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BRIEF REPORT

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Diagnostic uncertainty and decision-making in home-based primary care: A qualitative study of antibiotic prescribing

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Abstract

Background: Evaluating infection in home-based primary care is challenging, and these challenges may impact antibiotic prescribing. A refined understanding of antibiotic decision-making in this setting can inform strategies to promote antibiotic stewardship. This study investigated antibiotic decision-making by exploring the perspectives of clinicians in home-based primary care.

Methods: Clinicians from the Department of Veterans Affairs Home-Based Primary Care Program were recruited. Semi-structured interviews were conducted from June 2022 through September 2022 using a discussion guide. Transcripts were analyzed using grounded theory. The constant comparative method was used to develop a coding structure and to identify themes.

Results: Theoretical saturation was reached after 22 clinicians (physicians, $n = 7$; physician assistants, $n = 2$, advanced practice registered nurses, $n = 13$) from 19 programs were interviewed. Mean age was 48.5 ± 9.3 years, 91% were female, and 59% had ≥6 years of experience in home-based primary care. Participants reported uncertainty about the diagnosis of infection due to the characteristics of homebound patients (atypical presentations of disease, presence of multiple chronic conditions, presence of cognitive impairment) and the challenges of delivering medical care in the home (limited access to diagnostic testing, suboptimal quality of microbiological specimens, barriers to establishing remote access to the electronic health record). When faced with diagnostic uncertainty about infection, participants described many factors that influenced the decision to prescribe antibiotics, including those that promoted prescribing (desire to avoid hospitalization, pressure from caregivers, unreliable plans for follow-up) and those that inhibited prescribing (perceptions of antibiotic-associated harms, willingness to trial non-pharmacological interventions first, presence of caregivers who were trusted by clinicians to monitor symptoms).

Conclusions: Clinicians face the difficult task of balancing diagnostic uncertainty with many competing considerations during the treatment of infection

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in home-based primary care. Recognizing these issues provides insight into strategies to promote antibiotic stewardship in home care settings.

KEYWORDS
anti-bacterial agents, diagnosis, home care services, infections, uncertainty

INTRODUCTION

A growing population of older adults rarely leave home or leave home only with assistance or significant difficulty.[1,2] Over 7 million older adults were homebound in 2020, and these patients are often unable to access ambulatory care services.[1–3] Home-based primary care (HBPC) offers one method for homebound older adults to receive comprehensive care in their home.

Patients enrolled in HBPC are highly vulnerable to infection, and antibiotic prescriptions are prevalent in this population.[1,3–9] Yet the diagnosis of infection in homebound older adults who receive HBPC is challenging. These patients may be unable to endorse symptoms due to cognitive impairment, and the prevalence of atypical presentations of infection in older adults complicates the assessment of nonspecific clinical features (e.g., altered mental status).[6] Additionally, access to diagnostic testing in the home may be limited. These challenges make it difficult to follow clinical guidelines for the management of infection that have been developed for other healthcare settings and that require specific symptoms in combination with laboratory, microbiological, or radiographic findings to establish the indication for antibiotics.[10–12] A study of antibiotic prescription fills in HBPC suggested that many were prescribed inappropriately.[9] However, the challenges of diagnosing infection in homebound older adults who receive HBPC increase the complexities associated with antibiotic prescribing.

To understand more about these issues, it is necessary to explore factors that are difficult to measure quantitatively, such as processes of care and experiences and attitudes of clinicians. We therefore conducted a qualitative study of clinicians affiliated with the largest HBPC program in the United States. Our aim was to investigate antibiotic decision-making in order to provide insight into strategies to promote antibiotic stewardship in homebound older adults.

Key points

- Clinicians face considerable uncertainty about the diagnosis of infection in home-based primary care due to the characteristics of homebound patients and the challenges of delivering medical care in the home.
- When clinicians in home-based primary care face diagnostic uncertainty about infection, many factors influence the decision to prescribe antibiotics, including those that promote prescribing (desire to avoid hospitalization, pressure from caregivers, unreliable plans for follow-up) and those that inhibit prescribing (willingness to trial non-pharmacological interventions first, concern about antibiotic-associated harms, presence of a trusted caregiver).
- Recognizing these issues provides insight into strategies to promote antibiotic stewardship in home care settings.

