

The Role of Environmental Cleaning and Disinfection in Preventing HAIs

Learning Objectives:

- Discuss the role of environmental cleaning and disinfection in the prevention of HAIs.
- Identify evidence-based methods and best practices for environmental cleaning in healthcare facilities.
- Discuss controversies and challenges for infection control managers and resources for effective management.

Outline of Today's Presentation

Issues with terminology

Why terminal room cleaning is important

Addressing suboptimal cleaning practice

Does enhanced cleaning make a difference?

Conventional vs. enhanced environmental cleaning
monitoring

Where are we going with surface disinfectants and new
technologies?

Terminology

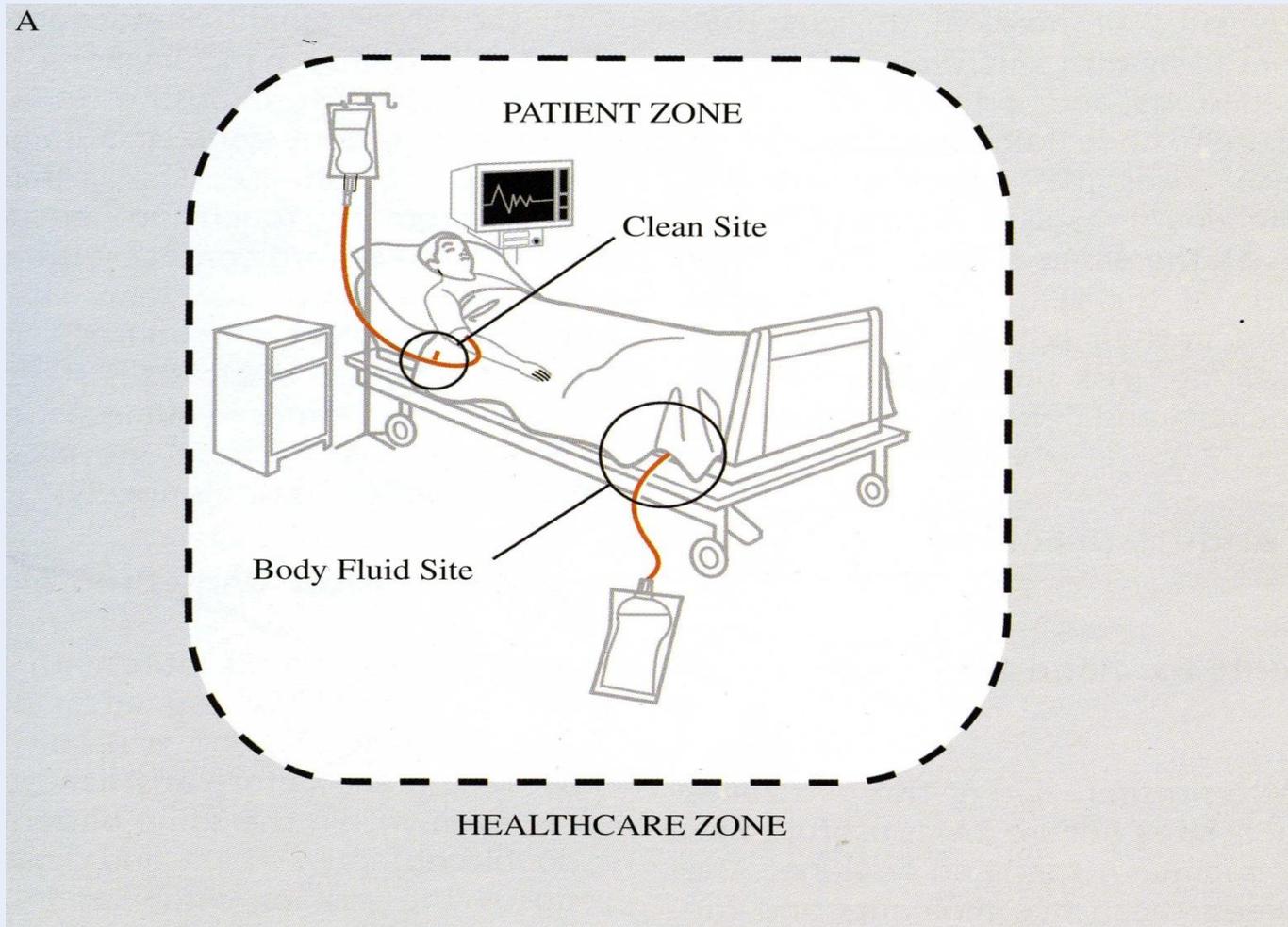
- **Disinfection cleaning** – Implies the use of a low level disinfectant to decrease bio-burden
- **Environmental cleaning** – (in Healthcare) – surface cleaning to reduce bio-burden
- **Hygienic cleaning** – New, more specific term – surface cleaning to reduce bio-burden (confusion with hand hygiene?)

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How **clean** vs. How well **cleaned**....Just because it is clean does not necessarily mean it was well cleaned

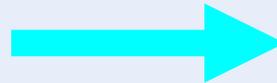
Terminology



How Clean is the Clean Appearing Hospital Environment ?

Surface evaluation using ATP bioluminescence

Swab surface → Luciferase tagging of ATP → Hand held luminometer



Used in the commercial food preparation industry to evaluate surface cleaning before reuse and as an educational tool for more than 30 years.

How Clean is the Clean Appearing Hospital Environment ?

Visually clean surfaces may be contaminated.

