You are connected to the WCLN Webinar *"Benefits of Microbial Burden Management"*

We will begin the webinar

at 12:00 noon

Wisconsin State Laboratory of Hygiene
UNIVERSITY OF WISCONSIN–MADISON

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Continuous control of microbial burden in clinical environments fosters patient safety through reductions in healthcare associated infections

Michael G. Schmidt, Ph.D.
Professor, Microbiology and Immunology
Medical University of South Carolina

Abstract

- National health-service providers, private health insurers, and healthcare practitioners have each called for increased practices that foster patient safety.
- Healthcare associated infections (HAI) represent one of the most significant risks to patient safety, occurring at an alarmingly high rate of 1 per 25 hospitalizations in the US.
- Components fabricated from solid copper alloys have an ability to continuously control the concentration of microbes *in situ* at levels recommended subsequent to terminal cleaning (<250 cfu/100cm^2).
- In one clinical trial, limited placement of copper surfaces was shown to mitigate the rate of HAI acquisition through a reduction to environmental burden.
- The HAI rate was significantly lower in rooms with copper surfaces (11.8 to 4.8 per 1,000 patient days (p= 0.013)). Here we report on the *in situ* evaluation of copper surfaces within an ambulatory-surgical care center.
- Results
  - Thirteen different objects were evaluated over 500 days.
  - Objects fabricated using copper alloys were found to harbor significantly lower concentrations of bacteria than control facsimiles (p<0.0001).
  - The median burden associated with the copper objects was below the limit of detection.
- These results represent the first evaluation of copper alloy surfaces in a setting of ambulatory-surgical care
- Support previous observations that copper alloys continuously control the concentration of bacteria within built clinical environments.
- Collectively these data serve to advance the conclusion that an application of copper touch surfaces throughout healthcare can enhance infection control efforts augmenting patient safety.

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Disclosures

1. ***Some of the work described here was supported by the US Army Medical Research and Materiel Command under Contract No. W81XWH-07-C-0053. The views, opinions and/or findings presented here are those of the author(s) and should not be construed as an official US Department of the Army position***
2. ***Unrestricted research grant from Olin Brass to evaluate the antimicrobial effectiveness of CuVerro™ Products***
3. ***Unrestricted research grant from Ministry of Health of the Republic of Chile by investment funds for refurbishing the Intensive Care Unit of the Roberto del Río Hospital and the Corporación Nacional del Cobre de Chile (CODELCO) administered through DUAM S.A***

Michael G. Schmidt, Ph.D.

Professor of Microbiology and Immunology, Medical University of South Carolina

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Continuous control of microbial burden in clinical environments fosters patient safety through reductions in healthcare associated infections

Learning Objectives

1. Understand the linkage between the intrinsic burden of the built clinical environment and Healthcare Associated Infections (HAI)
2. Review the opportunity that burden management of the built environment affords healthcare resulting in improvements to patient outcomes and satisfaction.
3. Evaluate the clinical opportunity afforded by interventions for limiting HAI
4. ***E***valuate the cost effectiveness of burden management in mitigating HAI acquisition rates

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Professor of Microbiology and Immunology, Medical University of South Carolina

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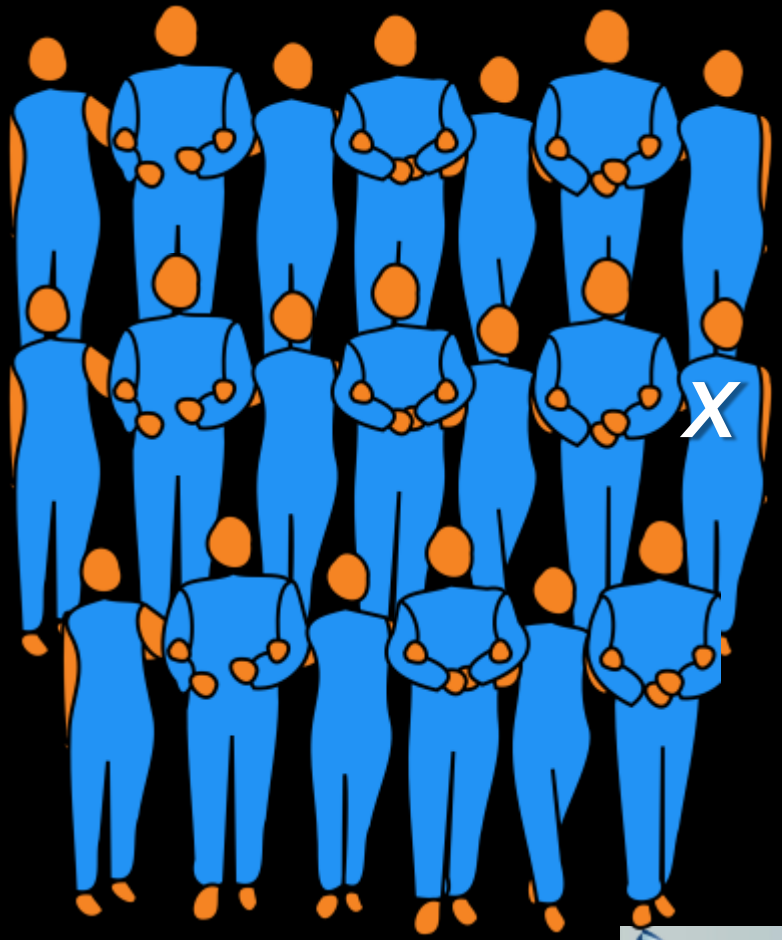
If one full wide bodied jet was lost each day would anyone fly?

In the United States

1 : 25 Contract an infection



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HAI > HIV AIDS + Breast Cancer

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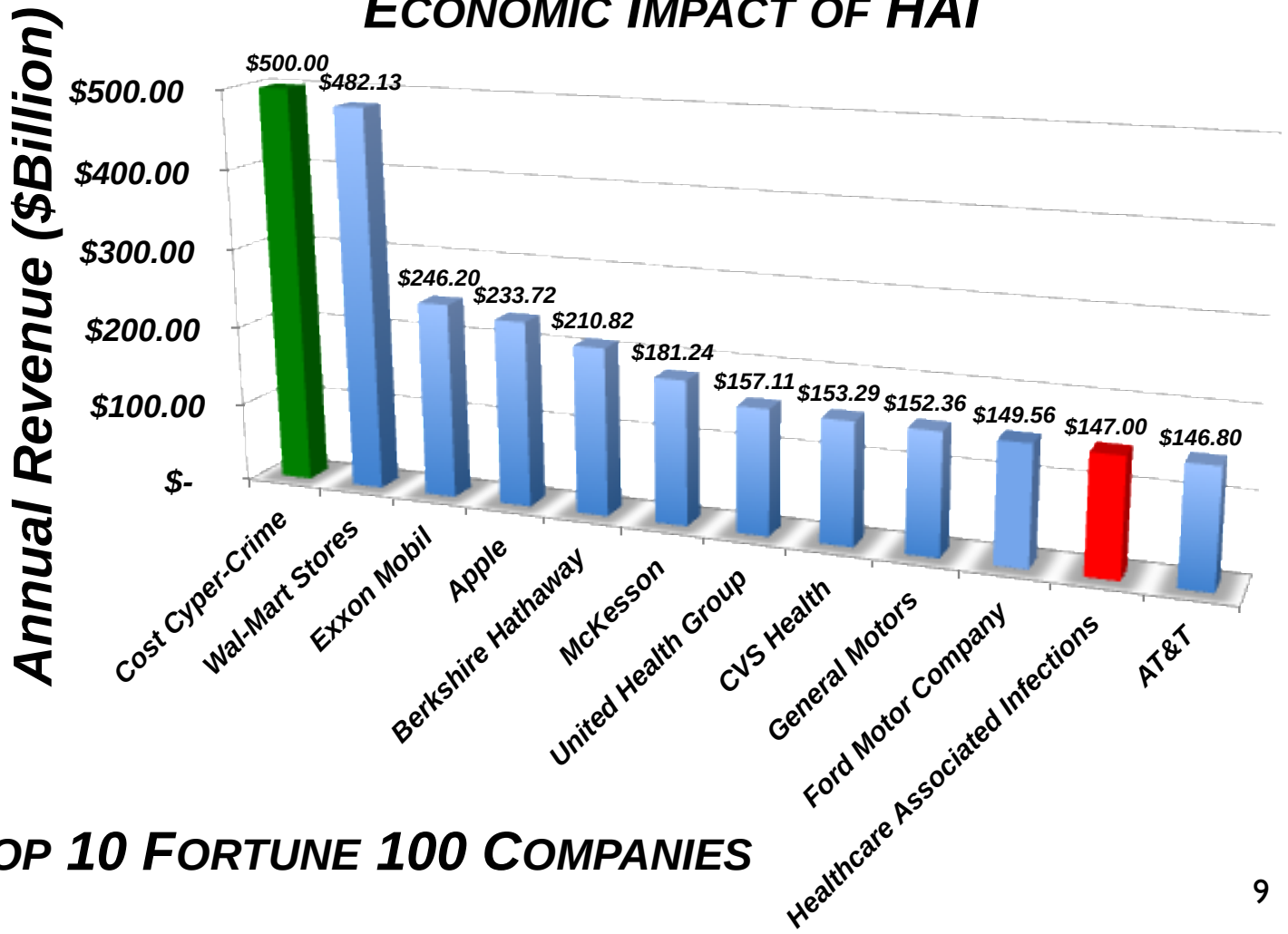
Accounts for an additional ~$147 Billion in health care costs in the United States

Economic Impact of HAI



Top 10 Fortune 100 Companies

Cleaner environment

>90% Reduction

Lower RISK of infection

Fewer infections

> 50 % Reduction

Better outcomes & lower costs

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Solutions for Clean Hospital Environments

