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This article presents the educational effectiveness of recognizing asymptomatic bacteriuria (ASB) in a long-term care facility using presentations and clinical pathways. Results indicate interventions are effective in identifying ASB but inconclusive of the number of inappropriate UA reductions.

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Introduction

Asymptomatic bacteriuria (ASB) is defined as a positive urinalysis (UA) or urine dipstick for bacteria without signs or symptoms of infection. ASB is common in long-term care facilities (LTCFs), with a prevalence of 25% to 50% of women and 15% to 50% of men (Nicolle, 2016; as cited in Nicolle et al., 2019), which is more prevalent than symptomatic urinary tract infections (SUTIs) in the elderly in LTCFs (Nicolle, 2001, 2000; as cited in Zabarsky et al., 2008). Therefore, ASB often is misidentified as SUTIs in elderly residents who reside in LTCFs, resulting in inappropriate use of antibiotics, potential subsequent adverse outcomes, such as multidrug-resistant (MDR) and Clostridium difficile infections (CDIs), and practice that does not follow antibiotic stewardship (Nace et al., 2014).

Moreover, Stone et al. (2012) revised the original 1991 McGeer criteria for UTI surveillance for LTCFs. McGeer criteria are a set of consensus-based infection surveillance definitions developed explicitly for LTCFs (Stone et al., 2012). The updated McGeer criteria finetuned the definition of fever to be consistent with the 2008 Infectious Diseases Society of America (IDSA) guidelines, excluded criteria of "change in the character of the urine", "worsening of functional status", and "worsening of mental status" based on the low probability of SUTI in the absence of localized urinary symptoms in LTCF residents without indwelling catheters (Nace et al., 2014; Stone et al., 2012). According to Nicolle (2019), these excluded symptoms are most often associated with ASB. However, the original McGeer criteria are still being utilized.

It is prudent that staff working in LTCF be provided with education related to the updated McGeer criteria. Providing appropriate education allows for appropriate UA collections and proper recognition of ASB (Genao et al., 2012). In addition, such education has been linked to a

decreased number of UA collections and a reduction in the use of antimicrobials to treat ASB in long-term care settings (Leduc, 2014; Lee et al., 2018; Salem-Schatz et al., 2020; Zabarsky et al., 2008).

Purpose

The purposes of this clinical scholarship project were to provide nursing staff [Register Nurses (RNs), Licensed Practical Nurses (LPNs), and Certified Nursing Assistants (CNAs)] employed at an LTCF with education and create a clinical pathway to assist staff in recognition of ASB. Proper recognition of ASB can reduce inappropriate UA collections, provide an evidence-based guide to update current facility standing orders and promote antibiotic stewardship. Nursing staff will be referred to as staff in this article.

Evidence

Seventeen articles and one practice guideline were selected through an in-depth literature review. Most studies were low level in the strength of evidence but with high recommendations. For example, the clinical practice guideline for managing asymptomatic bacteriuria by IDSA used the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system to weigh the strength of recommendation and quality of evidence (Nicolle et al., 2019). Available evidence revealed that treating ASB does not reduce SUTI incidence (Nicolle, 2014) nor improve survival rates (Genao et al., 2012, p. 1). Thus, screening or treating ASB is not recommended (Nicolle et al., 2019). Moreover, education on ASB is critical in managing ASB and SUTIs (Lee et al., 2018; Leduc, 2014; Salem-Schatz et al., 2020; Zabarsky et al., 2008).

Implementation

A multi-faceted educational intervention was implemented through visual learning via face-to-face education during staff meetings and online voiceover PowerPoint (PPT)

presentations. Pre-and post-intervention nursing staff surveys were conducted. Additionally, ASB/SUTI assessment pathways were created to guide appropriate UA collections and management. The population of interest in this quality improvement project was the nursing staff at a rural LTCF in Southeastern Minnesota.

Staff education consisted of an on-site PPT presentation provided at four staff meeting sessions and voiceover PPT for those unable to attend these presentations in September 2021. The definitions of ASB and SUTI, the original and updated McGeer Criteria, updated definition of fever, anatomy of male and female urinary systems, the prevalence of ASB for different populations, the importance of recognizing ASB, key evidence through literature review, and best practices in infectious disease from various professional medical societies were included in the educational presentation. In addition, clinical ASB/SUTI assessment pathways were created based on the evidence retrieved through the literature review. These pathways were posted at each nursing station.

