# Our Place in Healthcare Quality: The Role of the Hospital Epidemiologist

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# Disclosures

- I have nothing to disclose.

# Objectives

- Discuss the role of the Hospital Epidemiologist in healthcare quality.

- List effective strategies to communicate infection prevention and antibiotic stewardship recommendations to both hospital leaders and frontline providers

# The Problem

TABLE A1. Reported Rates of Healthcare-Associated Infections in US Hospitals in 2002

| Type of infection | No. of infections | No. of deaths from infection | Case fatality rate, % |
|---|---|---|---|
| Catheter-associated bloodstream infection | 248,678 | 30,665 | 12.3 |
| Ventilator-associated pneumonia | 250,205 | 35,967 | 14.4 |
| Catheter-associated urinary tract infection | 561,667 | 13,088 | 2.3 |
| Surgical site infection | 290,485 | 8,205 | 2.8 |
| Other | 386,090 | 11,062 | 2.9 |
| Total | 1,737,125 | 98,987 | 5.7 |

NOTE. Data are from Klevens et al.[2]

Klevens RM, et al.Public Health Rep 2007;122(2):160–166.

# Healthcare-Associated Infections

Point prevalence survey of HAIs in the US in 2011:

- **1 in 25** hospitalized patients have at least 1 healthcare associated infection (HAI)
- **648,000 Patients** with HAIs
- **722,000 HAIs**
- **75,000** associated **deaths**

Magill SS et al. NEJM. 2014;370:1198-208.

| Major Site of Infection | Estimated Number |
|---|---|
| Pneumonia | 157,500 |
| Gastrointestinal illness | 123,100 |
| Urinary tract infection (UTI) | 93,300 |
| Primary bloodstream infections | 71,900 |
| Surgical site infection (SSI) | 157,500 |
| Other types of infection | 118,500 |
| **Total HAIs** | **721,800** |

# Health Care–Associated Infections
## A Meta-analysis of Costs and Financial Impact on the US Health Care System

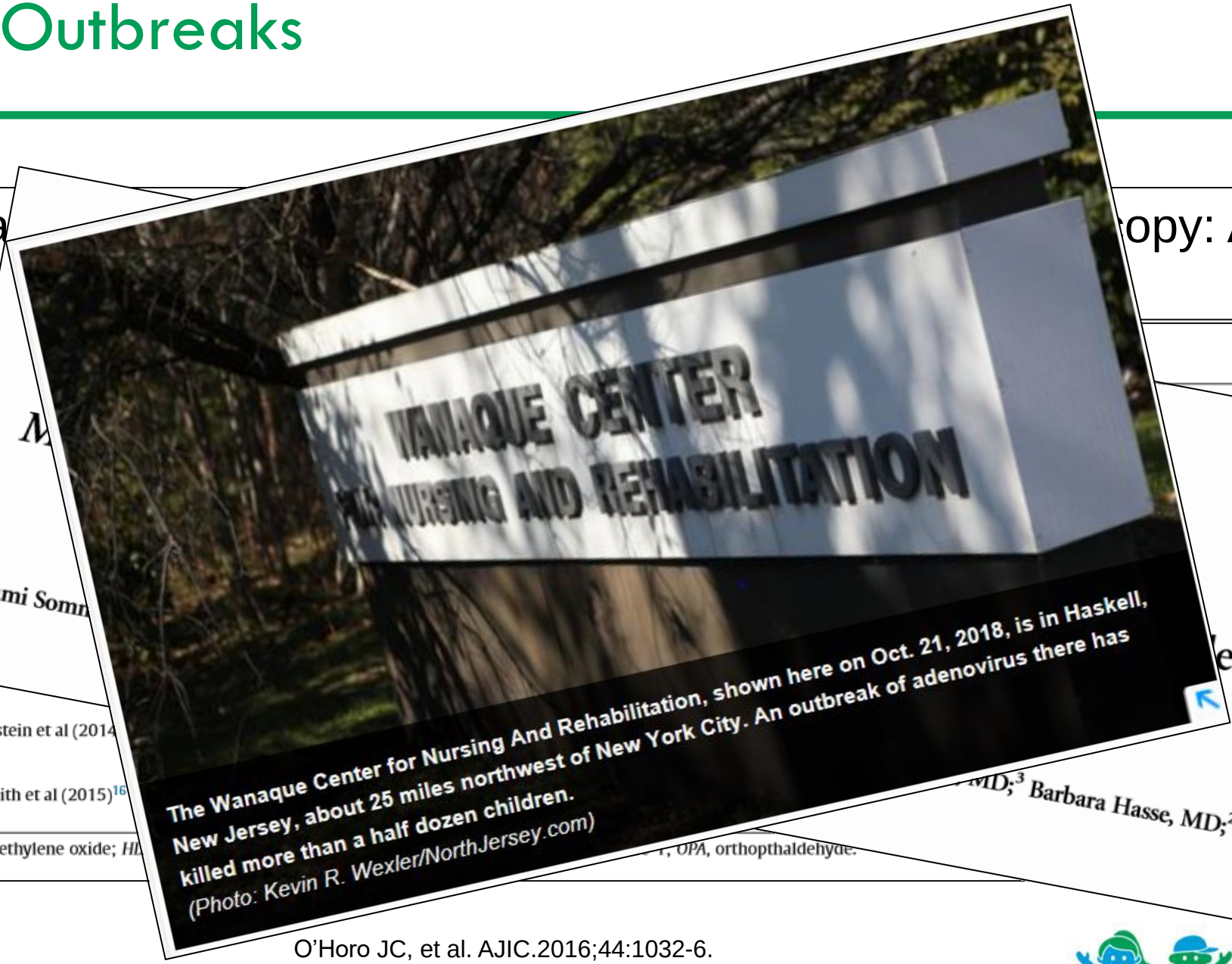
Table 3. Total Attributable Financial Impacts of Health Care–Associated Infections in US Adult Inpatients at Acute Care Hospitals, 2009[a]

| Health Care–Associated Infection Type | Costs | | |
|---|---|---|---|
| | Total | Lower Bound | Upper Bound |
| Surgical site infections | 3 297 285 451 | 2 998 570 584 | 3 595 841 680 |
| MRSA | 990 539 052 | 93 785 080 | 1 935 883 296 |
| Central line–associated blood-stream infections | 1 851 384 347 | 1 249 464 195 | 2 636 608 279 |
| MRSA | 389 081 519 | 111 253 391 | 1 160 029 019 |
| Catheter-associated urinary tract infections | 27 884 193 | 18 765 813 | 37 002 574 |
| Ventilator-associated pneumonia | 3 094 270 016 | 2 796 898 212 | 3 408 445 101 |
| *Clostridium difficile* infections | 1 508 347 070 | 1 218 707 008 | 1 814 293 587 |
| **Total** | **9 779 171 077** | **8 282 405 811** | **11 492 191 220** |

| | | |
|---|---|---|
| *Clostridium difficile* infections | 11 285 (9118-13 574)[b] | 3.3 (2.7-3.8)[b] |

