# *Assessment of practices in screening and treating women with bacteriuria*

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***Introduction:*** *Evidence-based screening and treatment for bacteriuria is crucial to prevent increasing antibiotic resistance. The Infectious Disease Society of America (IDSA) previously released guidelines on the management of asymptomatic bacteriuria (ASB) and uncomplicated urinary tract infections (UTIs) in women. The study's objective was to assess physicians' practices in managing women with bacteriuria relative to these guideline recommendations.*

***Materials and methods:*** *Cross-sectional data from physicians were collected using an anonymous questionnaire. Multivariable logistic regression analyses identified independent predictors of adherence to guidelines.*

***Results:*** *Data were collected from 260 physicians. Over half of physicians surveyed were unfamiliar with IDSA guidelines and overtreat ASB. Variables independently associated with overtreatment of ASB included a non-academic practice and practicing as an OBGYN. Nearly one third (30.1%) of physicians reported prescribing an antibiotic other than a recommended first-line agent for uncomplicated cystitis. Relative to internists, OBGYNs and urologists were more likely to prescribe a recommended first-line agent to women with uncomplicated cystitis. Of those who correctly selected a first-line agent, 29.8% prescribed a longer than recommended duration of therapy. IDSA guideline awareness was not associated with physicians' practices in managing women with bacteriuria.*

***Conclusions:*** *Most physicians surveyed were unfamiliar with guidelines related to managing ASB and uncomplicated UTIs in women, likely contributing to overscreening and overtreatment of ASB and the use of inappropriate antibiotic regimens in treating uncomplicated cystitis. However, optimal antibiotic prescribing was not associated with knowledge of IDSA guidelines, suggesting that guideline dissemination alone may not alter practice patterns among physicians managing women with bacteriuria.*

**Key Words:** antibiotics, urinary tract infection, female urology

## Introduction

Widespread use of antibiotics has contributed to significant antibiotic resistance. The Centers for Disease Control and Prevention has reported 2 million illnesses and 23,000 deaths occur yearly due to antibiotic-resistant organisms.[1] These numbers will rise if appropriate antibiotic prescribing patterns among health practitioners does not improve. Evidence-based practices in managing bacteriuria in women could significantly decrease the amount of antibiotics inappropriately prescribed.

Bacteriuria is common among women. The incidence is 4% in young women and increases by 1%-2% each successive decade.[2,3] In the United States, evaluation and management of bacteriuria is extremely expensive, costing approximately $3.5 billion dollars yearly.[4,5] Additionally, antibiotics for the treatment of urinary tract infections (UTIs) constitute 15% of outpatient prescriptions.[3]

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Distinguishing asymptomatic from symptomatic bacteriuria can reduce antibiotic prescriptions. In most clinical scenarios only bacteriuria associated with acute symptoms requires treatment. A meta-analysis by Bent et al determined that when women present to clinic with specific symptoms such as dysuria and frequency, in the absence of vaginal irritation or discharge, the probability of a UTI is > 90%.[6]

The Infectious Disease Society of America (IDSA) published guidelines in 2005 for the diagnosis and treatment of asymptomatic bacteriuria (ASB) in adults.[7] The guidelines indicate that in the absence of signs and symptoms of a UTI only pregnant women and those undergoing urologic procedures anticipated to cause bleeding should be screened and treated for bacteriuria. The creation of these guidelines was an important step to reduce unnecessary prescribing of antibiotics to individuals with ASB and the detrimental downstream effects including increased prevalence of antibiotic-resistant bacteria.[8]

The decision to prescribe antibiotics, however, is only one aspect of bacteriuria management. IDSA guidelines released in 2011 address two other aspects: the choice and duration of antibiotic therapy in non-pregnant, premenopausal women.[9] The recommended first-line agents for acute uncomplicated cystitis are 1) nitrofurantoin monohydrate/macrocrystals 100 mg BID for 5 days, 2) trimethoprim-sulfamethoxazole 160/800 mg BID for 3 days, 3) fosfomycin trometamol 3 g once, and 4) pivmecillinam (not available in the US) 400 mg BID for 5 days.

