Appropriate Antimicrobial Use in California: The Path of Least Resistance

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Outline

• Rationale
• Regulatory messages and mandates
• Antimicrobial Stewardship Program
• Initiatives:
  – Get Smart Program
  – AWARE
  – California Antimicrobial Stewardship Program Initiative
    • Activities
    • California Antibiogram Project
30-60% of antimicrobial use is either unnecessary or inappropriate

Rationale for Antimicrobial Use Optimization

- Antimicrobial resistance
  - Inherent
  - Antimicrobial exposure

- Patient safety
  - Arrhythmias, rhabdomyolysis, nephrotoxicity, *Clostridium difficile* infections, death

- Cost
  - Unnecessary use, switching from IV to PO, broad-spectrum to pathogen-directed therapy
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Sir Alexander Fleming

“The time may come when penicillin can be bought by anyone in the shops. Then there is the danger that the ignorant man may easily underdose himself and, by exposing his microbes to non-lethal quantities of the drug, educate them to resist penicillin.”

Nobel lecture, 1945
Geographical Distribution of KPC-Producing *Enterobacteriaceae*

November 2006
Geographical Distribution of KPC-Producing Enterobacteriaceae

January 2011

[Map showing geographical distribution of KPC-producing Enterobacteriaceae in January 2011]
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- ED visits for antibiotic-related adverse effects
  - Estimated 142,000 per year (116K-168K)
  - Most prescriptions for URI, COPD, Otitis media and sinusitis
  - 78% due to allergic reactions (PCN)
  - Sulfas – highest rate of serious allergic reactions
  - 50% overall due to Sulfas and Clindamycin
  - Sulfas and quinolones associated with highest rate of neurological events

Shehab et al., CID 2008:47-735-43
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## Cost of Antimicrobial-resistant Infections (ARI)

<table>
<thead>
<tr>
<th></th>
<th>All Patients</th>
<th>Patients with ARI</th>
<th>Patients without ARI</th>
</tr>
</thead>
<tbody>
<tr>
<td>n (%)</td>
<td>1391</td>
<td>188 (13.5)</td>
<td>1203 (86.5)</td>
</tr>
<tr>
<td>APACHE II score</td>
<td>42.1</td>
<td>54.8*</td>
<td>40.1*</td>
</tr>
<tr>
<td>LOS (days)</td>
<td>10.2</td>
<td>24.2*</td>
<td>8.0*</td>
</tr>
<tr>
<td>HAI (n)</td>
<td>260</td>
<td>135*</td>
<td>125*</td>
</tr>
<tr>
<td>Cost per day ($)</td>
<td>1651</td>
<td>2098*</td>
<td>1581*</td>
</tr>
<tr>
<td>Total cost ($)</td>
<td>19,267</td>
<td>58,029*</td>
<td>13,210*</td>
</tr>
<tr>
<td>Death [n (%)]</td>
<td>70</td>
<td>34 (18.1)*</td>
<td>36 (3.0)*</td>
</tr>
</tbody>
</table>

*p<0.001

Additional Factors

- Funding for antimicrobial studies
- Development of new antimicrobials
- Everyone is an antibiotic expert…
Infectious Diseases (ID) Issues

• Void in antimicrobial studies since mid-1980s
  – AIDS epidemic captured leaders in ID field
  – Multiple societies developed own guidelines
  – Drug companies decreased funding to studies or left the field (e.g., Lily, BMS)

• Length of therapy = ?

• Many diseases are treated with antimicrobials because of “accepted practice” based on retrospective reviews or case reports
Antimicrobial Approvals

DECLINING ANTIBACTERIAL APPROVALS (PAST 25 YEARS)

Spellberg, CID 2004, Modified
The Pipeline is Dry

- Only 15-16 antibiotics are in development
- Only 8 of these have activity against key Gram negative bacteria
- None have activity against bacteria resistant to all current drugs

European Centre for Disease Prevention and Control/European Medicines Agency Joint Technical Report
Infectious Diseases Society of America – April 2010

Bad Bugs Need Drugs

10x ‘20

Ten new ANTIBIOTICS by 2020
Everyone is an expert...

