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Major article

Overtreatment of asymptomatic bacteriuria: Identifying provider barriers to evidence-based care

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Background: Inappropriate use of antibiotics to treat asymptomatic bacteriuria (ASB) is a significant contributor to antibiotic overuse in hospitalized patients despite evidence-based guidelines on ASB management. We surveyed whether accurate knowledge of how to manage catheter-associated urine cultures was associated with level of training, familiarity with ASB guidelines, and various cognitive-behavioral constructs.

Methods: We used a survey to measure respondents' knowledge of how to manage catheter-associated bacteriuria, familiarity with the content of the relevant Infectious Diseases Society of America guidelines, and cognitive-behavioral constructs. The survey was administered to 169 residents and staff providers.

Results: The mean knowledge score was 57.5%, or slightly over one-half of the questions answered correctly. The overall knowledge score improved significantly with level of training ($P < .0001$). Only 42% of respondents reported greater than minimal recall of ASB guideline contents. Self-efficacy, behavior, risk perceptions, social norms, and guideline familiarity were individually correlated with knowledge score ($P < .01$). In multivariable analysis, behavior, risk perception, and year of training were correlated with knowledge score ($P < .05$).

Conclusions: Knowledge of how to manage catheter-associated bacteriuria according to evidence-based guidelines increases with experience. Addressing both knowledge gaps and relevant cognitive biases early in training may decrease the inappropriate use of antibiotics to treat ASB.

Asymptomatic bacteriuria (ASB) is the clinical condition in which bacteria are present in bladder urine in the absence of clinical symptoms referable to the urinary tract.[1,2] Antibiotic treatment of ASB does not confer any known clinical benefit except in 2 specific patient groups, pregnant women and patients undergoing urologic surgery.[1] Nontreatment of ASB has strong support in evidence-based guidelines, including those published by the Infectious Diseases Society of America (IDSA)[1] and subsequently endorsed by the US Preventative Services Task Force.[3] In reality, the gap between guidelines and practice is wide in the management of ASB. Recent studies from the United States and Canada document that 20%-80% of episodes of ASB are treated inappropriately with antibiotics,[4] or, stated differently, up to one-third of positive urine cultures diagnosed and treated as catheter-associated urinary tract infection (CAUTI) are actually ASB.[5,6]

Increasing public awareness of health care–associated infection (HAI) and external regulatory pressures on health care institutions to decrease their HAI rates have increased the focus on CAUTI

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prevention. Furthermore, the American Geriatrics Society, in conjunction with the American Board of Internal Medicine Foundation, recently identified treatment of ASB as 1 of 5 overused services in its "Choosing Wisely" campaign.[7] In this climate, we designed an intervention to more effectively implement the IDSA guidelines on nontreatment of catheter-associated ASB.[8] Our intervention design seeks to modify factors known to affect the adoption of clinical guidelines in practice, such as awareness of the guidelines, familiarity with guideline contents, and existing cognitive biases that inhibit knowledge transfer.[9] Thus, we designed a survey to measure these factors at baseline in our target sample to better understand the mechanisms influencing the effectiveness of our intervention.

Our survey explored several hypotheses. We investigated whether accurate knowledge of how to manage catheter-associated urine cultures was associated, at baseline, with familiarity with ASB and CAUTI guideline contents, various cognitive-behavioral constructs, and level of training. We also predicted that the survey would confirm cognitive biases suspected to drive inappropriate antibiotic use,[5,6] including type of organism, presence of pyuria, and advanced patient age.

METHODS

Setting and participants

The ASB survey was administered on paper in group settings at an academically affiliated tertiary care medical center between June and September 2011. The hospital had 375 acute care beds and 120 extended care beds, the latter including nursing home beds, skilled nursing care beds, and hospice beds. The targeted participants were the health care providers who make decisions regarding ordering and treating urine cultures. The study was approved by the hospital's Institutional Review Board.