Zimlichman E, et al. JAMA Intern Med.2013;173(22):2039-2046

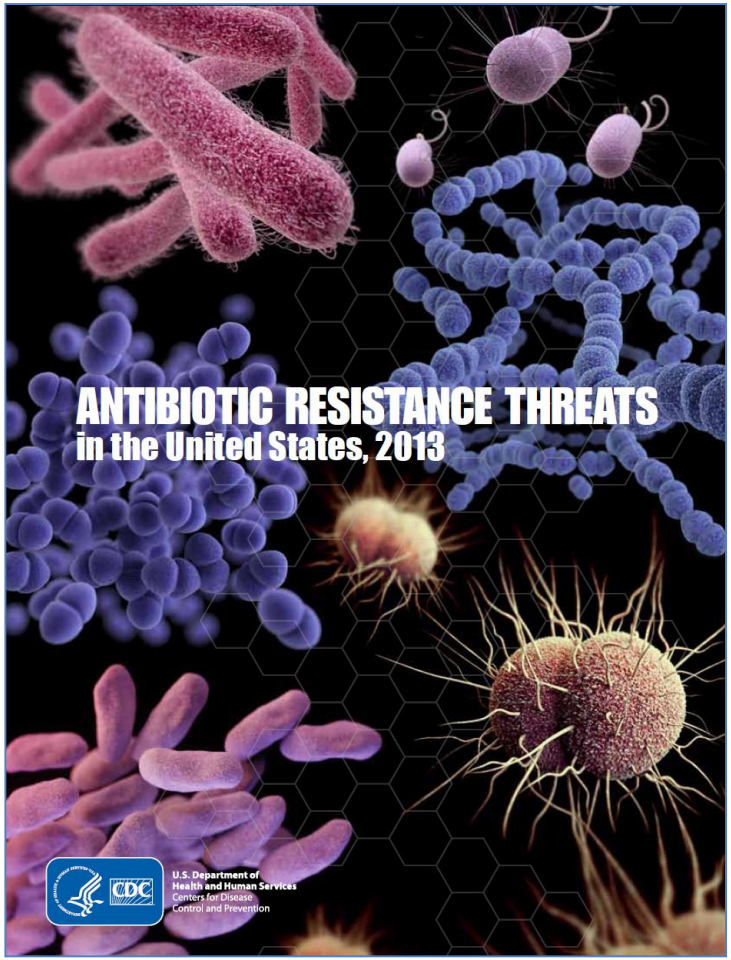
# Outbreaks




O'Horo JC, et al. AJIC.2016;44:1032-6.
Sommerstein R, et al. ICHE.2017;38(1):103-8.

# Antibiotic Resistance

- Up to 50% of antibiotics are not indicated or prescribed sub-optimally
- Serious infections from antibiotic-resistant bacteria
  - 2 million people
  - 23,000 people die
- *Clostridium difficile*
  - 250,000 people treated in hospital
  - At least 14,000 deaths
- Antibiotic-resistant infections
  - Prolonged hospitalization
  - Estimated $20 billion in excess direct healthcare costs



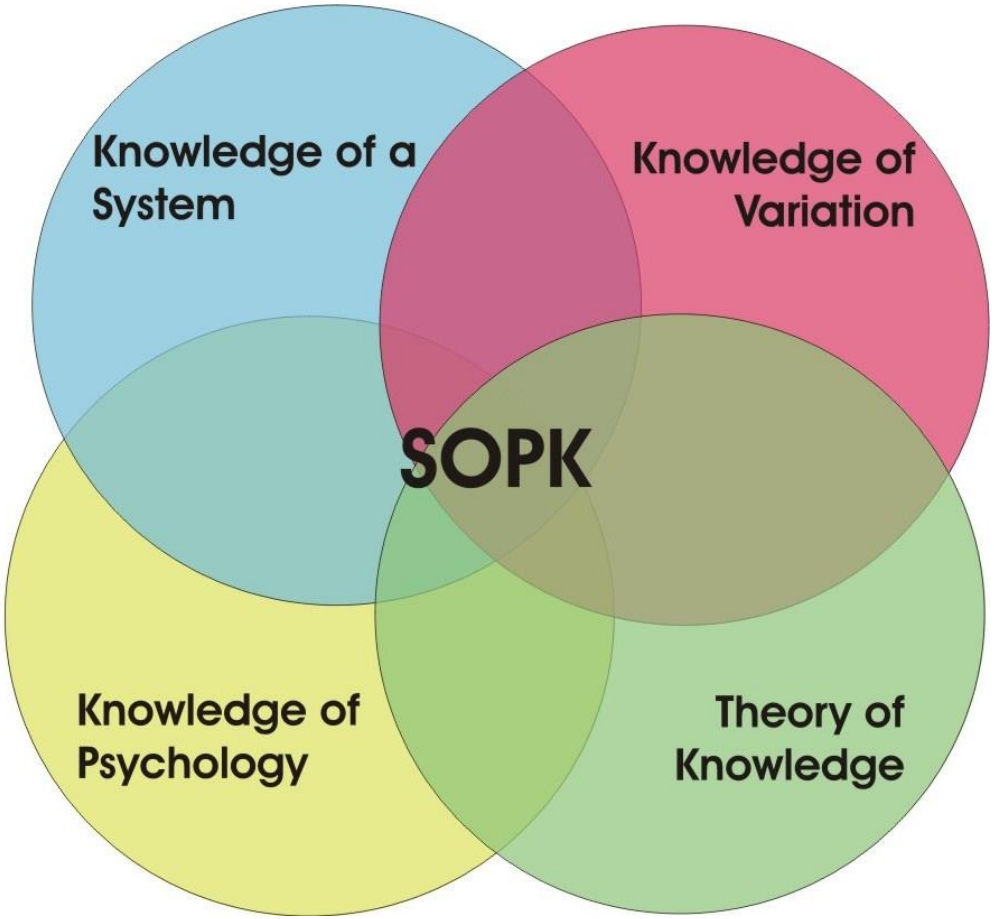
# HAIs and Antibiotic Resistance

- Account for significant proportion of the quality and safety issues that occur in hospitals
- Increased morbidity and mortality
- Prolonged hospitalizations
- Increased healthcare costs

# The area of expertise of the Hospital Epidemiologist

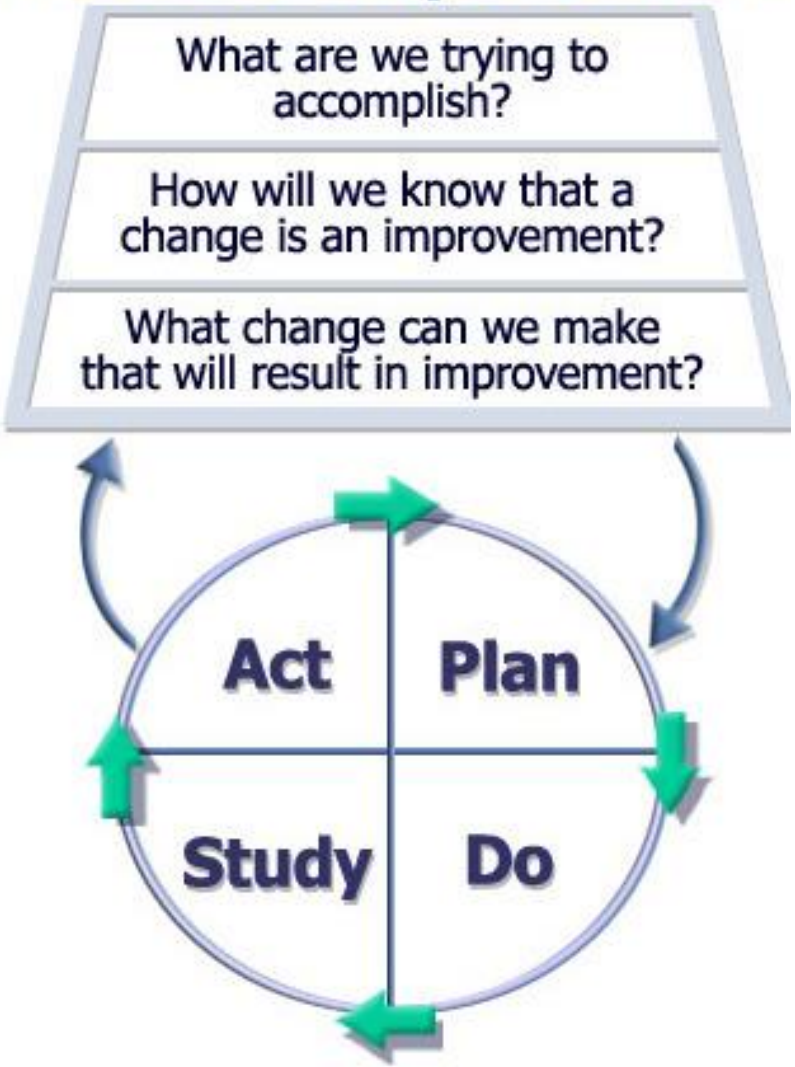
# What the Hospital Epidemiologist Brings to the Table

