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## Challenges of Antibiotic Prescribing for Assisted Living Residents: Perspectives of Providers, Staff, Residents, and Family Members

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### Abstract

**Objectives**—To better understand the antibiotic prescribing process in assisted living (AL) communities given the growing rates of antibiotic resistance.

**Design**—Cross-sectional survey.

**Setting**—Four AL communities in North Carolina.

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#### Conflict of Interest

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Study concept and design: Zimmerman, Sloane, Mitchell.

Acquisition of data: Kistler and Khandelwal, Analysis and interpretation of data: Kistler, Sloane, Zimmerman, Platts-Mills, Weber, Reed, Chisholm.

Drafting of the manuscript: Kistler and Zimmerman.

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Statistical analysis: Kistler and Reed.

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**Participants**—AL residents who received antibiotics (n=30) from October 20, 2010 to March 31, 2011, and their primary family member, staff, and the prescribing medical provider.

**Measurements**—Semi-structured interviews conducted about prescribing included the information available at the time of prescribing and the perceptions of the quality of communication among providers, staff, residents and family members about the case. Providers were asked an open-ended question regarding how to improve the communication process related to antibiotic prescribing for AL residents.

**Results**—Among 30 cases of antibiotic prescriptions, providers often had limited information about the case and lacked familiarity with the residents, the residents' families, and/or staff. In addition, they felt cases were less severe and less likely to need an antibiotic than did residents, families, and staff. Providers identified several ways to improve the communication process including better written documentation and staff/family presence.

**Conclusion**—In our small sample of AL communities, providers faced an array of challenges in making antibiotic prescribing decisions. Our work confirms the complex nature of antibiotic prescribing in AL communities and reveals further work is needed to determine how to improve the appropriateness of antibiotic prescribing.

### Keywords

Assisted Living; antibiotic; older adults; prescribing

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## INTRODUCTION

Antibiotic resistance may cost the United States upwards of \$20 billion annually,<sup>1</sup> and antibiotic-resistant infections are one of the greatest threats to global health in the coming decades due in part to inappropriate use and over prescribing of antibiotics in key populations.<sup>2-4</sup> One key population is older adults residing in nursing homes (NH), among whom antibiotic prescribing is high,<sup>5,6</sup> and where an estimated 40% of antibiotic prescriptions may be inappropriate.<sup>7-9</sup> Another at risk population may be older adults residing in assisted living (AL) communities. Although residents in AL communities tend to be less dependent in activities of daily living than those in NHs, this population shares many common attributes with NH residents, including age, race, and gender,<sup>10</sup> and so they too may be at an increased risk for prescribing challenges. For example, AL providers have an even wider range of practice patterns and types of communication than do nursing home providers.<sup>11</sup> In addition, these settings do not require nursing personnel or a medical director, and care is often provided by primary providers in a private medical office as is done for community-dwelling adults. Furthermore, the range of health-related services offered in AL communities is more variable than in nursing homes.<sup>10,12,13</sup> This process is therefore complex to navigate for providers, AL residents, families, and staff, and may be particularly challenging for the parties involved.

A review of the literature found no published studies focused on antibiotic prescribing practices in AL communities, which now provide supportive care for almost one million older adults in 31,000 communities across the country.<sup>14</sup> Given the growing rates of antibiotic resistance and the lack of information on prescribing practices in AL communities, an exploration of prescribing practices in AL is vital. Consequently, to better understand the process involved in antibiotic prescribing in AL communities, we analyzed 30 cases in four AL communities in which antibiotics had been prescribed to AL residents, interviewing the providers, the staff member most involved in the prescribing decision, the resident, and (when available) the family member most closely involved in care. We analyzed the interviews to assess the illness characteristics leading to the prescriptions, the perceptions of

the various stakeholders, and provider recommendations for improving the process. Our goal was to illuminate the prescribing process and identify target areas to reduce potentially inappropriate prescribing.

