Antimicrobial Stewardship in Hospitals: Improving Outcomes Through Better Education and Implementation of Effective Interventions

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Antimicrobial Prescribing: IMPLEMENTATION METHODS IN STEWARDSHIP

DILIP NATHWANI

Implementing Partners
Acknowledgement

• My sincere thanks to:

• Sara Cosgrove, MD, MS; Associate Professor of Medicine, Division of Infectious Diseases; Director, Antimicrobial Stewardship Program; Johns Hopkins Medical Institutions
Implementation

• Incorporating an innovation or core intervention into routine practice.
• Includes a range of strategies to address individual, organizational, and systemic characteristics (e.g., skills training, administrative buy-in, policy changes).
The need to accelerate implementation in health: Two streams of policy concern

- **Stream 1** -- *translational roadblocks; implementation gap*
  
  barriers to rapid, efficient progression of innovations from basic science to clinical application to routine use

- **Stream 2** -- *quality chasm*
  
  gaps in the quality, safety, equity, efficiency, timeliness and patient-centeredness of health care delivery
What % of strong evidence based practice is integrated consistently into everyday healthcare?

- <20%
- >20-50%
- >50<80%
- >80%
THE IMPLEMENTATION GAP

17 years to get 14% of evidence into practice

Balas EA, Boren SA. Managing clinical knowledge for health care improvement. Yrbk of Med Informatics 2000; 65-70
The Implementation Gap

Effective Intervention \[ \times \] Ineffective or Insufficient Implementation = Inconsistent; Not Sustainable; Poor Outcomes

http://sisep.fpg.unc.edu/learning-zone/science-of-implementation/
The Break-Even Point:

“Society’s huge investment in technological innovations that only modestly improve efficacy, by consuming resources needed for improved delivery of care, may cost more lives than it saves.”

Steven H. Woolf, MD, MPH

ABSTRACT

“Health, economic, and moral arguments make the case for spending less on technological advances and more on improving systems for delivering care.”

The US spends 0.02% of its medical research budget on quality improvement advances and more on improving systems for delivering care.
IMPLEMENTATION & CHANGE STRATEGIES

• Social and behavioural scientific approach
• Organisational culture change model based on Hofstede’s model
• Change models e.g. Kotter’s managing change
• Implementation science
Changing behaviour?

Antibiotic prescribing in hospitals: a social and behavioural scientific approach

Marlies EJL Hulscher, Richard PTM Grol, Jos WM van der Meer

Lancet Infect Dis 2010; 10: 167–75

Panel: Examples of potentially effective strategies to improve antibiotic use in hospitals

Improvement strategies at the organisational level

Antibiotic policies
- Provide an antibiotic formulary
- Provide an antibiotic order form
- Provide an antibiotic order form including restriction requiring prior authorisation of prescriptions by infectious disease physicians, microbiologists, pharmacists
- Provide automatic stop orders
- Install an infection prevention committee
- Provide written antibiotic guidelines
- Provide an antibiotic booklet

Strategies to improve coordination, collaboration, communication, teamwork, and care logistics
- Introduce pharmacists to review orders and to contact physicians to reinforce appropriate use
- Introduce ward rounds to stimulate collaboration between doctor and pharmacist or microbiologist
- Introduce telephone advice for doctors to discuss prescriptions with the pharmacist or microbiologist
- Introduce flow sheets regarding the coordination of care
- Improve the logistics of care, for example, to reduce the time between requesting laboratory diagnostics and prescribing antibiotics

Improvement strategies at the individual level

- Distribute educational materials (eg, guidelines)
- Provide group education including conferences, seminars, and skills training programmes
- Provide small group education
- Stimulate local consensus processes
- Use local opinion leaders
- Provide individual instruction at the physician’s office (outreach visits or academic detailing)
- Provide feedback (provision of summary of clinical performance, based on, for example, medical records)
- Provide reminders (prompts to perform specific actions), including decision support by computer
# Table 3 Barriers and recommendations influencing awareness, agreement, adoption, and adherence to clinical practice guidelines

