ANTIBIOTIC STEWARDSHIP

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- Issues associated with use of antibiotics were recognized shortly after their introduction into clinical medicine in the early 1940s.

- The introduction of new antibiotics during the next decade saw increasing and often inappropriate use of these agents.

- In 2010, 258 million courses of antibiotics were prescribed to outpatients in the United States, a rate of 833 per 1000 population.

- Approximately 60% of all hospitalized patients in the United States receive at least one dose of an antibacterial drug during hospitalization. About 50% of this use is considered unnecessary or otherwise inappropriate.

Unwanted consequences of antimicrobial therapy

- Adverse reactions
- Increased morbidity and mortality
- Increased length of stay
- Increased cost of hospitalization
- Predisposition to secondary infections
- Emergence of drug-resistant microorganisms

- Antimicrobial drug use is at least partially responsible for:
  - The rising incidence of serious infections caused by:
    - ✓ Methicillin- and glycopeptide-resistant *staphylococcus aureus*
    - ✓ Vancomycin-resistant enterococci (VRE)
    - ✓ Extended-spectrum β-lactamase–producing enterobacteriaceae
    - ✓ Multidrug-resistant *pseudomonas aeruginosa* and *acinetobacter* spp., And *klebsiella* spp. Expressing *klebsiella pneumoniae* carbapenemases
  - Proliferation of more virulent strains of *clostridium difficile*

Development of novel antimicrobial agents active against these resistant organisms has not kept pace with their proliferation

Thus

More effective use of current agents is essential to preserve the value that antimicrobials provide to modern medicine

Antibiotic Stewardship Program (ASP)

- Antimicrobial drugs are in a different class from all other pharmaceuticals:
  - Their use in one patient has the potential for adverse consequences in other patients who have not received them
  - Usefulness of these drugs is declining as their use increases

- Introduction of the term "stewardship" in 1996 to draw attention to these unique characteristics

Antibiotic Stewardship Program (ASP) (cont'd)

- Programs designed to increase the appropriateness of antimicrobial use in hospitals had been described since the 1970s
  - ✓ Antimicrobial "management" or "control" program
  - ✓ The focus of these programs tended to be financial because antibiotic expenditures accounted for as much as 30% to 50% of a hospital's total drug budget.

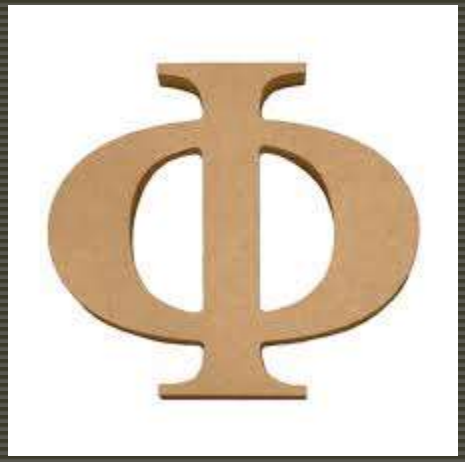
- The currently preferred term, antimicrobial stewardship, serves to emphasize the special status of this class of drugs.

Antibiotic Stewardship Program (ASP) (cont'd)

- The focus of these programs is improvement in the quality of patient care, with the primary goals of improving clinical outcomes and stabilizing or reducing rates of resistance.

- Support for ASPs in hospitals received a major boost in 2007 with the publication of stewardship guidelines
  - Infectious Diseases Society of America (IDSA)
  - Society for Healthcare Epidemiology of America (SHEA)

Philosophy of Antimicrobial Use



- To address the problem of inappropriate antimicrobial usage:
  - constraints under which physicians work
  - pressures that are exerted on them to prescribe drugs

- Physicians must balance the risks of not treating or inadequately treating a patient with antimicrobials against the risks of antimicrobial use in terms of adverse effects, drug costs, and contribution to antimicrobial resistance.

- Because the last consequence (antimicrobial resistance) is typically removed in time and place from the original prescribing decision, it often receives little weight.

- Metlay and colleagues

  - “risk of contributing to antimicrobial resistance” ranked last among seven factors that physicians were asked to weigh when deciding which antimicrobial to prescribe for a hypothetical patient.

  - Patient expectations to receive antimicrobials when they visit a physician for a condition they perceive is infectious was identified as a key factor in overprescribing of antimicrobials.

- Interventions for dissuading patients from demanding unnecessary antimicrobials may be more time-consuming and require more training relative to simply prescribing an antimicrobial.

- Diagnostic tests for infections may be perceived as overly expensive, invasive, or time-consuming relative to simply prescribing an antimicrobial for a suspected infection.

- Ordered diagnostic tests are often slow to turn around and limited in their sensitivity.

- Reluctance of taking the risks of not prescribing an antimicrobial or prescribing a narrower spectrum antimicrobial because of malpractice and litigation concerns

- Clinicians may lack adequate knowledge of infectious disease diagnostics and management, especially in the face of a growing population of immunocompromised patients

- All of these factors may lead physicians to fall back on the relative “comfort” of broad-spectrum antimicrobial use.

