

**Effectiveness of an Educational Program on the Reduction of  
Urinary Tract Infections in Long Term Care Residents**

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### **Dedication and Acknowledgements**

First, I want to thank my God, Lord, and Savior for without him nothing is possible. I would also like to thank my husband, children, parents, and special friends who have been by my side cheering me on through this journey. They are the reason I continue to push through every day and pursue my dreams.

### **Abstract**

**Problem:** Urinary tract infections (UTIs) are a common, costly, yet preventable problem among residents in long-term care. Unlicensed staff are the primary caregivers of residents in long-term care and can implement strategies to prevent UTIs.

**Objective:** The purpose of this quality improvement project was to determine if an evidence-based education presentation would increase the knowledge of unlicensed staff related to UTIs and prevention and reduce their occurrence.

**Methods:** An evidence based education program was developed and presented to unlicensed staff who participated in the project. A validated pre- and post-assessment questionnaire was used to measure knowledge gained from the education.

**Results:** The average score for pre- to post-assessment increased from 69.39 to 85.32. Retrospective chart reviews were completed for 94 patients three months before and three months after education was provided to determine if the intervention was effective in preventing UTIs. The result was a reduction from 19 to 12 UTIs, a 36.8% decrease between pre-intervention and post-intervention.

**Conclusion:** Educating caregivers on prevention strategies for UTIs increased knowledge and reduced the number of UTIs documented in the facility.

*Keywords:* geriatric, urinary tract infection, long-term care facilities, quality improvement, assisted living, toolkit, education, caregiver, unlicensed staff

## **Effectiveness of an Educational Program on the Reduction of Urinary Tract Infections in Long Term Care Residents**

There is an increased need and utilization of long-term care (LTC) facilities in the United States. In 2016, there were over 2.1 million residents living in LTC facilities with 811,000 of those residents living in assisted living facilities (ALF) (Health and Human Services [HHS], 2019). Most residents living in ALF's are over the age of 65. In 2015, there were 47.8 million Americans aged 65 and older. It is projected by 2050 there will be an increase of 84% of Americans over the age of 65 to 87.9 million (HHS, 2019). Urinary Tract Infection (UTI) is one of the most commonly diagnosed infections in older adults. In 2011, UTIs were responsible for approximately seven million office visits, one million emergency department visits, and over 400,000 hospitalizations with an estimated cost of \$2.8 billion in the United States (Simmering et al., 2017). In long-term care residents, UTI's, the most commonly diagnosed infection, account for fully one-third of all nursing home-associated infections (Simmering et al., 2017). It is important to note that approximately 25% of geriatric hospitalizations and 6.2% of geriatric deaths are related to complications of UTIs (Dutta et al., 2022).

UTIs are bacterial infections that are most often caused by bacteria from the skin or rectum entering the urethra and infecting the urinary tract (Centers for Disease Control [CDC], 2021). The bacteria can affect different parts of the urinary tract, but the most common location is the bladder resulting in cystitis (CDC, 2021). UTIs are seen more in females than in males due to the urethra being shorter and closer to the rectum allowing for the bacteria to enter the urinary tract. UTIs are the most common cause in infection of elderly women living in long-term care and elderly women who are

hospitalized. They are the second-most common infection in elderly women living in the community (Rodriguez-Mañas, 2020). Other risk factors for UTIs include; previous UTIs, pregnancy, age, sexual activity, changes in the bacteria outside the vagina, poor hygiene, and structural problems of the urinary tract (CDC, 2021).

The geriatric population is at increased risk of UTI due to risk factors resulting from a combination of normal physiological changes of aging, changes in immune function, increased exposure to pathogens, and comorbidities (Freeman-Jobson et al., 2016). Risk factors for UTI in the geriatric population include malnutrition, uncontrolled diabetes mellitus, poor bladder control that can lead to urinary retention or incontinence, constipation, long-term hospitalizations, vaginal atrophy, prostate hyperplasia, unhygienic living conditions, and altered mental state (Dutta et al., 2022). Prevention of UTIs is key in the geriatric population. There are prevention strategies that have been shown to reduce the risk of UTIs including changes to diet, exercise, increasing fluid intake, and managing personal hygiene are strategies that can be decrease the risk of UTIs (Psihogios et al., 2022).

