

# An Approach to Antimicrobial Resistance: The Role of Stewardship

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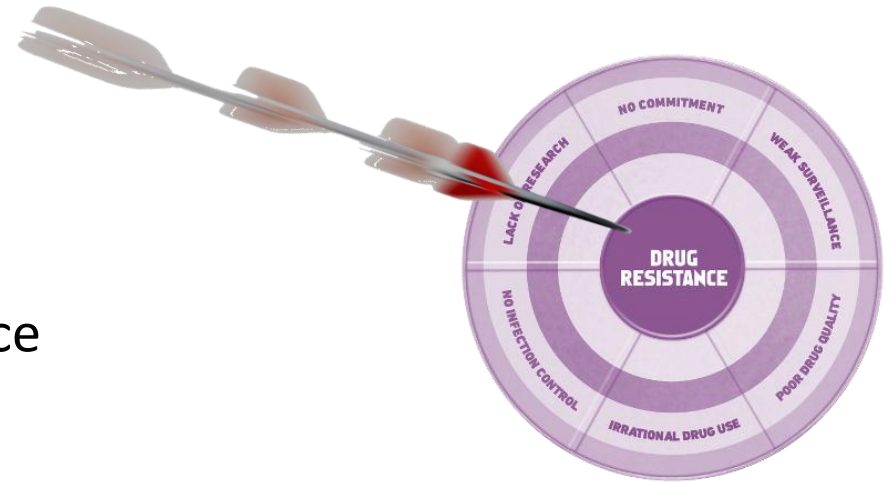


# Disclosures

- I have no known conflicts of interest regarding the material presented herein.
- I am not an employee, board member, or stockholder for a company with direct financial interest in this subject.
- The views offered in the presentation are not necessarily the views of the Ontario Agency for Health Protection and Promotion.

# Overview

- Emerging Antimicrobial Resistance
  - WHO Strategy
  - Local Trends
- Why Develop Antimicrobial Stewardship?
  - Consequences of Inappropriate Antimicrobial Use
  - A Call to Action - Current Healthcare Initiatives
- Key Elements of Program Implementation
  - Two Proactive Methods
  - Additional Tools
  - Survival Techniques
- Challenges & Special Considerations



# WHO 2001:

## Global Strategy for the Containment of Antimicrobial Resistance

### Inappropriate Prescribing Patterns in Acute Care



# WHO 2001:

## Global Strategy for the Containment of Antimicrobial Resistance



### Inappropriate Prescribing Patterns in Acute Care

Inappropriate Prescribing Patterns in the Community

Self-Medication and the Use of Counterfeit Antimicrobials

International Travel and Tourism

Direct-to-consumer Pharmaceutical Advertising

Inadequate Therapy due to Limited Resources

Use of Antimicrobials in Food-Producing Animals

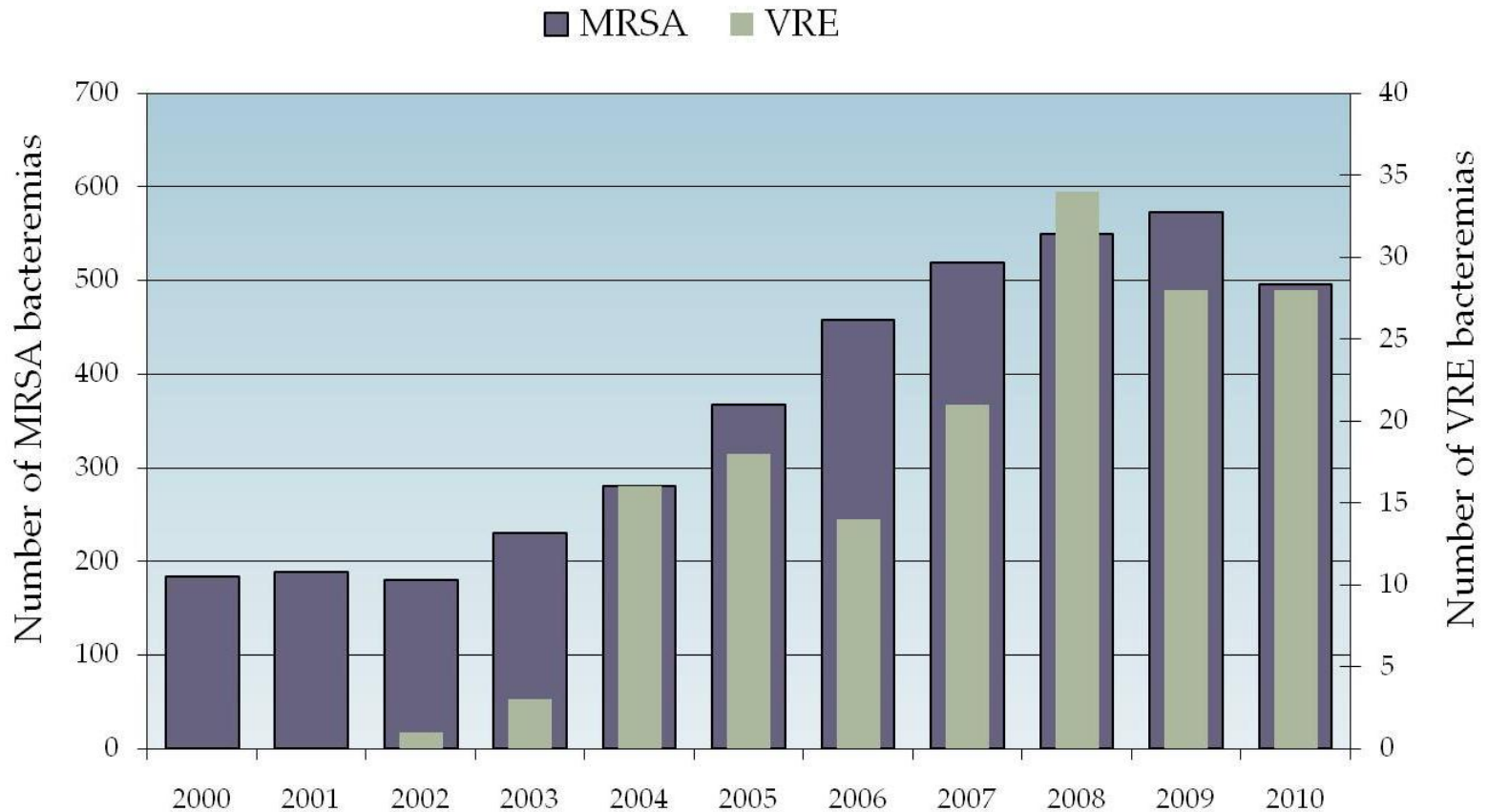
Limitations in Current Surveillance Systems