Developing an ASP

- Effective antimicrobial stewardship programs can be financially self-supporting and improve patient care.

- Comprehensive programs have consistently demonstrated a decrease in antimicrobial use (22%–36%), with annual savings of $200,000–$900,000 in both larger academic hospitals and smaller community hospitals.

- A comprehensive evidence-based stewardship program to combat antimicrobial resistance includes elements chosen based on local antimicrobial use and resistance problems and on available resources.

ASP Elements

- ASP team:
  - A dedicated multidisciplinary team
  - involves ongoing communication and collaboration
    - ✓ Among multiple disciplines
    - ✓ Across departments

- ASP strategies
  - Interventions:
    - ✓ active monitoring of resistance
    - ✓ fostering of appropriate antimicrobial use
    - ✓ Collaboration with an effective infection control program to minimize secondary spread of resistance

ASP CORE TEAM

- Infectious Disease – trained Physician
- Clinical Pharmacist with infectious diseases training
- Clinical Microbiologist
- Infection Control Representative
- Hospital Epidemiologist
- Hospital Administrator
- Information system specialist (IT)

Infectious Disease–trained Physician

- Program Leader
- Dedicating a portion of time to the design, implementation, and function of the program
- Supervision to ensure that therapeutic guidelines, antimicrobial restriction policies, or other measures are based on the best evidence and practice and will not put patients at risk
- Lending the program legitimacy among physicians practicing at the hospital, and reduce the chance of the program simply being seen as a pharmacy-driven cost-savings scheme

Clinical Pharmacist

- Clinical pharmacist specialists in infectious diseases share responsibility for a number of activities
  - ✓ Development of guidelines for antimicrobial use
  - ✓ Education of physicians and other health care professionals
  - ✓ Review of hospital antimicrobial orders with feedback to providers
  - ✓ Administration of restrictive strategies
  - ✓ Pharmacokinetic consultation
  - ✓ Research on program outcomes

Clinical Microbiologist

- The clinical microbiology laboratory is a key component in the function of ASPs
- Summary data on antimicrobial resistance rates allow the antimicrobial stewardship team to determine the current burden of antimicrobial resistance in the hospital, facilitating decisions as to which antimicrobials to target for restriction or review

Clinical Microbiologist (Cont'd)

- Preparation of antibiograms specific to certain patient care areas, especially intensive care units, may allow identification of local problems and focused antimicrobial stewardship and infection control efforts

- Having resistance data available on a monthly or quarterly basis allows closer tracking of trends and facilitates well-designed studies of interventions

Clinical Microbiologist (Cont'd)

- Dissemination of antibiograms to clinicians may allow better selection of empirical therapy based on local susceptibility patterns
- Timely and accurate reporting of microbiology susceptibility test results allows selection of more appropriate and focused therapy, and may help reduce broad-spectrum antimicrobial use

Infection Control Staff and Hospital Epidemiologists

- The problem of spread of antimicrobial-resistant organisms within hospitals has long been a concern of infection control professionals

- While some resistant organisms have primarily been thought to be infection control problems and others antibiotic-use problems, an absolute distinction is artificial and both transmission and selection play important roles in the spread of antimicrobial resistance

Infection Control Staff and Hospital Epidemiologists (Cont'd)

- Infection control staff gather highly detailed data on nosocomial infections which may assist in the antimicrobial stewardship team's evaluation of the outcomes of their strategies

- Hospital epidemiologists have the expertise in surveillance and study design to lend to efforts studying the effect of antimicrobial stewardship measures

Infection Control Staff and Hospital Epidemiologists (Cont'd)

- In turn, antimicrobial stewardship programs may be able to assist in efforts to control outbreaks by focused monitoring and/or restriction of antimicrobials in the targeted units.
- Any antimicrobial stewardship program should either be fully integrated with or work closely with a hospital's infection control program
- Such collaboration has the opportunity to synergistically reduce antimicrobial resistance and improve patient outcomes

Information system specialist (IT)

- Health care information technology
  - ✓electronic medical records
  - ✓computer physician order entry
  - ✓clinical decision support
- Can improve antimicrobial decisions through the incorporation of data on patient-specific microbiology cultures and susceptibilities, hepatic and renal function, drug-drug interactions, allergies, and cost.