Symptoms of UTI typically present as painful urination, suprapubic pain, new or worsening urinary urgency, and/or urinary frequency (Dutta et al., 2022). In the geriatric population, symptoms are atypical and can include confusion, delirium, dizziness, drowsiness, falls, decreased appetite, and urinary incontinence. Atypical symptoms such as absence of fever and absence of pain with urination can make a diagnosis of UTI more difficult (Dutta et al., 2022).

As the population ages, the burden of UTIs is expected to grow exponentially, increasing the need for improvement in management and prevention strategies

(Freeman-Jobson et al., 2016). Unlicensed personnel are the primary care providers for residents in ALFs. The aim of this project was to create an educational program for unlicensed personnel related to identification of symptoms and ways to prevent UTIs in residents. The ability of staff to recognize and report changes in a resident's condition is necessary for swift evaluation and treatment to avoid unnecessary emergency room visits and hospitalizations (Simmering et al., 2017).

### **Purpose**

The purpose of this quality improvement project was to determine if an educational program designed for unlicensed care givers in ALFs would result in increased knowledge of caregivers and a reduction in the number of UTIs. The primary outcome was to assess the level of unlicensed personnel knowledge of UTIs after receiving education on how to recognize symptoms and help prevent UTIs. The secondary outcome was to measure if the education on UTIs resulted in a reduction in the occurrence of UTIs in the assisted living facility.

### **Review of Current Evidence**

As the most commonly diagnosed infection in the elderly, UTIs are responsible for more than 400,000 hospitalizations in the U.S. at a cost of about \$2.8 billion for care and treatment (Simmering et al., 2017). When LTC residents experience UTIs that progress to urosepsis, the mortality and morbidity increase dramatically (Rahmel et al., 2020).

### **Education of Care Givers**

UAPs provide most care for patients living in assisted living facilities yet they receive the least amount of training of all personnel providing direct patient care. UAPs

provide 1.81 hours of care per patient per day compared to licensed staff who provide 0.24 hours per patient per day in facilities (Weaver et al., 2022). The education or training for UAPs averages only 2 to 6 weeks through a vocational school or through the employer (Weaver et al., 2022). It is vital UAPs are trained with the information and skill-set essential to identify slight changes in a patient status that could be essential in avoiding unnecessary emergency room visits and hospitalizations (Freeman-Jobson et al., 2016). A previous study completed by Weaver and her colleagues (2022) found that 65% of the UAPs who volunteered for the QI project had never received any training or education on UTIs. The QI project showed a significant improvement of knowledge on UTIs by the UAPs pre and post education (Weaver et al., 2022).

### **Prevention of UTIs in the Elderly**

There are several strategies that can be used to help prevent UTIs. Increased fluid intake is very important as drinking water helps dilute urine and causes more frequent voiding, that flushes the urinary tract. A randomized controlled trial that included increasing fluid intake by 1.5 liters of water a day was assessed and found to reduce recurrent UTI's (Hooten et al., 2018). Adequate hydration also contributes to normal bowel function and elimination of constipation that can cause urinary retention leading to UTI. Proper hygiene including wiping from front to back following urination or defecation helps to prevent bacteria from the anal region entering the urethra (Finney et al., 2023).

The Center for Disease Control describes the following additional strategies for prevention of UTIs: proper hand hygiene to include hand washing, use of hand sanitizer, adherence to routine toileting schedules, fluid intake of six to eight glasses of water per

day, maintaining residents' mobility through ambulation, routine use of gloves, prevent urine backflow when using a drainage bag, and washing residents' perineum with mild soap and water after each episode of incontinence (CDC, 2022).