- Hand Hygiene

- Chemical cleaners & disinfectants

- Extended Cleaning with Robots
  - Ultraviolet
  - Hydrogen Peroxide

- **Inherently bactericidal surfaces**

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Daily Cleaning

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Daily Cleaning

Terminal Cleaning

Frequency, on average once every 5th day

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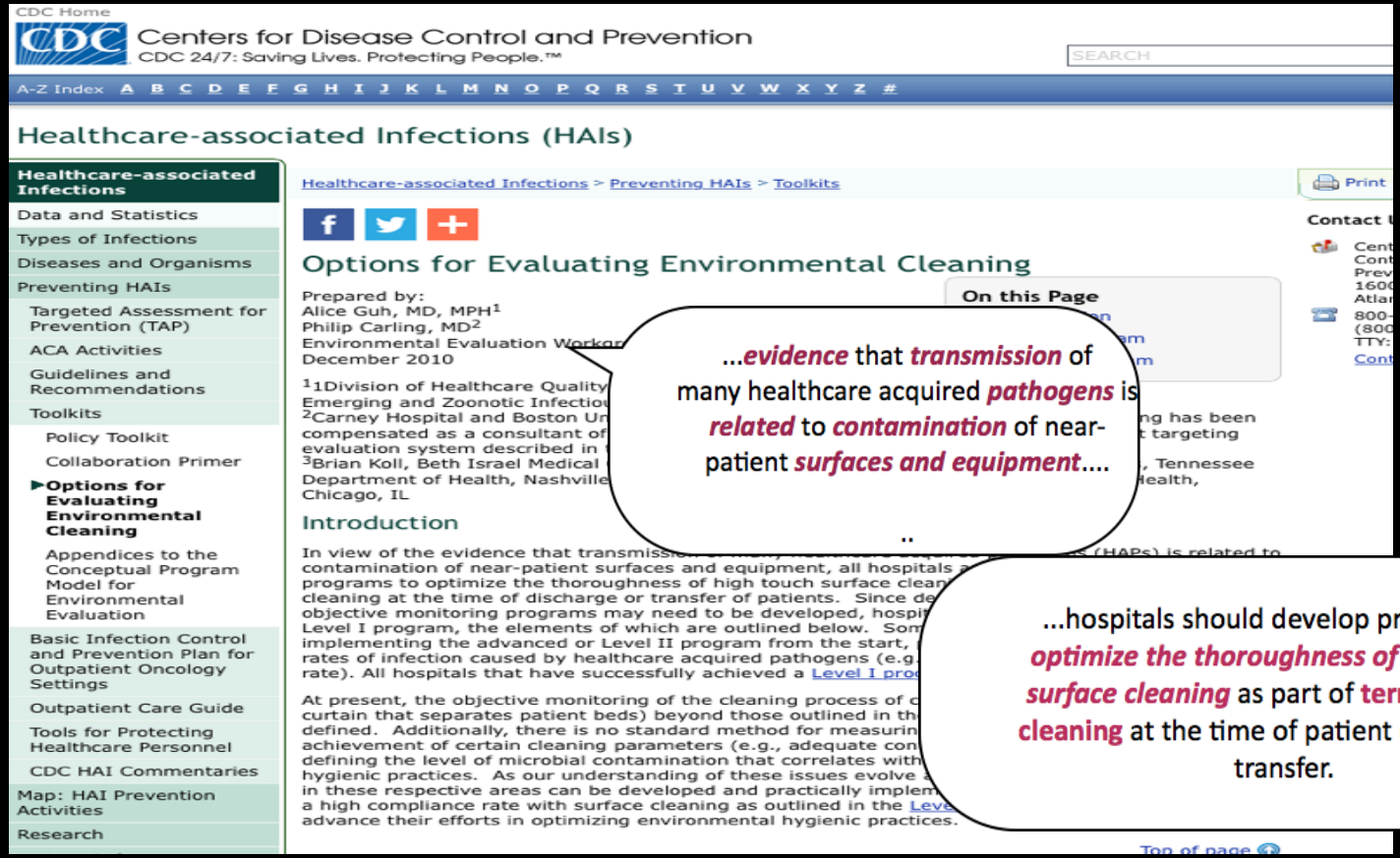
When We Clean



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How Well We Clean?

TABLE. Comparison of Rates of Cleaning for 14 Types of High-Risk Object (HRO) in 36 Acute Care Hospitals, Before and After Intervention

High Risk Objects (HRO)

Type of HRO	Mean % of HROs cleaned (range)	95% CI	Mean % of HROs cleaned	
Sink	79 (38–97)	72.4–84		
Tray table	74 (35–100)			
Toilet seat	71 (3–100)			
Flush handle				80.1–90.7
Side rail			00)	73.9–88.6
Bedside tab			76 (29–100)	68.5–83.7
Call b		80.8	81 (38–100)	73.9–87.5
Chair		42.4–62.8	78 (33–100)	70.5–85
Telepho		43.3–55	78 (20–100)	72.4–83.6
Bathroo	29 (0–82)	22.1–36.2	71 (19–95)	64.1–78.1
Bathroon	28 (0–90)	20.9–35.8	74 (15–100)	66.1–81.6
Bathroom light switch	25 (0–84)	17.1–33.1	64 (8–100)	55.9–72.9
Room door knobs	22 (0–73)	15.9–28.4	66 (25–100)	59.7–73.2
Bedpan cleaner	22 (0–79)	15.9–28.3	62 (0–100)	51.7–71.4

NOTE. All *P* values are <.001; CI, confidence interval.

48% of surfaces are not clean after terminal cleaning.

http://journals.cambridge.org/abstract_S0195941700027077

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Microbes Ubiquitously Attach Biofilms are the Consequence

Microbes Ubiquitously Attach
Biofilms are the Consequence

Even the 'Safe objects' are not Immune !

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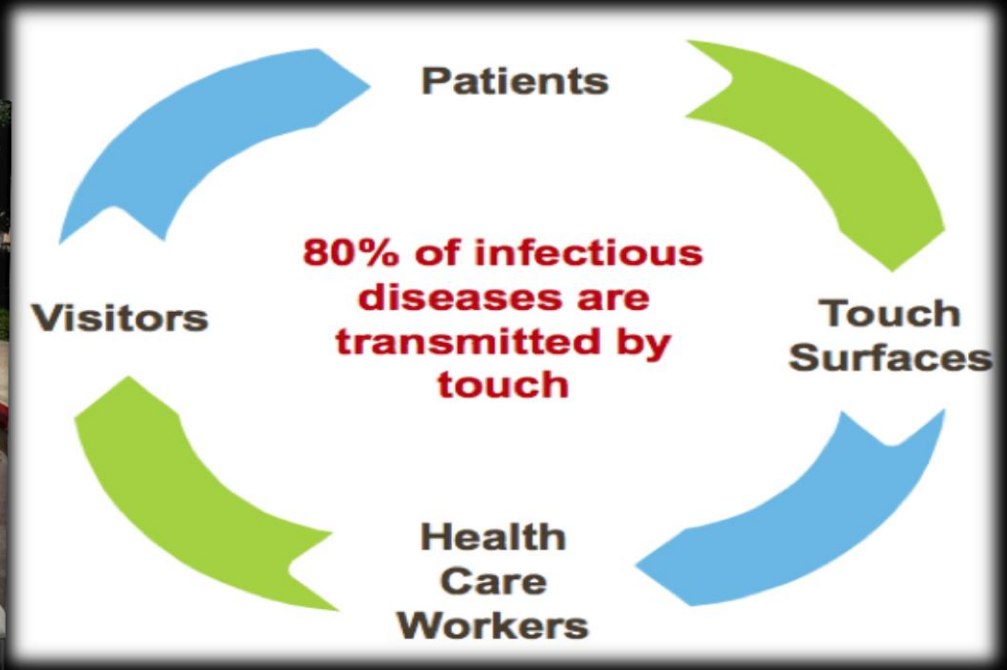
Consider The Path of Microbes



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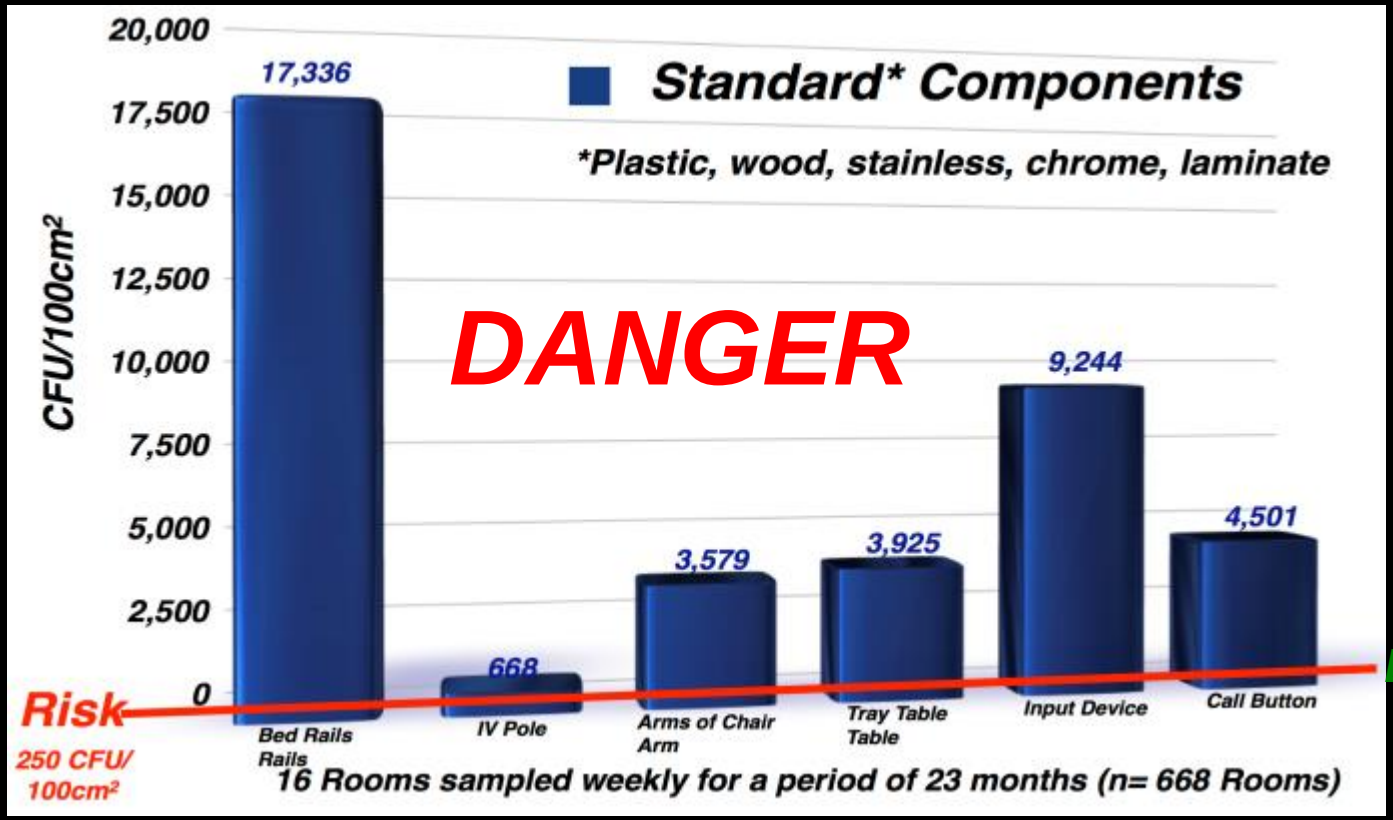
When we look, the risk is omnipresent!