## Edwards Deming's System of Profound Knowledge




https://deming.org/explore/so-p-k

# Model for Improvement



# Improving Outcomes

# What is preventable?

- **CLABSIs and CAUTIs: 65%- 70% preventable**
- **VAP and SSIs: 55% preventable**

Umscheid CA, et al. ICHE. 2011;32(2):101-114

# Reducing HAIs: Comparing 2011 and 2015 Data

- **633,300 patients** with an HAI
- **687,200 HAIs**
- Significant reductions in
  - SSIs
  - UTIs
- **3.2%** of patients had an HAI (down from 4%)
  - Represents 1 in 33 patients with an HAI
  - **HAI 16% less likely** compared to 2011
- No change in the percentage of people with HAIs who died

Magill SS et al. NEJM. 2018;379:1732-44.

**Table 4. Percentages of All Surveyed Patients with Specific Types of Health Care–Associated Infection, 2011 vs. 2015 Survey.***

| Type of Infection | 2011 Survey | | | 2015 Survey | | | P Value† |
|---|---|---|---|---|---|---|---|
| | No. of Patients with Infection | No. of Infections | Percentage of Patients with Infection (95% CI) | No. of Patients with Infection | No. of Infections | Percentage of Patients with Infection (95% CI) | |
| Pneumonia | 110 | 110 | 0.98 (0.81–1.20) | 110 | 110 | 0.89 (0.74–1.10) | 0.52 |
| Ventilator-associated pneumonia | 43 | 43 | 0.38 (0.28–0.51) | 39 | 39 | 0.32 (0.23–0.43) | 0.41 |
| Other pneumonia | 67 | 67 | 0.59 (0.47–0.75) | 71 | 71 | 0.58 (0.46–0.73) | 0.87 |
| Gastrointestinal infection | 86 | 86 | 0.76 (0.62–0.94) | 91 | 91 | 0.74 (0.60–0.91) | 0.84 |
| *Clostridium difficile* infection‡ | 61 | 61 | 0.54 (0.42–0.69) | 66 | 66 | 0.54 (0.42–0.68) | 0.97 |
| Other gastrointestinal infection | 25 | 25 | 0.22 (0.15–0.33) | 25 | 25 | 0.20 (0.14–0.30) | 0.76 |
| Surgical-site infection | 109 | 110 | 0.97 (0.80–1.20) | 69 | 69 | 0.56 (0.44–0.71) | <0.001 |
| Deep incisional or organ-space infection | 77 | 77 | 0.68 (0.55–0.85) | 54 | 54 | 0.44 (0.34–0.57) | 0.01 |
| Superficial incisional infection | 33 | 33 | 0.29 (0.21–0.41) | 15 | 15 | 0.12 (0.07–0.20) | 0.004 |
| Bloodstream infection | 50 | 50 | 0.44 (0.34–0.58) | 51 | 52 | 0.41 (0.31–0.55) | 0.74 |
| Central catheter–associated bloodstream infection | 42 | 42 | 0.37 (0.27–0.50) | 37 | 38 | 0.30 (0.22–0.42) | 0.35 |
| Other primary bloodstream infection | 8 | 8 | 0.07 (0.03–0.14) | 14 | 14 | 0.11 (0.07–0.19) | 0.29 |
| Urinary tract infection | 65 | 65 | 0.58 (0.45–0.73) | 39 | 39 | 0.32 (0.23–0.43) | 0.003 |
| Catheter-associated urinary tract infection | 44 | 44 | 0.39 (0.29–0.52) | 24 | 24 | 0.20 (0.13–0.29) | 0.005 |
| Other urinary tract infection | 21 | 21 | 0.19 (0.12–0.29) | 15 | 15 | 0.12 (0.07–0.20) | 0.21 |
| Other infection§ | 78 | 83 | 0.69 (0.55–0.86) | 61 | 66 | 0.50 (0.39–0.64) | 0.05 |
| Any infection | 452 | 504 | 4.0 (3.7–4.4) | 394 | 427 | 3.2 (2.9–3.5) | <0.001 |

Magill SS et al. NEJM. 2018;379:1732-44.

# Improving fluoroquinolone susceptibility after antibiotic preauthorization

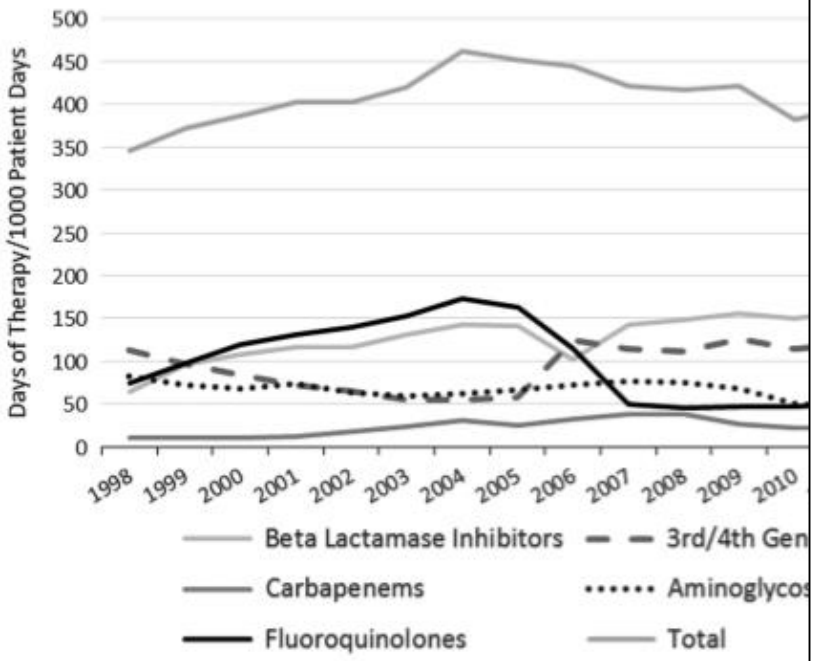



**Fig. 1.** Total average days of therapy per 1,000 patient days of major classes of antibiotics. Beta-lactamase ... m, and ticarcillin-clavulanate.

