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The Problem of Suboptimal Antibiotic Use. Why Does it Occur? How Do We Solve it?

It is well-documented that 30-50% of antibiotic use is unnecessary or suboptimal. Given that fact, why do Antibiotic Stewardship (AS) programs have such difficulty gaining physician acceptance? Rather than disparaging physicians for not complying, the first step to attaining higher physician acceptance rates is to understand and appreciate their points of view.

There are informational, legal and emotional reasons that conscientious and hardworking physicians are prone to suboptimal antibiotic use. Reasons include:

1. Antibiotics and Microbiology are **complex and rapidly changing**. There is an entire medical subspecialty of Infectious Diseases (ID) devoted to the understanding of these areas. A non-ID physician cannot be expected to master this discipline, which includes the nuances of ~100 commonly used antimicrobials and countless microbes.
2. Diagnostic **uncertainty**. The majority of clinical infections, even with a state-of-the-art laboratory, are not defined microbiologically, especially upon initial evaluation. Microbiology lab reports usually are not available for days. Distinguishing bacterial infections from viral infections or other inflammatory conditions on first examination is not reliable. Initial therapy is therefore often empiric and guided by predicting the microbiology of a specific syndrome. Without culture data, the physician may be concerned he/she may be undertreating an un-isolated, unknown organism. Prescribing broad spectrum antibiotics helps relieve the uncertainty and the fear of treatment failure. Ironically, treatment failure and secondary complications may be more likely when the broad spectrum approach is overutilized.
3. **Toxicity of antibiotics is not obvious**. When penicillin and sulfa drugs were first introduced in the 1930's and 40's they were hailed as 'miracle drugs'. They were thought to cure without side effects. This mindset has persisted well into the 21st century with many physicians prescribing antimicrobial chemotherapy with the thought, 'What's the harm?' This attitude has endured because many of the adverse effects of antibiotic use are not easily visible or measurable. There is no blood test or physical finding to demonstrate the immunologic consequences of the obliteration of the normal flora, now known to be a necessary component of a healthy immune system. One cannot see on physical exam the colonization with resistant organisms caused by prolonged antibiotics. Secondary infections such as Clostridium difficile colitis, disseminated yeast infections, etc. are often not perceived as direct antibiotic toxicity by clinicians. Of course, overt side effects are also common. Antibiotics are the most common cause of drug reactions and account for 19% of all ER visits for adverse drug reactions. Other serious overt toxicities include renal failure, cardiac arrhythmias, hepatitis, cutaneous reactions, fevers, glucose irregularities and mental status changes, among other serious reactions.

4. **Resistance to De-escalation** or the 'Don't fix it if it ain't broke' mentality is pervasive. De-escalation of very broad spectrum antibiotics is recommended for hospitalized patients on days 2-4 of therapy, when culture data has become available. Therapy is to be more precisely targeted to avoid superinfections and unnecessary toxicity. If the patient is improving from severe sepsis, the physician often is reluctant to narrow the therapeutic spectrum due to fear of relapse. This same mindset explains the common tendency to give excessively long durations of antibiotics when usually shorter durations are recommended. Again, as described earlier, this reluctance stems from a lack of confidence in microbiology data and lack of appreciation of the toxicity of antibiotics. An alternative explanation is the physician is often so busy that when he/she sees the patient doing well, he/she feels there is no need to reevaluate the antibiotics since they appear to be working.
5. Physicians, like all of us, fall into work **habits** or methods that have made them efficient and effective in the past. Changing habits is never easy. Many active physicians were trained during the 80's, 90's, or early 2000's, when habits of profligate antibiotics were more accepted. A Stewardship physician or pharmacist will often hear the phrases: 'This has always worked for me.' 'I have been practicing for years and don't want someone else telling me how to practice.' For AS success, physicians should be to be presented with data as to why a change in habits will benefit his/her patients. The relevant information is best appreciated by the physician when he/she actually needs it, i.e., during the actual moment of the prescription, embedded in the normal work flow.
6. Antibiotic Stewardship principles encourage physicians to withhold antimicrobials until a clear infection that needs treatment is identified unless the patient is at risk for severe sepsis. However, an opposing concern often guides physicians. That is, if for some reason things go wrong and the patient has a poor outcome, it is easier to defend having 'done something' by giving antibiotics than to be perceived as passive or inattentive for having withheld antibiotics. That is to say, sins of commission are easier to defend than sins of omission when a case is under review. This **need to appear active and interventional rather than observational and supportive** is pervasive. Pressure from concerns of malpractice or patient/family complaints are often cited by physicians.
7. **Control.** Physicians generally do not appreciate unsolicited advice from a person who has not examined the patient, has not received comparative medical training, or who he/she perceives as having different goals for patient care. Decades of ever-increasing practice constraints from government regulations, insurance company restrictions and hospital cutbacks have encroached on traditional physician authority and art. A defensive attitude among physicians is the result. Representatives of the hospital administration, including pharmacists, are perceived as having different goals than the physician. The pharmacist's call often sounds like it is more about saving drug costs for an administration than what is best for the patient. The physician is often in no mood to do a 'favor' for an administration perceived to be at odds with the various needs and goals of the physician rather than a partner in achieving optimal patient care.

