


## Original Article

# “There is no one to pick up the pieces”: Sustainability of antibiotic stewardship programs in nursing homes

Sandhya Seshadri PhD, MA, MS<sup>1</sup> , Christina B. Felsen MPH<sup>2</sup>, Craig R. Sellers PhD, MS, RN, AGPCNP-BC, GNP-BC, FAANP<sup>3</sup> and Ghinwa K. Dumyati MD<sup>2,4</sup>

<sup>1</sup>School of Nursing and Department of Neurology, University of Rochester, Rochester, New York, <sup>2</sup>Center for Community Health and Prevention, University of Rochester Medical Center, Rochester, New York, <sup>3</sup>School of Nursing and Department of Medicine, Geriatrics and Aging, University of Rochester, Rochester, New York and <sup>4</sup>Infectious Diseases Division, University of Rochester Medical Center, Rochester, New York

### Abstract

**Objective:** To describe nursing home staff experiences and perceptions of the factors that impact the sustainability of an antibiotic stewardship program (ASP).

**Methods:** Using a qualitative descriptive design, semistructured interviews with staff at 9 not-for-profit nursing homes with an established ASP were conducted and audio recorded. De-identified transcriptions of the interviews were coded using a sustainability framework and were analyzed to identify themes.

**Results:** Interviews were conducted with 48 clinical and administrative staff to elicit their perceptions of the ASPs, and 7 themes were identified. ASPs were perceived to be resource intensive and “data driven,” requiring access to and interpretation of data that are not readily available at many nursing homes. Though motivated and committed, ASP champions felt that they could not single-handedly sustain the program. Attending to daily clinical needs (ie, “fires”) made it hard to progress beyond implementation and to reach step 2 of sustainability. Longstanding treatment habits by external prescribers and regulations were believed to impede ASP efforts. Partnerships with an external consultant with antibiotic stewardship expertise were considered important, as was the need for internal leadership support and collaboration across disciplinary boundaries. Participants felt that consistent and ongoing education on antibiotic stewardship at all staff levels was important.

**Conclusions:** Although many interconnected factors impact the sustainability of an ASP, nursing homes may be able to sustain an ASP by focusing on 3 critical areas: (1) explicit support by nursing home leadership, (2) external partnerships with professionals with antibiotic stewardship expertise and internal interprofessional collaborations, and (3) consistent education and training for all staff.

(Received 18 June 2020; accepted 7 September 2020; electronically published 26 October 2020)

The overuse of antibiotics can lead to *Clostridioides difficile* infection (CDI), allergic reactions, and antibiotic-resistant organisms. Among older adults residing in nursing homes, the annual prevalence of antimicrobial use ranges from 40% to 79%.<sup>1,2</sup> Much of this use is unnecessary, especially for treatment of common infections such as urinary tract infections (UTIs).<sup>3–5</sup>

Antibiotic prescribing in a nursing home is influenced by many factors such as the clinical uncertainties in evaluating frail residents and those with cognitive impairments, lack of on-site assessment prior to prescribing, and pressure from nurses and families to treat with antibiotics.<sup>6</sup> The Centers for Disease Control and Prevention (CDC) developed antibiotic stewardship guidance to optimize antibiotic use in healthcare facilities. The 7 core elements of this program include leadership commitment; identifying a person accountable for leading the program; involving a person with drug

expertise; development and implementation of interventions; measuring antibiotic use and providing feedback; and education of clinical staff, residents, and families.<sup>7</sup>

In 2016, a hospital-based team (HBT) comprising 2 members with antibiotic stewardship expertise, concluded a 5-year, grant-funded, collaborative project to optimize antibiotic use and reduce CDI in 9 nursing homes in Monroe County, New York, in collaboration with a nursing home medical-director advisory group. The team provided education, analyzed data, and provided feedback on antibiotic use, and they developed treatment guidelines focusing on alternatives to quinolone use for common infections. Each nursing home formed an antibiotic stewardship program (ASP) team and identified a champion to lead the program. The project resulted in a 39% decrease in fluoroquinolone monthly days of therapy rate and an 18% decrease in the quarterly CDI rate.<sup>8</sup> Despite the successful implementation of the project, ASP champions voiced concerns about the long-term sustainability of the program without the HBT's support.