Diminishing Supply of Effective Antimicrobials

Need for Global Initiatives and Legislation

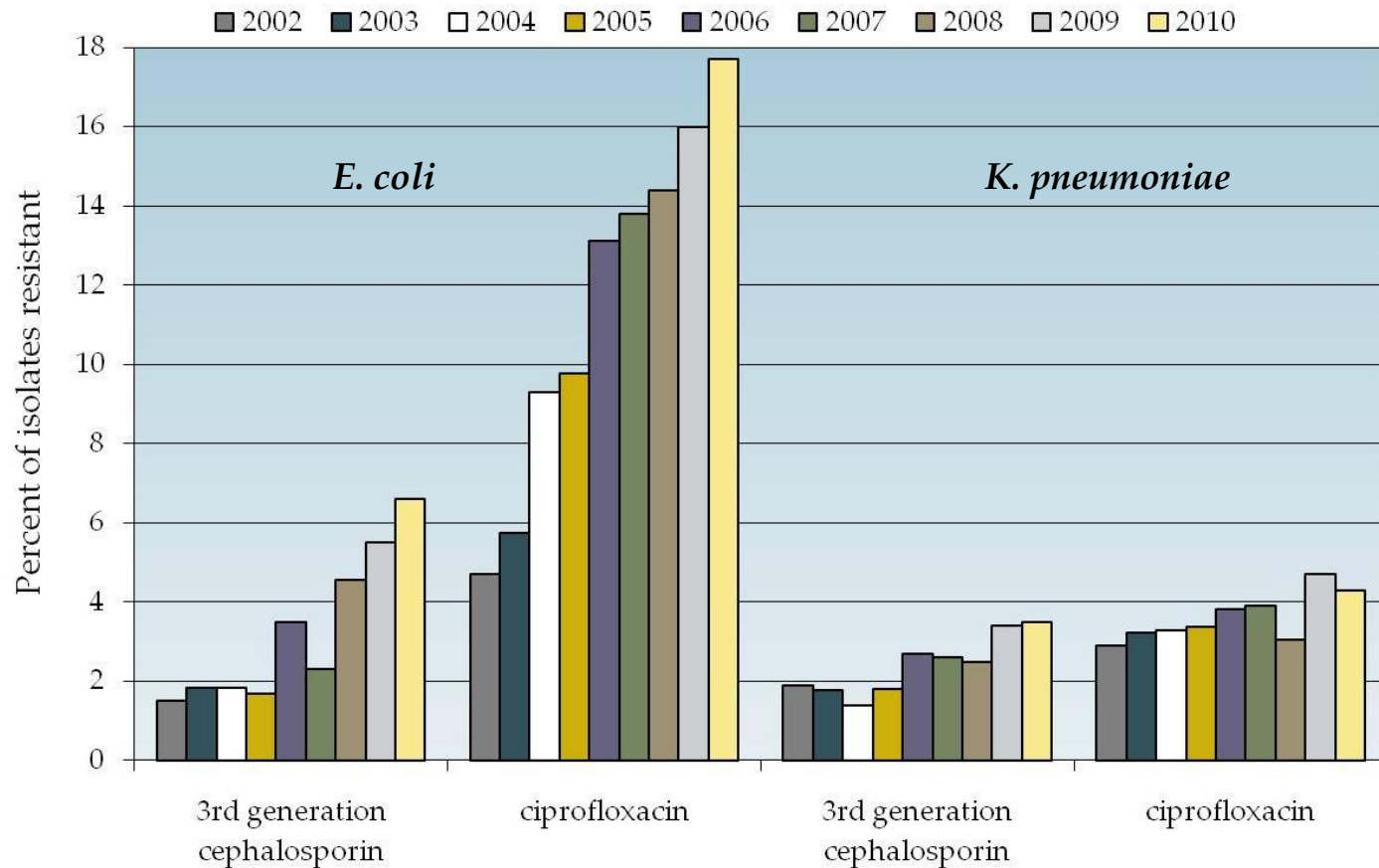
## Local Antimicrobial Resistance Trends:

# MRSA & VRE Bacteremia, Ontario, 2000-10



1) Quality Management Program – Laboratory Services, unpublished data.

# Local Antimicrobial Resistance Trends: Gram(-) Resistance, Ontario, 2002-2010



1) Quality Management Program – Laboratory Services, unpublished data.  
PublicHealthOntario.ca

# Why Develop Antimicrobial Stewardship?

- Up to 50% of antimicrobial use is inappropriate<sup>1-3</sup>
- Inappropriate use selects for drug-resistant pathogens<sup>4-5</sup>
- Drug-resistant pathogens are associated with:
  - Increased health care costs<sup>6</sup>
  - Increased length of hospital stay<sup>7</sup>
  - Increased patient mortality<sup>8</sup>

1) Scheckler WE et al. JAMA 1970; 213: 264-7.

2) Marr JJ et al. J Infect Dis 1988; 157:869-76.

3) John JF et al. Clin Infect Dis 1997; 24:471-85.

4) Neuhauser MM et al. JAMA 2003; 289: 885-8.

5) Polk RE et al. Clin Infect Dis 2004; 39:497-503.

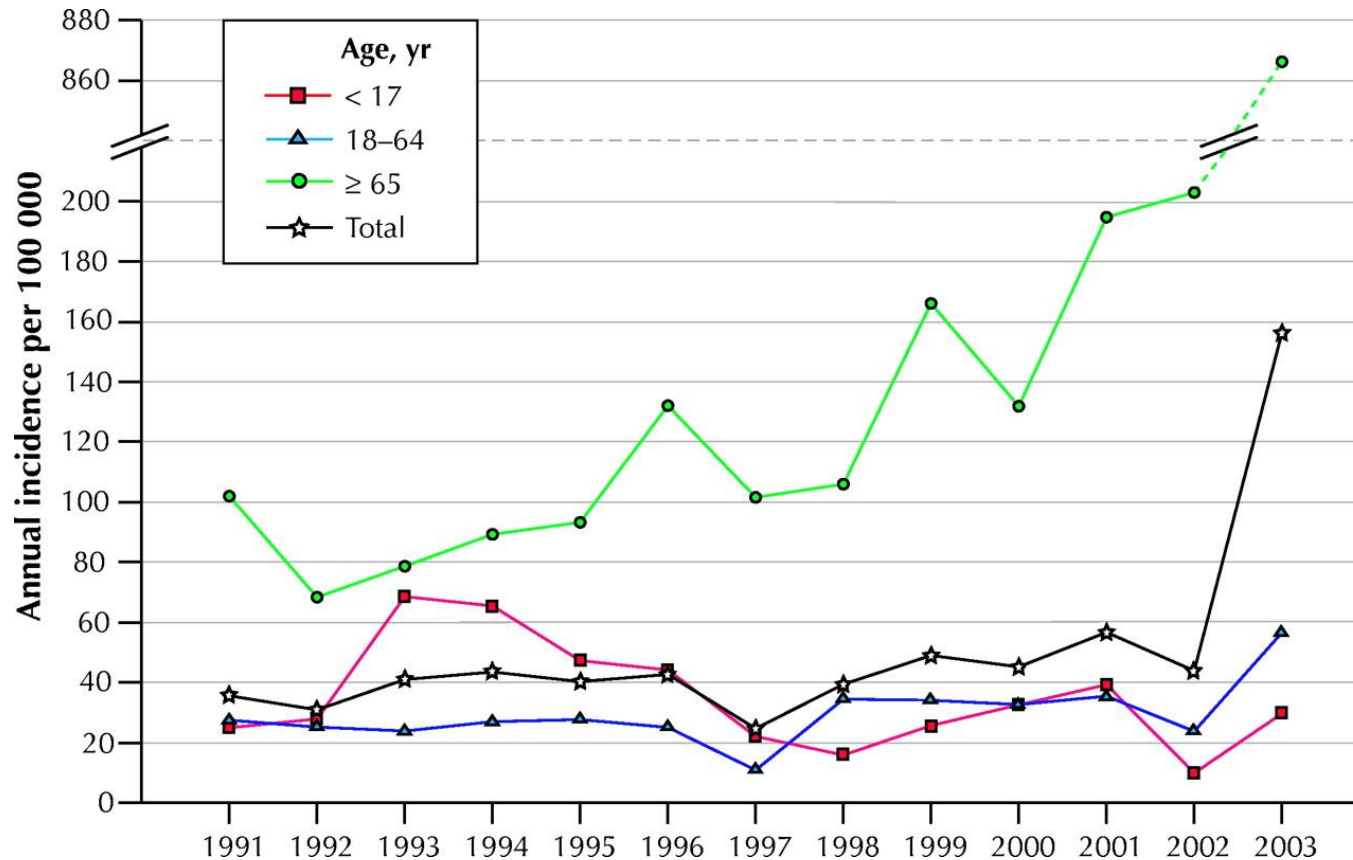
6) McGowan JE Jr. Emerg Infect Dis 2001; 7:286-92.

7) Kim BN. J Hosp Infect 2002; 52(2): 99-106.

