ANTIMICROBIAL STEWARDSHIP

Katherine Lusardi, PharmD
Clinical Specialist, Antimicrobial Stewardship
UAMS Medical Center
Little Rock, AR
ktlusardi@uams.edu

Objectives

- Pharmacists
  - Describe the stewardship strategies outlined in the 2007 IDSA/SHEA guidelines
  - Discuss current literature evaluations of stewardship practices
  - Design practical goals for stewardship programs
  - List tools and resources available to new stewardship programs

- Technicians
  - Discuss the importance of timely antibiotic administration
  - List the advantages and disadvantages of oral antibiotic administration
  - List some high cost antimicrobials that can be targeted for stewardship

What is Antimicrobial Stewardship?

- The judicious and appropriate use of antibiotics
- The primary goal of antimicrobial stewardship is to improve patient care by:
  - Optimize selection, dosing and duration of antimicrobials
  - Minimize "collateral damage"
  - Reduce the emergence of resistance

Who is talking about it?

- IDSA/SHEA (and SIDPI)
- ASHP
- JCAHO
- California

Disclosures

- Nothing to disclose.
- I may inadvertently mention proprietary products, but it is not meant as an endorsement.

What is Antimicrobial Stewardship?

The judicious and appropriate use of antibiotics
The primary goal of antimicrobial stewardship is to improve patient care by:
- Optimize selection, dosing and duration of antimicrobials
- Minimize "collateral damage"
- Reduce the emergence of resistance


Why Stewardship

- IDSA/SHEA (and SIDPI)
- ASHP
- JCAHO
- California

www.idsociety.org
IDSA/SHEA/SIDP

- Bad Bugs Need Drugs – 10 x ’20 Campaign
- Push for 10 new antimicrobials by 2020
- Solve the pipeline problem “by bringing together global political, scientific, industry, economic, intellectual property, policy, medical and philanthropic leaders to develop creative incentives that will stimulate new antibacterial research and development.”

ASHP and JCAHO

- ASHP: assembling a Stewardship Task-Force
  ▪ Statement on Pharmacist’s role available
- Joint Commission: Acknowledge the correlation between stewardship and resistance


California

- California Senate Bill 739 mandated that, by January 1, 2008, CDPH require general acute care hospitals to monitor and evaluate the utilization of antibiotics
- In February 2010 the CDPH Hospital Acquired Infections (HAI) program developed the only state wide stewardship initiatives

Benefits of Stewardship

- Reduces secondary consequences from broad spectrum therapy
- Decreases mortality
- Minimizes the development of antimicrobial resistance
- Supports institutional infection control processes
- Minimizes toxicity and/or adverse effects
- Decreases healthcare expenditures

http://www.cdph.ca.gov/programs/hai/Pages/antimicrobialStewardshipProgramInitiative.aspx


Guidelines

- IDSA/SHEA released guidelines in 2007
  ▪ Endorsed by SIDP
- Outlined
  ▪ Stewardship team
  ▪ Stewardship strategies
  ▪ Target outcomes

http://www.cdph.ca.gov/programs/hai/Pages/antimicrobialStewardshipProgramInitiative.aspx

Stewardship Plan

Core Team:
- ID Physician
- ID Pharmacist

Core Strategies:
- Prospective Review
- Pre-authorization/ restricting

Order Sets
Dose Optimization
IV to PO
Streamlining

Education
Guidelines

The Team

Core
- ID Physician
- ID Pharmacist

Other members
- Microbiologist
- Infection control
- Information technologist
- Hospital epidemiologist

Post-Prescriptive Review

- Assess the appropriateness of order and intervene if necessary
- Combined with a direct intervention and feedback

Post-Prescriptive Review: application

- Sunnybrook Health Services Centre in Toronto, Canada
- Evaluate the impact on antibiotic use of a formal prospective audit and feedback program in critical care patients
  - 48 ICU beds (including a burn unit)
- Process
  - Review broad spectrum antibiotics at 3 & 10 days
  - Place note in the chart
  - Give verbal feedback to the team

