Sanificazione e Disinfezione nelle Strutture Sanitarie.
Bologna
24 giugno 2019

Ruolo dell'ambiente nelle infezioni correlate all'assistenza .

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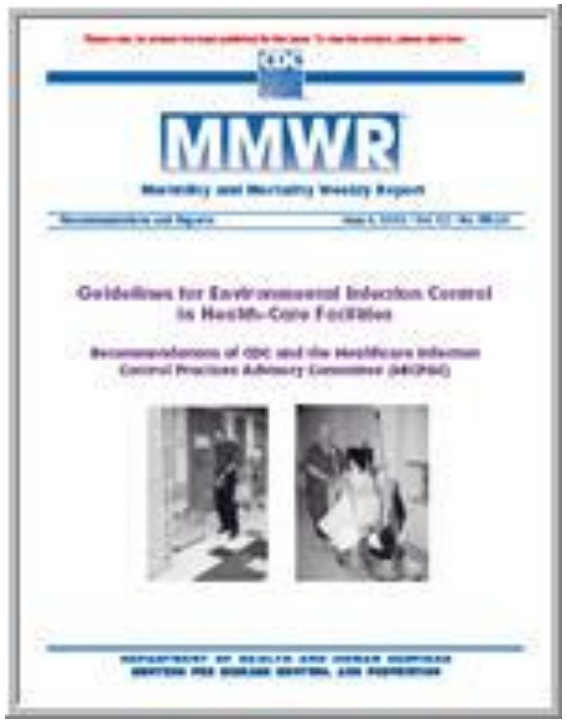

Guidelines for environmental infection control in health-care facilities

Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee - 2003

…The mere presence of a microorganism on an environmental surface does not confirm it as the cause of patient infection even if the same microbe is recovered from both. Rather, necessary steps involved in the ***"chain of cross-transmission" must be completed.***

Journal of Hospital Infection (2007) 65(S2) 50–54

Available online at www.sciencedirect.com

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www.elsevierhealth.com/journals/jhin

Environmental contamination makes an important contribution to hospital infection

John M. Boyce[a,b]

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Journal of Hospital Infection xxx (2018) 1–10

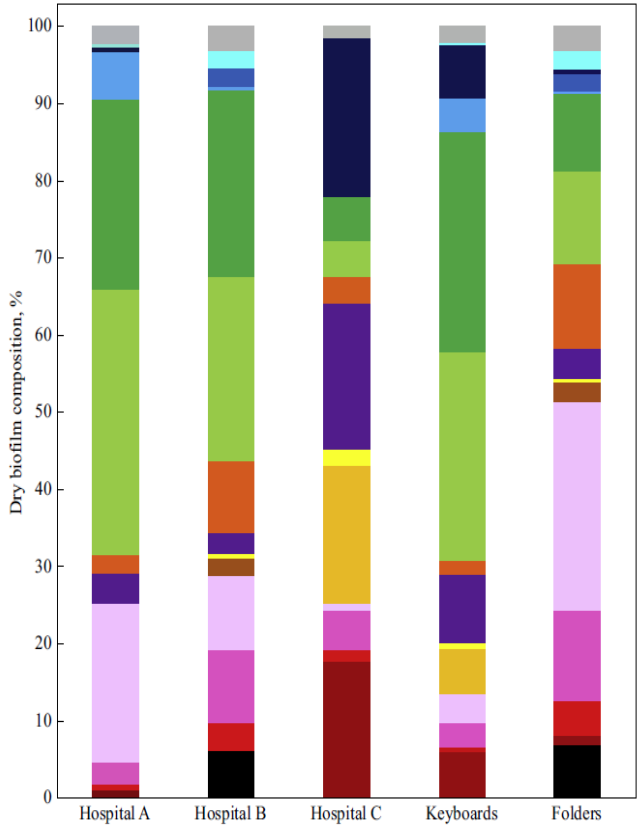
Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevier.com/locate/jhin

Beware biofilm! Dry biofilms containing bacterial pathogens on multiple healthcare surfaces; a multi-centre study

K. Ledwoch[a], S.J. Dancer[b,c], J.A. Otter[d,e], K. Kerr[a], D. Roposte[a], L. Rushton[f], R. Weiser[f], E. Mahenthiralingam[f], D.D. Muir[g], J.-Y. Maillard[a,*]



