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Protecting Our Most Vulnerable: Why Antimicrobial Stewardship for Senior Living Is a Must– Results From Four Large Senior Living Centers

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Background:

Antibiotics are commonly prescribed for nursing home residents, with approximately 10% of them receiving antibiotics at any given time.[1] Overdiagnosis of infections is a significant problem. For example, 30% to 56% of antibiotics are prescribed in nursing homes for treatment of suspected urinary tract infection (UTI), of which one-third of the patients are treated for asymptomatic bacteriuria.[2] Misuse of antibiotics is associated with patient harm, including adverse drug reactions, increased risk of colonization, *Clostridium difficile* infection and multidrug-resistant organisms. The elderly are most vulnerable to side effects related to inappropriate antibiotic use and at highest risk for *C. difficile* complications, which may be deadly. A recent study of 100,000 patients in 600 nursing homes reported 24% greater risk of antibiotic-related adverse events, including emergency department (ED) visits and hospitalization for *C. difficile* infections, diarrhea, allergies, resistant organisms and general medication adverse events, in the nursing homes with high antibiotic use.[3]

Methods:

Ascension Living provides healthcare and related services to seniors in 37 facilities, four of which account for a third of the skilled nursing resident population. We evaluated the use of systemic antibiotics, the diagnosis of facility-onset UTI (based on McGeer Criteria), and *C. difficile* infections in these four large (> 250 resident beds) Ascension Living facilities in four different states. All measures were normalized per 1,000 resident days and evaluated over nine months between July 2015 and March 2016. In addition, we visited the four facilities and qualitatively evaluated factors that may influence antibiotic use through conducting interviews with physicians, nurses and leaders.

Results:

There were 27,255 antibiotic days at a rate of 106.8 antibiotic days per 1,000 resident days (range 24-174). Non-quinolone anti-UTI agents accounted for 22.3 (20.9%) antibiotic days per 1,000 resident days, quinolones for 21.5 (20.2%), cephalosporins 16.8 (15.7%), penicillins 8.0 (7.5%), tetracyclines 8.2 (7.7%), and macrolides 6.31 (5.9%). Facilities A and B had more than six times the antibiotic use of facility D and had the highest rates of UTI ***(Table 1)***. There were marked differences in use of urinary antimicrobials between the four facilities ***(Figure 1)***. Antimicrobials often used for a urinary source were used at a rate of 69.4 antibiotic days per 1,000 resident days for facility A, 72 for facility B, 31 for facility C, and 7 for facility D. *C. difficile* infections were highest at facility A compared to other facilities.

Qualitative evaluation of the four sites:

The two facilities with lowest antimicrobial use had strong physician-nursing partnership with engaged medical directors. Facility D, which had the lowest use of antibiotics, fewest UTIs, and no facility-onset *C. difficile* events, showed a strong team approach with engagement of the physician medical director, the nursing director, the administrator and all the other supporting services. ***Table 2*** describes the themes discussed at the site visits.

Table 1. Antimicrobial use, UTIs and *C. difficile* infections at four facilities

	Facility A	Facility B	Facility C	Facility D	P-value
Antibiotic days	11,087	9,439	5,109	1,620	
UTIs	106	143	31	32	
C. difficile infections	16	4	6	0	
Resident days	63,906	57,871	67,007	66,411	
Antibiotic days per 1,000 resident days	173.5	163.1	76.3	24.4	**< 0.001**
UTIs per 1,000 resident days	1.66	2.47	0.46	0.48	**< 0.001**
C. difficile infections per 1,000 resident days	0.25	0.07	0.09	0	**0.001**

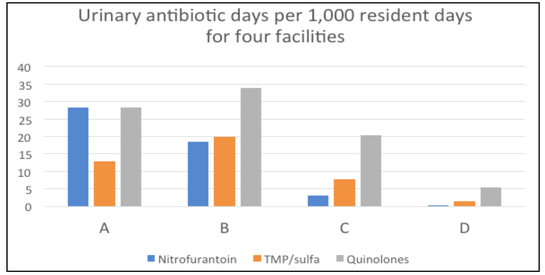

Figure 1. Nitrofurantoin, trimethoprim (TMP)/ sulfamethoxazole, and quinolone rates for four facilities

Table 2. Qualitative themes from the four site visits

Ascension Living site attribute	Advantages and areas of opportunities	Potential improvements
Infrastructure	• Lack of or minimal electronic health records (EHRs) structure • Lack of a simple method to evaluate the different provider practices regarding testing and antimicrobial use	• Having regular reports through EHRs to evaluate trends of antimicrobial use over time • UTIs and *C. difficile* infection rates (already reported publicly) are metrics that can be trended over time. • Currently using the prescribed antibiotics, we can evaluate the proportion of antimicrobials prescribed by each provider but cannot normalize to patients seen by the same provider. Engaging high prescribers can be our initial focus.
Providers	• Wide variation of care, especially for providers that have not "invested" a large proportion of their time caring for the residents at the facility • Accountability of medical directors for quality at the facilities. One of the two facilities with highest utilization had one medical director that does not want to be engaged; the other facility did not properly engage the medical director. • Local practices and referrals may adversely affect utilization (one site with a wound care surgeon with excessive culturing of superficial wounds and antibiotic use)	• Medical directors of the facilities need to engage other clinicians so the care (testing and treatment) is more in line with best practices. Feedback on performance will help all prescribers better address their utilization of antibiotics. • Medical directors engaging practitioners (physicians, nurse practitioners, physician assistants) on best practices and expectations
Nurses	• Understanding the value of urine analysis and cultures and how they affect patient care (so odor, smell, color are not reasons to culture) • Understanding that antimicrobials are not harmless, so evaluation of continued use and engaging physicians would be the norm	• Share educational material with all nurses so best use of testing occurs. • Ensure that engagement of physicians includes a comprehensive evaluation of patient signs and symptoms so that better care decisions are made. • Share CDC core elements of antimicrobial stewardship.
Relationship with hospitals and EDs	• Concern from Ascension Living facilities about misdiagnosis of UTI for patients seen by the ED	• Encourage engagement of the EDs with feedback. In addition, regular reassessment of residents evaluated by the EDs for accuracy of diagnosis.
Testing	• Advantages: No standing orders for urinalysis or cultures. However, some use of urine cultures, especially for residents who experience confusion.	• Work between nurses and physicians on having better parameters for evaluating the confused patient

Discussion:

Significant variation exists between the four facilities. This variation is explained by a wide difference in practice between those facilities. The best outcomes were associated with a strong local team with an engaged medical director. Engaging both nurses and physicians is key to standardizing the care and improving the outcomes. In addition, other stakeholders, such as infection prevention, physical therapy, and other ancillary services, may be of substantial help to promote best practices. For example, at facility D, the infection preventionist also serves as the wound care nurse. The dual function reduced unnecessary culturing of wounds that may result in inappropriate antibiotic use. Physical therapists may also push for mobilizing residents, thereby reducing inappropriate use of urinary catheters.

The physician component is very important. Physicians who are more available may be better able to evaluate patients for antimicrobial need, thus prescribing antimicrobials more carefully. Pushing for the sharing of best practices and the standardization of treatments are first steps to get physicians on board. Medical directors can play a pivotal role in discussing with the other physicians the importance of appropriate testing and optimal antimicrobial selection, for the shortest duration needed.

Nurses have the closest contact with residents and are responsible for evaluating any changes in condition. By ensuring that clear and objective evaluations are done when a change in condition occurs, nurses can better manage this vulnerable population and reduce the likelihood of sharing incomplete information with physicians, which, in turn, reduces the chance of physicians ordering inappropriate tests and treatments.

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