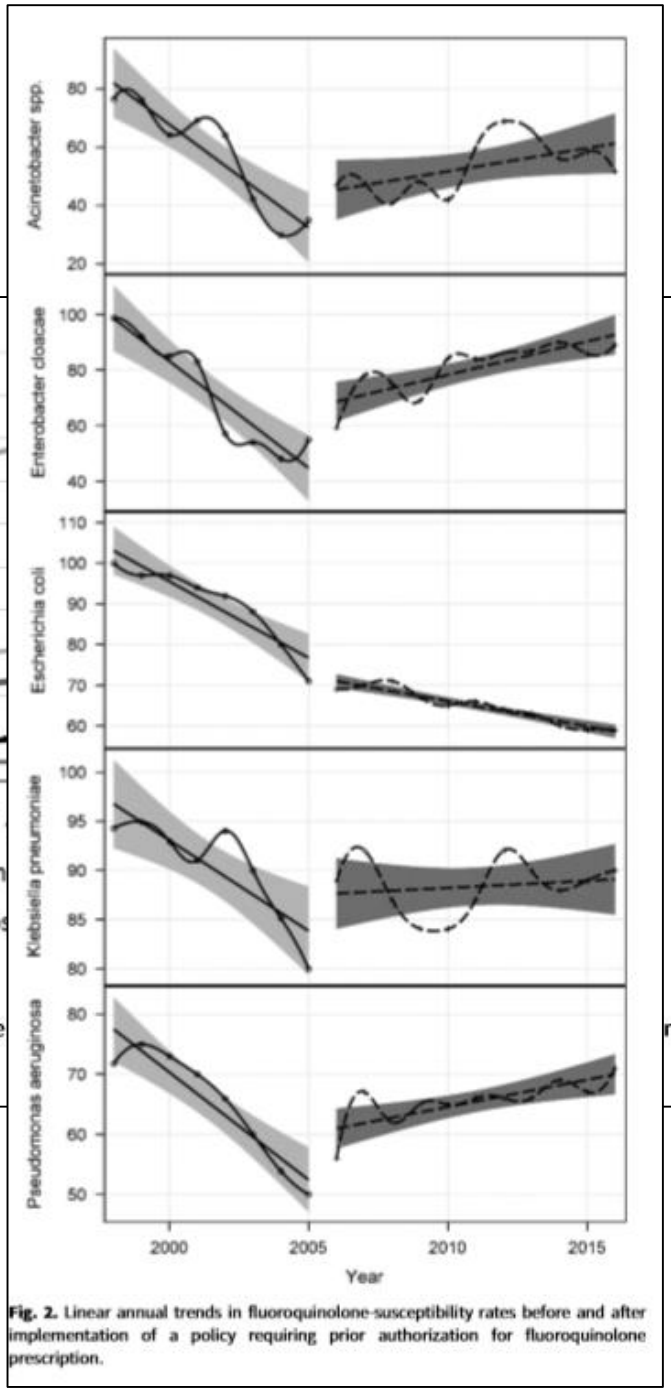


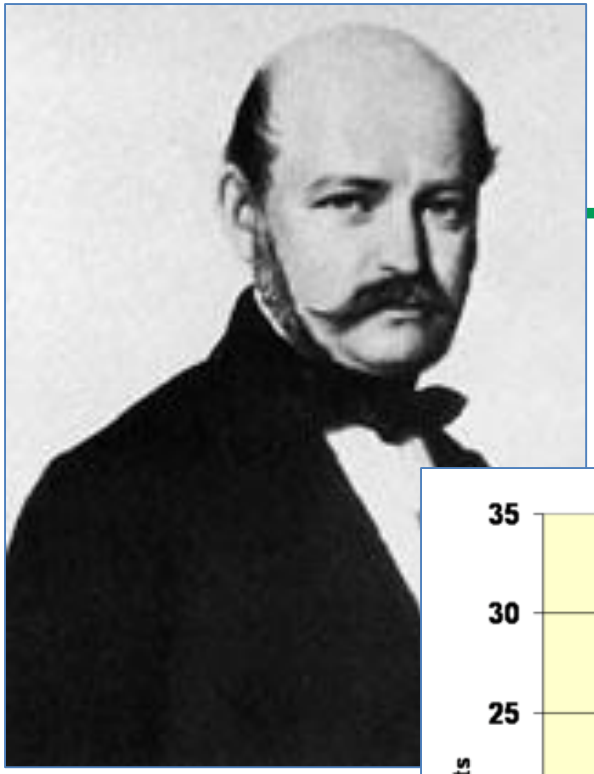

**Fig. 2.** Linear annual trends in fluoroquinolone-susceptibility rates before and after implementation of a policy requiring prior authorization for fluoroquinolone prescription.

Lee RA, et al. ICHE.2018;9:1-6.

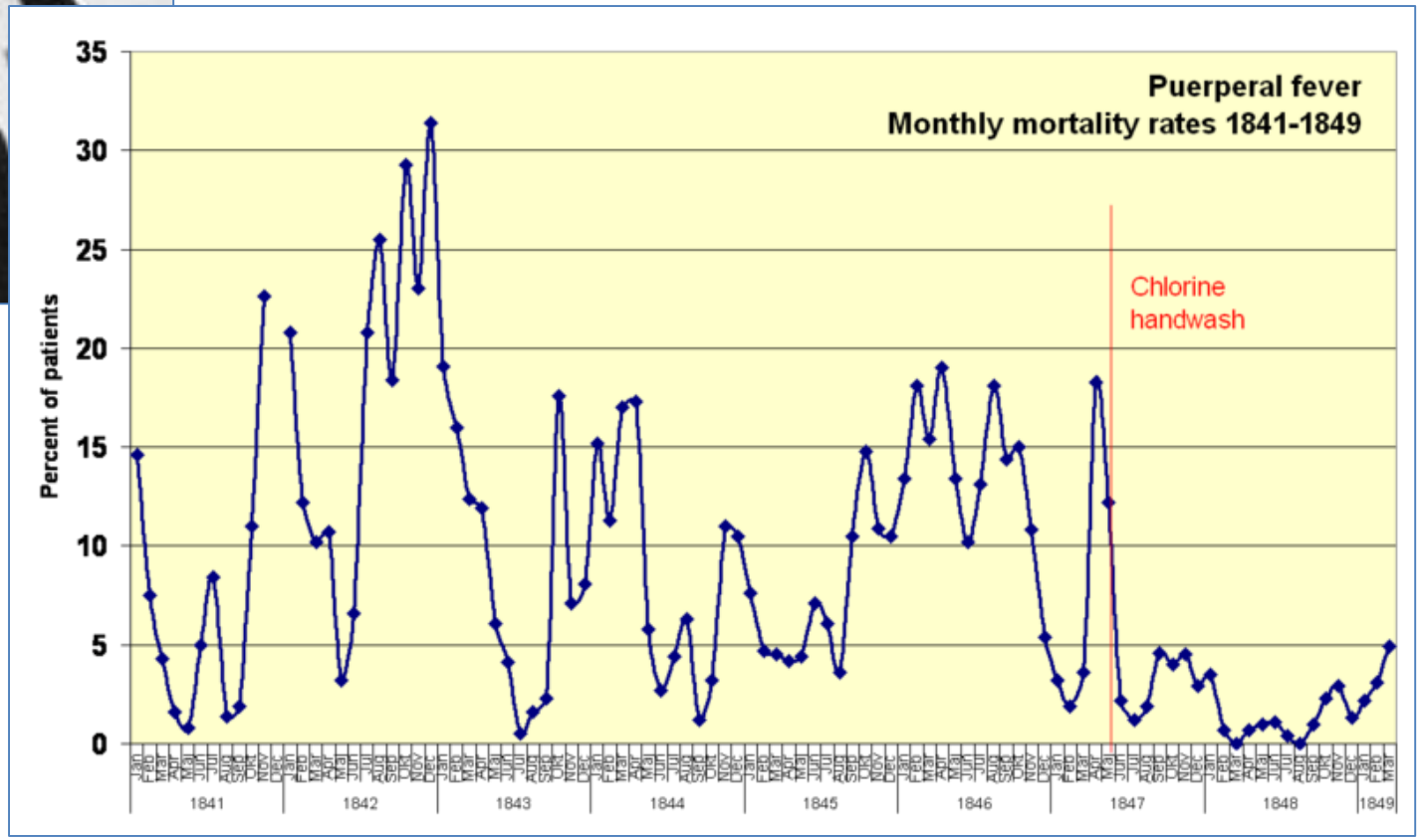
# Hospital Epidemiologists Have Played an Essential Role in Reshaping Healthcare Quality

