



Cleaning in Healthcare

Keeping hospitals clean is not an esthetic necessity
but a patient safety issue

Andreas Voss, CWZ & Radboudumc, Nijmegen, The Netherlands

Hosted by Prof. Didier Pittet
University of Geneva Hospitals

www.webbertraining.com December 18, 2019



- Air
- Water
- Droplets
- Environment**
- Hands**

Direct transmission
Indirect transmission

Routes of transmission

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Survival times of MDROs

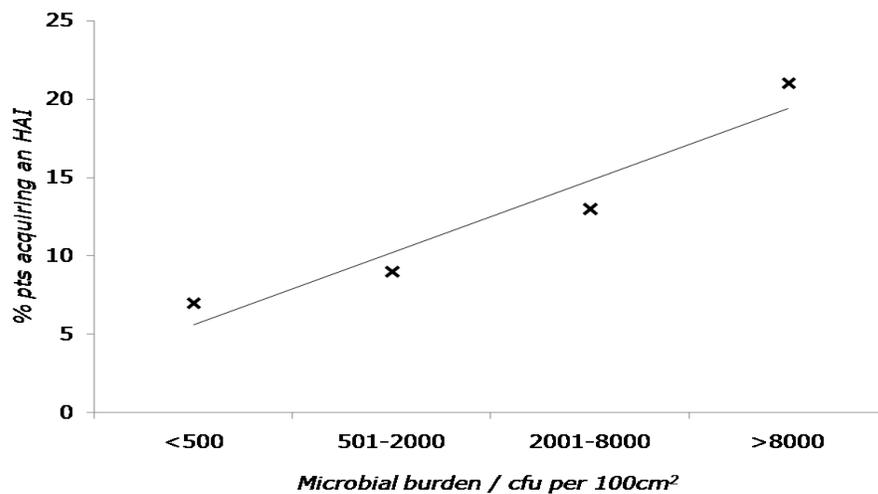
Organism	Survival time
Methicillin-resistant <i>Staphylococcus aureus</i>	7 days→7 mo
<i>Acinetobacter</i>	3 days→5 mo
<i>Clostridium difficile</i>	>5 mo
Vancomycin-resistant <i>Enterococcus</i>	5 days→4 mo
<i>Escherichia coli</i>	2 h–16 mo
<i>Klebsiella</i>	2 h→30 mo
Norovirus	8 h–7 days



[preven] Dancer Clin Microbiol Rev 2014;27:665

3

An environmental ‘dose-response’?



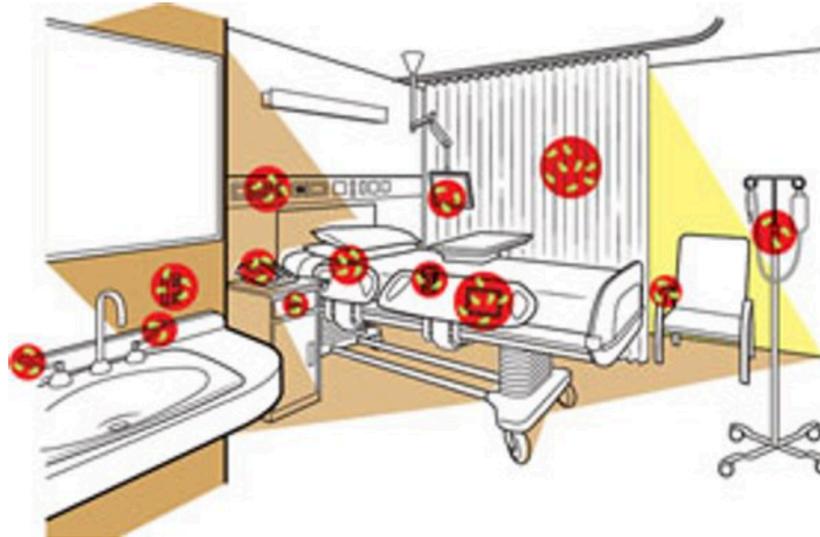
There was a significant correlation between burden and HAI risk (p=0.038).

[preven] Salgado et al. Infect Control Hosp Epidemiol 2013;34:479-486.

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Contamination –

Is it everywhere ?
It is everywhere !



[prevent]

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Freeman et al. *Antimicrobial Resistance and Infection Control* 2014, 3:5
<http://www.aricjournal.com/content/3/1/5>



RESEARCH

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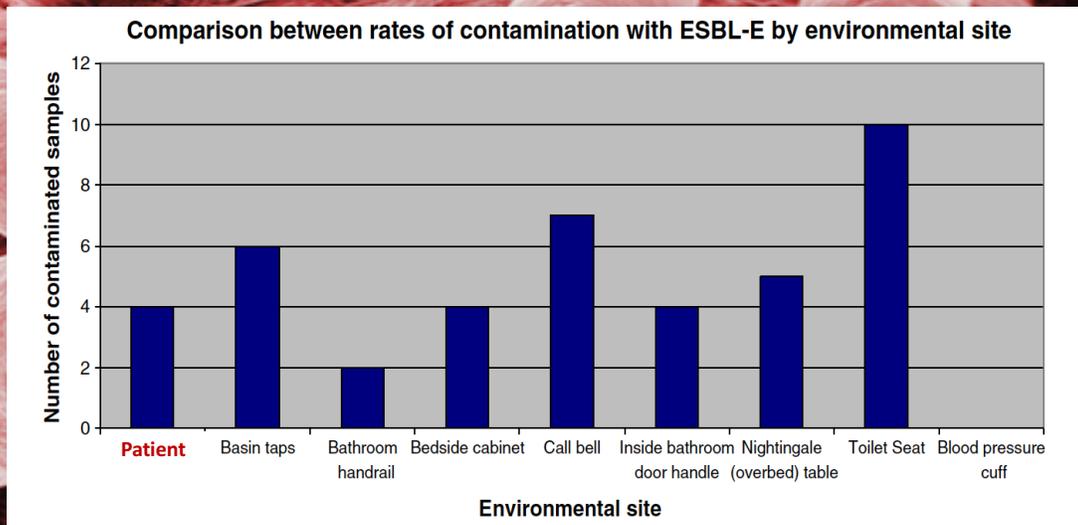
Predictors of hospital surface contamination with Extended-spectrum β -lactamase-producing *Escherichia coli* and *Klebsiella pneumoniae*: patient and organism factors

Joshua T Freeman^{1,2*}, Jessica Nimmo², Eva Gregory², Audrey Tiong¹, Mary De Almeida¹, Gary N McAuliffe¹ and Sally A Roberts^{1,2}

Freeman et al. *Antimicrob Resistance Infect Control* 2014;3:5

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Relative Rates of Contamination Across the Different Sites



Freeman et al. Antimicrobial Resistance and Infection Control 2014, 3:5

7

Do all surfaces need the same treatment



[|preven|]

