

The New Approach to Mitigating
Clostridioides difficile (C. diff)
Transmission While Saving Direct Cost to
the Hospital

American Hospital Association Webinar

May 18, 2023

Presenters

Philip Carling, M.D. - Boston University School of Medicine

Disclosure: Consultant, Ecolab, Inc. and patents for DAZO™

Billy Fischer, Regional Director, Trinity Health Hospitality
Services, Mid-Atlantic Region

Disclosure: Employee Trinity Health Care

Objectives:

- Discuss the study design and the novel approach taken
- Examine the difference in products and methods used at the participating hospitals
- Quantify the **patient health benefits** and the **hospital's direct savings** which results from such a program

Key Takeaways:

- Understand the critical role EVS personnel play in reducing infection rates
- Learn how a **structured implementation strategy** can support successful adoption of this new approach to mitigating HO-CDI

Environmental disinfection cleaning is a **fundamental** intervention for infection prevention in healthcare.



Mitigating Healthcare C. diff : A problem for 40 years

The most serious healthcare associated pathogen, *Clostridioides difficile* (*C. diff*), is resilient, lives on surfaces for months and is resistant to the most commonly used surface disinfectants

“*C. difficile* infections are at an all-time high causing 14,000 deaths a year”



Centers for Disease Control and Prevention
[Reduce Risk from Surfaces | HAI | CDC](#)

Mitigating Healthcare C. diff : A problem for 40 years

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“*C. difficile* infections are at an all-time high causing 14,000 deaths a year”

One death every 30 minutes in the US



Centers for Disease Control and Prevention
[Reduce Risk from Surfaces | HAI | CDC](#)

For decades we have known that patients with active

CDC:1987 - Present

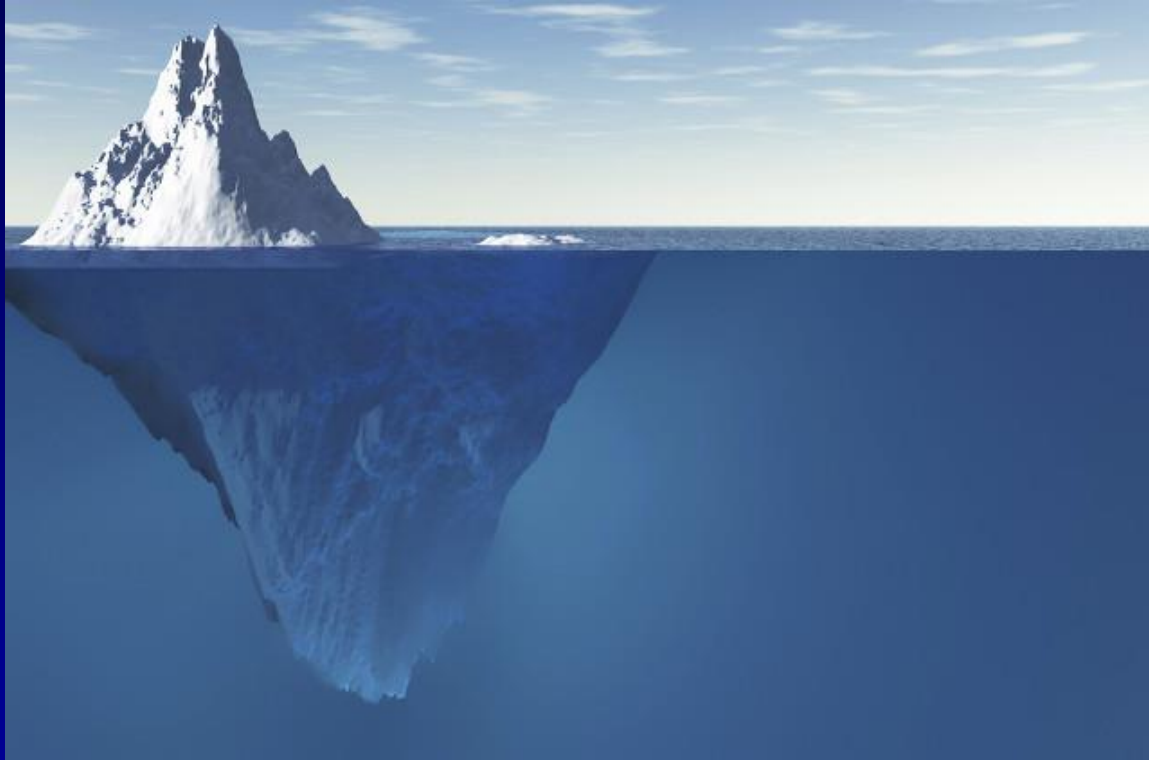
infection can transmit *C. diff* to other patients via

contaminated patient room surfaces
“Make sure cleaning staff follows CDC recommendations, using EPA approved, spore killing disinfectant in **rooms where *C. difficile* patients are treated.**”



CDC:1987 - Present

Why this approach has not worked



Over the past several years it has become evident that we have been directing environmental sporadic cleaning at the tip of the iceberg

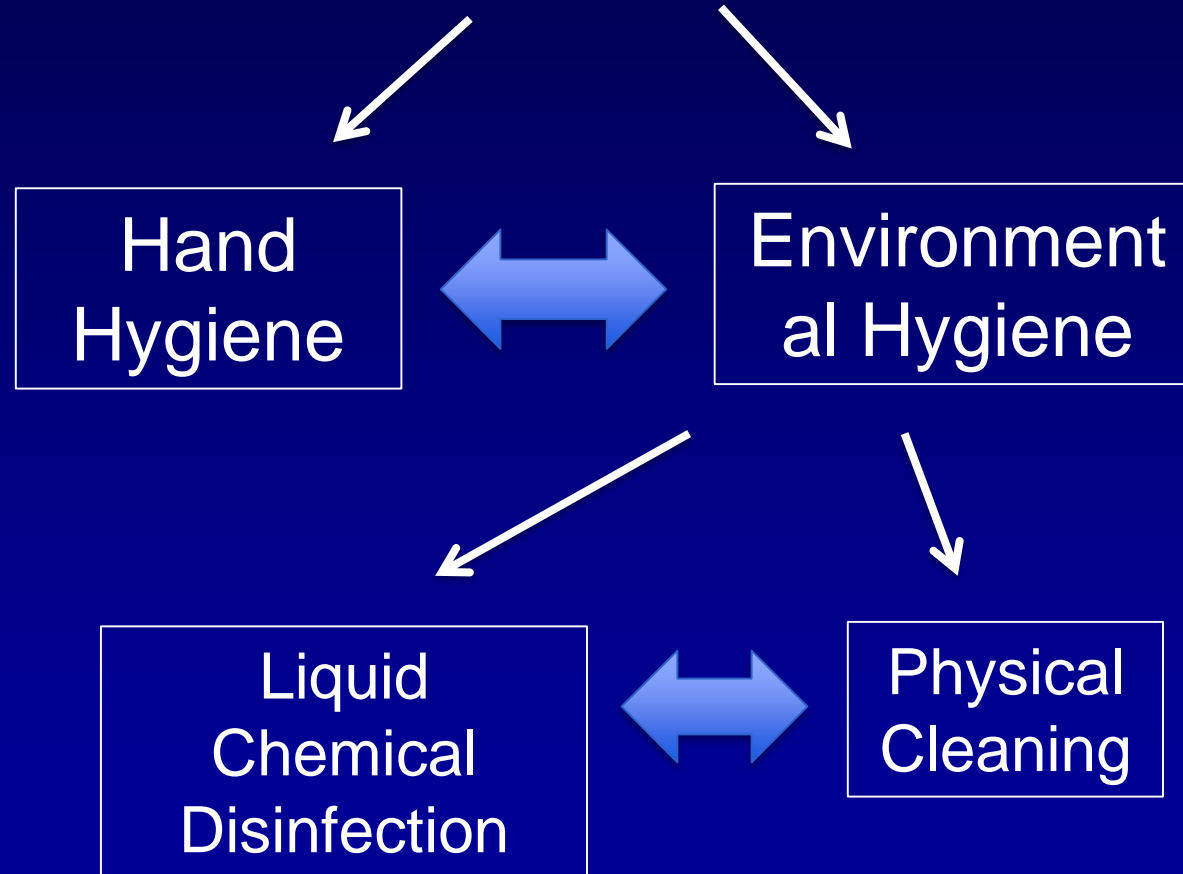
Clarified Epidemiology of HO-CDI

Elements of *Clostridioides difficile* Environmental Epidemiology

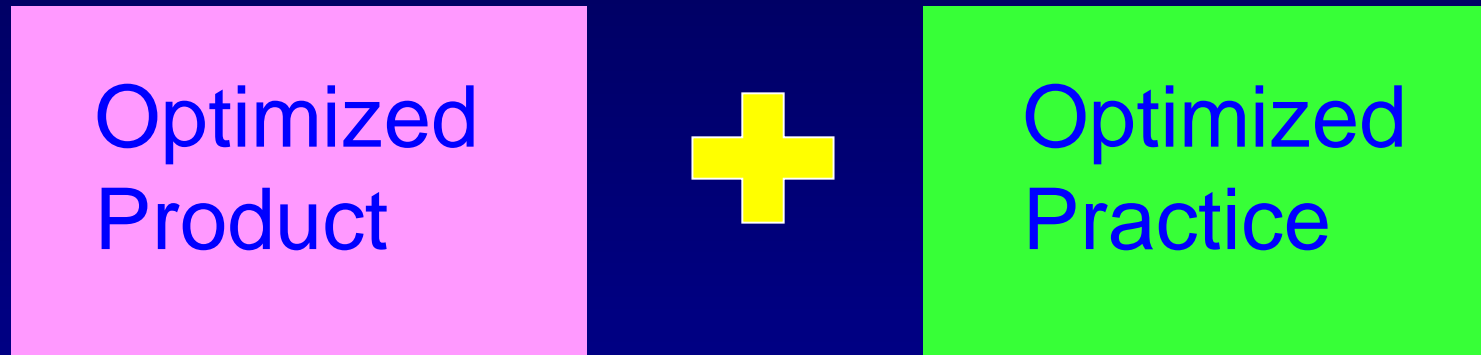
1. At the time of hospitalization 10.6% of patients (range 2.8 – 21%) are CD carriers.	Ref: 47-59
2. During hospitalization 12.5% of patients (range 2.9-21%) are CD carriers.	Ref: 47,60-65
3. Transmission of CD spores to environmental surfaces is associated with: Patients with acute infection Patients recovering from acute infection Asymptomatic CD colonized patients	Ref: 70-72
4. Treatment does not decrease ongoing environmental spore contamination for more than a month.	Ref: 73
5. Wide spread surface contamination far from known CD infected patients	Ref: 46,59
6. Increased Cleaning and disinfection result in: Decreased surface and hand contamination Decreased CD acquisition	Ref: 46,69,70,75
7. Genomic confirmation of the role of asymptomatic CD carriers in transmission	Ref: 61,66-69
the prior room occupant receiving antibiotics	

The New Approach to Mitigating HO-CDI in Hospitals

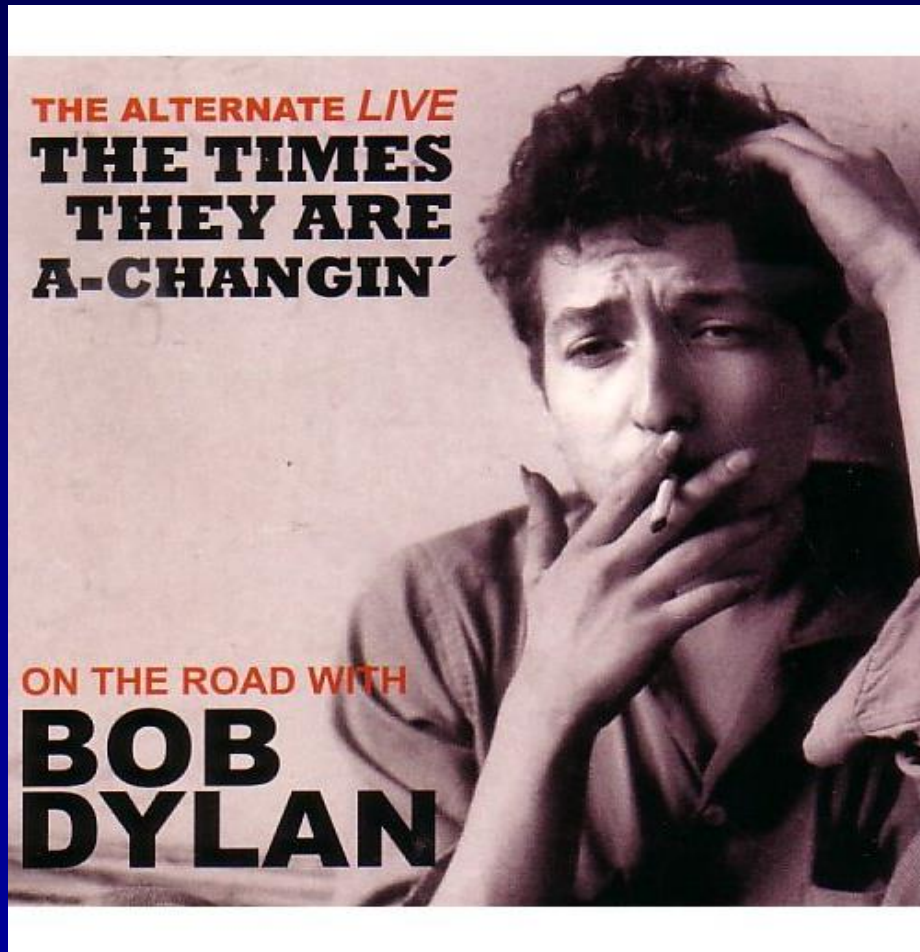
Horizontal Healthcare Hygienic Practices



The Environmental Hygiene Equation



Optimized Product - Healthcare Surface Disinfectants



- For the first time ever (almost), the surface disinfectant landscape has changed.

