Prevalence of Urinary Tract Infection and Health Outcomes in Older Adults Undergoing Hip Surgery: A Prospective Study

Sureerat Mongkolpun, Inthira Roopsawang, Suparb Aree-Ue*

Abstract: Urinary tract infections are complications found mostly in older adults undergoing hip surgery. However, little is known about the impact of urinary tract infections on health at after post-hip fracture surgery, particularly in Thailand. This prospective study investigated the prevalence of urinary tract infections and their impact on length of stay, functional ability, re-admission, surgical site infections, and in-hospital mortality. The participants were 120 older adults undergoing hip surgery at four tertiary care hospitals in Bangkok, Thailand. Instruments for collection the data were the Demographic Data Questionnaire, Health Outcome Data Record Form—length of hospital stays, surgical site infections, re-admission, and in-hospital mortality, and the Hip Disability and Osteoarthritis Outcome Score. Data were analyzed using descriptive statistics and Firth's logistic regression.

Results demonstrated that the prevalence of urinary tract infections was 28.32%. Significantly, older adults who developed urinary tract infections had a 2.88-fold increased the risk of impaired functional ability four weeks after surgery and a 3.21-fold increased the risk of re-admission to the hospital compared to those without urinary tract infections. Findings suggest that nurses should continually evaluate urinary tract infections and related factors from admission to post-discharge, as urinary tract infections profoundly affect health outcomes. Strict compliance with guidelines or strengthening post-acute care services to prevent urinary tract infections and its consequences is recommended to promote and restore health, especially functional ability in older adults undergoing hip surgery.

Pacific Rim Int J Nurs Res 2023; 27(1) 19-33

Keywords: Functional ability, Health outcomes, Hip fracture, Hip surgery, Infections, Older adults, Postoperative complications, Quality of life, Urinary tract infections

Received 17 August 2022; Revised 17 September 2022; Accepted 22 September 2022

***Sureerat Mongkolpun**, RN, MNS (Candidate), Ramathibodi School of Nursing, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Thailand. E-mail: mamty2277@gmail.com*

***Correspondence to: Inthira Roopsawang**,* RN, PhD, Dip. APMSN, Assistant Professor, Ramathibodi School of Nursing, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Thailand. E-mail: inthira.ros@mahidol.edu*

***Suparb Aree-Ue**, RN, PhD, Dip. APAGN, Cert. in Nurse Practitioner, Associate Professor, Ramathibodi School of Nursing, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Thailand. E-mail: suparb.are@mahidol.ac.th*

Introduction

Urinary tract infections (UTIs) are the most common complication of post-hip surgery.[1,2] The prevalence of UTIs in older adults with hip surgery was as high as 5.0-10.6%, which is the leading cause of detrimental health outcomes.[2,3] Evidence has revealed that preoperative, intra-operative, and postoperative factors influence the risks of UTIs. Preoperative factors such as age and comorbidity are significant in predicting UTIs. Notably, having UTIs

prior to surgery is a significant factor in postponing surgery and preventing early physical rehabilitation.[4] The intraoperative factors include the type of anesthesia, a predominant cause developing UTIs. Many lines of evidence have demonstrated that having spinal anesthesia during hip replacement might lead to inefficient bladder function, which results in developing urinary retention, requiring catheterization, causing poor bladder sphincter, and eventually leading to UTIs.[5,6] Regarding post-surgery factors, physical limitations due to avoiding hip dislocations or experiencing severe postoperative pain are pivotal factors in developing UTIs post-hip surgery. Extensive research has shown that UTIs in older adults undergoing hip surgery are predictive of adverse health outcomes, including poor functional status, prolonged hospitalization,[1] developing acute confusional status or delirium, escalating healthcare costs, and rising mortality rate.[4,7] Besides, UTIs can lead to life-threatening events such as bloodstream infections, which increase the risk of 1-year mortality and 2-year mortality by 33.3% and 51.7%, respectively.[8] Although UTIs seem to be potentially preventable, the high prevalence and adverse short- and long-term consequences have remained in this population.

As mentioned above, UTIs are a clinically significant issue in older adults undergoing hip surgery. However, research to date has not determined the impact of UTIs on health outcomes such as length of hospital stays, functional ability post hip surgery, re-admission, surgical site infection, and in-hospital mortality. Also, little is known about the impact of UTIs on health at immediate periods post-hip fracture surgery, particularly in Thailand where this study took place. Thus, we were interested in exploring the prevalence of UTIs and its impact on health outcomes in Thai older adults undergoing hip surgery, especially during the immediate recovery from hip fracture surgery at 2- and 4-weeks post-surgery. Monitoring health restoration during immediate recovery may help in early detection, prevent UTI-related complications, and promote functional restoration. Therefore, this prospective study was expected to provide essential information regarding the relationship between UTIs and health outcomes to enhance better understanding, raise awareness of UTIs prevention, improve the quality of professional care, and promote quality of life in older adults undergoing hip surgery.