Post-Prescriptive Review: application

- Primary Outcome
  - Target antibiotics Days of Therapy (DOT) per 1000 patient days (DOT/1000 PD)
    - Pre-Intervention
      - 2,358 Patients
      - 1,423 PD
      - DOT: 644
    - Post-Intervention
      - 2,339 Patients
      - 12,431 PD
      - DOT: 503
- Recommendation Acceptance Rate: 82%
  - 56% for discontinue
  - 26% to change agent
  - 8% to change dose or route of administration

- Secondary outcomes
  - Overall DOT/1000 PD: 1134 → 985
  - Antibiotic spend: decreased by $95,000
  - Susceptibility changes: Meropenem susceptibility 78% → 83%
  - C difficile: 16 cases → 11 cases (decrease 31%)
  - Non-ICU cases increased 33% in some period
Restriction/Pre-authorization

- Requires approval before an antibiotic would be dispensed
  - Based on indications, physician services
- Limited antibiotics available
- Potential to sharply decrease antibiotic costs
  - At OSU, 30% of antibiotic spend is on daptomycin, linezolid, and piperacillin/tazobactam


Restriction/Pre-authorization: application

- Pitt County Memorial Hospital, Greenville, NC
- Examine the effect of ciprofloxacin restriction on use patterns, and Gram-negative bacteria
  - 861 Beds; 11 ICUs; no burn unit
- ASP began in 2001, ciprofloxacin restriction began 2007
  - Compare 42 months pre/post restriction
  - Procedure: pre-approval required from on-call ID fellow


Restriction/Pre-authorization: application

- Outcome – Drug Usage
  - Change in Defined Daily Doses/1000PD (DDD/)
  - 
    | Drug       | Pre-restriction DDD/1000 PD | Post-restriction DDD/1000 PD | P |
    |------------|-----------------------------|-----------------------------|---|
    | Ciprofloxacin | 87.09                      | 8.04                        | 0.0027 |
    | Group 2 Carbapenem | 11.96                     | 28.19                      | 0.0134 |
    | Cefepime and PIP/tazo | No statistically significant change | No statistically significant change | |
    | All Abx | Decreased 18.4% | P < 0.001 |


Restriction/Pre-authorization: application

- Outcome – Resistance
  - Pseudomonas aeruginosa: 1,664 non-duplicate isolates
    - Pre-restriction – 182.5 isolates/month
    - Post-restriction – 222.6 isolates/month
    - Ciprofloxacin-resistant P. aeruginosa
      - Pre-restriction - stable
      - Post-restriction – decreased 13.7% (p<0.001)
    - Carbapenem-resistant P. aeruginosa
      - Pre-restriction - stable
      - Post-restriction – decreased 13.2% (p=0.0351)
  - No significant changes in resistance observed for Enterobacteriaceae, Acinetobacter, and Stenotrophomonas


Timeliness of Antibiotics

- Delays in antibiotic therapy have been associated with higher mortality
- Winters et al found more delays >1 h for antibiotics associated with restriction and pre-approval
- Utilization of restriction after first dose allows for combination of both core strategies

Antibiotic ordered
Patient receives first dose without delay
Review of subsequent doses

Martin CA, et al. AJHP. 2011; 68: 100-110

Education

- Most effective when combined with intervention
  - Education as a process
  - Raise awareness

Guidelines

- Common Infections and most likely pathogens
- National guideline recommendations
- Our Institute specific susceptibilities
- Formulary status and cost

Order Sets

- Incorporate:
  - Institution guidelines
  - Automatic stop dates
  - Paper or CPOE
  - Core measure compliance
  - Care bundles

Order Sets: application

- Banner Estrella Medical Center, Phoenix, AZ
- 214 Bed, suburban, non-academic medical center
- Evaluate the impact of linezolid guidelines for use integration with CPOE on usage
  - Process:
    - First intervention: developed guidelines for use, rolled out to medical staff with education led by ID physicians
    - Second intervention: Incorporation of guidelines into CPOE system, integrating alternative antibiotic recommendations

Outcome – linezolid spend

- 16 month savings – $638,000
- Annualized → $479,000
- No changes in VRE infection rates were noted

Streamlining/De-escalation

- Most likely organisms and risk factors taken into consideration
- Narrow based on preliminary culture data
- Finalize antibiotic choice with final report
Dose-optimization

- Pharmacokinetic and pharmacodynamics
  - Antibiotic dosing protocols
  - Renal dosing protocols
- Effective antibiotic use