Why does this study matter?

This study highlights the complexity of diagnosing and treating infection in home-based primary care due to the characteristics of homebound patients, the challenges of delivering medical care in the home, and the various factors contributing to the decision to prescribe antibiotics, thereby providing critical insight into strategies to promote antibiotic stewardship in home care.

METHODS

Study design

Methods and results of this qualitative study are reported in accordance with the COnsolidated criteria for REporting Qualitative research (COREQ).[13] The study protocol was deemed exempt from review by the institutional review boards at the Veterans Affairs Connecticut Healthcare System and Yale University.

Settings and participants

We recruited clinicians from the Department of Veterans Affairs (VA) HBPC program. This program operates in

approximately 140 medical centers and provides longitudinal care to nearly 60,000 patients each year through interdisciplinary teams. HBPC sites vary widely with respect to clinician types, care models, and access to healthcare resources.[14] Patients enrolled in HBPC are predominantly male (96%) and older (mean age, 77.7 ± 10 years) and have, on average, eight chronic conditions with 68% dependent on ≥2 activities of daily living.[15] We recruited physicians and advanced practice providers (physician assistants and advanced practice registered nurses) who practiced in HBPC and prescribed antibiotics. There were no exclusion criteria.

Recruitment

Participants were recruited using a national listserv of HBPC Medical Directors. We posted a brief message that described the study, introduced the research team, and requested an interview with clinicians to learn more about how antibiotics are prescribed. Once a Medical Director agreed to participate, we arranged a time to conduct a study interview. Medical Directors had the option of recommending other clinicians in their program for participation. We conducted interviews until theoretical saturation was achieved and further interviews provided no new insights. This occurred after 22 interviews had been performed.[16] All participants provided verbal informed consent. Participation was voluntary and uncompensated.

Data collection

In-depth, one-on-one interviews were performed by a trained clinical research nurse (A.B.) with experience in qualitative methods using a discussion guide that was developed by a multidisciplinary research team with expertise in infectious diseases (R.D.), HBPC (A.C.), medication appropriateness in older adults (T.F.), and qualitative research (L.I.) (Supplemental Appendix 1). The discussion guide contained open-ended questions about caring for patients with suspected infection who were and were not prescribed antibiotics, the choice and duration of antibiotics, and the significance of antibiotic-associated harms in home care. It was pilot tested with three HBPC physicians, and the wording and sequence of questions were modified as a result of feedback received. Interviews were conducted via Microsoft Teams and lasted 30–60 min. All interviews were video-recorded and transcribed in Microsoft Teams and independently verified for accuracy by a trained researcher (W.C.).

Data analysis

Transcripts were analyzed according to principles of grounded theory.[17] The constant comparative method was used to develop a consistent coding structure for open-ended data. Transcripts were de-identified and assigned unique numbers to blind investigators to participants. Two investigators (R.D. and E.K.) independently reviewed transcripts, identifying essential concepts and cataloguing them with codes assigned to portions of the text. The investigators then met to discuss the identified codes and to resolve disagreements about how they had been applied. This process continued until five transcripts had been reviewed, first by each investigator independently and then as a group with members of the research team (R.D., E.K., T.F., A.C.). Sections of new transcripts were compared to previously coded transcripts to determine whether the same concepts were apparent and the same codes could be applied. Once a coding structure was in place, the remaining transcripts were coded by investigators (E.K. and R.D.) with discussion to reach consensus when there were disagreements, until a single agreed-upon set of coded transcripts was produced. Members of the research team then met again to examine the relationship among codes and to identify themes. ATLAS.ti 7.1 (Berlin, Germany) was used to facilitate data management and analysis.

RESULTS

Participant characteristics

We interviewed 22 clinicians (physicians, $n = 7$; physician assistants, $n = 2$, advanced practice registered nurses, $n = 13$) from 19 HBPC programs between June 2022 and September 2022. Participants had a mean age of 48.5 years (SD, 9.3 years), 91% were female, 91% were White, 59% had ≥6 years of experience in HBPC, and 40.9% were from the Northeast.