Review of Literature

By 2050, hip fracture is projected to increase globally by over 6.3 million per year; and notably, Asia will account for nearly 50% of these hip fractures.[9] Hip fracture is a significant health problem that not only drastically increases mortality, but also tremendously affects the quality of life in older adults.[10-12] The prevalence of hip fracture has up-surging with advanced age leading to an increased risk of re-fractures, long-term care needs, and late-life disability which exceeds the cost of care and family burden globally. As populations age, undeniably, health problems and socio-economic burdens continue to grow. Hip surgery is the most effective treatment for restoring function; however, regaining functional status in older adults undergoing hip surgery may require specific care beyond traditional perspectives. Functional recovery after hip surgery in older adults varies depending on personal health conditions and the severity of postoperative complications.[10,11,13] Moreovoer, age-related physiological changes combined with multiple chronic diseases are influenced older adults more vulnerable to developing complications.[9,14-16] Therefore, preventing complications, and promoting health in older adults undergoing hip surgery, is more challenging for health care professionals.

Prevention of possible postoperative complications is pivotal to providing a better care to this population. Although several complications have been reported in hip surgery, UTIs are a prevalent and significant cause of death and adverse health outcomes of older adults with hip fractures, including sepsis, prolonged length of hospital stay, and re-admission.[13,16] In general, UTIs refer to an infection in any part of the urinary

system presenting with typical symptoms such as pain or burning with urination, or urinating frequently; however, detecting UTIs in older adults seems difficult since it is mostly an asymptomatic clinical presentation.[17,18] Remarkably, approximately 20-37.8% of the older adults show no obvious symptoms after getting the infection,[19] causing difficulty in diagnosis, increasing the risk of bloodstream infection, and subsequent death.[17,18,20] Such risk factors and predisposing conditions influence UTIs during hospital admission and discharge to home, such as increasing age, having spinal anesthesia, insertion of a urinary catheter, pain, limitation of movement or ambulation, and postoperative urinary retention.[5,20-22] Once UTIs develop, short-term or long-term adverse health outcomes occur, including the decline in physical functions, increased hospital stays and medical expenses, substantial risk of re-admission, developing surgical site infections, delaying functional recovery, and eventually increasing mortality rate.[1,4,16,18,21] Notably, recent evidence underlined that older adults having UTIs and multiple comorbidities are at highest risk of developing second fractures two years after their hip surgery.[12] Mounting evidence emphasizes that experienced symptomatic UTIs significantly predict future UTIs higher than those with a UTI history.[12,23] Consequently, proper healthcare management may prevent and/or minimize negative health outcomes in this population.

Regarding health outcomes associated with hip surgery, previous evidence demonstrates the significant indicators of surgical treatment include length of hospital stays, functional ability, re-admission, surgical site infection, and in-hospital mortality. Length of hospital stays (LOS) is an essential indicator of surgical treatment because a longer length of stay affects patients, family caregivers, the cost of care, and increasing risk of infections. Prolonged hospital stays also increase the risk of complications, particularly UTIs as they are a common factor leading to a more extended hospital stay.[1] A study found that 0.89% of older adults with UTIs at post-hip arthroplasty are more likely to get a deep infection,[1] while others demonstrated that having UTIs caused longer hospital stays.[24]

Functional ability is considered one of the essential aspects related to the quality of life in older adults undergoing hip surgery. Although hip surgery may regain functional ability at three months post-surgery, loss of functional ability and mobility are more prevalent.[9,25] Physiological changes on top of multiple chronic illnesses in older adults not only increase the risks of post-hip surgery, but also reduce functional ability and recovery.[26] Evidence reveals that approximately 50% of older adults undergoing hip surgery remained dependent and had functional ability decline; also, more than 33.9% of this population required long-term care for at least one year after the surgery.[13] Some studies highlighted that more than 24% of older adults undergoing hip fracture surgery developed UTIs while hospitalized, resulting in increased risks for other complications and delayed functional recovery.[1] Catheter-associated UTIs (CA-UTIs) post hip and knee arthroplasty has been ranked in the top five harmful complications leading to excessing costs and adverse health outcomes during hospital admission.[15] Moreover, it was noted that older adults having UTIs prior to the discharge had significantly diminished functional ability to perform daily activities in comparison to those without UTIs.[1]

Re-admission impacts patients and their relatives, family members, or caregivers, specifically care costs or economic burdens, as it requires repeated expenditure of money and time on the treatments. According to Meyer and colleagues,[27] who investigated factors related to re-admission in 170,193 people aged over 60 years undergoing hip surgery, 39.0% were re-admitted for any reason within one year after hip fracture, and the most common cause of re-admission was UTIs (8.9%). In addition, having UTIs before hip surgery significantly increases the risks of re-admission within 30 days, sepsis, and septic shock.[4] Experiencing preoperative UTIs at the time of hip surgery is associated with all postoperative complications, 30-day re-admission

and 30-days unplanned re-operation.[4] Moreover, postoperative UTIs significantly predict prolonged hospital stays (more than two days), sepsis, and hospital re-admission.[16] Undeniably, developing UTIs in older adults with hip fracture surgery has accentuated the problems of hospital re-admission and infections above and beyond.

