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Original Article

A qualitative evaluation of a program to implement antimicrobial stewardship for asymptomatic bacteriuria: how site attributes affected uptake

Jonah Pesikoff BS[1,2], Tyler J. Brehm MD[2,3], Larissa Grigoryan MD, PhD[2,4], Barbara W. Trautner MD, PhD[2,5] and Trenton M. Haltom PhD[1,2]

[1]Department of Medicine, Section of Health Services Research, Baylor College of Medicine, Houston, USA; [2]Center for Innovations in Quality, Effectiveness and Safety (IQuESt), Michael E. DeBakey VA Medical Center, Houston, USA; [3]Department of Medicine, Section of Infectious Diseases, Baylor College of Medicine, Houston, USA; [4]Family and Community Medicine, Baylor College of Medicine, Houston, USA and [5]Department of Medicine, Washington University School of Medicine in Saint Louis: Washington University, St. Louis, USA

Abstract

Objective: Determine site attributes affecting uptake of a national, multi-site antimicrobial stewardship project focused on reducing unnecessary urine culture orders and antibiotic prescriptions for asymptomatic bacteriuria (ASB).

Methods: Forty-one United States Veterans Affairs Medical Centers (VAMCs) were randomized into two arms: "Technical Assistance" (TA) or the "Virtual Learning Collaborative" (VLC). TA sites could request one-on-one guidance from the coordinating center, and VLC sites participated in semimonthly informational webinars. Otherwise, we provided TA and VLC sites with the same resources to educate healthcare professionals on proper ASB management. At the intervention's conclusion, we conducted 45–60-minute semi-structured interviews with local site leads and focus groups with their teams. TA and VLC sites were sampled based on time spent on intervention implementation, resulting in 19 participants across varying roles (e.g., pharmacists, physicians). We iteratively coded transcripts using thematic analysis.

Results: We propose five considerations for how site attributes informed uptake of our stewardship initiative: (1) existing connections with leadership and important contacts; (2) workplace structure and culture; (3) previous and concurrent antimicrobial stewardship initiatives; (4) availability of existing resources (e.g., time); and (5) personnel turnover (e.g., daily provider transition, job turnover).

Conclusions: We recommend conducting pre-intervention interviews to identify site-specific obstacles and then tailoring the intervention to site-specific needs. Additionally, we stress the importance of sites' prior experiences with antibiotic stewardship and the availability of personnel to work on stewardship initiatives. Ultimately, a better understanding of sites' unique environments is an essential step for improving uptake of antimicrobial stewardship projects.

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Introduction

Asymptomatic bacteriuria (ASB), bladder colonization by bacteria without causing local or systemic symptoms, is a common condition often screened for and treated with antibiotics despite evidence-based guidelines recommending the contrary.[1–3] Prescribing antibiotics for ASB is a misuse of antibiotics and exacerbates antimicrobial resistance, *C. difficile* infections and rising healthcare costs.[4–6]

Our cluster-randomized controlled trial, "Kicking Catheter-Associated Urinary Tract Infection 2.0" (Kicking CAUTI 2.0), focused on diagnostic and antibiotic stewardship to reduce screening for and treatment of ASB in hospitalized and long-term care patients. We provided educational tools (e.g., teaching cases and a pocket-sized decision aids) and an implementation guide on a SharePoint website available to all intervention teams. We also supplied engaging cases to teach principles of antibiotic and diagnostic stewardship for asymptomatic bacteriuria and urinary tract infections. Site teams, usually led by a pharmacist, delivered the teaching cases as audit and feedback to local prescribers, aiming to reduce unnecessary urine testing and treatment. Targeting urine cultures is becoming more common as evidence shows that limiting urine cultures decreases antibiotic prescriptions.[7] After two successful iterations ("Kicking CAUTI" and "Less is More"), Kicking CAUTI 2.0 further explores our stewardship approach.[1,8–10]

Antimicrobial stewardship interventions are challenging because they require healthcare professionals to change long-standing behaviors.[11,12] As such, stewardship interventions often fail either in initial implementation or in sustainability.[13] Prior qualitative studies about antimicrobial stewardship intervention uptake show that providers rely on clinical experience rather than

Corresponding author: Trenton M. Haltom; Email: trenton.haltom@bcm.edu

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guidelines, have limited time for education, overtreat, and struggle to convert antimicrobial stewardship knowledge into practice.[14–17]

Qualitative interviews and focus groups provide nuanced perspectives on what factors led to implementation success or failure. As a postimplementation assessment of the Kicking CAUTI 2.0 intervention year, we conducted both interviews and focus groups with local stewardship personnel. This paper focuses on how sites' unique environments affected their uptake which we define as a facility's engagement in, adoption of, and fidelity to the intervention. Participants' perspectives inform future diagnostic and antibiotic stewardship interventions.