Long thought to be a preventative measure for UTIs, the consumption of cranberry juice has been found to not be as effective as the aforementioned strategies. A meta-analysis revealed that in order to maintain the level of cranberry intake necessary for UTI prevention, a resident would need to consume 300 milliliters of cranberry juice every day. This practice was found to be cost-prohibitive and does not take into consideration other dietary concerns (Cayley, 2013).

### **Theoretical Framework**

The guiding framework for this project was Knowles' Theory of Adult Education. Knowles theory includes four assumptions including self-concept, the adult learning experience, readiness to learn, and orientation to learning. In 1984, Knowles added a fifth assumption, motivation to learn (Stoltz, 2021). The first assumption of the theory is that adults possess a secure self-concept because they have the skills necessary to learn and understand concepts independently. The second assumption is that adults have experience contextualizing new ideas acknowledging things to come more naturally or more instinctively. The third assumption is that adults have a readiness to learn and want to learn things that will help them accomplish relevant tasks. Adults learn best when applying new concepts to their everyday life, the fourth assumption. The fifth assumption is that adults learn because they have an internal motivation to gain knowledge. (New England Institute of Technology, 2021). Knowles' theory supports this



QI project because the long-term care staff expressed a need and a desire to improve their knowledge of UTIs to improve patient safety and quality of life.

## **Methods**

### **Setting**

The project setting is a 142-bed assisted living facility in Burlington, NC. The facility has two types of assisted living; regular assisted living and memory care assisted living. The memory care unit has 48 beds and is a locked unit. The assisted living unit has the remaining 94 beds. This facility employs approximately 60 unlicensed assistive personnel (UAP) including medication aids, personal care assistants, and certified nursing assistants to assist the facility residents with their activities of daily living. UAP's are trained to provide specific tasks of resident's care that have been delegated by a licensed nurse (North Carolina Board of Nursing [NCBON], 2021).

### **Participants**

Participants in this project were UAPs who provided the primary care for patients living in the assisted living facility. There were no exclusion criteria for participants as all UAPs, full or part-time, were invited to participate in the educational program. Participation was voluntary. The focused patient population included all residents of the assisted living facility. There were no exclusion criteria.

### **Interventions**

All UAPs were invited to participate in the educational offering during the weekly staff meeting. Each participant was given the validated pre-assessment tool with 10 multiple choice questions to complete prior to the education. They each chose a 4-digit number to place at the top of their assessment that had no identifying information. The

evidence based practice educational material was presented in a PowerPoint presentation and delivered in an interactive discussion by the principal investigator during the weekly staff meeting. The education focused on prevention, interventions, and symptoms of UTIs. The post assessment was delivered to the volunteer participants two weeks following the pre-assessment and presentation of the education. The post assessment was the same validated tool with 10 multiple-choice questions. The UAPs assigned the same 4-digit number used for the pre-assessment so that individual learning could be assessed.

To monitor the effectiveness of the intervention of education, a chart review was completed by the PI before and after the intervention for assessment of a diagnosis of UTI. Patients who were new to the facility, and patients who moved or were deceased during the project were not included in the secondary data.

### **Study of the Interventions**

This project aimed to assess UAPs degree of knowledge s related to symptoms of UTIs and interventions for prevention. The primary outcome was to improve the knowledge of the UAPs through an education intervention on prevention and recognizing symptoms of UTIs. The secondary outcome was to reduce the number of UTIs diagnosed in the facility following the education intervention. The impact of the training intervention was assessed with a pre- and post-intervention survey and a retrospective chart reviews before and after intervention. The chart reviews consisted of all patients living in the facility for three months prior to intervention and three months following the intervention with a documented diagnosis of UTI.