Because sustainability of any quality-improvement project requires integrating practices into daily operations,<sup>9</sup> following

Author for correspondence: Sandhya Seshadri, E-mail: [sandhya\\_seshadri@urmc.rochester.edu](mailto:sandhya_seshadri@urmc.rochester.edu)

**Cite this article:** Seshadri S, *et al.* (2021). “There is no one to pick up the pieces”: Sustainability of antibiotic stewardship programs in nursing homes. *Infection Control & Hospital Epidemiology*, 42: 440–447. <https://doi.org/10.1017/ice.2020.1217>

our 5-year collaborative project,<sup>8</sup> we sought to understand the factors that influence the sustainability of ASPs. We examined the experiences and perceptions of clinical and administrative staff across the collaborative nursing homes, and we utilized a sustainability framework<sup>9</sup> to inform policies and practices for sustainability and to provide specific recommendations for ASP sustainability in nursing homes.

## Methods

### *Study setting, design, and participants*

Using a qualitative descriptive research design,<sup>10</sup> we conducted 57 semistructured interviews with 48 employees across the hierarchical structures of these 9 nursing homes. The nursing homes varied in size (range, 120–566 beds) and intensity of care they provided (eg, some included postacute or ventilator beds). The leadership and the antibiotic stewardship champions at the nursing homes, along with the HBT, identified potential study participants, all of whom agreed to participate and provided written informed consent. We included participants with varying job functions as well as those who were part of the implementation project. The University of Rochester's Institutional Review Board approved this study.

### *Data collection*

Over a 6-month period, interviews were conducted at the nursing homes with senior leadership (20 minutes per interview) and with other staff (up to 60 minutes per interview) by a team member with qualitative research expertise (S.S.). We interviewed 9 staff twice to gather additional information. The interviews covered their understanding of, experience with, and perceptions of ASP implementation and sustainability.

### *Data analysis*

All interviews were audio recorded, deidentified, transcribed verbatim, and managed using ATLAS.ti qualitative data analysis software.<sup>11</sup> We chose an integrated sustainability framework<sup>9</sup> to guide the analysis, and we developed codes within 5 categories: (1) ASP characteristics, (2) ASP champion and team characteristics, (3) processes, (4) inner contextual factors, and (5) outer contextual factors (Table 1). Also, 3 team members (S.S., G.D., and C.F.) coded 5 transcripts together, resolved differences by consensus, and developed a codebook. Thereafter, 1 member (S.S.) coded the remaining transcripts. Two team members (S.S. and C.R.S.) completed the analyses and identified themes that were discussed and agreed upon by the team. Attention to rigor and validity were maintained through memos, audit trail, and peer review.

## Results

Participants included 12 senior leaders and 36 “other staff” (Table 2). ASP champions who led the program were either infection preventionists (IPs) or pharmacists. The 7 themes identified illustrate how complex internal and external factors of nursing-home operations influence ASP sustainability (Table 3).

### *Theme 1. An ASP is resource intensive for nursing homes with limited resources*

Despite support from the HBT (Table 3, T1 Qa), participants felt that an ASP was resource intensive with inadequate staff, time, and financial resources dedicated to stewardship functions. Champions were overwhelmed by the additional antibiotic stewardship duties

and felt that “. . . it's kind of a piece of everyone's job, but nobody has the time for it.” Champions with clinical duties had to juggle their time between resident care and antibiotic stewardship. Staffing shortages (Table 3, T1, Qb) further decreased the time champions needed to devote to antibiotic stewardship activities, partially due to the need to provide antibiotic stewardship training to the constant influx of new staff (Table 3, T1 Qc). Financial constraints (Table 3, T1, Qd) made it difficult to reimburse consultant pharmacists for any additional time needed to analyze antibiotic use data as one pharmacist noted, “[the nursing homes] don't want to pay me for what I [can] do.” With constrained resources of staff, time, and finances, the champions were concerned that without the HBT's support there would be “no one to pick up the pieces.”