Methods

This project was reviewed by the university institutional review board (IRB) and was considered exempt from IRB. Organizational IRB approval was not required as the project was a QI project. Pre-and post-staff education surveys were conducted, and numbers of UAs collected and patient symptoms at pre-and post-intervention were obtained through retrospective chart review. Outcome measures included pre-and post-survey results, UAs collected from January through June 2021, and UAs collected one-month post-education. No residents had a chronic indwelling Foley catheter during the project implementation period.

The staff survey contained ten questions related to ASB and SUTI. In addition, the participants provided years of LTC working experience and job titles. A total of four face-to-face

education sessions were delivered through four staff meeting sessions in September 2021. Pre-surveys were conducted before the education sessions, and post-surveys were performed immediately after each education session. The pre-and post-surveys were matched to each participant using a randomly assigned number. Correct responses to the ten questions were coded as "1" and incorrect answers as "0". Paired *t*-test, one-way analysis of variance (ANOVA), and chi-square McNemar's tests were utilized to analyze the pre-and post-survey results. In addition, the percentage of UAs that did not meet the update McGeer criteria was used for comparison pre-and post-interventions.

Results

Fifty-seven staff participated in the pre-survey, and 21 staff participated in the post-survey. Five percent of staff felt "well informed" on ASB pre-education, whereas fifty-seven percent felt "well informed" post-education. The overall pre-and post-survey results were analyzed using a paired *t*-test. Post-education survey scores improved significantly ($p < .0001$) compared to the pre-education surveys. However, no significant differences were found between the pre-and post-survey results by job titles using a one-way ANOVA test ($p = 0.4$). Each question from pre- to post-education had increased correctness except question ten, "Whose responsibility is it to identify ASB in residents?" Chi-square McNemar's test compared staff who increased their scores from pre- to post-survey and those who decreased their scores. Question three, "Which of the following are true statements of ASB? Choose all that apply," and question seven, "Which of the following is not associated with symptomatic UTI?" did not show statistically significant improvements on scores pre-and post-surveys. See Table 1, Table 2, Table 3, and Table 4 for detailed results. Years of working experience were not analyzed due to low numbers of RN participants post-education sessions.

There were 36 UA samples collected between January 2021 and June 2021. Of the reviewed chart associated with the UA tests, eight residents had UA samples collected recurrently during the review period. Thirty-six UAs resulted in nine negative UA (25%), ten positive UAs (28%) without positive urine cultures, and 17 (47%) positive urine cultures. In addition, there were only three UAs (8%) that met the 2012 Stone SUTI surveillance criteria (updated McGeer Criteria) of having symptoms localized to the urinary tract (Nace et al., 2014; Stone et al., 2012). However, these three UAs resulted in two (67%) positive urine cultures.

Of the 28 residents who warranted UA collection: six were males (21%), and 22 were females (79%). Fifteen residents have severe dementia (54%), and 15 residents have type 2 diabetes mellitus (54%). Furthermore, among symptoms that prompted UA collections, confusion was the highest symptom for UA collections (Nine out of 36, 25%), change in urine characters and fever alone both ranked the second reason for UA collection (six out of 36, 17%), and acute lower back/flank pain rated the third reason for UA collection (four out of 36, 11%).

Four weeks post-intervention, four residents had four UA collected per staff request in October 2021. Two UAs met the criteria (50%) for localized urinary symptoms. One UA was collected due to hematuria, and one UA was collected due to increased confusion. In addition, three UAs (75%) resulted in positive urine cultures. Among these four residents: three residents (75%) had type 2 diabetes, three (75%) were females, and two (50%) had moderate to severe dementia.