Good News

More Rapid Sporicides

And

Green Sporicides

Bad News

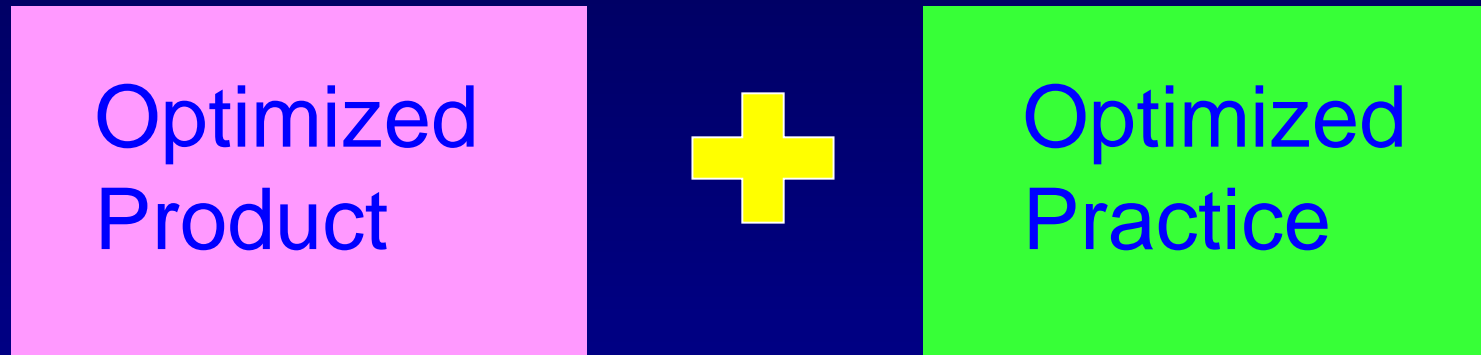
Lots of marketing

You need to look for

Clinical Comparisons

Cost issues

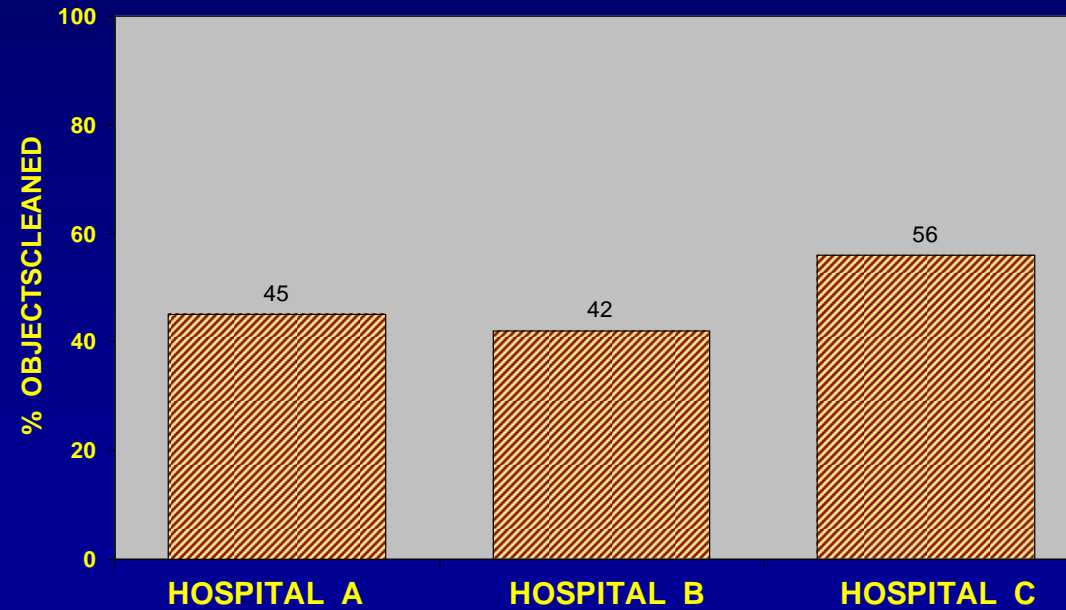
The Environmental Hygiene Equation



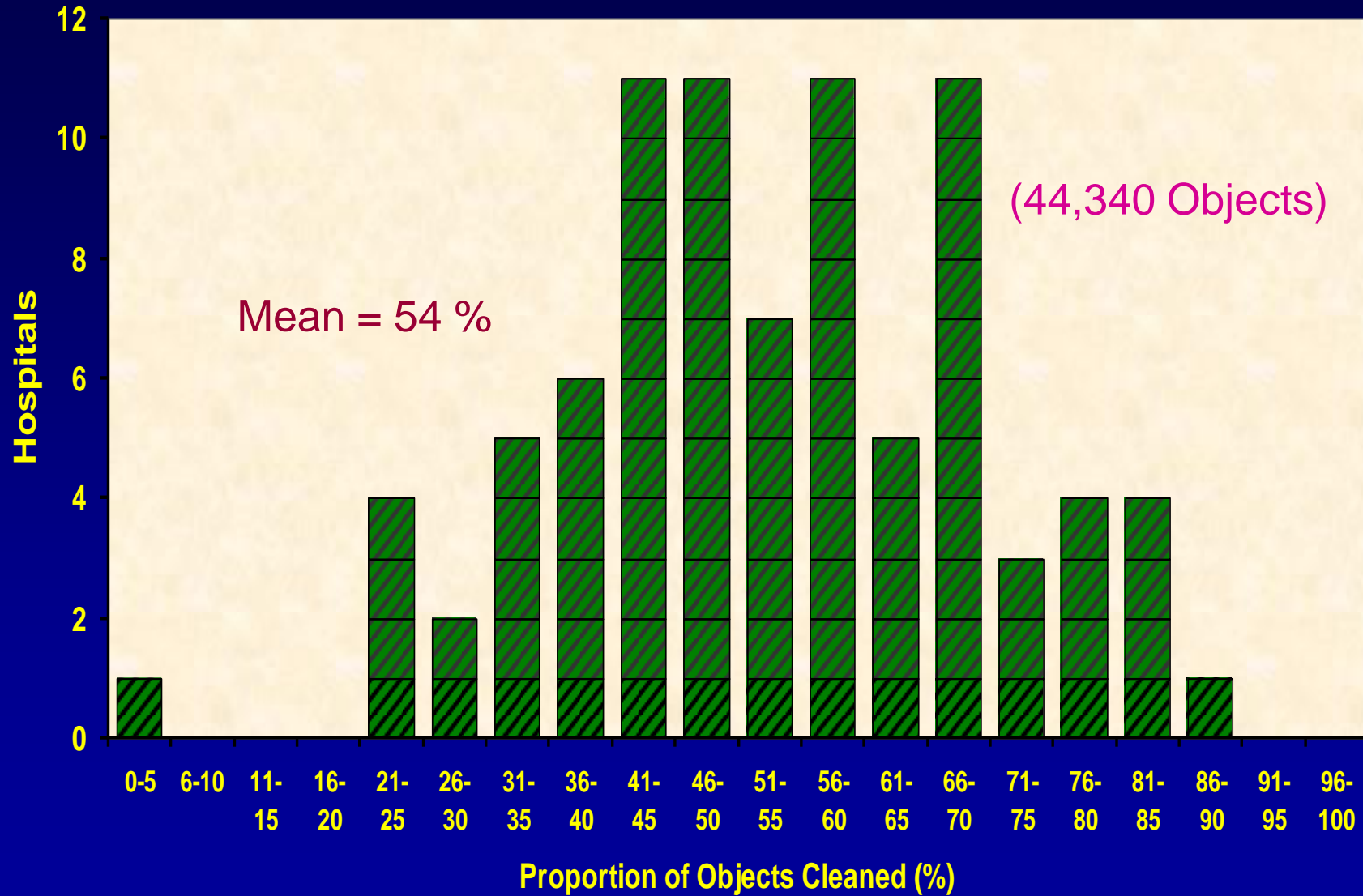
Disinfection Cleaning – The Problem

An evaluation of patient area cleaning in 3 hospitals using a novel targeting methodology

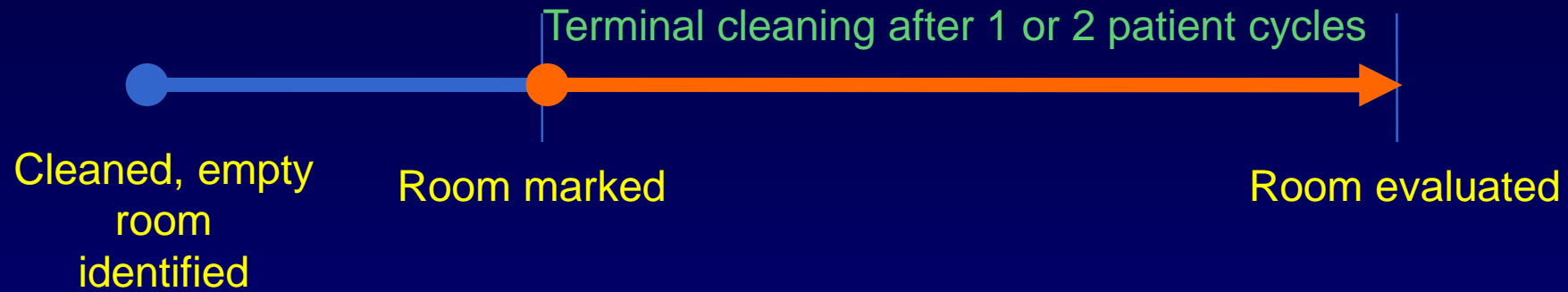
Philip C. Carling, MD,^{a,d} Janet Briggs, BSN,^a Deborah Hylander, BSN,^b and Jeannette Perkins, BSN^c
Boston, Quincy, and Sandwich, Massachusetts



Baseline Environmental Evaluation of 82 Acute Care Hospitals

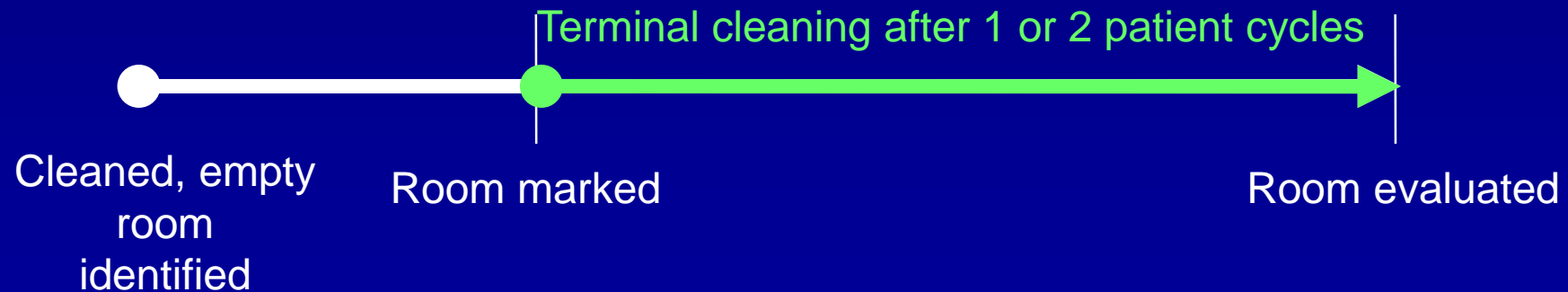


Phase I: Covert Baseline Environmental Cleaning Evaluation



Phase II: A. Programmatic Analysis B. Educational Interventions – ES staff

Phase III: Re-evaluation of Cleaning and Feedback to ES



The recognition that:

A. Acute care hospitals in the U.S. were often not cleaned in accordance with established disinfection cleaning policies:

B. The thoroughness of cleaning practice could be sustainability improved by implementing a structured process improvement program based on objective performance monitoring



Options for Evaluating Environmental
Cleaning

December 2010

CDC Recommendations

Acute Care Hospitals should implement a:

Level I Program:

Basic interventions to optimize disinfection cleaning policies, procedures and ES staff education and practice.
When completed move to Level II Program

Level II Program:

All elements of Level I + Objective monitoring

Options for Evaluating Environmental Cleaning

October 2010

National Center for Emerging and Zoonotic Infectious Diseases

Division of Healthcare Quality Promotion



CDC Recommendations

Web Link:

<http://www.cdc.gov/HAI/toolkits/Evaluating-Environmental-Cleaning.html>

Options for Evaluating Environmental Cleaning

October 2010

National Center for Emerging and Zoonotic Infectious Diseases

Division of Healthcare Quality Promotion



Practice Optimization -- Program Evaluation

Level II Program

Consistent with the:

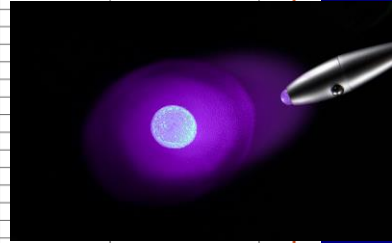
- 7 Program Elements
- Elements of Educational Intervention (A.- H.)
- Objective use of the standardized fluorescent marker*
- Sample size determination
- Surfaces to be evaluated
- Results – "Thoroughness of disinfection cleaning" =TDC (%)

CDC Environmental Checklist for Monitoring Terminal Cleaning¹

Date: _____
Unit: _____
Room Number: _____
Initials of ES staff (optional):² _____

Evaluate the following priority sites for each patient room:

High-touch Room Surfaces ³	Cleaned	Not Cleaned	Not Present in Room
Bed rails / controls			
Tray table			
IV pole (grab area)			
Call box / button			
Telephone			
Bedside table handle			
Chair			
Room sink			
Room light switch			
Room inner door knob			
Bathroom inner door knob / plate			
Bathroom light switch			
Bathroom handrails by toilet			
Bathroom sink			
Toilet seat			
Toilet flush handle			
Toilet bedpan cleaner			



Evaluate the following additional sites if these equipment are present in the room:


High-touch Room Surfaces ³	Cleaned	Not Cleaned	Not Present in Room
IV pump control			
Multi-module monitor controls			
Multi-module monitor touch screen			
Multi-module monitor cables			
Ventilator control panel			

Mark the monitoring method used:

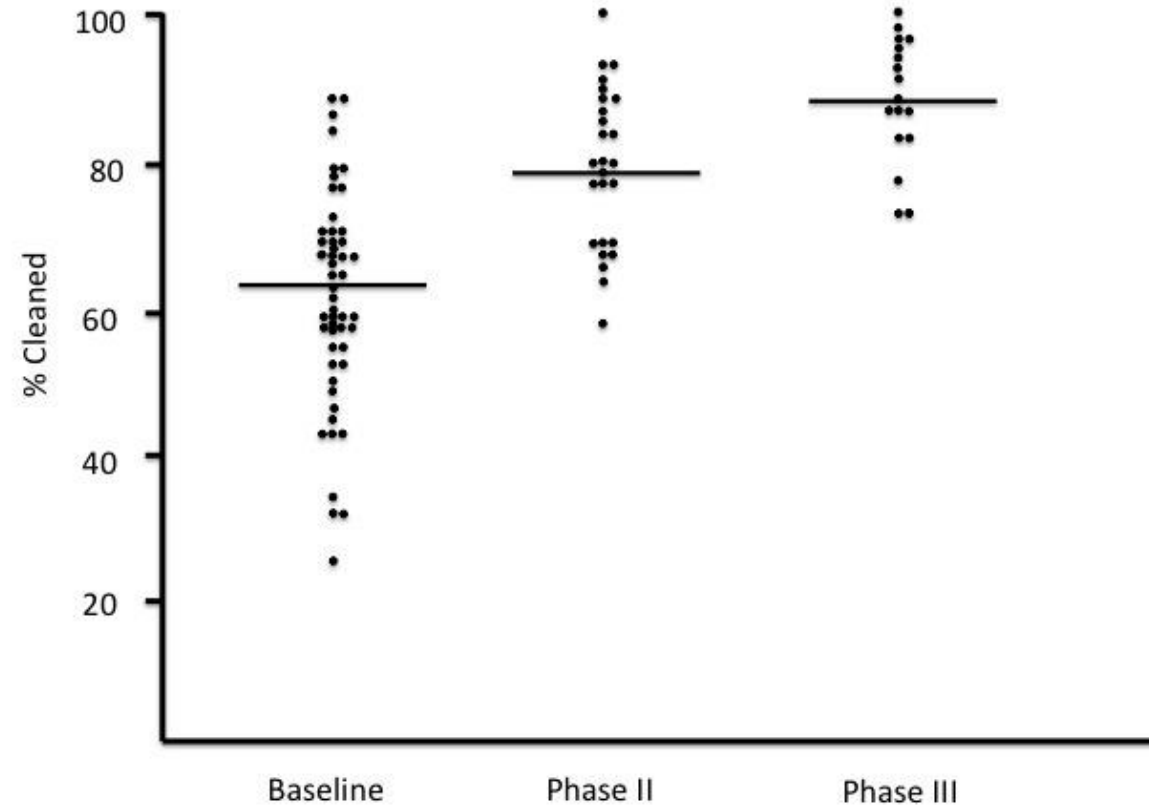
Direct observation Fluorescent gel Agar slide cultures
 Swab cultures ATP system

¹Selection of detergents and disinfectants should be according to institutional policies and procedures
²Hospitals may choose to include identifiers of individual environmental services staff for feedback purposes.
³Sites most frequently contaminated and touched by patients and/or healthcare workers

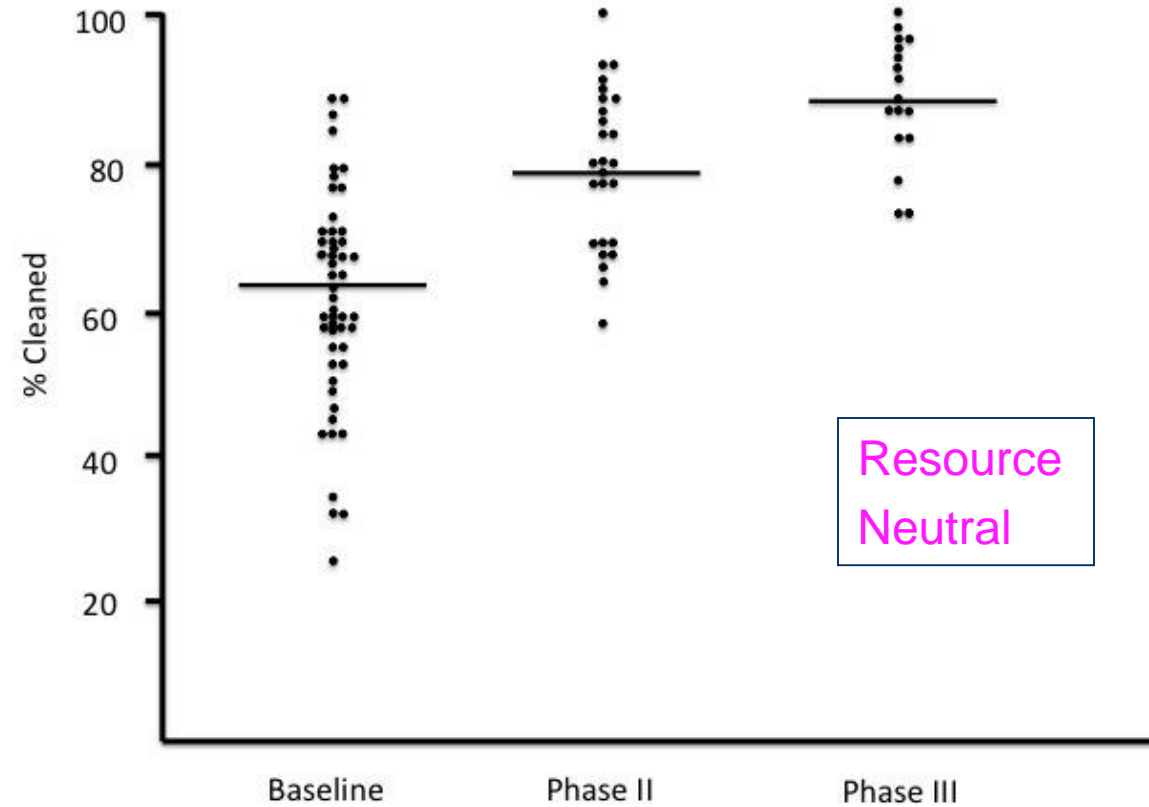
National Center for Emerging and Zoonotic Infectious Diseases
Division of Healthcare Quality Promotion



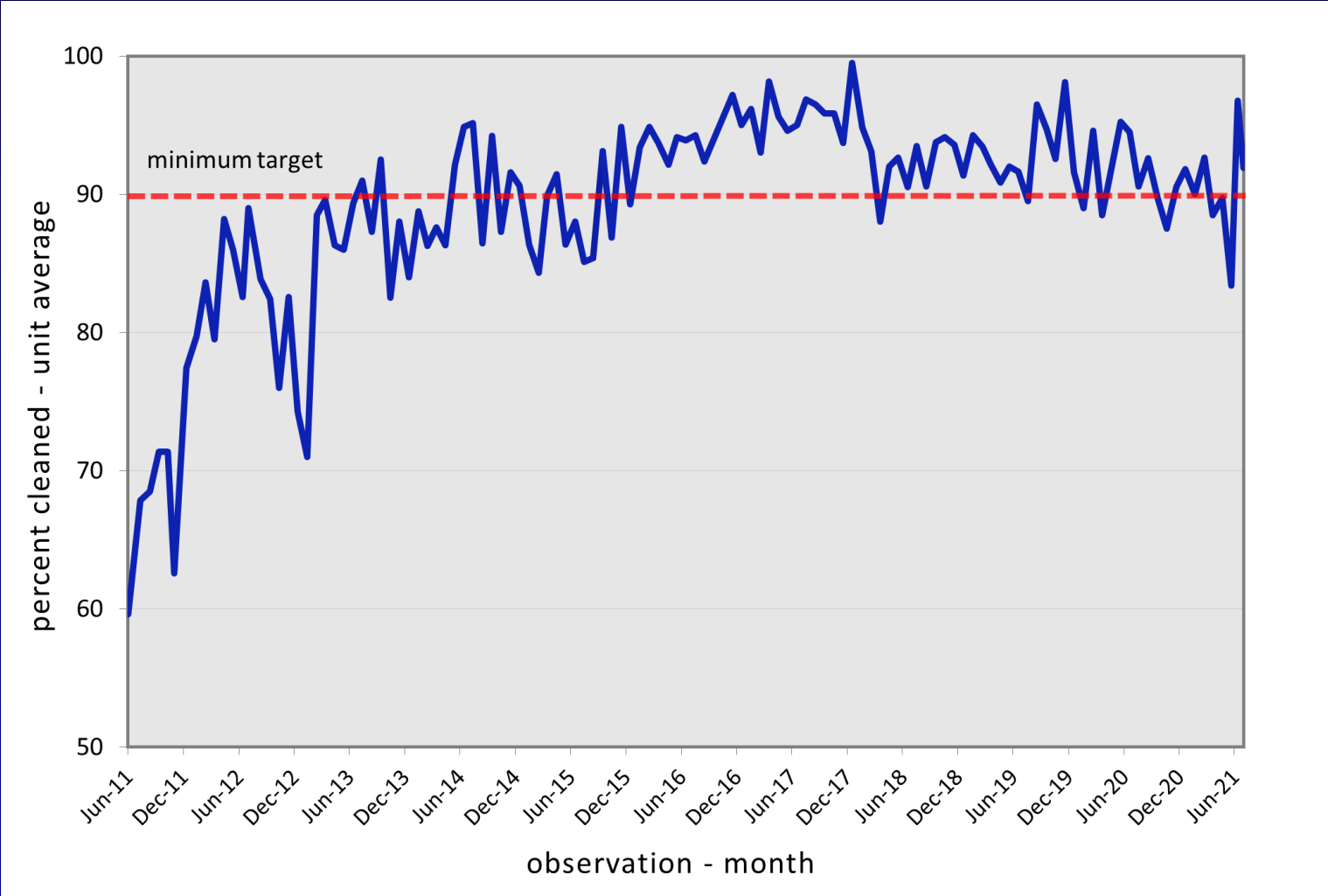
The Iowa Project – 56 Hospitals



The Iowa Project – 56 Hospitals



Monthly cleaning-disinfection rates over a ten-year period



Parry MF, et al. (2022). Environmental cleaning and disinfection: Sustaining changed practice and improving quality in the community hospital. *Antimicrobial Stewardship & Healthcare Epidemiology*, <https://doi.org/10.1017/ash.2022.257>

The Key Elements to such a Program

How to implement a program to objectively improve disinfection cleaning in your hospital

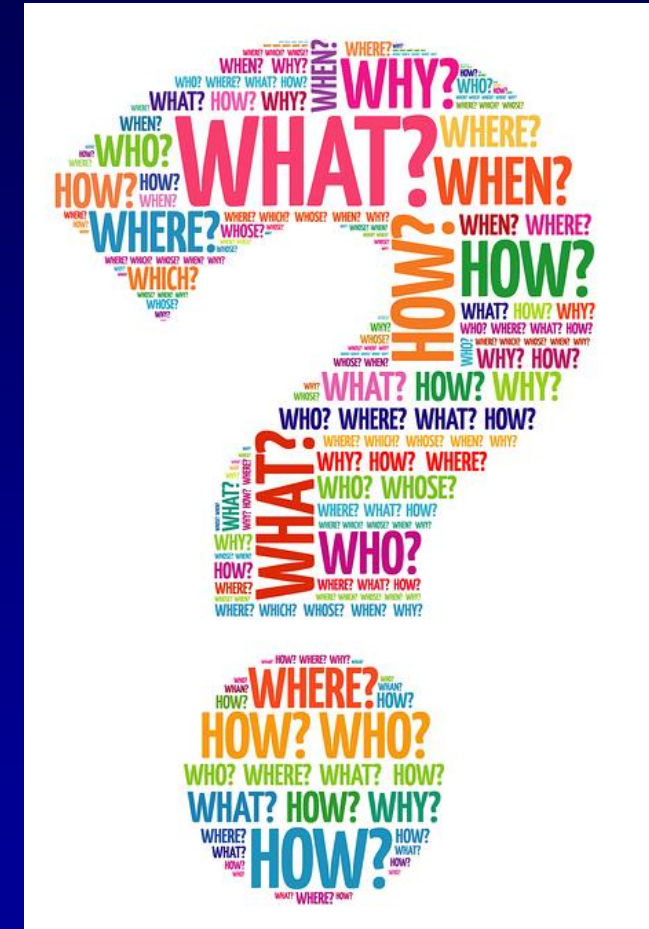
Change Management

- Determine Hospital Culture – Willingness to Change and Support
- Develop Executive Oversight Committee
 - EVS
 - Administration
 - Infection Prevention
 - Nursing
 - Human Resources
 - Employee Health



FAQ's

- Discuss
 - Why
 - Patient Care
 - Reimbursement
 - When
 - Time Frame for Roll-Out
 - Where
 - Identify Units that Will Rollout and Those that Might Not



Operationalizing Your Program

Key Elements:

- Vendor Partnership – Communications Plan & Training Outline
 - 45-60 days before initial implementation
 - Infection Prevention should lead communications
- Group Training – Seek questions and concerns
 - 1:1 Training
 - Determine which medical units will roll-out first – Biggest impact

How was it rolled out across the hospital?