In older adults, surgical site infection (SSI) is denoted as a significant complication found in patients with complex conditions. Evidence underlined that surgical patients with multiple comorbidities increased the risk of developing SSI post-surgery. Furthermore, preoperative and postoperative UTIs were associated with SSI.[7] Notably, SSI is a severe postoperative complication that may turn into life-threatening conditions in older adults. Experiencing SSI is a leading cause of mortality. Mounting evidence has emphasized that having deep SSI increases the mortality rate; early deep SSI also significantly predicts 90-day and 1-year mortality after hip fracture surgery of 55.8% compared to 24.9% of those with no infection.[28,29]

In-hospital mortality is one of the most significant health care indicators of quality of care. High-quality health care service will provide the best care in preventing unpleasant events, side effects, or complications after the treatments that may cause poor health outcomes. The most recent evidence suggests that advanced age, gender, having kidney diseases or cancer, mobility before hip fracture, and mobility after surgery significantly predict in-hospital mortality in older adults with hip fracture surgery.[13,30] Moreover, prior evidence demonstrates that more than 49.6% of older adults with hip surgery developed in-hospital complications; the high prevalence of complications was catheter-associated urinary tract infection (CAUTI), delirium, and anemia, which lead to 3.8% of in-hospital mortality.[3]

Study Aim

This study aimed to explore the prevalence of UTIs and examine the associations between in-hospital UTIs with health outcomes (length of hospital stays, functional ability at 2-week post-surgery, functional ability at 4-weeks post-surgery, re-admission, surgical site infection (SSIs), and in-hospital mortality) in older adults undergoing hip surgery.

Methods

Design: A prospective research design was utilized and is reported here using the observational studies in epidemiology—STROBE guideline checklists.

Sample and Setting: The sample was older adults aged 60 years and over who were scheduled for hip surgery at four tertiary care hospitals, Bangkok, Thailand, and selected by a cluster sampling method. The following criteria were used for recruiting participants: 1) no cognitive impairment determined by the Thai version of the 6-item cognitive function test with scores of less than or equal to 7 points;[31] 2) able to communicate and understand the Thai language; and 3) willing to participate via written or verbal permission on informed consent. Those who had multiple traumatic injuries or had a pathologic fracture, and required emergency hip surgery, were excluded from this study.

The sample size calculation was guided by Burmeister and Aitken[32] for regression analysis which was expected to be 20 participants per factor. In this study, Firth's logistic regression with six predicting factors was utilized; hence, the sample was required to be 120 participants. The proportional stratified random sampling formula was applied to recruit the prospective participants from each hospital.

Ethical Considerations: This study was approved by the Institutional Review Broad (IRB) of the tertiary care hospitals, the Faculty of Medicine Ramathibodi Hospital (COA. MURA2020/1630), the Royal Thai Army Medical Department (Q026q/63_Exp), the Lerdsin Hospital (LH631061), and the Bangkok Medical Administration Hospitals (U020h/63_Exp). Details of data collection and objectives of study were explained to the targeted clinical settings concerning ethical

principles for research involving humans, the rights protection of the participants' privacy, the principle of respect for the person, together with the principles of benefits and justice. After written or verbal consent agreement were obtained, all information provided was kept confidential and de-identified, and could be used only for educational purposes.

Instruments: The following instruments include the tools for screening and for data collection.

The 6-Item Cognitive Impairment Test Thai Version (6 CIT) was used for cognitive impairment screening. The 6CIT Thai version was translated by Aree-Ue and Youngcharoen from the original version.[3] The 6CIT comprises 7 items, namely 1) surrounding circumstance perception (3 items), 2) attention (2 items), and 3) memory (1 item) with multiple-choice or open-ended questions. The total score ranges from 0 to 28 points. Scores higher than 7 points indicate a higher tendency to have a cognitive impairment. The 6CIT indicated the content validity index for scales (S-CVI) and for items (I-CVI) of 1 and 1, respectively, and when compared to Mini-Cog, the concurrent validity was acceptable ($r_s = -.42, p < .001$). The Cronbach's Alpha coefficient in this study was .87.

A Demographic Data Questionnaire was developed from a literature review; it was used to obtain data from medical records and interviews; this questionnaire consisted of items regarding general and health information: age, gender, underlying diseases, surgical treatment, complications, preoperative health status (American Society of Anesthesiologists [ASA]) classification, and type of anesthesia. The items were multiple-choice or open-ended questions.

The Health Outcome Data Record Form was used to monitor the health outcomes of the study, including UTIs, length of hospital stays, re-admission, surgical site infection (SSI), and in-hospital mortality. The UTIs were evaluated by a physician's diagnosis or treatment records, or clinical symptoms presented based on the McGeer criteria.[34] At least three of the following signs and symptoms need to be present for a UTI to be diagnosed: fever (> 38°C) or chills; new or increased burning pain on urination, frequency, or urgency; new flank pain or suprapubic pain or tenderness; a change in the character of urine; and worsening mental or functional status.