Several groups have studied asymptomatic bacteriuria and overtreatment rates in the inpatient setting.[10,11] There has been limited evaluation of physicians' awareness of and adherence to these guidelines in the outpatient setting. Adherence to guidelines for screening and treating women with ASB and uncomplicated cystitis is important because inadequate adherence may contribute to unnecessary expenses, cause adverse clinical events, and increase antibiotic resistance.

We created an anonymous questionnaire to collect data from physicians in fields that commonly encounter women with bacteriuria. We hypothesized that: 1) many physicians screen and prescribe antibiotics to women with ASB who do not require antibiotics, 2) many physicians treat uncomplicated cystitis with noncompliant regimens, and 3) physician characteristics could be predictors of guideline adherence.

## Materials and methods

### *Design, recruitment, and IRB approval*

We performed a cross-sectional evaluation of physicians' practices in managing women with bacteriuria. Internists, family practitioners, OBGYNs, urologists, and emergency medicine physicians were recruited via e-mail between July 2016 and October 2016.

Researchers from Columbia University and Vanderbilt University were the primary distributors of the questionnaire and recruited physicians from their respective institutions including the departments of Medicine, Obstetrics and Gynecology, Family Practice, Emergency Medicine and Urology (approximately 2500 and 500 recipients from each institution respectively). Additionally, physicians were also recruited using e-mail lists obtained through professional organizations, like the New York section of the AUA (approximately 1100 members), to diversify the population of responders. Several email requests to the same recipients were sent between July and October requesting completion of the survey.

The study investigators obtained Institutional Review Board approval from their respective institutions before distributing the questionnaire (Columbia IRB Protocol AAAQ8042, Vanderbilt IRB Protocol 161305). Informed consent was obtained, and those who consented to participate were directed to complete an anonymous questionnaire.

### *The questionnaire*

Details of participants' careers, work environments, and clinical practices related to management of bacteriuria were collected. Participants reported if they were aware of the IDSA guidelines, and if so, if the guidelines were useful. Hoping to spread guideline awareness, we included a link to the IDSA guidelines at the end of the questionnaire.

### *Assessing clinical practices of screening for bacteriuria*

One question assessed methods of urine sample collection to identify the number of physicians who apply practices that reduce the risk of contamination. Seven methods were given, Table 1. Two minimize the risk of specimen contamination, while the remaining five choices potentially increase the risk.

We also evaluated practices in screening for ASB. Seven descriptions of asymptomatic women > 18 years old were given, Table 1. Physicians selected which of these patients would undergo routine urinalyses. The IDSA recommends that only pregnant women undergo routine screening for ASB.[7] If physicians selected at least one other population to routinely perform a urinalysis, they were categorized as overscreening for ASB.

TABLE 1. **Select survey questions and answers**

| **How are urine samples routinely collected in your practice?** | | **For whom of the following asymptomatic women 18 years or older would you routinely (at least once/year) perform a urinalysis?** | | **When would you choose to prescribe antibiotics to a woman 18 years or older with bacteriuria?** | |
|---|---|---|---|---|---|
| **Reduces contamination risk** | **Increases contamination risk** | **Consistent with IDSA guidelines** | **Not consistent with IDSA guidelines** | **Consistent with IDSA guidelines** | **Not consistent with IDSA guidelines** |
| Patients are given a wipe and collect a mid-stream sample in a sterile cup | Patients are given a wipe and collect a mid-stream sample in a non-sterile cup | Pregnant women | Premenopausal, non-pregnant women | Patient is symptomatic | Patient is asymptomatic, pre-menopausal and not pregnant |
| Catheterized samples are collected | Patients are not given a wipe and collect a mid-stream sample in a sterile cup | | Postmenopausal women living in the community | Patient is asymptomatic and pregnant | Patient is asymptomatic, post-menopausal and residing in the community |
| | Patients are not given a wipe and collect a mid-stream sample in a non-sterile cup | | Postmenopausal women living in a long term care facility | Patient is asymptomatic and scheduled to have an invasive urologic procedure during which mucosal bleeding is expected | Patient is asymptomatic, post-menopausal and residing in a long term care facility |
| | Patients are given a sterile cup with or without a wipe, and are not counseled to collect a mid-stream sample | | Women with diabetes mellitus | | Patient is asymptomatic with only pyuria |
| | Patients are given a non-sterile cup with or without a wipe, and are not counseled to collect a mid-stream sample | | Women with indwelling catheters | | Patient is asymptomatic with only red blood cells in urine |
| | Uncertain of collection method | | Women with spinal cord injuries | | Patient is asymptomatic with only cloudy and/or foul smelling urine<br>Patient is asymptomatic with diabetes mellitus<br>Patient is asymptomatic with a structurally and/or neurologically abnormal urinary tract<br>Patient is asymptomatic with spinal cord injury<br>Patient is asymptomatic with indwelling catheter |

