Antibiotic use in Hospitals in the United States

Two main goals of antimicrobial stewardship programs are to measure and improve the appropriate use of antimicrobials. Two recently published studies provide important information about antimicrobial use in US hospitals and highlight targets for stewardship interventions.


Magill et al. performed a multistate, acute care hospital antimicrobial-drug use prevalence survey from May to September 2011 to determine the prevalence of inpatient antimicrobial-drug use, the most common antimicrobial drug types, and the reasons for their use. Participating hospitals performed a 1-day survey that included a random sample of acute care inpatients identified from the morning census on the survey date. Data collectors reviewed medical records on the survey date to determine whether patients may have been receiving intravenous, intramuscular, inhaled, or enteral antimicrobial drugs. Surveillance epidemiologists then collected information on antimicrobial drugs by retrospectively reviewing medical records of patients who met the following screening criteria:

1. The patient was administered or was scheduled to be administered at least 1 antimicrobial drug on the survey date or the calendar day prior to the survey date.
2. The patient was a patient undergoing dialysis who received or was scheduled to receive parenteral vancomycin or an aminoglycoside during the 4 days prior to the survey date.
3. The patient’s antimicrobial drug information was unknown or was not available at the time of the survey.

Data collectors recorded the following information about each antimicrobial: rationale for use (treatment of infection, surgical prophylaxis, medical prophylaxis, a noninfection-related reason, or unknown rationale), anatomical site of infection, and location of onset (survey hospital, other health care facility, or community). Overall, 183 hospitals and 11,282 patients participated in the survey.
The paper's main findings include:

- Half of the patients surveyed met antimicrobial use screening criteria, and of these patients, almost all received or were scheduled to receive antimicrobial drugs on the day of the survey or the day before the survey.
- The prevalence of antimicrobial use was 49.9% (95% CI, 29.0% - 50.9%) and was higher in critical care units than in other locations (57.7% vs. 48.6%).
- Of patients who received antibiotics, half received more than one antimicrobial drug.
- 76% of patients received antimicrobials to treat infections, 19% for surgical prophylaxis, 7% for medical prophylaxis, 1% for noninfection-related reasons, and 7% for no documented rationale.
- The most common site for which patients received antimicrobial drugs for the treatment of infection was lower respiratory tract (34%), followed by urinary tract infection (17%), skin and soft tissue infections (15%), and gastrointestinal infections (11%). 9% of patients receiving antibiotics were treated for infections of undetermined site, including empirical therapy for suspected infection.
- There were 83 different antimicrobial drugs administered to treat infection, the most common of which were parenteral vancomycin (14%), ceftriaxone (11%), piperacillin-tazobactam (10%), levofloxacin (9%), and azithromycin (5%).
- Most antimicrobial treatment was for community-onset infections.
- Antimicrobial drugs given only for surgical prophylaxis were largely consistent with current guidelines.

**Assessment of empirical antibiotic therapy optimization in six hospitals: an observational cohort study.**

Braykov et al. were interested in how empirical antimicrobial use is optimized in the general hospital population. They assessed this by measuring the frequency with which patients were started on empirical antimicrobials, characteristics of the empirical regimen and the patients at the time of starting antimicrobials, patterns of changes to empirical therapy at different time points, and modifiable factors associated with changes to the initial empirical regimen in the first 5 days of therapy. The study consisted of chart reviews of adult inpatients receiving one or more antimicrobials in six US hospitals on 4 days during 2009 and 2010. The primary outcome was the modification of antimicrobial regimen on or before the 5th day of empiric therapy.

Across the six hospitals, 6,812 patients were admitted on the four review dates, of whom 4,119 (60%) had an active antimicrobial order. Of these, 730 patients were randomly selected for further analysis.
The paper’s main findings include:

- Broad-spectrum and extended-spectrum antimicrobial regimens accounted for the most empirical use.
- Fluoroquinolone monotherapy was the most common prescription (18%).
- Piperacillin-tazobactam and vancomycin, alone and in combination, accounted for more than 22% of regimens.
- Nearly a third of patients receiving empirical antibiotics had neither a fever nor an elevated white blood cell count.
- Narrowing or discontinuation occurred in 29% of patients at any point after a course was started (9% by day 3 and 22% by day 5).
- The median duration before courses were narrowed/discontinued or escalated was 4.0 days (IQR 3.0 – 5.0) and 4.5 days (IQR 3.0 – 6.0), respectively.
- Narrowing or discontinuation was more common for UTIs and when more than one site was suspected as the origin of infection.
- Admission to a facility with preauthorization or prospective review antimicrobial stewardship program seemed to show an association with narrowing or de-escalation, but was not statistically significant.

In the final generalized linear model for change to therapy by day 5, the collection of microbiological culture at the start of therapy was associated with narrowing or discontinuation of therapy (OR 1.68, 95% CI 1.05-2.70), as was the lack of infection noted on an imaging study (OR 1.76, 95% CI 1.11-2.79). Escalation was associated with multiple infection sites (OR 2.54, 1.34-4.83) and the presence of a positive culture (OR 1.99, 1.2-3.29).

**Summary points for stewardship:**

- Broad-spectrum and extended-spectrum antimicrobial regimens are common, and de-escalation therapy is not commonly performed.
- Obtaining culture data and an imaging study at the start of therapy were associated with narrowing or earlier cessation of antibiotics.
- Approximately two-thirds of all antimicrobial drugs were given to treat lower respiratory tract, urinary tract, or skin and soft tissue infections. Focusing stewardship efforts on these three infection syndromes, specifically by obtaining culture and imaging data at the start of therapy when these syndromes are suspected, could address more than half of all inpatient antimicrobial drug use.

**References:**