

STRATEGIES TO ASSESS ANTIBIOTIC USE TO DRIVE IMPROVEMENTS IN HOSPITALS



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Strategies to assess antibiotic use to drive improvements in hospitals

- ➔ The suggestions outlined in this document are intended to help antibiotic stewardship programs in hospitals assess antibiotic use to see if there are opportunities for improvement.
- ➔ Hospitals reporting data into the National Healthcare Safety Network's (NHSN) Antibiotic Use option could use this assessment tool in conjunction with the standardized antibiotic administration ratio, or SAAR, to target assessments in areas where use is unexpectedly high (www.cdc.gov/nhsn).
- ➔ Facilities that are not yet submitting data to the NHSN Antibiotic Use option could still find this tool useful to assess higher than expected levels of antibiotic use.
- ➔ This tool might also help antibiotic stewardship programs find opportunities for improvement, even in locations where antibiotic use is within expected levels.
- ➔ The suggestions listed here do not represent every opportunity to improve antibiotic use, but are intended to be areas where the potential for improvement is high based on previous studies and experience. Ideally, these assessments will be driven by local data on antibiotic use.



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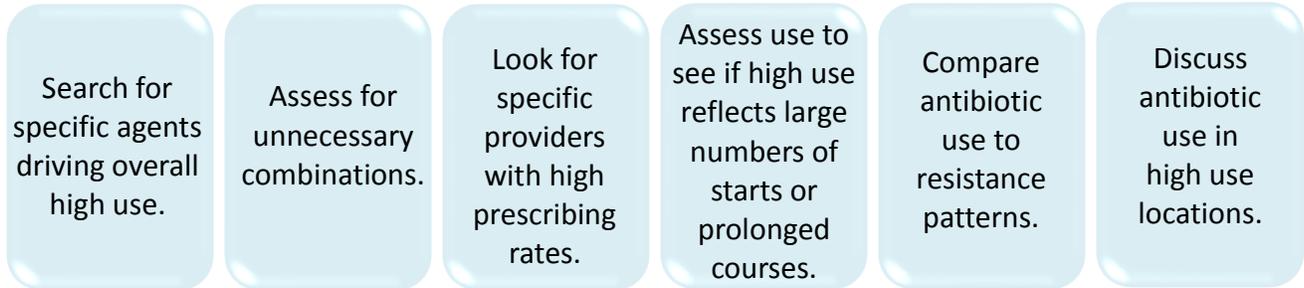


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SAAR or other indicators of antibiotic use show higher than expected values

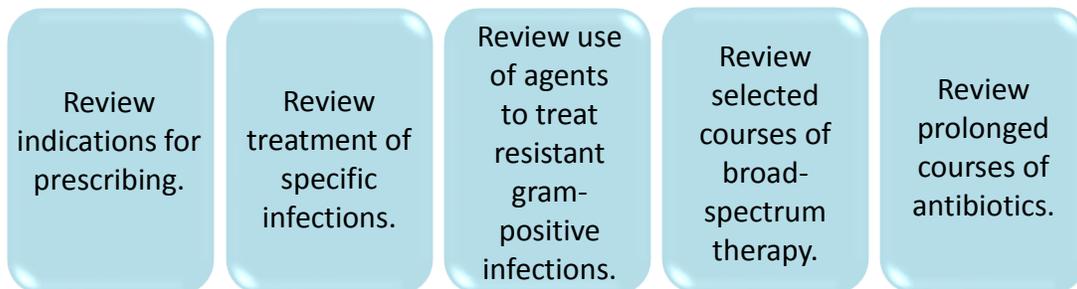


General Assessments



Narrow investigation targets  Medication use evaluations

Detailed Reviews



Stewardship Actions



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Assessing antibiotic use in response to a high SAAR

Assessing location classification

- Check the classification of the location with the high SAAR in the Antibiotic Use option to ensure the classification reflects the patient population.

If a stewardship program is conducting an antibiotic use assessment in a location with a high SAAR, it is important to validate the location's categorization within the Antibiotic Use option. Expected levels of antibiotic use are based on comparisons to general wards and intensive care units (ICUs). If an ICU or step down unit is misclassified as a general ward location, the SAAR will likely be falsely elevated. Likewise, some wards or ICUs might house special populations where antibiotic use is commonly high, like cystic fibrosis or transplant patients. If these units are classified as general wards, the SAAR will likely be elevated. In NHSN, at least 80% of the patients in a location must be considered general ward or ICU patients for the location to qualify as a general ward or ICU location, respectively.

This tool may still be useful in identifying potential opportunities for improvement even in circumstances where a location has been misclassified as a general medical or surgical location. However, if resources are limited you might choose to start improvement efforts by targeting assessments in true general locations with high SAARs where the comparisons to expected use will be more accurate.



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General assessments of elevated antibiotic use

There are some general assessments that might help direct reviews of antibiotic prescribing. The suggestions that follow have the advantage of being possible by accessing only aggregate data, so a chart review is not required. Though most of these assessments may not directly reveal opportunities for improvement, they can help inform more detailed reviews.