## METHODS

### Study Design and Setting

Our study was designed to recruit a provider, staff, resident, and family member involved in each of 36 cases of systemic antibiotic prescriptions in four AL communities in central North Carolina from October 20, 2010 to March 31, 2011 (i.e., nine cases per site) to complete comprehensive quantitative interviews containing both general clinical questions about the resident, the specific clinical findings of the presumed illness, and each participant's perceptions about the case. The four participating AL communities averaged 95 beds (range 64–147), and three were for-profit. To identify cases, the medication administration records of all residents in each community were reviewed on a weekly basis. Cases were included if the resident received a prescription for systemic antibiotics except when the prescription had been written within 2 days of an overnight hospital stay, the antibiotic was prescribed prophylactically, or the resident had already participated in the study.

Once a case was identified, a nurse data collector determined the resident's capacity for providing consent by asking the staff. If the resident was unable to provide consent, consent was obtained from the resident's legally authorized representative (LAR). Either the resident or the LAR provided the name of the family member most involved in the resident's care and gave permission for this person to be interviewed. Once consented, interviews were conducted with the providers, the resident, the staff member who either had communicated with the provider or was most familiar with the resident's health status, and the family member most involved in the resident's care. Resident and staff interviews were conducted in the AL community; provider and family member interviews were completed by telephone at a time convenient to the participant. The study was approved by the University of North Carolina at Chapel Hill Institutional Review Board.

### Measures

General demographic information was obtained on each participant. Characteristics obtained regarding AL residents included functional and cognitive status using a list of activities of daily living and the Minimum Data Set Cognition Scale (MDS-COGS),<sup>15</sup> and risk factors for infection (e.g., COPD, diabetes). To assess the decision making process, respondents were asked questions in three key areas: 1) characteristics of the case; 2) perceptions of case severity and the need for antibiotics; and 3) familiarity with and communications about the case. To assess perceptions of case severity, all respondents were asked how sick the resident was at the time the antibiotic was prescribed as compared to his/her usual state of health. To evaluate perceptions of the need for antibiotics, each participant was asked, using a 4-option response, "Without the antibiotic, how likely do you think it is that [you/the resident] would have gotten better in a few days?" Familiarity with and communication about the case were asked of all respondents but the questions and format varied as appropriate for the participant.

Certain characteristics of the case were obtained only from residents and family members or from staff and providers. The areas addressed to staff and providers included fever, general functional changes, recent falls, and non-specific symptoms (e.g., confusion). If the presumed infection was one of the four most common infections (urinary tract, respiratory, skin, or gastrointestinal), specific questions were asked about that infection's common

symptoms and the course of treatment, such as laboratory testing and imaging studies, based on the Loeb criteria.<sup>16</sup> Providers were asked additional open-ended questions about the extent to which they were satisfied with the communication process around the prescription and what they thought could be done to improve the process.

### Statistical Analysis

We used frequencies to describe the demographic characteristics and responses to categorical items. Comparisons between participant group responses were conducted using related-samples McNemar's exact tests, Kendall's coefficient of concordance exact tests, and related-samples Cochran's Q applied to dichotomized responses where appropriate, using SPSS, version 18. Only staff and families who were aware of the resident's presumed infection at the time of antibiotic prescribing were included in the analysis. Two independent researchers (CK and PS) performed an inductive content analysis of the providers' open-ended responses about their satisfaction with the communication process and suggestions for improvement.<sup>17</sup> They individually recorded the most common themes and compared their results, resolving disagreements by discussion.

## RESULTS

Out of 44 eligible cases, consent was obtained for 30; 12 (27%) refused, and 2 (5%) family members did not respond. Among the 30 recruited cases, interviews were completed as follows: 30 provider interviews (from 22 providers), 30 staff interviews (from 15 staff), 24 resident interviews (6 could not respond due to cognitive impairment), and 29 family member interviews. In total, 113 interviews of providers, residents, family members, and staff were conducted. The median number of days between the prescription and interview was 6.5 days for providers, 6.0 days for residents, 9.0 days for the family member, and 6.0 days for staff. Participant characteristics are reported in Table 1. Of the 30 AL residents involved in the cases, 43% had moderate or severe cognitive impairment and 50% were impaired in three or more activities of daily living. Medical providers were the primary care provider for the resident 77% of the time. The cases of presumed infections comprised 11 urinary, 12 respiratory, 6 skin, and one tooth abscess.

