Optimizing Antibiotic Use in Nursing Homes Through Antibiotic Stewardship

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Antibiotic stewardship is becoming a requirement for nursing homes. Programs should be interdisciplinary and multifaceted; should have support from nursing home administrators; and should aim to promote antibiotics only when needed, not just in case. Recommended components include use of evidence-based guidelines; ongoing monitoring of antibiotic prescriptions, cultures, and study results; monitoring of health outcomes; use of nursing home–specific antibiograms; regular reporting and feedback to medical providers and nurses; and education of residents and families.

Antibiotic resistance is and will continue to be a major threat to health [1]. Factors contributing to resistance include antibiotic overuse in medicine and other areas such as agriculture, the rapid spread of resistant organisms due to population mobility, and the slowdown in development of new antibiotics. The result is that our antimicrobial armamentarium is increasingly unable to adequately treat serious infections [2, 3]. These developments have led to multiple calls to reduce nonessential antibiotic use in order to preserve existing antibiotics for future use—a process that is referred to as antibiotic stewardship [4].

Historically, the primary targets for antibiotic stewardship programs were acute care hospitals and ambulatory settings. Recently, however, nursing homes have been recognized as important contributors to antibiotic resistance due to their chronically ill population and frequent use of antibiotics. At any given time, 10.8% of nursing home residents are taking systemic antibiotics (ie, given by mouth or injection) [5], and the average nursing home resident receives an antibiotic prescription every 77 days [6]. Not surprisingly, in the months after admission, nursing home residents become increasingly colonized with resistant bacteria [7].

In 2015, the Centers for Disease Control and Prevention (CDC) issued a recommendation that all nursing homes implement antibiotic stewardship programs [8], and the Centers for Medicare & Medicaid Services proposed regulations that would require all nursing homes to have an antibiotic stewardship program [9]. These developments indicate that antibiotic stewardship will soon become a requirement of infection control practices in nursing homes. In this article we discuss the issues involved in implementing such activities, drawing on the extensive experience of the North Carolina Statewide Program for Infection Control and Epidemiology at the University of North Carolina (UNC).

Unique Challenges to Assuring the Quality of Antibiotic Prescribing in Nursing Homes

The community nursing home is very different from the typical hospital. Staffing is different, decision making is different, and the patient population differs in many ways. In particular, the following 7 features distinguish nursing homes as settings for antibiotic stewardship activities.

First, nursing home residents typically live several years in this setting, so the impact of overprescribing on antibiotic resistance tends to be compounded over time. In contrast, hospital stays are typically short, so the bacterial resistance associated with high antibiotic use in hospitals more often manifests after discharge [10].

Second, nearly all nursing home residents are elderly; as a result, many principles and practices developed for younger populations do not apply. For example, the average temperature for nursing home residents is not 98.6°F but 97.8°F, and the threshold for fever is not 100°F or 100.5°F, but rather 99.0°F [11].

Third, many nursing home residents have Alzheimer's disease or other cognitive impairments, making history taking difficult and sometimes impossible.

Fourth, physicians and other prescribers are usually not on site in nursing homes, unlike hospitals, and pharmacists are only peripherally involved in care. This situation leads to much decision making and prescribing taking place via telephone, based on observations of and communications by on-site nursing staff [10, 12].

Fifth, nurses, residents, and families have particularly strong roles in decision making in nursing homes; they tend to believe that antibiotics are needed more often than do physicians; and they often have misconceptions about infections. For example, many nurses believe that the presence of

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any bacteria in the bladder is reason to prescribe an antibiotic [13].

Sixth, nurses and nursing administrators have far fewer resources than hospitals for quality monitoring and improvement. For example, our research demonstrates that the average nursing home infection control nurse—the person responsible for all infection-related quality—spends fewer than 5 hours per week on infection control.

Finally, guidelines for diagnosis of infections and initiation of antibiotics rest on a very thin evidence base and have little correlation with actual practice or outcomes [14, 15].