Risk is omnipresent, despite cleaning



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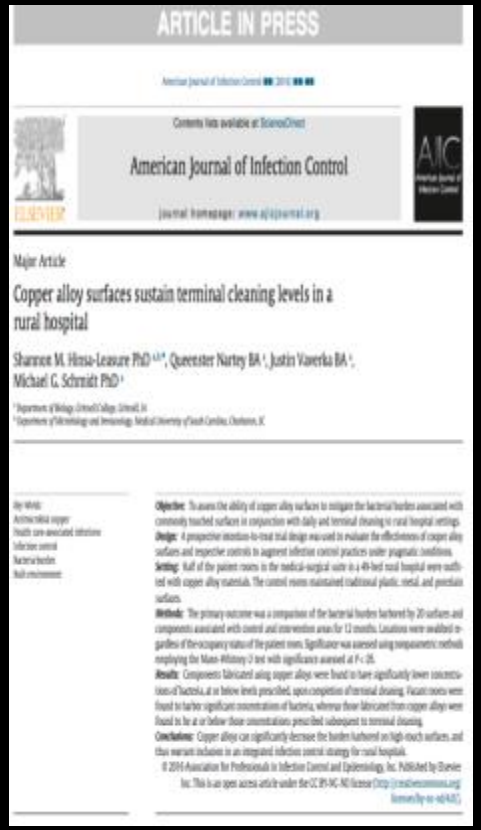
Risk is Clustered



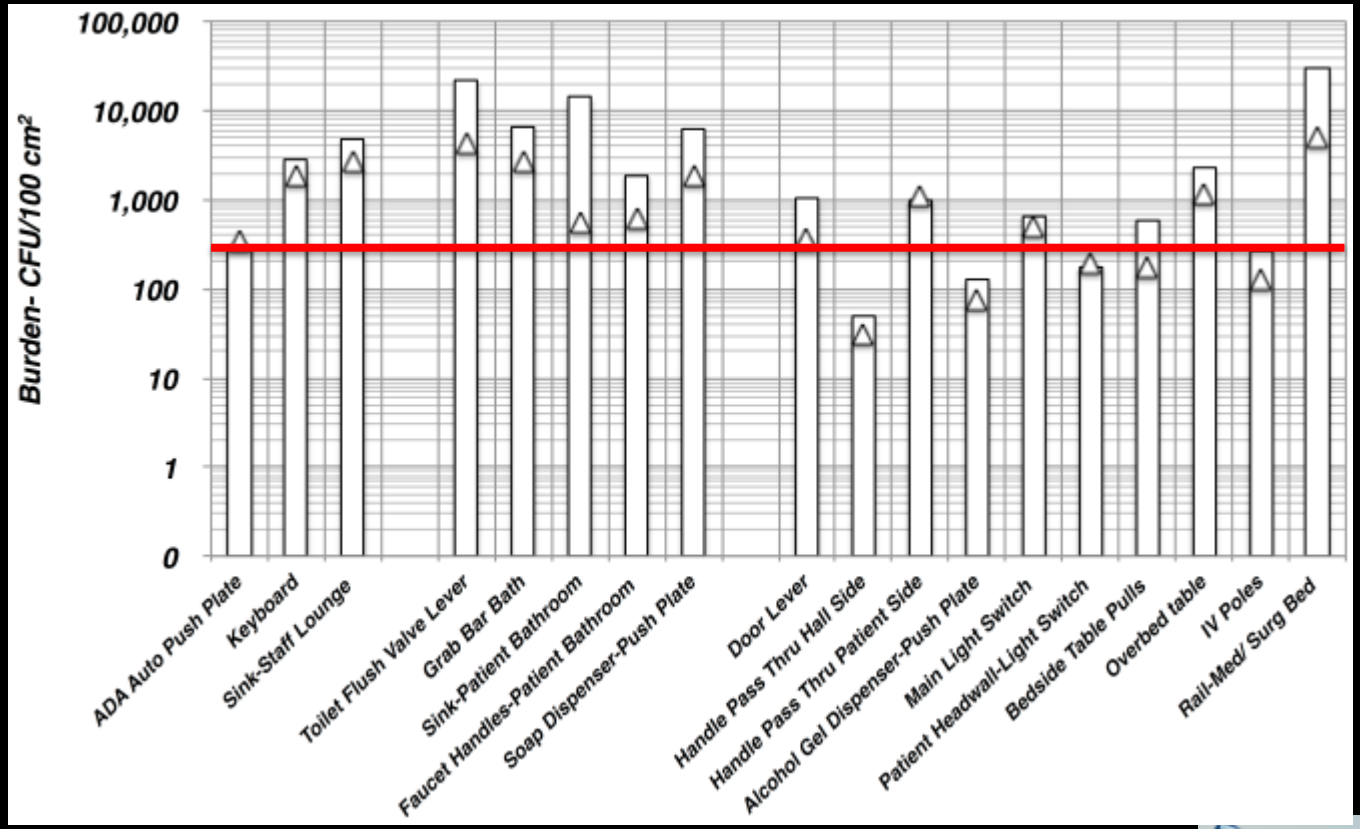
ARTICLE IN PRESS

American Journal of Infection Control

Major Article

Copper alloy surfaces sustain terminal cleaning levels in a rural hospital

Shannon M. Hinsa-Leasure PhD [a,b,*], Queester Nartey BA [a], Justin Vaverka BA [a], Michael G. Schmidt PhD [a]



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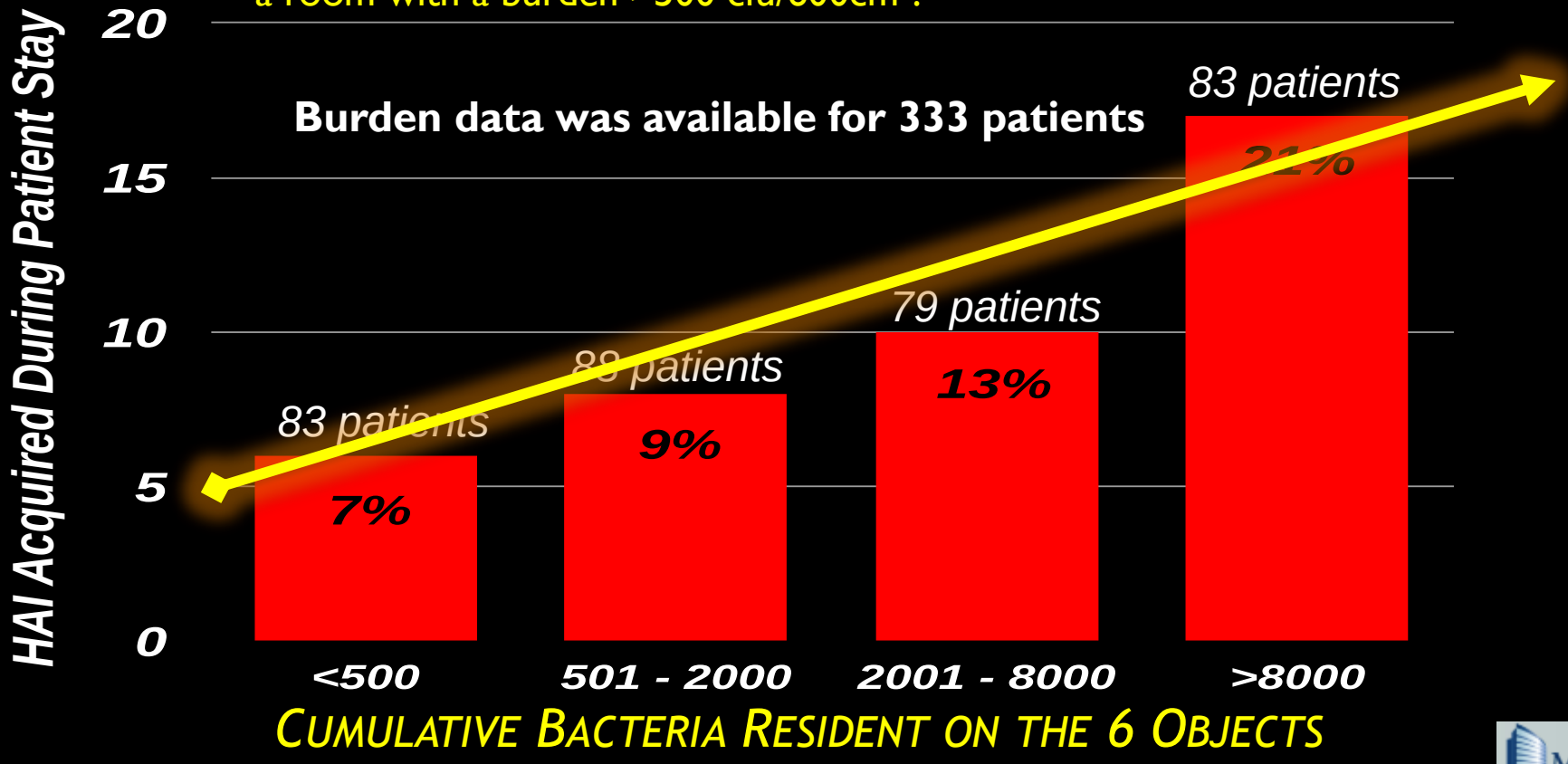
Burden Matters! There was a significant association between burden and HAI risk (p=0.038) with 89% of HAI occurring among patients cared for in a room with a burden >500 cfu/600cm^2.