Characteristics of the cases. Providers did not examine the resident prior to prescribing in 21% of cases (6/29)(Table 2). Among the eleven cases of presumed urinary tract infection (UTI), over a quarter (3/11) did not report any of the five key UTI symptoms (dysuria; new/increased urgency, frequency, or gross hematuria; new/worse urinary incontinence; costovertebral/suprapubic tenderness; change in urine appearance/odor). Most urinary cases (8/11) had cultures performed, although in all but one case the results were not available at the time the antibiotic was prescribed. Among the twelve cases of presumed respiratory infection, no respiratory rate was recorded in a quarter of cases (3/12). Slightly more than one-half (7/12) had a chest radiograph ordered, three of which had positive findings; two of the ordered radiographs were never done. Of the six presumed skin infections, one (17%) had no key skin symptoms reported (swelling; new/expanding erythema [redness] around a wound; an ulcer for 3 or more weeks; tenderness; or purulent drainage [pus]).

Perceived familiarity and communication of the provider with the residents, family members, and staff. Providers reported they had either "not at all" or "a little" familiarity with the resident over a third (11/30) of the time and with the family member almost two thirds (19/30) of the time. They communicated with the staff prior to prescribing in 27% (8/30) of the cases and with the family member in 20% (6/30) of cases. Fewer than half (13/29) of family members and 60% (18/30) of staff knew the resident was sick at the time the antibiotic was prescribed.

Perceived severity of the case and the likelihood of recovery without antibiotics. Providers, residents, their family members, and staff differed somewhat in their perceptions of illness severity and need for an antibiotic (Table 3). When asked to compare the resident's current state of health with their usual health, no providers felt the resident was "a great deal" worse than usual, compared to 29% (7/24) of residents, 15% (2/13) of family members, and 17% (3/18) of staff ( $p=0.016$ ). When asked whether the resident would have gotten better without an antibiotic in a few days, 40% (12/30) of providers felt it was "not at all" likely that the resident would have gotten better, compared with 75% (18/24) of residents, 69% (9/13) of family members, and 78% (14/18) of staff ( $p=0.05$ ). Although six of the eight staff (75%) who initiated contact with providers felt that the resident would have gotten worse without an antibiotic, five of these six felt that the resident was either "not at all" or "a little" worse than usual.

**Provider Satisfaction with Communication.** Provider satisfaction with communication with the staff was mixed, with 43% (13/28) being generally dissatisfied (i.e. "not at all" or "a little" satisfied) and 54% (15/28) being "mostly" or "a great deal" satisfied. Provider satisfaction was not associated with the individual AL community ( $p = .50$ ). A content analysis of these data revealed that the satisfied group in general felt that there was nothing the AL community could do to improve communication. One provider said "[The AL community] does a remarkable job." Others reported that the residents come with an informed staff member or with medical records to facilitate communication. The dissatisfied group reported they would like either more information or a better assessment from the staff, with reported information needs ranging from general medical information (e.g., current medications or an allergy list) to a detailed history of the present illness. One provider stated, "I would have liked the AL community to have known anything. They had no clue she was sick."

## DISCUSSION

In our four communities, antibiotic prescribing for AL residents appears to present several challenges to providers. Providers often possessed limited information about the case and lacked familiarity with the residents, families, and/or staff. They had limited communication with the various respondents, particularly staff and families. In addition, providers differed in their perceptions of the severity of the case and need for an antibiotic as compared to residents, families, and staff. Providers identified several ways to improve the communication process including better written documentation or staff/family presence.

As found in prior work<sup>11</sup>, providers identified lack of information about the resident as problematic. This lack of information included both resident-related factors and staff related factors. In our sample, 43% of residents had at least moderate cognitive impairment, which may contribute to the inability to gather information and increased prescribing, although work in nursing homes has shown decreased prescribing rates in dementia residents.<sup>18,19</sup> In addition, key physical signs were not assessed, and 21% of cases included no physical examination. Providers ordered studies, such as 2 chest radiographs, which were not performed. Nearly a quarter of providers were not the resident's primary care provider. Focusing future work on these factors may help to improve the process of antibiotic prescribing for AL residents.