Length of hospital stays (LOS) was extracted from the participants' medical records. Based on standard clinical guidelines, hospital stays longer than five days indicate a prolonged length of hospital stay;[4] hospital stays shorter than or equivalent to 5 days were considered a standard hospital stay in this study.

Re-admission referred to older adults who had been discharged from the hospital, but must return to the hospital within 28 days of discharge to receive any treatments related to the previous admission. The hospital re-admission data were extracted from participants' medical records or interviews.

Surgical site infection (SSI) is the infection of surgical wounds based on the following criteria[35]: occurs within 30 days post-surgery (the day of surgery considered as the first day); involves the skin and subcutaneous tissue only; shows at least one of the following characteristics: oozing pus from the surgical wounds; distinguishing the liquid or tissue from a surgical wound with an aseptic technique; having at least one of these symptoms: pain or tenderness, red swelling, or high temperature; or diagnosed with SSI. The SSI was checked and extracted from nurses' notes and treatments in participants' medical records.

In-hospital mortality denoted the death rate in the hospital of the study participants caused by UTIs, as extracted from participants' medical records.

The Hip Disability and Osteoarthritis Outcome Score: HOOS, JR [36] —a self-report questionnaire—was used to measure the functional ability for joint replacement—a health outcome variable. It consists of 6 items (2 items about hip pain during activity and 4 items about the difficulty in doing daily activities). The HOOS measured physical function in this study. The scores range from 0 to 4; 0 point indicates no hip pain with no difficulty in performing daily activities, and 4 points indicate severe hip pain with the most difficulty in performing daily activities. A total raw score between 0 and 24 points is transformed into a score of 0-100 points; the higher the score, the better the functional ability. Also, the scores of or lower than 49 points

indicate limited functional ability, while the scores of 50 points or higher demonstrate good functional ability. The original HOOS, JR score was calculated for the Hospital for Special Surgery (HSS) cohort and in collaboration with the Function and Outcomes Research for Comparative Effectiveness in Total Joint Replacement (FORCE-TJR), and reported high internal consistency of the Person Separation Index, .86 (HSS) and .87 (FORCE), respectively.[36]

The HOOS, JR was translated into Thai with permission by one of the co-investigators. The forward and back-translation methods were applied using the independent translation by the two experts (native Thai and bilingual experts), then verified by experts in orthopedics, including an orthogeriatric nurse practitioner. The HOOS, JR content validity was investigated by three experts in related areas; the content validity index (CVI) was 1. The Cronbach's alpha coefficient reliability was .83 tested in 10 older adults and was .87 in 120 older adults in this study.

Data Collection: The data collection process occurred from October 2020 to September 2021 after the participants reported their willingness to join the study. The research team and four trained research assistants (master-prepared registered nurses) collected the data. To avoid age-related eyesight problems, an interview was performed to collect data at 4-time points, including at admission, the date of discharge, and two and four weeks after a hip surgery. Since data collection was carried out during the COVID-19 pandemic, the research team strictly followed the infection prevention policy—Social Distancing, Mask Wearing, Hand Washing, Temperature Testing, Thai-Cha-Na Scan (DMHTT)—during interviews by keeping a social distance, wearing masks, hand washing, and spending less time interviewing for 5-10 minutes. In addition, research team members were fully vaccinated.

Data Analysis: Data were analyzed using R macOS 10.14+ and Statistical Package for the Social Sciences for Windows (SPSS/ FW) program version 18. Descriptive statistics were performed for analysis data of personal data and health information; the inferential statistics—using Firth's logistic regression analysis—were performed to explore an association between in-hospital UTIs and health outcomes in older adults undergoing hip surgery.

Results

A total of 130 older adults undergoing hip surgery were enrolled. Of these, 10 participants were excluded for various reasons: failing the cognitive assessment (5), declining to participate in study (4), or dying before surgery (1). Finally, 120 older adults undergoing hip surgery remained in the study; most were females (85%) with an average age of 77.98 years (SD = 8.33; range 60-93 years). One-third of these participants were aged 80 or older (45%). The participants' characteristics and health information are presented in **Table 1**.

Table 1. Participants' characteristics (N = 120)

Personal Characteristics	Number	Percentage
Gender		
Female	102	85
Male	18	15
Age (years)		
(Mean = 77.98 years; SD= 8.33; Range 60-93)		
60-69	23	19.17
70-79	43	35.83
≥ 80	54	45
Marital status		
Married	67	55.83
Widowed/Divorced/Separated	39	32.50
Single	14	11.67

Table 1. Participants' characteristics (N = 120) (cont.)