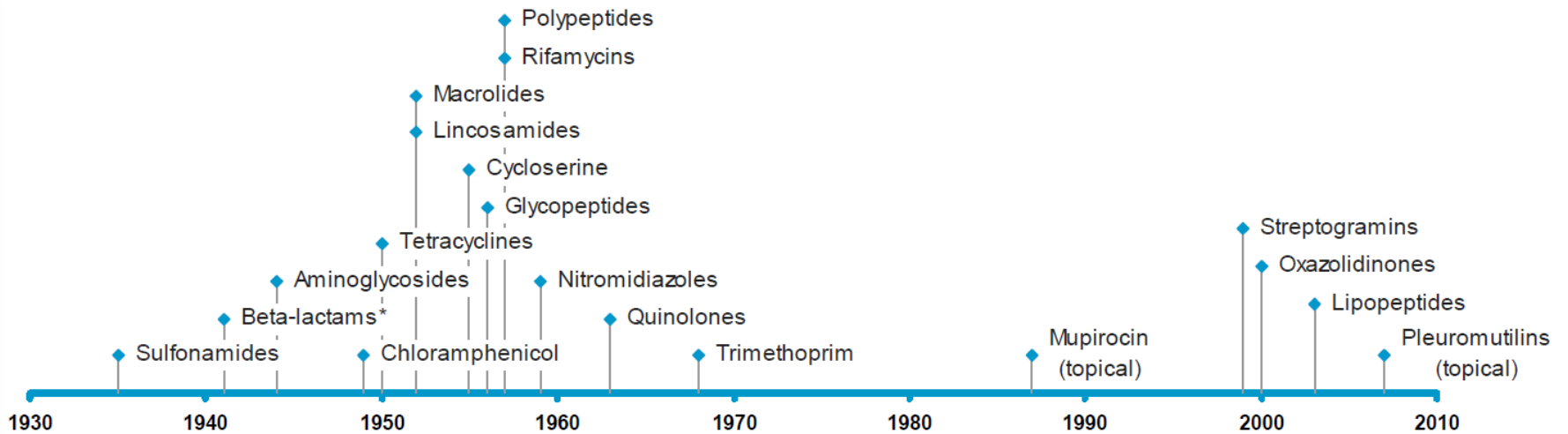
8) Paterson DL et al. CID 2004; 29(1): 31-7.

Additional Consequences:

# *C. difficile*, Sherbrooke Quebec, 1991-2003

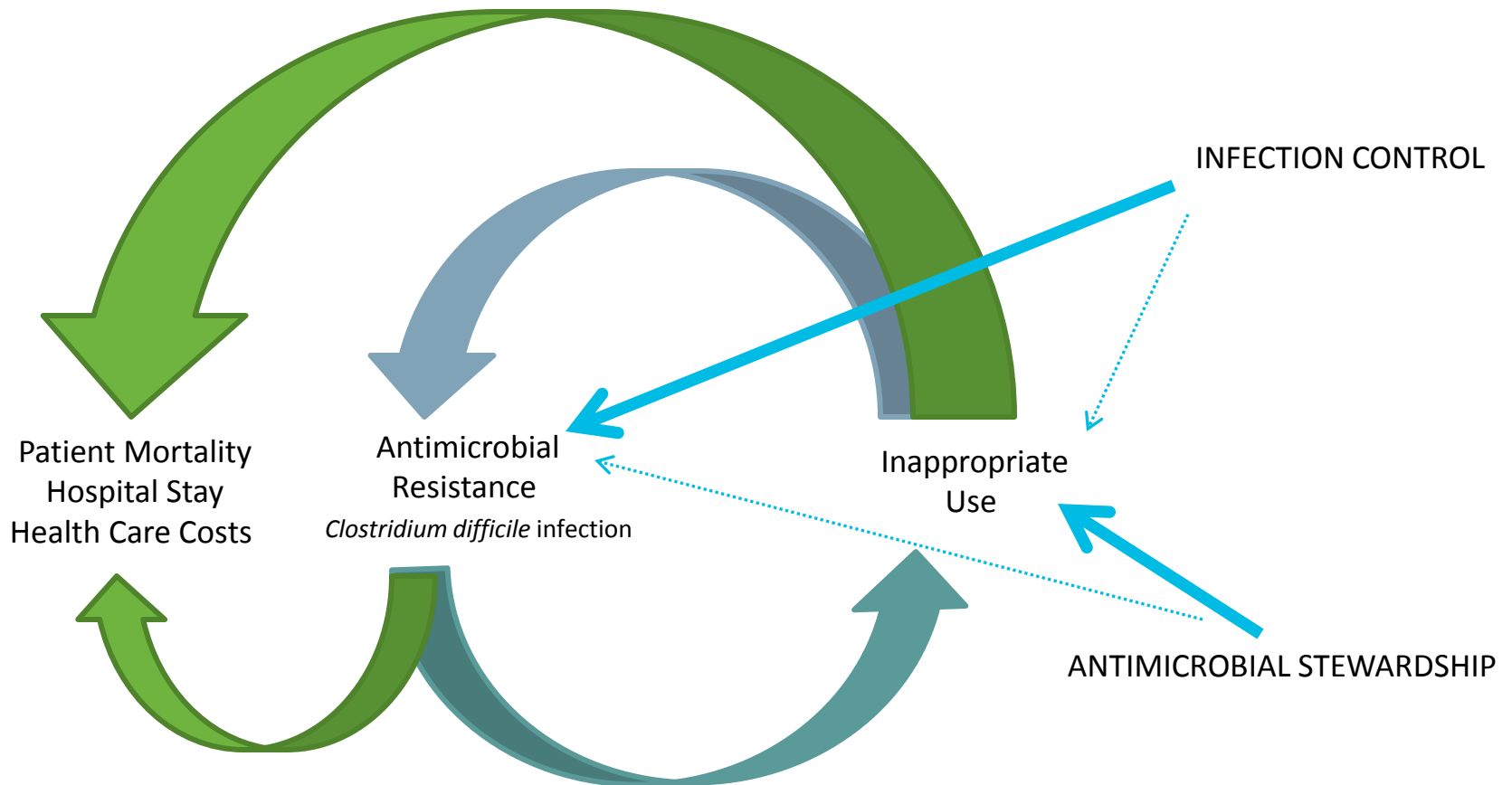


# The Diminishing Antimicrobial Pipeline



\* Beta-lactams include three groups sometimes identified as separate classes: penicillins, cephalosporins, and carbapenems.

# The Role of Antimicrobial Stewardship



1) McGowan JE. Clin Infect Dis 2004; 38: 939-42.

# Current Healthcare Initiatives

## Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship

**Timothy H. Dellit,<sup>1</sup> Robert C. Owens,<sup>2</sup> John E. McGowan, Jr.,<sup>3</sup> Dale N. Gerding,<sup>4</sup> Robert A. Weinstein,<sup>5</sup> John P. Burke,<sup>6</sup> W. Charles Huskins,<sup>7</sup> David L. Paterson,<sup>8</sup> Neil O. Fishman,<sup>9</sup> Christopher F. Carpenter,<sup>10</sup> P. J. Brennan,<sup>9</sup> Marianne Billeter,<sup>11</sup> and Thomas M. Hooton<sup>12</sup>**

<sup>1</sup>Harborview Medical Center and the University of Washington, Seattle; <sup>2</sup>Maine Medical Center, Portland; <sup>3</sup>Emory University, Atlanta, Georgia; <sup>4</sup>Hines Veterans Affairs Hospital and Loyola University Stritch School of Medicine, Hines, and <sup>5</sup>Stroger (Cook County) Hospital and Rush University Medical Center, Chicago, Illinois; <sup>6</sup>University of Utah, Salt Lake City; <sup>7</sup>Mayo Clinic College of Medicine, Rochester, Minnesota; <sup>8</sup>University of Pittsburgh Medical Center, Pittsburgh, and <sup>9</sup>University of Pennsylvania, Philadelphia, Pennsylvania; <sup>10</sup>William Beaumont Hospital, Royal Oak, Michigan; <sup>11</sup>Ochsner Health System, New Orleans, Louisiana; and <sup>12</sup>University of Miami, Miami, Florida

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# What is Antimicrobial Stewardship?

