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Review Article

Antimicrobial Stewardship in Long-Term Care Facilities: A Call to Action

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A B S T R A C T

Antimicrobial resistance is a global public health crisis and a national security threat to the United States, as stated in an executive order signed by the president in September 2014. This crisis is a result of indiscriminant antimicrobial use, which promotes selection for resistant organisms, increases the risk of adverse drug events, and renders patients vulnerable to drug-resistant infections. Antimicrobial stewardship is a key measure to combat antimicrobial resistance and specifically seeks to do this by improving antimicrobial use. Antimicrobial stewardship compliments infection control practices and it is important to note that these 2 disciplines are distinct and cannot be discussed interchangeably. Antimicrobial stewardship promotes the appropriate diagnosis, drug, dose, and duration of treatment. The appropriate diagnosis falls into the hands of the prescriber and clinical staff. Optimal antimicrobial drug selection, dosing strategy, and duration of treatment, however, often require expertise in antimicrobial therapy, such as an infectious disease–trained physician or pharmacist. Therefore, successful antimicrobial stewardship programs must be comprehensive and interdisciplinary. Most antimicrobial stewardship programs focus on hospitals; yet, in long-term care, up to 75% of antimicrobial use is inappropriate or unnecessary. Thus, one of the most pressing areas in need for antimicrobial stewardship is in long-term care facilities. Unfortunately, there is little evidence that describes effective antimicrobial stewardship interventions in this setting. This review discusses the need for and barriers to antimicrobial stewardship in long-term care facilities. Additionally, this review describes prior interventions that have been implemented and tested to improve antimicrobial use in long-term care facilities.
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Antimicrobial resistance is one of the greatest public health threats in the United States, prompting the president of the United States, the Centers for Disease Control and Prevention (CDC), and the World Health Organization to spearhead initiatives seeking effective solutions.[1–3] The prevalence of antimicrobial-resistant organisms is increasing throughout the United States, as is the use of "last line" and toxic antibiotics to treat infections caused by resistant bacteria.[4] The driving force that selects for antimicrobial-resistant bacteria and promotes *Clostridium difficile* infection is antimicrobial use.[1] Approximately 50% of antimicrobial use in hospitals and up to 75% of antibiotic use in long-term care facilities may be inappropriate or unnecessary.[5,6] As such, it is critically important to the safety of patients that antimicrobial use is improved throughout the entire health care system. Antimicrobial stewardship is typically defined as any activity to improve the drug, dose, duration, or route of an

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antimicrobial.[7] However, stewardship should also focus on an appropriate diagnosis. The primary goal of antibiotic stewardship is to optimize clinical outcomes while minimizing unintended consequences of antimicrobial use.

Implementation of new antimicrobial stewardship programs is challenging, requiring increased resources and time. Despite this, implementation of antimicrobial stewardship programs has been recommended for all health care settings in the United States, including long-term care facilities.[7,8] According to the CDC, over the next 5 years, approximately 619,000 infections due to resistant pathogens and *C difficile* could be prevented with the immediate and national implementation of antibiotic stewardship and infection control interventions.[9] In acute care facilities, comprehensive antimicrobial stewardship programs have been shown to improve the quality of patient care and safety. Through reduction of inappropriate antibiotic use and optimization of antimicrobial therapy, antimicrobial stewardship programs can reduce rates of *C difficile* infection and slow the emergence of antimicrobial resistance.[10–12] However, applying the evidence-based principles of antimicrobial stewardship developed in acute care facilities to long-term care facilities presents significant challenges.[7]

In an effort to support improved antimicrobial use, the Obama administration recently released an executive order (September 2014) and a National Action Plan (March 2015) for combating antibiotic-resistant bacteria.[3,13] This plan specifically calls for strengthening antibiotic stewardship in long-term care settings "by expanding existing programs, developing new ones, and monitoring progress and efficacy."[3] Additionally, for the first time since 1991, the Centers for Medicare and Medicaid service (CMS) has now opened for comments their new proposed rules for long-term care facilities. Proposed recommendations include (1) a required infection prevention and control officer, and (2) an antibiotic stewardship program that includes antibiotic use protocols and a system to monitor antibiotic use. Additionally, the CDC recently released 7 Core Elements of antimicrobial stewardship in long-term care facilities, including (1) facility leadership commitment, (2) accountability, (3) drug expertise, (4) actions to improve use, (5) education, (6) tracking, and (7) reporting.[14] Although progressive, these recommendations face many challenges, particularly due to the paucity of evidence on effective antimicrobial stewardship practices in long-term care. Here, to help advance these efforts, we review the literature describing antimicrobial stewardship efforts in long-term care. Specifically, we discuss the need for and barriers to antimicrobial stewardship in long-term care facilities as well as previous strategies that have been implemented to improve antimicrobial use in this unique setting.

