Computer Support Systems and Technology in an Antimicrobial Stewardship Program

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Elizabeth Dodds Ashley’s Disclosures

- Pfizer & Ortho-McNeil: consulting
- Merck: speaker’s bureau member

Objectives

- Discuss the role of computerized physician order entry in a stewardship program
- Identify the different clinical decision support systems and their limitations
- Describe information technology specialist role on the antimicrobial stewardship team
The Role of Computerized Support Systems in Antimicrobial Stewardship

• What the guidelines say...
  – Healthcare information technology in the form of electronic medical records (A-III), computer physician order entry (B-II) and clinical decision support (B-II) can improve antimicrobial decisions through the incorporation of data on patient-specific microbiology cultures and susceptibilities...
  – Computer-based surveillance can facilitate good stewardship by more efficient targeting of antimicrobial interventions, tracking of antimicrobial resistance patterns and identification of nosocomial infections and adverse events (B-II)

Clinical Decision Support

• Definition: systems that intelligently filter clinical knowledge and patient-related information
• Six key functions:
  – Alerting - Critiquing
  – Interpreting - Diagnosing
  – Assisting - Managing

What can clinical decision support do?

• Based on the literature:
  – Increasing influenza vaccinations
  – Improving peri-operative antibiotic delivery time
  – Reduction in post-operative antibiotic use
  – Improve dosing (intra-operatively & in patients with organ dysfunction)
  – Facilitate IV to oral conversion
Clinical Decision Support & Clinician Interaction

- Passive:
  - Rely on input from end users
  - Clinicians must seek the help to receive it
  - Depends on correctly answering the questions
- Active:
  - “knowledge-embedded” systems
  - Automatically communicate with clinicians
  - Act in real time to provide guidance without asking for it

Types of Computerized Systems

- Reports from existing pharmacy computer systems
- Computerized Provider Order Entry (CPOE)
- Integrated systems
  - Home-grown technology
  - Commercially available programs

Using What you Have

All commercially available pharmacy systems have some form of reporting capability

- Pros:
  - Can be implemented nearly immediately
  - Pharmacy users familiar with system/ minimal training needed
  - Best used as a tool to identify patients for review by stewardship team
  - Essentially FREE!

- Cons:
  - Traditionally, no link with other hospital systems
  - Not capable of tying together micro or other laboratory data with drug use
  - Use mostly limited to identifying patients on drug or combinations of agents
  - Many not able to document activities in usable format
Pros:
- Allows ability to collect additional data at the point of order entry
- Can remind providers of guidelines at order entry
- Can flag dose changes, allergies etc.
- Additional data allows more thorough review at time of dispensing

Cons:
- Programming functionality can be a challenge
- Electronic reporting of order data not always easy to obtain

CPOE Example: Antibiotic Indication
- At the time of order entry, additional data can be collected from providers
- Can be a tool on multiple levels:
  - Core measures + stewardship
  - Allows additional interventions

CPOE Example: Pre-Defined Indications
- Prophylaxis Indications
  - Surgical - Pre-op
  - Surgical - Post-op
  - Non-surgical prophylaxis
- Treatment Indications
  1. Bloodstream
  2. Bone and joint
  3. Central nervous system
  4. Diabetic foot
  5. Empiric therapy - febrile neutropenia
  6. Empiric therapy - unclear source
  7. Intraabdominal
  8. Pneumonia - community-acquired
  9. Pneumonia - Other
  10. Skin/soft tissue
  11. Urinary tract
  12. Other (followed by prompting for free-text response)
Integrated Systems for Clinical Decision Support

- Pulls data relevant patient-specific data from multiple systems
  - Or, in the case some electronic medical records, one system houses all information
- Includes sophisticated alert and reporting capabilities combining pharmacy and microbiology data

Desirable Characteristics of Clinical Decision Support Programs

- Vaccination reminders
- Catheter use alerts
- Drug-bug mismatch alerts
- Drug-spectrum alerts
- Timing of therapy alerts
- Prophylaxis timing alerts
- Recommend consultation as appropriate
- Drug dose alerts
- IV to PO switch
- Therapy recs for confirmed infection
- Automatic prophy recs
- Automated antibiograms
- Empiric recs
- Determine colonization
- Target-drug alerts
- Duration of therapy
- Track and alert emerging resistance