## *ANTIMICROBIAL STEWARDSHIP:*

### *IMPROVE USE:*

*by selecting the appropriate dose,  
route, and duration of therapy*

*with the GOAL of:  
achieving optimal clinical  
outcomes, minimizing toxicity,  
controlling costs, and minimizing  
the resistance*



## Centers for Disease Control & Prevention: 12 Steps to Avoid Antimicrobial Resistance

- 1) Vaccinate
- 2) Prevent conditions that lead to infection
- 3) Remove non-essential indwelling devices
- 4) Target the pathogen
- 5) Access local experts and use regional data
- 6) Practice antimicrobial control
- 7) Treat infection, not contamination or colonization
- 8) Discontinue therapy after treatment
- 9) Use isolation precautions
- 10) Break the chain of contagion
- 11) Hand hygiene
- 12) Surveillance

Adapted from: <http://www.cdc.gov/drugresistance/healthcare/ha/12stepsHA.html>

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Antimicrobial  
Stewardship

# National Efforts to Combat Resistance:

- Antimicrobial Resistance Surveillance
  - Canadian Antimicrobial Resistance Alliance (CARA)
  - Canadian Integrated Program for Antimicrobial Resistance Surveillance
  - Canadian Committee on Antibiotic Resistance
  - Canadian Bacterial Diseases Network
  - Antimicrobial Resistance and Nosocomial Infections
  - The Canadian Nosocomial Infection Surveillance Program
  - Public Health Agency Canada
- Antimicrobial Use In Human, Animal & Food Sources
  - Canadian Integrated Program for Antimicrobial Resistance Surveillance

# Local Efforts to Combat Resistance: Partners for Appropriate Anti-infective Community Therapy

- Community-based, Multi-faceted Educational Program
  - Has significantly altered antibiotic prescribing patterns<sup>1</sup>
  - An innovative teaching model for community-based health professionals
  - Physician-pharmacist teams use case-based small group session
    - Lead local consensus on diagnosis, treatment and patient management strategies
- Based on *Anti-infective Guidelines for Community-acquired Infections*<sup>2</sup>
- CoMPLI
  - **C**ommunity Wide
  - **M**ulti-stakeholder, Multi-intervention
  - **P**atient-focused
  - **L**eadership by health professionals
  - **I**nteractive case and guideline-based

1) Stewart J et al. Can Fam Phys 2000; 46: 851-859.

2) Ontario Anti-Infective Review Panel. Toronto: Queen's Printer for Ontario; 2010.

# Antimicrobial Stewardship In Ontario



# Institute for Safe Medical Practices Survey

**Table 1. Professions and Hospital Types Represented by Survey Respondents<sup>a</sup>**

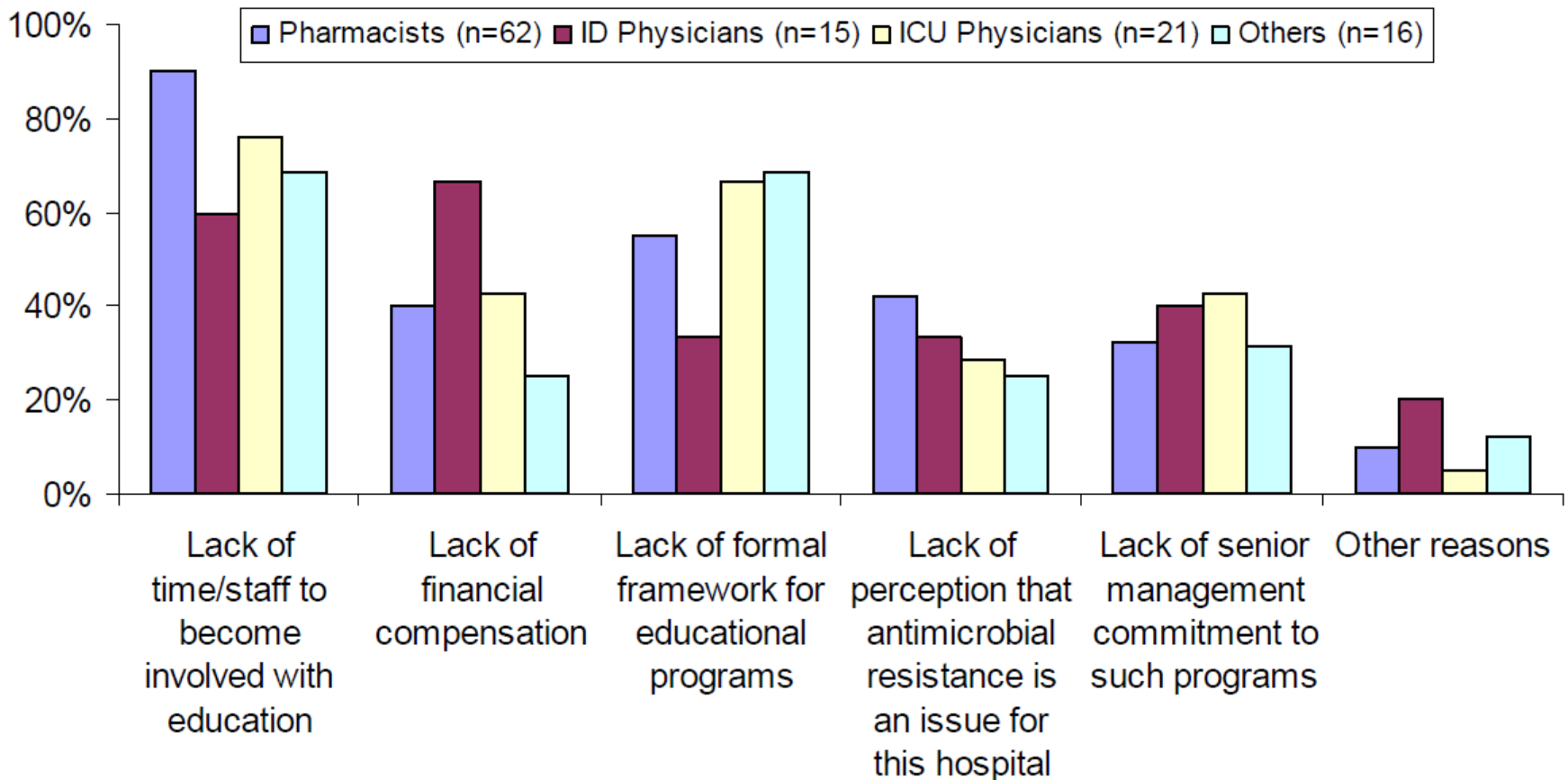
Characteristic	No. (%) of Respondents <sup>b</sup> (n = 114)
<b>Professional group</b>	
Pharmacist	62 (54)
Infectious diseases physician	15 (13)
Medical director of intensive care unit	21 (18)
Other physician	9 (8)
Other clinician	7 (6)
<b>Hospital type<sup>a</sup></b>	
Academic health sciences centre	28 (25)
Large community hospital	39 (34)
Small community hospital	41 (36)
Chronic care or rehabilitation hospital	6 (5)

<sup>a</sup> A given hospital may be represented more than once in these data, if respondents from more than one professional group at that hospital completed the survey

<sup>b</sup> Percentages may not sum to 100% because of rounding.