### *Assessing clinical practices of treating bacteriuria*

We determined the number of physicians who, based on the guidelines, appropriately prescribe antibiotics to women with bacteriuria. Thirteen scenarios involving a theoretical female patient 18 years or older with bacteriuria were given including three in which guidelines endorse antibiotic use and 10 in which antibiotics are not indicated, Table 1. If a physician only selected to prescribe antibiotics in the three scenarios where antibiotics are indicated, practices were consistent with guidelines recommendations. If physicians selected to prescribe an antibiotic in any other scenario, these physicians were categorized as overtreating ASB.

Another question assessed selection of antibiotics for uncomplicated cystitis. As mentioned above the IDSA recommends three first-line agents available in the United States. If physicians selected to prescribe one of these to a woman without allergies who had uncomplicated cystitis with a pansensitive uropathogen, they were noted to have selected an appropriate antibiotic.

We further assessed the appropriateness of chosen regimens by asking responders to specify durations of therapy prescribed for uncomplicated cystitis. The guidelines indicate that nitrofurantoin, trimethoprim-sulfamethoxazole, and fosfomycin should be prescribed for 5, 3, and 1 day(s), respectively. The number of physicians who selected to prescribe a first-line agent for a longer duration than recommended was noted. The number of physicians who selected to prescribe a fluoroquinolone was also noted. Finally, physicians were asked if they routinely order tests of cure for asymptomatic patients who were recently treated with antibiotics for uncomplicated UTIs.

### *Statistical analysis*

We performed a descriptive analysis to characterize participants and their practices related to screening and treating women with bacteriuria. Additionally, we performed multivariable regression analyses to determine if any physician characteristics were independent predictors of guideline adherence. Characteristics included in the analysis included: gender, type of medical facility, setting of practice, specialty, percentage of female patients, proportion of work spent performing clinical duties, and IDSA guideline familiarity. Two-sided p values $< 0.05$ were considered statistically significant. All statistical analyses were performed using SPSS version 23.0 (IBM Corp., Armonk, NY, USA).

## Results

### *Characteristics of questionnaire responders*

Data were collected from 260 physicians from 11 different states across the United States and one respondent from outside the United States. The majority of participants were women (54.6%), Table 2. Five specialties were represented: 29.6% internal medicine, 29.6% urology, 25.8% OBGYN, 9.2% emergency medicine, and 5.8% family medicine. Sixty-eight percent of participants were board certified in at least one specialty. Additionally, 16.7% of OBGYN and urology participants (9.2% of all participants) were board certified in female pelvic medicine and reconstructive surgery (FPMRS). Sixty-five percent of responders practice medicine at academic centers, and 85.4% work in urban settings. The majority graduated from medical school more than 10 years prior to study participation. Nearly three-fourths of the responders have a patient population composed of 50% or more of women. Furthermore, 83.5% of spend at least half of their time performing clinical duties.

## Clinical practices of questionnaire responders and multivariable regression analysis results

### *Urine sample collection*

Seventy percent of responders reported that patients are given a wipe and collect a mid-stream sample in a sterile cup and 2.3% reported that patients are catheterized, Table 3. Additionally, 10.4% of responders reported that they were uncertain how samples were collected. The remaining physicians (17.4%) reported that samples are routinely collected through methods that likely increase the risk of contamination.

### *Screening for asymptomatic bacteriuria*

Nearly 69% of physicians' responses were consistent with overscreening of ASB. With internists as the reference population, urologists were less likely to follow ASB screening guidelines in female patients (OR 0.377, $p = 0.037$), Table 4.

### *Prescribing antibiotics for bacteriuria*

Nearly 57% of physicians' responses were consistent with inappropriate prescribing of antibiotics for ASB. Independent variables associated with overprescribing of antibiotics included a non-academic practice (OR 3.093, $p = 0.021$), practicing as an OBGYN (OR 3.240, $p = 0.011$), and having $< 50\%$ female patients (OR 3.556, $p = 0.002$), Table 4.