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An Opportunity Afforded by Antimicrobial Copper to Health Care

Part 2

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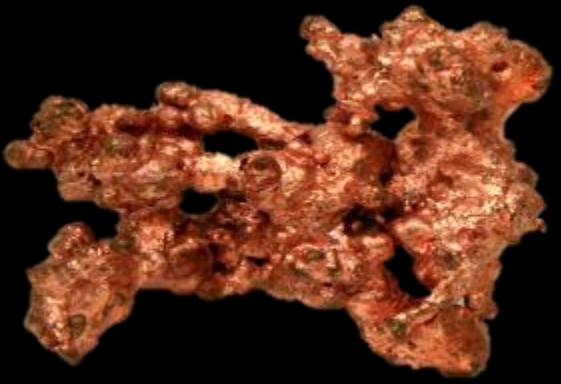
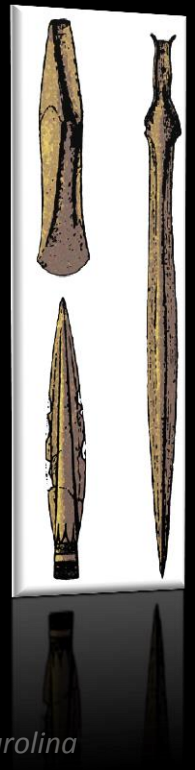
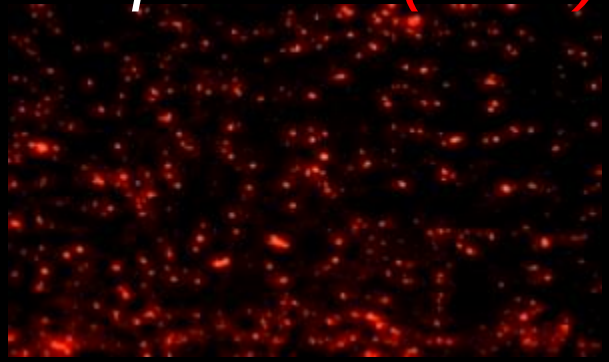
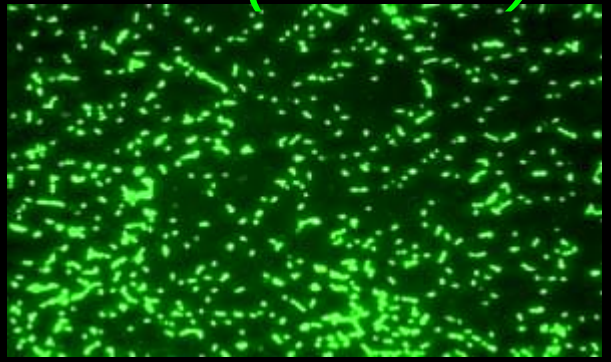
HUMANS HAVE BENEFITED FROM COPPER SINCE ANCIENT TIMES



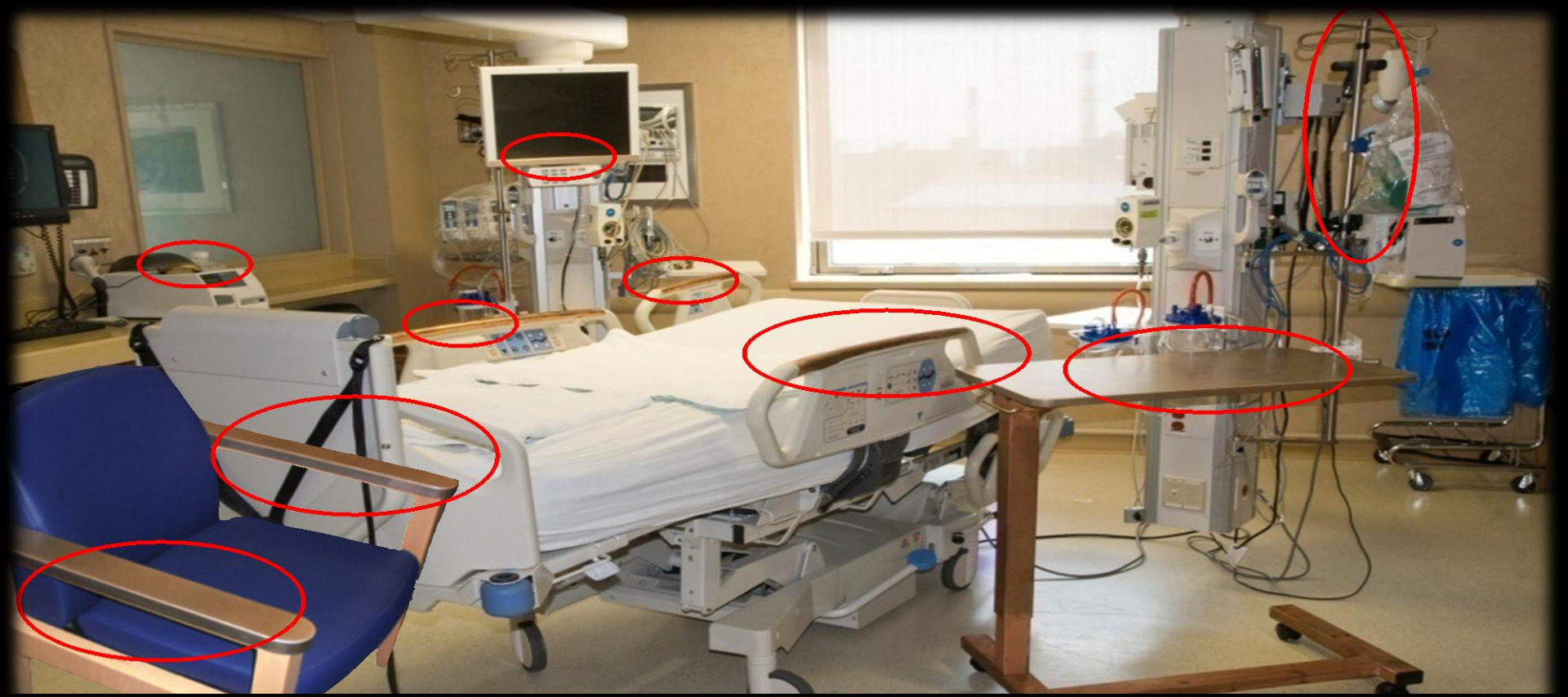


But then… Humans appreciated that Copper Had Remarkable, Antimicrobial, Properties

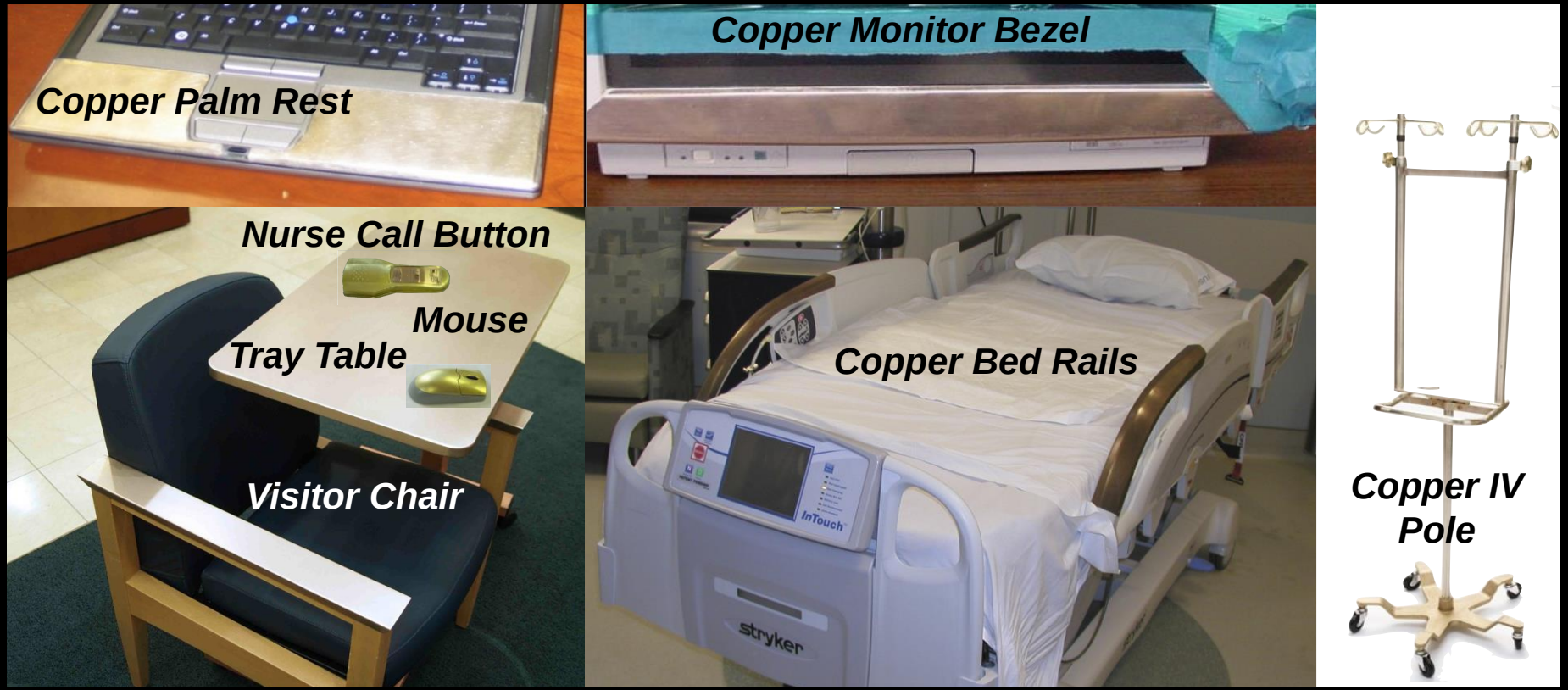
Contact with copper results in rapid death from multi-component mechanism