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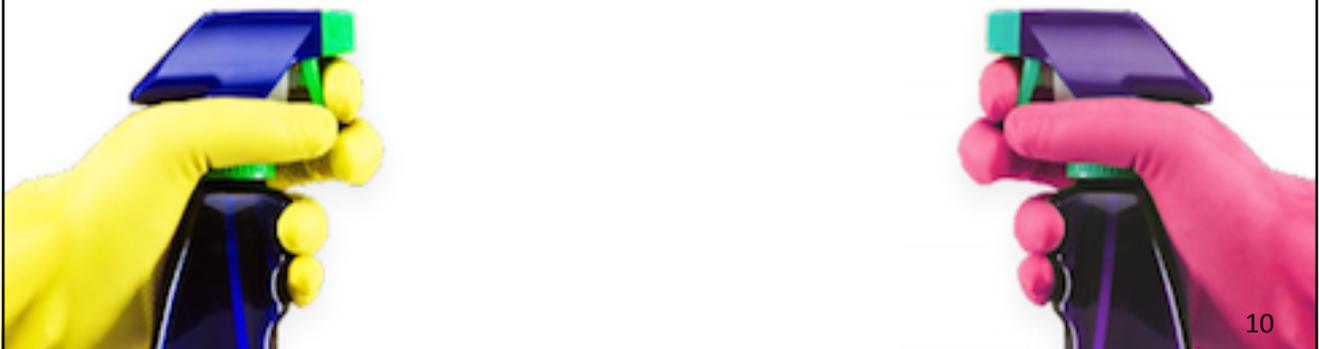
Critical surfaces in hospitals

- Frequently touched items such as telephones, handles, taps, light switches, knobs, buttons, keyboards, push plates, toys, bed rails, etc..
- These items are likely to benefit from enhanced cleaning, including disinfection.



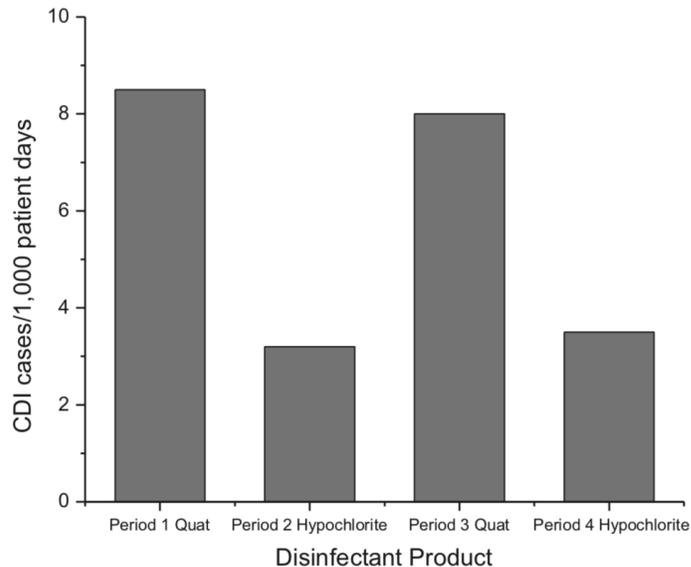
Cleaning versus disinfection

- Both reduce bacterial contamination
- Difference in reduction



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The product choice matters



ONE SIZE
DOES NOT
FIT ALL

Different bug –
different stuff

[prevent]

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Cleaning versus disinfection

- ⦿ Daily disinfection of high-touch surfaces for patients in isolation should be done!
- ⦿ Daily disinfection of high-touch surfaces for all patients is something we might have to think about (after studying it)



The Dutch only clean
on a daily base.



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The inconvenience truth



[prevent]

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This is what we get?



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Who is Cleaning the Commodes in Your Hospital?



[prevent]

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Responsibilities

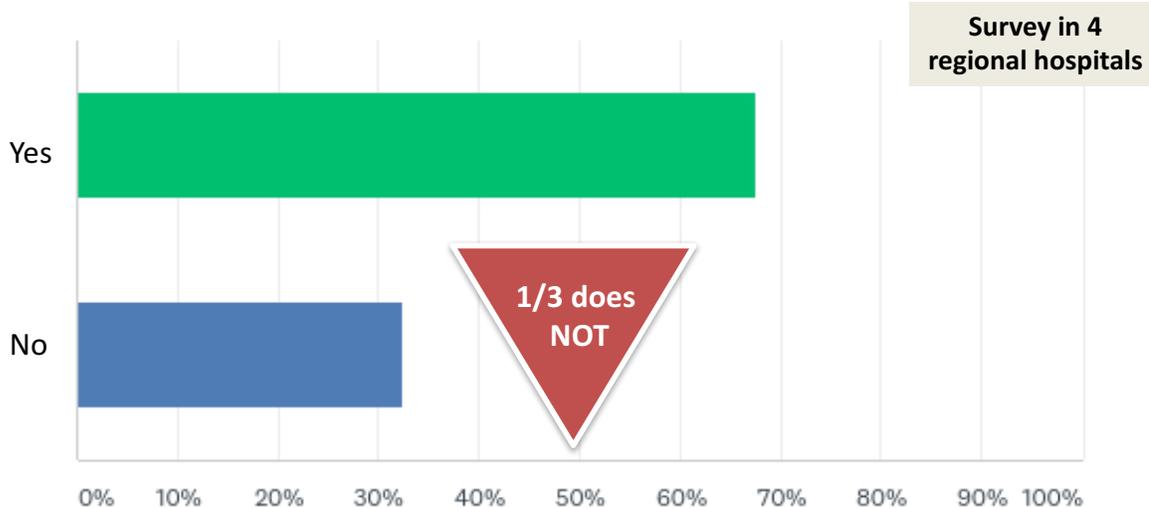


- ⦿ Roomservice
- ⦿ Roomservice-plus
- ⦿ Registered nurse
- ⦿ Nurse assistant
- ⦿ Cleaning

[prevent]

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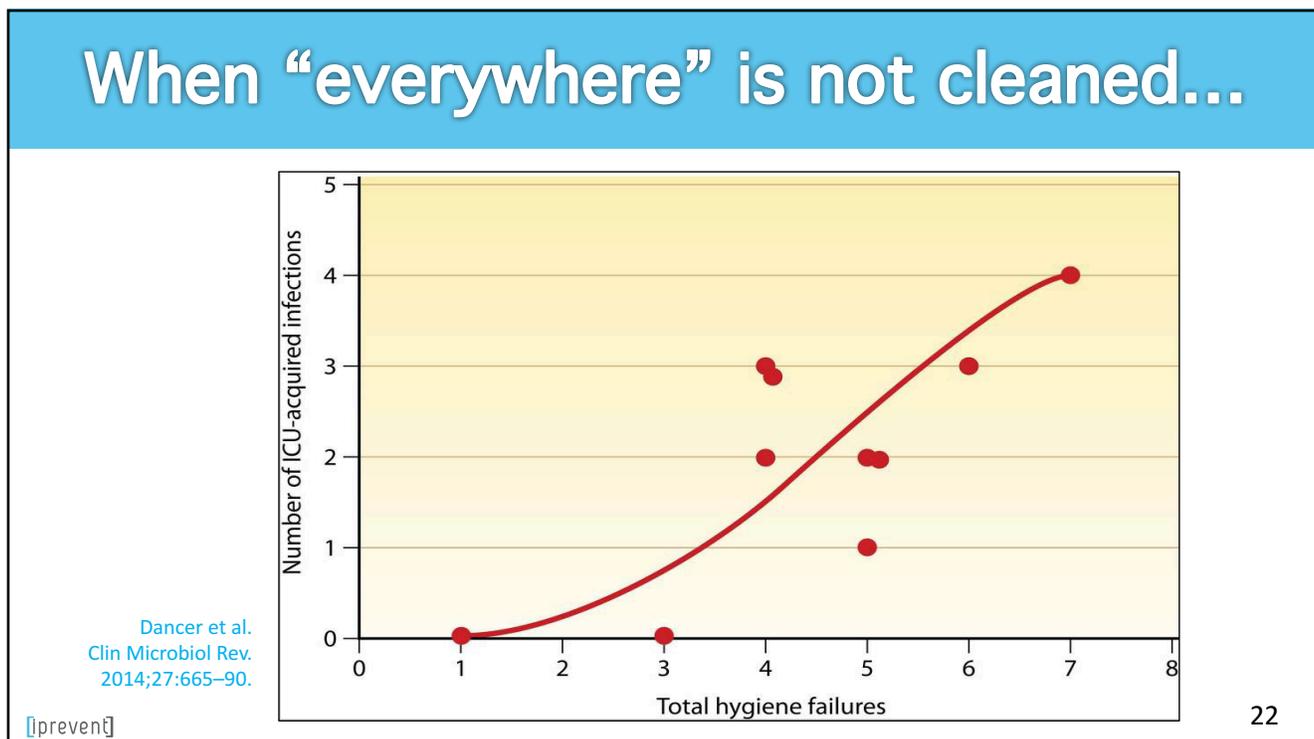
Do you know your tasks with regard to cleaning & disinfection



