Decreasing Urinary Tract Infections in Long-Term-Care Facility Residents

Submitted by

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Abstract

The elderly population in the United States is rapidly expanding and will nearly double in number over the next 20 years. It is estimated that greater than 40 percent of persons aged 65 years and greater will require some care in nursing facilities, at some point during their lifetime. For the most part, long-term care facility (LTCF) residents are old and have some age-related immunologic changes, chronic diseases, cognitive/physical impairments, and diseases that alter host resistance; therefore, it is much easier for them to be highly susceptible to infections and develop complications from those infections. Urinary tract infections (UTIs) are the most common infection in the LTCFs residents. UTI-related costs add a heavy burden on the patients, their families, the society as well as the government. However, many causes linking with UTIs in the LTCF residents are preventable. Staff education is one of the key factors to reduce the occurrence of UTIs in the residents. Decreasing the occurrence of UTIs in LTCF residents will greatly reduce the healthcare cost.

Introduction/Problem Statement

The elderly population, aged 65 years and greater, is rapidly increasing in the United States (Bentley et al., 2000). It is estimated that within the next 20 years, the number of the elderly people will be twice as many as today. Studies have described that more than forty percent of the people aged 65 years and older will require care in a long-term care facility, at some point during their lifetime because LTCFs deliver various services to people with a range of functional disability and chronic disease (Bentley et al.,
2000; Nicolle, 2001). Normally speaking, residents of LTCFs are very old and have age-related physical impairments, and diseases that alter host resistance. Therefore, they are highly susceptible to infections and develop complications from the infections (Bentley et. al., 2000).

Urinary tract infections (UTIs) are the most common bacterial infections in the residents living in the long-term care facilities (Eriksen et al., 2006). UTIs are the important cause of morbidity and mortality in this group of population (Dignam et. al., 2003). The prevalence of UTIs increases with advancing age in both men and women (Kamel, 2005). Recurrent and complicated UTIs are also more common in older adults compared to younger adults. This is because the elderly people have increased frequency of predisposing anatomic and pathophysiologic factors, such as uterine prolapsed, urolithiasis, and genitourinary tract malignancies (Kamel, 2005). Other risk factors linking with UTIs in LTCF residents include menopause, neurogenic bladder caused by certain conditions, such as stroke, Alzheimer’s disease, Parkinson’s disease, diabetes, prostatic enlargement in male residents, urinary and fecal incontinence, and bedridden (Nicolle, 2000; Smith & Rusnak, 1997; Kamel, 2005). UTIs caused by the use of urinary catheters are also common in the elderly (Kamel, 2005).

UTIs not only are associated with increased morbidity and mortality in the elderly population, but also add a heavy burden to our healthcare cost. Studies have shown that in the United States, the total cost of both community-acquired and hospital-acquired infections is more than $2 billion every year (Robichaud & Blondeau, 2008). An article written by Rosenthal (2007) describes that in fiscal year of 2006, there were 11,780 Medicare cases on catheter-associated urinary tract infection, and average Medicare
payment for the admission due to catheter-associated urinary tract infection was $40,347.

Decreasing the occurrence of UTIs in LTCF residents will help reduce the morbidity and mortality risks in this group of population as well as help relieve the burden on the healthcare costs.

This project is designed to help nursing staff in two long-term-care facilities in North Dallas to increase their knowledge of UTIs among the residents in long-term-care facility, thus decreasing the UTI cases and hospitalizations due to UTIs.

**Goals and Objectives**

- Describe the prevalence of UTIs in long-term care facility residents
- List all the possible risk factors for UTI among the residents living in the long-term care facilities
- Identify the common organisms isolated in positive urine culture in elderly population
- Describe both typical and atypical signs and symptoms of UTI in the long-term care facility residents
- List the non-pharmaceutical interventions and other preventative methods learned from the literature review
- Describe the methodology of data collection on UTI cases in two selected long-term care facilities
- Describe the interventions to decrease UTI occurrence in these two chosen long-term care facilities
• Evaluate of the effectiveness of the interventions by counting the number of UTI cases and the number of hospitalizations due to UTIs monthly in the next three months and expecting the UTI cases and hospitalizations due to UTIs to be decreased by 50% by the end of the third month