To address these factors, antibiotic stewardship activities in nursing homes must be setting-appropriate and not based solely on models that are successful in hospitals. Data collection and training must be streamlined. Activities must take into account absenteeism and staff turnover, the latter of which is far higher in nursing homes than in a hospital environment: 47% for licensed nurses and 65% for certified nursing assistants [16]. Training may be more successful if it focuses on what to avoid rather than what to do [17], as was shown in a controlled trial conducted by a UNC research team; this trial focused on when not to prescribe antibiotics and reduced prescribing by 28% in 7 North Carolina nursing homes [6].

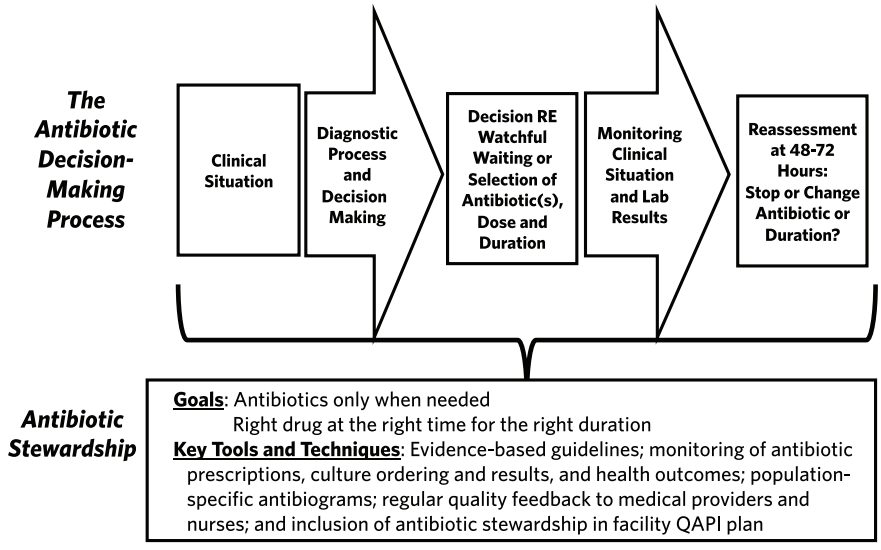
Components of an Antibiotic Stewardship Program in a Nursing Home

Antibiotic stewardship in nursing home settings must address all the elements of the antibiotic prescribing process (see Figure 1). In general, antibiotic stewardship requires a multifaceted approach that has support from administrators. Programs should aim to promote the use of antibiotics only when needed, emphasizing that "just in case" use is no longer acceptable. Recommended components of antibiotic stewardship include an interdisciplinary team involving physicians, nurse practitioners, physician assistants, nurses, and consultant pharmacists; policies to optimize antibiotic use and discourage inappropriate overuse; adherence to evidence-based guidelines when available and appropriate; ongoing monitoring of antibiotic prescriptions, cultures, and study results; monitoring of health outcomes such as hospitalizations for sepsis; development, promulgation, and use of nursing home–specific antibiograms to aid medical providers in antibiotic selection; and regular reporting and feedback to medical providers and nurses. Antibiotic stewardship should therefore be a key component of a nursing home's infection control and Quality Assurance/Performance Improvement programs.

An antibiotic stewardship program has several elements that require particular attention. First, it is important to target the areas where antibiotics are most often overprescribed. Because the vast majority of systemic antibiotics are prescribed for presumed urinary, respiratory, skin, or soft tissue infections [6], each of these areas should be targeted. Asymptomatic bacteriuria, viral respiratory infections (including bronchitis), and overuse of systemic antibiotics for localized skin conditions should receive specific attention.