Methods

We implemented Kicking CAUTI 2.0 in 41 U.S. Veteran's Affairs Medical Centers (VAMCs). Facilities volunteered through a presentation made to the Veterans Affairs Antibiotic Stewardship Task Force which hosts webinars with an audience of 500+ pharmacists, physicians, and other clinicians. Volunteering site leads completed a baseline survey and submitted names of team members to join the 52-week intervention which began in May 2023. At baseline, 97.5% of sites had some full-time equivalent dedicated to antibiotic stewardship and 87.5% were performing audit and feedback.

One goal of Kicking CAUTI 2.0 was to assess the effectiveness of Virtual Learning Collaborative (VLC) and Technical Assistance (TA) implementation strategies.[18–20] VLCs were classroom-like virtual learning environments in which participants attended twice-monthly webinars with antimicrobial stewardship expert presenters. Attendance was not required. In each session, select VLC sites shared stewardship strategies in "site spotlights." TA sites were not invited to the webinars and instead could request one-on-one guidance by the coordinating center via virtual meetings or e-mail. Requests for advice usually resulted in brief video conferences with the lead investigator and a research coordinator.

We randomized VA sites into the VLC (n = 21) or TA (n = 20) arms using site complexity levels to ensure balance across study arms. Both arms otherwise received the same tools noted above and other "swag" (e.g., sticky notes).[21]

Data collection

Data come from 45–60-minute semi-structured, one-on-one interviews and focus groups for data richness.[23] Our intention was to interview site leads and conduct focus groups with team members to avoid workplace hierarchies.[22] That is, we did not want team members to feel uncomfortable talking about the intervention in front of site leads. In practice, some sites had multiple leads; leads invited their team to what was intended to be a one-on-one interview, or sites only had a lead and no team. The number and roles of participants in these sessions thus fluctuated to accommodate participants' preferences and schedules.[22,23]

To sample, we used sites' weekly time logs to form four quartiles based on time spent implementing Kicking CAUTI 2.0. This approach is supported by extant scholarship demonstrating that increasing implementation time in ASB stewardship positively correlates with decreases in antibiotic use.[24] We used quota sampling to select one site from each arm in each quartile and approached participants by email. We collected data from nine sites, sampling twice from the third TA quartile due to initial nonresponse.

Using Proctor's *Outcomes for Implementation Research* to inform the interview and focus group guides (see **Appendix 1**), we asked participants about their satisfaction with and the sustainability of the intervention and implementation processes and strategies.[25] The interview guide touches on each outcome of Proctor's framework (i.e., acceptability, adoption, appropriateness, feasibility, fidelity, penetration, sustainability). Here, we focus on how these elements informed uptake. All interviews and focus groups were led by a qualitative methodologist (TMH) with no relationship with participants prior to data collection. TMH obtained verbal consent prior to data collection, and the study was approved by an institutional review board. Interviews and focus groups were conducted, recorded, and transcribed using Microsoft Teams.

Data analysis

Using thematic analysis, three analysists (JP, TJB, TMH) iteratively coded transcripts using Atlas.ti software.[26] Coders developed the codebook using a sample of transcripts and, with ongoing discussion, generated codes until analysists agreed on a final version that captured the data's breadth and depth. Two coders analyzed each transcript, and all coders adjudicated discordance. We then organized codes into themes and subthemes focusing on site attributes contributing to uptake of Kicking CAUTI 2.0.

Results

Participants (see Table 1) from the local intervention teams come from 8 interviews and 5 focus groups. We identified 5 themes and 9 respective subthemes concerning uptake of Kicking CAUTI 2.0. We refer to participants using their role, identification number (Role_100_ = interview; Role_200_ = focus group), and implementation arm (e.g., Pharmacist_100_TA).

Leveraging hospital connections to implement stewardship

Leveraging connections with leadership and networking with clinicians proved essential to teams initiating and growing the intervention.