### *Theme 2. No matter how committed, a single person cannot sustain an ASP*

Initially, based on the HBT's recommendations, ASP teams comprised medical directors, directors of nursing, IPs, and pharmacists. Over time, due to competing priorities and staff turnover, nursing homes shifted the responsibility to the ASP champion. Although all champions were motivated and committed (Table 3, T3 Qa), the enormity of the task and the inability to maintain a cohesive team was overwhelming (Table 3, T3 Qb), resulting in “a lot of 10- to 12-hour days” and work on weekends. Sustaining the program single-handedly was challenging because “you give your 150% . . . but you're one person.” This led to some leaving the job, further jeopardizing the program (Table 3, T3 Qc). ASP champions often had multiple responsibilities (eg, assistant director of nursing, infection preventionist, and nurse educator), and with staffing shortages, they also cared for residents (Table 3, T2 Qd). A champion who left her job said, “I feel like it's making [me] a scapegoat. Because state [regulators] walk in, education's lacking, I'm in charge of education. IP's lacking, I'm in charge of IP. Staffing's lacking, I'm the one (in charge).” Although motivated, with innumerable responsibilities, the champions felt that they could not sustain an ASP alone.

### *Theme 3. An ASP requires access to and interpretation of data not readily available at many nursing homes*

During the implementation project, the HBT provided detailed antibiotic data summaries and interpretation and created tracking tools to enable nursing home staff to independently tabulate their data when the partnership ended. However, participants felt that the antibiotic stewardship was “data driven,” and that the lack of an in-house electronic health record (EHR) system limited their access to data. Gathering hand-written information from medical charts was time-consuming and labor intensive (Table 3, T3 Qa). For consulting pharmacists, lack of an EHR was challenging because they didn't “have all the information . . . 99% of the time there's a diagnosis” without any other indicators for an antibiotic. Access to records from other healthcare facilities where nursing home residents were treated was also limited (Table 3, T3 Qb). Champions created new forms for data collection that were later abandoned because providers did not have time to complete them (Table 3, T3 Qc). Some ASP champions struggled with the use of electronic data and maintained both electronic and paper systems to keep track of the data (Table 3, T3 Qd). Additionally, once data were collected, the ASP champion's level of comfort with data analyses varied. One participant stated: “Nobody is doing a thing with it. They have no clue what to do with the information.” To sustain the ASP, champions needed access to real-time

**Table 1.** Antibiotic Stewardship Sustainability: Categories and Codes

Categories	Inner Contextual Factors	ASP Characteristics	ASP Champion & Team Characteristics	Processes	Outer Contextual Factors
Codes	<ul style="list-style-type: none"> <li>Leadership support</li> <li>Resources</li> <li>Staffing</li> <li>Residents</li> </ul>	<ul style="list-style-type: none"> <li>Perceived benefits</li> <li>Adaptability of ASP to nursing homes</li> <li>Cost and reimbursements</li> </ul>	<ul style="list-style-type: none"> <li>Characteristics of ASP champion</li> <li>Characteristics of ASP team</li> </ul>	<ul style="list-style-type: none"> <li>External partnership with HBT</li> <li>Internal collaborations</li> <li>Clinical practice processes</li> <li>Antibiotic data collection and monitoring</li> <li>Roles and responsibilities for antibiotic stewardship education and training</li> </ul>	<ul style="list-style-type: none"> <li>Regulations and regulators</li> <li>Families of residents</li> <li>External providers and healthcare settings</li> </ul>

Note. ASP, antibiotic stewardship; HBT, hospital-based team.

**Table 2.** Participant Characteristics

Job Title	Participants, No. (%)
<b>Senior leadership</b>	
Administrators	3 (6)
Medical directors & assistant medical directors	7 (14)
Directors of nursing	2 (4)
<b>Other staff</b>	
Nurse practitioners & physicians assistants	9 (18)
Assistant directors of nursing	2 (4)
Pharmacists	7 (14)
Infection preventionists (IPs)	5 (10)
Nurse managers (RNs)	6 (12)
Nurse educators	2 (4)
Licensed practical nurses & certified nursing assistants	5 (10)
<b>Total</b>	<b>48 (100)</b>

Note. IP, infection preventionist; RN, registered nurse.

antibiotic use data and the technology and personnel to interpret and act on the data.

