

**Antimicrobial Stewardship and Infection Prevention and Control**

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### **A Scenario**

Mrs. Smith, an 82-year-old woman, recently underwent a total knee replacement and has been admitted to Skilled Nursing and Rehab (SN&R) for therapy. She is very independent, and she lived alone successfully until the pain from her arthritis made it impossible for her to move about safely and comfortably and perform at her normal level of activities. Mrs. Smith has been able to manage her hypertension and diabetes over the years, and she did not suffer from common sequelae like peripheral neuropathy. She does suffer from allergens common to the area, such as mold, cedar, and other pollens. Cognitively she has also been able to manage instrumental activities of daily living such as paying her bills and taking her medications; otherwise, she experienced only normal aging changes in cognition. However, while hospitalized, she did experience delirium, and now, 2 weeks post-surgery, she still feels slightly confused, has lapses in memory about what happened in the hospital, and cannot answer questions of orientation consistently (e.g., What day is it?). At admission, her score on the Brief Interview for Mental Status (BIMS) was 10, indicating moderate impairment.

Mrs. Smith is supported by her daughter Jenny, who lives in a small community about 20 minutes away. Jenny feels that her mother is making good progress in rehab but is concerned about her continuing confusion. On a Friday afternoon when Jenny visits her mother, she notices that her mother has developed cold-like symptoms, sounds congested, and is complaining of a headache. Jenny notifies the nurse and explains that her mother has a long history of allergies that lead to sinus infections. Mrs. Smith usually does well with a round of azithromycin antibiotic and requests that the nurse notify the provider on call. The provider prescribes the

medication, and the first dose is given on Saturday. By Monday, Mrs. Smith is feeling worse and running a fever. Three other residents on the rehab wing have also begun to complain of cold- and flu-like symptoms. The physical therapist assistant (PTA) who has been working with Mrs. Smith calls in sick. Later that day, the director of nursing is notified that the PTA has been diagnosed with the flu. Mrs. Smith and the other residents are tested and diagnosed with the flu as well. For Mrs. Smith, the antibiotic is stopped immediately, and she is treated with Tamiflu. For the facility, the staff post signs to let the public know that flu has been identified, and they provide masks and hand sanitizer in multiple locations. The director of nursing hopes that cases will be limited to the rehab unit, but by Wednesday, two patients in the long-term stay unit and four staff have been diagnosed with flu.

This scenario of inappropriately prescribing an antibiotic for a viral infection is not unique. Nor is the quick spread of the flu virus in a facility even when there is a certain level of awareness and there are preventative measures such as educational signs about hand washing or posters like “Cover Your Cough” by the Centers for Disease Control and Prevention (CDC). This scenario provides an opportunity to explore two important initiatives mandated by the federal government for long-term care facilities, both of which require compliance by 2019. The first is the antibiotic stewardship program; the second consists of revisions to the rules that describe a facility’s infection prevention and control program (IPCP).

## **Antibiotic Stewardship Program**

### **The Problem**

Mrs. Smith was prescribed a common antibiotic for bacterial infections when in fact she had a virus. Of course, viruses do not respond to antibiotics, and in that action, Mrs. Smith became a statistic. Over 70% of nursing home residents are prescribed a course of antibiotics per

year, and 40% to 75% of those prescriptions are inappropriate or unnecessary (Lim, Kong, & Stuart, 2014). Although no immediate harm came to Mrs. Smith other than a delay in appropriate diagnosis and treatment, the potential harm for her as an individual and to the larger community was great. Older adults, especially frail older adults exposed to inappropriate antibiotics, have increased risk of serious diarrheal infections from *Clostridium difficile* (*C. difficile*; CDC, 2015). There is also the risk of increased adverse drug reaction, with recent studies providing evidence that some antibiotics can lead to cases of delirium (Grahl et al., 2018).

Another risk from inappropriate use of antibiotics is colonization and/or infection by antibiotic-resistant organisms. Bacteria can adapt and become resistant to an antibiotic, and the number of antibiotic-resistant bacteria continues to grow. These include methicillin-resistant *Staphylococcus aureus* (MRSA), at one time thought to be transmitted only in hospital patients but now transmitted in the general community. Other resistant bacteria include the more well-known vancomycin-resistant *Enterococcus* (VRE), the less known multi-drug-resistant *Mycobacterium tuberculosis* (MDR-TB), and carbapenem-resistant *Enterobacteriaceae* (CRE), including *Klebsiella* species and *Escherichia coli* (*E. coli*). These bacteria are risks for the general population. The CDC (2018) estimates that more than 2 million illnesses and 23,000 deaths are caused each year in the United States by such antibiotic-resistant bacteria.