Comparing Systems

<table>
<thead>
<tr>
<th>Home-grown</th>
<th>Commercially Available</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pros:</strong></td>
<td><strong>Pros:</strong></td>
</tr>
<tr>
<td>- You build exactly what you want</td>
<td>- Can be available more quickly</td>
</tr>
<tr>
<td>- Guarantee it will work with your systems</td>
<td>- Less maintenance than home-grown system</td>
</tr>
<tr>
<td><strong>Cons:</strong></td>
<td><strong>Cons:</strong></td>
</tr>
<tr>
<td>- Time available to build</td>
<td>- Varying degree of customization available</td>
</tr>
<tr>
<td>- Resources to support</td>
<td>- More costly</td>
</tr>
<tr>
<td>- Technical / maintenance issues, ongoing commitment</td>
<td>- Customer service-vendor dependent</td>
</tr>
</tbody>
</table>
Examples of Home-Grown Programs

Commercially Available Systems

- Abx Alert by ICNet
- Guardian by Atlas Development Corp.
- BD Protect
- CareFusion MedMined
- Cerner Corporation
- epiQuest
- Quality Compass / Advisory Board

- RL Solutions
- SafetySurveillor by Premier
- Sentri 7 by PharmayOne
- TheraDoc Hospira Inc.
- VigiLanz Dynamic Monitoring System
Commercial Programs: Data Sources

- All systems combine antimicrobial use with microbiology laboratory data
- These considerations especially important for institutions without integrated medical record
- Data sources that need to be considered:
  - Radiology
  - Pyxis
  - CPOE integration
- Another important consideration is site of data storage

Commercial Programs: Interventions

- Consider what you already have available in pharmacy systems

<table>
<thead>
<tr>
<th></th>
<th>Med-Mined™</th>
<th>Quality Compass™</th>
<th>Safety Surveillor™</th>
<th>Sentri7®</th>
<th>Theradoc®</th>
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</thead>
<tbody>
<tr>
<td>IV to PO</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes – if built</td>
<td>Yes</td>
</tr>
<tr>
<td>Drug-bug mismatch</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Dosing rules</td>
<td>Yes, if built</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Duplicate therapy</td>
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<td>Not yet</td>
<td>Yes</td>
<td>Yes–if built</td>
<td>Yes</td>
</tr>
<tr>
<td>Drug interaction</td>
<td>Yes</td>
<td>Not yet</td>
<td>Future</td>
<td>Yes–if built</td>
<td>Yes</td>
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Commercial Programs: Documenting Capability

- Intervention documentation remains a challenge in many pharmacy systems
- External validity for stewardship results are often difficult, currently, benchmarking is for HAIs

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<th>Safety Surveillor™</th>
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<tr>
<td>External bench- marking</td>
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<td>?</td>
<td>Yes vs. NHSN</td>
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<td>Yes vs. NHSN</td>
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SIDP Survey Summary

- Antimicrobial use data is most often utilized to assess and monitor cost at facility level
- Data source utilized is often pharmacy purchase data derived from pharmacy or hospital administrative databases
  - Data often imported into Excel
- DDD/patient volume is most frequently utilized metric
- Lack access to data for external benchmarking but have great interest in receiving these data

Benchmarking Antimicrobial Usage

- Comparisons of intra-facility antimicrobial usage
  - Risk-adjusted
  - Standardization in numerator and denominator
- Provides direction for further evaluation and potential areas of quality improvement
  - Does not assess appropriate use

Benchmarking from the CDC: National Healthcare Safety Network (NHSN)

- Secure, internet-based surveillance system
- Currently enrolling all types of healthcare facilities
- Purpose includes:
  - Collect data to estimate magnitude of HAIs/ADRs
  - Conduct research

www.cdc.gov/nhsn/about.html
Medication-associated Module

Antimicrobial Use and Resistance (AUR)