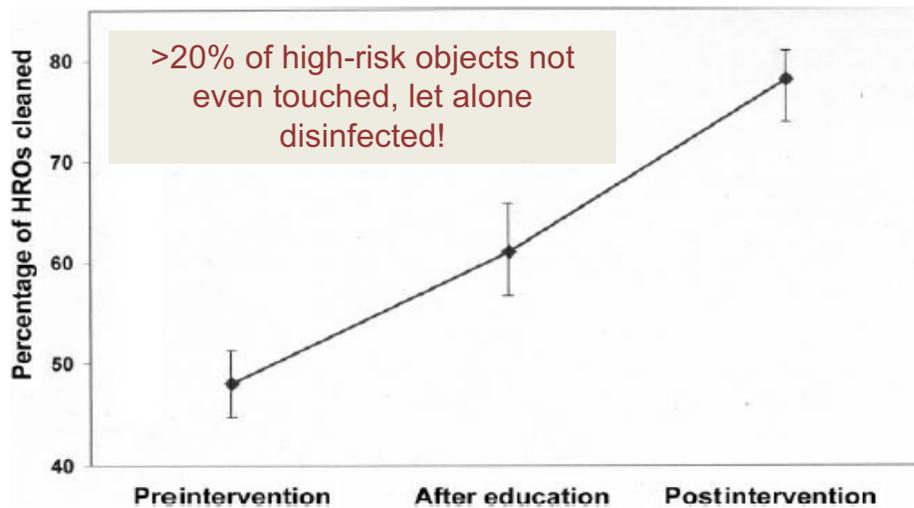
[prevent]

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Cleaning performance in 36 acute hospitals judged by removal of fluorescent markers from high-risk objects



[prevent] Carling et al. *Infect Control Hosp Epidemiol* 2008;29:1035-41.

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Is outsourcing the solution?

**"A SANITARY ENVIRONMENT
WILL KEEP YOUR STAFF
AND PATIENTS SAFE"**

PROVIDING THE HIGHEST STANDARD OF HOSPITAL CLEANING

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Healthcare & Cleaning

Facility Management

I want to care about cleaning, but I can't. Need to save money

I want you to clean my hospital for less than before

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We Can Do It!

Impossible but I can't lose this customer

Same personnel "different" contract
Less time per unit
Different materials?
Training?!

Professional Cleaning

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- Hospitals don't offer enough money
- Companies accept to keep/get customer

It is not outsourcing that is wrong but the condition under which it is "sold" and "bought"

COLUMN

Marcel Levi is interim en CEO van het University College London Hospitals (UCLH). Daarvoor was hij bestuursvoorzitter van het AMC.

Marcel Levi

Door uitbesteding gaat expertise in de eigen organisatie verloren



Uitbested, slecht besteed?

D e nieuwste modegril van de ziekenhuisbestuurders is om zoveel mogelijk activiteiten uit te besteden. Dat gebeurt al met schoonmaak, catering, beveiliging en salarisadministratie, maar de laatste tijd neemt het bijzonderlijk enthousiasme rap toe om meer vitale functies, zoals onderhoud van medische apparatuur of sterilisatie van chirurgisch instrumentarium, uit te besteden. In Engeland is het uitbestedingsvirus inmiddels zo sterk in ziekenhuizen doorgedrongen dat cruciale medische functies, zoals verslaan van röntgenfoto's of taken van de ziekenhuisapotheek ook al worden *geoutsourct*. Voor kleine gezondheidszorgorganisaties is het nog enigszins begrijpelijk dat delen van het werk worden uitbesteed, omdat het vrijwel onmogelijk wordt alle ballen in de lucht te houden. Denk aan ICT met de wiraar van verschillende systemen, angst voor cyberbedreigingen en telkens toenemende eisen van de privacywettelijkheid. Voor grotere instellingen is het motief om functies uit te besteden echter bijna altijd om geld te besparen. Inderdaad zijn de aanbiedingen van uitbestede werk in vrijwel alle gevallen ruim goedkoper dan als de organisatie het zelf zou doen. Maar schijn bedriegt ook hier en zoals vaak is de werkelijkheid van uitbestede werk een stuk weerbarstiger dan de suggestie die uitgaat van de glimmende prospectus en gladder aanbiedingen van de uitbestedingsindustrie. Het is wellicht een goed idee dat ziekenhuisbestuurders voordat zij verbinding maken door dollars-telens in hun ogen, zich eerst verdiepen in de pertinent minder enthousiaste ervaringen die veel gezondheidszorgorganisaties inmiddels met uitbestedingen hebben opgedaan. Zo is in veel gevallen de kwaliteit van de geleverde diensten aanzienlijk minder dan gougereerd in de aanbieding. Maar wellicht is nog belangrijker dat het voor de uitbestedende organisatie vrijwel onmogelijk is hier goed grip op te krijgen en noodzakelijke kwaliteitsverbeteringen door te voeren. Alle aandacht verschuift van het verbeteren van de kwaliteit van een dienst naar het managen van een contract of een flexibel omroedevolume. Vaak is ook geen rekening gehouden met allemaal bijzondere omstandigheden en kleine lettertjes die het voor het ziekenhuis uiteindelijk toch allemaal veel moeilijker maken. In de praktijk blijkt de partij die de uitbesteding binnen hoeft geleest – natuurlijk niet verrassend – vooral uit op winst en minder gretigheid in kwaliteitsoverwegingen van het ziekenhuis. Vervolgens leidt uitbesteding ertoe dat de kennis en expertise binnen de eigen organisatie geheel verloren gaat, waardoor men nog meer overgeleverd raakt aan de makkers van externe partijen. Tevens wordt vaak vergeten dat de medewerkers die de uitbestede werkzaamheden uitvoeren, niet zelden slechtere arbeidsvoorwaarden hebben dan ziekenhuismedewerkers en zich in het ziekenhuis al snel tweedeklassers voelen, wat hun motivatie niet ten goede komt. In een artikel getiteld "The outsourcing boom and why it is falling" in The Washington Post wordt haarscherp geconcludeerd dat door toevallige en andere redenen uitbesteding vrijwel altijd leidt tot kwaliteitsvermindering en uiteindelijk hogere in plaats van lagere kosten. Ook in de Engelse National Health Service stapelen de mislukte outsourcingprojecten zich op en wordt de roep om een verbod op uitbesteding van medische diensten steeds luider. Vooruitlopend hierop heeft ons Engelse ziekenhuis besloten om het uitbesteden van roeggeverlagen geheel te stoppen en deze dienst weer voor 100 procent in eigen hand te nemen. Omwille van kwaliteit en efficiëntie is er wellicht een betere manier om het geld in de gezondheidszorg te besteden dan door diensten uit te besteden. ■