• Describe the budget resources needed for implementing the interventions in these two facilities

• Discuss future implications of decreased UTIs in long-term care facilities

**Methodology**

The baseline data of UTI cases from October 2009 to December 2009 in two long-term-care facilities was collected retrospectively. Assistant Directors of Nursing (ADONs) assisted providing the UTI cases. However, the data did not indicate if those UTI cases include chronic urinary catheter users or if the residents were admitted to the hospitals because of UTIs. Therefore, with the permission of the administrators and the Directors of Nursing (DONs), patients’ medical charts were reviewed. Since there were no resident identifiers except for their age, obtaining the consent from the residents or their families was not necessary. In addition, surveys were distributed to the nursing staff in these two facilities in order to obtain more information about their experience and their knowledge about UTIs in elderly population. The survey content includes nursing license status (registered nurse=RN, licensed vocational nurse=LVN), years of nursing experience, knowledge of UTIs, such as risk factors linking with UTIs, common organisms presented in positive UTI results, signs of symptoms (both typical and atypical), urinary insertion techniques, ways to take care of the urinary catheters, average amount of minutes or hours they spend with each resident per shift for direct patient care,
the frequency they walk with their residents, the frequency and amount of fluids offered to the each resident per shift, and documentation of the residents’ intake and output each shift (please also refer to Appendix II).

Results

In facility A, there were 39 UTI cases from October 2009 to December 2009, with an average of 13 UTI cases each month. The average resident number was 140 each month during these three months, and residents’ age ranged from 48 to 102 years old. Only two residents were younger than 65 years old. There were six residents with an indwelling urinary catheter. Seven cases of UTI occurred in those residents with an indwelling urinary catheter, and seven cases of UTI were admitted to hospital. There were total of 11 nurses (2 RNs and 9 LVNs) and 17 Certified Nurse Aids on duty during these three months.

In facility B, the average number of residents was 41 during those three months. The residents’ age ranges from 62 to 103 years old. There were 15 cases of UTI, with an average of 5 UTI cases each month. Five cases of UTI occurred in those with an indwelling urinary catheter, and four UTI cases were admitted to the hospital. In this facility, two residents had an indwelling chronic urinary catheter in placed. There were one RN, four LVNs, and ten CNAs on duty during those three months.

Surveys were only distributed to the nurses in both facilities, and 14 nurses (3 RNs and 11 LVNs) completed the survey. In facility A, the average time for a RN to provide direct patient care per resident per day were 15.5 minutes, and the average time for a LVN to provide direct patient care per day was 13.3 minutes. In facility B, the
average time for a RN to provide direct patient care per resident per day was 15 minutes and 13.6 minutes for a LVN.

**Facility A**- Monthly Information On #s of Residents, #s of UTI Cases, UTI Cases in Residents With an Indwelling Urinary Catheter, and Hospitalizations Due UTIs (10/2009- 12/2009)

<table>
<thead>
<tr>
<th>Month-Year</th>
<th>Residents</th>
<th>UTI Cases</th>
<th>UTI cases with an indwelling urinary catheter</th>
<th>Hospitalizations Due to UTIs</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct-09</td>
<td>138</td>
<td>11</td>
<td>2</td>
<td>2</td>
<td>7.97%</td>
</tr>
<tr>
<td>Nov-09</td>
<td>141</td>
<td>14</td>
<td>2</td>
<td>2</td>
<td>9.93%</td>
</tr>
<tr>
<td>Dec-09</td>
<td>140</td>
<td>14</td>
<td>3</td>
<td>3</td>
<td>10%</td>
</tr>
</tbody>
</table>

**Facility B**- Monthly Information On #s of Residents, #s of UTI Cases, UTI Cases in Residents With an Indwelling Urinary Catheter, and Hospitalizations Due UTIs (10/2009- 12/2009)