IV to PO

- Patients on oral therapy:
  - Shorter hospital stay
  - Less cost
  - Reduce risk of infection

Cowens RC. Diag Micro Infect Dis. 2006; 61: 110-128

IV to PO: application

- Considered the lowest of the “low hanging fruit”
- Ohio State Medical Center
  - Collaborated with dietary to get list of patients taking PO diet
  - Cost avoidance: $242,713
- Johns Hopkins
  - Target: voriconazole, pantoprazole, levetiracetam, chlorothiazide
  - Budget burden of $1,166,769

Goff DA, et al. CID. 2012; 55: S87-S92

IV to PO: application

- Acute Care VA hospitals across US
- Retrospective analysis of IV fluoroquinolone use
  - Ciprofloxacin, levofloxacin, moxifloxacin
  - Assess whether it could have been avoided
- Results
  - Avoidable FQ usage: 46.8% of all FQ; 90.9% of all IV FQ
    - ICU – 65% avoidable; Non-ICU – 42.7% avoidable
  - Could have avoided ~$4million in expenses


Outcome tracking

- Goals of Stewardship
  - Improve patient outcomes
  - Improve patient safety
  - Reduce resistance
  - Reduce cost

McGowan JE. ICHE. 2012; 33: 331-336
Outcome Tracking

- Antibiotic usage/cost
  - Easiest to measure
  - DDD/1000 PD
  - DOT/1000 PD
  - LOT/1000 PD
  - Abx $/PD

McGowan JE. ICHE. 2012; 33: 331-336

Beardsley JR, et al. ICHE. 2012; 33: 398-400

Outcome Tracking

- Cochrane review (through 2003) showed improved clinical outcomes when the stewardship interventions focused on optimizing treatment, not reducing antibiotic use

- Wake Forest University, North Carolina
  - Projected Abx$/PD based on two inflation models, looked at savings over 11.5 years
  - Method A - $10,350,787
  - Method B - $23,224,961

McGowan JE. ICHE. 2012; 33: 331-336

Outcome Tracking

- Patient Safety
  - Inappropriate empiric antibiotics are associated with decreased survival
  - Collateral damage
    - C. difficile infection – after a national stewardship initiative in Scotland, the rate of CDI had dropped over 40% among patients over 65 years of age

McGowan JE. ICHE. 2012; 33: 331-336


Outcome Tracking

- Resistance
  - Takes years to notice benefits on resistance
  - Reduction of 3rd generation cephalosporins leads to reduction of MDR GNR
  - Reduction of fluoroquinolones leads to reduction in MRSA
    - Also decreases resistance to beta-lactams in GNR

Outcome Tracking

- Hospital acquired infections
  - MDRO infection rate
  - CLABSI rate
  - Culture contamination rate
  - CDI rate

Tips for getting started
Getting Started

- Know why stewardship is being undertaken
- Start small with measurable goals
- Define how success will be measured up front
- Establish reporting
- Identify champions

Resources

- Stewardship Certificate Programs
  - MAD-ID (www.mad-id.org)
  - SIDP (www.sidp.org)
- Free Online CE
  - ASHP Advantage (http://www.leadstewardship.org/)
  • Industry Sponsored (Pfizer, Cubist, Astellas)
- Established Programs
  - Nebraska Medical Center
    • http://www.nebraskamed.com/careers/education-programs/cap
  - University of Kentucky
    • http://www.hosp.uky.edu/pharmacy/amr/default.html

Summary

- Stewardship is about optimizing antibiotic usage, in order to deliver the best care to patients
- Start a program small, with reasonable, measurable goals
- Recent literature and established programs provide great resources

References


ANTIMICROBIAL STEWARDSHIP

Katherine Lusardi, PharmD
Clinical Specialist, Antimicrobial Stewardship
UAMS Medical Center
Little Rock, AR
klusardi@uams.edu
References

- Seemungal IA, Bruno CJ. Attitudes of housestaff towards a prior-authorization based antimicrobial stewardship program. ICHE. 2012; 33: 429-431.
- Beasley JR, Williamson JC, Johnson PM, et al. Show me the money: long-term financial impact of an antimicrobial stewardship program. ICHE. 2012; 33: 399-400.