#### **Theme 4. ASP sustainability requires external partnership, internal leadership support, and collaboration across longstanding disciplinary boundaries**

Participants reported that internal and external partnerships as well as explicit leadership support were critical for sustainability. The partnership with the HBT was valued because the HBT understood the complex conditions of residents and provided clear and concise guidelines that could be used readily (Table 3, T4 Qa, Qb). ASP champions worried that without this partnership, the program would “very much struggle . . . because there is no help to do so,” and they would have to rely on internal collaborations and explicit leadership support for sustainability.

However, rigid internal interprofessional boundaries and the lack of communication (Table 3, T4 Qc) made collaboration challenging because “they’re very regimented: this is a nursing issue, this is a pharmacy issue, this is a medical issue.” For the champions to cross these boundaries without a good reason was unacceptable. Boundaries were seen as restrictive even by licensed practical nurses (LPNs) who felt that their clinical judgement was ignored

and that they were not partners in promoting antibiotic stewardship (Table 3, T4 Qd). Nevertheless, these boundaries could be crossed with tangible and explicit leadership support. For example, a pharmacist said, “We can suggest . . . a pathway, but we really need the support of the medical director to actually support it.” All members of the nursing home leadership had signed letters of support for the ASP, but some champions felt there was not enough buy-in and that antibiotic stewardship could not be a “grassroots operation . . . the right thing has to be done from above” (Table 3, T4 Qe). Champions who perceived explicit leadership support felt that they were able to better execute their responsibilities (Table 3, T4 Qf).

#### **Theme 5. It is hard to “get to step two” and sustain an ASP because clinical “fires come first”**

Urgent resident care needs always took precedence over ASP tasks (Table 3, T5 Qa). These “clinical fires” were routine because of inadequate staffing that was perceived as a 2-fold problem: too few staff (Table 3, T5 Qb) and too few newly hired frontline nurses with the skills to care for residents with complex needs. Temporary, “agency nurses” were perceived as lacking the skills to care for residents because “How do you teach people to care? Long-term care [is] not attractive to work in [and with poor pay] the turnover is constant.” At some nursing homes, turnover existed at all levels of the organization, making it difficult to promote antibiotic stewardship efforts (Table 3, T5 Qc). Many nursing home employees did not know about the ASP (Table 3, T5 Qd), nor did they remember the elements of antibiotic stewardship (Table 3, T5 Qe). Urgent medical needs and inadequate staffing made it hard for the champions to “ever get to step 2” of sustaining the program because, with high turnover, they needed to constantly re-educate staff. Additionally, caring for residents with complex medical conditions sometimes meant that antibiotics were started “a little bit more empirically . . . [because] we’ve seen people go septic so fast over and over and over again,” and sometimes antibiotic start dates were not documented on time (Table 3, T5 Qf).

#### **Theme 6. Consistent and constant education on ASP is important for sustainability**

Though the champions and medical directors at the nursing homes received antibiotic stewardship education and training from the HBT, the education of other nursing home personnel was fragmented. With high turnover, ASP teams were reconfigured frequently and the primary responsibility for antibiotic stewardship education often defaulted to the champions who were constantly “re-educating” new staff. In some nursing