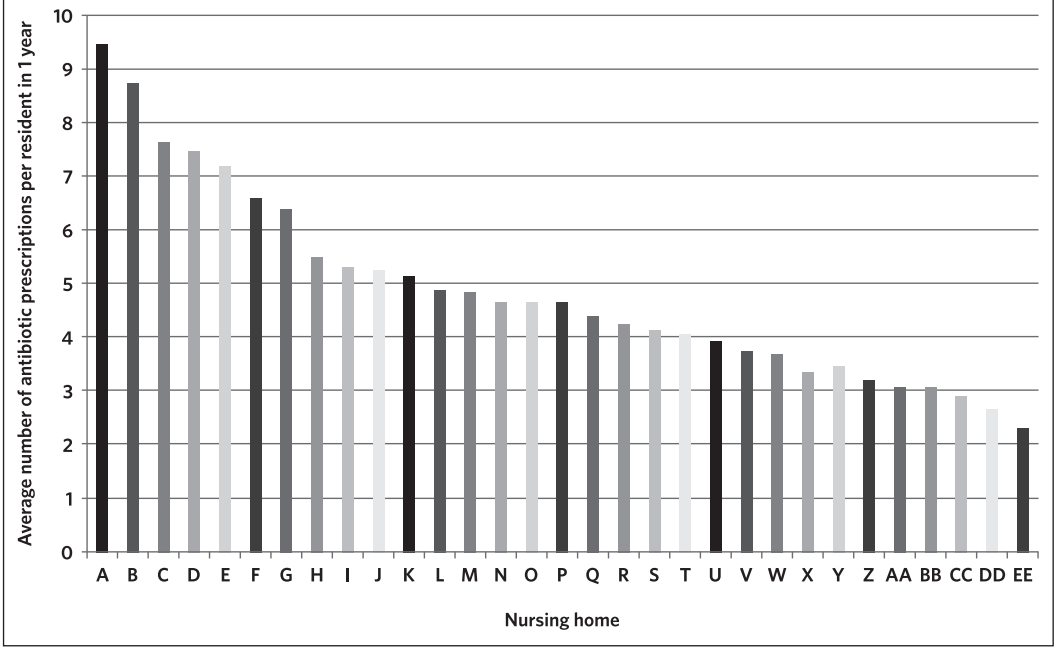
Another important consideration is assessment and benchmarking. The rate of antibiotic prescribing varies widely between nursing homes (Figure 2), so one key component of quality management is to assess how each nursing home is performing vis-à-vis its peers, adjusting for differences in resident populations. Facility-level or system-level antibiograms can help nursing homes set evidence-based guidelines for empirical antibiotic prescribing, so that staff

FIGURE 1.
Schematic Representation of the Process of Antibiotic Prescribing Decision Making and the Role of Antibiotic Stewardship



Note. QAPI, Quality Assurance/Performance Improvement.

FIGURE 2.
Range of Antibiotic Prescriptions Per Resident Across 31 North Carolina Nursing Homes



and providers can chose appropriate first-line agents [18].

Nursing homes also must have infection control nurses who are actively involved and well trained. These nurses should monitor ongoing antibiotic prescriptions and monitor for harms of antibiotic overuse, such as *Clostridium difficile* infections. At the same time, infection control nurses should monitor for possible harms of withholding antibiotics, such as hospitalizations for possible sepsis, and they should provide regular feedback to other nurses on infection control efforts.

Another key to good antibiotic stewardship is challenging the conventional wisdom that nonspecific symptoms, such as not eating or being more confused than usual, indicate an underlying infection that constitutes grounds for empirical antibiotics. Expert opinion states that, in the absence of fever and organ-specific signs or symptoms, the preferred course of action is watchful waiting combined with meticulous attention to care elements—such as pain control, hydration, and bowel management. This process is sometimes referred to as delayed antibiotic prescribing [19].

Nursing homes and their physicians also need to bring antibiotic selection in line with expert recommendations. Particularly problematic is the tendency for physicians to overuse fluoroquinolone antibiotics for suspected urinary and skin infections, which has fostered high levels of resistance among respiratory tract pathogens and helped to fuel the increasing incidence of *C. difficile* enterocolitis [20].