Antimicrobial Use-Pharmacy Option

Antimicrobial Resistance-Microbiology Option

AUR Module: Pharmacy

2006-2009: Manual Entry


Commercial Programs: Reporting

- The output of your program will be as important as the input for justification

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<td>Yes</td>
</tr>
<tr>
<td>Export reports</td>
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<td>Excel/PowerPoint</td>
<td>Excel Internal Excel/PowerPoint</td>
<td>Excel Internal Excel/PowerPoint</td>
<td>Excel Internal Excel/PowerPoint</td>
</tr>
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</table>
Commercial Programs: Cost Reporting

- Cost as a metric of stewardship success remains controversial
- Justification for many of these commercially available programs will be based on pharmacy cost savings
- Types of savings that might be calculated:
  - IV to PO
  - Decreased infections (using estimated cost of additional infection)
  - Decreased length of stay questions

Desirable Characteristics for Infection Control/Prevention

- Isolation alerts
- Precaution reminders
- Health care associated infection alerts
- Patient location tracking
- Population location tracking
- Target-organism alerts
- Handwashing reminders
- On-line infection control information

Key Steps to Implementation of Computerized Support

- Gain administrative support for computerized decision support
- What to expect during implementation?
- Establishing workflow
- End user education
- Measuring success of the project
Gain administrative support

• Establish “the gap” in practice
  – Joint Commission National Patient Safety Goal
    07.03.01: Implement evidence-based practices to prevent health care-associated infections due to multidrug-resistant organisms in acute care hospitals
  – Published literature
  – Internal medication use evaluation data
  – Other available internal data

• Present “the gap” and ask for support from key leaders
  – Director of pharmacy
  – Infection control
  – Quality and safety
  – Microbiology
  – Hospital administration

• Develop a proposal/ business plan
  • Key elements include:
    – Expected progress with computerized support
    – Describe the potential benefits to your institution:
      • Improved patient quality and safety
      • Reduced antimicrobial expenditures
      • Decreased C. difficile rates
      • Reduction in bacterial resistance rates
      • Other hot button issues in your practice
    – Hardware, software, and implementation cost estimates
    – Timeline
What to expect during implementation

- Establish your role in implementation
  - Clinical champion (extensive involvement throughout the entire process)
  - Super user (moderate involvement during training phase of implementation)
  - End user (minimal or no involvement in implementation)

- Hardware and software sizing and installation performed by information technology (IT) experts
  - Clinical champion often collaborates with IT to make decisions on details to assist in sizing and programming
  - Anticipated size of end user group?
  - Acceptable backup method if system goes down
  - Which interfaces are necessary? (i.e. radiology, microbiology, pharmacy)
  - What information needs to come across interfaces?
  - Customization

- Data validation
  - May be time consuming!
  - Clarify how extensive is the validation process needed for each interface?
  - Who will perform this validation?

- Support
  - Establish who will provide IT support for the system
  - i.e. user name, password requests, lockouts, basic customization, programming, and maintenance

- Training
  - On-site
  - Remote (webinar or teleconference)
  - Common approach: train super users who perform subsequent training of end users

Establishing workflow

- Implementation of a new computerized support system is an opportunity for clinical innovation!

- Establish a clear leader or leaders for the project
  - Create a timeline and track your progress
  - Develop a workgroup of key leaders to brainstorm ideas for best practices
  - What are the institutional and departmental priorities?
  - Who are the end users and what are their needs on a daily basis?
What Can These Programs Do for You: Daily Routine Example

- **Dashboard**
  - Review alerts per unit
  - Action alert (multiple actions possible)
  - Comments
    - Manual entry
    - Multiple user access / transparency in documentation
    - Longitudinal data
  - Print Notes function

Advisor Dashboard
Barriers to Acceptance

- Historical:
  - Lack of using standard infrastructure (HL-7)
  - Slow adoption of clinical terminology
  - Cost of implementation
  - Health care IT infrastructure for transaction processing
  - Perceived increase in liability
  - Suboptimal models for maintaining
  - Developed academically, not transferrable


Additional Stumbling Blocks to Anticipate

- Training time
- Full commitment of proposed resources
  - Especially IT component
- Resistance to workflow changes
  - Perhaps more common with infection control/prevention
- Communication of changes
• Thank you for your attention.
• We would like to thank the following additional contributors to this presentation:
  – Susan Davis, PharmD