

Role of Technology in Antimicrobial Stewardship

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KEYWORDS

• Antimicrobial stewardship • Electronic medical record • Social media • Technology

KEY POINTS

- Incorporating the electronic medical record and clinical decision support systems to perform antimicrobial stewardship activities is an important avenue for time optimization.
- Web sites and mobile applications are able to provide vast amounts of medical information that is easily retrievable.
- With the increase in pertinent information available regarding antimicrobial utilization, social media can be used to disseminate up-to-date educational materials to providers and patients.

INTRODUCTION

Because of the increasing plague of antimicrobial resistance (AR) and antibiotic misuse, antimicrobial stewardship programs (ASPs) are now a mandatory entity in all US hospitals.^{1,2} Depending on the resources available to the institution, ASPs can target low-hanging fruit, such as intravenous (IV) to oral conversions, or high-impact targets, such as blood culture automated reviews with prospective audit and feedback.^{3,4} The more an ASP attempts to take on, the more important time efficiency becomes. Technological advances, such as the electronic medical record (EMR), clinical decision support systems (CDSS), mobile applications (apps), and social media, are important avenues for ASPs to optimize their time.⁵

INCORPORATING THE ELECTRONIC MEDICAL RECORD

By simply implementing an EMR, Cook and colleagues⁵ showed that an ASP can increase the number of charts reviewed and interventions made compared with paper

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charts, which correlated with a 28.8% decrease in broad-spectrum antimicrobial use (AU). The antimicrobial stewardship capabilities of 2 of the most common EMRs, Epic and PowerChart [Cerner], have recently been reviewed.^{6,7} Some of the capabilities include tracking interventions, dose checking alerts, best practice alerts, antimicrobial time-outs, restriction processes, and IV to oral monitoring. All of these are key components to a successful ASP.

One of the most common ways to use the EMR for antimicrobial stewardship is to incorporate antibiotic restriction processes.^{6,8} Using the order entry system (Siemens/Cerner Invision), Lambl and colleagues⁸ placed a restriction to fire whenever a fluoroquinolone or clindamycin was prescribed. This restriction prompted the provider with a rationale for avoiding these agents and a list of approved indications. If a clinician selected a nonapproved indication, a phone intervention was triggered for review by a pharmacist or infectious diseases (ID) specialist. This built-in restriction resulted in a 91% reduction in days of therapy per 1000 patient days for clindamycin and fluoroquinolones, which in turn correlated with a 24% reduction in hospital-acquired *Clostridium difficile* infections ($P = .05$).

Another tactic is to implement an antibiotic time-out into the EMR. In one study, the impact of an antibiotic time-out was compared with the previous workflow, which involved vancomycin and piperacillin/tazobactam use beyond 3 days requiring approval by the ID fellow, pharmacist, or attending physician. With the time-out, the ID approval was waived and antibiotic continuation was approved if the provider completed a renewal template. The electronic antibiotic time-out led to similar rates of antibiotic discontinuation compared with the historical requirement for approval from an ID practitioner but was much less labor intensive.⁹ Another study used a daily prompt in the EMR that reminded clinicians to ensure all antimicrobials have an appropriate indication and stop/review date recorded. On implementation of this intervention, 96% of orders were recorded to have an indication and stop date.¹⁰

When antimicrobial stewardship interventions are integrated into the EMR, it is important to keep in mind the needs of the hospital practitioners. An overabundance of alerts can cause alert fatigue with eventual desensitization. It is also important to keep the workflow efficient and allow deviations from the typical order set to prevent loss of autonomy.¹¹ Structuring interventions to the sociocultural antibiotic prescribing practices and technologically available resources is critical.

CLINICAL DECISION SUPPORT SYSTEMS

Electronic CDSSs, whether contained within an EMR (eg, Epic's Antimicrobial Stewardship Module) or a stand-alone product (eg, Theradoc [Premier], Senti7 [Wolters Kluwer]), can play a critical role in ASPs. CDSSs have the ability to generate real-time alerts and reports to help ASPs identify patients for potential interventions.

Real-time alerts can include the following:

- Patients with positive blood cultures
- Patients with rapid diagnostic test results
- Patients ordered a specified antimicrobial
- Patients with cultures for a specified microorganism (eg, *Staphylococcus aureus* or *Pseudomonas aeruginosa*)

Reports can include the following:

- Patients on antimicrobials for defined time periods
- Patients who are candidates for IV to oral conversion
- Patients with decreased renal function

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