8. It has been shown that as fatigue sets in over a long day, prescribing habits change. Pressure to be efficient is constant. It is **easier to simply prescribe the antibiotics than to worry over the patient**. If the physician just proceeds with broad spectrum therapy, then the patient is 'covered' and the physician expends less mental and emotional energy.
9. The **physician simply does not have all the salient information** to allow for truly optimal antibiotic selection and dosing in hand at the moment of writing orders. For a list of variables needing consideration prior to prescribing antibiotics see [Selecting Optimal Antibiotics](#). There is no single practical resource for the busy physician that can guide him/her through antibiotic prescribing. Handbooks or apps that give a physician a drug of choice for a certain syndrome or publish some dosing regimens cannot take into account all of the real life considerations of prescribing antibiotics. From the point of view of a coordinated resistance control program, there is no method for the physician to know what antibiotics other patients on the unit are receiving or that a specific type of resistance is current. Without embedded decision support, it is much more efficient for the physician to just give broad spectrum antibiotics with best guess at optimal dosing.
10. Patient expectations and beliefs are an important component of the healing process. The **emotional concerns of the patient and family** are an important component of recovery. The reassurance of knowing the physician is administering modern, high-tech medicines has a powerful effect on patient perceptions and peace of mind. Not receiving a 'curative' medicine gives the patient a sense of uncertainty and foments a lack of confidence. Hence, there is considerable pressure from patients/family to prescribe antibiotics for fevers or any illness that implies an underlying infection. There is little patience for the 'Wait and See' approach. The toxicity of antibiotics is little appreciated by the ill patient and family.
11. **Lack of fully qualified and trained personnel on hand to assist the physician**. Ideally, a stewardship-minded Infectious Diseases specialist would be immediately available with the physician for every antibiotic prescription. Hospitals cannot afford a cadre of specially-trained pharmacists to round with all physicians 24/7, and such a cadre is not available even if money were no object.

The Antibiotic Adjuvant solution addresses these barriers to physician compliance by making it easier for physicians to practice the art of medicine and not burdening them with phone interruptions and challenges to their medical care plans.

1. Embedded Education with each decision, like having a knowledgeable infectious diseases pharmacist there with the physician during the prescribing process.
2. Decreased uncertainty and added emotional support for the physician provided by algorithm evidence based results.



3. Clearly directed to improved patient care, not just to reduced antibiotic costs.
4. Speed and efficiency. Less interrupting calls. Very rapid click through to select and dose antibiotics.
5. Maintains an acceptable level of physician control.
6. Algorithms address ~90% of daily antibiotic prescribing events.
7. Guided Infectious Diseases or ID pharmacist support for situations that fall out of algorithms or other designated instances.