Personal Characteristics	Number	Percentage
Living arrangement		
Family (spouse/children/relative)	111	92.50
Living alone	6	5
Nursing home/ Friends	3	2.50
Educational level		
Informal study	11	9.16
Primary level	63	52.50
Secondary level	22	18.33
Diploma	8	6.67
Bachelor's degree	14	11.67
Higher than the bachelor's degree	2	1.67
Body Mass Index (kg/m²)		
(Mean = 22.96; SD= 4.85; Range 11.90-34.48)		
Low (< 18.5)	20	16.67
Normal (18.5-22.9)	47	39.17
Overweight (23.0-24.9)	15	12.50
Obese I (125.0-29.9)	25	20.83
Obese II (≥ 30.0)	13	10.83
Underlying diseases		
No underlying diseases	10	8.33
1-3 diseases	79	65.84
> 3 diseases	31	25.83
Underlying diseases, top 5*		
Hypertension	100	83.33
Diabetes	74	61.67
Dyslipidemia	70	58.33
Cardiovascular diseases	20	16.67
Chronic kidney	15	12.50
Number of medications used		
None	17	14.17
1-4 types	49	40.83
> 4 types	54	45
Type of hip fracture		
Intracapsular	106	88.33
Extracapsular	14	11.67
Type of hip surgery		
Open reduction internal fixation	70	58.33
Arthroplasty	50	41.67
Type of anesthesia		
Spinal block	75	62.50
General anesthesia	45	37.50
American Society of Anesthesiologists Classification (ASA Class)		
< Class 3	48	40
≥ Class 3	72	60

Table 1. Participants' characteristics (N = 120) (cont.)

Personal Characteristics	Number	Percentage
Waiting time for surgery after hip fracture		
< 24 hours	6	5
24-48 hours	18	15
> 48 hours	96	80
Catheterization		
Yes	115	95.83
No	5	4.17

Note: * One participant may have more than one answer; ORIF = Open reduction internal fixation

Table 2 illustrates the prevalence of UTIs and the health outcomes of participants. The prevalence of UTIs was 28.32%. For the health outcomes, 85.83% of the participants had a hospital stay of more than 5 days, 51.67% had good functional ability after 2 weeks of discharge, and 80% had good functional ability after 4 weeks of discharge. However, 10.83% were re-admitted, 3.33% had a surgical site infection, and 0.82% died in the hospital.

Table 2. Health outcomes of interest (N = 120)

Health outcomes	Number (%)	Mean ±SD
Urinary Tract Infections (UTIs)		
Before surgery	17 (14.16)	
After surgery	17 (14.16)	
Health outcomes		
Length of hospital stay		12.54 ± 11.53
< 5 days	17 (14.17)	
≥ 5 days	103(85.83)	
Functional ability week 2		14.21 ± 4.96
Poor functional ability	58 (48.33)	
Good functional ability	62 (51.67)	
Functional ability week 4		9.77 ± 5.47
Poor functional ability	24 (20.00)	
Good functional ability	96 (80.00)	
Re-admission		
No	107 (89.17)	
Yes	13 (10.83)	
Causes of re-admission	13 (100.00)	
UTIs	3 (23.10)	
Diarrhea	2 (15.38)	
Surgical site infection	2 (15.38)	
Hip dislocation	2 (15.38)	
Pneumonia	1 (7.69)	
Cerebral infarction	1 (7.69)	
Acute limb ischemic	1 (7.69)	
Calcium pyrophosphate deposition disease	1 (7.69)	
Surgical site infection		
No	116 (96.67)	
Yes	4 (3.33)	

Table 2. Health outcomes of interest (N = 120) (cont.)

Health outcomes	Number (%)	Mean ±SD
In-hospital mortality		
No	119 (99.16)	
Yes	1 (0.82)	

The association between in-hospital UTI and health outcomes in older adults undergoing hip surgery are shown in **Table 3.** After controlling for other factors (age, gender, type of surgery, time for operation, and type of fractures), the multivariate Firth's logistic regression analysis demonstrated that in-hospital UTIs significantly increased the risk of developing poor functional ability at 4 weeks post-surgery and hospital re-admission. On the other hand, no significant relationship was found in prolonged length of hospital stays (more than 5 days); poor functional ability at 2 weeks post-surgery; surgical site infection; and in-hospital mortality, as shown in **Table 4.**

Table 3. The correlation among in-hospital urinary tract infections and health outcomes of interest in older adults undergoing hip surgery (N=120)

Variables	1	2	3	4	5	6	7
1. UTIs	1.000						
2. LOS	.191*	1.000					
3. FCWK2	.166	.114	1.000				
4. FCWK4	.237**	.027	.430**	1.000			
5. Re-admission	.230*	.067	.195*	.427**	1.000		
6. SSI	-.002	.077	.003	.138	.233*	1.000	
7.Death in hospital	-.152	-.037	NA	NA	NA	NA	1.000

*p <.05, ** p <.01

Abbreviations: UTIs= Urinary tract infections, LOS = Length of hospital stay, FCWK2 = Functional ability at 2 weeks, FCWK4 = Functional ability at 4 weeks, SSI =Surgical site infection

Table 4. Firth's logistic regression analysis model of the impact of urinary tract infections on health outcomes in older adults undergoing hip surgery after controlling for other variables (N=120)