Survey design

No previously validated survey was available to assess factors associated with appropriate management of ASB. We created our ASB survey through a literature review of clinical guidelines adoption, review of existing antimicrobial stewardship projects, and discussion with investigators conducting related studies, including studies of ASB.[10-14] The constructs used in this study are adapted from established psychological theories of decision making applied to medicine.[15] The specific survey items were adapted from similar surveys of factors associated with management of hypertension[14,16] and pneumonia,[11] prevention of CAUTI,[17,18] and inappropriate use of urinary catheters.[19] In addition, our own data from surveillance for ASB treatment in 2 different medical centers suggested important cognitive biases for overprescribing antibiotics for ASB, namely the presence of pyuria, age of the patient, and type of organism cultured from the urine.[5,6,20]

Our initial survey consisted of 3 sections, measuring knowledge of how to manage catheter-associated bacteriuria, familiarity with the contents of the relevant IDSA guidelines, and a set of 6 cognitive-behavioral constructs (Appendix). Knowledge of appropriate treatment of ASB was measured through 17 questions posing case scenarios and asking whether antibiotics were indicated, with response options in yes/no format. Self-reported familiarity with guideline contents was measured on a 6-point Likert-type scale, ranging from 1, "have not heard of the guidelines," to 6, "complete recall of guidelines content." Using questions drawn from previously validated subscales,[21] the following cognitive-behavioral constructs were also measured: self-efficacy, behavior, social norms, risk perceptions, acceptance of practice guidelines generally, and acceptance of the ASB guidelines specifically. Each construct consisted of several distinct questions with responses on a 5-point Likert-type scale, ranging from 1, "strongly disagree" to 5, "strongly agree," plus a sixth option, "don't know," not included in the numerical score (Table 1). The 36-question survey was pilot tested with 15 infectious diseases fellows from 2 institutions; in response, 3 questions were modified to create the final version of the survey (Appendix). The surveys were answered and scored anonymously.

Analysis

Knowledge score

Respondents received 1 point for every correct answer on the knowledge section; the percentage of points correct out of a possible 17 points represented the knowledge score. Clinical experience was characterized by level of training and provider type. Level of training was stratified by postgraduate year after medical school; year 1 included interns, years 2-4 included residents, and years 5+ included physicians, nurse practitioners, and physician assistants who were staff clinicians (nontrainees). Only 1 resident was in year 4 of training, and thus years 3 and 4 were analyzed together. One respondent did not identify the year of training and thus was excluded from analyses using that variable. Provider type included the following categories of training experience: internal medicine residents (including medicine and medicine-pediatrics), noninternal medicine residents rotating on an internal medicine training experience (including anesthesiology, psychiatry, neurology, and transitional year residents), and staff clinicians (Table 2). Descriptive statistics established the mean knowledge score for various groups of respondents, and analysis of variance was used to compare knowledge scores by participant level/type of clinical experience or year of training.

Guidelines familiarity

Familiarity with guidelines was also analyzed with descriptive statistics and then assessed for associations with both level of training and provider type using the χ^2 test. The relationship between guideline familiarity and knowledge score was measured using the Pearson correlation coefficient.

Cognitive-behavioral constructs

Several of the questions in this section were designed to be reverse-scored. Total points per domain were averaged over the number of questions answered to generate the numerical score for that domain. Cronbach's α was computed to analyze the internal consistency of the set of questions representing each construct; 1 question was excluded from the social norms subscale (Appendix). Ultimately, 26 questions were included in the analysis of cognitive-behavioral constructs, with 2-7 questions per construct.

We assessed the correlation between the cognitive-behavioral constructs and knowledge score using the Pearson correlation coefficient. Multivariable analysis was performed using linear regression, with knowledge score as the dependent variable and cognitive constructs, guidelines familiarity, and training level as independent variables. We ran the model 2 ways, with the clinical experience variable as years of training and then with the experience variable as the type of provider. As a sensitivity analysis, we also repeated both models using either all 6 cognitive-behavioral constructs or the 4 constructs significantly correlated with knowledge score—in other words, excluding attitudes toward guidelines in general and toward the ASB guidelines specifically.