### **Actions**

In September 2014, then president Barack Obama issued the executive order “Combating Antibiotic-Resistant Bacteria,” which outlined a plan to reduce the emergence and spread of antibiotic-resistant bacteria and to ensure the continued availability of effective therapeutics for the treatment of bacterial infections (Obama, 2014). A task force was established with the charge to provide a 5-year action plan by February of 2015. By 2016, the Department of Health and

Human Services had to complete a review of existing regulations and provide new regulations to establish antibiotic stewardship programs across healthcare settings. The task force was responsible for creating and implementing stewardship programs in a variety of settings, including long-term care.

Antimicrobial or antibiotic stewardship “refers to a set of commitments and actions designed to ‘optimize the treatment of infections while reducing the adverse events associated with antibiotic use’” (CDC, 2015). The CDC has taken the lead in developing guidelines and programs to create antibiotic stewardship programs in long-term care settings, based on guidelines originally developed for hospitals (CDC, 2014). The state of Texas has taken up this initiative, defining antimicrobial stewardship as a coordinated program that promotes the appropriate use of antimicrobials (including antibiotics), improves patient outcomes, reduces microbial resistance, and decreases the spread of infections caused by multidrug-resistant organisms (Texas Department of State Health Services, 2019). To move the stewardship programs forward, the Texas Department of State Health Services hired a Texas Antibiotic Stewardship Expert to provide education and develop materials to implement programs across the state. As recently as May 2018, the Commissioner of the Department of Health and Human Services wrote a letter advocating the joint effort for antimicrobial stewardship across all settings in Texas (Texas Department of State Health Services, 2019).

While the CDC was moving forward with initiatives to create antimicrobial stewardship programs, the Centers for Medicare & Medicaid Services (CMS, 2015) advanced infection control regulations. Proposed rules required long-term care facilities to designate an infection preventionist (IP) responsible for oversight of the IPCP within the facility. Prevention was a new focus, with the expectation that the IPCP would enable prevention, recognition, and control of

the onset and spread of infection to the extent possible and facilitate reviews and updates annually and as necessary (CMS, 2017). The IPCP is expected to cover not only residents but also staff, volunteers, and visitors, and its written policies and procedures will include an antibiotic stewardship program. The IP can be one or more designated person(s) who works at least part time in the facility and can be a nurse or a person with professional training in medical technology, microbiology, epidemiology, or another related field. The IP is required to dedicate time to perform specific duties based on the needs of the facility and must also show evidence of specialized training in infection prevention and control (CMS, 2017). The IP is expected to also serve as a member of the facility's Quality Assessment and Assurance Committee (QAA). These rules are being phased in, with the establishment of the IPCP by November of 2016, the antimicrobial stewardship program by November 2017, and the final establishment of the IP and involvement of the IP in the QAA program by November 2019. According to data gathered by the Texas State Department of State Health Services, Texas long-term care facilities face challenges in attempting to meet these rules, given that in facilities surveyed, only 17% had documented infection control training (vs. 46% nationally), and only 76% had appropriate policies in place (vs. 91% nationally; Baumann & Fischer, 2019).

## **Programs**

Antimicrobial stewardship is essentially a subcomponent of the overall IPCP. Using the scenario of Mrs. Smith's experience, one can see both the opportunity to promote antibiotic stewardship and how the IPCP would be utilized to prevent or manage a flu outbreak. First, consider the CDC's (2015) core elements of antimicrobial stewardship presented below. The core elements comprise leadership, accountability, drug expertise, action, tracking, reporting, and education.

Leadership, the first core element of antimicrobial stewardship, implies that facility leaders including owners, administrators, and nurse leaders must establish an antimicrobial stewardship culture. Stewardship duties must be included in the job descriptions of the medical director, pharmacist, and nurse leaders. Leaders should communicate expectations of stewardship through written statements and should verbalize the facility's expectations regarding the use, monitoring, and enforcement of stewardship policies. The culture of stewardship requires that leaders create a message, educate stakeholders (e.g., staff, healthcare providers, vendors, patients, and families), and celebrate improvements (CDC, 2015). In Mrs. Smith's facility SN&R, steps could be taken by leadership to create a plan for review and revision of job descriptions to include roles in antimicrobial stewardship. In addition to this concrete step, perhaps the facility's leadership style itself should be evaluated. Some evidence suggests that leadership based on empowerment rather than control may facilitate antimicrobial stewardship (Steinmann et al., 2018).