Health outcomes	Univariate ORs (95%CI)	p-value	Adjusted ORs (95%CI)	p-value
LOS	6.88 (0.87-54.24)	.066	4.41 (0.95-43.01)	.058
FCWK2	2.17 (0.92-5.09)	.075	1.63 (0.68-4.02)	.271
FCWK4	3.34 (1.29-8.61)	.012	2.88 (1.10-7.56)	.031
Re-admission	4.16 (1.27-13.60)	.018	3.21 (1.02-10.27)	.046
SSI	0.98 (0.09-9.76)	.984	1.11 (0.10-7.23)	.912
In-hospital mortality	3.73 (3.66-3.79)	.000	5.75 (0.36-1453.70)	.205

*R analysis adjusted variables: Model fitted by Penalized ML; 1-Wald, 2-Profile penalized log-likelihood: Adjusted variables: Age, gender, type of surgical, time for operation, type of hip fractures

Abbreviations: ORs= Odds ratios; CI= Confidence Interval, LOS = Length of hospital stays, FCWK2 = Functional ability at 2 weeks, FCWK4 = Functional ability at 4 weeks, SSI =Surgical site infection.

Discussion

In this study, the prevalence of UTIs in older adults undergoing hip surgery was 28.32%. This finding is consistent with previous studies in which the prevalence of UTIs during hospital admission was 24% and in post-hip surgery in older adults (12-61%).[1] A possible explanation for this might be due to several factors. Age-related conditions result in decreased immune system efficiency. In addition, most of the participants were women, and evidence revealed that the UTI incidence was relatively high, 5.1-36%.[37] The female urethra is short and located near the anus, which is more likely to get bacterial contaminations resulting in bladder infection quickly. Moreover, comorbid diseases may induce UTIs among older adults; evidence demonstrated that metabolic syndrome is 1.43 times more likely to develop UTIs;[38] and in this study, 61.67% of the participants had diabetes mellitus as a comorbid disease.

Additionally, most participants received spinal block anesthesia, which caused a temporary decrease in their bladder functional ability resulting in acute urinary retention.[5] Remarkably, older adults mostly present with muscle or sphincter malfunction in the pelvic cavity and anal sphincter, causing the inability to urinate effectively, and leading to urine retention in the bladder. Postoperative urinary retention (POUR) after undergoing hip surgery increases the use of indwelling catheterization and the development of UTIs.[5] The insertion of a urinary catheter and catheter-associated urinary tract infection (CAUTI) occur in approximately 70-80%.[6] Notably, in our study, approximately 10% of participants were unable to urinate normally after removing the catheter; 50% of these participants were discharged from the hospitals with a catheter and experienced UTIs. Consequently, additional research is required with a greater emphasis on long-term monitoring of the effects of UTIs on multiple dimensions of health in this population, as well as the need for special care planning or interventions to prevent UTIs, from preoperative through to post-hospital discharge in older adults undergoing hip fracture surgery.

Concerning the relationship between UTIs and health outcomes in older adults undergoing hip surgery, once controlling for age, gender, type of surgery, type of hip fracture, and time of surgery, the findings demonstrated no significant differences in poor functional abilities between older adults with and without UTIs within two weeks after the surgery. A possible explanation might be that bone healing and functional recovery post-hip surgery vary in older adults with complex health conditions. Partial dependence on basic activities of daily living (ADLs) with slightly less pain is mostly anticipated during the early functional recovery.[14] Moreover, participants with and without UTIs shared similar characteristics, including advanced age, gender, type of fracture, and multiple comorbidities; hence, recovered functional abilities at two weeks post-surgery may not distinctly differ due to these factors.

Notably, this study found that developing UTIs during hospitalization significantly contributed to poor functional ability at four weeks post-hip surgery. Our findings echo a previous study emphasizing the impact of developing postoperative complications affecting functional recovery in older adults undergoing total hip surgery[1], resulting in delayed recovery. Undeniably, poor functional recovery increases disease situations on top of age-related decline and may accelerate functional impairment or disability.[3,4,14] Further, a recent study underlined that having UTIs in older adults with multiple comorbidities significantly predicts a second fracture two years after the first hip surgery.[12] In light of findings on the prevalence of UTIs during hospital admission, it is conceivable that enhancing adherence to infection control guidelines and caution in the overuse of urinary tract catheterization during hospitalization is of concern in this population.[1,4,5] Nurse-led interventions to prevent UTIs during hospitalization and strengthen post-acute/immediate care in older adults undergoing hip surgery are pivotal topics for future research.

Regarding hospital re-admission, findings revealed that UTIs have a significant impact on hospital re-admission. According to our study, more than 20% of participants with UTIs were re-admitted to the hospital, and most of these re-admission were caused by post-hospital discharge UTIs. Moreover, older adults undergoing hip surgery who developed UTIs had a significantly 3.21-fold higher risk of hospital re-admission than those without UTIs. The results further support previous findings that UTI complications during hospitalization and post-hospital discharge are significant in an increased risk of hospital re-admission in older adults with hip fracture surgery.[27] Post-hospital discharge UTI monitoring is essential for improving better care and future research in this population.