Additionally, only 18.8% of physicians selected that they would prescribe antibiotics exclusively in the three

TABLE 2. **Descriptive analysis of participating physicians**

| | Frequency | Percent |
|---|---|---|
| Gender | | |
| Man | 117 | 45.0 |
| Woman | 142 | 54.6 |
| Trans | 1 | 0.4 |
| Total | 260 | 100.0 |
| Specialty | | |
| Internal Medicine | 77 | 29.6 |
| Family Medicine | 15 | 5.8 |
| OBGYN | 67 | 25.8 |
| Urology | 77 | 29.6 |
| Emergency Medicine | 24 | 9.2 |
| Total | 260 | 100.0 |
| Medical facility | | |
| Academic | 169 | 65.0 |
| Non-academic | 40 | 15.4 |
| Multiple | 51 | 19.6 |
| Total | 260 | 100.0 |
| Medical practice setting | | |
| Urban | 222 | 85.4 |
| Suburban | 25 | 9.6 |
| Rural | 5 | 1.9 |
| Multiple | 8 | 3.1 |
| Total | 260 | 100.0 |
| Years with M.D. | | |
| < 5 | 66 | 25.4 |
| Between 5 and 10 | 47 | 18.1 |
| Between 10 and 20 | 75 | 28.8 |
| Between 20 and 30 | 37 | 14.2 |
| > 30 | 35 | 13.5 |
| Total | 260 | 100.0 |
| Resident or fellow | | |
| No | 188 | 72.3 |
| Yes | 72 | 27.7 |
| Total | 260 | 100.0 |
| Board certified in family medicine, emergency medicine, internal medicine, OBGYN or urology | | |
| No | 83 | 31.9 |
| Yes | 177 | 68.1 |
| Total | 260 | 100.0 |
| Urologists or OBGYNs board certified in female pelvic medicine & reconstructive surgery | | |
| No | 120 | 83.3 |
| Yes | 24 | 16.7 |
| Total | 144 | 100.0 |
| Percentage of female patients | | |
| < 50% | 70 | 26.9 |
| About 50% | 55 | 21.2 |
| > 50% | 135 | 51.9 |
| Total | 260 | 100.0 |
| Percentage of time spent performing clinical duties | | |
| 1%-25% | 17 | 6.5 |
| 26%-50% | 26 | 10.0 |
| 51%-75% | 54 | 20.8 |
| 76%-100% | 163 | 62.7 |
| Total | 260 | 100.0 |

TABLE 3. **Descriptive analysis of clinical practices**

| | Frequency | Percent |
|---|---|---|
| Urine sample collection method | | |
| Patients are given a wipe and collect a mid-stream sample in a sterile cup | 182 | 70.0 |
| Patients are given a wipe and collect a mid-stream sample in a non-sterile cup | 22 | 8.5 |
| Patients are not given a wipe and collect a mid-stream sample in a sterile cup | 8 | 3.1 |
| Patients are not given a wipe and collect a mid-stream sample in a non-sterile cup | 1 | 0.4 |
| Patients are given a sterile cup with or without a wipe, and are not counseled to collect a mid-stream sample | 11 | 4.2 |
| Patients are given a non-sterile cup with or without a wipe, and are not counseled to collect a mid-stream sample | 3 | 1.2 |
| Catheterized samples are collected | 6 | 2.3 |
| Uncertain | 27 | 10.4 |
| Total | 260 | 100.1 |
| Only screens for asymptomatic bacteriuria in pregnant women | | |
| No | 179 | 68.8 |
| Yes | 81 | 31.2 |
| Total | 260 | 100.0 |
| Only prescribes antibiotics to women with bacteriuria who are symptomatic, pregnant, or undergoing an invasive urologic procedure | | |
| No | 211 | 81.2 |
| Yes | 49 | 18.8 |
| Total | 260 | 100.0 |
| Prescribes antibiotics to women with bacteriuria in clinical scenarios where treatment is not indicated* | | |
| No | 112 | 43.1 |
| Yes | 148 | 56.9 |
| Total | 260 | 100.0 |
| Prescribes recommended first-line agent for uncomplicated UTIs | | |
| No | 78 | 30.1 |
| Yes | 181 | 69.9 |
| Total | 259 | 100.0 |
| Prescribing longer than recommended duration of first-line antibiotic | | |
| No | 127 | 70.2 |
| Yes | 54 | 29.8 |
| Total | 181 | 100.0 |
| Prescribes fluoroquinolone as first-line agent for uncomplicated UTI | | |
| No | 238 | 91.9 |
| Yes | 21 | 8.1 |
| Total | 259 | 100.0 |
| Routinely orders test of cure after uncomplicated UTI treatment | | |
| No | 222 | 86.7 |
| Yes | 34 | 13.3 |
| Total | 256 | 100.0 |

