



Prescription and Long-Term Use of Antibiotics in Hospitals

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One of the most important factors in improving patient outcomes is refining antibiotic use in hospitals. Unintended consequences, such as *Clostridium difficile* (*C. difficile*), diarrhea, and other adverse side effects, are the results of antibiotic use (1). More than 500,000 patients are affected by *C. difficile* infections, leading to more than 15,000 deaths in the United States each year. In addition, growing crises of antibiotic resistance is due to antibiotic use as the driving factor all over the world (2). The well-being of patients is threatened by resistance to antibiotics, and the loss of effective antibiotics imperils our ability to deliver lifesaving medical care, such as surgery and cancer chemotherapy.

Hopefully, antibiotic stewardship programs, as well as programs focusing on antibiotic use, have proven to be effective in reducing these threats. According to published studies, it has been made clear that antibiotic stewardship programs can improve infection cure rates, *C. difficile* infections, and adverse side effects of antibiotics and antibiotic resistance (3).

The core element of hospital antibiotic stewardship program has been released by CDC in 2014 to help hospitals implement and expand effective stewardship programs. To facilitate implementation in hospital of any size 7 core elements were designed (4). They are as follow:

1. Core Element 1 and 2: Leadership Commitment/Accountability

It is highly important to ensure the allocation of necessary resources to support stewardship programs; this goal can be achieved through leadership commitment of hospital executives and board trustees in small and critical access hospitals. Obtaining leadership commitment from the chief medical officers (CMO), pharmacy directors, and nursing leaders can facilitate the engagement of physicians, pharmacists, infection preventionists, and nurses to implement stewardship initiatives to create a strong and

sustainable program (4).

2. Core Element 3: Drug Expertise

To implement antibiotic stewardship programs, a pharmacist, usually one who is on-site, provides leadership and expertise in most critical access hospitals. When possible, having a physician leader is helpful to support pharmacists. Through a variety of educational programs and by participating in multi-hospital stewardship programs, collaborative leaders of stewardship programs can expand their knowledge and experience (4).

3. Core Element 4: Action

There are a number of evidenced-based interventions to improve antibiotic use. However, the decisions on which one(s) to implement should be based on local needs, which are best determined through discussions with providers and reviewing local information on antibiotic use.

Three conditions of community-acquired pneumonia (CAP), urinary tract infections (UTIs), and skin and soft tissue infections (SSTIs) specify most of all antibiotic uses in hospitals; and many studies have demonstrated a number of interventions to improve antibiotic use.

For instance, in community acquired pneumonia, we have to review cases in 48 hours to confirm pneumonia diagnosis versus non-infectious etiology and avoid empiric use of antipseudomonal beta-lactams and/or methicillin-resistant, unless clinically indicated because guidelines suggest that in most cases uncomplicated pneumonia can be treated in 5 to 7 days in the setting of a timely clinical response.

With respect to urinary tract infections, we have to implement criteria for ordering urine cultures to ensure that positive cultures represent infection rather than bladder colonization. Moreover, a urine culture is ordered only if the patient has signs and symptoms consistent with UTI, such as urgency, frequency, dysuria, suprapubic pain, flank pain, pelvic discomfort, and acute hema-

turia. For patients with urinary catheters, urine-based culturing solely on cloudy appearance or foul smell should be avoided in the absence of signs and symptoms of UTI. Non-specific signs and symptoms, such as delirium, nausea, and vomiting, should be interpreted with caution, as they have a low specificity for UTI. Establishing criteria to distinguish between asymptomatic and symptomatic bacteriuria is highly important. Antibiotic therapy for asymptomatic bacteriuria should also be avoided except in certain clinical situations, where treatment is indicated, such as for pregnant women and those undergoing an invasive genitourinary procedure. Fluoroquinolones are not often considered optimal empiric therapy because of using the shortest duration of antibiotic therapy, which is clinically appropriate (4).

For skin and soft tissue infection, diagnostic criteria should be developed to distinguish between purulent and non-purulent infections and severity of illness (i.e., mild, moderate, and severe) so that skin and soft tissue infections can be managed appropriately according to guidelines. Moreover, empiric use of antipseudomonal beta-lactams and/or anti-anaerobic agents should be avoided, unless clinically indicated because guidelines suggest that most cases of uncomplicated bacterial cellulitis can be treated in 5 days if there is a timely clinical response (4).

4. Core Element 5: Tracking

Data are essential for informing and assessing stewardship actions. A variety of data options are outlined below, and some hospitals might also have more individualized measures. Small and critical access hospitals can review options and make decisions based on local needs and resources. The ultimate key is to have a measure, which is useful for stewardship activities, meaningful to providers, and could be tracked over time, to assess improvements. Days of therapy are considered the most useful measure of antibiotic use to inform stewardship efforts. Facilities can electronically capture, analyze, and benchmark days of therapy (4).

5. Core Element 6: Reporting

The reports of critical access hospitals should be consistent with the actions and tracking components of the antibiotic stewardship program (e.g., optimizing diagnosis and treatment for the commonly encountered infections, reducing unnecessary duplicate therapy, etc.). As mentioned above, data on stewardship efforts should be reported not just to providers, but also to hospital leadership, and the board. A key to success is to discuss reporting options with stakeholders to determine optimal timing and format and delivery method(s) for the reports (4).

6. Core Element 7: Education

The limited number of providers, along with the collaborative nature of many small and critical access hos-

pitals, create some unique advantages for providing individualized education compared to larger hospitals. The pharmacist and/or physician leader can provide stewardship education (e.g., optimizing diagnosis and treatment for the commonly encountered infections, reducing unnecessary duplicate therapy, etc.) to individual providers and pharmacists. Specific education for nurses could also be very helpful including criteria for intravenous to oral conversion, optimal technique for culture collection, and criteria for when to obtain a urine culture. Lastly, patient and family education can also improve antibiotic use and empower patients and families to help monitor important adverse events (4).

In Iran, published studies have revealed occurrences of hospital infections with multi-drug resistance (MDR) and pan drug resistance (PDR), so it seems that implantation of antibiotic stewardship programs to prevent antibiotic resistance and use broad-spectrum antibiotics are the priorities of the health care system.

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