82% of sites visually clean

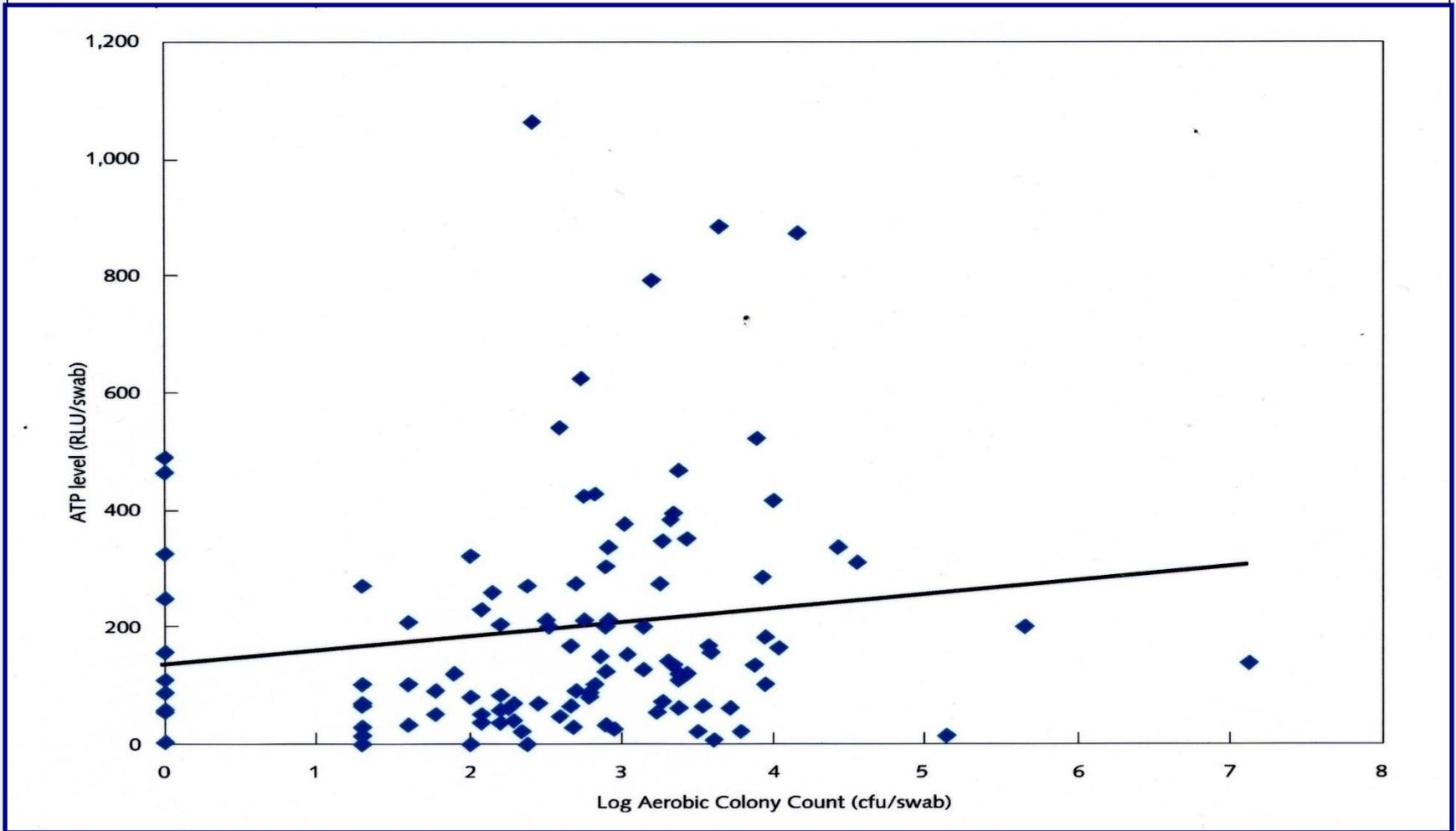
24% clean by ATP bioluminescence

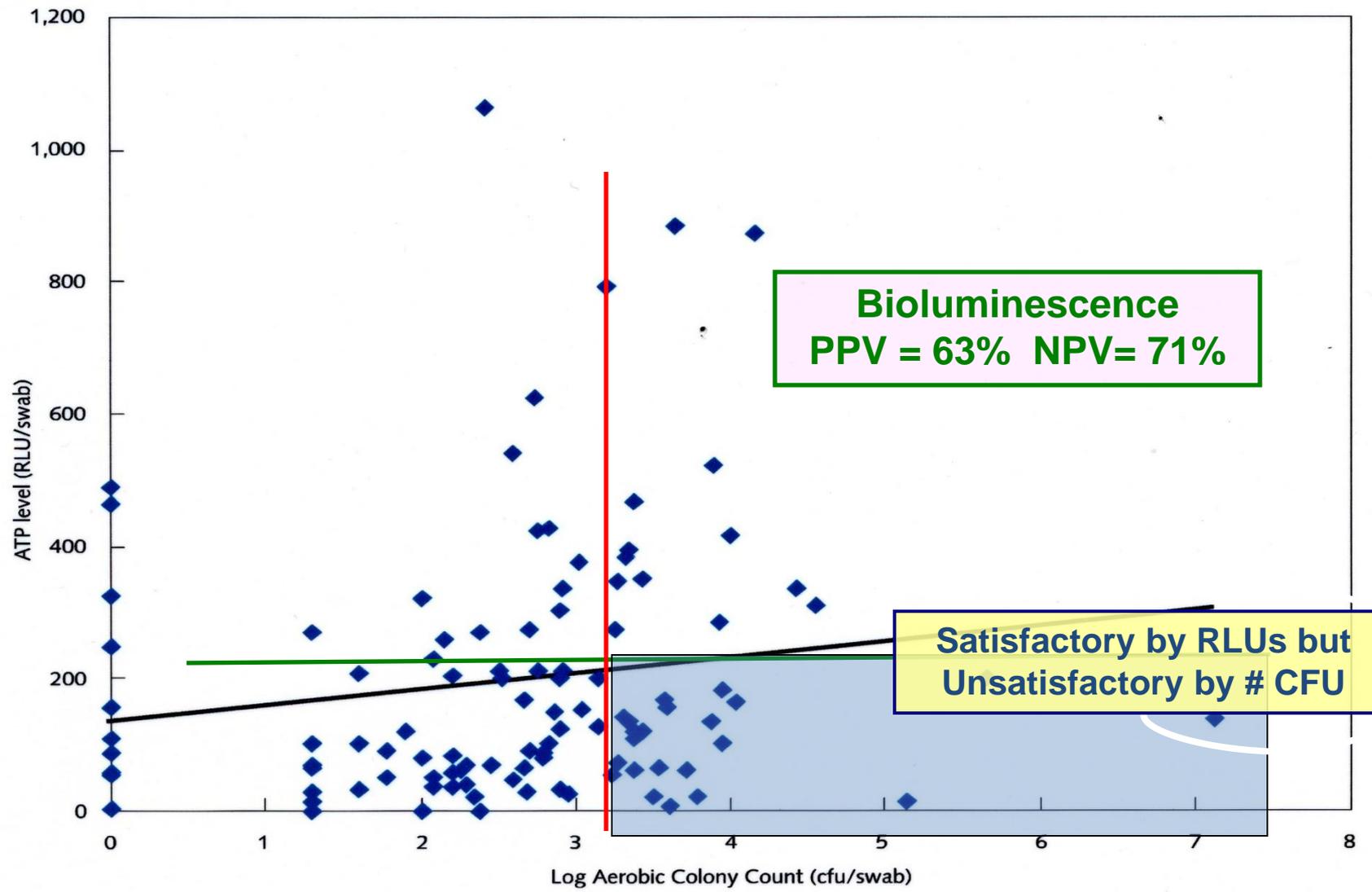
30% clean using microbiological techniques

Some “clean” surfaces had organism counts > 40 cfu/cm²

Griffith et al. *J Hosp Infect* 2000;45:19-28

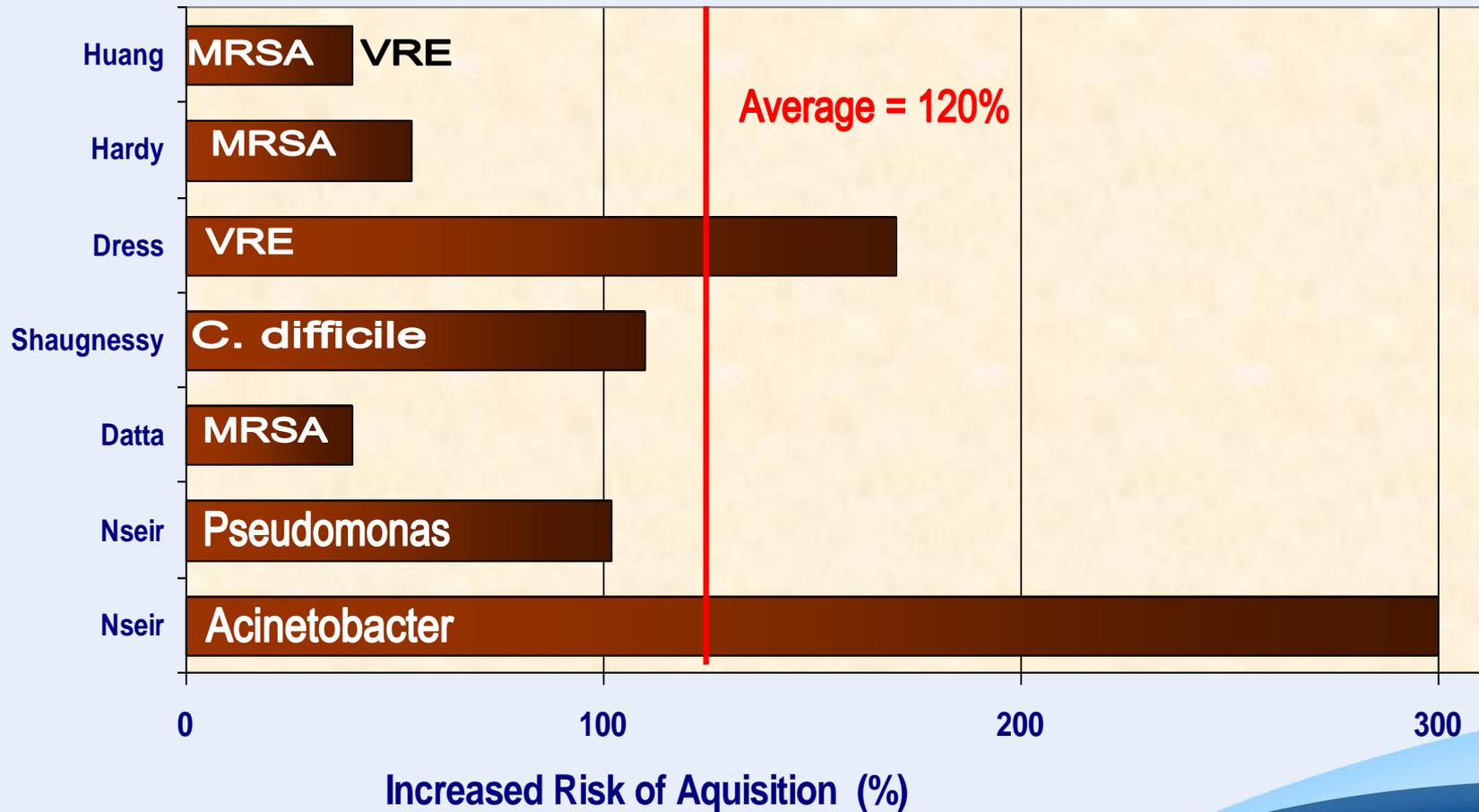
Correlation between ATP bioluminescence (RLU/Swab) and aerobic colony count (cfu/swab)





Does contamination of surfaces in the patient zone contribute to HAP Transmission?