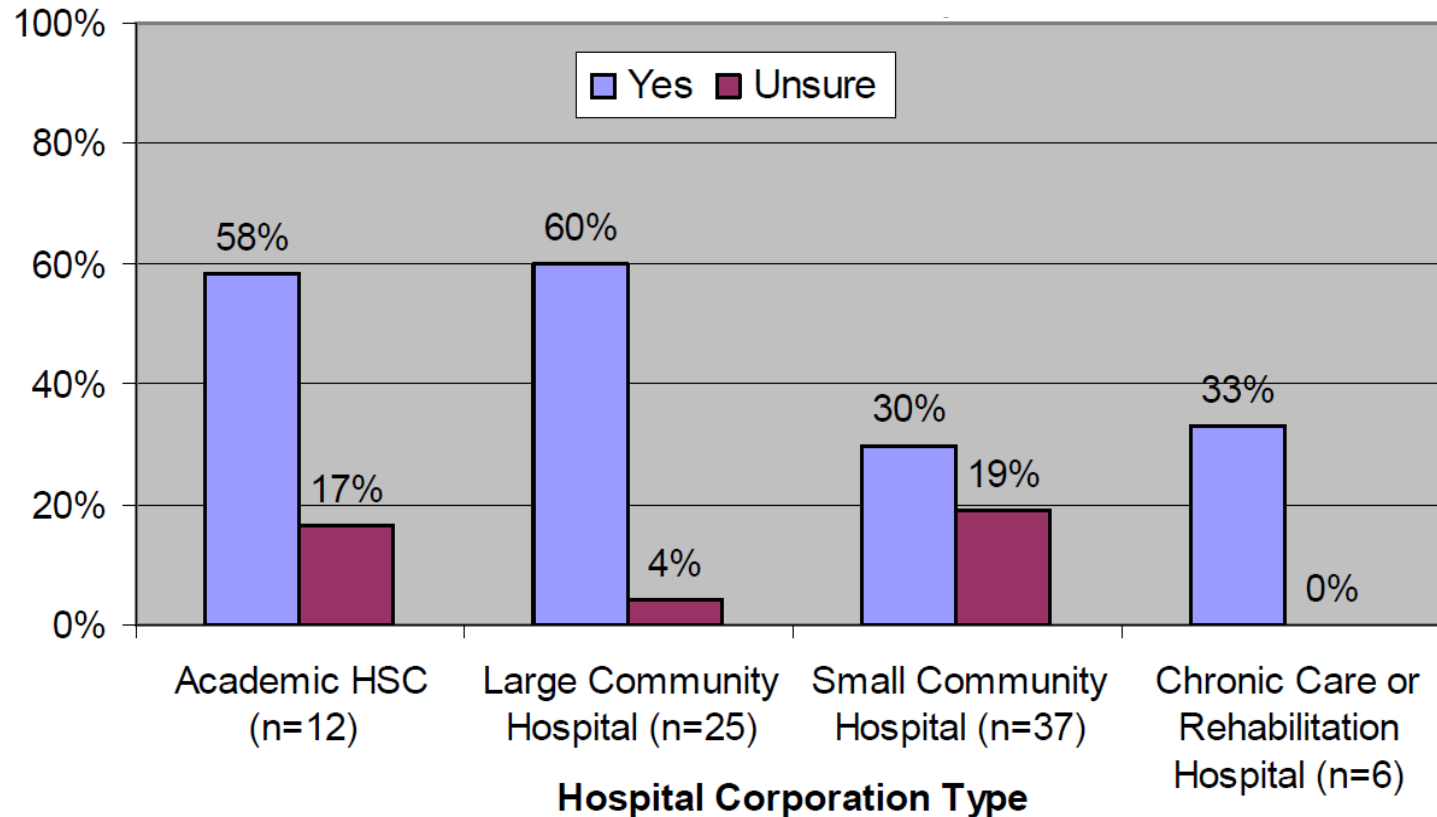
ISMP Survey:

# Barriers to Education About Drug Resistance



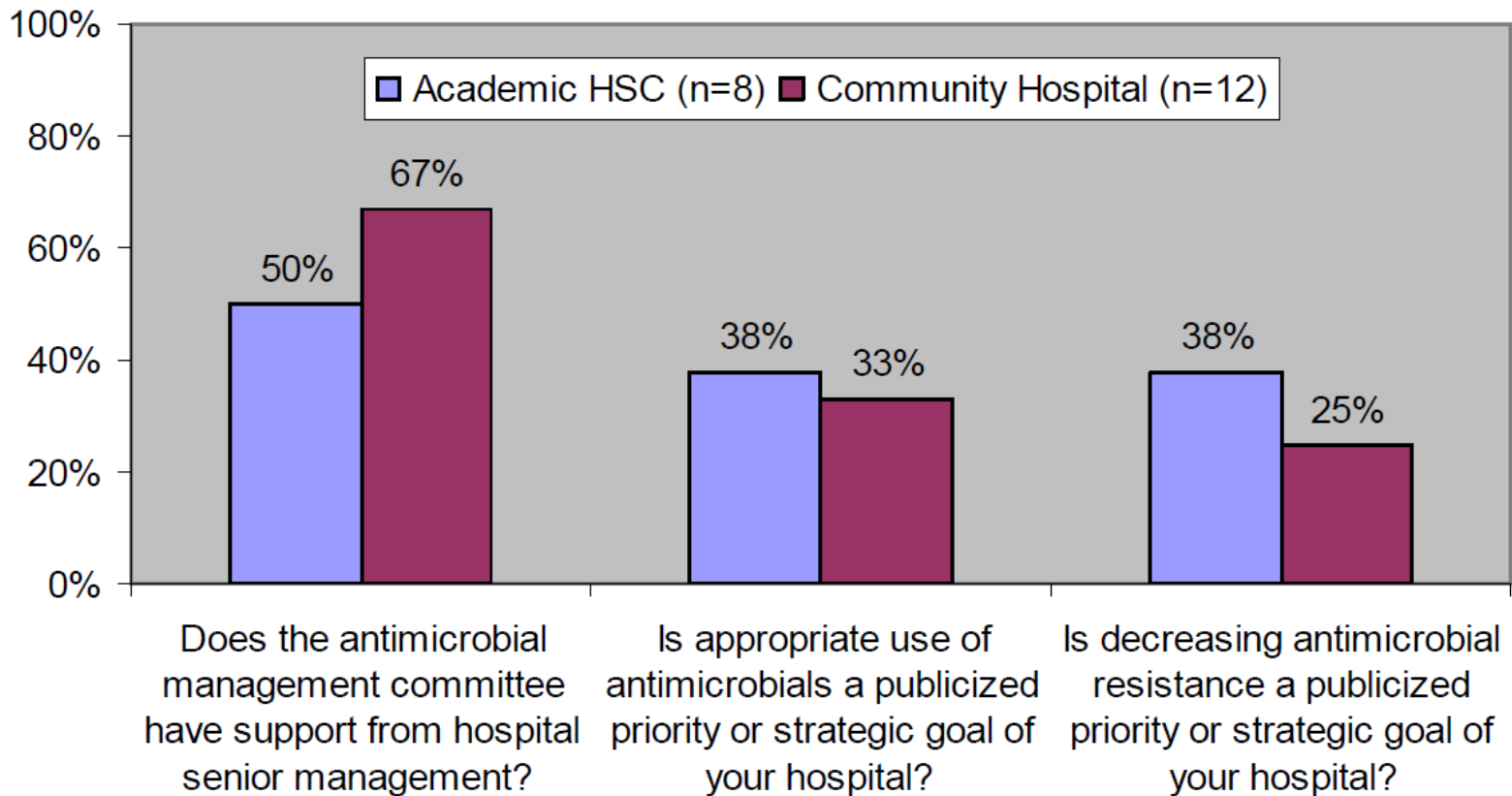
ISMP Survey:

# Presence of A Hospital-Supported ASP



ISMP Survey:

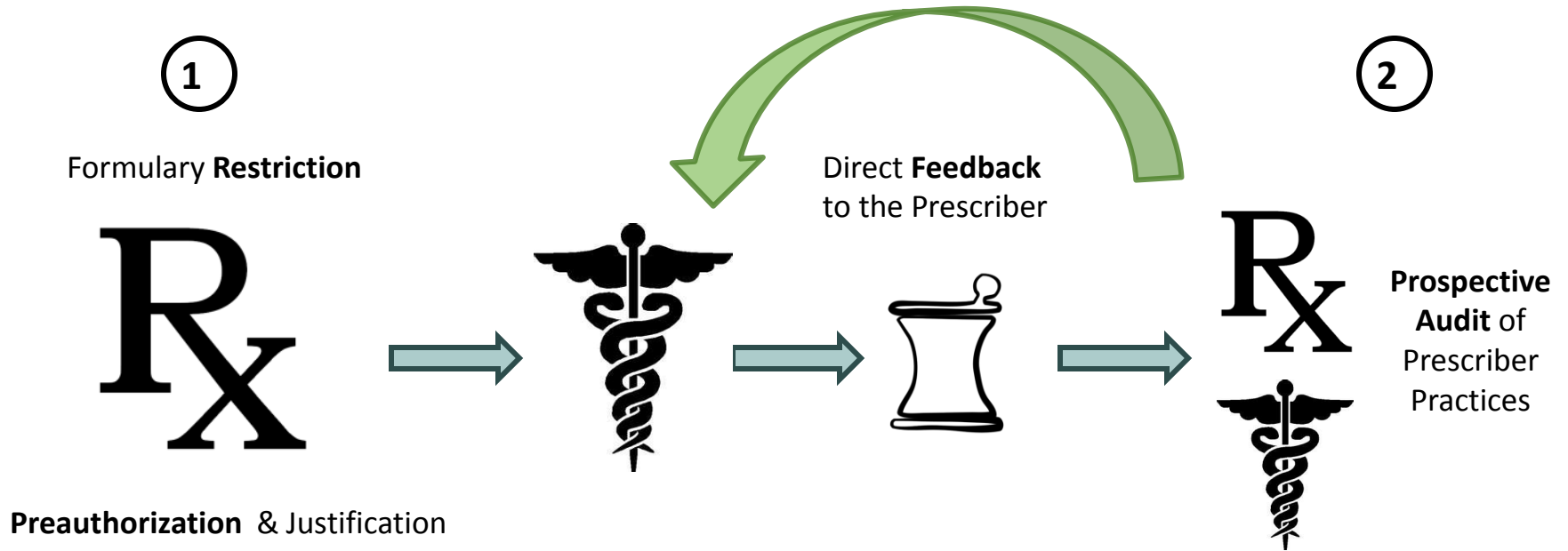
# Antimicrobial Stewardship as a Priority



# What are the Keys to Implementation?

- Core Team Members:
  - An infectious diseases physician
  - A clinical pharmacist with infectious diseases training
    - the inclusion of a clinical microbiologist, an information system specialist, an infection control professional, and hospital epidemiologist being optimal
- Essential Components:
  - Collaboration between the ASP, Infection Control and pharmacy
  - Support of hospital administration and medical staff
    - Function under the auspices of quality assurance and patient safety
    - Adequate authority and compensation
    - Infrastructure to measure and track antimicrobial use
  - Use of core strategies and supplemental activities

# Two Core, Pro-active Strategies



1) IDSA-SHEA guidelines.

# Prospective Audit and Feedback

- Improved antimicrobial utilization
  - Less unnecessary use<sup>1</sup>
    - Shorter duration of therapy
    - Fewer new starts
  - More appropriate **initial *and* definitive** use<sup>2</sup>
- Lower rates of *Clostridium difficile* infection<sup>3</sup>
- Fewer infections with drug-resistant pathogens<sup>3</sup>
- Shorter duration of hospital stay<sup>2</sup>
- Cost-savings<sup>4-5</sup>

1) Solomon DH et al. Arch Int Med 2001; 161: 1897-902.

2) Camins BC et al. Infect Control Hosp Epidemiol 2009; 30: 930-8.

3) Carling P et al. Infect Control Hosp Epidemiol 2003; 24: 699-706.

4) LaRocco A et al. Clin Infect Dis 2003; 37: 742-3.

5) Fraser GL et al. Arch Int Med 1997; 157: 1689-94.

# Formulary Restriction & Prior Authorization

- Has led to:
  - Cost containment<sup>1</sup>
  - Reduced antimicrobial usage
  - Control of *Clostridium difficile* outbreaks<sup>2,3</sup>
- Less convincing data to support:
  - An effect on antimicrobial resistance
    - Reduction in the use of one agent may favor another agent
- Success depends on the source of the restriction
  - Most effective when presented by an ASP member<sup>4</sup>

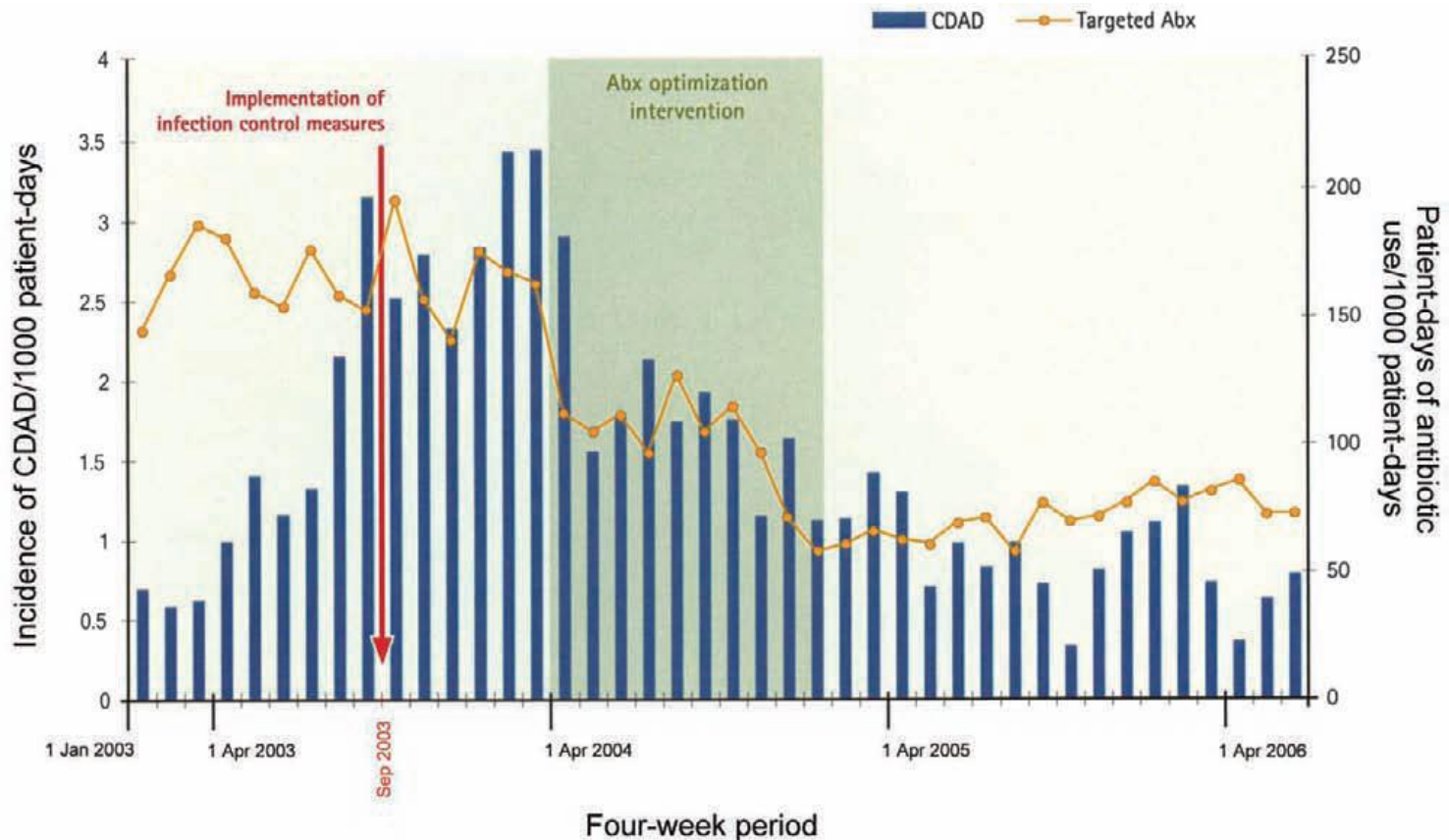
1) Burke JP N Engl J Med 2003; 348:651–6.