### **Measures**

Fifty UAPs employed by the facility volunteered to take part in the study. They were given a pre and post intervention assessment. The assessment was a 10-question multiple choice answer tool that had been validated in a previous study. The questions on the assessment tool were based on content of evidenced based practice. The tool had been validated in a previous study by an expert panel of nine nurses that had a minimum of three years clinical experience (Freeman-Jobson et al., 2016). The assessment answers were each given 10 points and scored as 10 points for correct and 0 points for not correct. Correct answers were summed for a complete score of 0-100 with higher scores indicating a higher level of knowledge.

### **Analysis**

Summary statistics were used to calculate the mean scores for pre- and post-intervention surveys. A paired sample *t*-test and a two-tailed Wilcoxon signed rank test were used to determine if there was a statistically significant difference in UAPs knowledge pre- and post-intervention. A Shapiro-Wilk test was conducted to determine whether the differences in pre-intervention and post-intervention could have been produced by a normal distribution.

Descriptive statistics were used to summarize the occurrence of UTIs based on retrospective chart reviews for all residents living in the facility for 3 months pre- and post-intervention to determine if the education intervention was successful in preventing UTIs. There was a significant decline of 36.8% of newly diagnosed UTIs after the intervention of education.

### **Ethical Considerations**

This project was approved by Lenoir Rhyne University's Institutional Review Board. Data collected from pre- and post-education surveys and patient charts were stored in a password protected computer only accessed by the PI. At the conclusion of data collection, data was entered into Intellectus Statistics software for analysis. No personal identifying information was collected for participants and patients, and all information was held strictly confidential. Participants selected a four-digit identifying number for their pre- and post-assessment. Paper surveys were stored in a locked cabinet and destroyed at the conclusion of the project. After completion of the project, all data was deleted, and surveys shredded.

## Results

Summary statistics were calculated for pre-intervention and post-intervention data related to education. The test scores pre-intervention had an average of 69.39 ( $SD = 12.15$ ,  $SE_M = 1.74$ , Min = 40.00, Max = 90.00, Skewness = -0.45, Kurtosis = -0.07). The test scores for post-intervention had an average of 85.92 ( $SD = 6.74$ ,  $SE_M = 0.96$ , Min = 80.00, Max = 100.00, Skewness = 0.69, Kurtosis = -0.61). The summary statistics can be found in Table 1.

**Table 1**

*Summary Statistics Table for Interval and Ratio Variables*

Variable	$M$	$SD$	$n$	$SE_M$	Min	Max
pre-intervention	69.39	12.15	49	1.74	40.00	90.00
post-intervention	85.92	6.74	49	0.96	80.00	100.00

A two-tailed paired samples  $t$ -test was calculated to examine whether the mean difference of pre-intervention and post-intervention was significantly different from zero.

First the assumptions of the parametric test needed to be verified. A Shapiro-Wilk test was conducted to determine whether the differences in pre-intervention and post-intervention could have been produced by a normal distribution (Razali & Wah, 2011). The results of the Shapiro-Wilk test were significant based on an alpha value of .05,  $W = 0.91$ ,  $p = .001$ . This result suggests the differences in pre-intervention and post-intervention are unlikely to have been produced by a normal distribution, indicating the normality assumption is violated. A two-tailed Wilcoxon signed rank test was conducted to examine whether there was a significant difference between pre-intervention and post-intervention. The two-tailed Wilcoxon signed rank test is a non-parametric alternative to the paired samples  $t$ -test and does not share its distributional assumptions (Conover & Iman, 1981).

The results of the two-tailed Wilcoxon signed rank test were significant based on an alpha value of .05,  $V = 10.50$ ,  $z = -5.89$ ,  $p < .001$ . The p-value of less than 0.001 indicates that the differences between pre-intervention and post-intervention are not likely due to random variation. The median pre-intervention test scores ( $Mdn = 70.00$ ) was significantly lower than the median of post-intervention test scores ( $Mdn = 80.00$ ).