Increased acquisition risk from prior room occupant 6 studies as of January 2011



How well is the Patient Zone being cleaned?

Fluorescent Gel System

The Targeting Solution

A mixture of several glues, soaps and a targeting dye which:

Dries rapidly

Is environmentally stable

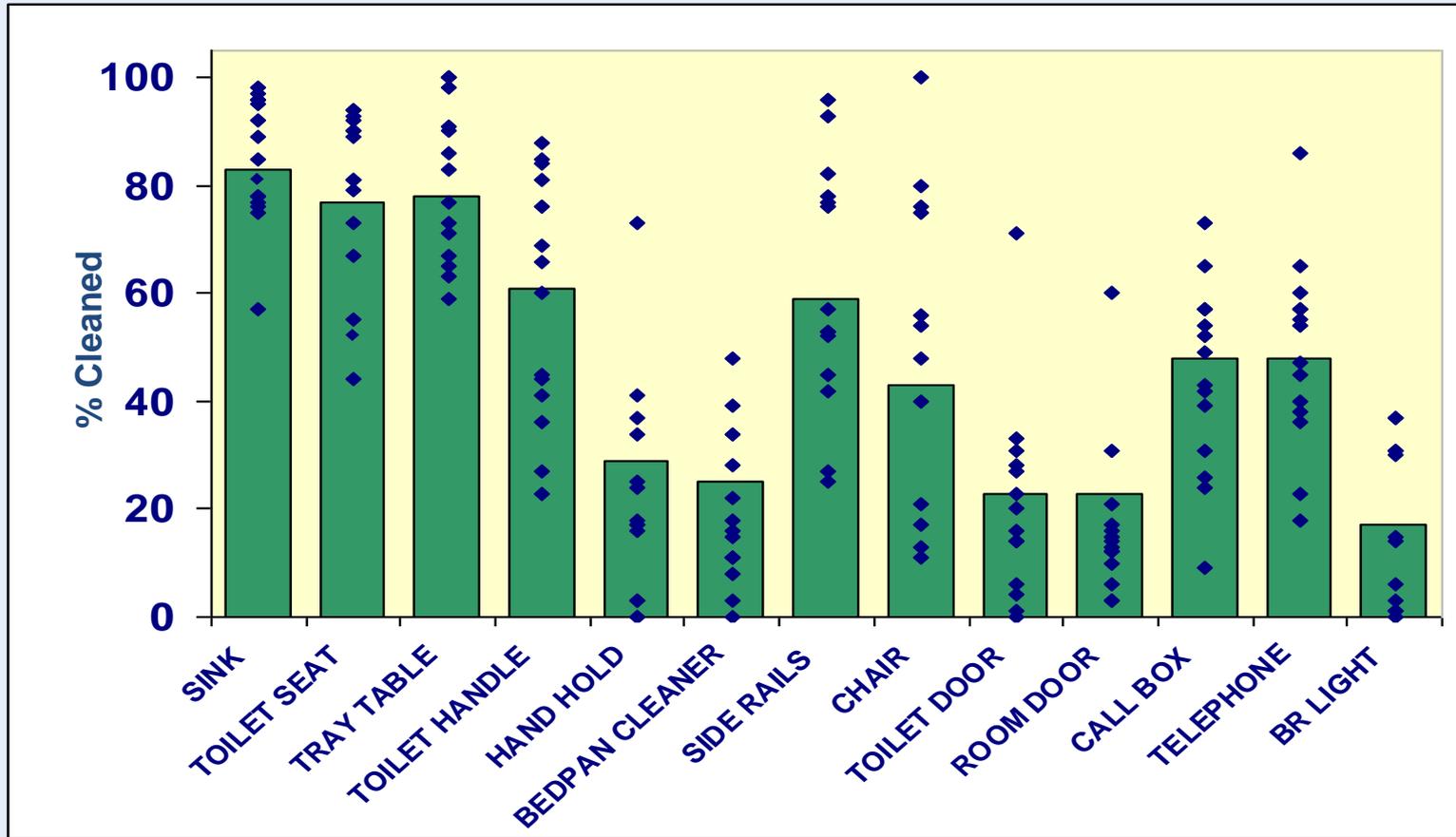
Is readily wetted by spray disinfectants

Is easily removed with light abrasion

Is inconspicuous

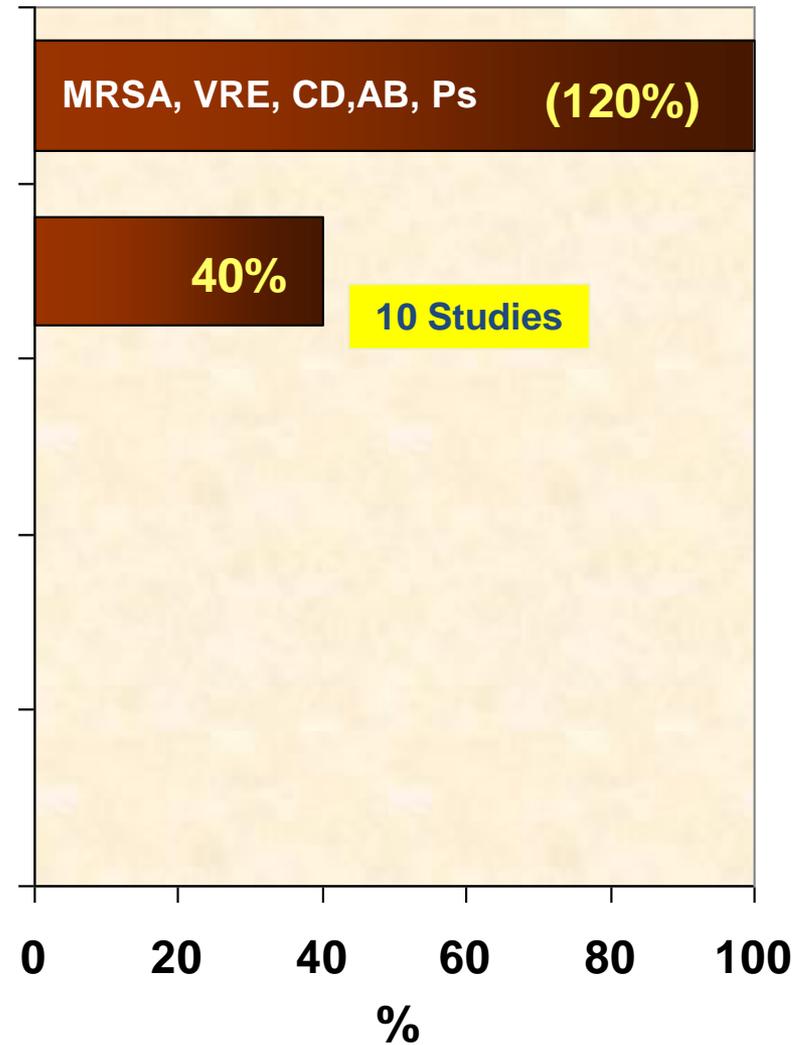


Proportion of Objects Cleaned as Part of Terminal Room Cleaning in 20 Acute Care Hospitals