The second core element of antimicrobial stewardship is accountability. Facility leadership empowers key leaders—the medical director, director of nursing, and pharmacist—to set standards and policies regarding antibiotic use and monitor collected data. Those standards and policies ensure accountability. For instance, the medical director should set standards for antibiotic prescribing for all prescribers working in the facility and then monitor the data to evaluate best practices. The director of nursing can set the standard for front-line nursing's assessments and monitoring of patients' status and reports of changes to prescribers. The front-line nurse's attitudes, beliefs, and education regarding antimicrobial stewardship can affect how information is conveyed and potentially impact a prescriber's decision making. A step that could be taken at SN&R would be for the director of nursing to create an SBAR (situation,

background, assessment, recommendation) tool for communication between nursing and physicians when an infection is suspected. Such tools are currently available for communication regarding suspected urinary tract infections (Agency for Healthcare Research and Quality [AHRQ], 2012). Through education of the front-line nursing staff, the director of nursing has the key role in influencing nurse leaders to ensure that antibiotic medications are prescribed appropriately (Brandt & Heil, 2016).

Accountability can also be provided through antibiotic oversight by pharmacists who conduct medication reviews and data analysis. It is the position of the American Society of Health-System Pharmacists (ASHP) that pharmacists should examine patient outcomes and assess the effectiveness of antimicrobial-use policies. Furthermore, pharmacists should analyze data to evaluate not only clinical but also economic outcomes (ASHP, 2010). Accountability provided by the IP includes tracking of antibiotic starts, monitoring adherence to evidence-based published criteria during the evaluation and management of treated infections, and reviewing antibiotic resistance patterns in the facility to understand which infections are caused by resistant organisms. This requires training, dedicated time, and resources, again suggesting the importance of leadership in support of the antimicrobial stewardship program.

The third core element is drug expertise within the facility, usually provided by the consulting pharmacist. Specialized training in infectious diseases is recommended by guidelines from the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America (Dellit et al., 2007). This element of antimicrobial stewardship can also include partnering with referring hospitals or local infectious disease practitioners who are willing to work with the facility's antimicrobial stewardship program.

The fourth element consists of action through changes in policy and practice. Facilities should implement policies for prescribing antibiotics and practices according to those policies. Policies based on evidence-based guidelines or recommendations reduce the inappropriate prescribing of antibiotics. Long-term care facilities must also have policies in place to address the CMS (2017) requirements for medication regimen review of each patient. Antimicrobial stewardship action would revise policies to specifically review residents' medication when they have been started on an antibiotic. Another example of a policy and procedure would be to adopt guidelines for the assessment of resident symptoms prior to administration of an antibiotic. In the case of Mrs. Smith, having a policy that residents who exhibit cold- and possible flu-like symptoms be screened for influenza would prevent the inappropriate prescription of an antibiotic. Clinical practice guidelines from the Infectious Diseases Society of America recommend that even during periods of low influenza activity, patients with acute onset of respiratory symptoms with or without fever should be screened, especially those who are immunocompromised or at high risk (Uyeki et al., 2018). High risk patients are adults over the age of 65 with chronic pulmonary, cardiovascular, renal, hepatic, or hematological diseases and metabolic disorders, as well as neurological and intellectual and developmental disabilities (Uyeki et al., 2018). Policies should be reviewed annually; examples of policies and practices can be found at the CDC's (2015) website Core Elements of Antibiotic Stewardship for Nursing Homes.

The fifth and sixth core elements are tracking and reporting. A key element to antimicrobial stewardship consists in tracking how and why antibiotics are prescribed and whether they are prescribed in a manner consistent with the facility's or organization's policies. Urinary tract infections, for example, are one the most common infections reported in long-term

care, representing up to 50% of the antibiotics prescribed. Many of these infections are asymptomatic cases (Genao & Buhr, 2012), and there is an initiative within the state of Texas to reduce the use of antibiotics in asymptomatic urinary tract infections (Fisher, 2019). If a facility has developed a policy or algorithm for the assessment and treatment of urinary tract infections based on guidelines such as those presented by the Infectious Diseases Society of America (High et al., 2009), tracking how the algorithm is followed within each case can provide important information for key stakeholders. Tracking compliance to a guideline is an example of tracking a process measure to provide feedback on how policies are being followed. Tracking can also include tracking the amount of antibiotic used by noting starts and days of therapy. Analysis of these data can reduce total days of therapy. Finally, measuring outcomes is important to antimicrobial stewardship. Tracking outcomes such as *C. difficile* infection rates or adverse drug events are two examples. Infection prevention and control committees may be tracking the occurrence of infections such as *C. difficile* currently, but tracking adverse events from antibiotics may be a new action. Tracking these outcomes can validate the antimicrobial stewardship program's effectiveness.

