UTI is the most common

infection in older people who live at home and in long-term care facilities.

In the group of patients who were free from UTI at admission ( $n=89$ ), 32% of those with intermittent catheterization contracted UTI postoperatively. The result is in line with other studies, e.g. Hedström *et al.* (1999) and Skelly *et al.* (1992), which have reported a UTI incidence of approximately 25% during hospital stay. Another finding was that the majority (61% of 18) of the patients treated with indwelling catheter contracted UTI during their hospital stay, compared with 32% in the group who were treated with intermittent catheterization. Because of the low number of patients in the groups this result must be considered with caution. However, it supports the use of intermittent instead of indwelling catheterization. Decreasing indwelling catheter use might also contribute to better rehabilitation of patients after hip fracture. Another positive outcome with intermittent catheterization is that this treatment leads to satisfactory voiding earlier than treatment with indwelling catheters (Skelly *et al.*, 1992). However, the effect of earlier voiding among patients with intermittent catheterization has not been investigated in this study. Another important issue to follow-up is how UTI affects the risk of wound infection among patients with hip fracture.

There are many reported factors associated with complications in relation to hip fractures, e.g. general health, age, cognitive impairment and activity level, which have been found to affect outcome in a negative way (Dolk, 1989; Sernbo & Johnell, 1993; Svensson *et al.*, 1996; Johansson *et al.*, 1998). The present study has shown that UTI was another factor which influenced outcome negatively by being associated with longer hospital stay. Patients with UTI stayed in hospital on average 5 days longer than non-UTI patients. This additional period of hospitalization may affect both patient well-being and the health care system negatively. If one patient gets a UTI during the hospital stay, the prolonged stay will cost about 18 000 Swedish crowns more, as 1 day in hospital is estimated to cost about 3600 Swedish crowns.

The new routine of the use of intermittent catheterization in this study was followed in 71% of the cases. As a result of unsatisfactory medical and nursing documentation we do not know the reason why the remaining 29% of patients received an indwelling catheter. This illuminates the difficulties in introducing new routines, in spite of using a bottom-up design. It also stresses the necessity for improving the quality of both nursing and medical documentation. In addition, this study highlights the importance of close co-operation between nurses and

physicians in order to succeed in a quality improvement project when introducing a change of routines.

One limitation in this study is the lack of identified additional diagnoses making patients predisposed to UTI. However, the result showed that the additional diagnosis of diabetes was not more frequent in the group who had UTI at admission compared with those without UTI. However, the results may not be generalizable, as we need to control for other confounding factors such as whether the patients have had recurrent UTI before hospitalization.

## Conclusion

Quality indicators are often discussed in relation to nursing and medical care. Collaborative development of common indicators is considered a unique way to create a quality-assurance programme (Pike *et al.*, 1993). Identification of UTI among patients with hip fracture could be used as an important quality indicator for this patient group. More attention should be paid to screening and prevention of UTI during hospitalization in patients with hip fracture and more research is required on how UTI is related to complications in hip fracture patients. Avoiding routine use of indwelling catheters could be another important way to decrease the occurrence of UTI as well as the number of hospital days. In addition, nursing and medical documentation in this area should be further developed.

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