2) Pear SM Ann Intern Med 1994; 120:272–7.

3) Quale J Clin Infect Dis 1996; 23:1020–5.

4) Gross R Clin Infect Dis 2001; 33:289–95.

# Prospective Audit & Feedback: Effect on a *C.difficile* Outbreak



# Supplemental Strategies

- Guidelines & clinical pathways
- Streamlining therapy
- Dose optimization
- Education
- Parenteral → oral conversion
- Electronic medical record
- Patient-specific data
- Antimicrobial order forms
- Computer physician order entry
- Clinical decision support
- Computer-based surveillance
- Process and outcomes measures

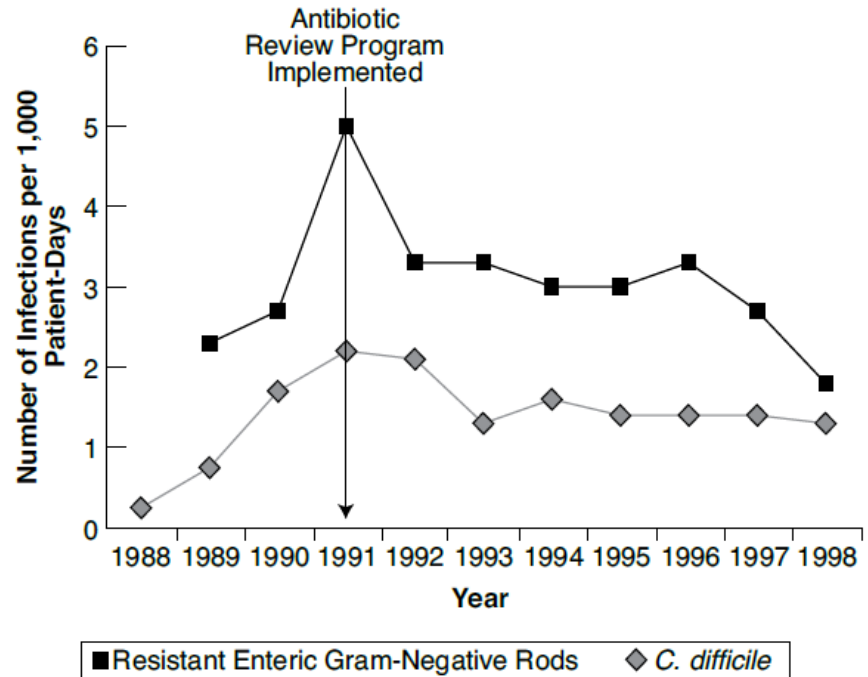
1) IDSA-SHEA guidelines.

# Measures

- Process Measures
  - Antimicrobial use
  - Cost savings
    - Appropriate antimicrobial is not always the least expensive
  - Surrogate impacts
    - Prescribing patterns, time to appropriate therapy, bug-drug mismatches
- Outcomes Measures
  - Patient-specific outcomes
    - Adverse event avoidance is difficult to assess
      - *Clostridium difficile* rates are often a surrogate marker
  - Drug resistance
    - Can be difficult to demonstrate over short periods of time

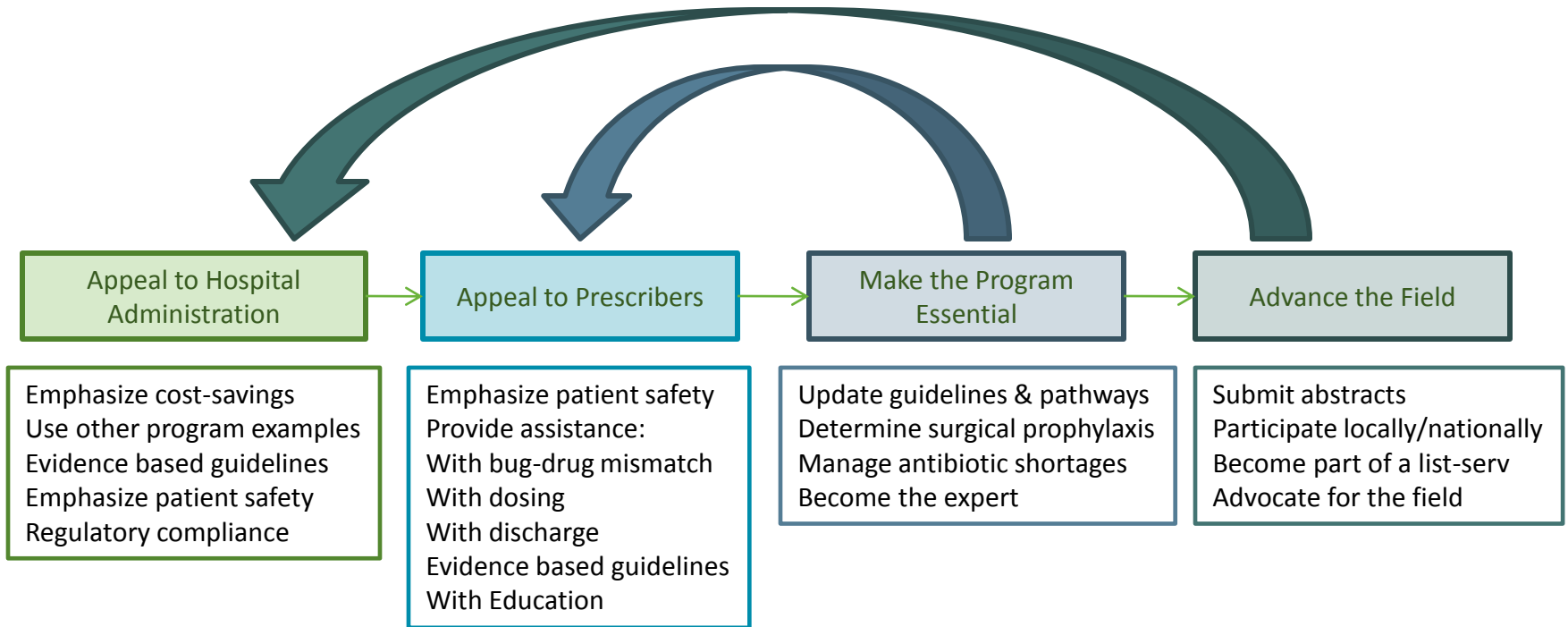
# ASP Effects on Antimicrobial Resistance

- Can be difficult to prove
  - Multiple interventions
  - Changing epidemiology
    - Rise in VRE/MRSA rates
  - Proof requires time
- Best data for:
  - Outbreak management
  - Gram-negative rods
  - *Clostridium difficile*
  - Specific units or patient populations



Carling P. Infect Control Hosp Epidemiol 2003; 24: 699-706.