<table>
<thead>
<tr>
<th>Step of model</th>
<th>Identified barriers</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness</td>
<td>▶ Inertia of current practice—reluctant to change practice</td>
<td>▶ Create clear and consistent guidelines via:</td>
</tr>
<tr>
<td>being aware</td>
<td>▶ Lack of specialty society membership</td>
<td>- liaison between clinical specialists</td>
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<tr>
<td>of clinical guidelines</td>
<td>▶ Lack of experience with patient group</td>
<td>- local development and implementation</td>
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<td></td>
<td>▶ Lack of knowledge about alternatives</td>
<td>- pilot testing and monitoring</td>
</tr>
<tr>
<td></td>
<td>▶ Limited distribution of guidelines</td>
<td>▶ Target dissemination of guidelines:</td>
</tr>
<tr>
<td>Agreement</td>
<td>▶ Genuine or perceived ambiguity in the underlying evidence</td>
<td>- to less experienced clinicians</td>
</tr>
<tr>
<td>agreeing with clinical guidelines</td>
<td>▶ Insufficient information to make a decision</td>
<td>- to clinicians working in small centres</td>
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<tr>
<td></td>
<td>▶ Personal beliefs about utility of recommendation</td>
<td>- using specialists to influence decision making</td>
</tr>
<tr>
<td></td>
<td>▶ Differential beliefs about applicability of guideline to the patient or population</td>
<td>▶ Utilise research evidence to clarify:</td>
</tr>
<tr>
<td></td>
<td>▶ Disagreement with specific recommendations—they will not lead to desired outcome</td>
<td>- expected outcomes—positive and adverse</td>
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<tr>
<td></td>
<td>▶ Confusing and complex recommendations</td>
<td>- key points of decision making</td>
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<tr>
<td></td>
<td>▶ Genuine or perceived ambiguity regarding side effects, contraindications and risks</td>
<td>- suitable patient population</td>
</tr>
<tr>
<td>Adoption</td>
<td>▶ Belief that it is difficult to change personal habits</td>
<td>▶ Provide patients with information about:</td>
</tr>
<tr>
<td>following clinical guidelines for</td>
<td>▶ Perception of inconsistency of recommendations with patient values and preferences</td>
<td>- their condition</td>
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<tr>
<td>some patients</td>
<td></td>
<td>- recommended treatment</td>
</tr>
<tr>
<td>Adherence</td>
<td>▶ Anticipated practical difficulties</td>
<td>- side effects, contraindications, risks</td>
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<tr>
<td>following clinical guidelines for</td>
<td></td>
<td>▶ Manage clinical environments to:</td>
</tr>
<tr>
<td>all appropriate patients</td>
<td>▶ High costs for patients and/or practice</td>
<td>- develop special purpose clinics</td>
</tr>
<tr>
<td></td>
<td>▶ Patient knowledge, expectations and compliance</td>
<td>- include patient reminder/prompt systems</td>
</tr>
<tr>
<td></td>
<td>▶ Patient motivation and support for recommendation</td>
<td>- display patient education information</td>
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<tr>
<td></td>
<td>▶ Lack of time, materials, logistical support</td>
<td>- publicly monitor key outcomes</td>
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<tr>
<td></td>
<td>▶ Issues of medico-legal liability</td>
<td>- promote time and cost efficient practices</td>
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<td></td>
<td>▶ High proportions of uninsured patients within a practice</td>
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Understanding the Determinants of Antimicrobial Prescribing Within Hospitals: The Role of “Prescribing Etiquette”

E. Charani, E. Castro-Sanchez, N. Sevdalis, Y. Kyrtsis, L. Drumright, N. Shah, and A. Holmes

Background. There is limited knowledge of the key determinants of antimicrobial prescribing behavior (APB) in hospitals. An understanding of these determinants is required for the successful design, adoption, and implementation of quality improvement interventions in antimicrobial stewardship programs.