*women with ASB who do not require treatment based on IDSA guidelines: 1) pre-menopausal and not pregnant, 2) post-menopausal and residing in the community, 3) post-menopausal and residing in a long term care facility, 4) with only pyuria, 5) with only red blood cells in urine, 6) with only cloudy and/or foul smelling urine, 7) with diabetes mellitus, 8) with structurally and/or neurologically abnormal urinary tracts 9) with spinal cord injures, or 10) with indwelling catheters.

TABLE 4. **Multivariable regression analysis of guideline adherence**

| | Only screens for asymptomatic bacteriuria in pregnant women | | | Prescribes antibiotics to women with ASB who do not require treatment[+] | | | Prescribes recommended first-line agent for uncomplicated UTIs | | |
|---|---|---|---|---|---|---|---|---|---|
| | OR | 95% CI | p value | OR | 95% CI | p value | OR | 95% CI | p value |
| Gender | | | | | | | | | |
| Male | Ref. | | | | | | | | |
| Female | 0.884 | 0.460-1.699 | 0.712 | .839 | 0.449-1.571 | 0.584 | 0.964 | 0.490-1.896 | 0.916 |
| Medical facility | | | | | | | | | |
| Academic | Ref. | | | | | | | | |
| Non-academic | 0.455 | 0.155-1.334 | 0.151 | 3.093 | 1.186-8.067 | 0.021* | 1.140 | 0.388-3.348 | 0.812 |
| Mixed | 1.401 | 0.663-2.960 | 0.377 | 1.186 | 0.581-2.421 | 0.640 | 1.712 | 0.730-4.016 | 0.217 |
| Medical practice setting | | | | | | | | | |
| Urban | Ref. | | | | | | | | |
| Suburban | 1.074 | 0.324-3.562 | 0.907 | 1.302 | 0.425-3.989 | 0.644 | 0.737 | 0.181-2.587 | 0.647 |
| Rural | 0.852 | 0.073-9.900 | 0.898 | 0.324 | 0.043-2.433 | 0.273 | 0.414 | 0.029-9.656 | 0.534 |
| Mixed | 0.331 | 0.037-2.959 | 0.323 | 3.015 | 0.522-17.416 | 0.217 | 0.728 | 0.100-5.536 | 0.751 |
| Specialty | | | | | | | | | |
| Internal medicine | Ref. | | | | | | | | |
| Family medicine | 2.560 | 0.723-9.065 | 0.145 | 0.765 | 0.220-2.660 | 0.673 | 1.407 | 0.396-5.002 | 0.598 |
| OBGYN | 0.803 | 0.321-2.010 | 0.693 | 3.240 | 1.307-8.033 | 0.011* | 21.228 | 4.323-104.244 | < 0.001* |
| Urology | 0.377 | 0.151-0.944 | 0.037* | 0.536 | 0.241-1.192 | 0.126 | 2.349 | 1.037-5.321 | 0.041* |
| Emergency medicine | 2.421 | 0.912-6.427 | 0.076 | 1.802 | 0.661-4.913 | 0.250 | 0.552 | 0.209-1.460 | 0.232 |
| Percentage of female patients | | | | | | | | | |
| > 50% | Ref. | | | | | | | | |
| About 50% | 0.946 | 0.397-2.256 | 0.901 | 1.237 | 0.551-2.778 | 0.606 | 0.660 | 0.290-1.503 | 0.323 |
| < 50% | 0.893 | 0.371-2.152 | 0.801 | 3.556 | 1.565-8.079 | 0.002* | 0.665 | 0.290-1.522 | 0.334 |
| Proportion of work spent performing clinical duties | | | | | | | | | |
| More than 75% | Ref. | | | | | | | | |
| 51%-75% | 0.699 | 0.320-1.529 | 0.370 | 1.626 | 0.793-3.332 | 0.185 | 0.667 | 0.307-1.448 | 0.305 |
| 26%-50% | 1.432 | 0.549-3.740 | 0.463 | 0.648 | 0.244-1.720 | 0.384 | 0.840 | 0.289-2.438 | 0.748 |
| 25% or less | 1.719 | 0.570-5.188 | 0.336 | 0.645 | 0.215-1.936 | 0.434 | 0.737 | 0.234-2.328 | 0.603 |
| IDSA guideline awareness | | | | | | | | | |
| Aware of neither guideline | Ref. | | | | | | | | |
| Aware of one guideline | 0.830 | 0.413-1.668 | 0.600 | 0.780 | 0.405-1.504 | 0.459 | 1.313 | 0.618-2.791 | 0.479 |
| Aware of both guidelines | 0.581 | 0.257-1.315 | 0.193 | 0.843 | 0.414-1.717 | 0.638 | 0.803 | 0.375-1.716 | 0.571 |