<table>
<thead>
<tr>
<th>Month-Year</th>
<th>Residents</th>
<th>UTI Cases</th>
<th>UTI cases with an indwelling urinary catheter</th>
<th>Hospitalizations Due to UTIs</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct-09</td>
<td>41</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>7.31%</td>
</tr>
<tr>
<td>Nov-09</td>
<td>43</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>18.60%</td>
</tr>
<tr>
<td>Dec-09</td>
<td>40</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>10%</td>
</tr>
</tbody>
</table>

**Survey Information**-Numbers of Registered Nurses (RNs) and Licensed Vocational Nurses (LVNs) and the Average Time for Direct Care Per Resident Per Day in Both Facilities
### Discussion

There are many risk factors associating with the cause of UTIs among long-term-care facility residents. Age is one of the common risk factors linking with the occurrence of UTIs. For instance, for the elderly men, with advancing age, they have more chances to develop bladder outlet obstruction because of enlarged prostate (Kamel, 2005). Other common risk factors due to advancing age include atrophic urethritis, atrophic vaginitis, prostatic cancer, genitourinary abnormalities and malignancies, menopause, neurogenic bladder caused by certain conditions, such as stroke, Alzheimer’s, or Parkinson’s disease, diabetes, urinary and fecal incontinence, and bedridden (Smith & Rusnak, 1997; Kamel, 2005). Charts review of the residents who had positive UTIs during the month of October
2009 to December 2009 showed that majority of these residents has multiple medical and surgical problems. Several male residents have the diagnosis of benign prostate hypertrophy and prostatic cancer. Significant amount of residents have history of stroke with hemiparesis. Many of them have neurogenic bladder caused by neurological problems, such as Alzheimer’s disease or Parkinson’s disease, and majority of these residents are wheelchair-bound or bedridden. Survey also showed that majority of the nurses listed “old age” as one of the risk factors linking to the cause of UTIs among the older population.

In addition, studies have shown that the incidence of UTIs increases in the residents with an indwelling chronic urinary catheter (Kamel, 2005). Catheters are commonly used for urinary retention, incontinence control, wound management and patient comfort. Catheter-related bacteriuria in the elderly is a frequent complication (Rothari, 2007). Charts review showed that in Facility A, one resident with an indwelling chronic urinary catheter in placement was found to have three UTIs during those three months, and a couple of residents with an indwelling urinary catheter had UTIs twice in three- month period. Charts review also showed that two residents in facility A and one resident in Facility B with an indwelling urinary catheter were admitted to the hospital due to complicated UTIs, such as Urosepsis or Septicemia caused by UTIs.

Furthermore, research studies have shown that compared to younger adults with UTIs, elderly residents with UTIs carry more types of isolated pathogens in their urine (Kamel, 2005). Escherichia Coli (E. Coli) is a more common pathogen, and it accounts for about 70 percent of pathogens of UTI in outpatient elderly females, and about 40 percent in older patients with indwelling catheters (Kamel, 2005). The second most
frequently isolated pathogen is Klebsiella pneumoniae. Other common pathogens in this group of population include Proteus Mirabilis, Proteus Vulgaris, Proteus Incostans and Morganell Mogannii. Gram positive bacteria, such as enterococci, coagulase-negative Staphlococci, and group B Streptococci are more frequently isolated in patients with “recurrent UTIs as a result of frequent use of antibiotics that are inactive against these organisms, such as quiolones” (Kamel, 2005, p. 1). In addition, studies also state that bacteriuria associated with short-term catheterization usually involves a single pathogen, more likely E. coli. However, bacteriuria associated with chronic catheter in placement is often multi-microbial (Rothari, 2007). Most common organisms presented in positive UTI cases from charts review were E.coli, Klebsiella Pneumoniae, Proteus Mirabilis, and enterococci. Positive UTIs in residents with an indwelling urinary catheter usually presented at least two organisms, such as E. coli and Klebsiella. Only one resident with an indwelling urinary catheter was found to have three organisms in her positive UTI from the chart review. It seems that the nurses did not know the organisms very well. Survey showed that over 95 percent of the nurses only knew E. coli. Only one RN listed both E.Coli and Enterococci on the survey.