Hands-off leadership support

Participants generally perceived that local hospital leadership was supportive. Pharmacist_109_VLC gave the caveat, however, that it was "on me to make sure everything fell into place" for the implementation. Others faced challenges with leadership, wherein higher-ups "supported [Kicking CAUTI 2.0] in theory but had other priorities in the department and facility" (Pharmacist_102_VLC). Leadership was generally "hands-off" towards Kicking CAUTI 2.0, allowing sites free rein, yet sometimes without active support. Participants mentioned extra funding, delegating personnel, and disseminating explicit messaging as examples of supportive measures leadership could have provided to aid stewardship.

Networking

Site leaders commented that networking was an important implementation tool. Physician_203_2_VLC found that "using existing connections to garner support worked best," especially given time limitations. Networking was not always easy, however. Pharmacist_101_TA underscored the importance—and difficulty—of using connections because "it's hard to network with people when we're so swamped with our workload." Overall, interviewees highlighted networking as an essential feature of antibiotic stewardship.

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Table 1. Participant and site characteristics (N = 19)

	n (%)
Research arm	
Virtual learning collaborative	9 (47)
Technical assistance	10 (53)
Role	
Pharmacist	9 (47)
Physician	4 (21)
Nurse	5 (26)
Nurse practitioner	1 (5)
Responsibility	
Site lead	10 (53)
Team member	9 (47)
VA site complexity*	
High complexity (1a)	11 (58)
High complexity (1b)	1 (5)
High complexity (1c)	6 (32)
Medium complexity (2)	0 (0)
Low complexity (3)	1 (5)

*The 2023 Veterans Health Administration Facility Complexity Model classifies site complexities in terms of volume of patients, patient risk, teaching, and research.[27] Sites can be complexity 1a, 1b, 1c, 2, or 3, with complexity 1a medical centers being the most complex and complexity 3 medical centers being the least.[28]

Networking evoked *handshake stewardship*, which relies on personal connections rather than mass educational sessions to engender changes in antibiotic use.[29] Pharmacist_109_VLC's strategy was to reach out to new providers directly rather than during new employe orientation because "there's gonna be nonclinical people in new employee orientation that aren't gonna care" about stewardship. Physician_107_VLC also touched on this, asserting that with a robust network "it was very easy to go to [providers] and explain 'Hey, this is what we think is going on, would you be fine stopping the antibiotics? Here's some education. Do you have any questions?'" These comments underscored site leads' preferences for intimate connections and use of personal networks for focused outreach.

Workplace structural and cultural factors

Participants faced a variety of workplace structural and cultural factors that affected Kicking CAUTI 2.0 at their facilities.

Workplace structural factors

Participants experienced challenges expanding Kicking CAUTI 2.0 into hospital divisions or clinical settings beyond their own. Physician_107_VLC had difficulty bringing the intervention to "the outpatient world" because their site lacked "representation within our core [antibiotic stewardship] group from that area." Participants also had trouble when clinical settings gave site leads limited time with providers to deliver education or when clinical documentation systems created administrative hassles. Overall, participants experienced a variety of structural hurdles proliferating Kicking CAUTI 2.0.

Cultural factors

Sites experienced an assortment of attitudes which both helped and hindered uptake. Participants struggled to overcome preexisting mindsets about stewardship practices "ingrained in the cultures" of sections like the emergency department (Pharmacist_201_3_TA). Others noted that "cultivating interest is something that we continue to struggle with" due to concerns over provider burnout (Physician_203_2_VLC). Though some healthcare workers were initially interested in Kicking CAUTI 2.0, competing demands prevented them from sustaining stewardship efforts.

Despite these obstacles, other VAMCs were more receptive to Kicking CAUTI 2.0. Pharmacist_205_VLC perceived that their site's status as a teaching hospital encouraged "a continuous learning state." Physicians also appreciated "knowing someone's backing them up and saying 'yep, you're doing the right thing'" (Pharmacist_109_VLC). This supportive culture likely boosted provider confidence in using Kicking CAUTI 2.0 techniques. Together, educational and engaging environments aided the intervention by creating a receptive atmosphere for stewardship.

