

SEVERAL ROADS LEAD TO ROME:

OPERATIONALIZING ANTIBIOTIC STEWARDSHIP PROGRAMS IN NURSING HOMES

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Despite being primarily known for his poetry, Geoffrey Chaucer also composed and compiled the *Treatise on the Astrolabe*, which is believed to be the oldest known technical manual in the English language.<sup>1,2</sup> An astrolabe was a medieval instrument primarily used by astronomers to estimate the altitude of celestial bodies. In this text, Chaucer writes, “Right as diverse pathes leden the folk the righte wey to Rome” which also happens to be the first known English-language use of the expression more commonly seen as “All roads lead to Rome.” That there are several methods to arrive at the same place, i.e. to reach a desired goal is the theme of this editorial in which we discuss several approaches for antimicrobial stewardship to overcome the many barriers and diverse and changing landscape in nursing homes.

It is well recognized that antibiotic prescribing is often suboptimal in nursing homes. Estimates of the prevalence of suboptimal prescribing have varied; however previous studies suggest up to 75% of antibiotic use in nursing homes is inappropriate or unnecessary.<sup>3-6</sup> In an effort to reduce inappropriate prescribing and associated poor outcomes, the Centers for Medicare and Medicaid Services (CMS) have required nursing homes to establish and maintain antibiotic stewardship as a condition for reimbursement.<sup>7</sup> However, despite this requirement, there are considerable challenges to optimizing antibiotic prescribing in this setting. Nursing home residents have a high prevalence of multi-morbidity and cognitive impairment, which increase the risk of infection and reduce the ability to effectively communicate symptoms. Infections often present with atypical symptoms such as fatigue, confusion and functional decline.<sup>8</sup> Furthermore, there is a burgeoning population of short stay residents in nursing homes

receiving post-acute care that often present with higher severity of illness, prevalence of antibiotic use both in the hospital and on discharge, and with indwelling devices, increasing the risk of acquisition and infection by multi-drug resistant organisms.<sup>9-10</sup> Beyond challenges in resident characteristics and presentation of infection, there are additional barriers to optimizing antibiotic use in nursing homes including the frequently fragmented administrative structure in this setting, lack of tools to support empiric antibiotic prescribing, and lack of education regarding guidelines and current evidence to support best practices.

Administrative fragmentation is characterized by lack of adequate hospital records, frequent staff and leadership turnover, frequent changes in regulations that inhibit the uptake, dissemination, and reinforcement of changes in antibiotic prescribing policies.<sup>11</sup> Sloane et al. used a pragmatic trial to compare the effect of an intervention bundle to reduce systemic antibiotic prescribing in 27 North Carolina nursing homes.<sup>12</sup> Two administrative structures were considered: 1) chain nursing homes in which the intervention was disseminated by a corporate leader; and 2) non-chain facilities in which the medical director and other providers disseminated the intervention. Over 24 months (18 months of active intervention and 6 months post intervention) investigators observed a 20% decrease in systemic antibiotic prescribing across all facilities. Furthermore, there was no significant difference between administrative structures; suggesting that both methods of intervention delivery can be effective. Also encouraging was that there was no observed difference in adverse events, i.e., hospitalizations and hospital readmissions, between baseline and following reductions in antibiotic prescribing. Less

encouraging was that there was no observed effect on clinical outcomes, i.e., methicillin-resistant *Staphylococcus aureus* and *Clostridioides difficile* infections. The authors hypothesized that these outcomes may take longer to realize or, in the case of *C. difficile*, more likely driven by hospital antibiotic use. However, given that this was a 24-month study and the baseline rates were not insignificant, we would have expected to see a difference. The lack of difference could also be attributable to data collection and reporting challenges in nursing homes given that facilities were charged with collecting and submitting their own data.

A lack of tools to support empiric antibiotic prescribing also challenges optimal antibiotic prescribing in nursing homes. Most antibiotic prescribing in nursing homes is empiric; i.e. in the absence of laboratory data on the species and antibiotic susceptibilities of the infecting organism.<sup>13</sup> In the absence of these data, acute care facilities frequently use antibiograms, which aggregate facility-wide antibiotic susceptibility data to inform prescribers on the underlying prevalence of antibiotic resistance within a facility. However, uptake and utilization in nursing homes has been limited and subject to several challenges.<sup>14</sup> Davenport et al. attempted to mitigate these challenges in a recent study to develop weighted-incidence syndromic combination antibiograms (WISCAs).<sup>15</sup> WISCAs largely utilize existing antibiogram methodology, but pool data on isolates from multiple pathogens associated with an infection type (e.g. urinary tract infections (UTIs)). As such, they increase the overall number of isolates included in the antibiogram and can inform on the probable infecting organism in addition to providing data on antibiotic susceptibilities. The authors demonstrated the ability to develop

WISCAs among 35 nursing homes in upstate New York which also mostly allowed them to meet Clinical Laboratory Standards Institute (CLSI) guidelines for the minimum number of isolates (i.e. 30) to be included in antibiograms.<sup>16</sup> WISCAs are still susceptible to the limitations common to all antibiograms in that nursing homes must still submit specimens to laboratories for analysis if these data are to be included in antibiograms. Furthermore, specimens sent for analysis should only be collected when symptoms are present to indicate a probable infection.