Although some of the residents in LTC facilities with UTIs may present such typical signs and symptoms as fever, dysuria, frequency, urgency, nocturia, suprapubic pain and increased incontinence, majority of the residents with UTIs may not present any typical UTI symptoms. This happens because majority of these residents are incontinent, immobile, confused or demented (Bentley et. al., 2000). They rather exhibit signs, such as delirium, poor appetite, frequent falls, weakness, lethargy, agitation, fatigue and malaise (Robichaud & Blondeau, 2008). Survey indicated that about 50 Percent of the
nurses listed “increased weakness, decreased appetite, agitation, and falls” as the signs of possible UTIs in elderly people. Charts review showed that Urine Analysis and Culture/Sensitivity was ordered and collected because the residents exhibited the signs such as decreased appetite, increased weakness, lethargy or increased agitation.

UTIs significantly increase the morbidity and complications in the residents in long-term care facilities; however, many causes linking with UTI occurrence are preventable (Saint et al., 2009). The methods of UTI preventions include staff nurse (especially RNs) direct care time over 30 minutes per resident per shift, correct urinary catheter insertion techniques and proper catheter care, justification of the need of an indwelling catheter, and adequate hydration, especially with at least 120 ml of cranberry juice per day. An analysis done in 2005 on the data from the National Pressure Ulcer Long-Term Study (NPULS) has shown that more RN direct care time (at least 30 to 45 minutes) per resident per shift was associated with better outcomes in the residents living in long-term care facilities. These outcomes include fewer skin infections, ulcers, UTIs, catheterizations, and hospitalizations. The outcomes also include lower incidence of weight loss and deterioration in the ability to perform daily activities, and more use of nutritional supplement. This study also have described that more CNAs /LVNs was associated with fewer pressure ulcers; however, it did not indicate to improve other outcomes, such as lower the UTI incidence or decreasing hospitalization rates due to UTIs (Horn, 2008; Horn et al., 2005). Nursing staff survey indicated that RN direct care time per resident per shift was less than 20 minutes, and less than 15 minutes for a LVN in both facilities. Survey was not able to indicate the association between the numbers of
Moreover, a few studies have stated that catheter-associated urinary tract infection can also be prevented (Saint et al., 2009). Federal regulations mandate that certain criteria must be met in order to justify the use of an indwelling catheter in the long-term care settings (Saint et al., 2009). Many residents did not have a catheter in-placed before they were sent to an acute hospital, but came back to the long-term care facilities with an indwelling urinary catheter. As a result, it increases the resident’s risk to develop UTIs.

CDC Guidelines for Prevention of Catheter-Associated Urinary Tract Infections strongly recommend to catheterize the patients only when necessary, educate the nursing staff in correct catheter care and insertion technique, secure the catheter once the catheter is inserted, maintain closed sterile drainage system, use intermittent method when irritation is necessary, obtain urine samples aseptically, when indicated, and maintain unobstructed urine flow (Kamel, 2004). The guidelines also recommend re-educating the nursing staff in catheter care periodically, using smallest bore of catheter if possible, avoiding changing the catheters at a regular interval, and performing daily meatal care (Kamel, 2004). Charts review indicated that during the month of October 2009 to December 2009, there were total of eleven UTI cases were admitted to the acute hospitals for treatment, and three of them are associated with an indwelling urinary catheter. Other eight cases were admitted to the hospitals without an indwelling catheter. However, two out of these eight cases came back to the LTC facilities with an indwelling urinary catheter in placed, and there was no documentation found why those two residents needed an indwelling urinary catheter. In addition, staff survey showed that about 40 percent of the nurses in
these two facilities stated that Foley catheter insertion is a sterile technique, and near 60 percent of the nurses chose “clean technique” for Foley catheter insertion. About 50 percent of the nurses stated that they occasionally check the chronic urinary catheter. Only very small amount of the nurses stated that they checked the catheter at least twice during their shift.

Moreover, several research studies have demonstrated the effectiveness of using nonpharmacological approaches such as offering cranberry juice to the residents in the long-term care facilities to decrease the UTI incidence. These studies suggest that consumption of at least 120 ml of cranberry juice per day effectively reduce the symptomatic UTIs in LTCF residents (Dignam et al., 2003). The nursing staff survey indicated that dietary technicians usually offer fluids to residents between the meals, and the fluids they use are water, orange juice and apple juice.