	Respiration (CTC)	DNA (SYTO9)
Stainless Steel 4 hours		
Copper 10 minutes	Collapsed membrane potential →	Destruction of nucleic acid as a consequence of free radical production

Clinical Opportunity Copper Affords Healthcare Part 3



Our opportunity as Reality



Our opportunity as Reality

Commercially Available Healthcare Products from Copper Alloys.

Commercially Available Healthcare Products from Copper Alloys.

Does it Improve Cleanliness?

Burden Significantly Lower with Copper

16 rooms sampled weekly for a period of 21 months, n=1012

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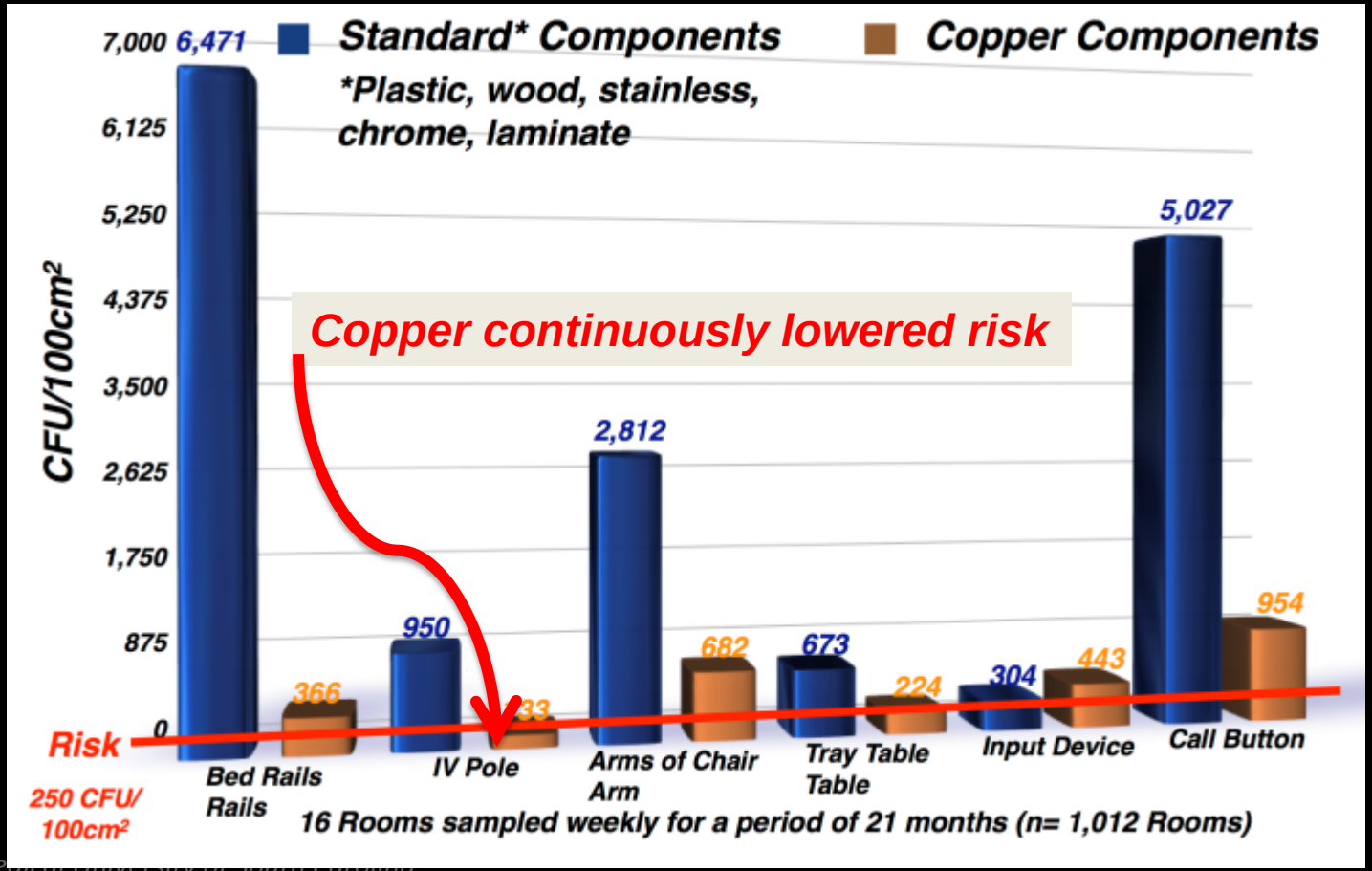
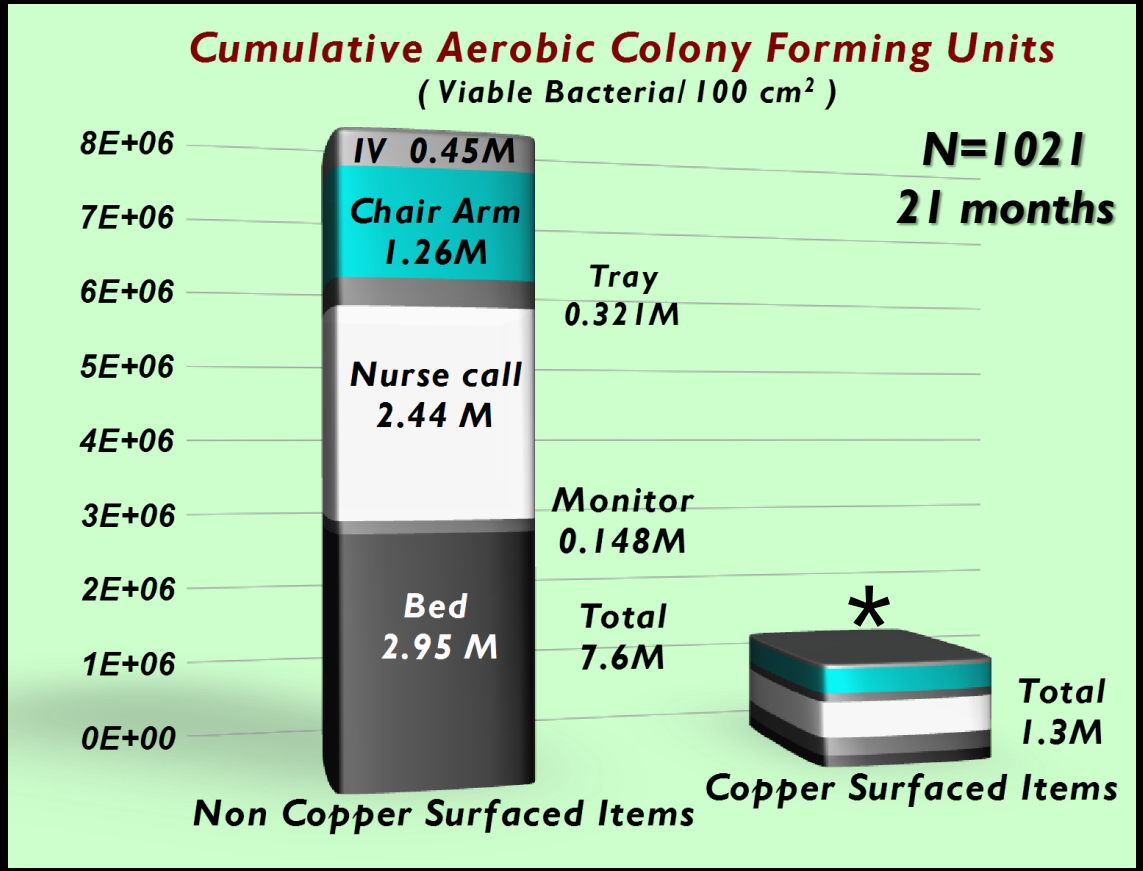
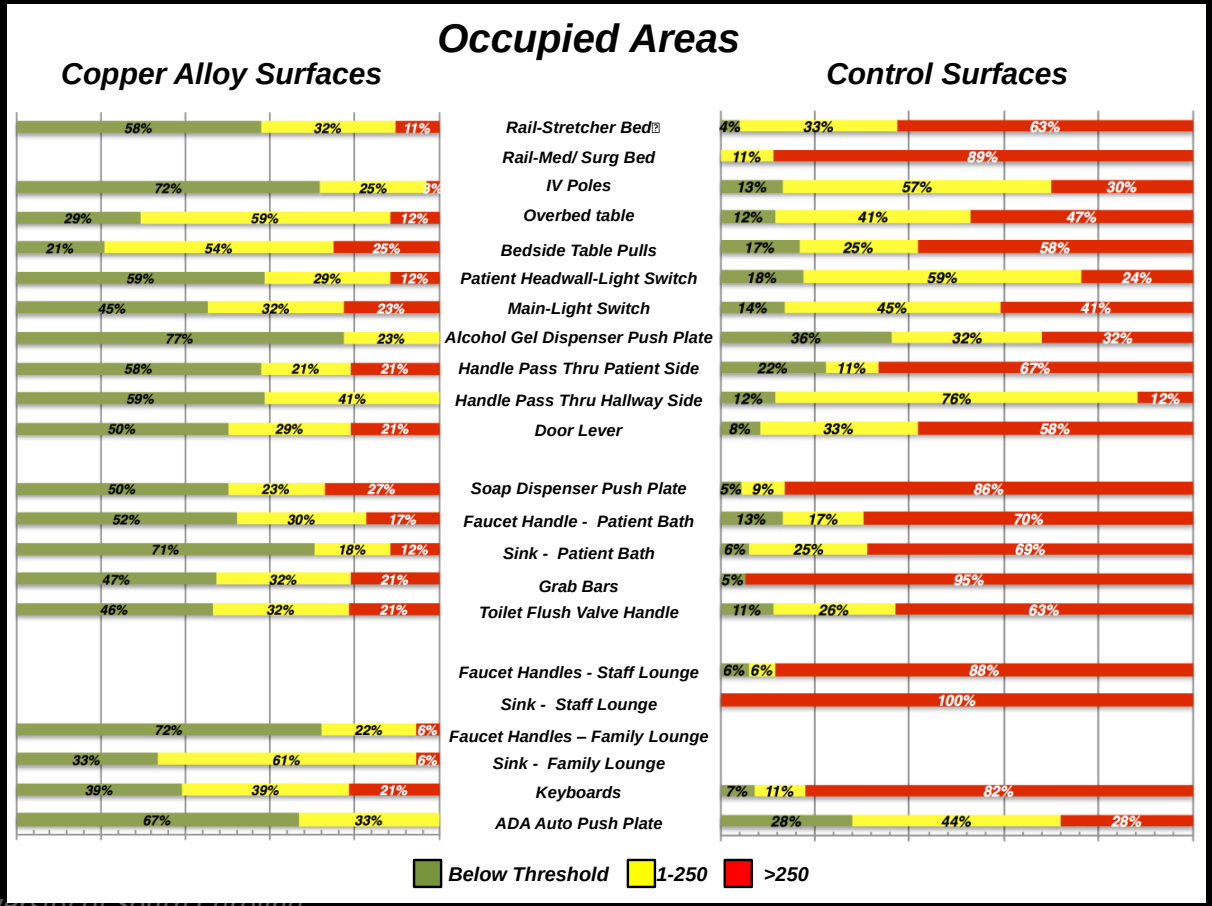
Risk was Significantly Lower with Copper