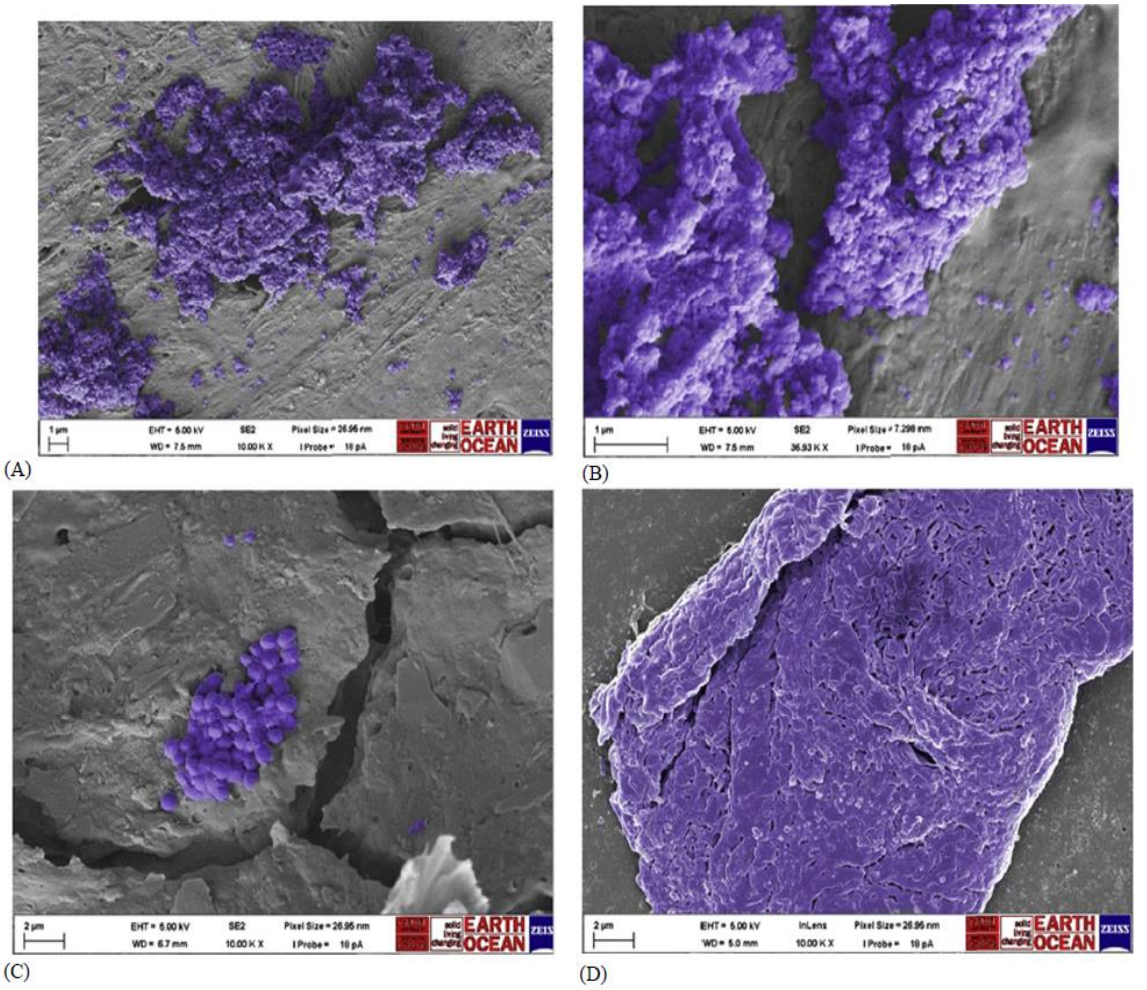


Figure 4. Examples of 'dry' biofilms recovered from surfaces; magnification ×10,000. (A, B) Patient folders, (C) patient chair, (D) keyboard key. Images of biofilms were coloured in purple to help visualization and contrast using GNU Image manipulation program (GIMP 2.8) software. Images were not otherwise altered.