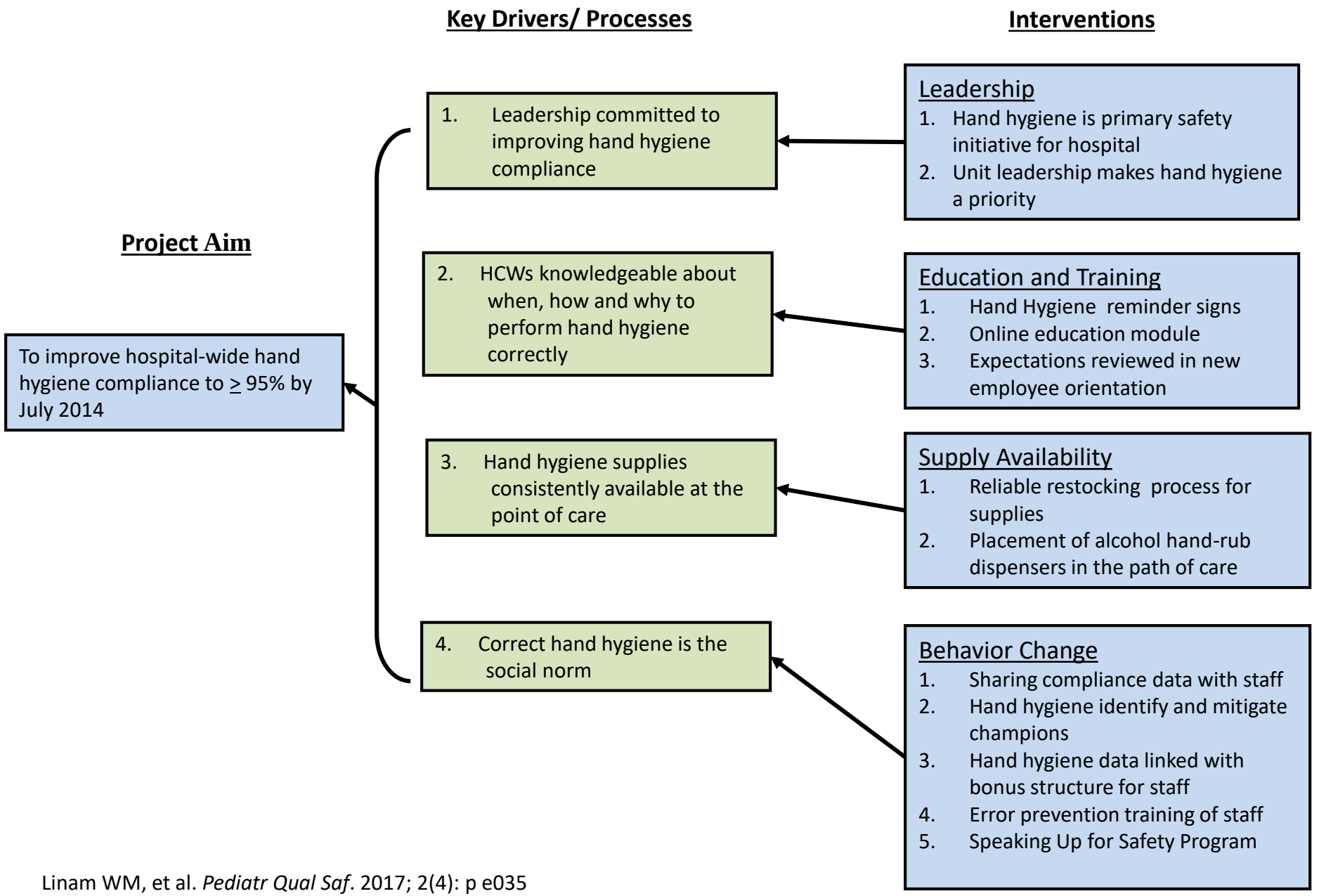
- Significant reductions in HAIs
- Improvements in antibiotic prescribing
- Reduction in antibiotic resistance
- There is still much to be done…