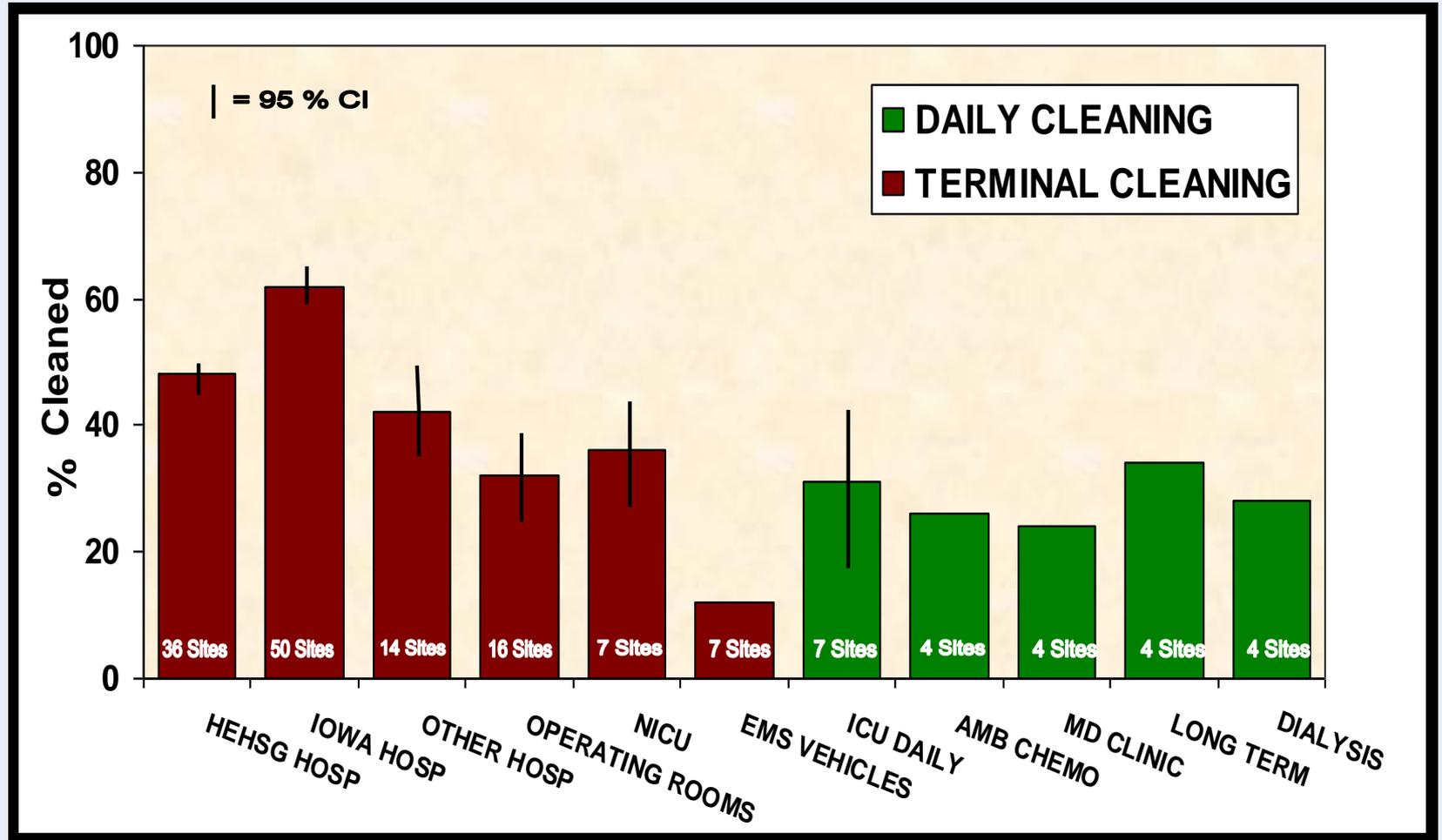


**Increased risk of prior room
occupant transmission**

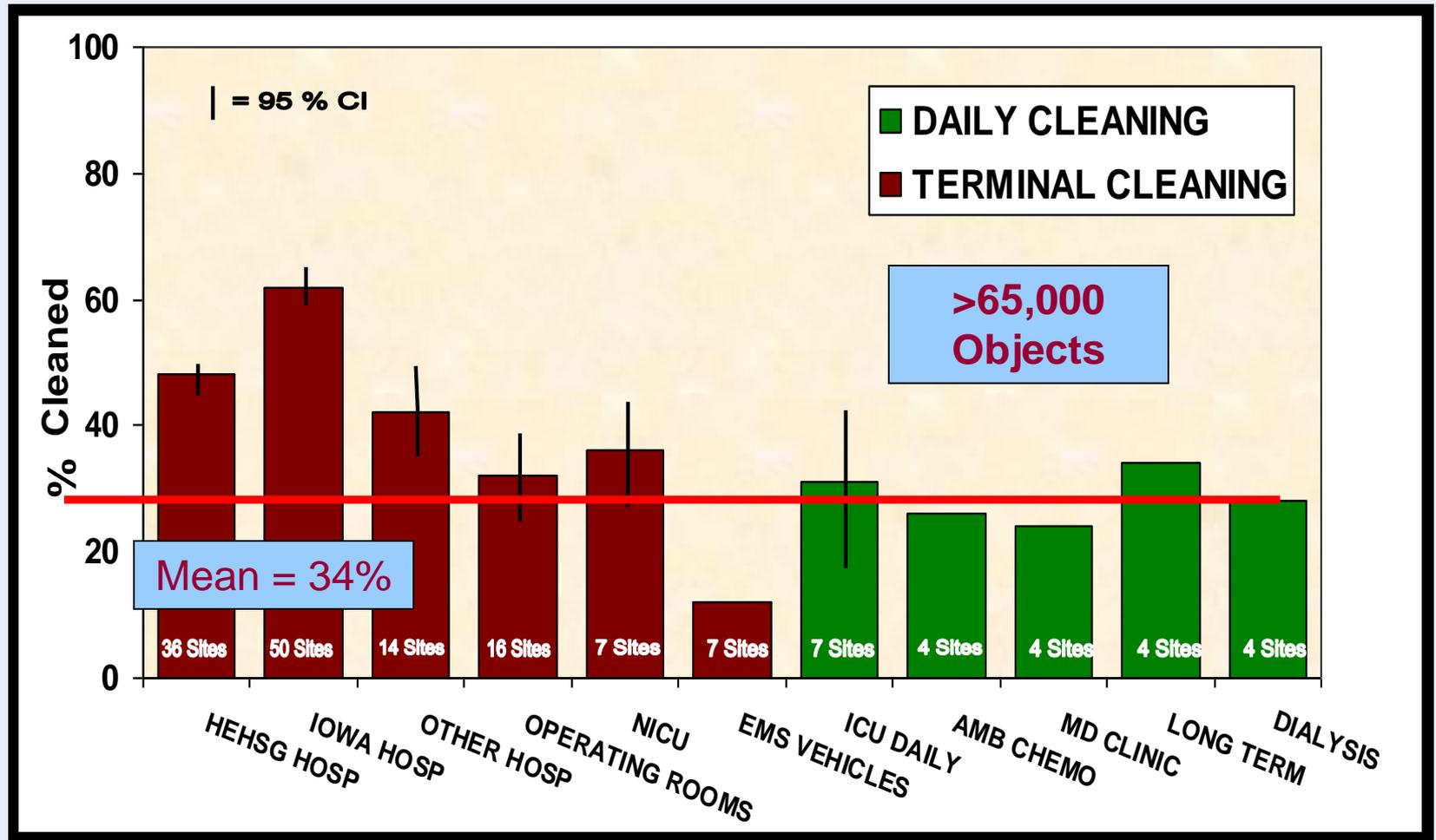
Baseline Thoroughness of Cleaning



Thoroughness of Environmental Cleaning



Thoroughness of Environmental Cleaning



Can the thoroughness of
disinfection cleaning be
improved?