Not surprisingly, this lack of information was mirrored by a lack of communication. Forty-three percent of providers were dissatisfied with communication with the staff with whom they had contact. Just as failures of patient-provider communication and lack of resident participation have been linked to adverse prescribing events,<sup>20</sup> failures in staff-provider communication may also cause problems particularly in key groups. Further, compared to

nursing homes, providers are more likely to lack confidence in the ability of AL staff to communicate, assess, and monitor problems.<sup>11</sup> In our study, when providers commented on their dissatisfaction with communication with the staff, they noted written documentation or staff presence as two of several areas for improvement. Improvement efforts in such domains may be able to improve the prescribing process between staff and providers.

While this study has provided information completely lacking related to antibiotic prescribing in assisted living, it has several limitations. Firstly, although we attempted to speak to every stakeholder in the prescribing process, it is possible that we missed important parties. Also, the participants may suffer from recall bias as only around one-half of family and staff knew the resident was sick at the time of the prescription. However given that the median time between the prescription and the interview was only 6.0–9.0 days, we feel that the family member or staff is unlikely to have forgotten about the episode in such a short period of time. Instead, we believe that the findings reflect the dynamics of AL communities, because while AL communities increasingly provide health-related services, for many residents they function primarily to provide supportive care for functional deficits. In these instances, staff might not be aware of AL residents' medical conditions because families may transport residents to the provider's office without staff knowledge, or conversely, a family member might not be informed of the presumed illness because the resident was exercising his/her autonomy and right to privacy. Also, the conclusions are based on 30 cases in four AL communities, and so no claims to the generalizability of the findings can be made. Further work is needed to elucidate the direct and indirect relationships between the challenges identified in this study and their links with inappropriate prescribing. We also did not examine the resulting chain of events after prescribing, such as the duration of treatment or the decision to stop antibiotics in the face of negative cultures.

In conclusion, this work represents the first effort to understand the antibiotic prescribing process and the challenges facing providers in AL communities. Our work confirms the complex nature of antibiotic prescribing in AL communities. Further work is needed to determine how these challenges may be linked to inappropriate antibiotic prescribing.

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**Table 1**

## Characteristics of Study Participants and the Cases of Presumed Infections

Characteristics	N (%) or Mean ( $\pm$ SD)
<b>Resident, n=30</b>	
Age, mean ( $\pm$ SD)	80.9 (9.6)
Female	23 (77)
Race, white	23 (77)
Education, college degree	8 (28)
Cognitive status, moderate or more impairment <sup>a</sup>	13 (43)
Functional status, impairment of 3 or more activities of daily living <sup>b</sup>	15 (50)
Bladder incontinence, occasionally or more often, but not daily	7 (23)
<b>Family member, n=29</b>	
Age, mean ( $\pm$ SD)	59.4 (12.6)
Female	18 (62)
Race, white	22 (76)
Education, college degree	20 (69)
Relationship to resident	
Spouse	3 (10)
Child	19 (66)
Sibling	4 (14)
Other	3 (10)
<b>Staff, n=15</b>	
Age, mean ( $\pm$ SD)	38.5 (10.1)
Female	15 (100)
Race, white	6 (40)
Education, college degree	1 (7)
Training/position	
Licensed practical nurse	1 (7)
Medication technician	10 (67)
Personal care assistant	4 (27)
<b>Provider, n=22</b>	
Age, mean ( $\pm$ SD)	45.1 (11.9)
Female	14 (64)
Provider is primary care provider	17 (77) <sup>c</sup>
Training/position	
Nurse practitioner	1 (5)
Physician assistant	1 (5)
Dentist	1 (5)
Physician – Emergency	4 (18)



Characteristics	N (%) or Mean ( $\pm$ SD)
Physician – Primary Care	15 (68)
<b>Presumed infection type, n=30</b>	
Urinary	11 (37)
Respiratory	12 (40)
Open wound/skin	6 (20)
Gastrointestinal	0 (0)
Other (tooth abscess)	1 (3)

<sup>a</sup>Cognitive impairment is based on a Minimum Data Set Cognition Score (MDS-COGS)  $\geq 2$ .

<sup>b</sup>Activities of daily living include bed mobility, transfer, locomotion, dressing, eating, toilet use, hygiene, and bath/shower.

<sup>c</sup>Includes two cases where staff thought the provider was the resident's primary provider, but provider did not think so.

