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Major Article

Survey finds improvement in cognitive biases that drive overtreatment of asymptomatic bacteriuria after a successful antimicrobial stewardship intervention

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Background: Lack of guideline knowledge and cognitive biases are barriers that drive overtreatment of catheter-associated asymptomatic bacteriuria (ASB). We explored whether providers' knowledge and attitudes toward management of ASB differed before and after a multifaceted guidelines implementation intervention, reported elsewhere.

Methods: We surveyed providers' knowledge of guidelines, cognitive-behavioral constructs, and self-reported familiarity with the relevant Infectious Diseases Society of America guidelines. The survey was administered to providers in the preintervention (n = 169) and postintervention (n = 157) periods at the intervention site and postintervention (n = 65) at the comparison site.

Results: At the intervention site, the mean knowledge score increased significantly during the postintervention period (from 57.5%-69.9%; $P < .0001$) and fewer providers reported following incorrect cognitive cues (pyuria and organism type) for treatment of ASB. The knowledge of guidelines was higher in the postintervention sample after adjusting for provider type in the multiple linear regression analysis. Cognitive behavioral constructs (ie, self-efficacy, behavior, social norms, and risk perceptions) and self-reported familiarity with the guidelines also significantly improved during the postintervention period.

Conclusions: We identified and targeted specific barriers that drive overtreatment of ASB. Guideline implementation interventions targeting cognitive biases are essential for encouraging the application of ASB guidelines into practice.

BACKGROUND

Asymptomatic bacteriuria (ASB) is the presence of bacteria in patients without signs and symptoms referable to the urinary tract.[1] It is very common in certain population groups such as elderly persons and patients with urinary catheters.[1,2] Current guidelines recommend ASB screening and treatment only in pregnant women and patients undergoing invasive genitourinary procedures.[1] However, inappropriate treatment of ASB is common in hospitals and nursing homes, especially among patients with urinary catheters. Studies performed in these settings in the United States and Canada have documented that 20%-83% of patients with ASB are treated unnecessarily with antibiotics.[2,3] Unnecessary antibiotic use

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undermines patient safety by increasing the risk of infection with resistant organisms,[3] adverse drug events,[3] *Clostridium difficile* infection,[4] and contributes to increased length of stay.[5]

Changing health care providers' prescribing behavior requires a theory-driven approach.[6] We designed a guidelines implementation intervention to decrease misdiagnosis of ASB as a catheter-associated urinary tract infection (CAUTI) and overtreatment of ASB. This intervention, Kicking CAUTI: No Knee-Jerk Antibiotics Campaign, was founded in the Cabana model of why physicians do not follow practice guidelines,[7] with key theoretical updates by Trautner et al[8] and Glasgow et al.[9] Domains that influence health care providers' adherence to the ASB nontreatment guidelines are knowledge (eg, awareness and familiarity) and attitudes (eg, acceptance and outcome expectancy).[10] To address these knowledge gaps and relevant cognitive biases, we conducted the Kicking CAUTI study at 2 Veterans Affairs (VA) health care system facilities. Preintervention surveys were performed to identify the key gaps/biases to address in case-based audit and feedback, using a fast and frugal diagnostic algorithm derived from the Infectious Diseases Society of America (IDSA) guidelines.[8,11] In our study and others, knowledge of the guidelines was limited among health care providers,[10,12-15] and providers' decision to treat ASB was erroneously influenced by specific cognitive biases that drive guideline-discordant treatment, such as the type of organism, old age, and the presence of pyuria.[10,12-15]

As previously reported, our intervention was highly successful at reducing unnecessary screening for ASB and decreasing overtreatment of ASB.[16] As part of this study, we administered a survey with health care providers at the intervention site pre- and postintervention and at the control site postintervention to explore whether the improvements we observed in clinical outcomes (ie, urine culture ordering and antibiotic use) were associated with underlying improvements in knowledge and attitudes toward management of ASB. Specifically, we explored whether providers' knowledge of the guidelines content, cognitive-behavioral constructs (such as outcome expectancy), self-reported guideline familiarity, and cognitive biases differed before and after the intervention and between intervention and comparison sites. We report these survey results here.