**Interventions**

After reviewing the literature on the incidence of UTIs in LTCF residents, the risk factors and pathogens associated with UTI incidence in this group of population, the signs and symptoms (both typical and atypical) of UTIs in the elderly people, and the methods of preventions of UTI occurrences in the older adults, as well as the data collected on the UTI cases and staff survey from the two facilities, a plan is developed. This plan will work on two different levels: nursing department, including nursing staff, nursing directors and infection control nurses, and administrative department. It appears that there is a need to educate the nursing staff on the risk factors linking with UTIs in elderly population, the signs and symptoms of UTIs, and UTI prevention methods.
Administrative department agrees to add cranberry juice to the hydration cart. Also, with the permission of the administrative department and nursing department, we plan to provide three in-services within the next two weeks to the staff members of different shifts in both facilities. Each in-service will take about 45 minutes. The in-service will include the introduction of UTI prevalence in LTCF residents, the risk factors associated with the occurrences of UTIs in this group of people, possible pathogens isolated in UTIs in older adults, possible signs and symptoms of UTIs exhibiting in this population, and UTI prevention methods, such as offering adequate amount of fluids (cranberry juice if possible) as well as proper catheter care as recommended by CDC guidelines for Prevention of Catheter-Associated Urinary Tract Infections. We will also stress the importance to the nursing staff to spend at least 30 minutes to provide direct care to each resident per shift, and offer at least 120 ml of cranberry juice to the residents who do not have diagnosis of diabetes or active gastric ulcer and do not have allergies to cranberry products. In addition, we plan to make the suggestions to the administrative department to hire more RNS than LVNs or LPNs if budget allows. We will also encourage the nursing department to implement protocols and policies to require nursing staff to record residents’ intake and output each shift, the amount of direct care time provided to each resident per shift, and keep the written documentation in the designated place.

**Evaluation/outcome measures**

This plan will be closely monitored and evaluated once a month for next three months (April 2010 to June 2010). There will be two main methods to evaluate the outcomes—a short quiz and charts review. The nursing staff will be re-evaluated for their knowledge of UTIs by taking a short quiz. The quiz will include to list at least five...
risk factors associating with UTIs in the elderly population, list three common organisms isolated in positive UTIs in older adults, list five possible signs and symptoms in older adults with UTI, choose the correct urinary catheter insertion technique. The staff nurses are expected to provide the correct answers for each question on this quiz. Charts review in the end of each month will include counting how many new UTI cases and how many hospitalizations due to those UTI cases. The numbers of UTI cases and the number of hospitalizations due to UTIs are expected to be decreased by at least 50 % by the end of the third month (June 30, 2010) in both facilities. For the residents who have the chronic urinary catheter in placement, the staff nurse will be able to provide documentation on why they need it, whether or not they have contacted with the residents’ primary care physicians, how often they check the catheter, and how they take care of the catheter when it is leaking or not draining appropriately. In addition, charts review will also include checking residents’ intake and output record and the staff nurses’ direct care time spent with each resident per shift.

**Budget**

The start-up budget will be applied from these two facilities. The budget includes three categories: salary expenses, supply expenses and transportation expenses. A medical/nursing assistant from one of these facilities will be trained on how to collect data (print data, distribute the survey and short quiz to the nursing staff and collect the completed information from the nursing staff and chart review). The nurse practitioner will provide the in-services to the nursing staff on the prevalence of UTIs in long-term-care facility residents, risk factors associated with UTIs in older population, common organisms isolated in positive urine culture, signs and symptoms of UTIs, and UTI
prevention methods. The salary expenses also will include the nurse practitioner’s time for material preparation for nursing staff in-service and the use of a statistician. Supply expenses will include the usage of paper, pen, printer ink, computer, internet, and cell phone. Transportation expenses include gas and mileage. For the specific amount for each category, please refer to Appendix I. Long-term budget may be applied from National Institutes of Health (NIH) with the similar expense categories if planning the similar interventions in other LTCFs.