**Table 3.** Themes, Associated Categories, and Quotations That Exemplify Themes

Theme	Associated Category	Illustrative Quotation
T1. An ASP is resource intensive for NHs with limited resources	ASP characteristics	<p>a) “And the workshops [the HBT] has had over the past couple of years, where [they are] giving people the spreadsheet tool, really a sophisticated dynamic tool. It calculates their days of therapy for them, really great stuff. I mean that would cost a lot of money to develop internally.” [ASP champion]</p> <p>b) “Everybody is competing in [xx city] for staff right now . . . 25 cents could cost you 10 CNAs or 5 nurses to go to another home up the road.” [ASP champion]</p> <p>c) “I feel it’s on me, I have to own retraining and reeducating staff as they come in. I don’t think I’ve done a great job because . . . my focus has been on reporting, setting up ways to report.” [ASP champion]</p> <p>d) “And it’s all about reducing expenses and you’re not-for-profit. You can’t stay afloat. They keep cutting and cutting and cutting money . . . and decreasing reimbursement.” [Director of Nursing]</p>
2. No matter how committed, a single person cannot sustain an ASP	ASP champion & team characteristics	<p>a) “[The ASP champion is] caring and superhuman, and [says] ‘I will take on more responsibility because I know that I can do this, and I will do it better than someone else.’” [Administrator]</p> <p>b) “I think if I felt we had a more cohesive team I wouldn’t feel so strained by the situation but that’s not the case . . . Everybody thinks somebody else will take care of it. And I think it has fallen on myself as the key role, which is unfortunate . . . I kept saying this cannot fall on one person.” [ASP champion]</p> <p>c) “I think there’s always a danger . . . that when a stewardship program is going well it’s because of the motivation of a small group of people and, when those people leave, it falls apart.” [Administrator]</p> <p>d) “It’s very unrealistic to not see your work suffer in another area [when] you’re still being held accountable for [AS] . . . You have to ask your higher ups ‘where do you want me to focus?’” [ASP champion]</p>
3. An ASP requires access to and interpretation of data not readily available at many NHs	ASP Characteristics	<p>a) “. . . Everything is paper, so not only has it been a challenge . . . first . . . you don’t have a lot of time to work on anything, second, you’re trying to learn . . . a foreign . . . procedure, concept, different skills . . . you’re trying to learn something, you don’t have time, and then everything is paper.” [ASP champion]</p> <p>b) “. . . Unfortunately, [the electronic health record system] is not designed for long-term care so we have to run two systems . . . sometimes ID [infectious diseases provider] notes we can see because they [the residents] go to [the hospital affiliated with the NH], but if it was [another hospital] we would not be able to see it.” [ASP champion]</p> <p>c) “We’re struggling with that [documentation]. So, it would be nice if there was a note after 48 to 72 hours . . . many don’t write a note, maybe they’ve asked the nurse, ‘Hey is Mr. S you know afebrile?’ but . . . we don’t have that piece formally in place yet.” [ASP champion]</p> <p>d) “I keep track of everything in my office. Not all is in the computer because I’m not a computer person, I have a lot of difficulty with that, so I have some spreadsheets that were made for me and . . . some things I do keep in a notebook because it’s easier for me to track.” [ASP Champion]</p>
4. ASP sustainability requires external partnership, internal leadership support, & collaboration across longstanding disciplinary boundaries	<p>1. Processes</p> <p>2. Inner contextual factors</p>	<p>a) “[HBT consultant] was very helpful because they understand that while you can have these cookie-cutter criteria and everything but still, you’re dealing with people and humans and variability of provider comfort.” [Nurse Practitioner]</p> <p>b) “I think what really contributed most [to ASP success] was having [HBT] here to give us information and baseline education . . . I use the UTI guidelines constantly . . . when the new guidelines come out for lower respiratory infections in general they were thirty five pages and . . . I had no idea what they were saying until I got the summary . . . from [HBT] . . . because, at least in my opinion, people will do what is the right thing if they know what the right thing is.” [ASP Champion]</p> <p>c) “Very often we say we function in silos.” [ASP Champion]</p> <p>d) “. . . Whether you’re RN<sup>1</sup> or LPN<sup>2</sup>, I think when someone doesn’t look good to you . . . sometimes, it’s not the respect but the acknowledgement that we are also, you know, capable of . . . knowing when something is wrong.” [LPN]</p> <p>e) “Well, this is going to sound really bad . . . I don’t think there’s a lot of buy-in [from leadership]. I think people like to see the final report [and say] ‘That’s wonderful, or rates have gone down.’ But there is no [buy-in].” [ASP Champion]</p> <p>f) “I’ve never brought an idea . . . to leadership and said, ‘Can we try this?’ and get, ‘Oh, no, can’t try that.’ The first thing we get is, ‘Okay, how are we going to do it, who’s going to be in charge, let’s talk about how we are going to roll this out.’” [ASP champion]</p>

(Continued)