Kicking CAUTI 2.0 as a component of wider stewardship efforts

Participants brought up other, similar projects to Kicking CAUTI 2.0 at their sites, providing context to how our intervention fit into the local stewardship culture. One site was involved with a previous iteration of Kicking CAUTI 2.0 which "definitely laid the groundwork for folks" implementing our intervention's proposed stewardship measures (Physician_203_2_VLC). Other sites reported prior stewardship projects that added mandatory order sets, "placing restrictions on who, why, and when the urine cultures could be ordered" and working synergistically with Kicking CAUTI 2.0 (Physician_112_TA). Furthermore, participants appreciated how the intervention helped sustain awareness of antibiotic overuse, but it was difficult to attribute improvements "to just this intervention" given existing stewardship cultures (Pharmacist_201_2_TA). Other stewardship projects seemingly helped the implementation, but this made it challenging to determine our impact.

Time, personnel, and workflow

When discussing resources and workload, participants often mentioned the interconnected effects of time, personnel, and workflow.

Resource scarcity

Participants often felt under-resourced. The "lack of personnel and time to actually implement" Kicking CAUTI 2.0 affected participants' abilities to work on intervention efforts (Pharmacist_101_TA). Noting similar setbacks, Pharmacist_102_VLC lamented that they "would love if we had a dedicated person or if I had dedicated time" to work on the project. Pharmacist_102_VLC, Physician_107_VLC, and Nurse_204_1_TA all commented that additional employees would have made Kicking CAUTI 2.0 implementation easier.

Participants also discussed how other priorities outweighed Kicking CAUTI 2.0, resulting in uptake barriers. Ultimately, the stewardship campaign "ended up being priority #12 and got pushed to the side" (Pharmacist_102_VLC). Pharmacist_102_VLC later commented that orienting new residents, employees' summer vacations, and "other priorities in our department" resulted in stewardship "getting pushed away." Both Pharmacist_111_TA and Physician_203_2_VLC mentioned "other projects" which detracted from their time for Kicking CAUTI 2.0.

Resource availability

Participants with ample resources pointed to teamwork and workload distribution as key. Though Physician_107_VLC reported

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that more personnel would have been ideal, their "team of people who all have a common goal [made it] really nice to spread out the workload." Similarly, Pharmacist_110_TA recalled that they could trade site lead responsibilities each month with another ID pharmacist, reducing the workload for all.

Some team members reported that Kicking CAUTI 2.0 did not significantly increase their workload because many of the tasks were already a part of their workflow. Physician_112_TA noted that the initiative "seamlessly integrated into my work" because the duties were "consistent with my roles and responsibilities as an infectious disease physician." Participants also depended on others to complete intervention tasks when their job descriptions aligned with a particular responsibility. For example, Pharmacist_109_VLC relied on a colleague who already did "urine culture surveillance" to flag unnecessary urine culture orders.

Overall, participants with fewer demands on their schedules, a collaborative team environment, and preexisting initiatives or complementary roles found antimicrobial stewardship easier than those without such resources.

Personnel change

Personnel change and turnover consistently impeded antimicrobial stewardship efforts because of routine provider transition, trainee rotations, and the challenge of continuously educating new staff members.

Daily provider transitions

VAMC staff and trainees on inpatient units rotate between patients, complicating sustained quality improvement efforts of any type—including antibiotic stewardship. Antibiotic and diagnostic stewardship requires providers' unified understanding of protocols for sending urine cultures and diagnosing UTIs, but turnover leads to situations where the "weakest link" can have significant impacts on the continuity and application of stewardship principles. Sometimes "you get a provider that's not normally there, that doesn't know the patients, and they're just gonna do what they do and move on as quick as possible" (Nurse_204_1_TA). Participants described this as "frustrating" (Nurse_204_2_TA) and "difficult" (Pharmacist_110_TA).

Physician trainee rotation

Many VAMCs have physician resident trainees who spend 4–6 weeks at the hospital before rotating to another site. The effects of these rotations on stewardship were mixed. Pharmacist_105_VLC believed a major challenge to educating residents was that "we can't control where they came from. The biggest barrier to overcome is what has been previously taught," revealing how misalignment education harms stewardship. By contrast, other sites perceived rotations as important to reinforcing stewardship because when trainees "would be there for the second or third time that year and we'd come in," the trainees would say "'I remember!'" (Physician_107_VLC). Some sites found trainee rotations difficult hurdles to overcome, while others emphasized the benefits of repetitive education.

Job turnover

Job turnover also challenged stewardship efforts because newly onboarded clinicians may not possess the same stewardship education as current employees. Pharmacist_111_TA, for instance, remarked that "we get new people in various areas; some people have been trained, other people have not." This variance in training challenged clinical teams' alignment in stewardship practices.

