Antibiotic stewardship: The role of clinical nurses and nurse educators

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Original Publication Citation

BYU ScholarsArchive Citation
Sumner, Sharon; Forsyth, Sandra; Merrill, Katreena Collette; Taylor, Caroline; Vento, Todd; Veillette, John; and Webb, Brandon, "Antibiotic stewardship: The role of clinical nurses and nurse educators" (2017). Faculty Publications. 5255.
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1. Introduction

Within 10 years of the breakthrough development of Penicillin, antibiotic resistance was reported. According to the Centers for Disease Control (CDC) and Prevention (CDC, 2017), each year 2 million cases of antibiotic resistant bacteria occur resulting in approximately 23,000 deaths in the United States. The World Health Organization (WHO) also reports that approximately 25,000 people die from antibiotic resistant organisms annually in the European Union (WHO, 2014). To combat these alarming trends, antibiotic stewardship (AS) programs have been strongly recommended by the WHO, the National Institute for Health and Care Excellence (NICE) Centers for Disease Control and Prevention (CDC), the International Society of Infectious Diseases, Infectious Disease Society of America, the Society for Healthcare Epidemiology of America, the American Society of Health System Pharmacists, and The Joint Commission (CDC, 2017; NICE, 2016).

Antibiotic stewardship (AS) refers to strategies that limit use of antibiotic agents to the minimum necessary spectrum and duration in conditions for which antibiotics are indicated (CDC, 2017). Some goals of AS are to reduce the development of antibiotic resistance and to improve patient outcomes. A common perception among nurses is that AS is a problem to be addressed by prescribing providers or pharmacists. In reality, because AS affects all venues of patient care (outpatient, inpatient, and long-term care), nurses across the healthcare continuum have an opportunity to play an important role in AS (Manning et al., 2016; Olans et al., 2016).

Successful antibiotic stewardship programs (ASP) utilize a multidisciplinary approach. The CDC Core Elements for Hospital AS suggest that nurses be involved in these multidisciplinary efforts, yet do not elaborate on optimal nursing activities within ASP (CDC, 2017). Although the role of nursing in AS has not been well developed, nurses are uniquely suited to implement successful AS measures at the point of care (Edwards et al., 2011). Further, nurse educators are in a position to promote AS and thereby improve patient outcomes. The aim of this paper is to provide an overview of the current literature related to the role of clinical nurses in AS and identify specific education implementation strategies to support nurses in AS.

2. Antibiotic Stewardship and Nurses’ Role

There is limited published information about the role of nurses in AS and no research studies published about the effect of the nurses’ role in AS (Edwards et al., 2011; Manning et al., 2016; Olans et al., 2016). Manning et al. (2016) outlined specific recommendations for action for practice, education, research and policy related to nurses’ role in AS (Manning et al., 2016). Many of these recommendations have yet to be implemented. For example, nurses at all levels across all clinical settings provide and receive education about AS, partner with interdisciplinary teams, raise awareness and use evidence-based strategies such as antibiotic time outs and national awareness campaigns supported by the CDC or National Health Service (CDC, 2017; NHS, 2017). In other work, authors indicate that nurses are already performing many AS interventions but their efforts are not well understood or integrated across practice (Olans et al., 2016). It is suggested that nurses support AS during the admission process (medication reconciliation, allergy history, antibiotic initiation), throughout the hospital stay (reconciling culture results, dose de-escalation, adverse events), and upon discharge (patient education, outpatient management) (Olans et al., 2016). While it is recognized that staff nurses at the bedside are not prescribers of antibiotics, there remains a collaborative role with AS similar to a number of other quality and safety initiatives such as decreasing healthcare acquired infections or pain management (Edwards et al., 2011). In summary, the few articles that addressed nursing AS indicate that
nurses play an essential role in AS, many nurses are currently performing AS activities and more education is needed for nurses and the multi-disciplinary team to effectively collaborate to fully implement AS in the acute care setting (Edwards et al., 2011; Manning et al., 2016; Olans et al., 2016).

2.1. Nurses as a Point of Care AS Advocate

Based upon this overview of the literature (Grant and Booth, 2009), nursing staff are well suited to provide important AS interventions directly at the point of care. The CDC (2017) suggests implementation of both broad and specific interventions to improve antibiotic use. Successful methods to accomplish this include monitoring antibiotic use and microbiology results followed by communication of recommendations to the health care team. Staff nurses are well positioned to identify opportunities for AS and collaborate to promote AS with the interdisciplinary team.

Examples of AS nursing interventions may include:

1. Facilitating the “antibiotic time-out”. AS guidelines advocate for a review for ongoing need of antibiotics at the 48 hour interval (Table 1)
2. Identifying the use of broad-spectrum antibiotics (Table 2)
3. Identify opportunities for switching from intravenous to oral antibiotics: this action will stimulate discussion regarding indications for antibiotics with the prescribing provider
4. Monitoring and identifying possible adverse events
5. Timely administration of antibiotics to acutely ill patients
6. Assuring cultures are obtained prior to starting antibiotics
7. Appropriate discharge instructions and follow up in the outpatient setting
8. Medication reconciliation
9. Patient education

Table 1
Elements of an antibiotic time-out.