**Table 3.** (Continued)

Theme	Associated Category	Illustrative Quotation
5. It is hard to “get to step two” and sustain an ASP because clinical “fires come first”	Inner contextual factors	<p>a) “Unfortunately, when I’m staff, meetings come second . . . the fires come first.” [ASP champion]</p> <p>b) “One of the biggest challenges . . . in the long-term care setting is . . . a high rate of turnover, we are literally doing anywhere from 20 to 35 new hires every other week.” [ASP Champion]</p> <p>c) . . . All the players in the nursing homes change. I call it recycling. They go from one place to another. Nursing, doctors, administrators . . . everybody changes . . . when the ownership changes, it changes everything.” [Consultant Pharmacist]</p> <p>d) “But the biggest frustration is that as much as I know that I put in hours and hours and month after month, it’s very disheartening to know that if I walked on the floors right now . . . [not many would know] what an antibiotic stewardship program even is.” [ASP champion]</p> <p>e) “I’ve been talking about this [AS] with plan of correction, and people are looking at me like it’s the first time they’ve heard it . . . even though we talk about it during orientation . . . and some of them are like, “Oh yeah, oh, do we have those around?” Or they don’t even remember.” [Nurse Educator]</p> <p>f) “You have to personally be tracking it because you can’t trust that they put everybody who had an antibiotic start on their line list per floor . . . there was 10 antibiotic starts on a floor and I saw two names on the list. So, it’s really up to me [and I don’t have the time].” [ASP champion]</p>
6. Consistent and constant education on ASP is important for sustainability	Processes	<p>a) “[The online AS education] is not useful . . . cause some of them, you don’t read it, and then the test part is just one question asking you if you read it. So, people who don’t know and don’t wanna know are not gonna know and are still checked off as done.” [LPN]</p> <p>b) “Because pulling staff from a unit would leave the residents unattended, and there’s not enough staff to be pulling them off the units, and I can’t mandate them to come in for training cause we can’t mandate nurses in [xx state] so in order to accomplish that, it’s very time sensitive and it’s usually in-the-moment training.” [ASP champion]</p>
7. Outer contextual factors impede stewardship efforts	Outer contextual factors	<p>a) “[Families of residents are] always upset [if antibiotics are not prescribed] and they think they know everything because they are Dr. Google.” [Administrator]</p> <p>b) “There’s a reactive culture push by administrators in long-term care to . . . get ready for survey. We got to do survey, we got to fix what survey found. It’s like this repetitive cycle instead of thinking about moving things forward, it’s ‘don’t let them find this,’ fix it, move it on, and [do] just reactive repairs.” [ASP champion]</p>

Note. ASP, antibiotic stewardship program; NHs, nursing homes; HBT, hospital-based team; IP, infection preventionist; CNA, certified nursing assistant; RN, registered nurse; LPN, licensed practical nurse.

homes, education was fragmented because a variety of personnel (medical directors, champions, nurse educators, IPs, and nurse managers) provided antibiotic stewardship education in silos. A nurse educator at one nursing home stated, “The medical department *I think* does their own [antibiotic stewardship] education . . . but we have not been involved in *their* education.” The provider at the same facility said, “I’m not sure what’s done in orientation . . . the nursing orientation, I am from medical; we do it, you know, on a case-by-case basis.” At one nursing home, both the champion and the nurse educator created antibiotic stewardship education modules for staff in parallel and did not know what or when the other provided antibiotic stewardship education. Furthermore, formal antibiotic stewardship education formats varied from new hire orientation to in-service and online modules. Some participants felt that online training was ineffective because they only had to indicate that they completed the module (Table 3, T6 Qa). Champions felt that the education of frontline staff (LPNs and certified nursing assistant [CNAs]) was important because “they’re face to face with the residents” and knew them well. The more dramatically they presented a resident’s change in condition to their manager, the more likely a call was made to a provider who would then order an antibiotic. Despite this, frontline staff were rarely prioritized for formal antibiotic stewardship education and often learned about antibiotic stewardship through overheard conversations on the units. However, providing formal antibiotic stewardship education was also challenging because they usually could not leave their resident-care responsibilities to attend educational sessions (Table 3, T6 Qb) because, as a nurse educator stated, “Do you want them to care for the residents, or do you want them to do the education? They need to do both.”