Methods. Qualitative semistructured interviews were conducted with doctors (n = 10), pharmacists (n = 10), and nurses and midwives (n = 19) in 4 hospitals in London. Interviews were transcribed, and a thematic analysis was applied to the data to identify themes and subthemes related to APB.

Results. The APB of healthcare professionals is governed by a set of cultural rules. Senior doctors consider themselves exempt from following policies that limit their prescribing decisions. Prescribing non-interference with the prescribing decisions of colleagues is a key determinant of APB. Senior doctors consider themselves exempt from following policies that limit their prescribing decisions.

Conclusions. To influence the antimicrobial prescribing of healthcare professionals, it is necessary to address prescribing etiquette and use clinical leadership to promote compliance with policies.

Keywords. prescribing etiquette; antimicrobial prescribing; prescribing behaviors

1. Non-interference with the prescribing decisions of colleagues: Reluctance to interfere with the prescribing decisions of colleagues. In the case of antimicrobial prescribing there is a reluctance to interrupt antimicrobial prescriptions started by colleagues. This recognizes the autonomous decision making process of prescribing.

2. Accepted non-compliance to policy: Deviations from policy recommendations are tolerated and put in the context of the prescriber’s experience, expertise and the specific clinical scenario. This leads to hierarchy and expertise, and not policy as determinants of prescribing practice behaviors.

3. Hierarchy of prescribing: Prescribing as an activity is performed by junior doctors. But it is the senior doctors who decide what is prescribed.
Normalization of deviance in health care delivery
Banja J et al Bus Horiz 2010; 53:2:139:

• Stupid & inefficient rules
• Imperfect or uneven knowledge
• The work and technology can disrupt behaviour and rule compliance
• I am breaking the rule for my patient
• The risks don’t apply to me; you can trust me
• Fear: workers are afraid to speak
• Leadership with holding or diluting findings on systems problem
How to have the difficult conversation

Table 1

Examples of empathetic responses to the problem employee*

<table>
<thead>
<tr>
<th>Response</th>
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<tbody>
<tr>
<td>“I’m sure you don’t realize this, but…”</td>
</tr>
<tr>
<td>“You are very important to this organization.”</td>
</tr>
<tr>
<td>“I could be wrong here.”</td>
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<tr>
<td>“May I explain what I’m seeing and get your point of view?”</td>
</tr>
<tr>
<td>“Right now, the way you do X would be considered risky or a departure from the standard of care.” (focus on safety, not competence)</td>
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<tr>
<td>“I value our friendship/relationship, and I want us to be honest with one another.”</td>
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<tr>
<td>“My understanding is X. Is that yours?”</td>
</tr>
<tr>
<td>“What do you think can be done about this?”</td>
</tr>
<tr>
<td>“When I bring up a concern, I see you tense up. Sometimes you cut me off or jump in with a disagreement. I think you stop listening and begin defending. You may not realize how you’re coming across, but that’s how it appears to me and others. Do you realize you’re doing that?”</td>
</tr>
</tbody>
</table>

* Adapted from Maxfield, Grenny, Patterson, McMillan, & Switzler (2005a); Neff (2003); Sotile and Sotile (1996a, 1996b).
Some ‘change models’

Lewin

Bridges: transitions

NHS Change Model

Merrill & Reid: personal styles

Johnson: polarity management

Rogers: Diffusion

Shapiro: creating contagious commitment

Gladwell: Tipping Point
Kotter’s Steps: Managing Change

Step 1: Create a sense of urgency
Step 2: Form a powerful guiding coalition
Step 3: Create a compelling vision for change
Step 4: Communicate the vision effectively
Step 5: Empower others to act on the vision
Step 6: Plan for and create short term wins
Step 7: Consolidate improvements and create still more change
Step 8: Institutionalize new approaches