Gathering data, however, is only a first step; reporting comes next. The results of data collection must be shared internally with stakeholders and externally with the larger community. Findings from data collected on processes and outcomes should be communicated by the IP to the QAA committee and on to prescribers, nursing, and staff. This allows for feedback to evaluate policies and to initiate changes in practice. Externally, facilities should report the occurrence of *C. difficile* and other selected antibiotic-resistant bacteria to the CDC's National Healthcare Safety Network (NHSN; <https://www.cdc.gov/nhsn/index.html>). The NHSN is the

most widely used national database for identifying problem areas and measuring the progress of preventive efforts, with the ultimate goal of ending healthcare-associated infections.

The seventh element is education. As indicated above, several levels of education need to be addressed. Nursing leadership includes educating staff on policies, procedures, and rationales for the antimicrobial stewardship program. To improve practice, the IP shares data with prescribing clinicians directly or through the QAA committee. The pharmacist consultant with specialized training educates providers and staff as well. But education must also extend to patients and families so that they are aware of the concepts of antimicrobial stewardship and the need to use the right antibiotic for the right reason at the right time. There are many ways to provide education; many resources are available from the CDC, including material specifically for residents (<https://www.cdc.gov/longtermcare/resident/index.html>). Education and feedback are critical to an antimicrobial stewardship program's implementation: Yam, Fales, Jemison, Gillum, and Bernstein (2012) have described education as a key component in implementation of an antimicrobial stewardship program that reduced the occurrence of *C. difficile* infection and antimicrobial purchasing cost in a rural hospital.

### **Preventing Antimicrobial Resistance**

Beyond the core elements of the antimicrobial stewardship program, the CDC has also created an initiative to prevent the development of antimicrobial resistance. This twelve-step program is divided into four main areas: prevention of infection, effective diagnosis and treatment, effective use of use antimicrobials, and prevention of transmission. The complete document may be found at <https://portal.ct.gov/-/media/Departments-and-Agencies/DPH/dph/HAI/PDF/12StepsPrevAntimicrobResistinLTCFpdf.pdf?la=en>.

Prevention of infections includes providing vaccination (influenza and pneumonia) to residents and encouraging all employees to get necessary vaccines as well. In addition, one must prevent conditions that lead to infections, such as aspiration, pressure ulcers, and dehydration. Unnecessary medical devices should be removed. Catheters and other devices should be inserted only when essential, following proper insertion protocols, evaluating need frequently, and minimizing the amount of time used.

For effective diagnosis and treatment of infections, it is important to use established criteria. In the example of Mrs. Smith, screening for influenza in the presence of her symptoms would have been prudent. To ensure appropriate diagnosis and treatment, it is important to consult infectious disease experts for complicated infections. Avoiding potential outbreaks is a matter of staying informed about local and regional data regarding infectious outbreaks, which can be obtained from the Texas Department of State Health Services. Another important step in appropriate diagnosis and treatment and prevention of further outbreak is to obtain previous microbiology data for any patient transferred into the facility.

Wise use of antimicrobials implies that clinicians must be able to reject the use of broad-spectrum antibiotics and must not minimize days of therapy. This requires a system for monitoring and feedback. It is important to ensure that true infections are treated, not colonization or contamination that can occur with improper culture collection. Finally, if a pathogen has been identified, it must be isolated, and the chain of contagion must be broken with hand hygiene as a basic element. Residents with multi-drug resistant organisms need to be identified and managed appropriately. These steps are basic in preventing antimicrobial resistance in healthcare settings.