Similarly, good antibiotic stewardship requires appropriate responses to urine and skin cultures. Treatment of asymptomatic bacteriuria does not improve outcomes but instead fosters antibiotic resistance [21], and positive skin cultures often reflect systemic colonization rather than deep tissue infection. In both cases, symptoms and signs rather than a positive culture should guide the clinician's response.

In a similar vein, nursing homes should eliminate inappropriately long courses of antibiotics. Studies show that many clinicians who care for nursing home residents prescribe antibiotics for longer than the treatment duration recommended by infectious disease specialists. This practice is believed to be a major preventable factor in increasing antibiotic resistance and the emergence of opportunistic organisms [23]. Likewise, a potential avenue to reduce antibiotic use overall is to discontinue antibiotics when they are no longer indicated, such as in the face of negative cultures or radiographs.

Another factor in good antibiotic stewardship is education and coordination with emergency departments. Approximately 8% of antibiotic prescriptions in nursing homes are initiated when residents are sent to emergency departments for problems such as falls or mental status changes. In the emergency department setting, nursing home residents often have antibiotics initiated because of patient or family expectations, lack of understanding regarding asymptomatic bacteriuria in elderly patients, or concern that patients will not be monitored or followed post-discharge [22].

Likewise, nursing home residents and families need to be educated about antibiotics. Many people outside the medical profession are unaware that antibiotic resistance is a pressing health concern. Our research has shown that families or other caretakers often feel that antibiotics are indicated when providers do not [24]. Brochures can be helpful in educating these individuals; even more important are one-on-one discussions between nursing home staff

and concerned residents or family members. Also useful are family nights that include an educational component stressing the benefits of antibiotic stewardship and the harms of antibiotics at the level of the individual patient.

Nursing home programs that have sought to implement expert guidelines for antibiotic prescribing, such as the Loeb Minimum Criteria for antibiotic initiation, have had difficulty reducing antibiotic prescribing [14, 25]. Reasons likely include the relative unreliability of patient histories and the paucity of physical examination and laboratory data at the point of decision making, both of which make it difficult for clinicians to have adequate information to meet guidelines. As a result, an approach that focuses on when *not* to prescribe may be more likely to lead to behavior change in nursing homes, as was demonstrated by the clinical trial carried out by our research team [6]. Implementation of such an approach should be based on selecting from a list of situations where antibiotics are often prescribed but are seldom needed, as in Table 1.

TABLE 1.
Twelve Common Nursing Home Situations for Which Systemic Antibiotics Are Often Prescribed but Rarely Indicated

1.	Positive urine culture in an asymptomatic patient.
2.	Urine culture ordered solely because of a change in urine appearance.
3.	Nonspecific symptoms or signs not referable to the urinary tract (with or without a positive urine culture).
4.	Upper respiratory infection (common cold).
5.	Bronchitis or asthma in a patient who does not have advanced chronic obstructive pulmonary disease.
6.	Infiltrate on chest x-ray in the absence of clinically significant symptoms.
7.	Suspected or proven influenza in the absence of a secondary infection (but *do* treat influenza with antivirals).
8.	Respiratory symptoms in a patient with advanced dementia, a patient on palliative care, or a patient at the end of life.
9.	Skin wound without cellulitis, sepsis, or osteomyelitis (regardless of culture result).
10.	Small (<5 cm) localized abscess without significant surrounding cellulitis (drainage is required of all abscesses).
11.	Decubitus ulcer in a patient at the end of life.
12.	Acute vomiting and/or diarrhea in the absence of a positive culture for *Shigella* or *Salmonella*, or a positive toxin assay for *Clostridium difficile*.

Situation-Background-Assessment-Recommendation

While affecting more than just antibiotic prescribing, improved communication among providers is a final point that deserves attention. In the nursing home, decisions often rely on telephone communication between on-site nurses and off-site medical providers. Unfortunately, nurses often complain that physicians make them feel rushed during these communications, and physicians often complain that staff contact them without having basic information such as symptoms and vital signs. Tools that help structure telephone decision making, such as the Situation-Background-Assessment-Recommendation checklist shown in Figure 3, can help make these communications more successful.