[+]women with ASB who do not require treatment based on IDSA guidelines: 1) pre-menopausal and not pregnant, 2) post-menopausal and residing in the community, 3) post-menopausal and residing in a long term care facility, 4) with only pyuria, 5) with only red blood cells in urine, 6) with only cloudy and/or foul smelling urine, 7) with diabetes mellitus, 8) with structurally and/or neurologically abnormal urinary tracts 9) with spinal cord injures, or 10) with indwelling catheters. OR = odds ratio; CI = confidence interval; *= numerical value statistically significant (p value ≤ .05); Ref. = reference

given scenarios of bacteriuria that required antibiotics: 1) symptomatic women, 2) asymptomatic pregnant women, and 3) asymptomatic women undergoing an invasive urologic procedure in which mucosal bleeding is anticipated. Urologists were more likely to prescribe antibiotics in only these three scenarios (OR 5.870,

p = 0.001), while non-academic physicians were less likely to demonstrate compliance. (OR 0.190, p = 0.034).

The remaining 24.3% of physicians' responses were consistent with undertreatment (i.e. they did not choose to treat in at least one of the three previously listed appropriate scenarios).

### *Antibiotic regimens for uncomplicated UTI treatment and test of cure use*

Nearly 70% of physicians reported prescribing a recommended first-line agent when treating an uncomplicated UTI in a woman without allergies and with a pansensitive uropathogen. Although there are three first-line agents available in the United States no responder selected to prescribe fosfomycin. Relative to internists, OBGYNs and urologists were more likely to prescribe a recommended agent (OBGYNs: OR 21.228, p < 0.001; urologists: OR 2.349, p = 0.041).

Of those who correctly selected a first-line agent, 29.8% prescribed a longer than recommended duration of therapy. Nearly one-third (30.1%) prescribed an antibiotic other than a recommended first-line agent, with 8.1% choosing a fluoroquinolone. Of the physicians who reported using an antibiotic to treat women with uncomplicated UTIs, 13.3% reported routinely ordering urine cultures (test of cure) after their patients completed a course of antibiotics and had resolution of symptoms.

### *IDSA guideline familiarity and perceived helpfulness*

Overall, 56.9% of physicians surveyed were not familiar with the two IDSA guidelines. Although fewer than half (43.1%) of responders were familiar with at least one guideline, over 75% reported that the guidelines were at least "somewhat helpful" to their practices. We also identified a disparity in guideline familiarity among the various specialties with Internal Medicine physicians reporting the highest knowledge of at least one guideline (50.6%) and some of the lowest among family medicine (40.0%) and OBGYN (29.9%)