### **SN&R Action Plan**

In Mrs. Smith's case, the Director of Nursing took appropriate actions to break the chain of contagion by posting signs about the flu outbreak, increasing handwashing vigilance, and reducing exposure. But what are the next steps in making sure that the antimicrobial stewardship is up and running at SN&R and compliant with regulations for facilities? The American Association of Directors of Nursing Services (AADNS) has provided a set of keys for antibiotic stewardship compliance (Davis, 2017): Section 483.80 of the Code of Federal Regulations requires two main elements: antibiotic use protocols and a system to monitor antibiotic use. Antibiotic protocols inform a system to assess residents for infection using standardized tools and criteria. Helpful resources for identifying assessment tools include the AHRQ (2012) toolkit mentioned before for assessing and treating urinary tract infections. Another frequently referenced tool comprises Loeb's minimum criteria (Loeb, Bentley, Bradley, & Crossley, 2001). Whatever tools are used, protocols must include a review of laboratory reports for susceptibility to agents and whether there is a need to change or whether treatment can be changed to a narrower spectrum antibiotic. Monitoring antibiotics requires a system that records usage and provides feedback to prescribing providers. Monitoring includes the frequency and mode of review and can include compliance with antibiotic-use protocols, ordered laboratory tests and their results, and prescription documentation. Monitoring can summarize antibiotic use from pharmacy data, and it can include types of antibiotics used as well rates of *C. difficile* infections. The antimicrobial stewardship program must also have education protocols, which include the mode and frequency requirements for educating prescribing clinicians and nursing staff.

To meet these criteria, the director of nursing should be familiar with the core elements of antibiotic stewardship for nursing homes presented here. Next, the director should seek out expertise to be a part of the team to evaluate and implement the antimicrobial stewardship

program. The current pharmacist or consulting physician may have specialized training in antibiotic stewardship, but if not, the director could ask whether the consulting pharmacy organization has an expert available. Other resources are the Texas Department of State Health Services and the Texas Antimicrobial Stewardship Expert, who is available for consultation and education. Next, AADNS recommends a focus on teamwork. The antimicrobial stewardship program should not become a single person's responsibility; if it does, it will be unlikely to succeed. The director of nursing can assign one or more people as IP, but the stewardship program must be championed by a team of people with expertise so that they can evaluate, modify, and implement protocols, policies, and procedures effectively. The Minnesota Antimicrobial Stewardship Toolkit offers helpful guidance (<https://www.health.state.mn.us/diseases/antibioticresistance/hcp/asp/ltc/index.html>).

Given the scenario of Mrs. Smith, one of the first focuses at SN&R would be to implement a standardized tool or algorithm for properly scripting when a change of condition should be reported to a physician. In Mrs. Smith's case, having an SBAR for reporting signs and symptoms of upper respiratory symptoms might have led to appropriate testing versus the prescription of an antibiotic. Another focus for SN&R would be to develop a policy for reviewing and understanding microbiology reports, to make sure that they are consistent with the antibiotic prescribed; if the antibiotic is not effective, a process should be in place to address this with the prescribing clinician. This policy might have reduced Mrs. Smith's days on antibiotics. Another policy would be to ensure a protocol for documenting the indication, dose, and duration of antibiotics.

Once these policies, protocols, and procedures are in place, the director of nursing should ensure that the IP monitors and tracks the data. For example, the IP should monitor and track the

documentation on initiation of the antibiotic. The IP must be allotted an appropriate amount of time and resources to perform this task, and the results must be communicated to the QAA committee. Ensuring that the IP has the resources is a commitment from not only the nursing leadership but the entire leadership. Of primary importance is that the IP has the special training needed. Information and educational material are available from the CDC at <https://www.cdc.gov/longtermcare/training.html>. To help the IP and the stewardship team decide what needs to be monitored, there are several resources for SN&R. One is Appendix B of *The Core Elements of Antibiotic Stewardship for Nursing Homes* ([www.cdc.gov/longtermcare/pdfs/core-elements-antibiotic-stewardship-appendix-b.pdf](http://www.cdc.gov/longtermcare/pdfs/core-elements-antibiotic-stewardship-appendix-b.pdf)). Another is the AHRQ toolkit *Implement, Monitor and Sustain an Antimicrobial Stewardship Program* (<https://www.ahrq.gov/nhguide/toolkits/implement-monitor-sustain-program/index.html>).

Collected and reported data drive the educational initiatives that the stewardship team needs to implement and further promote advancement of the antimicrobial stewardship program among providers, staff, patients, and families. With a fully implemented antimicrobial stewardship program, the delayed identification of a potential outbreak of flu and the administration of an inappropriate prescription to Mrs. Smith could be avoided. Implementation of an antimicrobial stewardship program will not only ensure SN&R compliance with CMS regulations but also prevent patients from becoming mere statistics.

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