Risk was Consistently Lower with Copper



Copper Minimizes Risk



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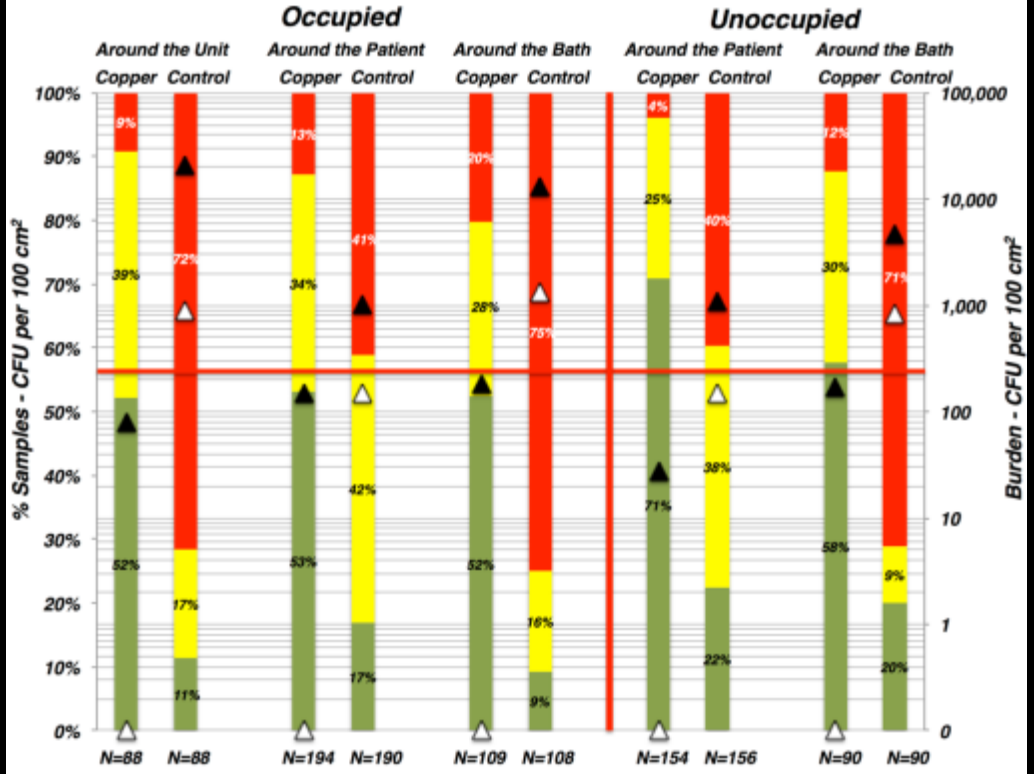

- *Components fabricated from solid copper alloys are consistently able to limit the concentration of microbes on commonly touched surfaces within occupied and unoccupied patient rooms at levels prescribed subsequent to terminal cleaning (<250 cfu/100cm²)*
- *Unoccupied rooms harbor significant concentrations of microbes subsequent to terminal cleaning*
- ▲ *Average Burden Observed* △ *Median Burden Observed*

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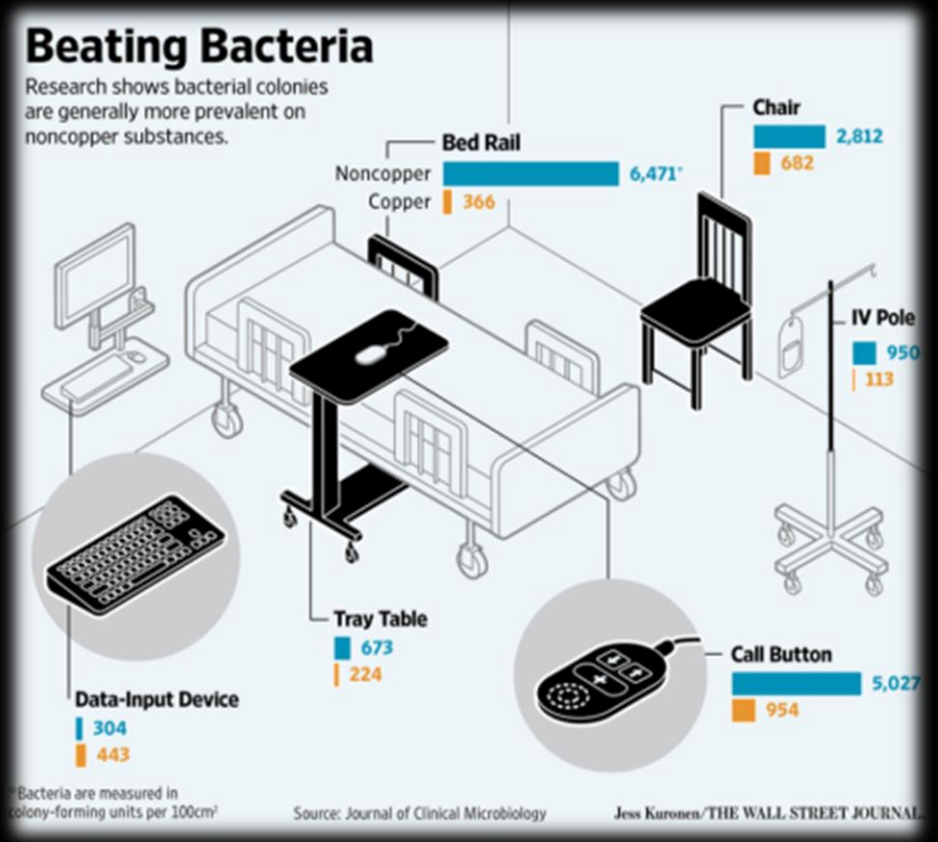
Does it Improve Cleanliness?

YES, in a hospital Setting

What about in Out Patient Surgery Centers?