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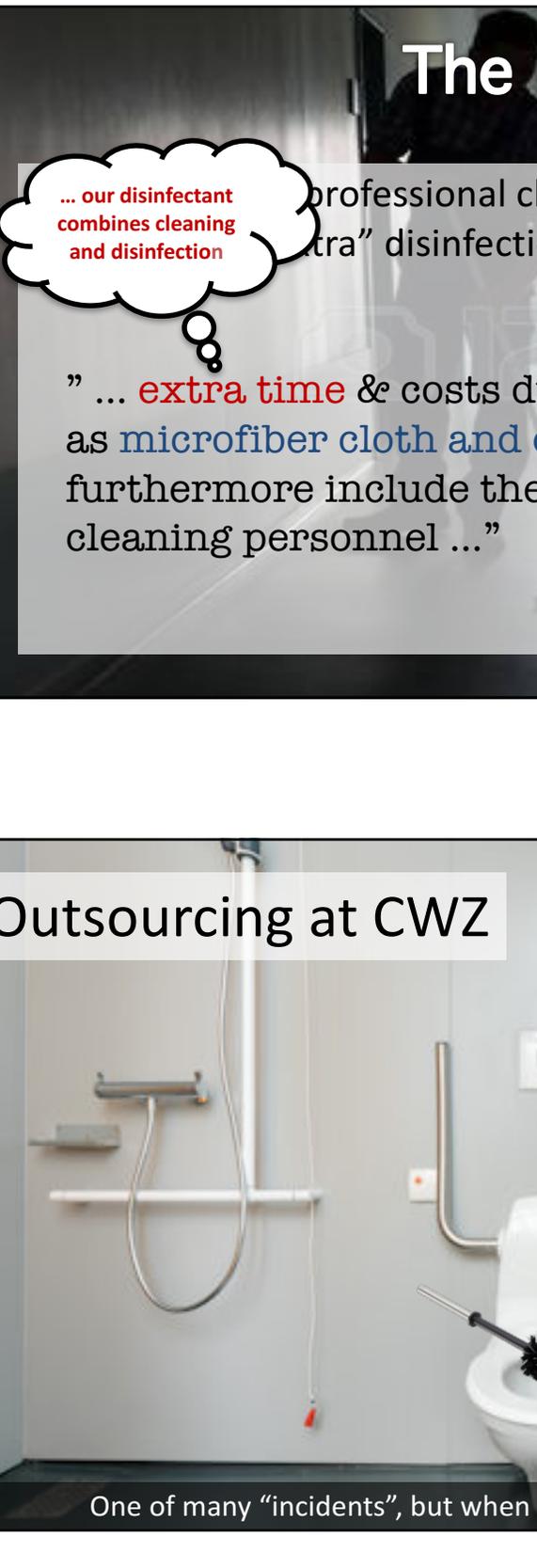
The Real Life

Letter from a professional cleaning company after being asked to perform "extra" disinfection:

" ... **extra time** & costs due to additional material such as **microfiber cloth and disinfectant** * ... the costs furthermore include the **education and training** of cleaning personnel ..."

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The Real Life



... our disinfectant combines cleaning and disinfection

... doesn't disinfectant destroys the microfiber cloth ?

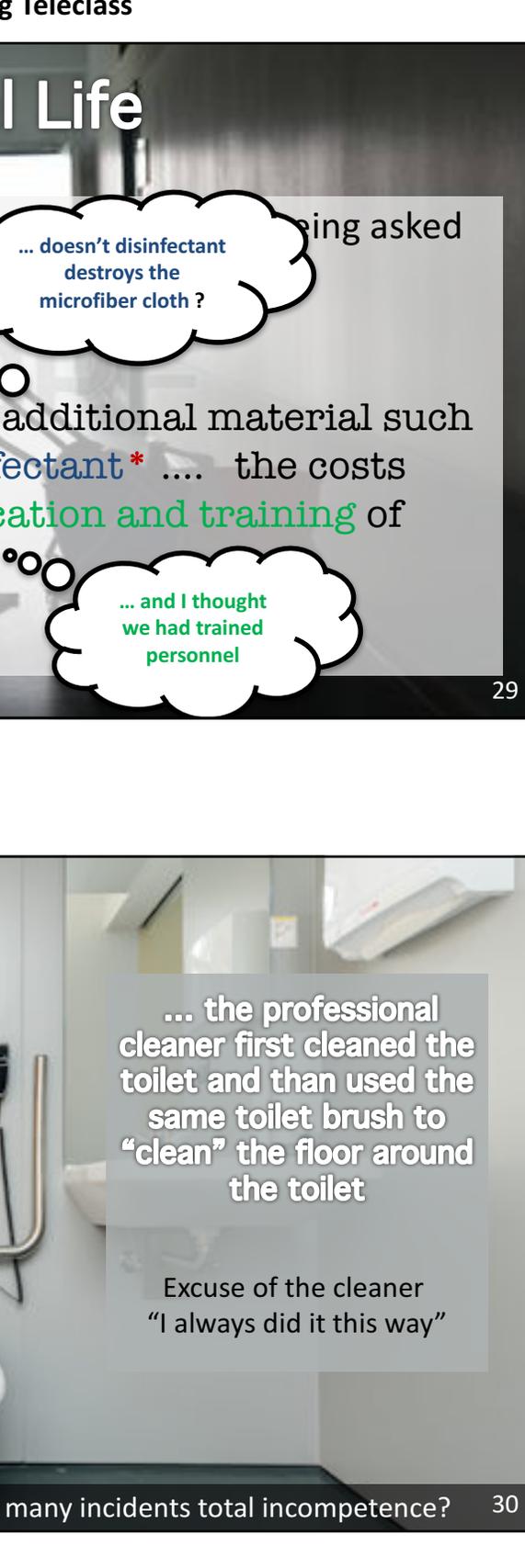
... and I thought we had trained personnel

professional cleaning ... being asked
"extra" disinfection:

" ... **extra time** & costs due to additional material such as **microfiber cloth and disinfectant*** ... the costs furthermore include the **education and training** of cleaning personnel ..."