Figure 3. Difference in 'dry' biofilm composition between hospitals. ■, *Anoxybacillus flavithermus*; ■, *Bacillus amyloliquefaciens*; ■, *Bacillus anthracis*; ■, *Bacillus cereus*; ■, *Bacillus licheniformis*; ■, *Bacillus megaterium*; ■, *Bacillus pumilus*; ■, *Bacillus* sp.; ■, *Bacillus subtilis*; ■, *Bacillus thuringiensis*; ■, *Staphylococcus aureus*; ■, *Staphylococcus epidermidis*; ■, *Staphylococcus lugdenensis*; ■, *Staphylococcus pasteuri*; ■, *Staphylococcus saprophyticus*; ■, *Staphylococcus warneri*; ■, other.

Journal of Hospital Infection 91 (2015) 218–219

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin

Commentary

Biofilms mean that the 'environmentome' of hospital surfaces is teeming with life

For many years we have described hospital surfaces as 'inanimate' but the study by Hu *et al*. demonstrates that this is far from true.[1] A sentinel study published in this Journal in 2012 first identified biofilms on a small number of surfaces in an Australian intensive care unit (ICU).[2] The study by Hu *et al*. published in the September edition of the Journal from the same Australian group identifies established biofilms on the vast majority of surfaces sampled in a similar setting to the 2012 study, supporting a diverse array of microbes including pathogenic species.

The diversity of bacteria identified in the biofilms was broad: **obligate anaerobes accounted for around 50% of the bacterial species identified**. This suggests that these obligate anaerobes **resided in the anaerobic portions of the biofilms**.

The identification of **biofilms on dry hospital surfaces** might explain why vegetative bacteria remain **viable on dry hospital surfaces for such long periods**, explain why conventional **cleaning and disinfection consistently fails to eliminate pathogens from surfaces.**

Journal of Hospital Infection 93 (2016) 263–270

Available online at www.sciencedirect.com

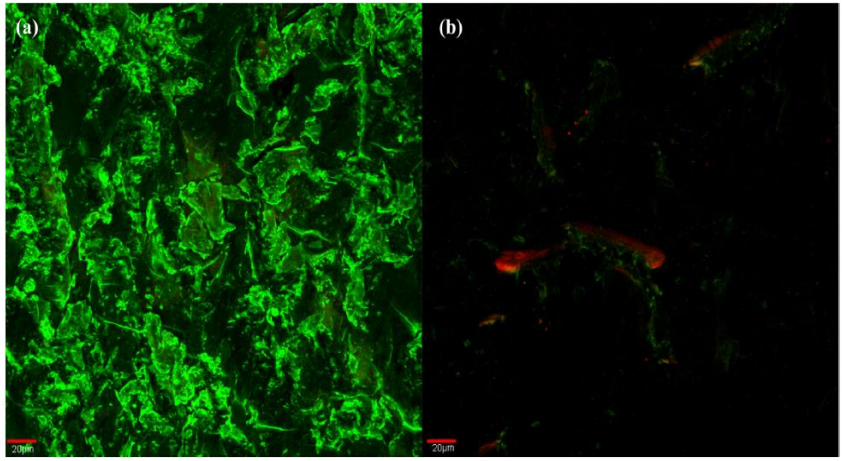
Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin

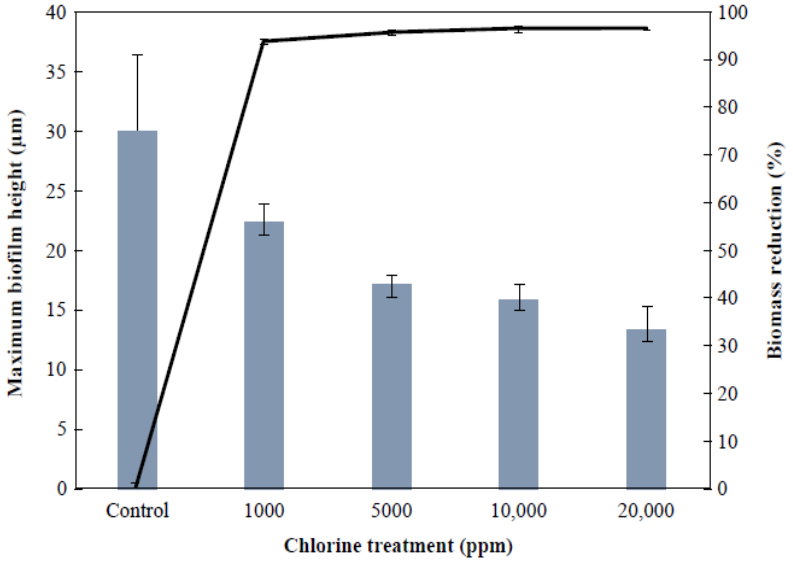
Staphylococcus aureus dry-surface biofilms are not killed by sodium hypochlorite: implications for infection control