# Improving Processes

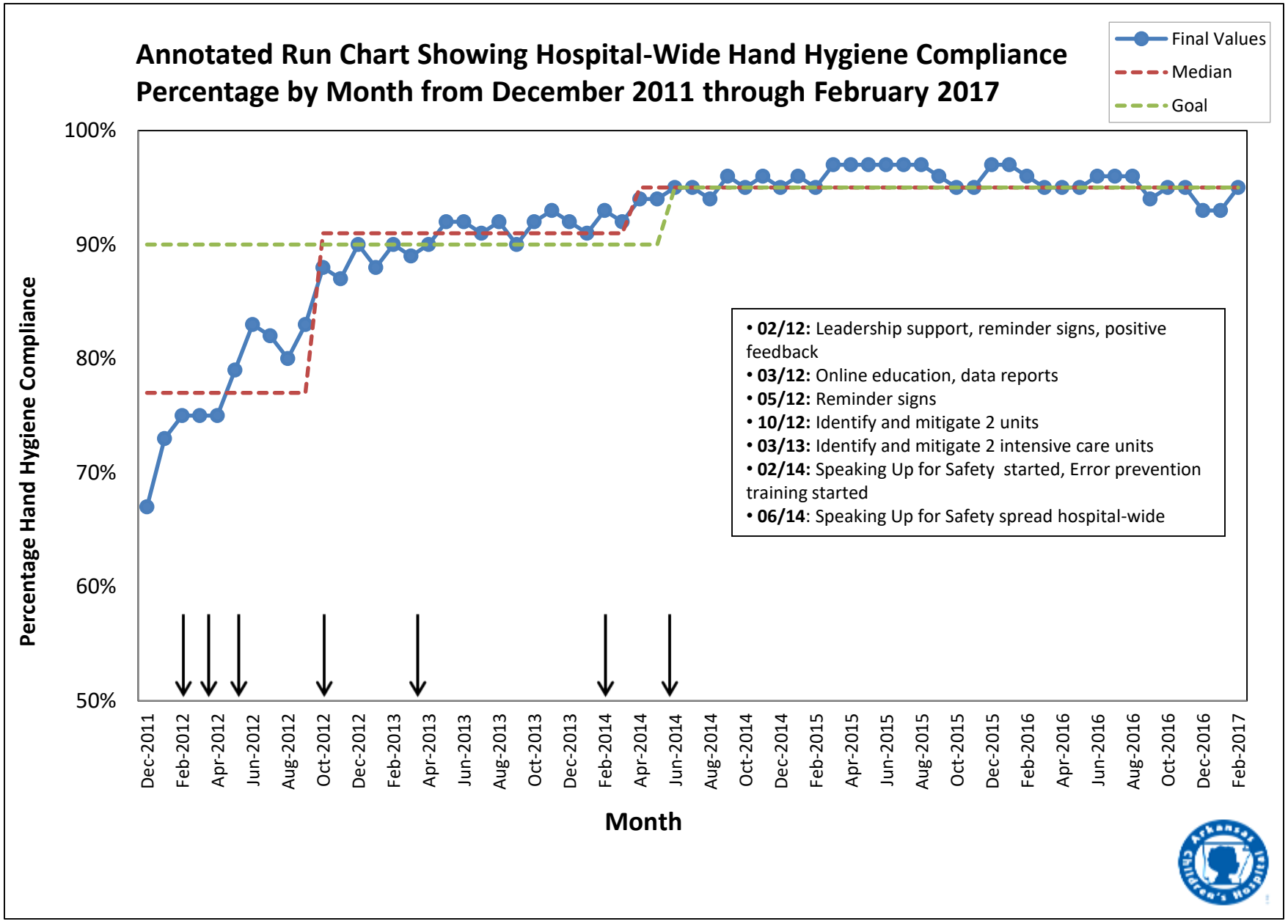


# Ignaz Philipp Semmelweis
# 1840



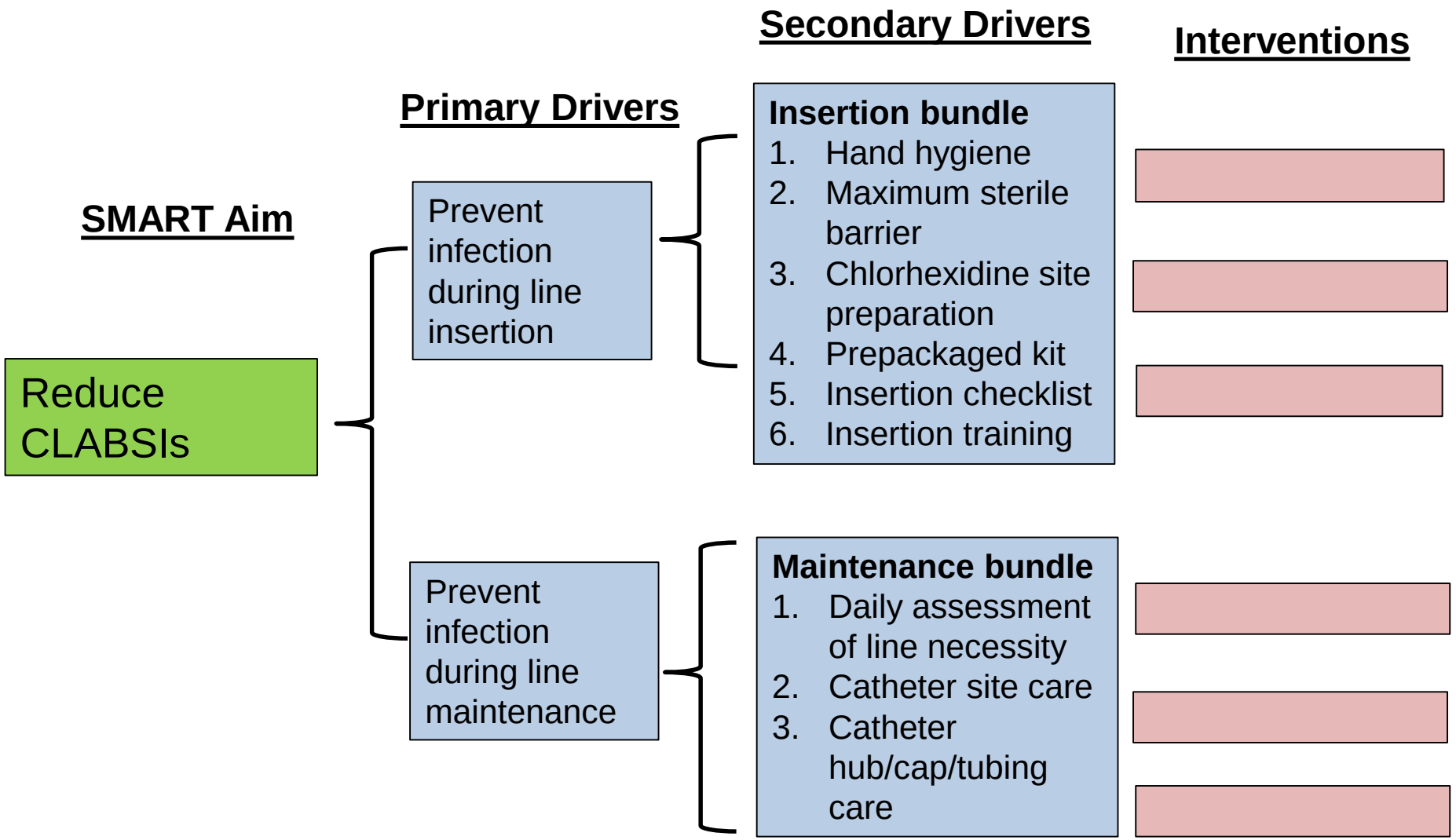



Linam WM, et al. *Pediatr Qual Saf*. 2017; 2(4): p e035




Linam WM, et al. *Pediatr Qual Saf*. 2017; 2(4): p e035

# Key Driver Diagram




Miller MR, et al. Pediatrics 2011; 128:e1077–e1083.