### Theme 7. Outer contextual factors impede stewardship efforts

Through the collaborative efforts of the HBT and the nursing home medical directors, the prescribing behaviors of in-house providers changed and led to reductions in the overall use of antibiotics and fluoroquinolones. However, outside entities, such as emergency departments (ED) and “on-call” providers, were perceived as impeding antibiotic stewardship efforts. A resident’s visit to the ED “resets everything you have tried to do. [Though] there’s no indication, [if] they go to the ED . . . [they] are diagnosed with a UTI and return with antibiotic prescriptions.” Some medical directors provided antibiotic stewardship education to external “on-call” providers who did not have antibiotic stewardship training. External specialists, like urologists or dentists, also posed challenges because they customarily prescribed prophylactic antibiotics. Similarly, families of residents exerted pressure for antibiotic prescriptions (Table 3, T7 Qa) because “[they] will not stop until they get a urine [analysis].” Lastly, the innumerable nursing-home regulations, including the mandated ASP, were burdensome because “setting up a regulation and then not putting resources behind it, is probably one of the biggest issues.” ASP champions spent much of their already depleted time and personnel in completing regulatory documentation and answering questions from regulators (Table 3, T7 Qb), and they felt that regulations fostered a “reactive culture” and undermined ASP sustainability.

## Discussion

Antibiotic stewardship is complex and requires the input of multiple professionals across hierarchical structures<sup>12</sup> in which internal

social norms may privilege some voices over others.<sup>13</sup> Our study provides insight into the multifactorial aspects of ASP sustainability and describes the collective perceptions of a diverse range of nursing home staff. By situating our findings within a sustainability framework (Table 1) that focuses on examining internal and external contextual factors, processes, characteristics of the ASP, and the antibiotic stewardship champion and antibiotic stewardship team, we present both the challenges as well as our recommendations for practices to foster ASP sustainability in nursing homes.

We found that many previously reported constraints on implementation of ASPs in nursing homes<sup>2,14-19</sup> had an impact on sustainability as well. Inadequate staffing and high staff turnover rates, particularly among nurses,<sup>20-23</sup> affects sustainability and the quality of resident care<sup>20</sup> because nurses are often the only professionals on site 24 hours per day.<sup>24-26</sup> Furthermore, medically fragile residents make diagnostic processes challenging,<sup>21,24,27,28</sup> and our participants struggled to sustain and balance antibiotic stewardship with the clinical uncertainties of the population. These inner contextual factors along with external factors, such as regulations and pressure from families and residents to prescribe antibiotics,<sup>15,29,30</sup> affected ASP sustainability in nursing homes.

Similarly, the limited access to resources including time, personnel, and funds,<sup>22,31</sup> hindered the implementation and sustainability of ASPs.<sup>32</sup> During the collaborative project, the HBT provided many of these resources, mitigating some antibiotic stewardship-related costs for nursing homes. However, after the project ended, ASP sustainability was in jeopardy. Additionally, because antibiotic stewardship is data driven, a lack of access and skills to analyze data hampered sustainability. In hospitals, EHRs and clinical decision-support systems for antibiotic stewardship data are associated with a reduction of use of broad-spectrum antibiotics.<sup>33</sup> Lacking EHRs and support systems for antibiotic stewardship, champions could not efficiently manage and analyze antibiotic stewardship data without the support of the HBT.

Although leadership support is key to ASP implementation,<sup>14,22,34</sup> it is critical for sustainability. For our participants, explicit leadership support was evidenced by active and consistent engagement in antibiotic stewardship, by vocal support of stewardship efforts, and by being visibly “in the trenches” with staff. Similarly, while rigid professional boundaries and hierarchical structures harm antibiotic prescribing practices during ASP implementation,<sup>35</sup> our participants felt that, for sustainability, nurses and prescribing providers in particular must have collaborative relationships. Equally important was the need for an external partnership with a professional with antibiotic stewardship expertise to guide education, to develop collaborative treatment guidelines, to assist with interpretation of antibiotic usage data, and to provide pharmacy expertise. Lastly, we found that antibiotic stewardship education for all staff based on their responsibilities was important<sup>2,19,26</sup> and needed to be guided by a collaborative educational plan developed by an antibiotic stewardship education team. We recommend that nursing homes with an established ASP can sustain them by prioritizing 3 critical areas: (1) explicit, ongoing leadership support, (2) partnerships with an external antibiotic stewardship expert and fostering internal inter-professional collaborations, and (3) consistent education and training for all staff, despite the constraints on nursing homes and the complex interactions between the factors impacting ASP