Overview of antibiotic decision-making

Participants reported uncertainty about the diagnosis of infection due to the characteristics of homebound patients and the challenges of delivering medical care in the home. When there was uncertainty about the diagnosis of infection, participants described a number of factors that either pushed them toward prescribing antibiotics or helped them decide that antibiotics were unnecessary.

Theme #1: Patient characteristics decrease diagnostic certainty about infection

Participants described several characteristics of homebound patients that decreased the certainty of a diagnosis of infection (Table 1). These characteristics included atypical presentations of disease, the presence of multiple chronic conditions, and the presence of cognitive impairment such as dementia. Participants consistently reported that cognitive impairment may result in patients not communicating the hallmark symptoms of infection, thereby reducing diagnostic certainty.

Theme #2: Delivering medical care in the home decreases diagnostic certainty about infection

Several characteristics of delivering medical care in the home also decreased diagnostic certainty (Table 1). All participants acknowledged barriers to diagnostic testing. Most often, these barriers involved the collection, storage, and transport of urine specimens. Participants also described challenges establishing access to the electronic health record in the home. When remote access to the electronic health record was unavailable, ascertainment of relevant past medical history was difficult, particularly in patients with cognitive impairment.

Theme #3: At times of diagnostic uncertainty about infection, multiple factors influence the decision to prescribe antibiotics

A number of factors were reported to influence the decision to prescribe antibiotics at times of diagnostic uncertainty. These factors encompassed those that promoted versus inhibited antibiotic prescribing (Table 2). Nearly, all participants acknowledged pressure from caregivers as a factor that promoted prescribing. Participants described a pressure to prescribe antibiotics even in circumstances where the clinician thought an infection was unlikely to be present and did not want to offer antibiotics. Participants also prescribed antibiotics to keep patients out of the hospital. Limitations in follow-up due to the time of day or calendar-day further increased the likelihood of prescribing antibiotics. In contrast, factors reported to inhibit antibiotic prescribing were a willingness to trial non-pharmacologic interventions first, concerns about antibiotic-associated harms, and careful surveillance of symptoms by caregivers who were trusted by clinicians. One participant specifically expressed concerns about the consequences of failing to prescribe antibiotics in a timely manner when they were indicated, resulting in adverse patient outcomes, and about the consequences of prescribing antibiotics when they were not indicated, resulting in adverse patient and population outcomes, as exemplified by the following quotation:

> Due to the limitations we have with not knowing sometimes if it's a true infection or not, and trying to prescribe in a timely fashion to try and prevent some of those [emergency room] and hospitalization visits, [there] could be overprescription and as a result, antibiotic resistance.
>
> (Physician)

TABLE 1 Factors that reduce diagnostic certainty about infection in home-based primary care.

Theme #1: Patient characteristics decrease diagnostic certainty about infection
• Complexity of homebound patients
[Homebound older adults] have an atypical presentation of illness...They don't have a fever with pneumonia. They may not be coughing that much. Oftentimes they present with altered mental status as a symptom... so I think that's one of the challenges...do they have an infection?...The traditional signs of infection a lot of times can be absent in frail older patients. (Physician)
Theme #2: Delivering medical care in the home decreases diagnostic certainty about infection
• Lack of access to diagnostic testing in the home
The biggest diagnostic testing that we do as far as infection would be a urine sample. And the biggest problem with getting that in the home is inability of the patient to urinate. Which happens to us quite frequently... it's hard to urinate on demand for many of these guys. A lot of them have advanced dementia and trying to follow commands or get them to do something on command is even more difficult. (Advanced Practice Registered Nurse)
• Quality of microbiological specimens
For a good catch, that's another big thing with a lot of our folks....lot of [urine samples] come back contaminated. [T] hey read contaminated even though the nurse says, you know, I tried. I wiped...These [homebound older adults], a lot of them are elderly, and the hygiene is [suboptimal]. (Advanced Practice Registered Nurse)
• Lack of access to technology
Most of us have stopped using the iPads to sign into [the electronic health record] in the field because we didn't have good connectivity and so stopped using that. So...I'm not getting into [the electronic health record] if I don't have the information on the printed pages in front of me. (Physician)

TABLE 2 Factors that influence the decision to prescribe antibiotics at times of diagnostic uncertainty about infection in home-based primary care.