Table 1

Summary of Change in Test Scores between Pre and Post Surveys

Summary of Survey Scores					
Mean Score Pre	Mean Score Post	Mean change = Std Dev	Lower 95%	Upper 95%	P-Value

2.8	6.0	3.3 ± 1.7	2.6	4.1	<0.0001

Table 2

Summary of Change in Test Scores between Pre and Post Survey by Job Title

Summary of Change in Survey Scores by Job Title					
Job Title	Number	Mean change = Std Er	Lower 95%	Upper 95%	P-Value
CNA	11	2.9 ± 0.5	1.9	4.0	0.4
LPN	8	4.0 ± 0.6	2.7	5.2	
RN	2	3.0 ± 1.2	0.6	5.4	

Table 3

Percent Correct for Pre and Post Surveys for each Question

Percent Correct		
Question #	Pre-Survey	Post-Survey
Q2	0.0%	38.1%
Q3	14.3%	57.1%
Q4	4.8%	57.1%
Q5	38.1%	95.2%
Q6	47.6%	100.0%
Q7	9.5%	42.9%
Q8	42.9%	90.5%
Q9	61.9%	85.7%
Q10	42.9%	28.6%

Table 4

Comparing people who increased their scores from Pre to Post quiz and those who decreased their scores by question

Question #	Increase Pre to Post (n)	Decrease Pre to Post (n)	*P*-Value
Q2	8	0	0.00
Q3	9	1	0.08
Q4	12	1	0.01
Q5	12	0	0.02
Q6	11	0	0.00
Q7	9	2	0.16

Q8	11	1	0.03
Q9	5	0	0.01
Q10	3	6	0.22

Discussion

The aim of recognizing ASB effectively through educational interventions was met based on statistically significant survey results. There was a decrease in the percentage of UA collections. However, it was inconclusive given a four-week duration. The facility is updating the standing house order on UA collections based on the evidence findings through this QI project.

Pre-intervention staff surveys revealed a mean score of 2.8, whereas the post-intervention survey revealed an improved mean score of 6.0 with a significant *p-value* < 0.0001 (95% confidence interval: 2.6 - 4.1). This result indicates that the educational intervention positively affected staff knowledge of recognizing ASB at this LTCF. In addition, each question increased correctness from pre- to post-education, except for question ten. Question ten's component was inadvertently missed in the educational presentation, which further evidence that learning outcomes would not improve without education. Finally, question three, "Which of the following are true statements of ASB? Choose all that apply," and question seven, "Which of the following is not associated with symptomatic UTI?" did not show statistically significant improvements on scores from pre-and post-surveys. These findings suggest that staff might have difficulties understanding the learning materials related to questions three and seven. Thus, these areas need to be reviewed with staff for further clarifications.

Despite overall statistically significant improvement of post-survey results, no significant differences were found by job titles with a *p-value* of 0.4. Twenty-one staff participated in the post-intervention survey: 11 CNAs, eight LPNs, and two RNs. This result suggests the

knowledge improvement was not significant by job titles in this post-survey participant group. However, the small sample size could have contributed to the insignificant finding by job titles.

Furthermore, inappropriate UA collection decreased from 92% (January through June 2021) to 50% in October 2021. However, it was inconclusive to state that this reduced inappropriate percentage of UA collection was associated with educational interventions as the chance of randomization could occur given the short duration of this project,

Limitations

This project took place at a single LTC facility with relatively small sample size. An immediate post-education survey revealed statistically significant educational effectiveness. However, this result would not reflect whether the knowledge was retained. Therefore, further post-surveys with different time intervals would be necessary to measure the sustainability of this educational intervention. Moreover, a four-week post-intervention data collection period also limits the generalization of the result. In addition, shortly after the project implementation, the facility had a coronavirus disease 2019 outbreak and experienced a staffing shortage. These factors could have drifted the staff's energies and attention to the project. Finally, the educational intervention did not include physicians, nurse practitioners, and physician assistants as only one physician and one nurse practitioner were managing this LTCF. Results would not generate any statistical significance due to the extremely small sample size.

Recommendations

Future plans for this project include further nursing staff surveys using the same questionnaire and audits of UA collection at three, six, and 12-month post-implementation to increase sustainability. Recommendations have been made to make this education part of new employee orientation and update the current standing house order on UA collections for

continuity of best practices and to sustain changes. More studies and finetuned guidelines are needed in the LTC setting on managing ASB and SUTI, given the complexity and ambiguity of clinical symptoms of the geriatric population.

Conclusion

Educational intervention effectively improves nursing staff knowledge of recognizing ASB in an LTCF. However, more time is needed to conclude the definite correlation between improved knowledge and inappropriate UA collections. In addition, dementia, atypical clinical presentations of the geriatric population, and the prevalence of lacking localized urinary symptoms create challenges for staff to comply with the current UTI surveillance criteria. Therefore, further studies and finetuned guidelines are needed to allow the nursing staff to follow the UTI surveillance criteria more effectively.

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