- Unit by Unit – Celebrate the Champions
- Monitor the cleaning thoroughness data and provide direct feed back to EVS managers and staff in a supportive manner

The Key to Success: Objective and Ongoing Performance Monitoring and Feedback

- Huddle Review
- Online Dashboard
 - Cleaning Evaluations and Ongoing Fluorescent Marker Monitoring
- Performance Review
 - Department
 - Individual
 - Infection Prevention Committee - Benchmarking
- Annual Competencies

See all photos

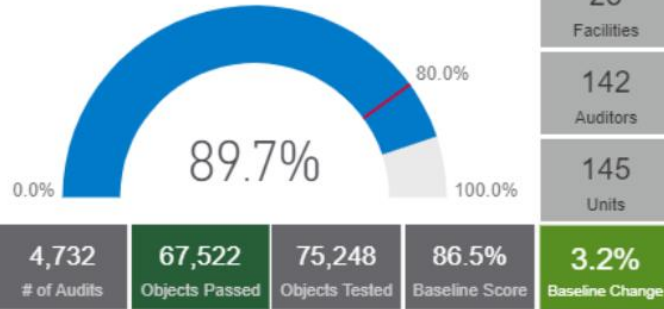
+ Add to



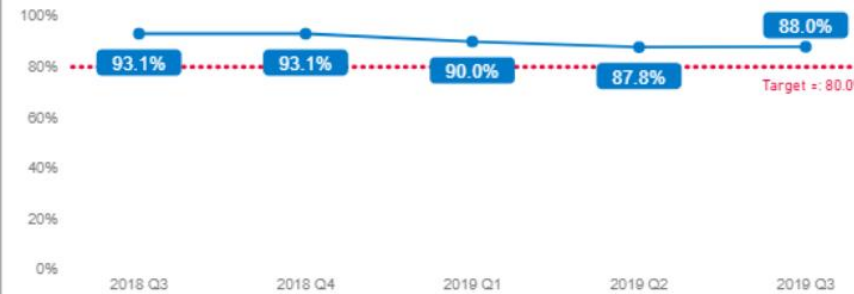
Get creative with this photo
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Date Range for Page: Last 12 Months
 Facility Name: All
 Area: Patient Room
 Unit: All
 Type: All

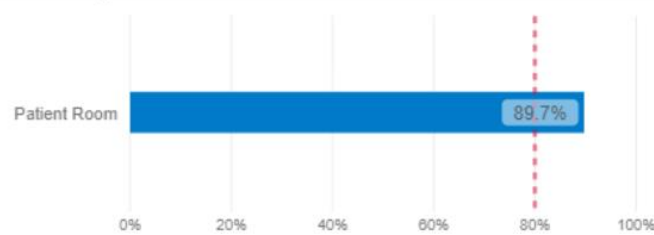
Cleanliness Score



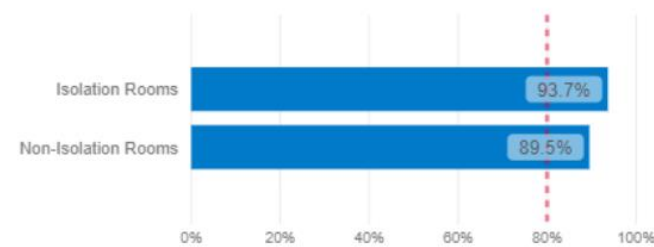
Cleanliness Trend



Results by Area



Results by Type



Facility Performance

Facility Name	Score	# of Audits	Quarterly Room Target
St Mary Mercy Livonia	96%	733	90
Mount Carmel East Hospital	84%	587	63
Holy Cross Ft. Lauderdale	90%	492	84
St. Joseph Mercy Health System Ann Arbor	89%	392	72
Saint Francis Hospital and Medical Center	94%	277	98
St Alphonsus Regional Medical Center Boise	94%	242	53
Mercy Health Saint Marys Hospital	86%	238	71
St Alphonsus Medical Center Nampa	91%	211	60
Gottlieb Memorial Hospital	94%	209	38
St. Joseph's Hospital Syracuse NY	95%	173	24
Holy Cross Silver Springs	70%	149	63
Loyola medical Center	98%	143	78
Holy Cross Germantown Hospital	87%	127	15
St. Agnes Medical Center	82%	124	60
St Alphonsus Medical Center Ontario	89%	123	15
St Marys Medical Center	73%	116	47
Total	90%	4,732	1,306

Given:

The new understanding of *C. Diff* environmental epidemiology, and...

Given:

The development of a new daily use sporicidal disinfectant...

Can:

Daily

Optimized;

Hospital wide;

Sporicidal cleaning;

of Patient- zone Surfaces...

**Mitigate
HO-CDI?**

Infection Control & Hospital Epidemiology (2022), 1–7
doi:10.1017/ice.2022.84



Original Article

Mitigating hospital-onset *Clostridioides difficile*: The impact of an optimized environmental hygiene program in eight hospitals

Philip C. Carling MD¹ , Lyndsay M. O'Hara PhD, MPH², Anthony D. Harris MD³ and Russell Olmsted MPH, CIC, FAPIC⁴

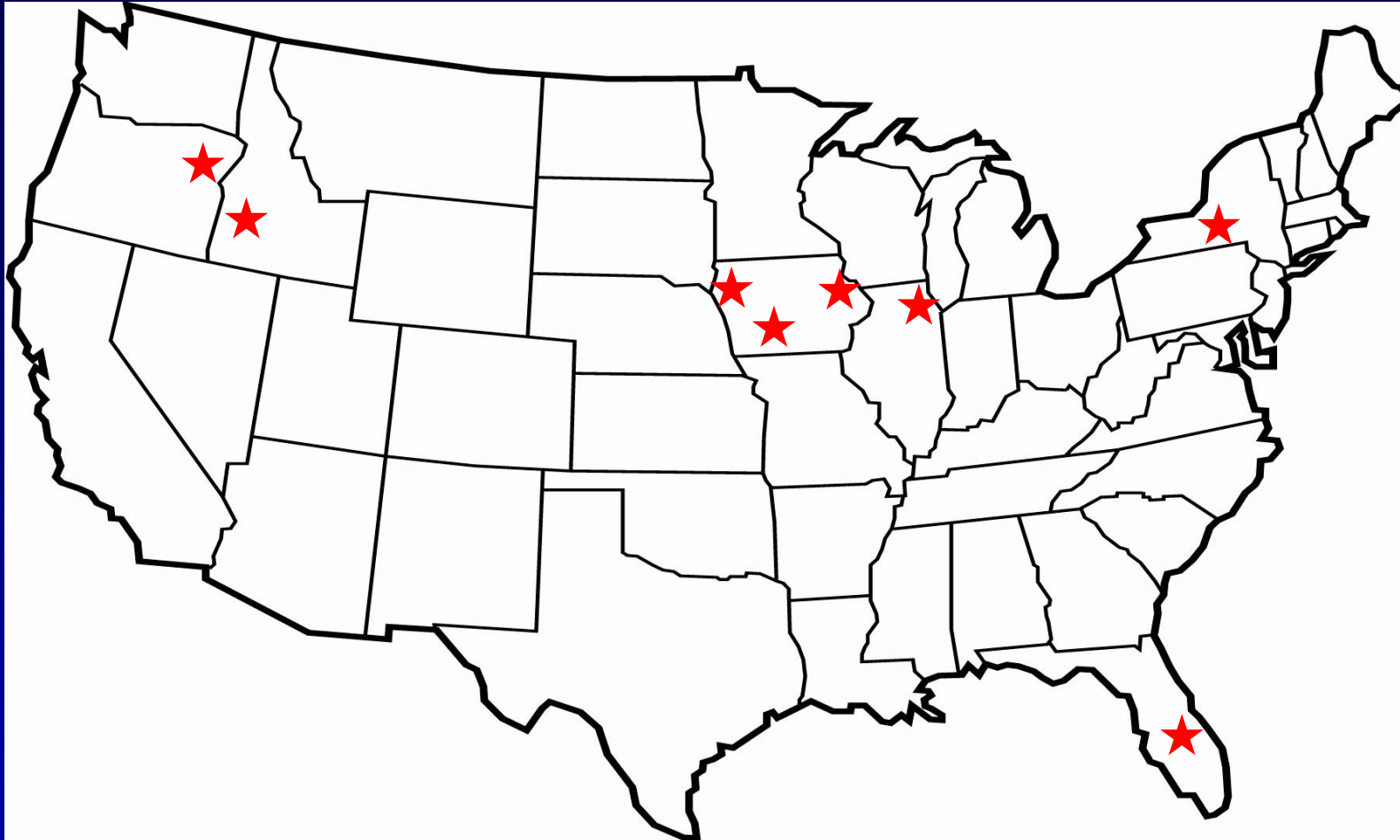
¹Boston University School of Medicine, Boston, Massachusetts, ²University of Maryland, Baltimore, Maryland, ³University of Maryland School of Medicine, Baltimore, Maryland and ⁴Trinity Health, Livonia, Michigan

The Trinity Health HO-CDI Study

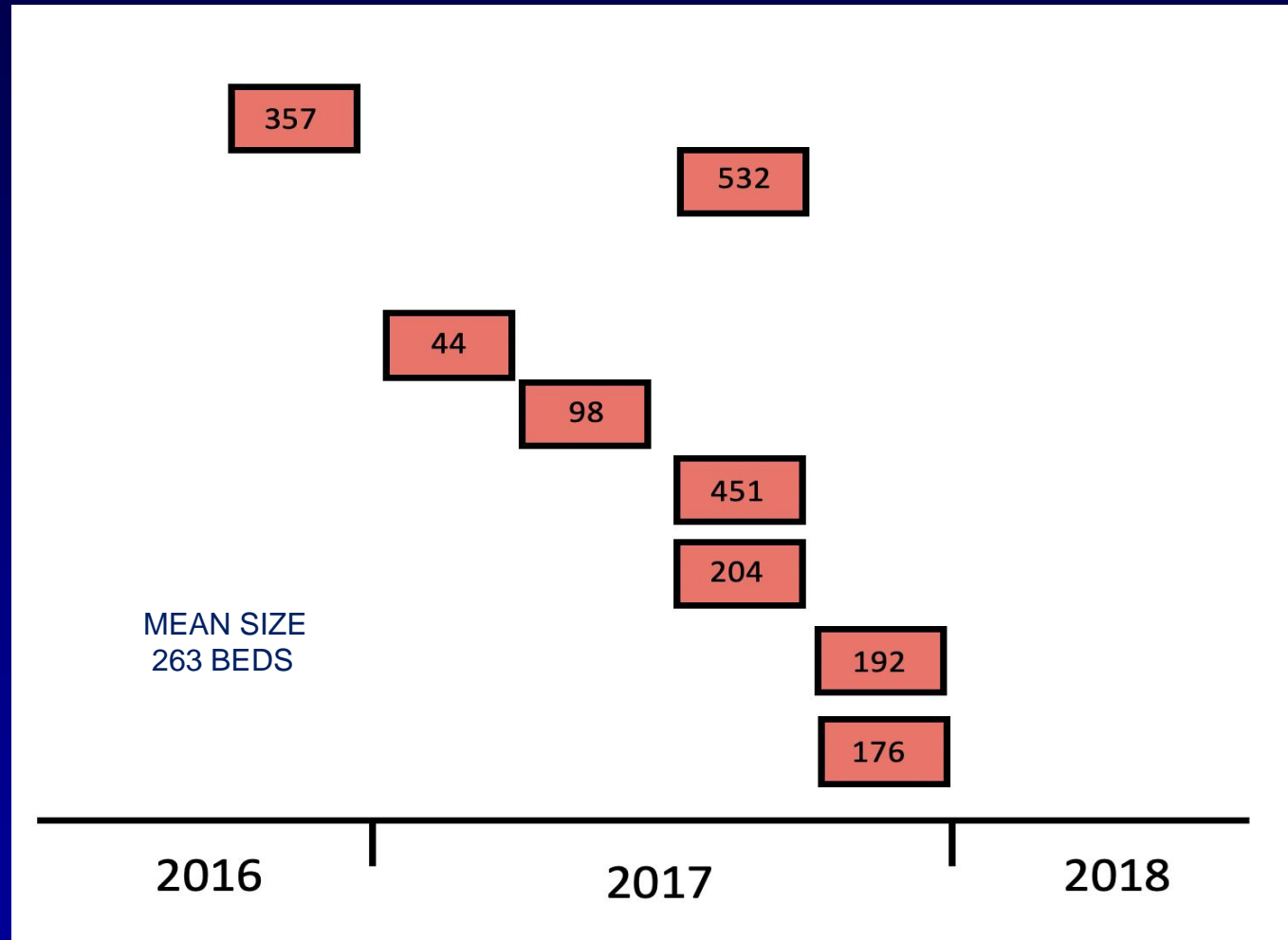
Implementation Methods:

- Availability selection of sites with stable endemic HO-CDI rates that had not implemented CDC Level II Monitoring
- Covertly validated cleaning thoroughness was monitored for 18 months
- The elements of the intervention were implemented concomitantly during a 3-month wash-in period.