• **Step 1: Create a sense of urgency**
  – Focus on patient safety and cost with hospital leaders
    • “Our CDI rates are too high and we are hurting patients”
    • “We are not compliant with the publically reported CAP measure and we are not going to win the good compliance award like our competitor”

• **Step 2: Form a powerful guiding coalition**
  – Team of leaders who represent key stakeholders
  – Team member characteristics: position power, expertise, credibility, leadership

• **Step 3: Create a compelling vision for change**
  – Vision statement “Helping patients receive the right antibiotics when they need them”

• **Step 4: Communicate the vision effectively**
  – Communicate to all levels (senior leadership/boards; department heads/unit directors; physicians/prescribers)
  – Communicate regularly

• **Step 5: Empower others to act on the vision**
  – Work with units/teams to develop mutually acceptable approaches
  – Empower non-traditional decision makers
    • Pharmacists
    • Nurses
Goals of Hospital Administration

- Decrease and control costs
- Optimize patient safety
- Regulatory compliance
- Stay competitive
- Good image/reputation

Argument to Hospital Administration

- Potential for cost-savings/reduction in LOS
  - Data from literature
  - Internal data
- Improved patient safety and reduce negative image of harm
  - Data
    - Improved antibiotic use
    - Decreased or stabilise resistance rates +/- C. difficile rates
    - Improved patient level outcomes
  - Active issues in your facility
    - Drug interaction problem
- Ensure compliance with infectious disease regulations
- Importance of offering the same standard of care as competing hospital
- Provide reassurance to public/patients/reputation

Include an executive summary
Use shiny paper
Goals of Prescribers

- Cure the patient
- Prescribing autonomy
- **Optimize patient safety**
- Look smart among peers
- Regulatory compliance

Argument to Prescribers

- You are not trying to tell them what to do, you are trying to make their lives better
  - Help with bug/drug mismatch
  - Help with dosing & timeliness
  - Help with IV to PO switch for earlier discharge
  - Single dose surgical prophylaxis
  - Prevent adverse events: drug interactions, allergies, *C. difficile*, harm and cost of resistance

Use education as a carrot
Complement good decisions
Be willing to compromise
Recruit thought leaders in different specialties to support and reiterate your message
Avoid too many discussions about cost
The reductions in antimicrobial utilization associated with stewardship interventions have not been associated with any worsening in nosocomial infection rates, length of stay or mortality among intensive care patients.”

- “Stewardship interventions were associated with … fewer antibiotic adverse events.”

• **Step 7:** Consolidate improvements and create still more change

• **Step 8:** Institutionalize new approaches
  – Ensure there is institutional understanding of the positive results
  – Strive to have prescribers themselves be stewards of antimicrobials
An Important Lesson

- We need to teach prescribers to make changes without constant prompting from the stewardship team
- We cannot be in all places at all times

Need for people to realise the costs & risks of maintaining status quo v risk & uncertainty of making the change

Push people by creating discomfort in the system e.g. educate people about consequences of not changing, remove buffers and expose people to the consequences of not changing.

Assumption that intrinsic motivation is not sufficient to bring about change

“Pull” change strategies connect a change to things people care about and desire – “change attractors” e.g.

- benefits for patients & carers
- positive outcomes for the individual
- advantages for their immediate (e.g. team/department) and wider (e.g. organisation/profession) environment
CLINICIAN ENGAGEMENT –”PUSH”

• ORGANISATIONAL REQUIREMENT THROUGH TARGETS: KEY ORGANISATION OBJECTIVE: external scrutiny & heart of Quality

• PERSONAL PROFESSIONAL ACCOUNTABILITY THROUGH REVALIDATION

• PERFORMANCE MANAGEMENT

• DO NOT ACCEPT DEVIAN'T BEHAVIOUR
Organisational culture & change for HAI

De Bono S JHI 2013

- Dissemination of key messages
- Marketing approaches
- Educational interventions
- Audit and feedback
- Use of opinion leaders & clinical leadership