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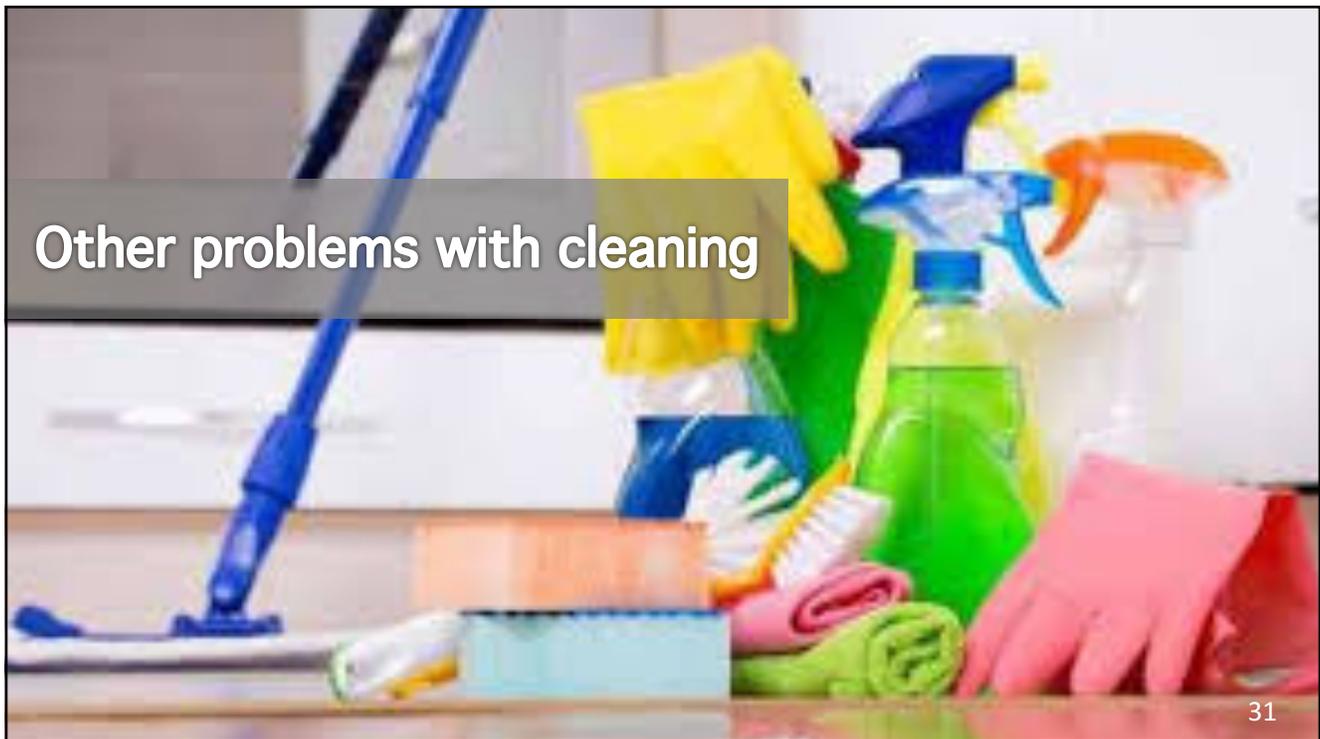
Outsourcing at CWZ



... the professional cleaner first cleaned the toilet and than used the same toilet brush to "clean" the floor around the toilet

Excuse of the cleaner
"I always did it this way"

One of many "incidents", but when become many incidents total incompetence? 30



Make Adequate Cleaning a Reflex



=



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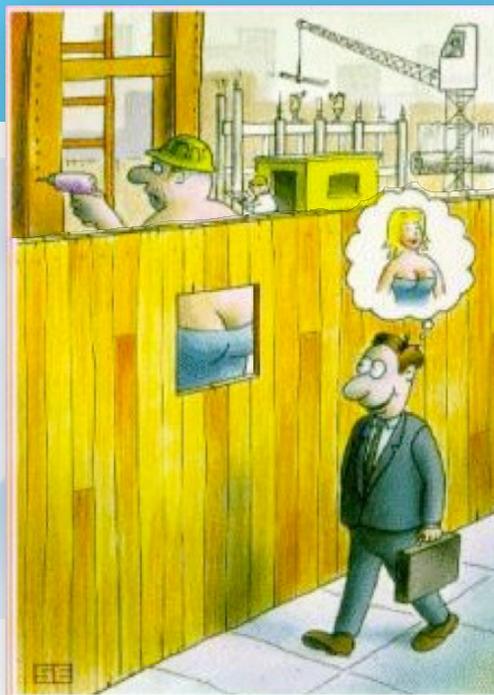


[prevent]

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Perception

... always look at the full picture



[prevent]

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Clinicians' perception of Cleaners



[prevent]

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The Story of Dirty (Dutch) Hospitals



Journalist/under-cover cleaner



[prevent]

An exception is exactly that, an exception - not the standard

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Cleaners' perception of MDs & RNs



[prevent]

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Nursing
Times



'Unless we redress this situation, it will only get worse'

JENNI MIDDLETON, EDITOR

HOME NEWS CLINICAL ARCHIVE LEARNING UNITS AND PORTFOLIO STUDENTS OPINION EVENTS JOBS SUBSCRIPTION OPTIONS

NURSE MANAGERS

Keeping hospitals clean: how nurses can reduce health-care-associated infection

1 FEBRUARY, 2004



COMMENT

MOST POPULAR

MOST COMMENTED

Annette Jeanes, MSc, RGN, SCM, DipN, Dip IC.

Lead Nurse, Infection Control, University Hospital Lewisham, London



UK government does deal with Jamaica to recruit nurses for NHS



Nurses warned about dermatitis risk from over-use of gloves

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Facilitate that nurses can do their work



[preven]

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Other problems with cleaning

- ⦿ Training and certification
 - ✦ in-house is a must
 - ✦ official training and certification would be great
- ⦿ Human component & communication
 - ✦ respect for each others profession
 - ✦ part of the team
 - ✦ human nature

Peters et al of Antimicrobial Resistance and Infection Control
<https://doi.org/10.1186/s13756-018-0420-3>

(2018) 7:132

Antimicrobial Resistance
 and Infection Control

MEETING REPORT

Open Access

Keeping hospitals clean and safe without breaking the bank; summary of the Healthcare Cleaning Forum 2018

Alexandra Peters¹, Jon Otter², Andreea Moldovan³, Pierre Parneix⁴, Andreas Voss⁵ and Didier Pittet^{1*}



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Education & training

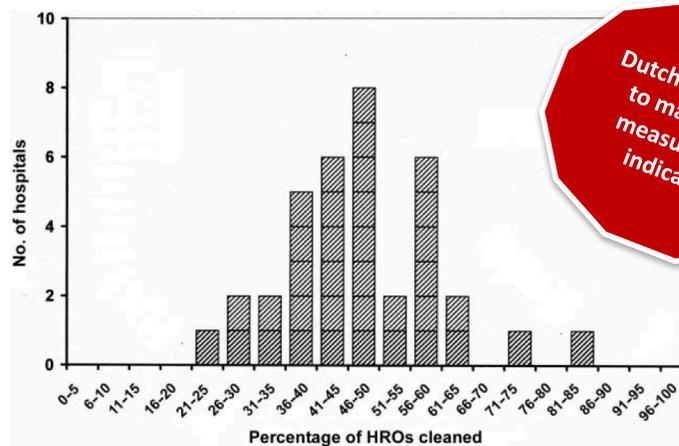
- Cleaning staff one of the few HCWs without certification
- Clear instructions frequently missing
- Who is doing what
- Background knowledge (the reason why) missing
- Need for cooperation with local infection control