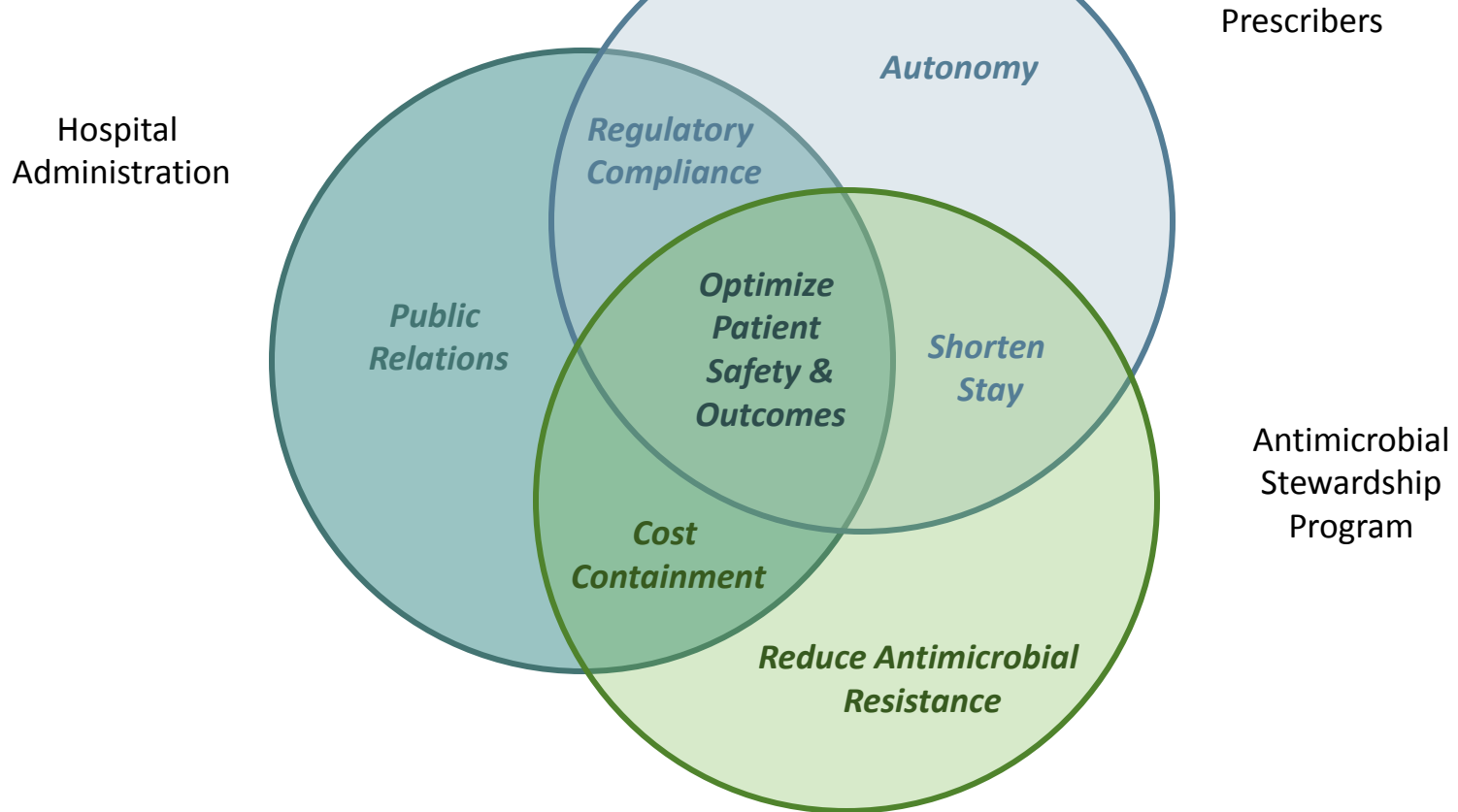
# Successful Implementation & Survival



1) Adapted from Cosgrove S. Driving Change: Why Antimicrobial Stewardship? IDSA Antimicrobial Stewardship Workshop, October 2010.

Challenges:

# Managing Expectations and Goals



Special Considerations:

## Resource-limited Settings

- **Re-consider the members of the multi-disciplinary team**
  - Facilities without an infectious disease MD:
    - May consult with an outside hospital MD
    - May contract with an outside hospital MD
      - For day-to-day activities
      - Most effective with an electronic medical record
    - Should identify a local “champion”
  - Facilities without an infectious disease pharmacist:
    - Target a pharmacist with interest and IT capabilities

Special Considerations:

## Resource-limited Settings

- **Focus the measures**

- Antimicrobial use review bi-weekly, instead of daily
- Target agents that are high-cost
- Review use of multiple agents or prolonged use
- Focus on high-impact units (intensive care)
- Glenwood Regional Medical Center, Louisiana - 120 beds
  - 12-month review, 2000
    - 488 recommendations
      - 38% involved discontinuation of an antimicrobial
    - time commitment = 8-12 hours / week
    - Estimated savings = \$177,000

1) LaRocco Jr. A Clin Infect Dis 2003;37: 742-3.

# What's Ahead....

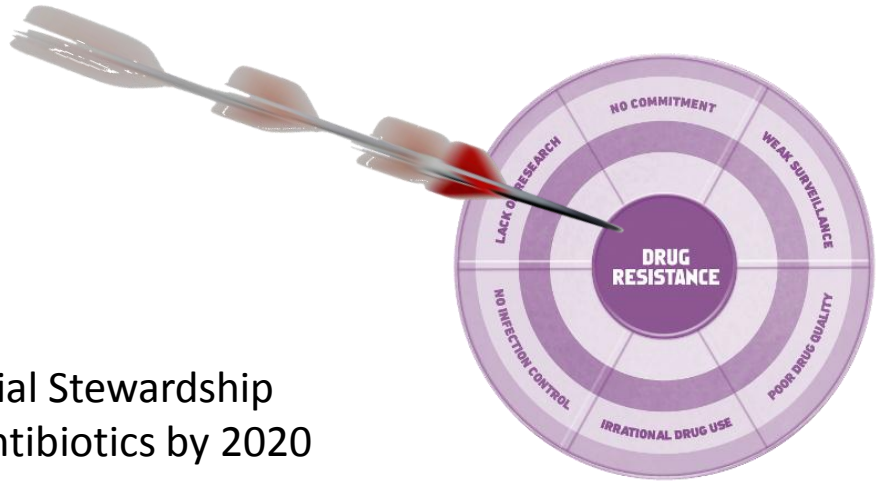
- New Approaches
  - Positive deviance
  - Toronto East General Hospital
- New Networks
  - National and international list-serv
  - Toronto Antimicrobial Stewardship Corridor
  - MSH-UHN sponsored city-wide meeting
- New Resources
  - Infectious-disease trained pharmacists
  - IDSA-SHEA antimicrobial stewardship workshops
- New Projects
  - The Ontario Antimicrobial Stewardship Project

# Summary

- Antimicrobial resistance is a multifaceted issue
  - Inappropriate use in acute care is one element
- Local trends are consistent with national & global trends
- Global and national initiatives highlight stewardship
- Comprehensive program guidelines exist
  - Prospective audit and feedback, formulary restriction and pre-authorization are the cornerstones of a successful program
  - Managing expectations is essential
- Antimicrobial stewardship is the focus of future efforts to contain resistance

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- Ontario Agency for Health Protection and Promotion
  - Infectious Disease Prevention and Control
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  - Department of Pharmacy
    - **Sumit Raybardhan BSc Phm, ACPR, MPH (RPh)**



# Additional Resources

- [www.idsociety.org/](http://www.idsociety.org/)
  - IDSA-SHEA guidelines for Antimicrobial Stewardship
  - IDSA's initiative – A call for 10 new antibiotics by 2020
- [www.who.int/world-health-day/2011/en/index.html](http://www.who.int/world-health-day/2011/en/index.html)
- [www.who.int/drugresistance/WHO\\_Global\\_Strategy.htm/en/](http://www.who.int/drugresistance/WHO_Global_Strategy.htm/en/)
  - World Health Organization
  - 2000 Global Strategy for Containment of Antimicrobial Resistance
- <http://www.mumshealth.com/>
  - Medication Use Management Service
    - Partners for Appropriate Anti-Infective Community Therapy (PAACT)
    - *Anti-infective Guidelines for Community-Acquired Infection*