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY NOVEMBER 2008, VOL. 29, NO. 11

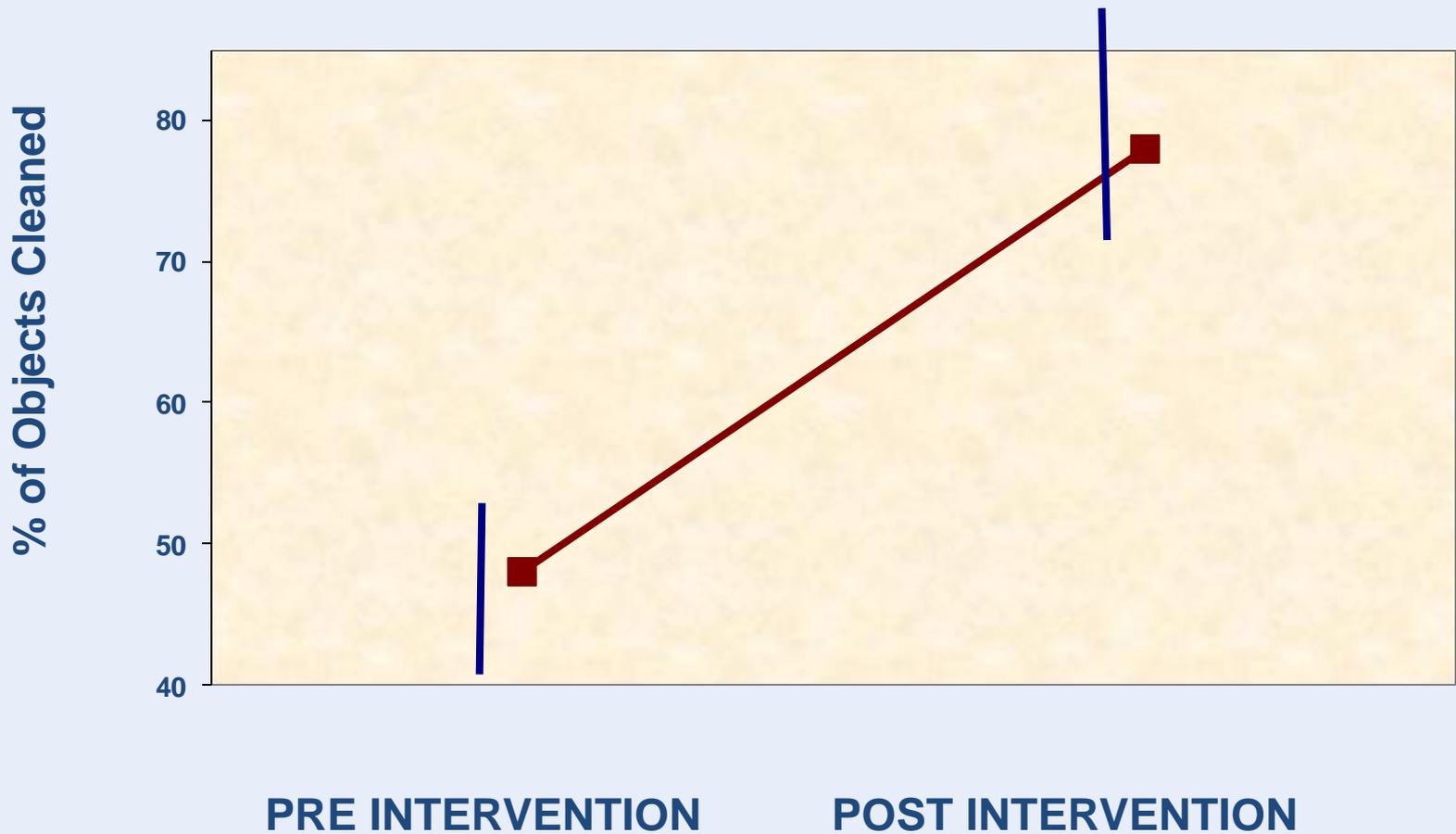
ORIGINAL ARTICLE

Improving Cleaning of the Environment Surrounding Patients in 36 Acute Care Hospitals

Philip C. Carling, MD; Michael M. Parry, MD; Mark E. Rupp, MD; John L. Po, MD, PhD; Brian Dick, MS, CIC;
Sandra Von Beheren, RN, BSN, MS, CIC; for the Healthcare Environmental Hygiene Study Group

RESULTS

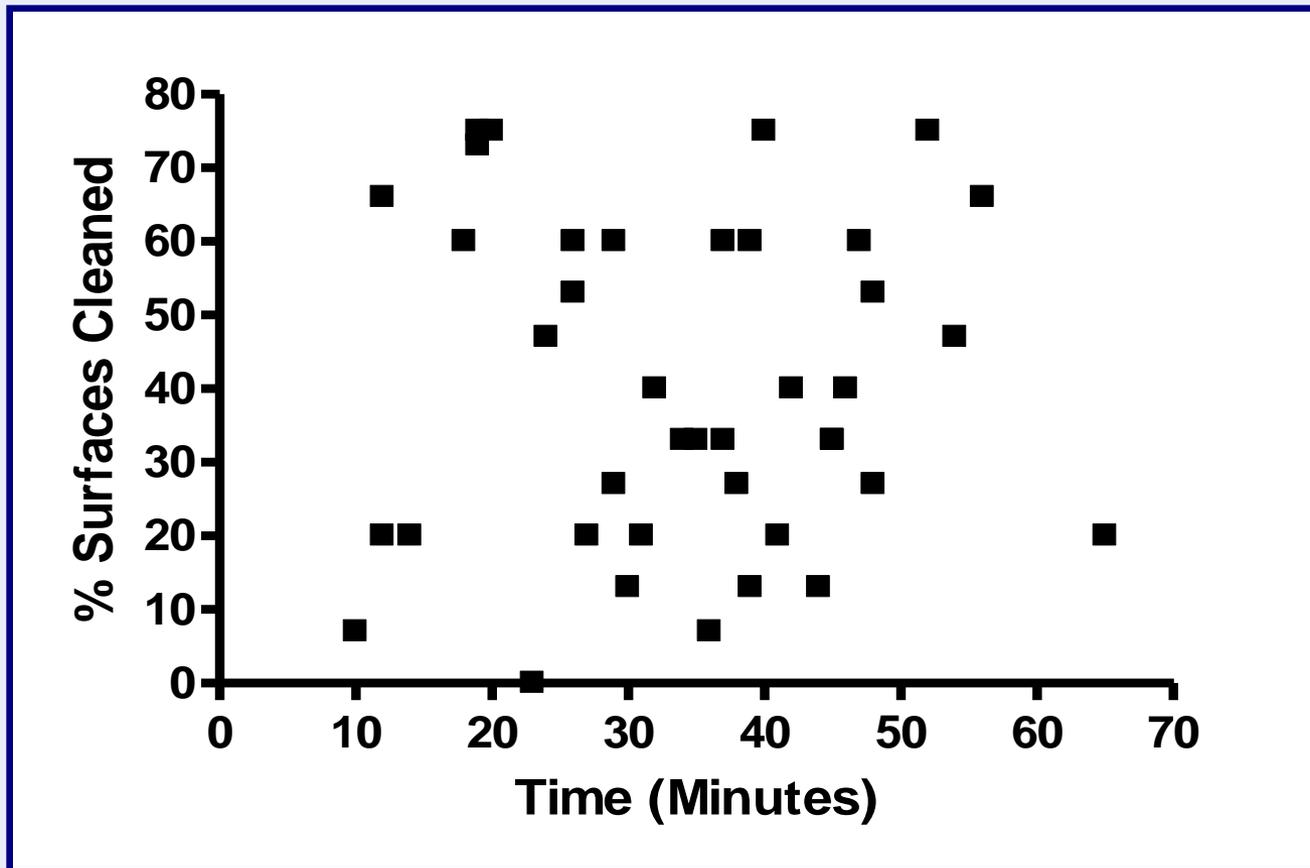
Hospitals Environmental Hygiene Study Group 36 Hospital Results