Improve existing procedures	Education & training
Question	"Answer"
What to clean?	Focus of "high-touch" sites seems sensible
Who cleans what?	Checklists can help
What agent(s) to use?	Depends on the situation; sporicidal agent for <i>C. difficile</i>
What materials to use?	Microfibre may help Wipes have pros and cons "Bucket method" most effective
How to educate staff?	More than we currently do! Difficult task
Daily cleaning: how often?	Evidence for daily or twice daily
Terminal cleaning: optimal protocols?	More stringent protocol should be used for terminal disinfection

Motivation by performance feed-back

- Use a standardized methods that delivers comparable results





'Given the choice of improving technology or improving human behavior, technology is the better choice'

Dr Bob Weinstein



The future, robots & Co



Modern technologies for improving cleaning and disinfection of environmental surfaces in hospitals

John M. Boyce

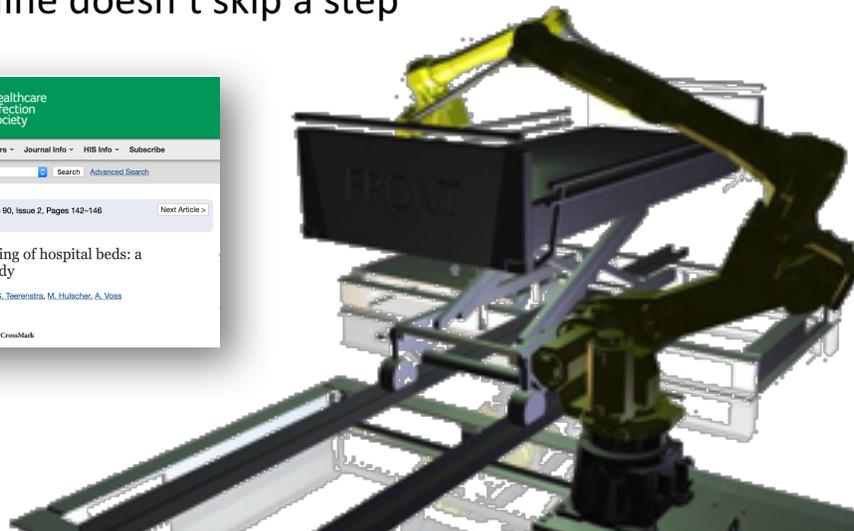
Antimicrobial Resistance & Infection Control 2016, 5:10

<https://doi.org/10.1186/s13756-016-0111-x> © Boyce, 2016

Received: 11 November 2015 | Accepted: 23 March 2016 | Published: 11 April 2016

Standardize by automation

⦿ A machine doesn't skip a step



Automated room decontamination (ARD)



Hydrogen peroxide vapour
30% H₂O₂ (HPV)



Aerosolised hydrogen peroxide
5-6% H₂O₂ (AHP)



Ultraviolet radiation
(UVC)



Pulsed-xenon UV
(PX-UV)

[prevent] Otter et al. *J Hosp Infect* 2013;83:1-13.

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Design bugs out

Mann et al. *Antimicrobial Resistance and Infection Control* 2014, 3:28
<http://www.aricjournal.com/content/3/1/28>

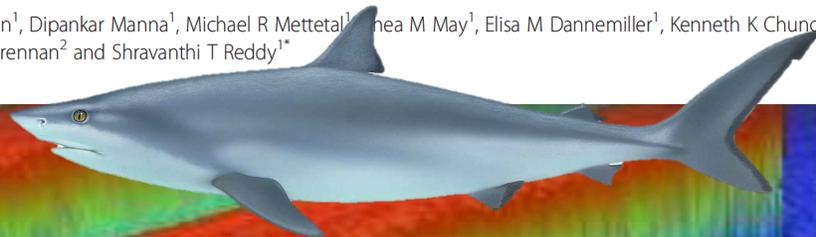


RESEARCH

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Surface micropattern limits bacterial contamination

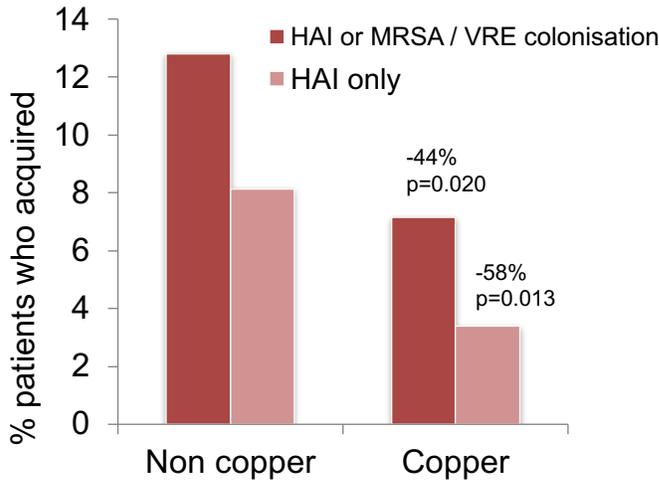
Ethan E Mann¹, Dipankar Manna¹, Michael R Mettetal¹, Ines M May¹, Elisa M Dannemiller¹, Kenneth K Chung¹, Anthony B Brennan² and Shravanthi T Reddy^{1*}



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Antimicrobial surfaces (e.g. copper)

614 pts in 3 hospitals randomised to 'copper' or 'non-copper' ICU rooms



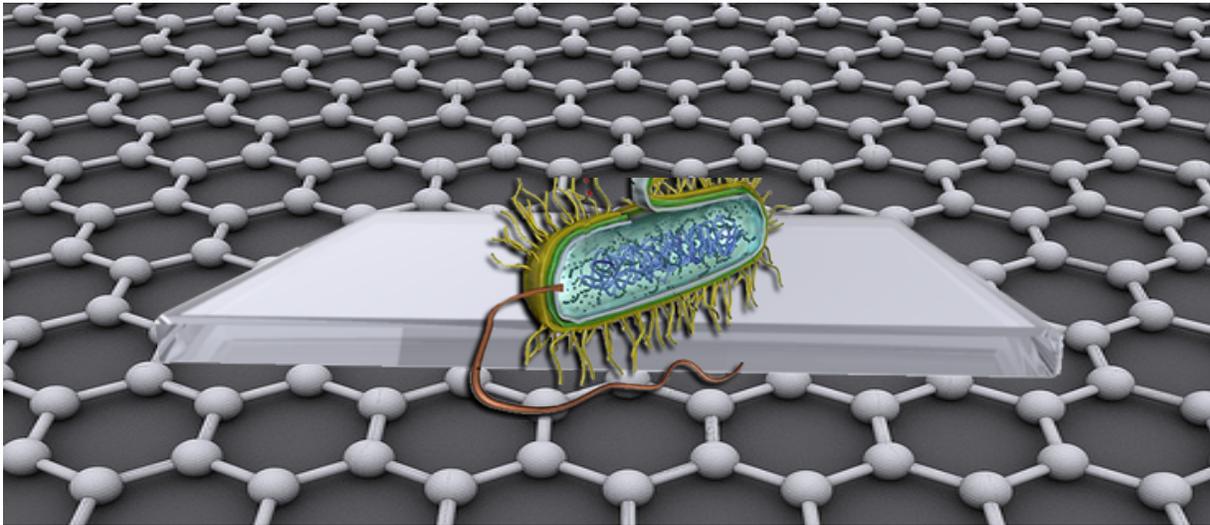
- Bedrails
- Overbed tables
- IV poles
- Visitor chair arms
- Nurse call button*
- Computer mouse*
- Computer palm rest*
- Rim of monitor*

(* = some rooms only)

Salgado et al. *Infect Control Hosp Epidemiol* 2013;34:479-486.