A. Almatroudi [a,b], I.B. Gosbell [c,d,e], H. Hu [a], S.O. Jensen [c,d], B.A. Espedido [c,d], S. Tahir [a], T.O. Glasbey [f], P. Legge [a], G. Whiteley [f], A. Deva [a], K. Vickery [a,*]

Hypochlorite exposure reduced plate counts by a factor of 7 log10, and **reduced biofilm biomass by a factor of 100**; however, staining of residual biofilm showed that live ***S. aureus*** **cells remained**.



hypochlorite-treated (**20,000 ppm**) biofilm showing significantly reduced numbers of live (green) and dead (red) bacteria



American Journal of Infection Control 45 (2017) 170-9

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

State of the Science Review

Infection control in the new age of genomic epidemiology

Patrick Tang MD, PhD [a,*], Matthew A. Croxen PhD [b], Mohammad R. Hasan PhD [a,c], William W.L. Hsiao PhD [b,d], Linda M. Hoang MD [b,d]

[a] Department of Pathology, Sidra Medical and Research Center, Doha, Qatar
[b] British Columbia Centre for Disease Control Public Health Laboratory, Vancouver, BC, Canada
[c] Department of Pathology and Laboratory Medicine, Weill Cornell Medical College in Qatar, Doha, Qatar
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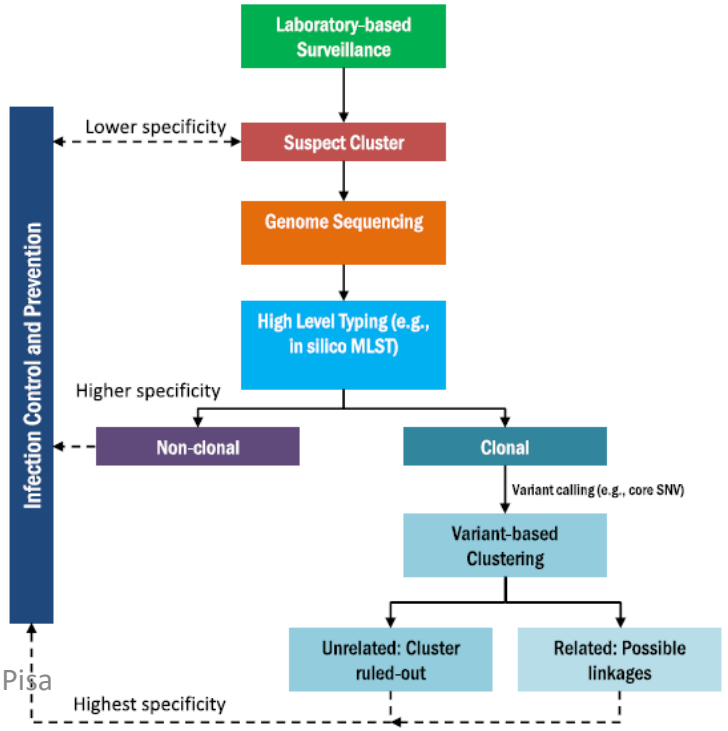
Key Words:
Whole-genome sequencing
Next-generation sequencing
Genomic epidemiology
Outbreak
Genotyping
Molecular epidemiology

With the growing importance of infectious diseases in health care and communicable disease outbreaks garnering increasing attention, new technologies are playing a greater role in helping us prevent health care–associated infections and provide optimal public health. The microbiology laboratory has always played a large role in infection control by providing tools to identify, characterize, and track pathogens. Recently, advances in DNA sequencing technology have ushered in a new era of genomic epidemiology, where traditional molecular diagnostics and genotyping methods are being enhanced and even replaced by genomics-based methods to aid epidemiologic investigations of communicable diseases. The ability to analyze and compare entire pathogen genomes has allowed for unprecedented resolution into how and why infectious diseases spread. As these genomics-based methods continue to improve in speed, cost, and accuracy, they will be increasingly used to inform and guide infection control and public health practices.