The Trinity Health HO-CDI Study



Sites by Wash-in Quarter (size)



MCCMI 1.71

1.73

ALOS 4.17

4.21 ICHE 2022

The Sporicidal Disinfectant

- EPA-registered, one-step disinfectant cleaner
- Hydrogen peroxide/ peroxyacetic acid.
- Complete killing of *C. difficile* in five minutes.
- It is also effective against *C. auris*, emerging viral pathogens, and a broad spectrum of other organisms.

Practice Optimization -- Program Implementation

A patient zone cleaning program

Consistent with Widely used guidelines

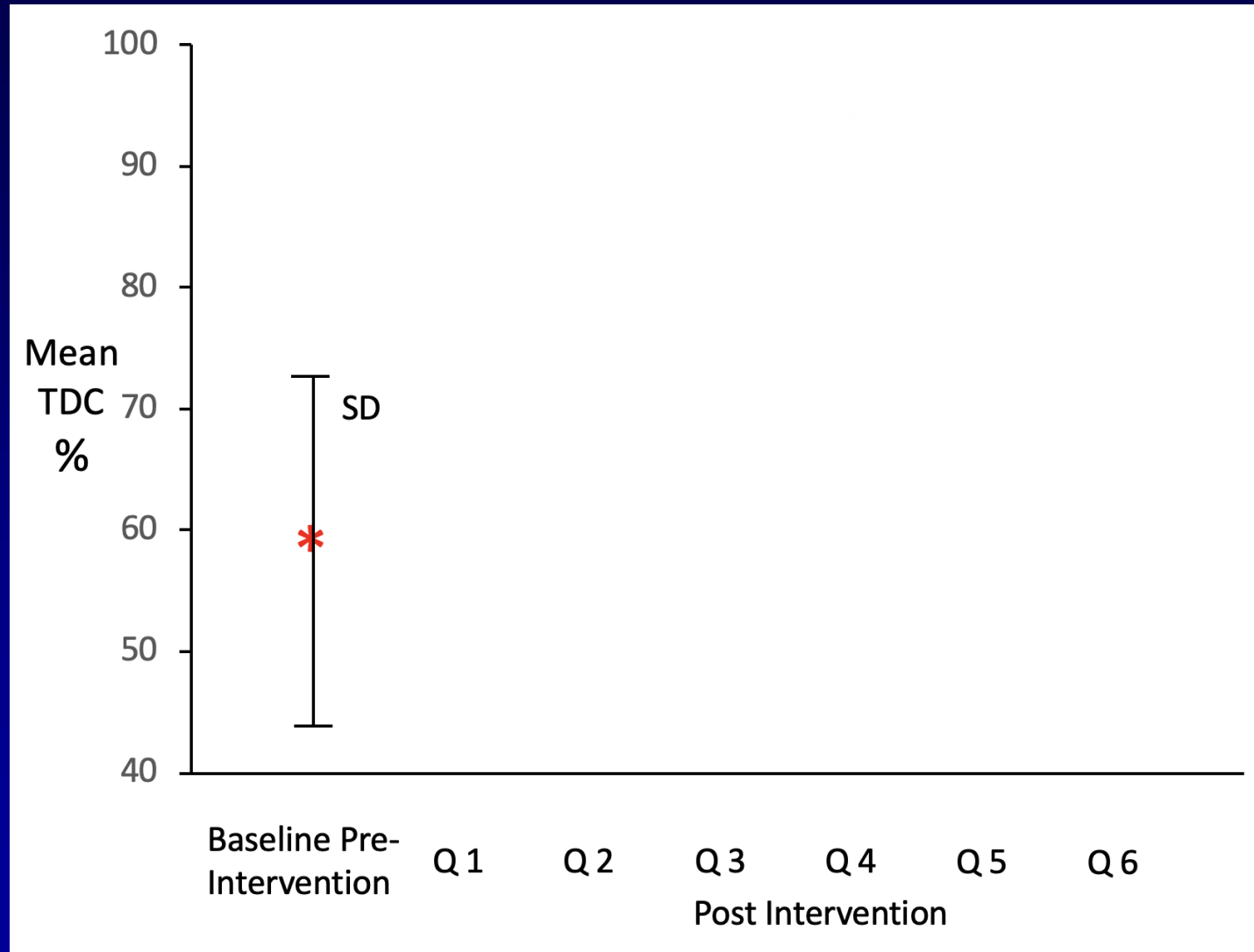
CDC – 2010 Level II Monitoring and Process
Improvement Program