Candidate	Application	Pros	Cons
Metals			
Copper	Manufactured in / liquid disinfectant	Rapidly microbicidal; large evidence-base; evidence of reduced acquisition.	Sporicidal activity equivocal; cost, acceptability and durability may be questionable.
Silver	Manufactured in / liquid disinfectant	Broadly microbicidal.	? sporicidal; tolerance development; relies on leaching so surface loses efficacy over time.
Chemicals			
Organosilane	Liquid disinfectant	Easy to apply.	Limited microbicidal activity; questionable "real-world" efficacy.
Light-activated (e.g. titanium dioxide or photosensitisers)	Manufactured in / liquid disinfectant	Broadly microbicidal; can be activated by natural light.	? sporicidal; requires light source for photoactivation (some require UV light); may lose activity over time.
Physical alteration of surface properties			
"Liquid glass" (silicon dioxide)	Liquid application	Reduces deposition; improves 'cleanability'.	Not microbicidal; some evidence of reduced contamination; unknown required frequency of application.
Sharklet pattern	Manufactured-in	Reduces deposition; reduced. biofilms.	Not microbicidal; not feasible to retrofit.
Advanced polymer coatings (e.g. PEG)	Manufactured-in	Reduces deposition; some can be 'doped' with copper or silver.	Not microbicidal; may be expensive; scale up to large surfaces questionable; not feasible to retrofit.
Diamond-like carbon (DLC) films	Manufactured-in	Reduces deposition; can be 'doped' with copper or silver.	Not microbicidal; likely to be expensive; feasibility of scale up to large surfaces questionable; not feasible to retrofit.

Effectiveness of Antimicrobial Polymer to Decrease Contamination of Environmental Surfaces



[prevent]

Thom et al. Infect Control Hosp Epidemiol 2014;35:1060-62

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Continuous disinfection

<p>INDIGO DISINFECTION MODE</p>  <p style="font-size: small; text-align: right;">©Indigo-Clean™ 2016</p>	<p>When to use it</p> <p>When the room is not in use, switch to Indigo Disinfection Mode for maximum bacteria killing power (exclusively 405nm).</p> <p>Safe to use when room is occupied or unoccupied.</p>	<p>Applications</p> <ul style="list-style-type: none"> • Operating Room • Medical Equipment Storage Areas • Patient Bathroom • Janitor Closets • Any room in "after-hours mode"
<p>WHITE DISINFECTION MODE</p>  <p style="font-size: small; text-align: right;">©Indigo-Clean™ 2016</p>	<p>When to use it</p> <p>Best suited for times when comfort and visual acuity are critical.</p> <p>A solution combining Indigo (405nm) and standard white LEDs to create the look of white overhead lighting. Use when room is occupied.</p>	<p>Applications</p> <p><i>Anywhere, but particularly effective in:</i></p> <ul style="list-style-type: none"> • Operating Room • Sterile Processing • Pharmacy • Procedure Room • Recovery Room • Waiting Areas

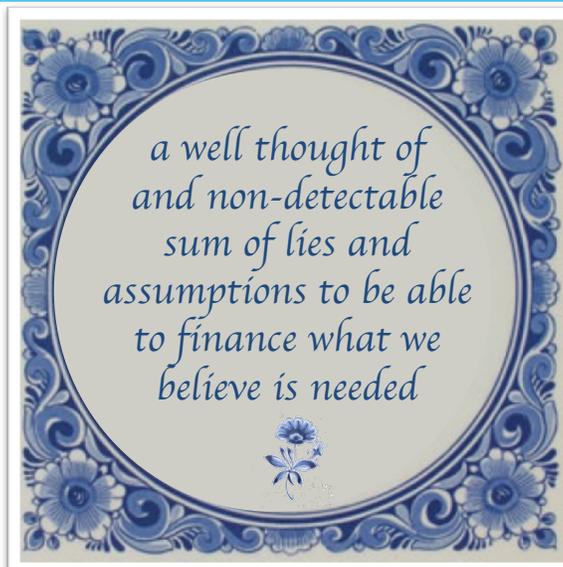
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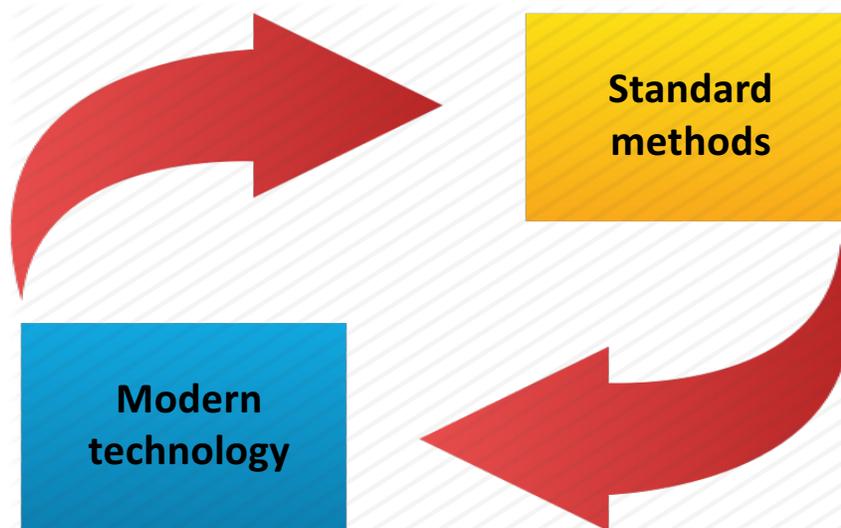
Structural versus additional

- Solutions that are built-in (during construction of the healthcare center) and are manufactured-in might have a better chance than retrofit or bought machines at a later time
- tough to create the business-case once the healthcare center is running

My personal view on business cases



It's not about replacement, but combined efforts



[prevent]

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Other “new” solutions

- ⦿ Reduce colonization and consequent spread (e.g. CHG, fidaxomicin)
- ⦿ Hospital built environment (e.g. sinks)



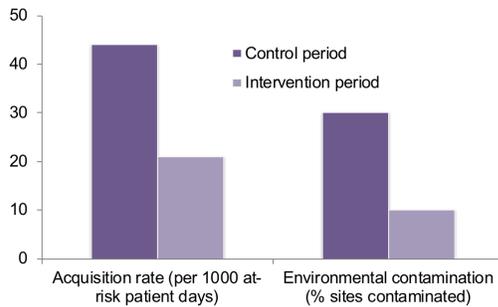
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Reduce colonization and consequent spread