**Conclusion and Implication**

Urinary tract infections are the most common infections among the LTCF residents and are the main cause of morbidity and mortality in this group of people. Since the population of older age is increasing, UTI-related health care costs will increase as well if the appropriate UTI prevention methods are not implemented urgently. It is essential for the nursing staff taking care of this group of people to have adequate knowledge of UTIs and be familiar with the methods to prevent the occurrence and re-occurrence of UTI incidence. In addition, the administrative policies and protocols should be implemented to help reduce the UTI incidence in the older population in long-term care facilities, thus helping decrease the morbidity and mortality rate and to reduce the costs associated with UTIs in the elderly population.
References


Appendix I

Budget Summary

1. Salary: $1190

Before intervention

- Training a medical/nursing assistant on how to collect data (2 hours) = $80 (will be done by myself)
- Data collection (from two facilities) (will be done by medical/nursing assistant. She is paid $10 per hour)
  a. print data- from October 2009- December 2009 (3 hours in one facility, and 1 hour in another facility, total of 4 hours = $40)
  b. give out survey and collect the completed survey (2 hours in one facility and 1 hour in another facility, total of 3 hours = $30)
  c. chart review (7 hours in one facility and 2.5 hours in another facility, total of 9.5 hours = $95)
- Nursing staff in-service (3 sessions per one facility, each session is 45 minutes, total for two facilities = $180) (will be done by myself)
- Material preparation for nursing staff in-service (including research and making power point and hand- outs) 12 hours = $480 (will be done by myself)
For evaluation

- Measuring outcomes from April 2010- June 2010 (monthly visit to two facilities, data collections including chart review, 7 hours in one facility and 2.5 hours in another facility, total 9.5 hours = $95 (will be done by medical assistant)
- Distribute the short quiz to the nursing staff in two facilities and collect the quiz, total 3 hours= $30 (will be done by medical assistant)

Salary for a statistician (3 hours x $50) = $150

2. Supply expenses: $355

- Paper = $15
- Pen = $10
- Printer Ink = $40
- computer usage = $200
- internet usage ( $20 per month for 3 months) = $60
- Cell phone usage ($10 per month for 3 months) = $30

3. Transportation expenses (gas and mileage): $100

30 miles from home to each facility = single trip, approximately 16 round-trips (will be made by medical assistant) = 960 miles, average gas price is $2.55/gallon, total cost for gas = $100

Total expenses = $1640
Appendix II

Survey

1. Are you a:
   A. Registered Nurse (RN)
   B. Licensed Vocational Nurse (LVN)

2. How long have you been a nurse?
   A. Less than 5 years
   B. 5-10 years
   C. Greater than 10 years

3. Have you ever worked in long-term-care facilities?
   A. Yes
   B. No

4. Please list at least three risk factors associated with urinary tract infections in elderly population.

5. Please list at least three signs and symptoms exhibiting in the elderly population with possible urinary tract infections.

6. Please name two common organisms isolated in urine with positive urinary tract infection in older adults.

7. Urinary catheter insertion technique is a (an);
   A. Sterile technique
   B. Clean technique
   C. Do not know
8. On average, how often do you check the urinary catheter if your residents have one in your shift?
   A. Never
   B. Once
   C. Twice
   D. Three times or more

9. On average, how many times do you walk with a resident if he/she is able during your shift?
   A. Never
   B. Once
   C. Twice
   D. Three times or more

10. On average, how often do you offer fluids to your residents in-between the meals during your shift?
    A. Never
    B. Once
    C. Twice
    D. Three times or more

11. Do you record residents’ intakes and outputs during your shift?
    A. Yes
    B. No
    C. Other, please specify___________
12. On average, how many minutes or hours do you provide direct care to each resident per shift?
Appendix III

Short quiz

1. Please list five risk factors (or causes) associated with urinary tract infections in elderly population.

2. Please name three common organisms isolated in positive urinary tract infections in elderly population.

3. Please list five possible signs and symptoms in the older adults with positive urinary tract infection.

4. Urinary catheter insertion technique is a (an):
   A. Sterile technique
   B. Clean technique