Discussion

The breadth of participant experiences speaks to the complexity and diversity of VAMC environments nationwide. We identified five major site attributes which helped or hurt uptake of a national antibiotic stewardship campaign. These factors should be used to inform future similar campaigns to optimize uptake.

Our findings align with previous qualitative studies about local cultures, time demands, continuity of care, and the importance of personal connections.[30–33] We add to this literature by highlighting the influence of previous and concurrent stewardship campaigns. Our participants noted that related projects increased healthcare workers' receptiveness to our initiative. Simultaneously, participants mentioned that these other projects made it challenging for them to see the individual effects of Kicking CAUTI 2.0. As such, we stress the importance of continuously educating clinical team members about stewardship techniques and implementing stewardship measures—even if the direct effects are nebulous.

We provide three suggestions for how to improve uptake of national antimicrobial stewardship campaigns. First, our findings indicate an urgent need for emphasis on antimicrobial stewardship from hospital leadership. Antimicrobial stewardship is fast-growing in hospitals nationwide, yet participants suggested that leadership was not outwardly supportive of team needs.[34] For instance, participants underscored the importance of protected or extra time for stewardship. However, in many cases support was perfunctory—verbal without action. While participants perceived leadership as generally supportive of stewardship efforts, some emphasized the ineffectiveness of a hands-off attitude. Though challenging given the demands on hospital leadership's time and resources, we suggest they should take a more active approach to supporting antimicrobial stewardship.

Second, individual facilities within a national healthcare network (the Veterans Health Administration [VHA]) can differ considerably in their infrastructure and resources, creating a need for individualized implementation strategies.[35] Short surveys such as the Organizational Readiness for Change Assessment (ORCA) or brief, preintervention interviews with site leads could help predict challenges and be used to tailor or modify implementation strategies.[36,37] For instance, sites with preexisting antimicrobial stewardship structures can learn efficient approaches for workload distribution and expand into other divisions. Sites with less infrastructure can focus on building leadership and provider networks to establish a stewardship culture. It is crucial to recognize and expect differences in resources among sites within a network and optimize stewardship efforts, a strategy relevant to any integrated healthcare network.[35,37]

Finally, our research highlights the need for consistency and repetition in antimicrobial stewardship training.[38] Participants emphasized that misalignment in stewardship education led to unnecessary urine culture orders. Job turnover, provider transition, and cultural divides may be unavoidable in hospital settings, yet consistent and updated messaging across hospitals and clinical settings is essential to ensure providers use proper stewardship techniques.[39,40]

Our study has limitations. Most participants (95%) came from high-complexity VAMCs which may emphasize trainee education

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and organizational attributes rather than factors affecting lower-complexity sites like competing responsibilities. Additionally, we interviewed few nurses and nurse practitioners despite their importance in antimicrobial stewardship. Sampling sites by complexity or role instead of by time spent may have yielded broader perspectives. We also did not directly compare research arms or site complexity; however, these comparisons are important for future work exploring the effectiveness of antibiotic stewardship interventions. Lastly, sites' previous stewardship projects obscured our ability to determine Kicking CAUTI 2.0's impact. This leads to further questions about the effectiveness of patient-level stewardship in a population-level intervention, particularly the roles of clinical cultures, availability of resources, or individual enthusiasm for stewardship.

Nevertheless, our interviews contain rich commentary from healthcare roles across VAMCs nationwide. Participants all worked for the VHA, the largest integrated healthcare network in the country, providing consistency across sites in terms of national policies. These attributes allow us to glean important and relevant perspectives on important topics in antimicrobial stewardship uptake that are clinically relevant to both frontline clinicians and antibiotic stewards. Thus, the message that antibiotic stewardship programs need to be adapted based on site-specific needs is applicable beyond the VHA.

In conclusion, our analysis of participants' experiences implementing a nationwide antimicrobial stewardship intervention, Kicking CAUTI 2.0, identified five key site attributes impacting the program's uptake. A history of stewardship initiatives and availability of local personnel to work on stewardship efforts appear especially important to the success of stewardship projects. More broadly, our study highlights the importance of recognizing and working with preexisting local stewardship environments to improve stewardship efforts.

Data availability statement. Due to the nature of our qualitative interviews, data will not be made available.

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Appendices

Interview and Focus Group Guide.

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