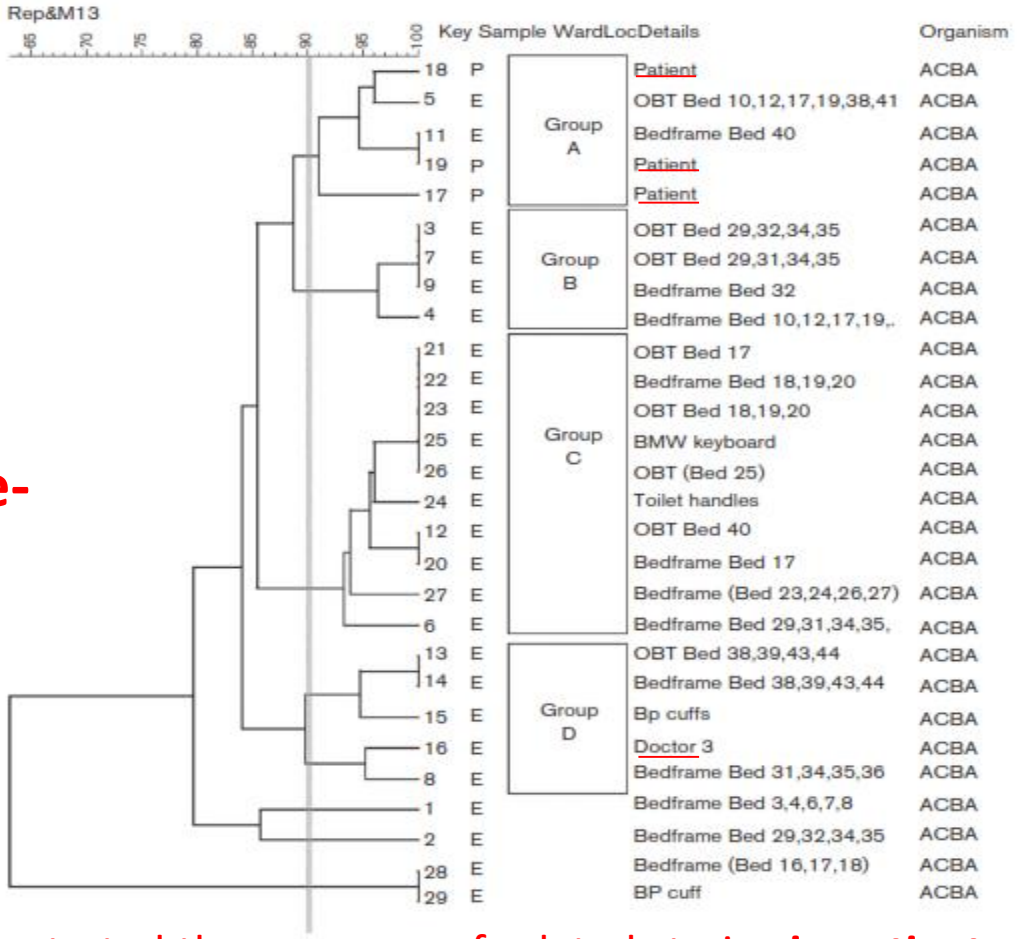


Journal of Medical Microbiology (2013), **62**, 766–772 DOI 10.1099/jmm.0.052860-0

Multidrug-resistant organisms in a routine ward environment: differential propensity for environmental dissemination and implications for infection control

Thean Yen Tan,[1] Jasmine Shi Min Tan,[2] Huiyi Tay,[2] Gek Hong Chua,[3] Lily Siew Yong Ng[1] and Nur Syahidah[4]

Fig. 2. Molecular typing of CR *A. baumannii* isolates.



La genotipizzazione per dimostrare la relazione tra contaminazione ambientale-paziente-operatore sanitario

Molecular typing demonstrated the presence of related strains **in patients and in the environment (Group A)** and on the **hands of healthcare workers and environment (Group D).**

Le superfici "inanimate".