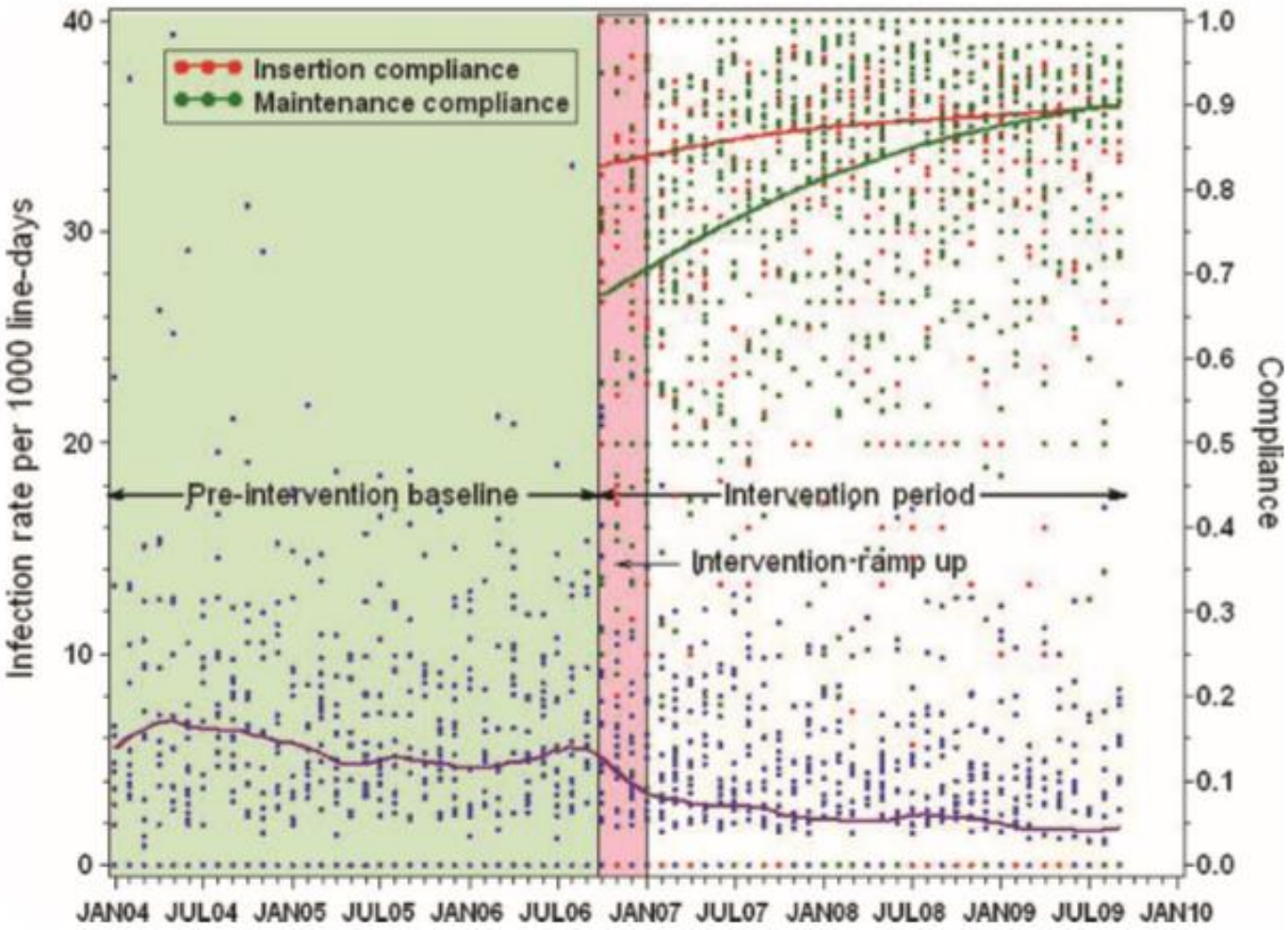



**FIGURE 1**

Plot of CLA-BSI rates and insertion and maintenance compliance rates (and 95% CIs) in the preintervention baseline and intervention periods for the 29 PICUs.

Miller MR, et al. Pediatrics 2011; 128:e1077–e1083.

# Communication Pearls

# Building the Business Case

**Step 1:** Frame the Problem and Develop a Hypothesis About Potential Solutions

**Step 2:** Meet With Key Administrators

**Step 3:** Determine the Annual Cost

**Step 4:** Determine What Costs Can Be Avoided Through Reduced Infection Rates

**Step 5:** Determine the Costs Associated With the Infection of Interest at Your Hospital

**Step 6:** Calculate the Financial Impact

**Step 7:** Include the Additional Financial or Health Benefits

**Step 8:** Make the Case for Your Business Case

**Step 9:** Prospectively Collect Cost and Outcome Data Once the Program Is in Effect

Perencevich EN, et al. ICHE. 2007; 28:1121-1133

Original Investigation

# Reasons Why Physicians and Advanced Practice Clinicians Work While Sick

## A Mixed-Methods Analysis

Julia E. Szymczak, PhD; Sarah Smathers, MPH, CIC; Cindy Hoegg, RN, CIC; Sarah Klieger, MPH; Susan E. Coffin, MD, MPH; Julia S. Sammons, MD, MSCE

## Study summary:

- Attending physicians and advanced practice nurses
- **94%** believed working while sick placed patients at risk
- **83%** worked while **sick ≥ 1** in the past year
- **9%** worked while **sick ≥ 5** in the past year

## Reason HCWs work sick:

- Ambiguity of what is too sick to work
- Logistic challenges with coverage
- Not wanting to let collegues/patients down
- Cultural norm to work

Szymczak J. et al. JAMA Pediatrics.2015;169(9):815-21

# Social Norms

Informal understandings that dictate the behavior of a reference group

Mackie G, Moneti F, Shakya H, Denny E. What are Social Norms? How are They Measured? 2015; https://www.unicef.org/protection/files/4_09_30_Whole_What_are_Social_Norms.pdf. Accessed November 28 2016.

# When We Misinterpret the Social Norm

- **Pluralistic ignorance:** The misperception that the behavior of others is different from our own
  - Assumption that the most memorable or extreme behavior is representative of the majority
  - Individuals alter their behavior to fit this pseudo-norm
  - Can influence the behavior of the majority
  - Exaggerate unhealthy behaviors and suppress healthy behaviors
- **False consensus:** The misperception that the behavior of others is similar to our own
  - Justifies problem behavior of the minority

Berkowitz AD. Chapter 13: An Overview of the Social Norms Approach. Changing the Culture of College Drinking. 2005; Hampton Press: 193-214

# Social Norms Approach

- Refers to the **misperception of social norms**
  - The majority already has healthy attitudes or behavior
- **Pluralistic ignorance** and **false consensus** reinforce each other and are **self-perpetuating**
  - The majority remains silent and does not voice disapproval
  - The minority is more vocal reinforcing the problem behavior
- **Self-fulfilling prophecy**
  - Everyone engages in the undesired behavior because everyone thinks everyone is engaging in the undesired behavior

Berkowitz AD. Chapter 13: An Overview of the Social Norms Approach. Changing the Culture of College Drinking. 2005; Hampton Press: 193-214

# A Multifaceted Social Norms Approach to Reduce High-Risk Drinking

***Lessons from Hobart and William Smith Colleges***

- Providing information about the actual norm can break the cycle
- Most effective when delivered as what people actually do not telling them what they should do
- Social media campaign