METHODS

Survey design and setting

The survey was a part of a multifaceted guidelines implementation study (Kicking CAUTI: The No Knee-Jerk Antibiotics) conducted at 2 VA hospitals from July 2010-June 2013. The details of this study have been reported previously.[11,16] Briefly, a before-and-after controlled study was used to determine the effects of the intervention on screening and treatment of ASB, compared with standard quality improvement efforts occurring at a matched comparison health system. The intervention included a diagnostic algorithm derived from the IDSA guidelines and case-based audit and feedback to train providers in use of the algorithm and embedded the algorithm in day-to-day decision making.

The survey was administered on paper and electronically during the preintervention (between June and September 2011) and postintervention (between May 2012 and February 2013) periods at the intervention site and in the postintervention period at the comparison site (between June and August 2012). Both sites were tertiary care medical centers, similar in terms of inpatient ward organization, patient populations, infection control programs, and medical resident involvement in patient care. The study was approved by the institutional review board at each site.

Participants

The targeted participants for the survey were the health care providers who make decisions to order a urine culture and to prescribe antibiotics on acute-care medicine wards and long-term-care units. Staff clinicians eligible to participate included physicians, nurse practitioners, and physician assistants in long-term care. Residents eligible to participate included internal medicine (ie, medicine and medicine-pediatrics) and noninternal medicine (ie, anesthesiology, psychiatry, neurology, and transitional year) residents who were on a medicine rotation at the time of the survey. Level of training was characterized by postgraduate year after medical school. We did not attempt to give the survey to the same providers before and after the intervention at the intervention site because our residents rotate through 4 different hospitals, and at least one-third of them graduate each year.

Survey instrument

The details on the development and validation of our survey instrument have been described previously.[10,11] Our questionnaire consisted of 3 sections, measuring knowledge of how to manage catheter-associated bacteriuria, familiarity with the contents of the relevant IDSA guidelines, and cognitive behavioral constructs. Knowledge of appropriate treatment of ASB was assessed by 17 case scenario questions asking whether antibiotics were indicated, with response options "yes/no/not sure." Respondents received 1 point for every correct answer on the knowledge questions. The knowledge score represents the percentage of correct points out of possible 17 points. Guidelines familiarity was measured on a 6-point Likert scale, ranging from 1 = "have not heard of the guidelines," to 6 = "complete recall of guidelines content." Cognitive behavioral constructs included self-efficacy, behavior, social norms, and risk perceptions, all focused on the issues that influence decision to treat ASB. Each of these constructs was assessed with a series of items composed of 5-point Likert scale statements. Specific questions from the knowledge section and cognitive-behavioral constructs probed suspected cognitive biases, such as whether organism type, patient age, and presence of pyuria influenced the inappropriate use of antibiotics (ie, guideline-discordant behaviors). A copy of the questionnaire is available from the corresponding author on request.

Statistical analysis

Descriptive statistics and frequencies were calculated. Knowledge score, cognitive-behavioral constructs, and self-reported guideline familiarity of providers were compared using Mann-Whitney *U* test and Fisher exact tests between the study groups. We used Wilcoxon signed-rank test for dependent samples to compare the knowledge score of the participants who were in both preintervention and postintervention samples. Multiple linear regression analysis was used to study the association between the study group and knowledge score adjusted for provider type to eliminate its confounding effect. To compare providers' yes or no treatment responses to the questions on cognitive biases between the preintervention and postintervention samples, χ^2 tests were used.

RESULTS

Respondent characteristics

At the intervention site, 169 providers (response rate, 83%) completed the questionnaires during the preintervention period, and 157 providers (response rate, 71%) completed the questionnaires