<table>
<thead>
<tr>
<th>Who</th>
<th>All clinicians (prescribers, pharmacist, nurses)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What</td>
<td>Reassess the continuing need and choice of antibiotics</td>
</tr>
<tr>
<td>Where</td>
<td>At the bedside</td>
</tr>
<tr>
<td>When</td>
<td>48 h after antibiotics are initiated</td>
</tr>
<tr>
<td>Why</td>
<td>When the culture results are available and more diagnostic tests are completed, the antibiotics the patient is receiving should be reviewed to determine if they still need an antibiotic or if they need a change in antibiotic.</td>
</tr>
<tr>
<td>How</td>
<td>1. Does the patient need to continue antibiotics?</td>
</tr>
<tr>
<td></td>
<td>2. Based upon the laboratory and diagnostic tests, is there another antibiotic that should be used to treat this infection?</td>
</tr>
<tr>
<td></td>
<td>3. Is the dose of the antibiotic correct?</td>
</tr>
<tr>
<td></td>
<td>4. Does the route of antibiotic administration need to change?</td>
</tr>
<tr>
<td></td>
<td>5. How long should the patient receive the antibiotic(s)?</td>
</tr>
<tr>
<td></td>
<td>a. Should we initiate an automatic stop after this period of time?</td>
</tr>
</tbody>
</table>


Table 2
Types of antibiotics: broad vs. narrow spectrum.

<table>
<thead>
<tr>
<th>Broad spectrum</th>
<th>Narrow spectrum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antibiotics that are useful against gram positive and gram negative organisms. These are often prescribed while waiting for culture results or other diagnostic tests.</td>
<td>Antibiotics that are only useful for specific organisms. These are often used when the type of infection is known or after the culture results or diagnostic tests are received.</td>
</tr>
</tbody>
</table>

Examples

- Terramycin (Doxycycline)
- Phenicol (Chloramphenicol)
- Fluoroquinolones “3rd generation” (Balfloxacin, Gatifloxacin, Grepafloxacin, Levofloxacin, Moxifloxacin, Paufoxacin, Sparfloxacin, Temafloxacin, Tolufloxacin)
- Fluoroquinolones “4th generation” (Besifloxacin, Clinafloxacin, Gemifloxacin, Sitafloxacin, Trovafloxacin, Prulifloxacin)
- Cephalosporins “3rd generation” (Cefcapene Cefdaloxime, Cefdinir, Cefditoren, Cefetamet, Cefixime, Cefmenoxime, Cefodizime, Cefotaxime, Cefpimizole, Cefpodoxime, Cefterax, Cefibutin, Cefitofir, Cefitolene, Cefizoxime)
- Cephalosporins “4th generation” (Cefclidine, Cefepime, Cefteprenam, Cefoselis, Cefozopran, Cefpirome, Cefquinome)
- Carbapenems (Imipenem, Doripenem)

Penicillins (Amoxicillin, Ampicillin, Carbencillin, Dicloxacillin, Nafcilin, Oxcillin)
Glycopeptides (Vancomycin) and bactracin: effective for gram-positive bacteria
Polymixins (Polymixin B, Colistin): effective for gram negative bacteria
Aminoglycosides (Gentamicin, Neomycin, Streptomycin, Tobramycin) and sulfonamides (Sulfamethizole, Sulfamethoxazole, Trimethoprim-Sulphamethoxazole): effective for aerobic organisms
Nitroimidazoles (metronidazole, tinidazole): effective for anaerobes and parasitic infections

* Examples are not inclusive of all antibiotic types.
10. Allergy review (see below).

2.2. Education Strategies

Education of both patients and providers are key aspects of AS programs. Nurses play an important role in health care education and thus are resources for AS. However, nurses need to be supported in this educational role. Nurse leaders and interdisciplinary partners need to facilitate and provide resources for education of nursing staff specifically to support AS before nurses can effectively participate. Most effective changes happen when strong administrative support is generated throughout the organization. With education and support, staff nurses would then be empowered to educate patients and speak with providers about antibiotic resistance, appropriate indications for antibiotic use and potential adverse reactions. To implement an AS program from the ground up, the following steps are recommended for nurse educators.

2.2.1. Ongoing Nurse Education

Update ongoing education or skills days. This may include courses or in-services about correct allergy verification and/or “Antibiotics 101”. It is important for nursing to collaborate with pharmacy, laboratory and infection preventionists to review basic microbiology, allergy basic drug classifications (broad vs. narrow spectrum activity) and their impact on antibiotic resistance. In addition, new nurse orientation needs to be reviewed and revised to reflect AS concepts.