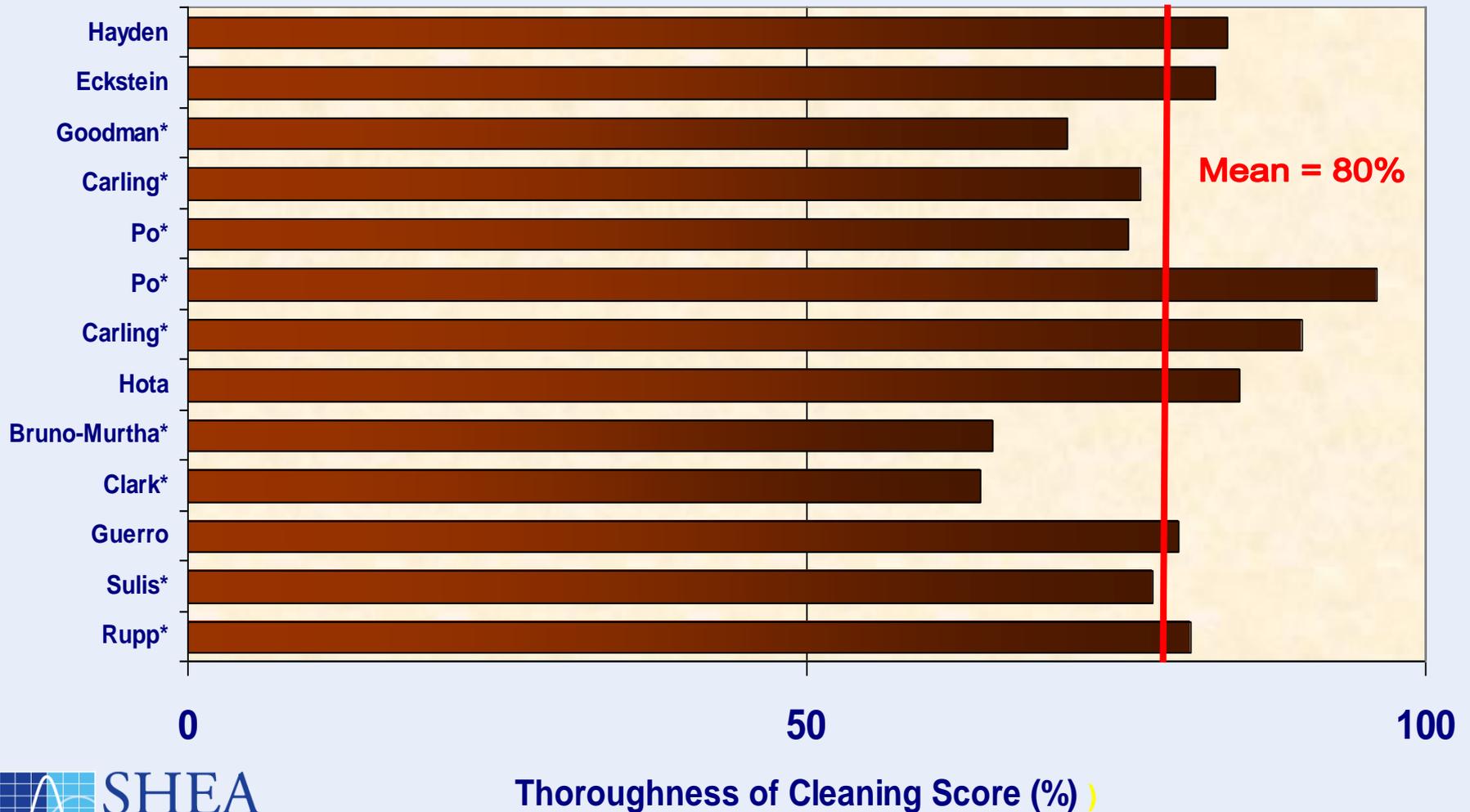
Resource Neutral

P = <.0001

Is it a surprise that this degree of improvement was resource neutral ??



Disinfection cleaning can be programmatically improved - 13 studies as of January 2011