APIC Text of infection Control

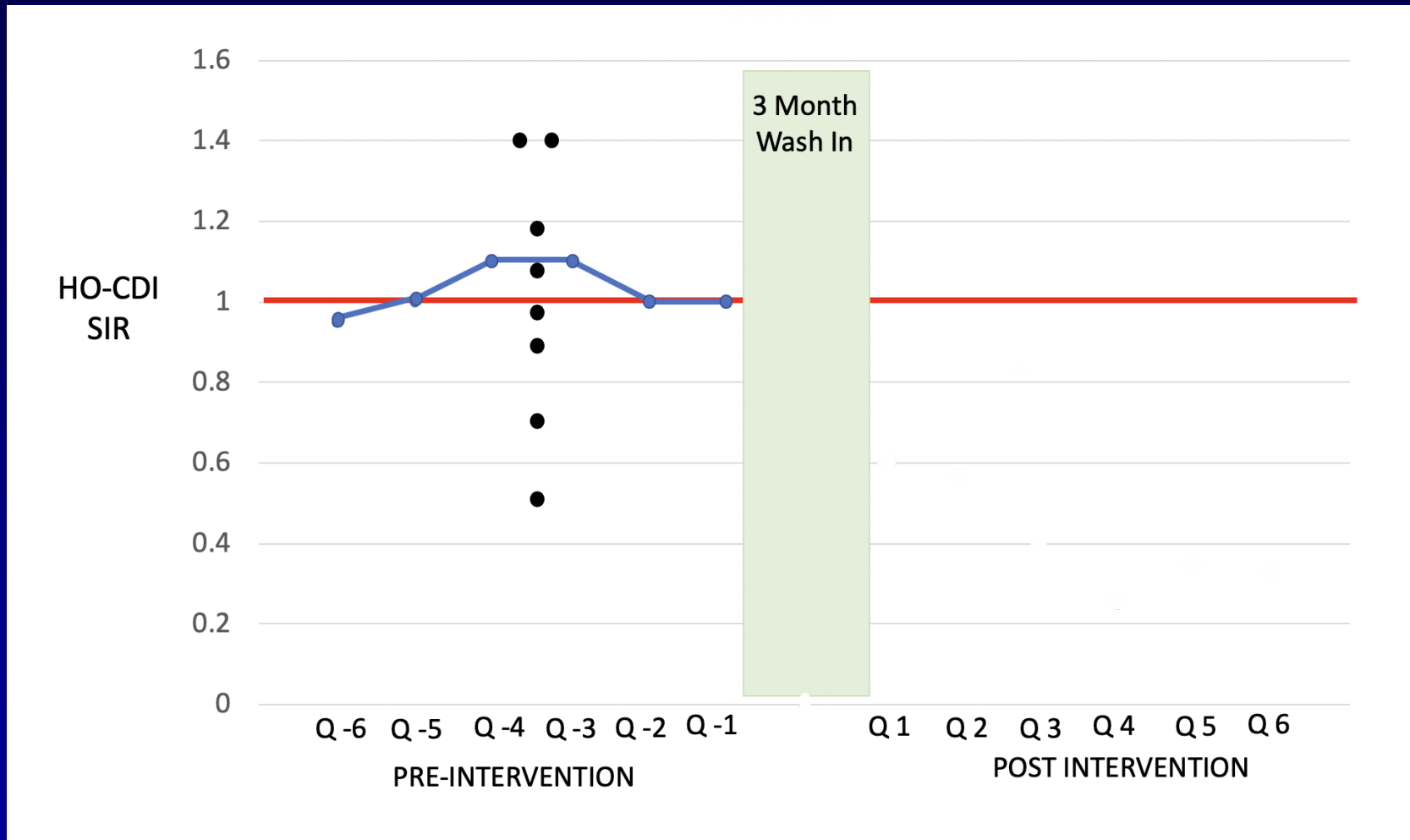
JCAHO Standards and CMS requirements

Pre-intervention Results

Thoroughness of Disinfection Cleaning in 8 Hospitals

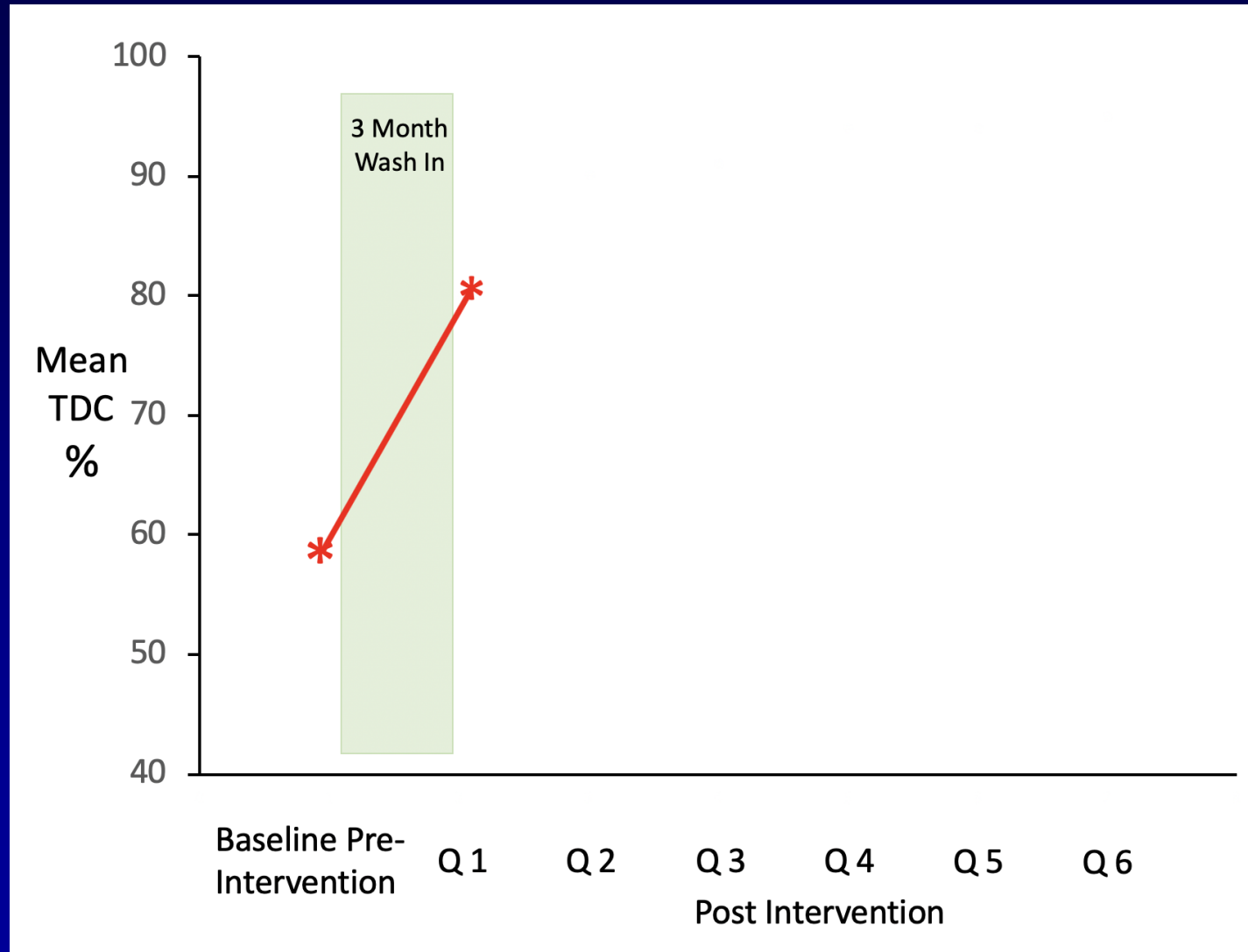


Endemic HO-CDI SIRS in 8 Hospitals

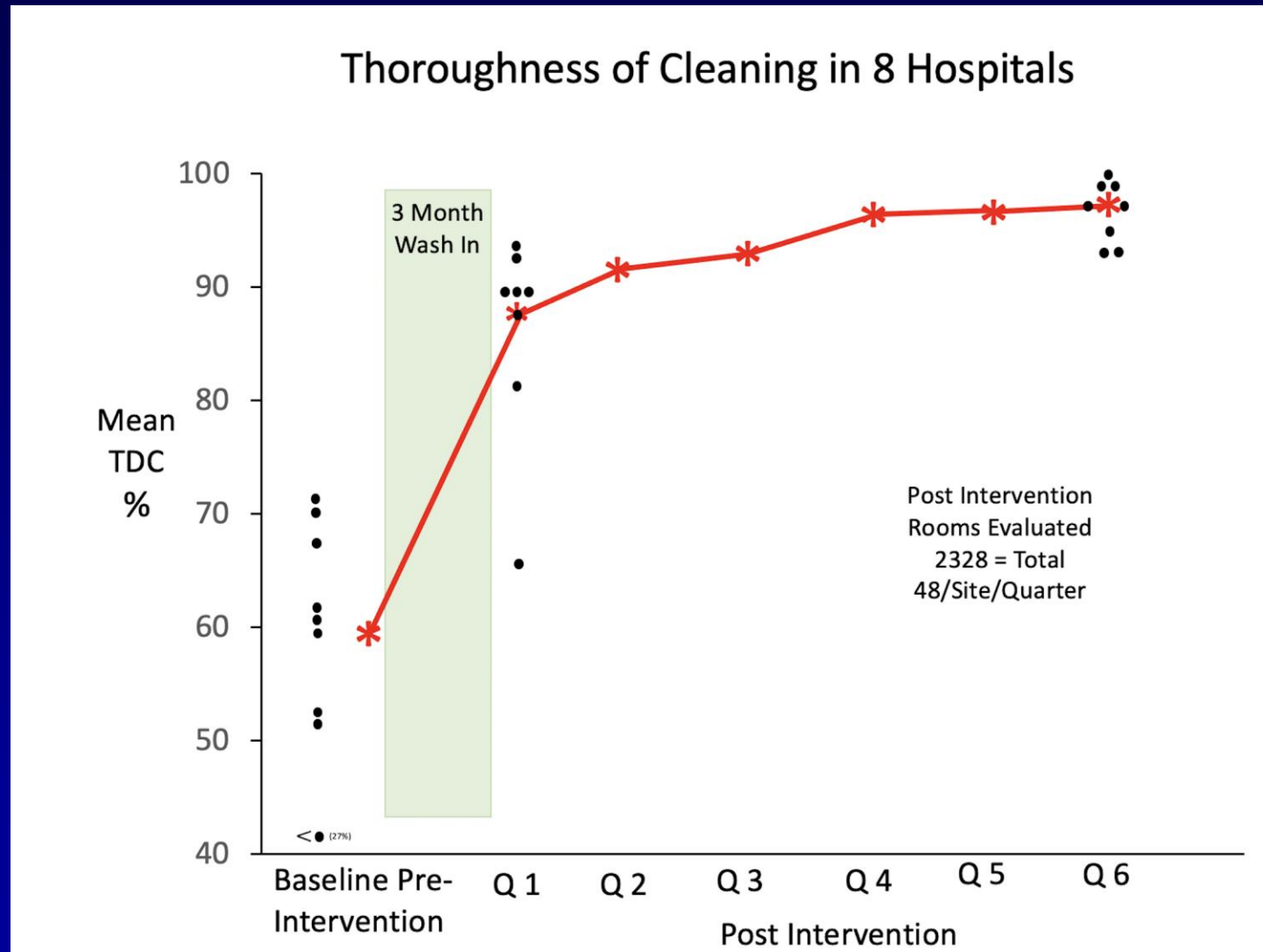


Post-intervention Results

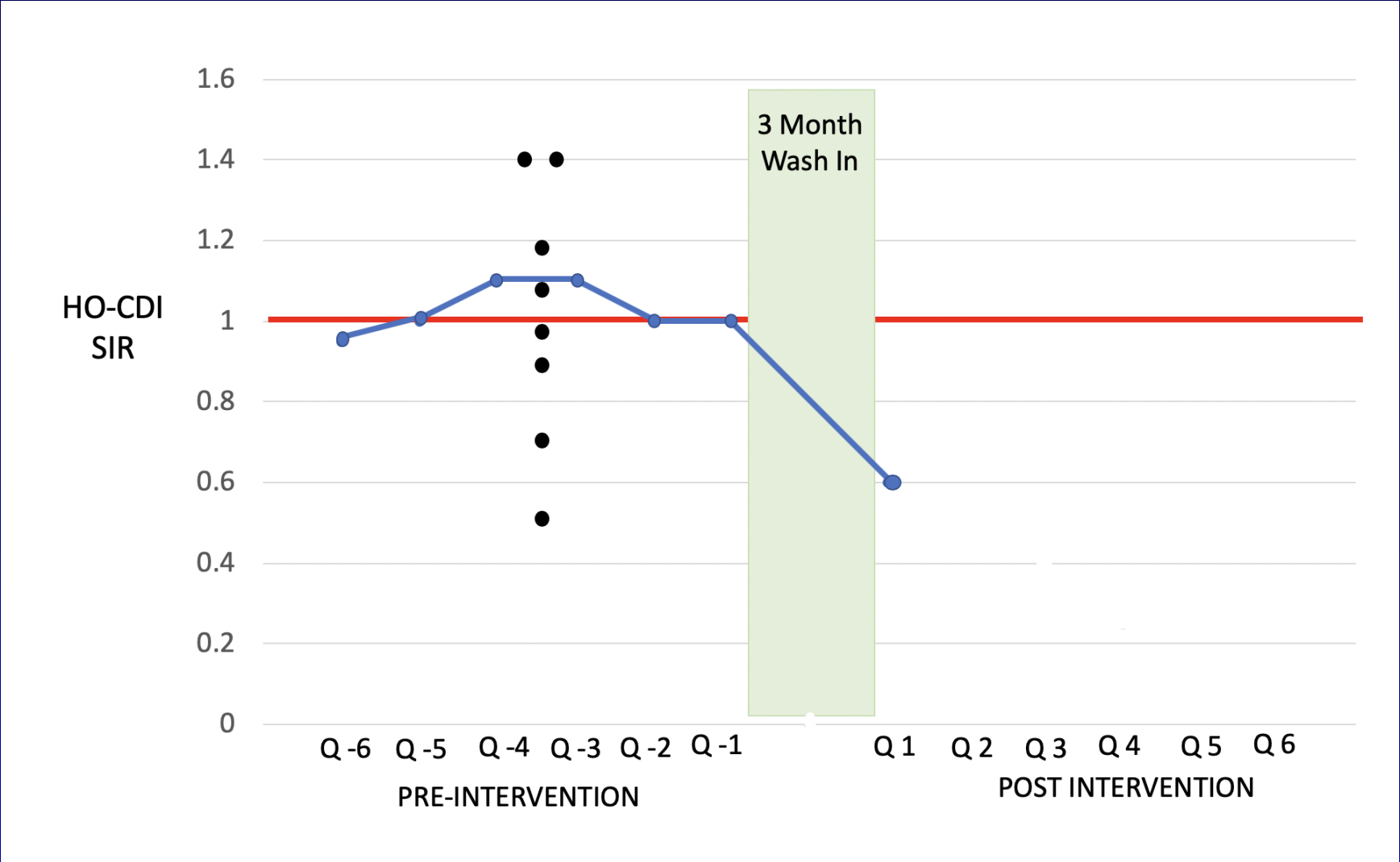
Thoroughness of Disinfection Cleaning in 8 Hospitals



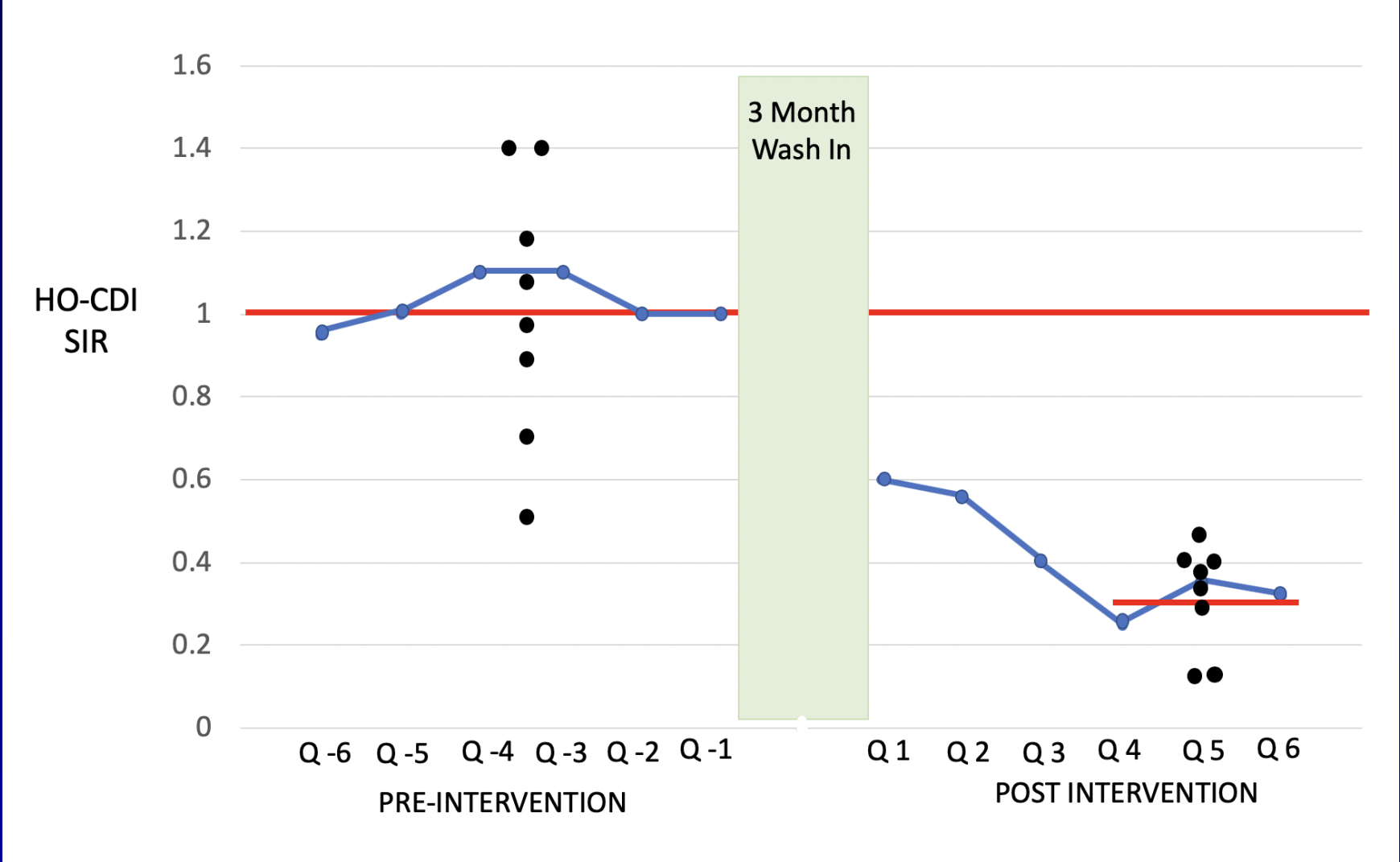
Thoroughness of Disinfection Cleaning in 8 Hospitals