- Antimicrobial training limited to two weeks in medical school in second year
- Further training is passed down by specialists in their field based on “experience”
  - “It looks infected” - Surgeon
  - “Has to be sepsis” – Intensivist
  - “Broader is better” – Everyone
- Other practitioners never receive formal training
  - Nurse Practitioners and Physician Assistants
  - “Walmart” effect and minute clinic – pressure for antibiotic therapy
SO, YA MEAN WE MADE THIS MESS OURSELVES?

YEP, SON, WE HAVE MET THE ENEMY AND HE IS US.
Antibiotic Management vs. Prescriber
Antimicrobial Use Optimization

- Widely accepted in acute care hospitals*:  
  - Improve antimicrobial resistance patterns  
  - Decrease patient toxicity  
  - Decrease costs
- Sparse literature and few studies in long-term care  
  - Efforts are necessary**

*SHEA/IDSA Guidelines, *CID* 2007 Jan;44(2):159-77  
Dept HHS: Top 5 Messages for Awareness Campaign 2010

• With Healthcare Infection Control Practices Advisory Committee (HICPAC)
• Top 5 campaign messages for healthcare worker and consumer awareness
  • Hand hygiene
  • Influenza vaccination
  • Prompt removal of catheters and other devices
  • Antimicrobial stewardship
Dept HHS: Antimicrobial Review in Long-Term Care Facilities

- With Center for Medicare and Medicaid Services (CMS)
- Effective September 30, 2009
- Interpretive Guidelines for Long-Term Care Facilities (LTCF)
  - “It is the physician’s responsibility to prescribe appropriate antibiotics and to establish the indication for use of specific medications. As part of the medication regimen review, the consultant pharmacist can assist with the oversight by identifying antibiotics prescribed for resistant organisms or for situations with questionable indications, and reporting such findings…”
California Senate Bill 739

- Health & Safety Code §§ 1288.5 to 1288.9 (2006)
- Established Healthcare Associated Infections (HAI) Program at CDPH
  - HAI surveillance, prevention and annual reporting in all general acute care hospitals
- Mandatory public reporting of process measures
  - CLIP, SCIP, and influenza vaccination
- Later legislation mandated HAI-specific public reporting (2008)

“By January 1, 2008, [CDPH] shall take all of the following actions to protect against health care associated infections (HAI) in general acute care hospitals statewide:

- (4) Require that general acute care hospitals develop a process for evaluating the judicious use of antibiotics, the results of which shall be monitored jointly by appropriate representatives and committees involved in quality improvement activities.”

Health & Safety Code § 1288.8(a)
What does §1288.8(a)(4) mean?

• Each California acute care hospital should have an Antimicrobial Stewardship Program
  – California is the only state with this type of legislation
Antimicrobial Stewardship Program (ASP)

• Promote and measure appropriate use of antimicrobials by selecting appropriate agent, dose, duration and route of administration

• Objective is to optimize utilization of antimicrobial agents in order to:
  • Minimize acquired resistance
  • Improve patient outcomes and toxicity
  • Reduce treatment costs
Antimicrobial Stewardship Program
Antimicrobial Movement in the Healthcare Setting

Patient Evaluation → Choice of Antimicrobial → Prescription Ordering → Dispensing Antimicrobial
ASP Strategies

Patient Evaluation

Choice of Antimicrobial

Prescription Ordering

Dispensing Antimicrobial

Education/Guideline

Formulary Restriction and Pre-authorization

Computer-assisted strategies

Review and Feedback
ASP Strategy Selection

• Facility dependent
  – Beds
  – Dedicated personnel
  – Funds
  – Pharmacy support
  – Electronic systems
ASPs: Improved Antibiotic Use

- Cluster randomized trial over 10 months
  - 6 IM teams received academic detailing regarding appropriate use of vancomycin, levofloxacain, piperacillin/tazobactam
  - 6 IM teams received guidelines only

<table>
<thead>
<tr>
<th>Hospital Size</th>
<th>ID MD</th>
<th>Microbiologist</th>
<th>Data analyst</th>
<th>IP</th>
<th>Antimicrobial Cost Savings</th>
<th>Drug Resistance &amp; Infectious Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>174 beds</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>Annual cost reduction: $200,000-$250,000</td>
<td>Reduced rate of nosocomial <em>Clostridium difficile</em></td>
</tr>
<tr>
<td>250 beds</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>Cost-savings during 18-month study: $913,236</td>
<td>Decreased resistance rates</td>
</tr>
<tr>
<td>650 beds</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>Net savings for 1 year: $189,318</td>
<td>Reduced rate of VRE colonization and bloodstream infections</td>
</tr>
</tbody>
</table>