TABLE 5. **IDSA guideline awareness and perceived helpfulness**

| | **Frequency** | **Percent** |
|---|---|---|
| Familiar with 2005 guidelines* | | |
| Yes | 88 | 33.8 |
| No | 172 | 66.2 |
| Total | 260 | 100.0 |
| 2005 guidelines helpful | | |
| Yes | 51 | 57.9 |
| No | 7 | 8.0 |
| Somewhat | 30 | 34.1 |
| Total | 88 | 100.0 |
| Familiar with 2011 guidelines+ | | |
| Yes | 75 | 28.8 |
| No | 185 | 71.2 |
| Total | 260 | 100.0 |
| 2011 guidelines helpful | | |
| Yes | 51 | 68.0 |
| No | 3 | 4.0 |
| Somewhat | 21 | 28.0 |
| Total | 75 | 100.0 |
| Overall familiarity with guidelines | | |
| Familiar with neither | 148 | 56.9 |
| Familiar with one | 61 | 23.5 |
| Familiar with both | 51 | 19.6 |
| Total | 260 | 100.0 |

*2005 Guidelines: "Infectious Diseases Society of America Guidelines for the Diagnosis and Treatment of Asymptomatic Bacteriuria in Adults"

+2011 Guidelines: "International Clinical Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women"

physicians. Of responding urologists 48.1% reported such knowledge. More detailed results related to participants' familiarity with and perceived usefulness of the guidelines appear in Table 5.

## Discussion

The study's results support our hypotheses that many physicians screen for and prescribe antibiotics to women with ASB who do not require antibiotics. These results are particularly concerning given that over 25% of physicians collect specimens through methods that may increase the risk of contamination thus increasing the amount of inappropriately prescribed antibiotics to patients with ASB.

One possible issue with the reported high prevalence of overscreening for ASB is that we assumed that responders were only obtaining urinalyses to screen for ASB. In hindsight, we recognize that urinalyses are used to screen for, monitor, and evaluate other conditions such as kidney disease, diabetes mellitus, urinary incontinence, or urologic malignancies. The latter two could explain why urologists had an increased likelihood of obtaining routine urinalyses compared to internists. Perhaps it would have been more effective to ask about obtaining a urine culture rather than a urine analysis.

Our results also indicate that while the majority of physicians prescribe antibiotics to those who did not require treatment, OBGYNs were more likely to overtreat ASB relative to internists. One possible explanation is OBGYNs frequently encounter one of the few populations who require antibiotics for ASB: pregnant women. Consequently, many OBGYNs may treat all women with bacteriuria even in the absence of symptoms.

We also hypothesized that many physicians treat uncomplicated cystitis with regimens not recommended by the IDSA; our results supported this hypothesis, as nearly a third of responders prescribe antibiotics not recommended as first-line agents, including 8.1% who reported prescribing fluoroquinolones. The percentage of fluoroquinolone prescribers was lower than expected based on our anecdotal experiences encountered in clinical practice, possibly as a result of recent safety communications from the U.S. Food and Drug Administration (FDA) related to fluoroquinolones in 2016. Since distribution of the questionnaire began in July 2016, it is likely that many of those surveyed were aware of the FDA's warnings regarding fluoroquinolone use, and may have changed their practices if they previously used fluoroquinolones as first-line agents for treating uncomplicated cystitis.

Additionally, although the majority of responders reported prescribing a recommended first-line agent, almost a third prescribed longer-than-recommended durations of therapy. In addition to physicians' unawareness of the IDSA guidelines, another potential explanation for why some physicians choose to prescribe longer durations of antibiotic therapy than is recommended is that previous studies have used a 7-day course of nitrofurantoin when comparing it's efficacy to other antibiotic regimens.[12,13] A more recent randomized clinical trial, however, identified that a 5-day course of nitrofurantoin is effective in treating acute uncomplicated cystitis in women.[14] The prior studies that assessed the efficacy of a 7-day course likely influenced other medical societies to publish recommendations that are not consistent with the IDSA guidelines.[15]

Approximately 13% of physicians reported ordering a test of cure following treatment of uncomplicated cystitis, a test that is not recommended and increases the risk of identifying ASB. Given the large percentage of physicians who over treat ASB, ordering cultures in patients whose symptoms have resolved could further increase unnecessary antibiotic use.

Practices related to ASB screening practices and antibiotic use were not associated with IDSA guideline awareness. However, given that fewer than half of the responders were familiar with at least one IDSA guideline, it is possible that the study was underpowered to identify a meaningful relationship between guideline awareness and adherence. Yet, over three-fourths of those who were familiar with at least one guideline reported that the guidelines were at least "somewhat helpful" to their practices, suggesting that the majority of responders who were unaware of the guidelines would likely find them helpful in guiding their practices related to managing bacteriuria.