Search for specific agents that are driving overall high use.

- Review use rates of individual antibiotics.

Identifying an individual agent or small number of agents that are the largest contributors to overall use can help target further reviews. This information can be obtained directly from the NHSN Antibiotic Use option and can also be obtained directly from most pharmacy systems.

Assess for combinations of antibiotics that are likely to be unnecessary.

- Search pharmacy data for rates of combinations that are usually unnecessary, such as:
 - Concurrent use of multiple agents with anti-anaerobic activity (e.g., piperacillin-tazobactam, ampicillin-sulbactam, ertapenem, meropenem, or imipenem-cilastatin in combination with metronidazole).
 - Concurrent use of multiple agents with activity against resistant gram-positive organisms.
 - Concurrent use of multiple beta-lactams and/or carbapenems.
 - Concurrent use of a respiratory fluoroquinolone (e.g., moxifloxacin or levofloxacin) with a macrolide.

There are some antibiotic combinations that are almost always inappropriate because they represent unnecessary overlaps in antibiotic spectra. This information can be obtained directly from pharmacy data and represents a good target for improvement interventions, for example through automated alerts to remind prescribers that they are ordering a combination that is generally unnecessary.

The most common unnecessary combination is the use of two or more agents with anti-anaerobic activity. Though in rare instances a patient might be receiving a broad-spectrum agent with anti-anaerobic coverage to treat one infection along with metronidazole (usually orally) to treat concomitant *Clostridium difficile* (*C. difficile*), in the majority of instances the use of two antibiotics with anti-anaerobic activity is unnecessary.



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Look for specific providers with high rates of prescribing.

- Assess pharmacy records for providers with high rates of prescribing. Care should be taken to identify the prescribing clinician, which might differ from the admitting or attending clinician.

In some instances, high antibiotic use in a location might be driven by a single or few providers. Many pharmacy systems can generate information on prescribing rates per provider, which might identify outliers. When such high prescribers are identified, further work will be required to determine if there are specific factors that are driving that high use, including case mix severity, which will require chart reviews or automated electronic medical record (EMR) data extraction to help investigate appropriateness. Conducting reviews of providers with high prescribing rates can be an efficient use of resources.

Assess durations of therapy.

- Estimate durations of antibiotic courses directly from pharmacy data.
 - Overall duration for a given antibiotic can also be estimated by dividing the total days of therapy for that antibiotic by the total number of unique medical record numbers in a location who got the agent in a given period of time.

One key step in targeting further reviews is exploring if high antibiotic use reflects smaller numbers of patients getting prolonged courses of therapy or larger numbers of patients getting short courses. The former might direct reviews to look at prolonged antibiotic courses to assess the appropriateness of durations. The latter would direct reviews to antibiotic starts, usually for empiric therapy. The frequent use of short course of antibiotics may indicate that the threshold for starting antibiotic therapy is unduly low (e.g., treatment of stasis dermatitis or congestive heart failure).

Compare antibiotic use to resistance patterns.

- Look for potential inconsistencies; for example:
 - High levels of carbapenem use in a hospital or location with low rates of extended spectrum beta-lactamase producing organisms.
 - High levels of agents with activity against resistant gram-positive organisms in hospitals or locations where methicillin-resistant *Staphylococcus aureus*, or MRSA, is infrequently identified.

There are some potential inconsistencies between antibiotic use and resistance data that could suggest opportunities for improvement. Finding such inconsistencies will require further review to determine why the agents are being used, but might help target reviews to specific agents. Unfortunately, there are not specific criteria for what levels of resistance would justify switches in empiric therapy, but comparing local resistance data to use might help identify potential opportunities for improvement.



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Discuss antibiotic use with providers in the locations with high use.

- Discuss to determine if there are theories on what factors, specific infections, and/or providers might be driving high use.

Often, staff working in locations with high antibiotic use will have thoughts about what factors and/or which providers might be responsible. Though these theories would have to be assessed through more detailed reviews, they could help direct efforts.



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More detailed reviews of antibiotic use

Ultimately, finding specific targets for antibiotic use improvement interventions requires some degree of review of individual prescriptions. However, the steps above might help pinpoint areas where further investigation would be particularly useful. The following strategies require review of individual prescriptions and are suggested as being potentially high-yield.

Review indications for prescribing.

- Review for key antibiotics, especially those often used to treat highly resistant pathogens.

There are a number of common examples where antibiotics are prescribed outside of treatment guidelines. These often represent good opportunities to improve use. Prescriptions can be examined to see if indicated uses are aligned with national and/or local guidelines. While some of these cases may be justified, further exploration is likely to be high yield. This type of review is greatly facilitated in hospitals that require an indication when antibiotics are ordered. In hospitals where this is not required, stewardship programs could look at a sample of admitting and/or discharge diagnoses for patients given specific antibiotics.