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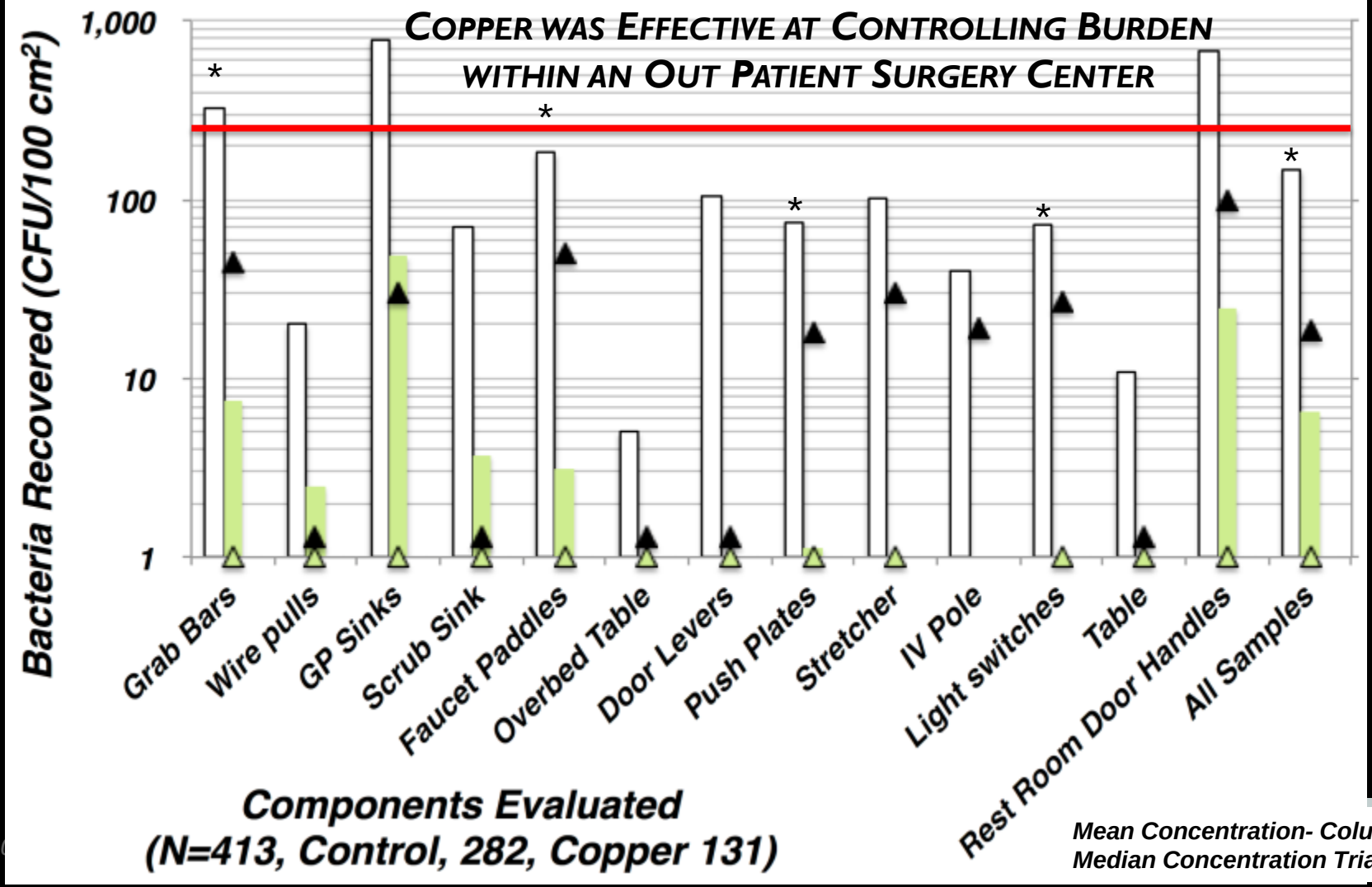
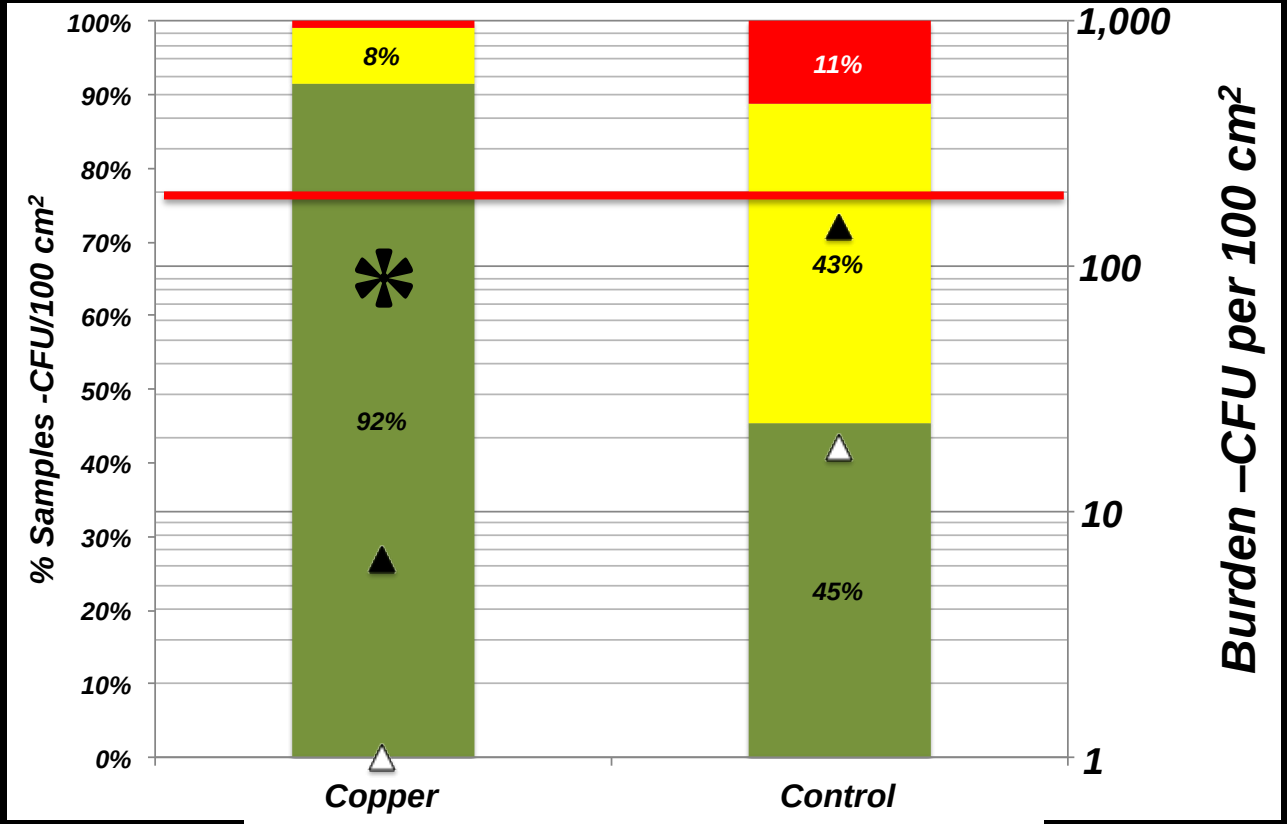

COPPER WAS EFFECTIVE AT CONTROLLING BURDEN WITHIN AN OUT PATIENT SURGERY CENTER
Bacteria Recovered (CFU/100 cm²)
1,000
100
10
1
*
*
*
*
*
Grab Bars
Wire pulls
GP Sinks
Scrub Sink
Faucet Paddles
Overbed Table
Door Levers
Push Plates
Stretcher
IV Pole
Light switches
Table
Rest Room Door Handles
All Samples
Components Evaluated
(N=413, Control, 282, Copper 131)
Mean Concentration- Columns
Median Concentration Triangles

Copper was Effective at Controlling Burden within an Out Patient Surgery Center



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COULD SOMETHING SO SIMPLE LIKE THIS WORK?

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY MAY 2013, VOL. 34, NO. 5

ORIGINAL ARTICLE

Copper Surfaces Reduce the Rate of Healthcare-Acquired Infections in the Intensive Care Unit

Cassandra D. Salgado, MD;[1] Kent A. Sepkowitz, MD;[2] Joseph F. John, MD;[3] J Robert Cantey, MD;[1] Hubert H. Attaway, MS;[4] Katherine D. Freeman, DrPH;[5] Peter A. Sharpe, MBA;[6] Harold T. Michels, PhD;[7] Michael G. Schmidt, PhD[4]

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MEMORIAL SLOAN KETTERING CANCER CENTER
RALPH H JOHNSON VA MEDICAL CENTER
COPPER DEVELOPMENT ASSOCIATION

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Yes,
Copper Surfaces Significantly Reduced HAI

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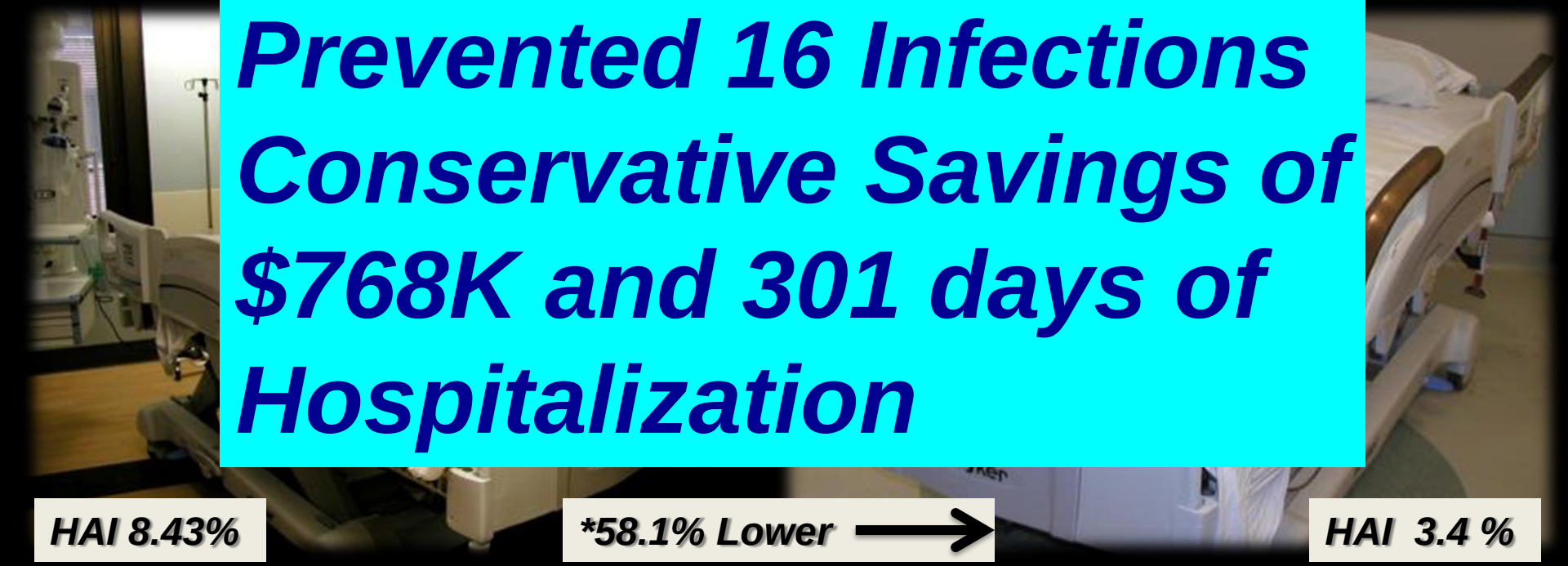
Copper Surfaces Significantly Reduced HAI



Prevented 16 Infections
Conservative Savings of $768K and 301 days of Hospitalization

HAI 8.43%

*58.1% Lower →

HAI 3.4 %

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-Conclusions-

Copper continuously complements cleaning controlling the bacterial burden within the built environment resulting in improved patient outcomes

Continuous Action of Copper

Placement of Copper Components facilitates the achievement of terminal Cleaning standards on a continuous basis

Part 4: What will it save?