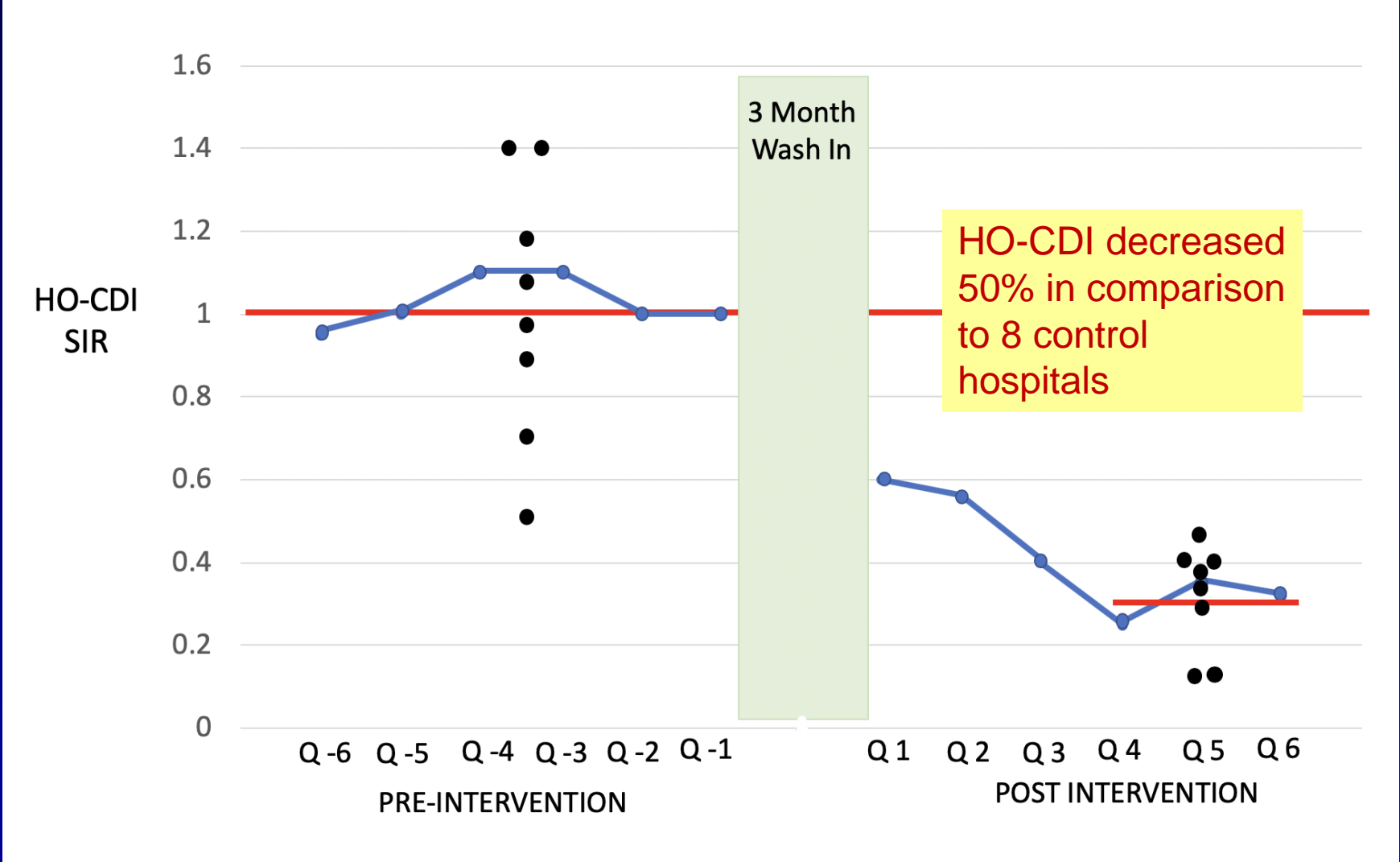
HO-CDI SIRS in 8 Hospitals



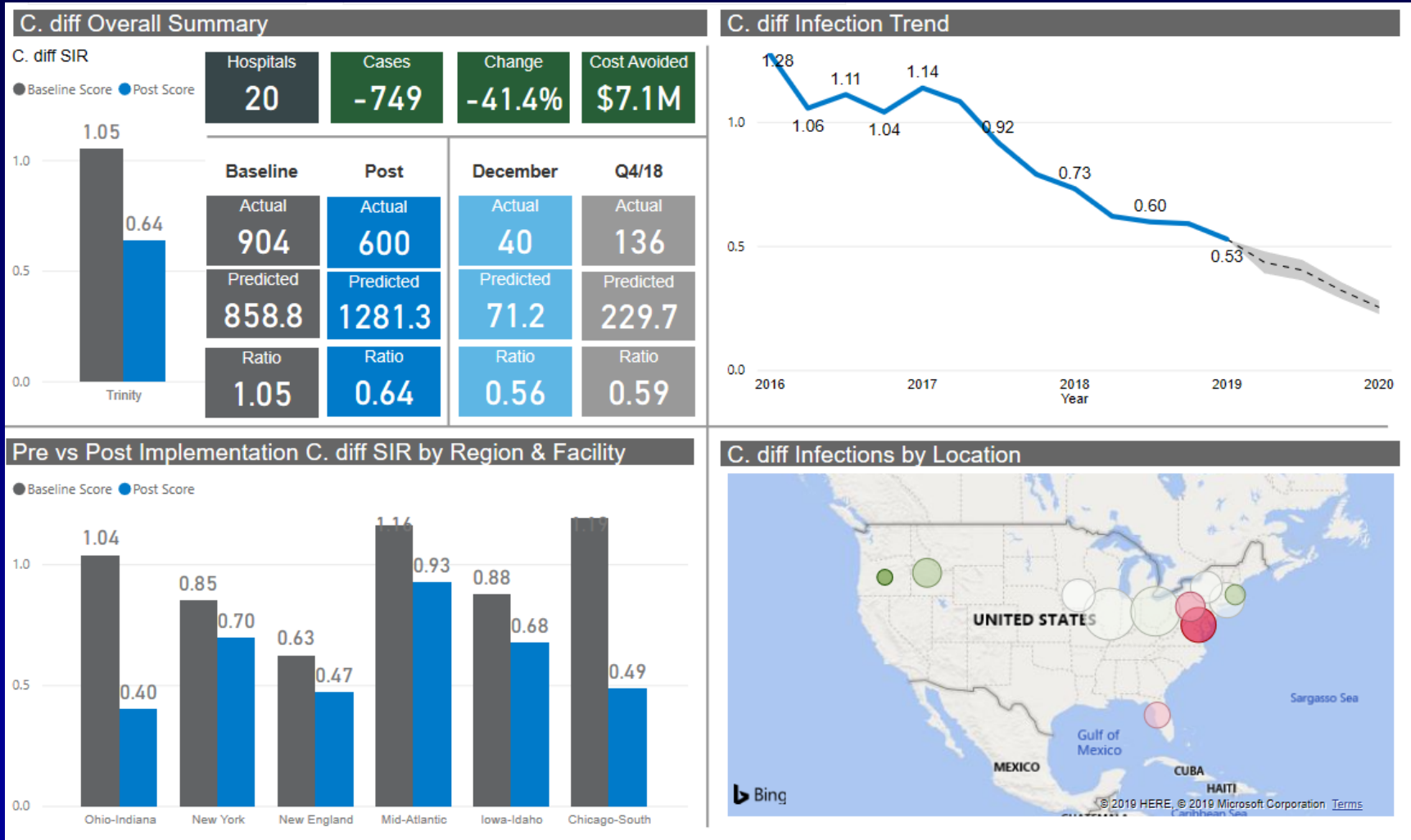
HO-CDI SIRS in 8 Hospitals



HO-CDI SIRS in 8 Hospitals



Trinity C. diff Trends Continue to Decrease



Key CDC Resources for optimizing your Environmental Hygiene Program




Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

October 2020

Healthcare-associated Infections

CDC > Healthcare-associated Infections (HAI) > Preventing HAIs > Healthcare Environmental Infection Prevention

 Healthcare-associated
Infections (HAI)

Reduce Risk from Surfaces

Core Components of Environmental Cleaning and Disinfection in Hospitals

<https://www.cdc.gov/hai/prevent/environment/surfaces.html>



Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

October 2020

Healthcare-associated Infections



Healthcare-associated Infections (HAI) > Preventing HAIs > Healthcare Environmental Infection Prevention

Reduce Risk from Surfaces

Core Components of Environmental Cleaning and Disinfection in Hospitals

<https://www.cdc.gov/hai/prevent/environment/surfaces.html>

Core Components of Environmental Cleaning and Disinfection in Hospitals

1. Integrate Environmental Services into the Hospital's Safety Culture
2. Educate and Train all Healthcare Providers Responsible for Cleaning and Disinfecting Patient Care Areas
3. Select Appropriate Cleaning and Disinfection Technologies and Products
4. Standardize Setting-specific Cleaning and Disinfection Protocols
5. Monitor Effectiveness and Adherence to Cleaning and Disinfection Protocols
6. Provide Feedback on Adequacy and Effectiveness of Cleaning and Disinfection to All Responsible HCP as well as Relevant Stakeholders (e.g., Infection Control, Hospital Leadership)

SHEA/IDSA/APIC Practice Recommendation

Strategies to prevent *Clostridioides difficile* infections in acute-care hospitals: 2022 Update

Essential practices

In the 2014 *Compendium*, encouraging appropriate use of antimicrobials for CDI and other infections was considered an essential practice, but formal adoption of an antimicrobial stewardship program was considered an additional approach. In the 2022 *Compendium*, encouraging appropriate use of antimicrobials by implementing an antimicrobial stewardship program is now recommended as an essential practice. Implementation of diagnostic stewardship practices for appropriate use and interpretation of *C. difficile* testing is a new essential practice recommendation. Assessing adequacy of room cleaning, an additional approach in the 2014 *Compendium*, is now an essential practice recommendation.

Additional evidence for the impact
of such a program

Original Investigation | Infectious Diseases

Evaluation of the Cost-effectiveness of Infection Control Strategies to Reduce Hospital-Onset *Clostridioides difficile* Infection

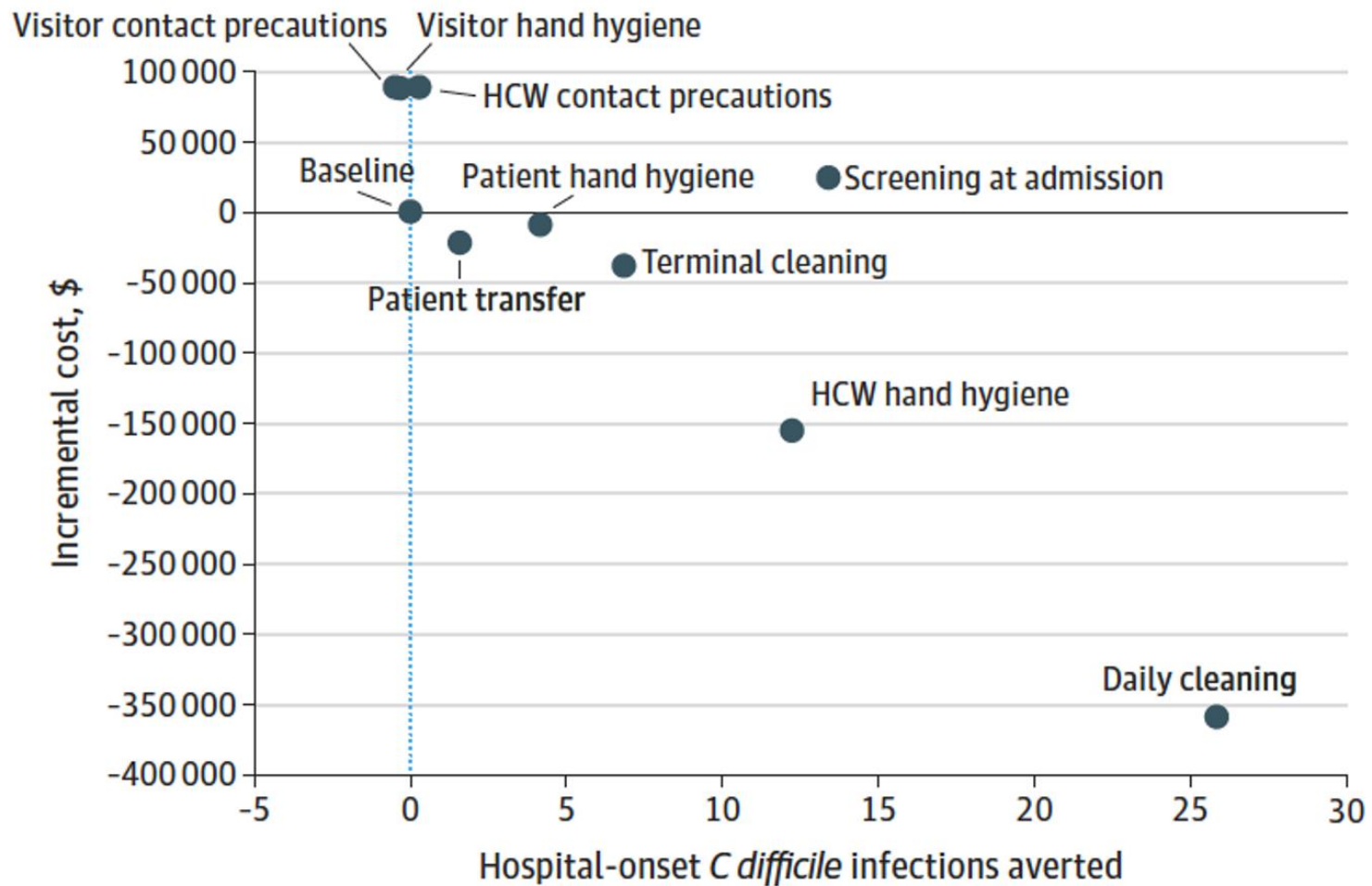
Anna K. Barker, MD, PhD; Elizabeth Scaria, BS; Nasia Safdar, MD, PhD; Oguzhan Alagoz, PhD

OBJECTIVE To compare the cost-effectiveness of 9 *C difficile* single intervention strategies and 8 multi-intervention bundles.