Implementation Science

• Implementation science is the study of methods to promote the integration of research findings and evidence into healthcare policy and practice
• It seeks to understand the behavior of healthcare professionals and other stakeholders as a key variables in the sustainable uptake, adoption, and implementation of evidence-based interventions
• AKA: translation of evidence into practice

http://fic.nih.gov/News/Events/implementation-science/Pages/faqs.aspx
The Improvement Pyramid
Program Implementation

1. Summarise the evidence
   Identify interventions associated with improved outcomes
   Select interventions with the largest benefit and lowest barriers to use
   Convert interventions to behaviours

2. Identify local barriers to implementation
   Observe staff performing the interventions
   “Walk the process” to identify defects in each step of implementation
   Enlist all stakeholders to share concerns and identify potential gains and losses associated with implementation

3. Measure performance
   Select measures (process or outcome)
   Develop and pilot test measures
   Measure baseline performance

4. Ensure all patients receive the interventions
   Implement the “four Es” targeting key stakeholders from front line staff to executives

   Engage
   Explain why the interventions are important

   Evaluate
   Regularly assess for performance measures and unintended consequences

   Educate
   Share the evidence supporting the interventions

   Execute
   Design an intervention “toolkit” targeted at barriers, standardisation, independent checks, reminders, and learning from mistakes

Overall concepts
   Envision the problem within the larger healthcare system
   Engage collaborative multidisciplinary teams centrally (stages 1-3) and locally (stage 4)
Implementation Models

• Common themes
  – Have a clear and specific goal
  – Synthesize and summarize evidence
  – Assess barriers
  – Make it easy to do the right thing
  – Engage emotions
  – Measure process and outcomes
  – Evaluate successes and failures
### Evidence:
- hand hygiene, good prep/drape, best site, take lines out

### Behavior:
- checklist

### Local barriers:
- could not find materials, dressings did not stick, nurses afraid of doctors

### Fixes:
- Line cart, new dressing, safety culture training

### Measures:
- compliance with process measures; CLABSI rates

### Engage
- Make the problem real: harm caused by CLABSI; HCW ideas for improvement

### Educate
- Present the evidence

### Execute
- Deploy the toolkit
- Regular meetings

### Evaluate
- Measurement and feedback
- Recognition and visibility
- Celebrate success
- Assess reasons for failure
4. Ensure all patients receive the interventions
Implement the “four Es” targeting key stakeholders from front line staff to executives

**Engage**
Explain why the interventions are important

**Evaluate**
Regularly assess for performance measures and unintended consequences

**Execute**
Design an intervention “toolkit” targeted at barriers, standardisation, independent checks, reminders, and learning from mistakes

**Educate**
Share the evidence supporting the interventions
Engage

• Show why prescribers need to care about antibiotics
  – Abstract stories and data don’t work—need to appeal to their emotions
    • Cases of real patients who were harmed
    • Evidence that the *individual* patient can be harmed
    • Understand physician abnormal behaviour and techniques for having the difficult conversation
“Train and hope” doesn’t work either. (Stilen 2013)
Education Alone in Hospital

- Before and after study compared prescribing practices after distribution of an educational handbook versus an order form.

- Compliance:
  - Handbook: from 11% to 18%
  - Order Form: from 17% to 78%


Ensure all patients receive the interventions

Implement the “four Es” targeting key stakeholders from front line staff to executives

**Engage**
Explain why the interventions are important

**Evaluate**
Regularly assess for performance measures and unintended consequences

**Educate**
Share the evidence supporting the interventions

**Execute**
Design an intervention “toolkit” targeted at barriers, standardisation, independent checks, reminders, and learning from mistakes
Checklists and Prompts

• Single MICU study—2 teams
  – Control: checklist alone
  – Study: checklist plus scripted prompting by a resident who did not have patient care responsibilities
  – Pre-intervention period