Cost of Hospital-Acquired Infections

Cost of Intervention with Antimicrobial Copper Touch Surfaces

Costs of an HAI

AHA Statistics:

- 5,686 Registered Hospitals in U.S.
- 914,513 U.S. Hospital Beds.
- Average size hospital *=160 Beds*

CDC reports:

- 2,000,000 Healthcare Associated Infections (HAI's) per year.
- 100,000 Deaths per year from HAIs
- *~2 infections/bed* *~One person dies per 20 HAIs*

AHRQ Reports HAIs results in:

- Additional patient hospital stay of *19.2 days*
- Increase in-Hospital Mortality by *600%*
- Increase average hospital charges by *$43,000*

DOD Clinical Trials conclude that copper:

- *Reduces Bacterial Contamination by ~ 90% Reduces HAIs > 50%*

US Army Medical Research and Materiel Command. Telemedicine & Advanced Technology Research Center (TATRC)

IMPACT OF HAI

	Average LOS Length of Stay
Without HAI	5.2 days
With HAI	24.4 days
Infections add:	*+19 days*

Agency for Healthcare Research and Quality August 2010. Adult Hospital Stays with Infections due to Medical Care. HCUP (Healthcare Cost and Utilization Project) statistical brief #94; Martin, J. 2011. Pennsylvania Health Care Cost Containment Council, February 2011. (http://www.phc4.org/reports/hai/09/docs/hai2009report.pdf)

IMPACT OF HAI

	Average LOS Length of Stay	*% In-Hospital Mortality*
Without HAI	5.2 days	1.5%
With HAI	24.4 days	9.0%
Infections add:	*+19 days*	*~ 6X risk*

Agency for Healthcare Research and Quality August 2010. Adult Hospital Stays with Infections due to Medical Care. HCUP (Healthcare Cost and Utilization Project) statistical brief #94; Martin, J. 2011. Pennsylvania Health Care Cost Containment Council, February 2011. (http://www.phc4.org/reports/hai/09/docs/hai2009report.pdf)

IMPACT OF HAI

	Average LOS Length of Stay	*% In-Hospital Mortality*	*Average Charge*
Without HAI	**5.2 days**	**1.5%**	**$9,377**
With HAI	**24.4 days**	**9.0%**	**$52,096**
Infections add:	***+19 days***	***~ 6X risk***	***+$43,000***

Agency for Healthcare Research and Quality August 2010. Adult Hospital Stays with Infections due to Medical Care. HCUP (Healthcare Cost and Utilization Project) statistical brief #94; Martin, J. 2011. Pennsylvania Health Care Cost Containment Council, February 2011. (http://www.phc4.org/reports/hai/09/docs/hai2009report.pdf)

IMPACT OF HAI

	Average LOS Length of Stay	% In-Hospital Mortality	Average Charge	Re-admission in 30 days
Without HAI	5.2 days	1.5%	$9,377	16.3%
With HAI	24.4 days	9.0%	$52,096	40.7%
Infections add:	*+19 days*	*~ 6X risk*	*+$43,000*	*+2.5x risk*

Agency for Healthcare Research and Quality August 2010. Adult Hospital Stays with Infections due to Medical Care. HCUP (Healthcare Cost and Utilization Project) statistical brief #94; Martin, J. 2011. Pennsylvania Health Care Cost Containment Council, February 2011.
(http://www.phc4.org/reports/hai/09/docs/hai2009report.pdf)

What if…

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Innovation Center Home > Model Impact Estimator

Model Impact Estimator

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About the Model Impact Estimator

The Model Impact Estimator is a tool designed to help health care innovators make cost calculation estimates based on 2011 Medicare utilization data. By inputting the percent change in utilization in one or more service categories, users can generate impact estimates for their proposed models. We emphasize that the impact estimates are estimates and should not be construed as an actuarial assessment. Since these estimates are based on the assumptions made by the user, the Centers for Medicare & Medicaid Services (CMS) does not endorse, in part or in full, the outputs of this tool.

About the data

The Model Impact Estimator estimates are derived from the aggregated 2011 Medicare costs data located on the Public Use File webpage on the CMS website. This tool uses the most current 2011 Medicare cost and utilization data that was available at the time of its publication. Although the tool focuses on cost, the source data also has aggregated demographic, spending, utilization, and quality indicators at the hospital referral region (HRR) level. As the underlying data is updated, some discrepancies may occur. For more information about the source data, please visit the CMS.gov Public Use File webpage. Please note that data cells in the tool containing user counts of less than 30 are represented by a hyphen (-).

How to use the tool

1. Select the State and Hospital Referral Region where the model will be implemented.
2. View the estimated total and per beneficiary per month (PBPM) impact for the selected Hospital Referral Region and the national average among 14 major Medicare service categories.
3. In the % change column, input the estimated impact of your model. Use negative values if you expect your model to reduce cost and positive values if you expect your model to increase cost. The table generates estimates based on your assumptions. (The validity of these estimates will vary based on the validity of your underlying assumptions.) Please see the Notes section for additional information.
4. Input the estimated implementation cost of your model, the estimated number of beneficiaries the model will include and the model duration. The tool will generate estimates based on these inputs.

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Today…

- Using the CMS model
  - An investment of $6.52/patient* will yield $13,052 /per patient!
    1. Assume it will cost *$3,000* to outfit the room with 10 copper objects
    2. Use 23 rooms as the number of rooms for the ICU, *$69,000* capital cost
    3. Assume average length of stay of 4 days/or 92 patients per room/per year
       - *$6.52/patient, assuming 5yr placement
    4. Assume a -58% reduction to infections
- Model predicts an *ANNUAL SAVINGS* of $6,005,704 per year from 23 rooms from one time investment of $69K! ~ *87 x ROI/yr*

- ◆ Replacement Rails
- ✓ IV Pole/Infusion Stand
- ✓ Overbed table
- ✓ Keyboard
- ✓ Computer mouse
- ✓ Sink
- ✓ Faucet
- ✓ Door lever
- ✓ Light Switches
- ✓ Cabinet pulls

Today…

- Using the CMS model
  - An investment of $6.52/patient* will yield $13,052 /per patient!
    1. Assume it will cost *$3,000* to outfit th… room with 10 copper objects
    2. Use 23 rooms as the n… the ICU, *$69,000*
    3. Assume a… 92…

…nd
…ble
…board
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- ✓ Sink
- ✓ Faucet
- ✓ Door lever
- ✓ Light Switches
- ✓ Cabinet pulls

…nfections

…UAL SAVINGS of …ear from 23 rooms …me investment of $69K! ~ …ROI/yr

IS PREVENTING AN INFECTION WORTH AN INVESTMENT OF $6.52 TO SAVE $43K?

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Infection – Cost Model - Savings

	Average Size Hospital
Number of beds	160
Number of HAI per bed	2
Number of HAI each year	320
Cost of HAIs each year	$15 million*
Annual Savings*	@ $43,000/HAI
With Copper Surfaces in Room:	**Average Size Hospital**
# HAIs saved	*185*
$ saved	*$7.9 million*

If @$29,000/HAI*
Average Size Hospital
185
$5.4 million

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Potential Savings from Copper Surfaces

Hospital Savings of $5.4 - $7.9 MM per year

- *Savings are Above and Beyond* Current Proactive Measures!*

- ✓ Single Patient Rooms
- ✓ Prominently located sinks and alcohol hand hygiene dispensers
- ✓ Hand washing compliance programs
- ✓ Regular cleaning of surfaces
- ✓ Bundles for controlling infections (e.g., CLABSI, CAUTI)

**Each of these measures were instituted prior to DOD trial*

-Conclusions-

Copper continuously complements cleaning controlling the bacterial burden within the built environment resulting in improved patient outcomes

Cleaner environment → **Lower RISK of infection** → **Fewer infections** → **Better outcomes & lower costs**

>90% Reduction

> 50 % Reduction

Summary

1. Built Environment represents a clear and present danger to patient care
2. Copper Alloys Were Found To Sustain The Levels Achieved From Terminal Cleaning
3. Copper alloys continuously sustain the terminal cleaning standard within vacant rooms

Conclusion

Placement of Copper Components facilitates the achievement of terminal Cleaning standards on a continuous basis

BLUF

Placement of Copper Components facilitates the achievement of terminal Cleaning standards on a continuous basis

One Out of Many

Healthcare Associated Infections

Thank you !

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