2.2.2. Patient Education

Develop ‘scripting’ for patient education during hospitalization. Discharge instruction documents will need to be updated to reflect AS concepts and bedside nurses will need to be trained to effectively and knowledgeably teach patients these concepts during the discharge process. For example, if a patient is being discharged on an antibiotic, standardized teaching should be implemented. Current standardized teaching materials should be reviewed if the diagnosis includes antibiotics.

2.2.2.1. Example Patient Script

2.2.2.1.1. Script 1: For Patient Receiving Antibiotics.

“This is an antibiotic. Your provider prescribed it because…. You are taking it for…. You need to take this exactly as prescribed. You should take all of your medicine, even if you are feeling better. You should not skip doses, save some for later or share your antibiotic with others. You may have some side effects including…. This is normal. If you have any of the following side effects/symptoms…. you should call your provider.” (NHS.uk).

2.2.2.1.2. Script 2: For Patient Not Receiving Antibiotics.

“There are some things that don't get better with antibiotics. For this reason, your provider did not prescribe an antibiotic. What you can do to feel better is…."

2.2.3. Allergy Review

Nurses frequently assist in gathering and documenting allergy history information from patients and therefore have a unique opportunity to make a valuable AS contribution in this area. Recent data suggest that the majority of documented beta-lactam allergies are not of the hypersensitivity-type and that inaccurate documentation of antibiotic allergies leads to unnecessary use of broad-spectrum alternatives, increased health care resource utilization and more antibiotic-associated adverse events (Shah et al., 2016). By using a structured allergy questionnaire to elicit detailed information about type of allergy, when it occurred, and whether similar agents have been safely used, nurses could better inform antibiotic prescribing choices by clinicians and mitigate unintended consequences of inaccurate documentation. Nurse educators need to ensure that allergy assessments are updated to reflect AS guidelines. Resources are available through the CDC, NHS and WHO that address antibiotic allergies (CDC, 2017; NHS, 2017; WHO, 2014). Providing a script may be helpful to teach nurses how to approach patients about allergies.

2.2.3.1. Script for Allergy Verification Review. “Some people report a history of being allergic to antibiotics. Research shows us that sometimes a normal side effect of antibiotics is interpreted as an allergy. Also, sometimes a person may outgrow an allergy. Therefore, it is important that we discuss with you the specifics about your antibiotic allergy. What antibiotic were you allergic to? What happened when you took the antibiotic? How old were you when you had this allergy? How was the allergy treated? After we review the information you provide to us, your health care team may decide to give you an antibiotic even though you reported being allergic to it. If this happens, we will closely monitor you and want you to report any concerns you may have.”

2.2.4. Provider Communication

Nurses may be hesitant to discuss ordered antibiotics with the prescriber. Nurse educators can help empower nurses to approach providers about antibiotic prescribing through development of scripting and role play scenarios.

2.2.4.1. Example Nurse-Provider Scripts

2.2.4.1.1. Script 1.

“Mrs. Jones culture results are back from the laboratory. The culture is positive for ____. She is currently receiving the following antibiotic(s) ____. Do you want to continue this/these antibiotic(s)?”

2.2.4.1.2. Script 2.

“The sensitivities on Mrs. Jones culture(s) have been received from the laboratory. The report indicates Mrs. Jones’ ____ is sensitive/resistant to ______. She is currently receiving the following antibiotic(s) ____. Do you want to continue this/these antibiotic(s)?”
2.2.4.1.3. Script 3.

“Mrs. Jones is afebrile and tolerating clear liquids, do you want to change her intravenous antibiotic to an oral alternative?”

3. Future Directions and Implications for Nurse Educators

In an effort to comply with AS recommendations and in consideration of best practice, nurse educators need to identify opportunities and provide the support and education required to enable staff nurses to participate in a meaningful way to promote better patient outcomes. AS is an important interdisciplinary program. For AS to be successful, nurse educators must champion staff nurses by providing adequate budget, education and time for AS in their environment.

4. Conclusion

The aim of this paper was to provide an overview of current literature related to the role of clinical nurses in AS and identify specific education implementation strategies to support nurses in AS. Antibiotic stewardship is an important multidisciplinary initiative. Nurses have a significant role to play in AS. Ideally, the gold standard for AS would be nurses at the bedside who promote responsible, targeted, antibiotic use by being able to identify the patients’ pathogen, verify that the pathogen is sensitive to the prescribed antibiotic, communicate discrepancies with the multidisciplinary team and provide appropriate interventions and patient education. These actions are only possible if nursing, laboratory, pharmacy, prescribers and others work together to coordinate their efforts.

Nursing educators have a unique opportunity to help ensure the success of AS by empowering nurses. Educators can provide AS-specific education and work with other AS leaders to develop, pilot and report on nursing-AS activities. In addition, future research is needed to fully evaluate the impact of nursing involvement in AS on patient outcomes.

Conflicts of interest

None to declare.

References


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