In the final study to be discussed in this article, Salem-Schatz et al. describe the development and implementation of nursing home collaboratives to improve management of UTIs in nursing homes.<sup>17</sup> While there remains a need for high-quality data, the Centers for Disease Control and Prevention (CDC) and several organizations have provided guidance and recommendations to improve antibiotic prescribing practices in nursing homes.<sup>18-20</sup>— However, uptake and application of these practices remains challenging. Collaboratives address these challenges by creating an environment for shared learning and support.<sup>21</sup> Using two collaboratives of 31 and 34 facilities, respectively in Massachusetts, authors reported improvements in UTI culturing, UTI diagnoses, and *C. difficile* infection. Limitations of quality improvement collaboratives are barriers to participation including lack of time, trained personnel, resources, and variable capability to engage fully across participating sites. This was demonstrated in this study where in 17/31 and 25/34 nursing homes respectively were able to participate fully and provide data.

Interventions and other characteristics for the studies described in this article are displayed in the Table. All strategies have some limitations which must be considered during planning, implementation, and evaluation of results. Limitations notwithstanding and despite important challenges in delivery and implementation of interventions in nursing facilities, these studies add an armament of strategies and solutions to curb inappropriate use of antibiotics in nursing homes. Substantial evidence now points to triggers of antibiotic initiation, improving the ‘culture of culturing’, role of ‘wait and watch’ approach for low-risk patients, discontinuing antibiotics when clinical cultures return negative, using antibiograms to guide prescribing and educating staff and physicians. With cost estimates to be potentially modest,<sup>22</sup> it is time to support facility teams in developing and executing these strategies to enhance safety and wellbeing of our older adults.

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Table: Description of Key Study Findings

Title	Population	Interventions	Findings
Decisional Guidance Tool for Antibiotic Prescribing in the SNF (Davenport et al)	28 regional SNFs and 7 in-network SNFs (i-SNFs)	<ul style="list-style-type: none"> <li>• Urinary source specimens in 1-year period; analyses limited to <i>E. coli</i>, <i>P. mirabilis</i>, and <i>K. pneumoniae</i>. Oral abx susceptibility results only.</li> <li>• Compared traditional antibiograms &amp; WISCA.</li> <li>• Compared aggregate antibiotic susceptibilities in i-SNFs with and w/o urinary tract infection protocols</li> </ul> <p>UTI Protocol = “interdisciplinary intervention” as below:</p> <ul style="list-style-type: none"> <li>• tracking the amount of fluid</li> <li>• instituting a toileting schedule</li> <li>• perineal hygiene for patients</li> <li>• monitoring and communication protocols (including testing algorithm)</li> </ul>	Improved susceptibilities in WISCA group; WISCAs can be developed in most SNFs & indicate successful antibiotic stewardship program. 3 of 7 i-SNFs had UTI protocols; those w/UTI protocols had improved antibiotics susceptibility rates. Less antibiotic resistance in NHs w/UTI protocols in place.
A Two-Year Pragmatic Trial of Antibiotic Stewardship in 27 Community Nursing Homes (Sloane et al)	27 NHs (2 arms, NH group & medical provider group)	<ul style="list-style-type: none"> <li>• System to record &amp; report antibiotic prescribing</li> <li>• 2 one-hr in-service training for nurses</li> <li>• 2 one-hr audio casts to all medical providers</li> <li>• Nursing pocket-cards with tips, ucx algorithm; posters in NH</li> <li>• Medical provider pocket cards re: IC guidelines &amp; antibiotic overprescribing</li> <li>• Quarterly quality improvement reports on NH-specific rates</li> <li>• Educational brochure to residents/families</li> <li>• Free training modules and continuing education</li> </ul>	Antibiotic stewardship programs effective through NH admin and medical provider groups. Med director involvement is key for both.
A Statewide Program to Improve Management of Suspected UTI in LTC (Salem-Schatz et al)	65 NHs, 42 submitting data for analysis	<ul style="list-style-type: none"> <li>• Use multidisciplinary group to develop content (geriatrician, infectious diseases, Quality Improvement consultant)</li> <li>• Engage multidisciplinary facility teams</li> <li>• Use quality improvement approach w/small test of change, ongoing measurements</li> <li>• Plan and develop curriculum for improvement</li> <li>• Varied learning modalities/coaching: face-to-face; webinar; workshops; coaching check-in call</li> <li>• Utilize tools/materials for clinicians</li> </ul> <p>Tools/materials-</p> <ul style="list-style-type: none"> <li>• UTI protocol/dx UTI in NH</li> <li>• Fact sheet for clinicians</li> <li>• Mnemonic poster for management of altered mental status</li> <li>• Family education brochures</li> <li>• Conversations with families re: UTIs, asymptomatic bacteriuria, antibiotics</li> <li>• Publicly accessible website with materials/ webinars; data entry site</li> </ul>	Decrease in urine culturing and Urinary tract infection rates. Using a multifaceted educational program for NH to manage UTI and subsequently decrease CDI.