Otter et al American Journal of Infection Control 41 (2013) S6-S11

- **Environmental surfaces were once thought to play a negligible role in the endemic transmission of nosocomial pathogens.**
- **However, recent data indicate that contaminated surfaces play an important role in the endemic and epidemic transmission of certain pathogens that cause health care-associated infections.**
- **Clostridium difficile, MRSA, VRE, norovirus, and multidrug-resistant (MDR) gram-negative rods including Acinetobacter baumannii share the ability to be shed from infected or colonized patients, survive on dry surfaces for extend periods, and are difficult to eradicate by cleaning and disinfection.**
- **Whereas the role of contaminated surfaces in the transmission of some pathogens such as the spore-forming C difficile has been recognized for some time, the importance of contaminated surfaces in the transmission of other pathogens such as MDR A baumannii has come to light only in recent years.**
- **The continued emergence of antimicrobial resistance in gram-negative bacteria in particular means that effective prevention and control strategies are required urgently.**

Cosa sappiamo oggi

- Le superfici che vengono frequentemente a contatto con le mani degli operatori/pazienti sono riconosciute come possibile **serbatoio** di agenti infettivi. *(Carling and Bartley; AJIC 2009 Weber, AJIC 2010, Boyce, JHI 2010; Adams, JHI 2017)*

- La contaminazione delle mani è **simile** dopo il contatto con il paziente e le superfici ambientali *(Carling; AJIC 2009)*

- Il **20% delle ICA** è attribuibile alle superfici ambientali *(Weinstein, AJM 1991)*

- Il **5-30% delle superfici risulta ancora contaminato** nonostante l'adozione di adeguati protocolli di pulizia/disinfezione *(Carling, AJIC 2010)*

- La presenza di **biofilm secchi** è stata avanzata come possibile causa del fallimento della sanificazione e della contaminazione delle mani degli operatori *(Otter, JHIC 2013)*

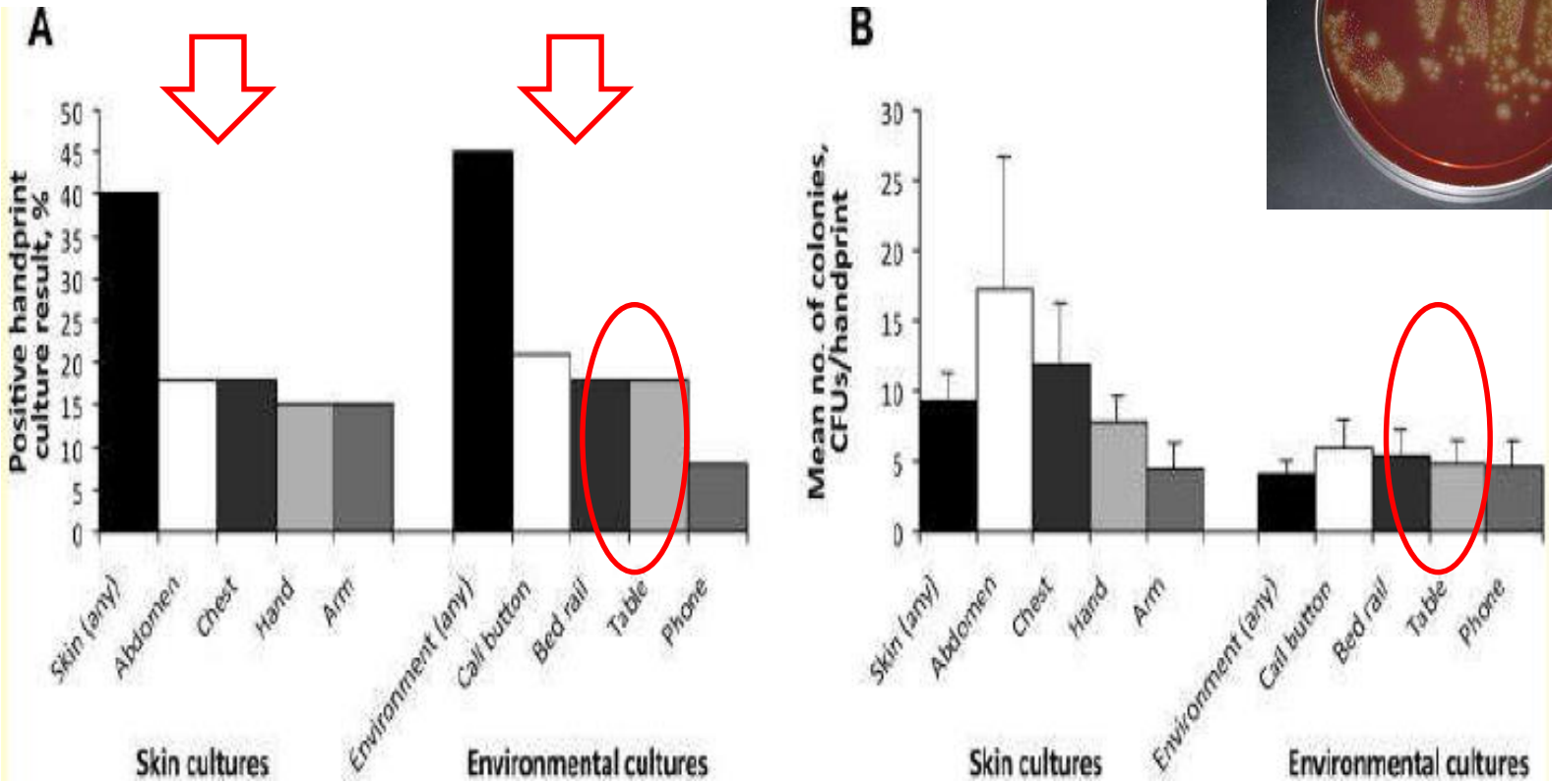
Transmission of healthcare-associated pathogens **most frequently occurs via the transiently contaminated hands of healthcare workers**[1,2], but **environmental surfaces such as medical equipment and housekeeping surfaces (hand-touch sites) may also contribute to the spread of pathogens**[1,3-12].