INTERVENTIONS Daily sporicidal cleaning, terminal sporicidal cleaning, health care worker hand hygiene, patient hand hygiene, visitor hand hygiene, health care worker contact precautions, visitor contact precautions, *C difficile* screening at admission, and reduced intrahospital patient transfers.

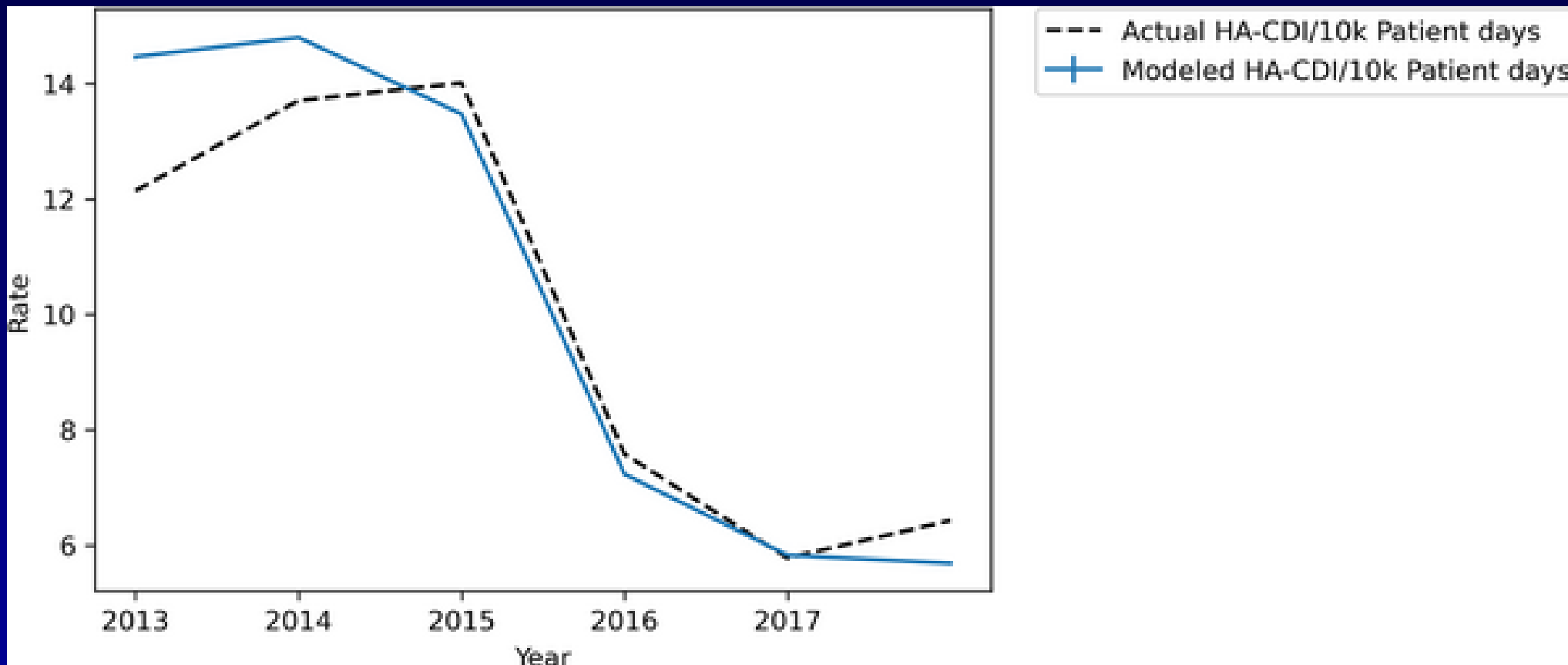
MAIN OUTCOMES AND MEASURES Cost-effectiveness was evaluated from the hospital perspective and defined by 2 measures: cost per hospital-onset *C difficile* infection averted and cost per quality-adjusted life-year (QALY).

B Hospital-onset *C difficile* infections averted



Barker AK, Scaria E, Safdar N, Alagoz O. Evaluation of cost-effectiveness of infection control strategies to reduce hospital-onset *Clostridioides difficile* infection. *JAMA Network Open*. 2020;3(8):e201252 2.

Fig 3. Modeled vs. actual rate of HA-CDI per 10,000 patient days, 2013–2018.



Scaria E, Safdar N, Alagoz O (2023) Validating agent-based simulation model of hospital-associated *Clostridioides difficile* infection using primary hospital data. PLOS ONE 18(4): e0284611. <https://doi.org/10.1371/journal.pone.0284611>
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0284611>

April 2023

Ok.. but how much does an
environmental hygiene
optimizing program cost
program cost??



Confirmation of Cost Savings

Population Based Studies on the cost of HO-CDI

Author	Study Period	Publication Date	Total Attributable Cost Per case (US\$)	Non-Reimbursed Cost Per case (US\$)
<u>Shorr</u>	2008-2010	2022	\$ 28,050	Not Evaluated
<u>Mollard</u>	2012-2016	2019	\$ 27,122	Not Evaluated
Sahrman	2011-2017	2022		\$14,257
Yu	2012-2019	2022	\$28,762	\$13,476

Confirmation of Cost Savings

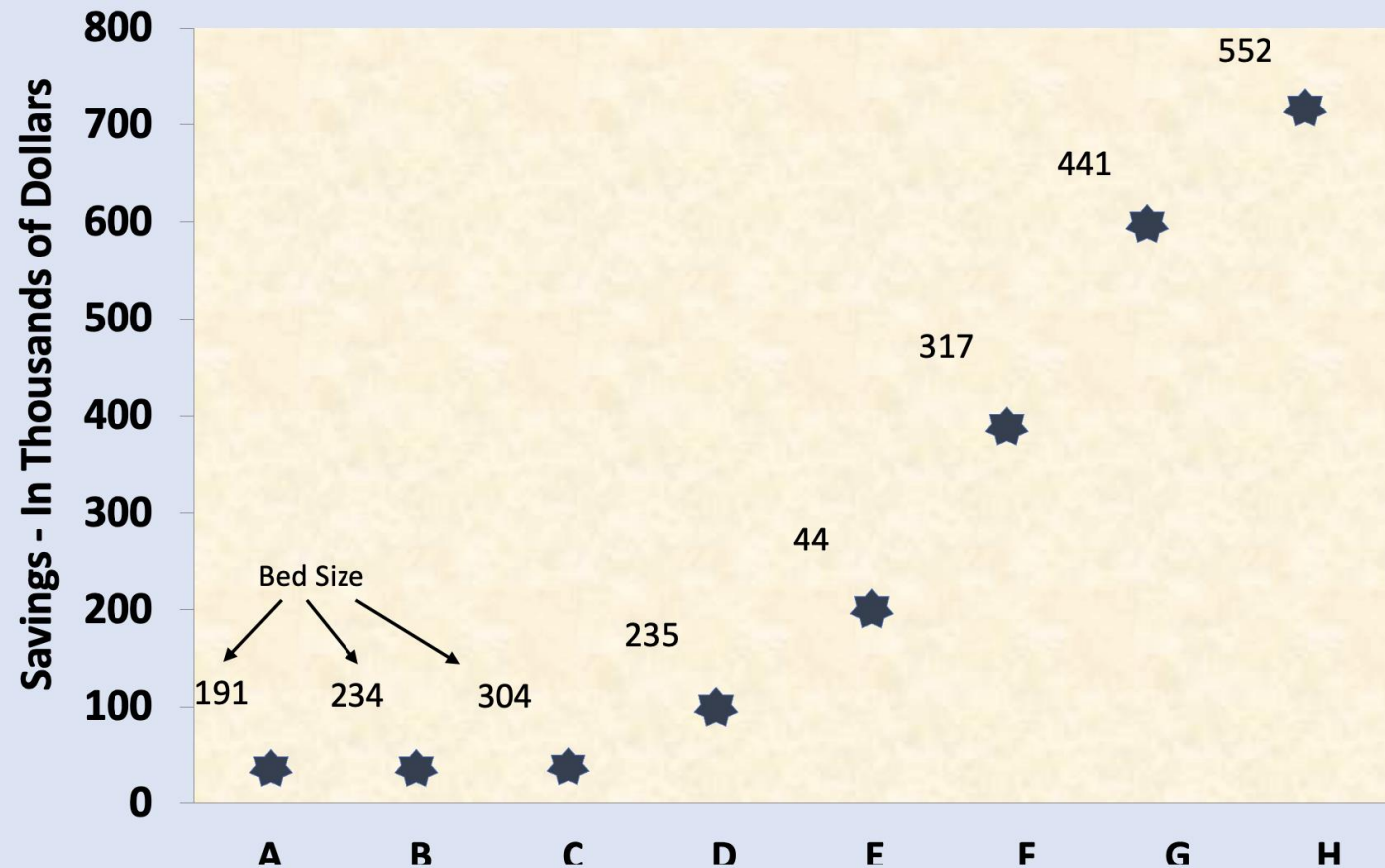
Population Based Studies on the cost of HO-CDI

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Sahrman	2011-2017	2022		\$14,257
Yu	2012-2019	2022	\$28,762	\$13,476

2015 \$\$

Since HO-CDI has a non-reimbursed cost it follows that reducing it represents a savings

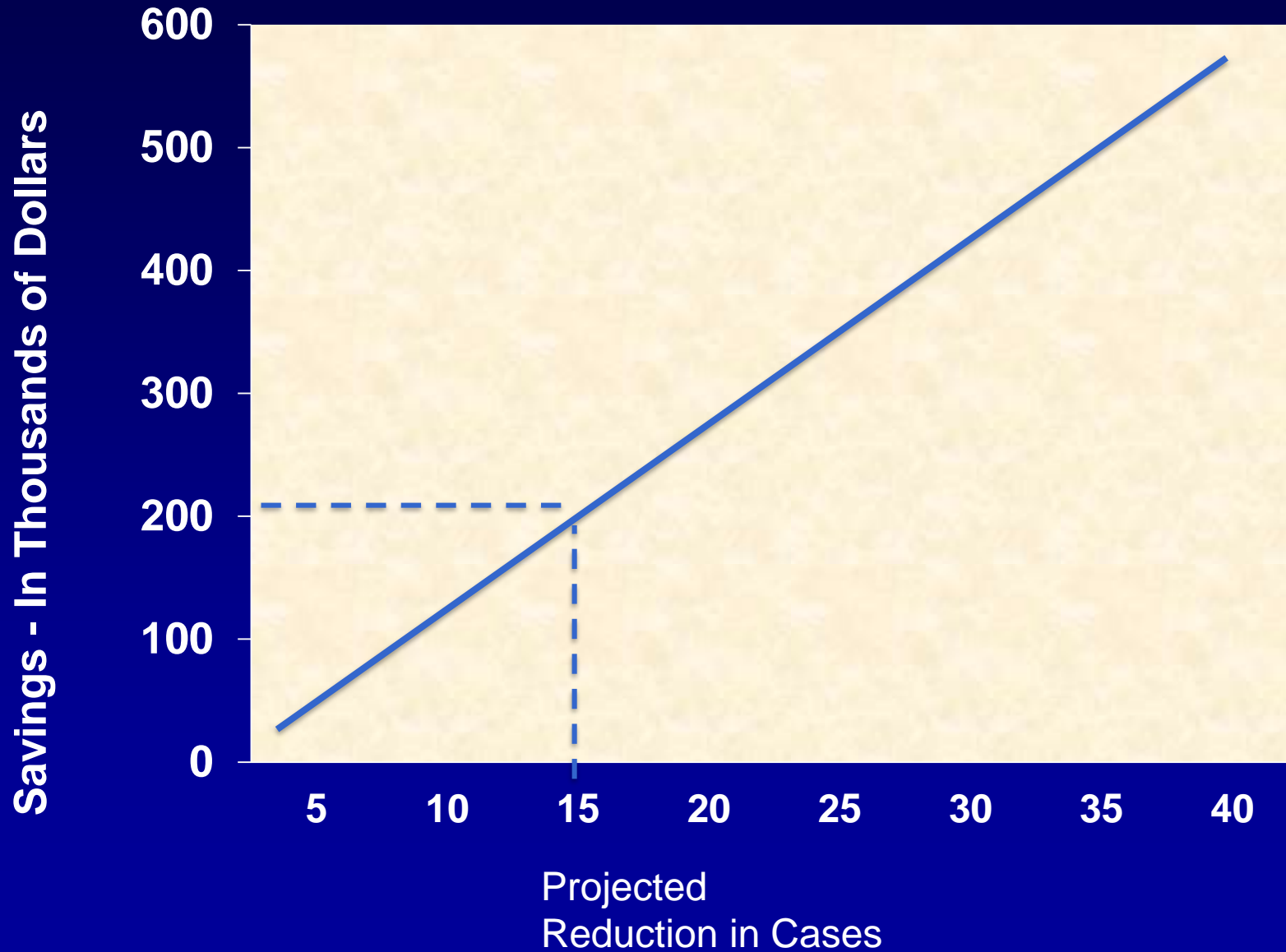
Yearly Cost Savings - Eight Study Hospitals



Carling p, Parry M, Olmstead R. Environmental Approaches to Controlling *Clostridioides difficile*. International Journal of Environmental Research and Public Health **2023** In-press.

OK...So what does this
mean for my hospital ?

HO-CDI Direct Cost Savings Calculator



Thank you!



Questions Comments?