Theme #3: At times of diagnostic uncertainty about infection, multiple factors influence the decision to prescribe antibiotics
Factors that promote prescribing
• Pressure from family members or caregivers
Sometimes you feel like you're your hands are tied, especially when the family or the Veteran is very, you know, 'Well, this is been going on a week now...I can't take it any longer'...I had one not that long ago. The daughter's like 'my dad gets these all the time. I know it's a urinary tract infection. You need to do something right now'...in that particular case, I actually did end up prescribing. (Advanced Practice Registered Nurse)
• Unreliable plan for follow-up
If it's 2:00 PM on a Friday and they're calling with new symptoms and they don't want to go to the [emergency room], they don't want to go to urgent care - in that case, sometimes I will send them the antibiotic and then also tell them other more serious things to look out for over the weekend. So sometimes when I know that I wouldn't be able to lay eyes on them or the nurse wouldn't be able to see them for three days [I'm more likely to prescribe antibiotics]. (Physician)
• Desire to avoid hospitalization
In some patients with Parkinson's disease with a tendency toward aspiration and ...multiple episodes of needing to be hospitalized or seek emergency care for aspiration pneumonia, if you receive a report that the patient's having increased cough and maybe mild shortness of breath, I might err toward treating that patient sooner than later without a whole lot of work up just because the avoidance of another hospitalization maybe is worth the risk of overprescribing. (Advanced Practice Registered Nurse)
• Delay from presentation to evaluation/treatment
[Homebound older adults] have a great deal more comorbidities. Their outcomes can be much more devastating with delayed treatment. Clinically deciding when to give my patients an antibiotic and not wanting to overprescribe [is a challenge]...I'm gonna err on the side of caution because they have histories of infections. (Physician Assistant)
• Desire to satisfy the patient and family
There is a longing to please the patient and show your medical power by prescribing. There's two huge things there. You please the patient because they got something or you did something for their husband, wife, or dad. And there's another one, which is 'I can help you.' I have the power of the pen to write that prescription and you can look at me and know I did something for him. (Advanced Practice Registered Nurse)
Factors that inhibit prescribing
• Response to non-pharmacological interventions
[I]f we get a call that says, 'I think my mom or dad has a [urinary tract infection]. Their urine is dark and it smells bad.' We'll say push fluids, get hydrated, and then call us back. So we do a lot of that...There's some vague symptoms here, [we want] to be conservative about antibiotic prescribing. So we'll give some instructions and then will follow up later that day or the next day to see if those symptoms have gotten better. And I would say often they do. (Physician)
• Concern about antibiotic-associated harms
Maybe some symptoms could be related to an infection. The thinking would be that the benefits maybe don't outweigh the risk of choosing antibiotics in that particular setting due to drug resistance. The choices that we have for antibiotics may not be offering enough benefit to warrant [treatment]. (Physician)
• Monitoring and reporting of symptoms by caregivers
[Caregivers are] our eyes and ears and temperature checkers, day in and day out, to help us with knowing when there's a clinical change that would indicate [infection]. (Physician)

DISCUSSION

This qualitative investigation aimed to understand how HBPC clinicians make decisions about antibiotic prescribing to inform strategies to optimize antibiotic use in a clinically challenging population and environment of care. We found that the characteristics of homebound patients and the challenges of delivering medical care in the home make it difficult to diagnose infection with certainty, and when faced with diagnostic uncertainty, HBPC clinicians must contend with the consequences of both underprescribing and overprescribing antibiotics. Recognizing these issues provides insight into methods to improve antibiotic use in HBPC.

Prior studies exploring how clinicians make decisions about antibiotic prescribing for older adults have largely

concentrated on nursing homes, with limited focus on primary care.[18–21] In two studies involving primary care settings in Europe, clinicians discussed many of the same factors found in our study, including issues related to diagnostic uncertainty, the complexity of older adults in the community, the desire to avoid hospitalization, and the perceived high risk of clinical decompensation.[22–24] Unique to the current study, barriers to diagnostic testing and follow-up were identified as key challenges to the diagnosis and treatment of infection in HBPC.