It's just as easy to pick up microbes from the environment as it is from patient

(Carling and Bartley; AJIC 2009)

John M. *Infect Control Hosp Epidemiol* 2009; 30:678-684.
Siegel JD *Am J Infect Control* 2007; 35:S65–S164.
Samore MH *Am J Med* 1996; 100:32–40.
Hayden MK *Clin Infect Dis* 2006; 42:1552–1560.
Hayden MK *Infect Control Hosp Epidemiol* 2008; 29:149–154.
Martınez JA *Arch Intern Med* 2003; 163:1905–1912.
Huang SS *Arch Intern Med* 2006; 166:1945–1951.
Goodman ER *Infect Control Hosp Epidemiol* 2008; 29:593–599.
Wu HM *Infect Control Hosp Epidemiol* 2005; 26:802–810.
Dancer SJ *J Hosp Infect* 1999; 43:85–100.
Moore G *Infect Control Hosp Epidemiol* 2013;34:500-6
Otter J *Am J Infect Control* 2013; 41: S6-S11

Le mani del personale sanitario si contaminano per contatto con il paziente o con le superfici ambientali?



La contaminazione delle mani con MRSA è simile dopo il contatto con il paziente (40% colture positive) e il contatto con le superfici ambientali (45%). Stiefel et al., ICHE 2011

OPEN ACCESS Freely available online March 2013 | Volume 8 | Issue 3 | PLOS ONE

A Long-Term Low-Frequency Hospital Outbreak of KPC-Producing *Klebsiella pneumoniae* Involving Intergenus Plasmid Diffusion and a Persisting Environmental Reservoir

Ståle Tofteland[1]*, Umaer Naseer[2,3], Jan Helge Lislevand[1], Arnfinn Sundsfjord[2,3], Ørjan Samuelsen[2]*

- **KPC-*K. pneumoniae*** (ST258-KPC2) strains were identified from the **sink drains** and patients.
- ***bla* KPC-positive *E. asburiae*** was also isolated from the **sink drain.**
- **after sinks and sink traps decontamination, KPC-*K.pneumoniae* was again recovered.**

- **backsplash** during hand washing in a contaminated sink and sink drains **has been suggested as a possible mode of transmission** to health care workers and subsequently to patients

AJIC 2005; 33: **14%-50% di colonizzazioni/infezioni**

Ecology of *Pseudomonas aeruginosa* in the intensive care unit and the evolving role of water outlets as a reservoir of the organism