Methods

We conducted a structured review of existing literature related to antimicrobial stewardship in long-term care facilities. This review was conducted to identify (1) the need for antimicrobial stewardship in long-term care facilities, (2) barriers to antimicrobial stewardship in long-term care facilities, and (3) previous studies related to implementation of antimicrobial stewardship interventions in long-term care facilities. We used Medline to perform the structured search using the following relevant key words: antimicrobial stewardship, antimicrobial use, long-term care facility, and nursing home. References in English dated between 1966 and June 2015 were considered. We also conducted a follow-up Internet Search and search of reference lists from relevant studies. Based on a review of titles and abstracts, documents were selected for full text review if they fell into 1 of the 3 categories. All documents selected for full-text review were included in our review article. To describe and synthesize intervention literature, the following were collected from each article: year of publication, infection type, study design, study setting, intervention, unit of analysis, and major findings.

Results

We selected 67 articles for inclusion based on full-text review. Of these, 30 (44.8%) articles were categorized as needs for antimicrobial stewardship, 26 (38.8%) as barriers to antimicrobial stewardship, and 15 (22.4%) as prior studies related to implementation of antimicrobial stewardship interventions in long-term care facilities. Four (6.0%) articles addressed more than 1 category. Needs for antimicrobial stewardship in long-term care can be found in Table 1. These articles included 23 (76.7%) observational studies, 5 (16.7%) review articles, and 2 (6.7%) professional society guidelines. Barriers to antimicrobial stewardship in long-term care can be found in Table 2. These articles included 9 (34.6%) review articles, 5 (19.2%) professional society guidelines/recommendations, and 4 (15.4%) observational studies.

Prior studies related to implementation of antimicrobial stewardship interventions in long-term care facilities can be found in Tables 3 and 4. These articles included 8 (53.3%) quasi-experimental studies, 5 (33.3%) randomized controlled trials, 1 (6.7%) pre- versus post-intervention survey, and 1 (6.7%) systematic review. Of the articles that tested an intervention (n = 14), 78.6% were multifaceted educational interventions. Studies that assessed the impact of interventions on general antibiotic use were most common (n = 7, 50.0%), followed by interventions that target a specific syndrome (n = 7, 50.0%).

Discussion

Need for Antimicrobial Stewardship in Long-Term Care Facilities

In 2013, approximately 1.4 million adults received nursing home care at one of the more than 15,700 facilities in the United States.[15] As a group, the residents of long-term care facilities represent some of the oldest and frailest members in our communities.[16] Based on results from the 2004 National Nursing Home Survey, 45% of nursing home residents were aged 85 years and older, with an average length of stay of 2.3 years.[17] Nearly 80% were dependent for assistance with at least 4 of the 5 activities of daily living: toileting, bathing, transfer, dressing, and eating. Increasing age, frailty, immune senescence, and comorbid conditions render long-term care facility residents vulnerable to infection. Even for experienced clinicians, determining whether a long-term care resident has an infection presents significant challenges. This may contribute to the high prevalence of antibiotic use in this population.[18,19]

Inappropriate and Unnecessary Antibiotic Use in Long-Term Care Facilities

Antimicrobials account for almost half of all prescriptions in long-term care facilities.[20,21] It is estimated that 50% to 75% of residents receive at least one course of an antibiotic each year.[22–24] Unfortunately, many of these prescriptions represent overuse or inappropriate use.[25] A study of 2 community-based nursing homes in Rhode Island found several types of inappropriate antibiotic prescribing patterns related to urinalyses ordered on 172 case residents. Antibiotic treatment was initiated in 70 case residents (41%) that did not meet the

Table 1
Needs for Antimicrobial Stewardship in Long-Term Care Facilities

Needs Identified
High prevalence of inappropriate and unnecessary antibiotic use
Increased risk for colonization with resistant bacteria
Increased risk of *Clostridium difficile* infections and potential complications