Increased risk of prior room occupant transmission

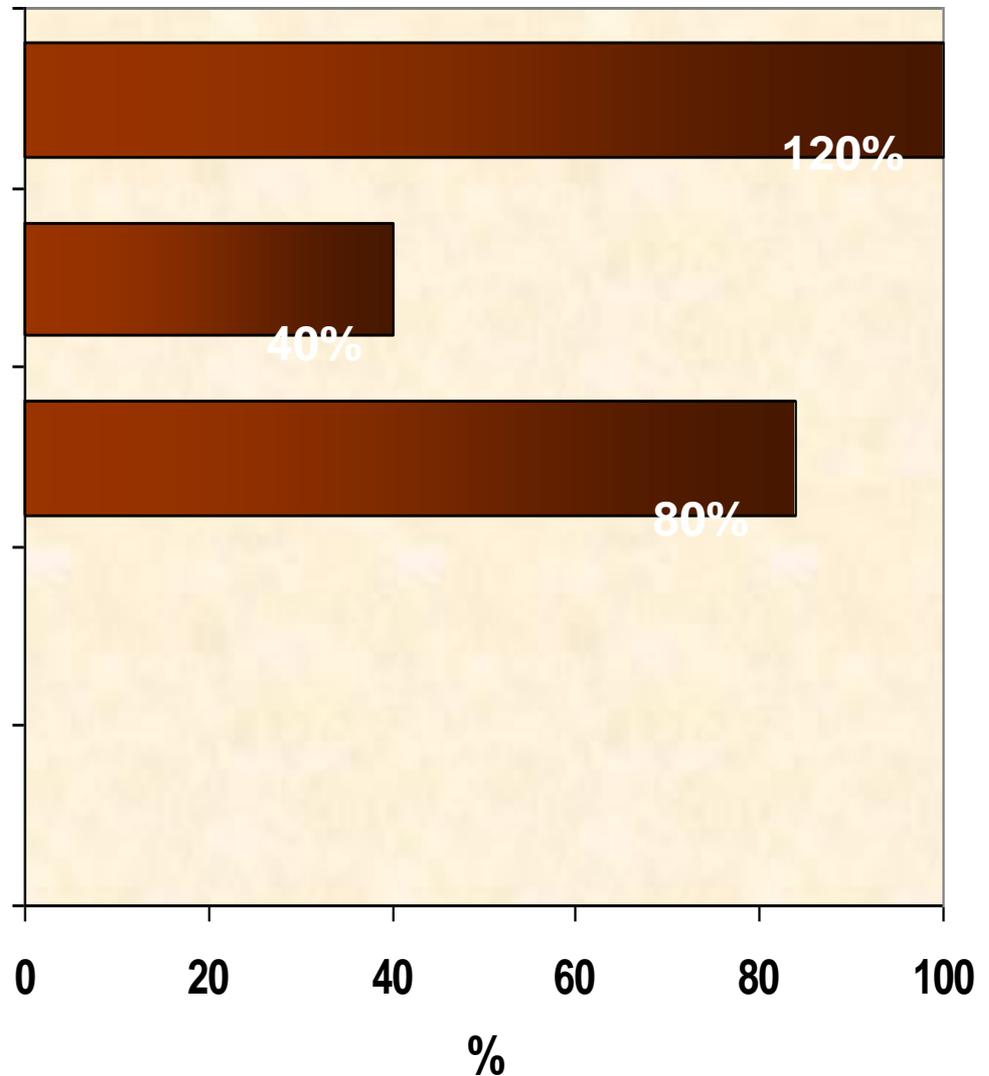
120%

Baseline Thoroughness of Cleaning

40%

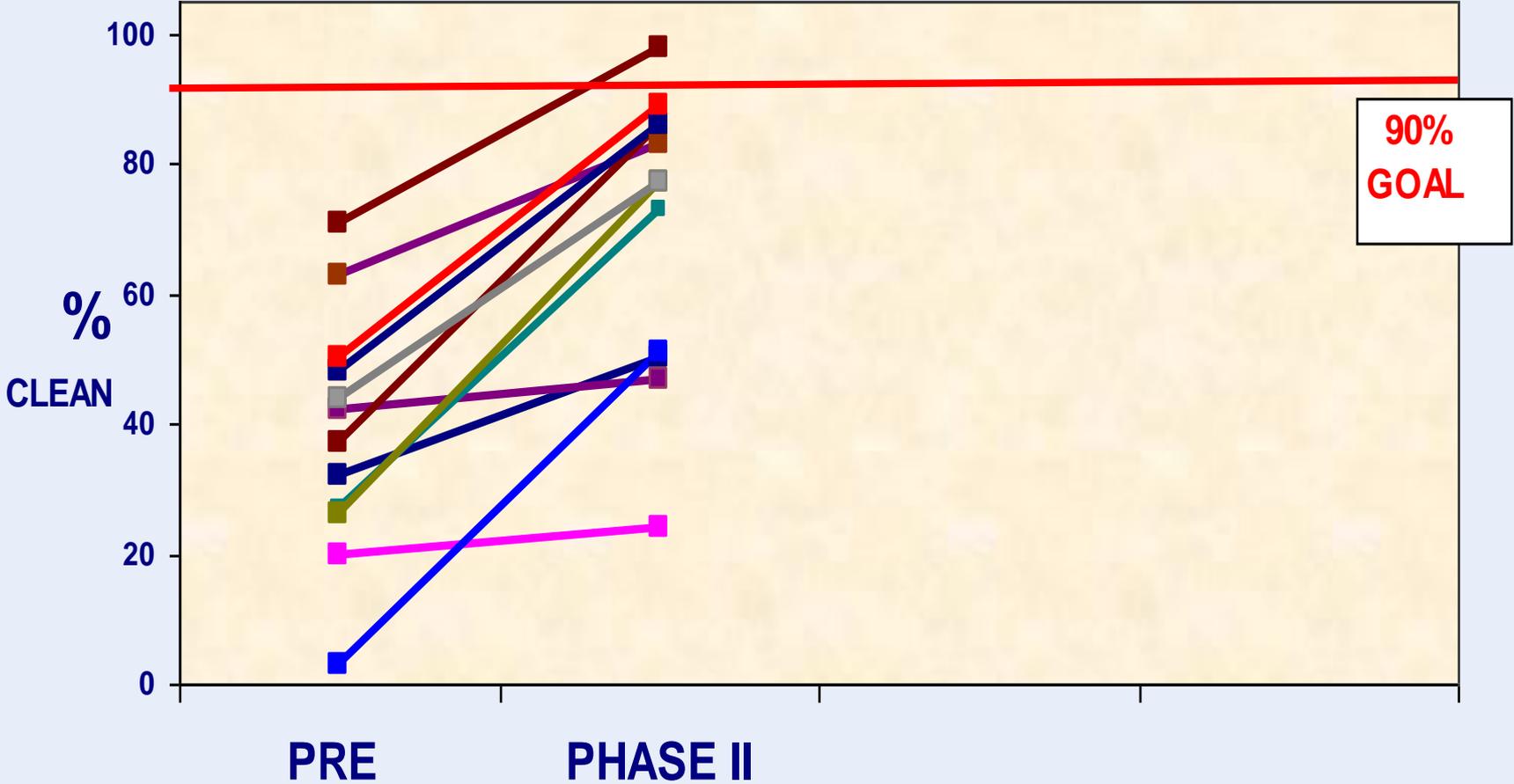
Thoroughness of cleaning following structured interventions

80%

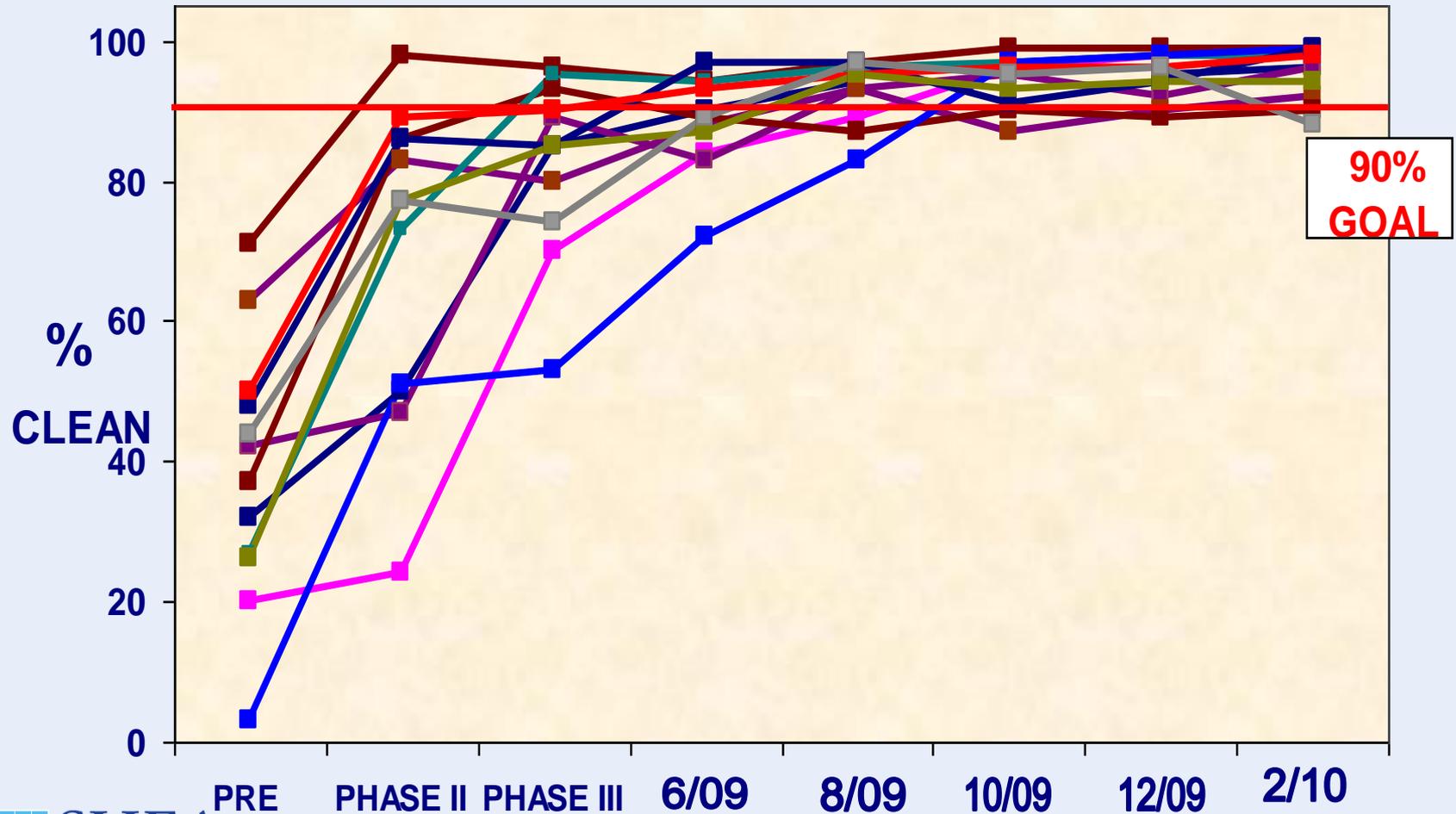


Are such results sustainable?