# Antibiotic stewardship in the intensive care unit

Charles-Edouard Luyt*, Nicolas Bréchet, Jean-Louis Trouillet and Jean Chastre

Table 1: A personal care bundle for optimizing antimicrobial treatment for intensive care unit patients with ventilator-associated pneumonia

<table>
<thead>
<tr>
<th>Antibiotic stewardship items</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1: Obtain bronchoalveolar specimens for Gram staining and cultures before introducing new antibiotics.</td>
<td>Every effort should be made to obtain reliable specimens from the specific infection site for direct microscope examination and cultures in order to enable de-escalation.</td>
</tr>
<tr>
<td>Step 2: Start antibiotics less than 2 hours after bronchoalveolar lavage.</td>
<td>Time to appropriate antimicrobial administration is a major outcome determinant for intensive care unit patients with severe bacterial infections.</td>
</tr>
<tr>
<td>Step 3: Start therapy using broad-spectrum antibiotics unless no risk factors for resistant pathogens are present.</td>
<td>Owing to the emergence of multiresistant GNB (for example, <em>Pseudomonas aeruginosa</em> and ESBL-producing GNB), empirical broad-spectrum antibiotics are justified for most patients with clinically suspected VAP.</td>
</tr>
<tr>
<td>Step 4: Stop therapy on day 3 if infection becomes unlikely.</td>
<td>Antibiotics can be discontinued very early when VAP diagnosis becomes highly unlikely based on negative cultures and clinical course and the elimination of an extrapulmonary infection.</td>
</tr>
<tr>
<td>Step 5: Use pharmacokinetic-pharmacodynamic data to optimize treatment.</td>
<td>Clinical and bacteriological outcomes can be improved by optimizing the therapeutic regimen according to pharmacokinetic-pharmacodynamic properties of the selected agents.</td>
</tr>
<tr>
<td>Step 6: Streamline antibiotic therapy by using narrower-spectrum antibiotics once the etiological agent is identified.</td>
<td>For many patients with VAP, including those with late-onset infections, therapy can be narrowed once respiratory tract and blood culture results become available, either because an anticipated bacterium (for example, <em>P. aeruginosa</em>, <em>Acinetobacter</em> spp., or methicillin-resistant <em>Staphylococcus aureus</em>) was not recovered or because the isolated pathogen is sensitive to a narrower-spectrum antibiotic than that used initially.</td>
</tr>
<tr>
<td>Step 7: Switch to monotherapy on days 3 to 5.</td>
<td>Using a two-antibiotic regimen for more than 3 to 5 days has no clinical benefits, provided that initial therapy was appropriate, the clinical course evolves favorably, and microbiological data exclude difficult-to-treat microorganisms.</td>
</tr>
<tr>
<td>Step 8: Shorten the treatment duration based on procalcitonin kinetics.</td>
<td>Shorter antibiotic administration for patients with VAP has achieved good outcomes with less antibiotic consumption. Prolonged therapy leads to colonization with antibiotic-resistant bacteria, which may precede recurrent VAP episodes.</td>
</tr>
</tbody>
</table>

ESBL, extended-spectrum β-lactamase; GNB, Gram-negative bacilli; VAP, ventilator-associated pneumonia.
LET DATA BE AT THE HEART OF YOUR LEARNING / COMMUNICATION
• Measure something

• For rapid cycle change, it is okay to show data that shows a trend of improvement
  – It does not have to be publication-ready
NHS Scotland
Use of carbapenem sparing agents in secondary care, DDD/100,000/day
Q3 2009 – Q2 2014

(12 NHS Boards covering ~ 91% of population)
Key messages

• Implementation of evidence based knowledge or good practice is probably the most single important challenge in stewardship

• There are a range of methods to effect change and they are best adapted to local culture, resources, geography, needs etc

• Measurement & feedback & action is the key partner for implementation