Regarding the length of hospital stay (LOS), although participants undergoing hip surgery who experienced UTIs were prone to stay longer during hospital admission (more than 5 days) with 4.42 times more than those without UTIs, this study was unable to demonstrate that hip surgery in older adults with UTIs significantly increases the risks of prolonged lengths of hospital stays. Considering the context and health care system of the tertiary care hospitals in this study, the health systems that support hip surgery (surgical resources, orthopedic care units, skilled personnel working in multidisciplinary teams, and clinical practice guidelines for caring for patients undergoing hip surgery) are critical in reducing the length of hospital stays. This is evidenced by the fact that the majority of patients with hip fractures underwent surgery within 48 hours and received care based on clinical practice guidelines. However, the high volume of patients in large-sized hospitals (> 200 beds) might require early discharge from hospitals, which may result in no difference in LOS between patients undergoing hip surgery who developed UTIs and those who did not experience UTIs.

Surgical site infection (SSI) was identified as a common complication after a hip surgery. Participants with UTIs were 1.12 times more likely to develop an SSI, but the results of this study did not explain the significant relationship between UTIs and SSIs. Our results were different from that of Yassa and colleagues,[7] who investigated the consequences of the delayed time for surgery (>24 hours after hospital admission) among 460 patients with hip fractures and found that UTIs before surgery was highly associated with SSI.[7] Differences in the results of this study and previous studies are most likely due to the sample size, protocol for hip surgery, and the duration for monitoring SSI following hip surgery. However, for in-hospital mortality, the present study indicated that UTIs increased the risk of developing in-hospital mortality in older adults undergoing hip surgery. Our study was unable to demonstrate a strong relationship between UTIs and in-hospital mortality and our results are in line with those of earlier studies. Bliemel and colleagues[1] emphasized that UTIs were not associated with in-hospital mortality. Several previous studies revealed that there were other considerable factors associated with in-hospital mortality post-hip fractures, such as older age, the severity of underlying diseases, functional ability to perform daily life before hip fracture, dementia, depression, pneumonia, cancer, coronary artery disease, dependence, and heart failure, respiratory failure, septicemia, pulmonary embolism, end-stage renal disease, and mobility ability after surgery.[27,30] Therefore, a relationship between UTIs among older adults with hip fracture surgery and the in-hospital mortality rate must be interpreted with caution because it might have confounding factors—the severity of underlying diseases or existing comorbid diseases—interfering with the complexity of this relationship. Thus, several questions remain unanswered at present. Further studies that take these variables into account need to be undertaken.

Limitations

Most participants were female older adults with hip fractures based on purposive sampling methods. Thus, the findings may limit generalizability due to

a non-randomization design and may not be generalized to male older adults with hip surgery. Notably, according to the restrictions policy facing the COVID-19 pandemic, outgoing activities were limited, which may have affected older adults' daily lives, leading to less likely to engage in normal activities, and increasing their risk of functional limitations or poor health outcomes post-hip surgery. In addition, UTIs and SSIs were not classified as sub-types which may impact health outcomes differently.

Conclusions and Implications for Nursing Practice and Research

This study revealed that the prevalence of in-hospital UTIs is common, but substantially impacts older adults undergoing hip surgery. The in-hospital UTIs significantly predicted poor functional ability at four weeks post-hip surgery and hospital re-admission. Experienced in-hospital UTIs may lead to delayed functional recovery, required long-term care, increased cost of care, and diminished quality of life. However, in-hospital UTIs can be prevented by early identification or effective monitoring. Thus, gerontological nurse practitioners may play a vital role in providing better care—early detection, effective collaborative continuing care, initiating in-hospital UTIs guidelines, strengthening post-acute/immediate care, and enhancing long-term monitoring—to promote health and restore functional ability in older adults undergoing hip surgery. Moreover, the findings of this study may be beneficial to other healthcare providers or nursing students not only for raising awareness of geriatric risk assessment care, but also for focusing on in-hospital UTIs prevention, particularly in females with hip fracture surgery.

Acknowledgments

The authors thank all participants in this study for sharing their time. and Faculty of Medicine Ramathibodi Hospital for funding support to present at the 2nd World Congress on Primary Healthcare and Medical Summit, November 7-9, 2022, Paris, France

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ความชุกของการติดเชื้อระบบทางเดินปัสสาวะและผลลัพธ์ด้านสุขภาพในผู้สูงอายุที่ได้รับการผ่าตัดข้อสะโพก: การศึกษาไปข้างหน้า