A retrospective chart review was completed on all residents who lived in the facility for 3 months pre and post intervention to determine if the education intervention was beneficial in preventing UTIs. Based on retrospective chart review, there was a change from 19 pre-intervention UTIs over three-months to 12 post-intervention UTIs over three-months. This was a significant decline of 36.8% of newly diagnosed UTIs before and after intervention of education.

## **Discussion**

### **Summary**

This evidence-based educational intervention increased the knowledge of UAPs related to symptoms and prevention of urinary tract infections in residents in the assisted living facility. Based on retrospective chart review, there was a change from 19 pre-intervention UTIs over three-months to 12 post-intervention UTIs over three-months or a 36.8% reduction.

### **Interpretation**

Providing focused education to UAPs effectively increased their knowledge base related to symptoms and prevention of UTIs. Based on the outcomes of this project, following the educational intervention, there was a reduction in the number of UTIs experienced by residents. These findings demonstrated UAPs knowledge of UTIs was significantly consistent with prior findings from the study by Freeman-Jobson and colleagues (2016) and the study completed by Weaver and colleagues (2022).

### **Limitations**

The findings of this project are limited by several factors. Implementation was done at a single assisted living facility in North Carolina. No data was collected on the UAPs level of education or years of experience in their role as a UAP. This could affect the level of knowledge and should be considered in a replication of this project. The sample size is relatively small and may reduce the generalizability to other facilities. A larger sample size including multiple facilities would provide a foundation for more confidence in the results.

### **Conclusions**

Direct patient care in ALFs is primarily provided by UAPs. Implementing an education program intervention for UAPs in facilities related to symptoms and prevention of UTIs increased the knowledge of the UAPs and resulted in fewer diagnoses of UTIs within the facility. The project showed a willingness of UAPs to gain knowledge that would benefit the residents they cared for. Following the educational intervention, the number of UTIs decreased by 36.8%. To sustain the benefits of this quality improvement project, the facility leadership has incorporated the educational intervention as a part of new employee orientation and training and as continuing education for all staff every six months.

This project would potentially be beneficial in other levels of long-term care where residents are less independent and require closer supervision. Additional elements that would strengthen the outcomes would include implementation of specific interventions related to prevention and the number of residents who require a visit to the emergency department for UTI.

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**Appendix A: Test of Knowledge Acquisition**

1. Identify the reason that does not place the older individual at risk for a UTI.
  - a. Old age.
  - b. Decreased mobility.
  - c. High fat diet.
  - d. Poor hygiene.
  
2. Which is the best way to prevent UTIs?
  - a. Increase fluids.
  - b. Take preventative medication.
  - c. Avoid caffeine.
  - d. Use an adult diaper at night.
  
3. UTIs are diagnosed by:
  - a. Urinary odor.
  - b. Deep yellow colored urine.
  - c. A laboratory test.
  - d. Changes in vital signs.
  
4. Urinary incontinence is the initial sign of a UTI
  - a. Yes.
  - b. No.
  
5. When a UTI is suspected, what action is appropriate?
  - a. Place the patient on bed rest.
  - b. Initiate isolation precautions.
  - c. Report your assessment as appropriate.
  - d. Inform a family member that hospitalization will be necessary.
  
6. Routine toileting will prevent UTIs.
  - a. Yes.
  - b. No.
  
7. A preventative activity for a UTI includes:
  - a. Daily baths.
  - b. Wearing loose fitting clothing.
  - c. Ensuring an adequate fluid intake.
  - d. Maintaining a low-fat diet.
  
8. Which health condition does not place a person at risk for a UTI?
  - a. Dementia.
  - b. Diabetes.
  - c. Blindness.
  - d. Previous stroke.

9. Assessment for UTI is the responsibility of:
  - a. The MD only.
  - b. The MD or the RN.
  - c. The MD, RN, or PCT.
  - d. Any family member.
  
10. Which of the following is not a symptom of a UTI?
  - a. Confusion.
  - b. Pain or tenderness in the lower abdomen.
  - c. Fever.
  - d. Localized rash.