**Table 2**Characteristics of the Case<sup>a</sup>, as Reported by Providers, n=29

Characteristics	N (%)
<b>General characteristics</b>	
Resident not examined prior to prescribing	6 (21)
Location of resident examination	
Office/Practice/Clinic	10 (34)
AL community	7 (24)
Emergency Department/Urgent Care/Hospital	6 (21)
Fever	4 (14)
Confusion	4 (14)
Decreased oral intake	4 (14)
Functional decline	6 (21)
Fall	5 (17)
Somnolence	1 (3)
New agitation	2 (7)
<b>Presumed urinary infection (n=11)</b>	
No report of any of five key urinary tract infection (UTI) symptoms <sup>b</sup>	3 (27)
No culture performed	3 (27)
Positive culture	2 (18)
<b>Presumed respiratory infection (n=12)</b>	
Chronic obstructive pulmonary disease	3 (25)
No report of any key respiratory symptoms <sup>c</sup>	1 (8)
Respiratory rate >20	0 (0)
No respiratory rate recorded	3 (25)
Positive chest radiograph	3 (25)
No chest radiograph performed <sup>d</sup>	5 (42)
<b>Presumed open wound/skin infection (n=6)</b>	
Diabetes mellitus	1 (17)
No report of any key skin symptoms <sup>e</sup>	1 (17)

Characteristics	N (%)
Ulcer for 3+ weeks	0 (0)
Purulent drainage	2 (33)
No culture performed	4 (67)

<sup>a</sup>Includes the cases from the three most common infection types (urinary, respiratory, open wound/skin), and excludes the tooth abscess case.

<sup>b</sup>Key UTI symptoms include dysuria; new or increased urgency, frequency, or gross hematuria; new or worse urinary incontinence; costovertebral or suprapubic tenderness; change in urine appearance or odor.

<sup>c</sup>Key respiratory symptoms include runny nose, sneezing, sore throat, new or worsening cough, muscle/body aches, chills, shortness of breath, pleuritic chest pain, acute malaise, headache, and increased respiratory rate.

<sup>d</sup>Includes both “no”, “don’t know”, and missing responses.

<sup>e</sup>Key skin symptoms include swelling; new or expanding erythema (redness) around wound; ulcer for 3 or more weeks; tenderness; and purulent drainage (pus).

**Table 3**

Perceived Severity of the Case and Likelihood of Recovery without Antibiotics<sup>d</sup>

Perceptions	N (%)					p-value
	Not at all	A little	Moderately	A great deal	Don't know	
<b>Severity- Resident worse than usual</b>						0.016 <sup>b</sup>
Provider, n=30 <sup>c</sup>	5 (17)	14 (47)	9 (30)	0 (0)	2 (7)	
Resident, n=24	5 (21)	6 (25)	6 (25)	7 (29)	0 (0)	
Family, n=13	3 (23)	4 (31)	4 (31)	2 (15)	0 (0)	
Staff, n=18	4 (22)	5 (28)	6 (33)	3 (17)	0 (0)	
<b>Likelihood of recovery<sup>d</sup></b>						0.05 <sup>e</sup>
Provider, n=30	12 (40)	13 (43)	3 (10)	0 (0)	2 (7)	
Resident, n=24	18 (75)	2 (8)	1 (4)	0 (0)	3 (13)	
Family, n=13	9 (69)	0 (0)	3 (23)	0 (0)	1 (8)	
Staff, n=18	14 (78)	1 (6)	3 (17)	0 (0)	0 (0)	

<sup>a</sup>Includes only those respondents who were aware of the resident's presumed infection at the time of antibiotic prescribing.

<sup>b</sup>Based on related-samples Kendall's Q coefficient of concordance exact tests using only the provider, resident and staff responses because of the few family members responses (p = .028 when including family responses); no post hoc pairwise adjusted comparisons were < .05.

<sup>c</sup>Provider options were: not sick, slightly, moderately, severely, and moribund; no cases rated as either severely sick or moribund.

<sup>d</sup>Rated as how likely the resident would have gotten well in a few days without an antibiotic.

<sup>e</sup>Based on related-samples Cochran's Q applied to dichotomized responses (not at all vs. a little to very) using only the provider, resident and staff responses because of the few family members responses (p = 0.29 when family member responses included); the post hoc pairwise comparison of provider responses to resident responses was statistically significant (adjusted p= 0.043).