The current study draws attention to two key aspects of infection management in HBPC. The first is diagnostic uncertainty. Participants described a number of patient-related factors such as multimorbidity, cognitive impairment, and atypical presentations of infection, which, combined with barriers to diagnostic testing in the home, contribute to a knowledge gap about whether there is an indication for antibiotic therapy. This knowledge gap may be accentuated when clinicians lack remote access to the electronic health record in the field. The second is the significant influence of nonclinical factors. Participants emphasized the importance of nonclinical factors such as pressure from family members and caregivers, barriers to follow up, and issues related to staffing and rurality. These nonclinical factors may push clinicians into prescribing antibiotics that are considered unnecessary (e.g., use of antibiotics for noninfectious or nonbacterial syndromes) or inappropriate (e.g., use of antibiotics in the setting of established infection to which the pathogen is resistant).[25]

High rates of broad-spectrum antibiotic use have been observed in HBPC, underscoring the need for antibiotic stewardship in this unique environment of care.[9] The current study provides insight into potential strategies to promote antibiotic stewardship in HBPC. Through telehealth, expertise in infectious diseases can be expanded to resource-limited settings like HBPC, and this approach has demonstrated efficacy in reducing unnecessary antibiotic use.[26,27] The implementation of comprehensive toolkits, such as the Agency for Healthcare Research and Quality Safety Program for Improving Antibiotic Use, may improve communication with family members and caregivers about why antibiotics are not always indicated for nonspecific clinical syndromes.[28] Furthermore, the integration of point-of-care diagnostic tests into HBPC may alleviate diagnostic uncertainty. For example, point-of-care ultrasounds may improve diagnostic accuracy among homebound patients.[29] Table 3 shows additional strategies that are adapted from the Centers for Disease Control and Prevention Core Elements of Antibiotic Stewardship, such as tracking and reporting antibiotic prescriptions within HBPC programs.[30]

Study limitations include minimal representation from non-White clinicians and limited generalizability to non-VA home care settings, including those that provide episodic and focused skilled care services. We did not observe clinicians in practice. Our interviews reflect their attitudes and perceptions of antibiotic prescribing. Additionally, we did not collect granular data from participants about the capacity for diagnostic testing in their HBPC programs.

TABLE 3 Strategies proposed by the investigative team to promote antibiotic stewardship in home-based primary care.

Strategy	Description
Enhanced diagnostic tools	Utilize point-of-care diagnostic tools that can provide rapid results for common conditions (e.g., point-of-care ultrasound)
Telehealth consultations	Utilize telehealth for remote consultations with infectious diseases specialists who can provide guidance for complicated cases
Education and communication	Educate family members and caregivers using established resources, such as comprehensive tool kits from the Agency for Healthcare Research and Quality Safety Program for Improving Antibiotic Use
Regular review and feedback	Develop a system for regular review and feedback among clinicians to discuss complex cases and reach consensus on management strategies
Antibiotic utilization review	Review prescriptions to identify patterns of use across multiple domains such as the patient (e.g., comorbidities, healthcare devices), prescriber (e.g., clinician type), and drug (e.g., diagnosis, class, duration of therapy)

In conclusion, we show that HBPC clinicians must grapple with the challenging task of balancing diagnostic uncertainty with many competing factors during the management of infection in homebound patients. Future studies are needed to implement strategies to promote antibiotic stewardship in HBPC.

AUTHOR CONTRIBUTIONS

Study concept and design: RD, TRF, and ABC. *Acquisition of subjects and/or data*: RD, EK, AB, LI, and WC. *Analysis and interpretation of data*: RD, EK, SK, TRF, and ABC. *Preparation of manuscript*: RD, SK, TRF, and ABC.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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The funders had no role in the study design; in the collection, analysis, or interpretation of data; in the writing of the report; or in the decision to submit the paper for publication.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Supplemental Appendix 1. Exploring the role of antibiotic stewardship in home-based primary care. Interview guide for home-based primary care clinicians.

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