*สุรีรัตน์ มงคลพันธุ์ อินทิรา รูปสว่าง * สุภาพ อารีเอื้อ*

บทคัดย่อ: การติดเชื้อระบบทางเดินปัสสาวะที่พบบ่อยในผู้สูงอายุที่ได้รับการผ่าตัดข้อสะโพก แต่ผลกระทบต่อสุขภาพในผู้สูงอายุที่ได้รับการผ่าตัดข้อสะโพกในระยะแรกหลังผ่าตัดยังพบการศึกษาน้อยโดยเฉพาะในประเทศไทย การศึกษาครั้งนี้เป็นการวิจัยแบบศึกษาไปข้างหน้า เพื่อศึกษาความชุกของการติดเชื้อระบบทางเดินปัสสาวะในผู้สูงอายุและผลกระทบของการติดเชื้อระบบทางเดินปัสสาวะต่อวันนอนในโรงพยาบาล ความสามารถในการทำหน้าที่ การกลับเข้ารักษาซ้ำในโรงพยาบาล การติดเชื้อแผลผ่าตัด และการเสียชีวิตขณะนอนในโรงพยาบาล คัดเลือกกลุ่มตัวอย่างโดยวิธีเฉพาะเจาะจงตามเกณฑ์คัดเข้า โดยเป็นผู้ที่มีอายุตั้งแต่ 60 ปี ขึ้นไป จำนวน 120 ราย ที่เข้ารับการผ่าตัดข้อสะโพกทุกชนิด ณ โรงพยาบาลระดับตติยภูมิ 4 แห่งในเขตกรุงเทพมหานคร เครื่องมือที่ใช้ในการเก็บรวบรวมข้อมูลประกอบด้วย แบบบันทึกข้อมูลพื้นฐาน แบบบันทึกข้อมูลผลลัพธ์ด้านสุขภาพ—วันนอนในโรงพยาบาล การติดเชื้อแผลผ่าตัด การกลับเข้ารักษาซ้ำในโรงพยาบาล และการเสียชีวิตขณะนอนในโรงพยาบาล—และแบบประเมินข้อสะโพกฮูสแบบสั้น (ฉบับภาษาไทย) วิเคราะห์ข้อมูลโดยใช้สถิติบรรยาย และสถิติการวิเคราะห์การถดถอยโลจิสติกแบบพหุ

ผลการศึกษาพบความชุกของการติดเชื้อระบบทางเดินปัสสาวะ ร้อยละ 28.32 ผู้สูงอายุที่เกิดการติดเชื้อระบบทางเดินปัสสาวะ มีโอกาสเกิดความพร่องในการทำหน้าที่หลังผ่าตัด 4 สัปดาห์ เป็น 2.88 เท่า เมื่อเปรียบเทียบกับผู้สูงอายุที่ไม่เกิดการติดเชื้อระบบทางเดินปัสสาวะอย่างมีนัยสำคัญทางสถิติ และ มีโอกาสเกิดการกลับเข้ารับการรักษาซ้ำในโรงพยาบาล เป็น 3.21 เท่า เมื่อเปรียบเทียบกับผู้สูงอายุที่ไม่เกิดการติดเชื้อระบบทางเดินปัสสาวะอย่างมีนัยสำคัญทางสถิติ

จากผลการศึกษาครั้งนี้ พยาบาลเวชปฏิบัติผู้สูงอายุควรมีการประเมินการติดเชื้อระบบทางเดินปัสสาวะ และปัจจัยเสี่ยงต่อการเกิดการติดเชื้อระบบทางเดินปัสสาวะ ไม่เพียงตั้งแต่แรกรับไว้ในโรงพยาบาลเท่านั้น แต่ควรติดตามต่อเนื่องหลังจำหน่ายกลับบ้าน เนื่องจากการติดเชื้อระบบทางเดินปัสสาวะมีผลต่อผลลัพธ์ด้านสุขภาพ การปฏิบัติตามแนวปฏิบัติอย่างเคร่งครัด และพัฒนากิจกรรมการพยาบาลการดูแลระยะแรกหลังผ่าตัดเพื่อป้องกันการเกิดการติดเชื้อระบบทางเดินปัสสาวะและผลกระทบตามมาอันจะช่วยส่งเสริม ฟื้นฟู ผลลัพธ์ด้านสุขภาพ โดยเฉพาะความสามารถในการทำหน้าที่ของร่างกายหลังผ่าตัดในผู้สูงอายุที่เข้ารับการผ่าตัดข้อสะโพก

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คำสำคัญ: การทำหน้าที่ ผลลัพธ์ด้านสุขภาพ กระดูกข้อสะโพกหัก การผ่าตัดข้อสะโพก การติดเชื้อผู้สูงอายุ ภาวะแทรกซ้อนหลังการผ่าตัด คุณภาพชีวิต การติดเชื้อระบบทางเดินปัสสาวะ

สุรีรัตน์ มงคลพันธุ์ *นักศึกษาหลักสูตรพยาบาลศาสตรมหาบัณฑิต สาขาวิชาการพยาบาลเวชปฏิบัติผู้สูงอายุ โรงเรียนพยาบาลรามาธิบดี คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล E-mail: mamty2277@gmail.com*

ติดต่อที่ : อินทิรา รูปสว่าง ** ผู้ช่วยศาสตราจารย์ โรงเรียนพยาบาลรามาธิบดี คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล*
E-mail: inthira.ros@mahidol.edu

สุภาพ อารีเอื้อ *รองศาสตราจารย์ โรงเรียนพยาบาลรามาธิบดี คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล E-mail: suparb.are@mahidol.ac.th*