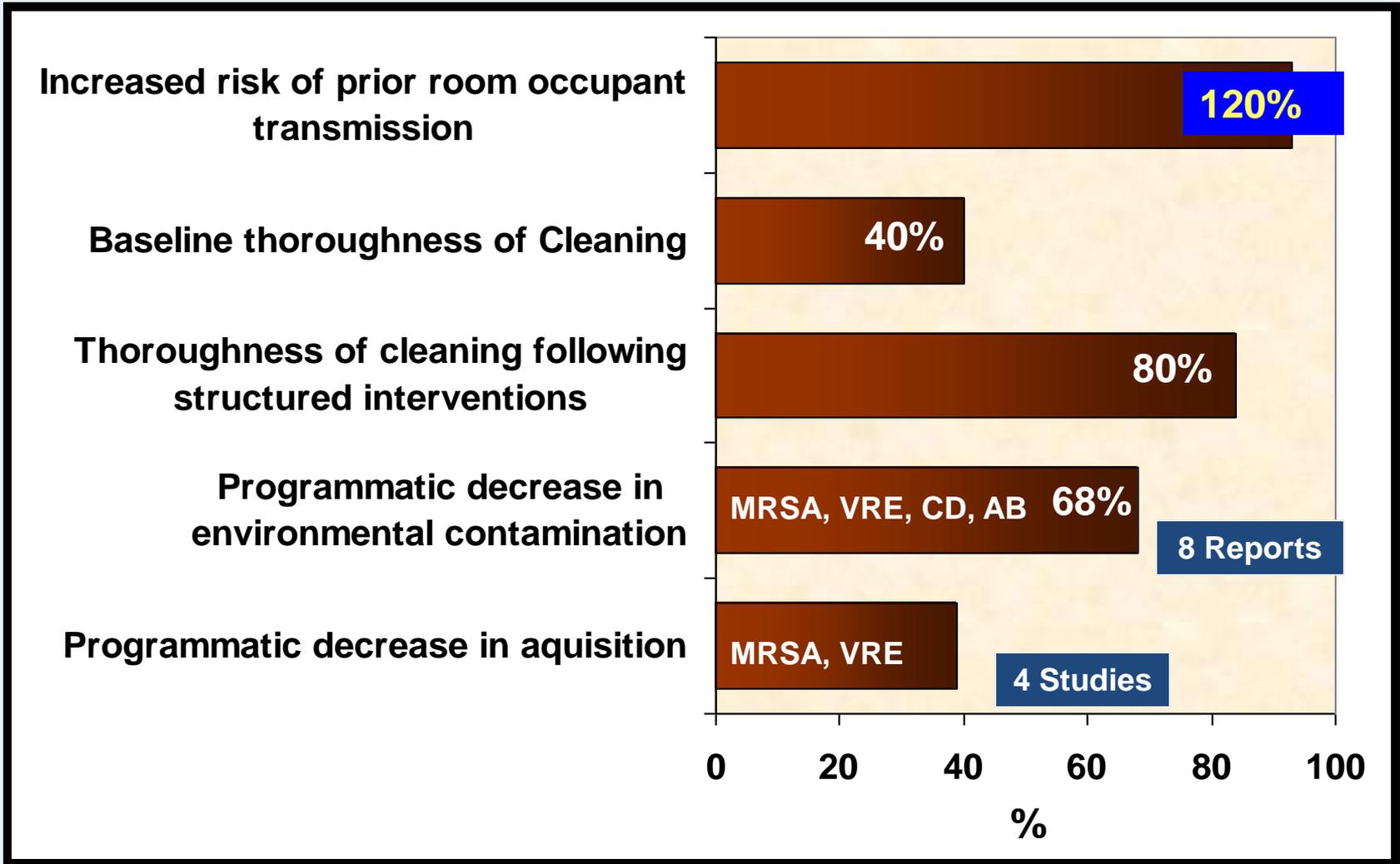
Kaiser Health Systems Southern California Hospital Group



Group Benchmarking



Improved thoroughness of hygienic cleaning is a worthy goal given the billions of dollars involved...but will it impact transmission of HAPs ?



Moving beyond Conventional Monitoring of health care environmental cleaning

Approaches to Programmatic Environmental Cleaning Monitoring

Conventional Program

- Subjective visual assessment
- Deficiency oriented
- Episodic evaluation
- Problem detection feedback
- Open definition of correctable interventions

Enhanced Program

- Objective quantitative assessment
- Performance oriented
- Ongoing cyclic monitoring
- Objective performance feedback
- Goal oriented structured Process Improvement model

Approaches to Programmatic Environmental Cleaning Monitoring

Conventional Program Advantages

An established model

Enhanced Program Advantages

- Direct evaluation of practice
- Uses a standardized, consistent, objective and uniform system of monitoring
- Provides regular and ongoing performance results to ES staff
- Facilitates the monitoring of many data points to optimize performance analysis
- Provides positive practice based feedback to ES staff
- Allows for objective remedial interventions
- Easily adaptable to existing PI modalities
- Facilitates compliance with JCAHO standards
- Facilitates compliance with CMS CoP
- Intrinsic internal benchmarking
- External benchmarking, reporting and recognition feasible

Approaches to Programmatic Environmental Cleaning Monitoring

Conventional Program Limitations

- Inability to evaluate actual practice
- Based only on negative outcome analysis
- Limited generalizability of findings
- Poor specificity and low sensitivity
- Subjectivity with a high potential for observer bias
- Poor programmatic specificity
- Potential for observer bias
- Only evaluates daily HP
- Limited ability to support JCAHO standard EC.04.01.03.EP2
- Limited ability to demonstrate compliance with CMS CoP 482.42
- Benchmarking not feasible

Enhanced Program Limitations

- Requires a new program implementation
- Ongoing administrative support critical to success
- Potential resistance to objective monitoring and reporting
- While useful, the covert baseline evaluation may be difficult to implement effectively

Monitoring tool considerations

Systems for Evaluating Healthcare Environmental Hygiene

Evaluating Patient Zone Environmental Cleaning

Method	Ease of Use	Identifies Pathogens	Useful for Individual Teaching	Directly Evaluates Cleaning	Published Use in Programmatic Improvement
Covert Practice Observation	Low	No	Yes	Yes	1 Hospital
Swab cultures	High	Yes	Not Studied	Potentially	1 Hospital
Agar slide cultures					
Fluorescent gel					
ATP system					

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ATP Bioluminescence Testing in Healthcare Settings

Potential usefulness:

Has been used as a surrogate for environmental culturing

Evaluates cleanliness

Can rapidly define how clean an object is....
but non-microbial ATP is also evaluated

Standards to optimize predictive values are still being evaluated

Can be used to do one-on-one education of ES staff

ATP Bioluminescence Testing in Healthcare Settings

Potential limitations:

Secondary cleaning of the site is required to remove disinfectant induced signal decay or enhancement.

Involvement of the ES staff is implicit since evaluation must be done within minutes of cleaning.

Pre-intervention evaluation of disinfection cleaning is difficult without inducing a Hawthorne effect

Results are individual ES staff / time specific.

Many manufacturers of luminometers and ATP swabs makes interinstitutional standardization difficult

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Fluorescent gel	High	No	Yes	Yes	49 Hospitals
ATP system	High	No	Yes	Potentially	2 Hospitals

Surface Disinfection – CMS Citation

Exposure Time

- CMS surveyors (CA) have been paying closer attention to cleaning the environment, including a determination if hospitals are following manufacturers' directions for disinfectant contact time
- Hospitals cited for using shorter contact time than manufacturers' directions
- Appealed based on published peer-reviewed literature supporting shorter exposure times
- Appeal denied

Surface Disinfection – CMS Citation

Exposure Time

- Multiple scientific studies have demonstrated the efficacy of hospital disinfectants against pathogens causing HAIs with contact time of one minute
- Environmental Services staff can achieve contact times of ten minutes by reapplying the disinfectant 5-6 times to the surface as the typical dry time is 1.5-2 minutes
- Equally important as contact time is the application of the disinfectant to the surface or equipment to ensure all contaminated surfaces are wiped
- No data that has demonstrated improved infection prevention by ten minute contact time vs. one minute contact time

What about new technologies?



They all:

- Have similarities and differences that are difficult to compare;
- Claim to effectively kill many log¹⁰ bacteria (C. diff not as well or more slowly);
- Claim to be less damaging to surfaces than bleach as if bleach was the only thing that kills C. diff spores;
- Are expensive both directly and indirectly;
- As of today they have limited, if any, defined applicability in general healthcare settings;

When in darkness so deep I move with an especially slow foot.

Remember:

While surface cleaning in the patient zone is important, we really don't know:

How important which disinfectant is;

How much better microfibre is than traditional cloth for surface cleaning;

When to use bleach and when not to;

When technological interventions should be considered

Decontamination with UVC

Disadvantages:

- Do not know if use decreases the incidence of HAIs
- Only done at terminal disinfection (i.e., not daily cleaning)
- All patients and staff must be removed from the room/area
- Capital equipment costs are substantial
- Does not remove dust and stains which are important to patients/visitors
- Sensitive use parameters (e.g., UV dose delivered)

Rutala W, 2010

Now is the time to carefully evaluate the role of product and technology in the clinical setting

Old assumptions and new claims of effectiveness of all tools, chemicals and technological interventions **must:**

be quantitatively evaluated clinically while objectively analyzing the thoroughness of cleaning practice

Conclusions

- It is very likely that surfaces in the Patient Zone are highly relevant in the transmission of Healthcare Associated Pathogens.
- While optimizing hand hygiene and isolation practice is clearly important there is no reason why the effectiveness and thoroughness of environmental hygienic cleaning should not also be optimized, particularly since such an intervention can be essentially resource neutral.