Some important examples of “indication mismatch” include situations where antibiotics predominantly used for drug-resistant pathogens are being used to treat community onset infections, e.g., piperacillin/tazobactam being used to treat community acquired infections where there is no concern for a resistant infection.

Review treatment of specific infections.

- Review treatment of common, community acquired infections: pneumonia, urinary tract infections and/or skin and soft tissue infections.

Three common infectious diagnoses—lower respiratory tract infections, urinary tract infections, and skin and soft tissue infections—account for more than half of all inpatient antibiotic use. Previous studies have demonstrated that there are significant opportunities to improve antibiotic prescribing for all three. Improving the management of these conditions is also aided by well recognized best practices and guidelines. CDC has developed assessment tools that can help stewardship programs review cases of treatment of community acquired pneumonia and urinary tract infections to see if the infections are being diagnosed and treated in accordance with best practices (<http://www.cdc.gov/getsmart/healthcare/implementation.html>). These tools can be modified for local needs.

For community acquired skin and soft tissue infections, past studies have found improvement opportunities in ensuring initial therapy and duration of therapy are guideline concordant. Deviations from these practices can be important improvement opportunities.



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These reviews are greatly facilitated in hospitals that require an indication when antibiotics are ordered. In hospitals where this is not required, stewardship programs could look at a sample of patients who had an admitting and/or discharge diagnosis for one of these three conditions.

Review use of agents to treat resistant gram-positive infections, especially vancomycin.

- Review cases where pharmacy records reveal patients received more than three days of therapy with an agent used to treat resistant gram-positive infections, e.g. vancomycin. Reviewing cases where the drugs were given for more than three days will focus on therapeutic, rather than empiric use.
- If vancomycin is the recommended empiric therapy for MRSA in the hospital, the program may also choose to review starts of other antibiotics used to treat resistant gram-positive infections.

Vancomycin is one of the most commonly prescribed antibiotics in hospitals. Empiric use of vancomycin is appropriate in a large number of situations since methicillin resistant *S. aureus* is such an important cause of both community and healthcare associated infections. However, vancomycin (and other drugs used to treat MRSA) can often be stopped if appropriate cultures do not grow MRSA. Moreover, these drugs should almost always be switched to a beta-lactam when appropriate cultures grow methicillin-susceptible *S. aureus*.

A review of a sample of patients receiving these agents can help see if use can be improved. CDC has developed an assessment tool that can help guide the review of the use of antibiotics used to treat resistant gram-positive organisms (<http://www.cdc.gov/getsmart/healthcare/implementation.html>). This tool can be modified for local needs.

Also, in many hospitals, vancomycin is the recommended empiric therapy for infections potentially caused by resistant gram-positive organisms. If that is the case, reviewing cases where other agents active against resistant gram-positive organisms were started empirically might help reveal deviations from hospital recommendations.

Review selected courses of broad-spectrum therapy.

- Review cases of empiric broad-spectrum therapy to look for missed opportunities to de-escalate or stop therapy, for example:
 - Cases where culture results show no organisms.
 - Cases of sepsis.

In most instances, antibiotics are started empirically. Therapy should always be re-assessed when more information is available to determine if the antibiotics should be changed or stopped. This can be especially important in cases of presumed sepsis where there is a critical need to start broad-spectrum antibiotics quickly and an equally important need to re-assess that therapy for optimization or



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discontinuation when more clinical data are available. Reviewing cases where broad-spectrum agents and/or multiple agents are prescribed initially is especially high yield.

Review prolonged courses of antibiotics.

- Review pharmacy records to identify instances where antibiotics were prescribed for more than 10 days to see if the prolonged durations are in accordance with treatment recommendations.

Though some infections require prolonged courses of antibiotics, many infections can be treated with courses of less than 10 days. Reviewing prolonged courses of therapy may help identify clinical situations and/or infections where antibiotics are being continued for too long.



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Cross sectional assessments of antibiotic use

Evaluate medication use.

Medication use evaluations are commonly employed to assess the use of a particular drug within the hospital. The advantage of these evaluations is that they afford an opportunity to look at a variety of different potential problems with antibiotic use.

For example, a medication use evaluation can address such issues as:

- Were cultures obtained before antibiotics were initiated?
- Did the patient have signs and/or symptoms of infection when the antibiotics were started?
- Was the correct diagnostic testing done for the suspected infection?
- Was the infection diagnosed correctly?
- Was the antibiotic used in accordance with hospital and/or national guidelines?
- Was the antibiotic dosed correctly?
- Was the antibiotic discontinued or de-escalated when it should have been?

The primary drawback to medication use evaluations is that they can be time consuming because they usually require detailed chart reviews. However, there is also the option to do a focused medication use evaluation to address a specific issue. There are a variety of tools available to assist with medication use evaluations (https://www.shea-online.org/images/priority-topics/%20Drug_Use_Evaluation_Form.pdf).



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