**Table 4.** Critical Focus Areas for Sustainability of Antibiotic Stewardship in Nursing Homes

Critical Focus Areas	Explicit Leadership Support	Partnerships- External & Internal	Consistent Antibiotic Stewardship Education
<b>Action Items</b>	<ul style="list-style-type: none"> <li>• Have ASP champion report to Medical Director with authority to cross interprofessional boundaries</li> <li>• Create ASP Team (medical director, pharmacist, infection preventionist, director of nursing)</li> <li>• Define roles of ASP Team members</li> <li>• Rotate role of champion</li> <li>• Vocally support ASP champion</li> <li>• Be physically “in trenches” with team</li> <li>• Listen to and address AS team’s concerns and plans</li> <li>• Plan for regular interactions between medical director and ASP champion</li> <li>• Provide all available resources (eg, time, personnel) for AS tasks</li> <li>• Engage in discussions on how to cross rigid interprofessional boundaries</li> <li>• Support AS education, track and analyze data, and problem solve</li> </ul>	<p><b>External Partnerships</b></p> <ul style="list-style-type: none"> <li>• Hire AS expert as consultant if financially viable</li> </ul> <p><b>Or</b></p> <ul style="list-style-type: none"> <li>• Collaborate with other NHs to obtain external support, develop peer-learning modules, and strategies to overcome challenges that impede AS efforts</li> </ul> <p><b>Or</b></p> <ul style="list-style-type: none"> <li>• Pool resources with other NHs to create an AS collaborative to develop guidelines, educate, and problem solve</li> </ul> <p><b>Internal Partnerships</b></p> <ul style="list-style-type: none"> <li>• Review interprofessional boundaries</li> <li>• Seek input from all professionals on barriers to communication</li> <li>• Share AS information and data with all NH employees</li> <li>• Promote dialogue on AS with all employees across professions and review and implement best practices on AS communication</li> </ul>	<ul style="list-style-type: none"> <li>• Identify AS education team, define roles and responsibilities, and assign AS education coordinator</li> <li>• De-centralize education</li> <li>• Seek input from all professionals on barriers to education and strategies to overcome these barriers</li> <li>• Have multiple formal and informal, in-person education opportunities</li> <li>• Design each educational module to align with the role and responsibilities of the staff member</li> <li>• Bring education to the staff by providing regular, 2-minute AS education and tips on units to save time</li> <li>• Promote an “Each One Teach One” module with teachers across hierarchy: eg <ul style="list-style-type: none"> <li>- Nurse educator teaches nurse managers AS and how to teach LPNs</li> <li>- LPNs learn AS and how to teach CNAs</li> <li>- CNAs receive education on AS and how to teach families</li> </ul> </li> </ul>

Note. ASP, antibiotic stewardship program; AS, antibiotic stewardship; LPN, licensed practical nurse; CNA, certified nursing assistant.

sustainability. We describe in detail the necessary practices that would enable nursing homes to foster ASP sustainability in Table 4.

Our study has several limitations. First, we performed interviews in 9 not-for-profit nursing homes in upstate New York that were involved in a collaborative project. Findings may not apply to nursing homes that are for-profit or in other regions. Second, despite concerted efforts, we recruited only 1 participant from 1 of the nursing homes because of high staff turnover and competing priorities.

Despite these limitations, we have identified the threats to ASP sustainability, and we have provided focused recommendations to nursing homes in 3 critical areas. We believe that sustainability cannot be an afterthought and needs to be integrated into the design of ASPs. Future research should target how ASPs in nursing homes with limited resources can be both implemented and sustained over time.

**Acknowledgments.** We thank all participants and members of the Rochester Nursing Home Collaborative. We thank Margaret Kearney, PhD, RN, FAAN, Professor Emerita, University of Rochester School of Nursing, whose insights provided valuable peer-review and added to the rigor of the study.

**Financial support.** No financial support was provided relevant to this article.

**Conflicts of interest.** All authors report no conflicts of interest relevant to this article.

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