Information system specialist (IT) (cont'd)

- Computer-based surveillance can facilitate good stewardship by:
  - ✓ more efficient targeting of antimicrobial interventions
  - ✓ tracking of antimicrobial resistance patterns
  - ✓ Identification of nosocomial infections
  - ✓ Identification of adverse drug events

Hospital Administrators

- None of the efforts of antimicrobial stewardship team to establish an ASP are likely to be successful without at least passive endorsement by hospital leadership

- Program funding, institutional policy, and physician autonomy are core issues in the development of ASP that must be addressed by hospital administration

Hospital Administrators (Cont'd)

- Without adequate support from hospital leadership, program funding will be inadequate or inconsistent since the programs do not generate revenue
- If hospital leadership is not publicly committed to the program, recalcitrant prescribers may thwart attempts to improve antimicrobial use without fear of sanction

Hospital Administrators (Cont'd)

- Leadership support
  - ✓Financial support
  - ✓Formal statements that the facility supports efforts to improve and monitor antibiotic use
  - ✓Including stewardship-related duties in job descriptions and annual performance reviews
  - ✓Ensuring staff from relevant departments are given sufficient time to contribute to stewardship activities
  - ✓Supporting training and education
  - ✓Ensuring participation from the many groups that can support stewardship activities

Antimicrobial Stewardship Core Team

- Share goals such as minimizing antimicrobial resistance
- Expert in initiative development
- Liaison for dual initiatives

- Compile raw isolate & susceptibility data
- Implement micro-driven initiatives

- Expert in analyzing population-level data
- Support research study design & outcomes reporting

- Design & integrate clinical decision support systems
- Ensure patient- and population-level data interface across systems

*A-II recommendation, others are A-III

1. Dellit TH, et al. Clin Infect Dis 2007; 44: 159-177.

ASP Strategies

- Prospective Audit and Feedback Strategies
- Antimicrobial Formulary Restriction Strategies
- Prior-Approval and Justification Strategies
- Educational Strategies

Prospective Audit and Feedback Strategies

- Prospective audit of antimicrobial prescribing (usually accomplished by daily review of prescriptions of targeted antimicrobials), coupled with feedback to physicians to improve antimicrobial use, is an important stewardship strategy

- Feedback should be educational and evidence-based, with the goal of appropriate individualized therapy.

Prospective Audit and Feedback Strategies (cont'd)

- Interventions:
  - ✓ Switch or step-down therapy: switching patients from intravenous to oral therapy
  - ✓ Streamlining: switching from broad-spectrum and combination therapy to more narrow-spectrum therapy
  - ✓ Dose optimization strategies: switching from excessive or inadequate doses to more appropriate doses

Antimicrobial Formulary Restriction Strategies

- Limiting the availability of agents on formulary is the most direct method to influence antimicrobial utilization
- It is a simple way to prohibit the use of newer, more expensive antibiotics in favor of older, equally effective drugs
- Beyond the issue of cost, exercising control over which antimicrobials are available for physicians to prescribe also may strongly influence the development of antimicrobial resistance in a health care institution

Prior-Approval and Justification Strategies

- At a level below institution-wide decisions about which antimicrobials are available are strategies that require physicians to justify their use of antimicrobials in some way.

- Spectrum:
  - Less restrictive
    - ✓ Use of antimicrobial order forms
    - ✓ Mandating an indication
  - More restrictive
    - ✓ Obtain approval from an infectious disease
    - ✓ Mandating formal infectious disease consultation

Prior-Approval and Justification Strategies (cont'd)

- Enforcement of a prior-approval program can be difficult, and the process may be viewed as a punitive exercise.
- Although these strategies are the most onerous to prescribing physicians, they undoubtedly are the most effective single interventions to change or improve usage patterns and to control the antimicrobial budget.

Educational Strategies

- Although education has long been considered one of the hallmarks of the activities of the infectious diseases physician, it is the least rigorously studied intervention
  - Staff conferences
  - Lectures by visiting professors (grand rounds)
  - Clinical pharmacy consultations
  - Drug-utilization evaluations
  - Newsletters
  - Development of clinical pathways or guidelines

DESIGN AND IMPLEMENTATION

1. Define the philosophy of the program

- Trivial step but foundation for the success or failure of the program
- Antibiotic misuse more often results from inadequate information than from inappropriate behavior

- Program designed to “improve” antibiotic use or patient care rather than an effort to “restrict” or “control” antimicrobials or solely to decrease costs

2. Gather baseline data

- Antimicrobial expenditures
- Antimicrobial utilization patterns
- Susceptibilities of nosocomial and community pathogens
- Antimicrobial budget and antimicrobial use to similar institutions

3. Define the structure of participation in the ASP

4. Develop a budget for all official positions and operating costs

5. Involve hospital administrators early in the design and implementation process and clarify budgetary issues

6. Evaluate the antimicrobial formulary
   - Redundancy
   - Competitive bidding

7. Develop and publish guidelines for antibiotic use and empirical antimicrobial therapy

- Local susceptibility profiles
- Appropriate dosing and dosage intervals
- Involving key personnel from all departments

Consensus

8. Define the strategies that the program will use.
9. Develop mechanisms to arbitrate disagreements.

10. Develop innovative educational methods.
11. Develop and maintain a database to monitor clinical and institutional outcomes.

12. Continually reevaluate the program, paying particular attention to changes in susceptibility profiles and patterns of use


Thanks