Control contamination at the source

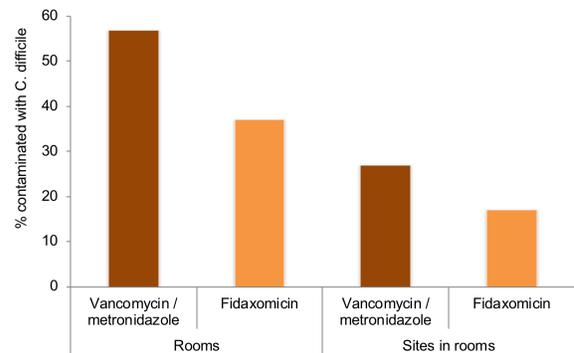
Pre-post study in a 16-bed ICU in Korea; CHG daily bathing implemented for 12 months after 14-month pre-intervention period. Significant reduction in rate of carbapenem-resistant *Acinetobacter baumannii* acquisition and environmental contamination.



Chung et al. *Am J Infect Control* 2015;43:1171-1177.

Contamination-sparing therapy?

n = 66 patients (rooms) and 264 surfaces for vancomycin / metronidazole, and 68 patients (rooms) and 272 surfaces for fidaxomicin, p<0.05 for both rooms and surfaces.



Biswas et al. *J Hosp Infect* 2015;90:267-270

How can we measure & compare?



Cleaning & measurement

- ❖ Measurable
- ❖ Objective
- ❖ Quantitative
- ❖ Standardized
- ❖ Multifactorial

- ❖ Compare
- ❖ Feedback

⦿ Cleaning

- ❖ visual
- ❖ microbiological cultures
- ❖ fluorescent markers
- ❖ ATP measures

Visual assessment



- Visual assessment of hospital cleaning is performed by measuring the apparent cleanliness of a room against a checklist.^{1,2}
- A room needs to be visually clean to be acceptable to the current and subsequent occupant.

Visual assessment of hygiene does not correlate with microbial contamination, and is a misleading measure of cleanliness³⁻⁵

1. Sherlock *et al. J Hosp Infect* 2009;72:140-146.
2. Mulvey *et al. J Hosp Infect* 2011;77:25-30.
3. Griffith *et al. J Hosp Infect* 2007;66:352-359.

4. Cooper *et al. Am J Infect Control* 2007;66:352-359.
5. Griffith *et al. J Hosp Infect* 2000;45:19-28.

Microbiological samples



- Microbiological surface cultures can be qualitative (pathogen presence or absence) or quantitative (aerobic colony counts)
- Several different sampling methods available; usually swabs (with or without enrichment) or contact plates
- Quality standards for both aerobic colony counts (<2.5 cfu / cm²) and specific indicator organisms (<1 cfu / cm²) have been proposed.^{1,2}

Cost and practicality mean that routine microbiological sampling is rarely performed

[preven]

1. Mulvey et al. *J Hosp Infect* 2011;77:25-30. 2. Malik et al. *Am J Infect Control* 2003;31:181-187.

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ATP assessment



- Adenosine triphosphate (ATP) is the “energy currency” of all living cells.
- Several “quality standards” have been set as relative light unit (RLU) thresholds, ranging from 100-500.¹⁻³

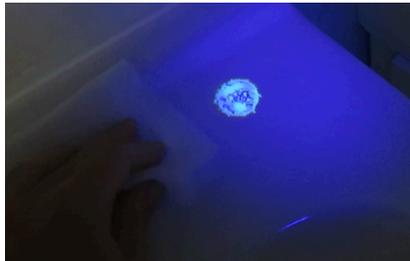
Probably data from different sites are comparable
(if the same system is used)

[preven]

1. Boyce et al. *Infect Control Hosp Epidemiol* 2011;32:1187-1189. 2. Mulvey et al. *J Hosp Infect* 2011;77:25-30.
3. Whiteley et al. *Healthcare Infection* 2012;17:91-97.

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Fluorescent markers



- Fluorescent material can be applied to a surface and its removal assessed by a 'black light'
- The % removal of the spots is used to evaluate cleaning performance.^{1,2}
- Educational interventions can improve significantly the removal of the market spots.²⁻³

The removal of marked spots has been shown to correlate with microbial contamination in some studies;²⁻³ cleaning staff may "get wise" to the location of the spots and preferentially target them⁴

1. Boyce et al. *Infect Control Hosp Epidemiol* 2011;32:1187-1189. 2. Carling et al. *ICHE* 2008; 29:1035-1041.
 2. Munoz-Price et al. *Infect Control Hosp Epidemiol* 2012;33:897-904. 4. Rutala et al. *ICHE I* 2011;32:743-747.

Method comparison

	Visual	Micro	ATP	Fluorescent
Ease of use	High	Low-Moderate	High	High
Good teaching tool	No	Moderate	Yes	Yes
Correlation with microbial contamination	Poor	Accurate	Indirect	Indirect
Identifies pathogens	No	Yes/No	No	No
Risk of "gaming" by staff	Low	Low	Low	Moderate
Identifies 'dirty' surfaces*	Yes	No	Yes	No
Evidence of attributable impact	No	Yes	Some	Some



Cleaning in Healthcare Settings

Cleaning -
not just a job, but
a profession

Time to turn all cleaning staff into certified professionals

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Respect

MD

ICP

RN

FM

Cleaner

Patient Safety Team

[preven]

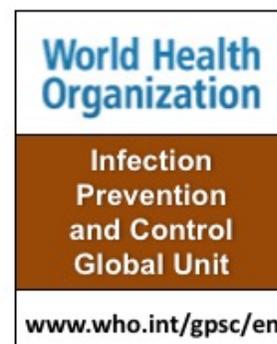
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Cleaning in Healthcare
Prof. Andreas Voss, Radboud University Medical Centre, The Netherlands
A Webber Training Teleclass

www.webbertraining.com/schedulep1.php

January 7, 2020	<u>SOCIAL MEDIA IMPACT ON INFECTION PREVENTION AND CONTROL</u> Speaker: Prof. Didier Pittet , University of Geneva Hospitals, Switzerland
	<i>(FREE Teleclass)</i>
January 23, 2020	<u>A ONE HEALTH PERSPECTIVE ON FOOD SECURITY</u> Speaker: Prof. Laura Kahn , Woodrow Wilson School of Public and International Affairs Princeton University
January 30, 2020	<u>POSITIVE DEVIANCE AND HAND HYGIENE: WHAT CAN WE LEARN FROM THE BEST?</u> Speaker: Josiane Létourneau , University of Montreal
February 13, 2020	<u>MALNUTRITION RISK AND HEALTHCARE INFECTION – A MUST DO</u> Speaker: Dr. Fidelma Fitzpatrick , Royal College of Surgeons in Ireland
	<i>(FREE European Teleclass ... Denver Russell Memorial Teleclass Lecture)</i>
February 18, 2020	<u>ANTIMICROBIAL RESISTANCE – A GLOBAL ONE HEALTH CHALLENGE</u> Speaker: Prof. Séamus Fanning , University College Dublin, Ireland

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