http://www.alcoholeducationproject.org/hws.pdf

# The Silent Numbers Campaign, continued

2/3 of all HWS students

=

Drink 1/4 of all alcohol consumed here

1/3 of all HWS students

=

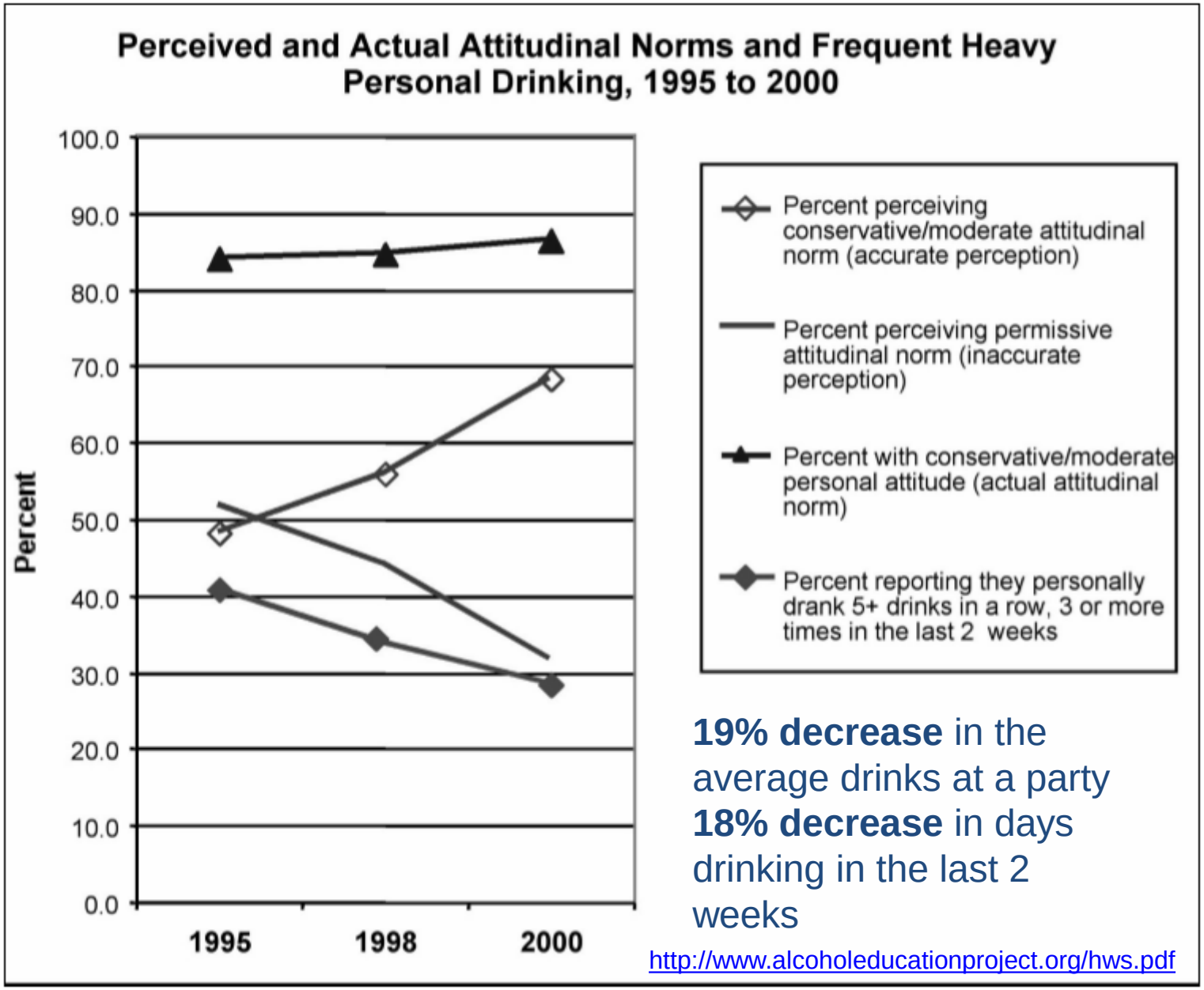
Drink 3/4 of all alcohol consumed here

Based on representative surveys of students in Spring 1995 and Fall 1997.

For further information contact: Prof. Perkins (3437) or Prof. Craig (3611).

http://www.alcoholeducationproject.org/hws.pdf

**While personal attitudes about alcohol remain steady, changes in students' perceptions of drinking norms affect actual drinking behavior on campus.**




**19% decrease** in the average drinks at a party
**18% decrease** in days drinking in the last 2 weeks

http://www.alcoholeducationproject.org/hws.pdf

# Handshake Stewardship

# Handshake Stewardship

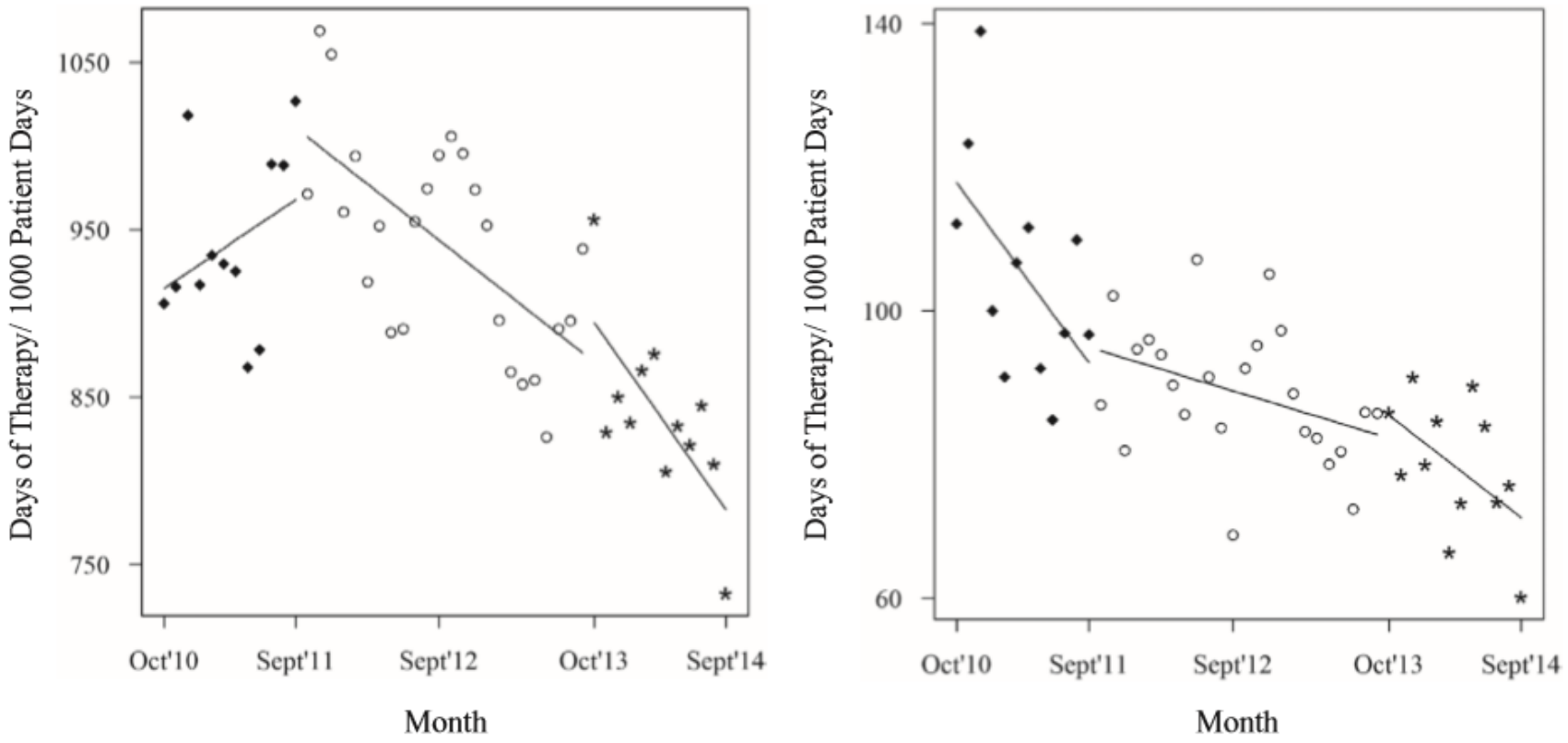



**FIGURE 2.** Trends in overall hospital-wide antimicrobial use (left panel) and vancomycin use (right panel) during preimplementation, planning and postimplementation phases of handshake stewardship by segmented regression. ♦, Monthly antimicrobial use during preimplementation phase; ○, monthly antimicrobial use during planning phase; *, Monthly antimicrobial use during postimplementation phase.

Hurst A, et al. PIDJ.2016;35:1104-1110.

# Summary

- Despite improvements, HAIs and antibiotic resistance continue to be major quality and safety concerns.
- The Hospital Epidemiologist is vital to the improvement process
  - Knowledge of the interconnected healthcare system
  - Understanding transmission risks and evidence-based interventions
  - Use of data to drive investigation and improvement
  - Close interactions with healthcare workers at all levels
- Our understanding and ability to change processes will help improve outcomes
- Communication pearls:
  - Leaders: present a clear business case
  - All staff: identify and correct misperceived social norms
  - All staff: face-to-face interactions