ASPs: Optimize Patient Safety

• Improved surgical prophylaxis
  – Intervention: Simplify drug options, standardize dosing, improve timing
    • All doses correct
    • Reduction in dosing after incision (20% to 7%)
    • Annual cost savings $112,000

• Improved renal dosing
  – Intervention: Clinical decision support system and academic detailing
    • Appropriate dosing of gentamicin increased from 63% to 87%
    • Appropriate dosing of vancomycin increased from 47% to 77%
    • Appropriate use of gentamicin therapeutic monitoring increased from 70% to 90%

Federal Initiatives
Get Smart: Know When Antibiotics Work

Activities
• Outreach and publicity efforts
  – Clinicians
  – Public
• Collaborative interventional efforts

Successes
• Brand recognition
• Examples of successful interventions
Goals: Get Smart for Healthcare

- Improve patient safety through better treatment of infections.
- Reduce the emergence of anti-microbial resistant pathogens and *Clostridium difficile*.
- Heighten awareness of the challenges posed by antimicrobial resistance in healthcare and encourage better use of antimicrobials as one solution.
State Initiatives
AWARE

- Program sponsored by the California Medical Association developed in 2000
- Goals:
  - Increase appropriate prescribing of antibiotics
  - Raise consumer awareness and understanding
  - Mobilize the community
- Resources: toolkits, informational handouts targeting public and providers

http://www.aware.md/
California ASP Initiative

• Component of HAI Program at CDPH began February 2010

• Goal is to assist all California hospitals and long-term care facilities optimize antimicrobial use to improve outcomes
  – Assess ASPs

http://www.cdph.ca.gov/programs/hai/Pages/AntimicrobialStewardshipProgramInitiative.aspx
Assessment of ASPs in California Acute Care Hospitals

- 220 (52%) hospitals participated web-based survey May 2010 – March 2011
  - 167 (76%) community hospitals
    - 45% current ASP
    - 31% planning ASP
- 128 hospitals
  - 23% influenced to start ASP by SB 739
California ASP Initiative: Activities

- Assess ASPs
- Assist hospitals to develop/strengthen
- Provide data for administrative buy-in
- Identify successful setting-specific strategies
- Develop regional collaborations

http://www.cdph.ca.gov/programs/hai/Pages/AntimicrobialStewardshipProgramInitiative.aspx
California ASP Initiative: Special Settings

- **Long-term acute care hospitals**
  - Develop and implement system-wide ASPs
- **Rural, small hospital Infection Prevention collaborative**
  - ASPs most important HAI-related concern
  - Focus outreach
- **Long-Term Care**
  - Recommend practical infection control and environmental disinfection in endemic and outbreak settings
  - Explore options for antimicrobial use optimization
California ASP Initiative: Activities

• Recommend internal and external process and outcome measures
  – Antibiotic Metrics Committee
  – External benchmarking for antimicrobial utilization difficult across all hospitals

• Compile antimicrobial susceptibility data
  – California Antibiogram Project
California Antibiogram Project

• 48 laboratories representing 79 hospitals in 2007

• State and regional antibiograms compiled to:
  – Track and monitor bacterial resistance trends of public health importance
  – Raise awareness of resistance problems
  – Identify opportunities to reduce inappropriate antibiotic usage

• Data posted on CDPH website

• Lost support

California Antibiogram Project

• Revamped to collect data 2008-2010
• Specific organism-antimicrobials combinations
  – 7 organisms and 21 antimicrobial classes
  – All specimen sites (blood, urine, wound not separated)
  – Inpatient isolates only
  – Information on how isolates were collected
• Currently being analyzed

http://www.cdph.ca.gov/programs/hai/Pages/CaliforniaAntibiogramProject.aspx
Goals of ASPs

- Optimize Patient Safety
- Decrease or Control Costs
- Reduce Resistance
California ASP Initiative: Lessons Learned

• Programs evaluating the judicious use of antibiotics are required in all acute care hospitals in California

• ASPs possible in every facility but their appearance will differ

• Process and outcomes must be measured and monitored over time

• Essential elements: administrative buy-in, well-respected physician champion, multi-disciplinary approach
It was on a short-cut through the hospital kitchens that Albert was first approached by a member of the Antibiotic Resistance.
Questions?

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