Other groups have studied physicians' attitudes towards clinical guidelines for uncomplicated cystitis.[16-18] As was the case in our study, guideline awareness among physicians surveyed was limited. Less than one-third of physicians reported they were fully familiar which each guideline, while approximately 60% reported they were at least somewhat familiar with the guidelines. We also identified a disparity amongst the various medical specialties with Family Medicine and OB/GYN reporting the least familiarity with either guideline. Additionally, less than one-third of responders reported that the guidelines altered patient care. The most common limitation of guidelines cited by study participants was that they were difficult to access. Other criticisms of guidelines that may

ultimately contribute to noncompliance include the perception that creating professional organizations lack credibility and challenge physician autonomy. Lastly, with guidelines pertaining to antibiotic use, some physicians may be more concerned with adverse outcomes related to not prescribing antibiotics relative to complications from overprescribing antibiotics.[19]

Our study is one of the first to collect data from multiple specialties on adherence to the ASB and uncomplicated cystitis IDSA guidelines. The data highlight multiple weaknesses within our medical community, including in those most frequently responsible for caring for the women to whom the guidelines apply, thus identifying potential areas for increased education and other interventions. Nevertheless, our study has several limitations. One weakness was the inability to calculate a response rate. The methods that were applied to distribute the survey involved taking advantage of e-mail listservs accessed through professional societies. Many of those who assisted in questionnaire distribution were unable to provide the number of physicians on their listservs. Additionally, some of the physicians included in one listserv may have also been on a second listserv that was used for questionnaire distribution and would have subsequently received the questionnaire e-mail twice. Although it is unfortunate that our methods did not grant us the ability to calculate a response rate, our study demonstrates widespread and startling overuse of antibiotics and emphasizes the need for increased efforts to reduce healthcare providers' unnecessary prescribing of antibiotics to women with bacteriuria.

An important consideration in regards to antibiotic practice patterns are local biograms. Institutional guidelines may differ dramatically from national suggestions based on regional microbiota and susceptibilities. Providers in this study may have been aware of and followed local guidelines and their decisions may have appropriately strayed from IDSA guidelines for first-line agents. We were unable to account for this in our analysis however a large percentage of providers were unfamiliar with the guidelines altogether.

Despite our efforts to recruit a population of physicians with diverse clinical practices from a variety of settings, another weakness of the study is a lack of diversity among the questionnaire responders. Although the population of participants was diverse in some areas such as specialty, overall, there was a relatively poor representation among responders from suburban, rural, and non-academic settings, despite our great efforts to recruit these physicians. It is therefore difficult to generalize this study's findings to all physicians who manage women with bacteriuria. However, since the majority of our study participants work at academic centers and see mostly female patients (populations that may be more adherent to guidelines for managing bacteriuria in women), we hypothesize that the study may have underestimated the proportion of physicians overtreating ASB and prescribing inappropriate regimens for uncomplicated UTIs. Given the large proportion of practitioners we have identified who do not comply with IDSA recommendations for treating bacteriuria in women, we believe that if we had also captured practitioners who do not see a majority of female patients or who practice in non-academic centers our results may have demonstrated even lower rates of guideline adherence.

## Conclusions

We collected cross-sectional data from physicians regarding approaches to managing women with bacteriuria and their familiarity with two relevant IDSA guidelines. More than half of physicians surveyed were unfamiliar with these guidelines. Additionally, the majority of physicians surveyed overscreen and overtreat ASB. Most physicians prescribe first-line agents when treating uncomplicated cystitis, but almost a third of these physicians prescribe a longer duration of therapy than is recommended. There was no association between practice patterns and knowledge of IDSA guidelines, suggesting that guideline dissemination alone is not sufficient to alter practice patterns. It is imperative to develop other strategies to reduce overprescribing of antibiotics and tailor stewardship approaches to various medical specialties, based on our findings that different specialties approach managing women with bacteriuria in variable fashions. Some possible suggestions include the introduction of mandatory learning modules with post learning testing to ensure understanding or perhaps introduction of alerts directly into the electronic medical record to reinforce consideration of the existing guidelines and improve screening and treatment practices. □

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