Implementing and Sustaining Nursing Home Antibiotic Stewardship Programs

A number of resources are available to help guide individual nursing homes or nursing home chains in developing antibiotic stewardship programs. In September 2015, the

FIGURE 3.
Sample Nurse Situation-Background-Assessment-Recommendation (SBAR) Communication Tool

SBAR TOOL FOR COMMUNICATING WITH PROVIDERS ABOUT RESPIRATORY SIGNS AND SYMPTOMS (S/S)

1. SITUATION (brief summary of current problem)

2. RELEVANT INFO
- ☐ Medical history (COPD, vaccine status)
- ☐ Medications and med changes
- ☐ Recent labs
- ☐ Drug allergies/advanced directives

3. VITAL SIGNS
- ☐ Blood pressure
- ☐ Pulse
- ☐ Respiratory rate
- ☐ Temperature *(Fever ≥99° or 1.2°F above baseline; include baseline and highest recorded in the past 24 hours)*
- ☐ Pulse Ox *(include baseline)*

4. NON-SPECIFIC S/S
- ☐ New or worsening confusion
- ☐ New or worsening agitation
- ☐ Decreased eating/drinking
- ☐ New or worsening weakness
- ☐ Sleepy/less active or alert
- ☐ Decline in function
- ☐ Malaise
- ☐ Body aches
- ☐ Headache
- ☐ Other non-specific changes

5. SPECIFIC S/S

<u>Suggests URI/bronchitis:</u>
- ☐ Nasal congestion/drainage
- ☐ Sneezing
- ☐ Sore throat
- ☐ New/worse cough *(+/- sputum)*

<u>Suggests possible pneumonia:</u>
- ☐ Shortness of breath
- ☐ Labored breathing
- ☐ Pleuritic chest pain
- ☐ Changes to lung exam *(focal)*
- ☐ Positive chest X-ray

6. ASSESSMENT

7. REVIEW, RECOMMEND AND NOTIFY

Note. COPD, chronic obstructive pulmonary disease; Ox, oxygenation; URI, upper respiratory infection.

CDC introduced a series of downloadable, Internet-based guides on nursing home antibiotic stewardship. The CDC program identifies and discusses key elements of program development: leadership commitment; accountability; drug expertise (ideally involving both medical staff and a consulting pharmacist); action-oriented policies and practices (such as prescribing guidelines and Situation-Background-Assessment-Recommendation communication guides); tracking and reporting antibiotic usage through data collection and report generation; and education of providers, staff, residents, and families. Materials on each of these topics are available at http://www.cdc.gov/longtermcare/prevention/antibiotic-stewardship.html.

Another resource is the Infection Management and Antibiotic Stewardship program developed by UNC's Cecil G. Sheps Center for Health Services Research. That program's website (https://nursinghomeinfections.unc.edu/) includes continuing education materials for medical providers and nursing staff in addition to downloadable resources such as a brochure for residents and families. Program staff members are available to provide consultation and assistance to nursing homes interested in implementing antibiotic stewardship programs.

Conclusion

Antimicrobial use in nursing homes is high. Antimicrobial drugs are often prescribed empirically and for extended durations [22]. Overuse and misuse of antimicrobial drugs potentially contribute to unintended clinical consequences; increased rates of health care–associated infections [19], colonization, or infection with antibiotic resistant organisms [7]; and potentially severe adverse drug events [26]. Efforts to promote antimicrobial stewardship are the foundation for optimal infection management in nursing homes; however, stewardship activities must be implemented and supported thoughtfully. Antimicrobial stewardship is of utmost importance for optimizing antimicrobial use, stemming the tide of antimicrobial resistance, and improving resident outcomes. Such interventions must be interdisciplinary and setting-specific, and they must make efficient use of the limited quality improvement resources available in most nursing homes. NCMJ

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