Matthias Trautmann, MD,* Philipp M. Lepper, MD,† and Mathias Haller, MD*
Stuttgart, Ulm, and Kempten, Germany

Intensive Care Med (2005) 31:1715–1718
DOI 10.1007/s00134-005-2824-9

BRIEF REPORT

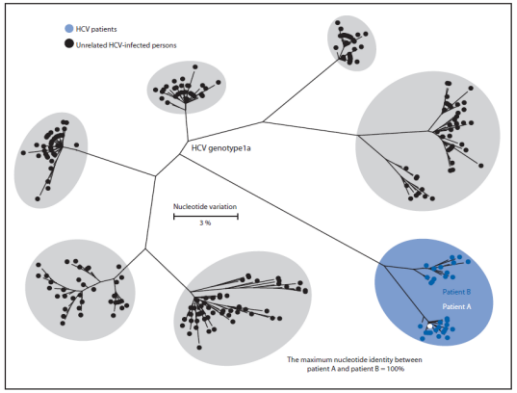
Jacques Merrer
Emmanuelle Girou
David Ducellier
Nicole Clavreul
Florence Cleran
Patrick Legrand
Michel Lameyn

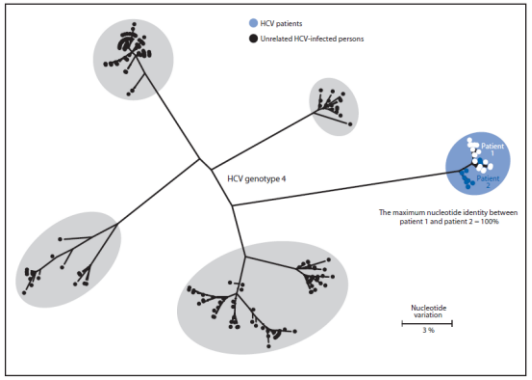
Should electronic faucets be used in intensive care and hematology units?

...a major reservoir for *P. aeruginosa and Legionella spp.*

Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Weekly / Vol. 64 / No. 7
February 27, 2015

Transmission of Hepatitis C Virus Associated with Surgical Procedures — New Jersey 2010 and Wisconsin 2011





- **What is already known on this topic?**
  - **Hepatitis C virus (HCV) transmission documented in health care settings has been primarily a result of unsafe injection practices including reuse of needles, fingerstick devices, and syringes, and other breaches in infection control.**
- **What is added by this report?**
  - **Two separate occurrences of health care–associated HCV transmission likely resulted from breaches of infection prevention practices during surgical procedures. In one case, two patients received injectable propofol from the same medication cart; in the other, two patients received kidneys that had been perfused on the same machine. Molecular analyses of HCV strains helped epidemiologic investigators identify the source of transmission.**

Contents lists available at ScienceDirect

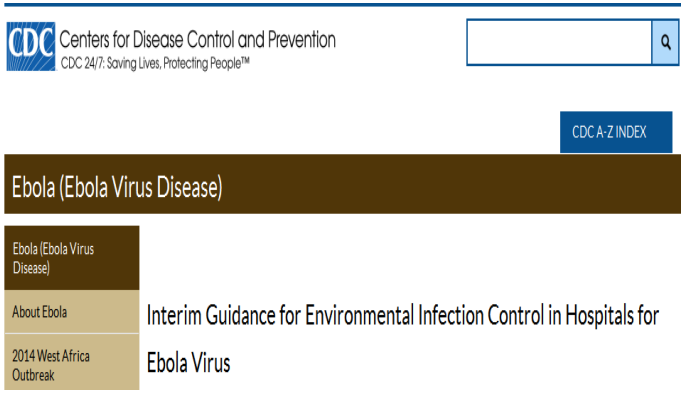
American Journal of Infection Control

journal homepage: www.ajicjournal.org

Commentary

Nebraska Biocontainment Unit patient discharge and environmental decontamination after Ebola care

Katelyn C. Jelden BS[a], Shawn G. Gibbs PhD[a,b], Philip W. Smith MD[b,c], Michelle M. Schwedhelm MSN[b,d], Peter C. Iwen PhD[e], Elizabeth L. Beam MSN[b,f], A. Kim Hayes RN[g], Nedra Marion MPA[g], Christopher J. Kratochvil MD[h], Kathleen C. Boulter BA[b], Angela L. Hewlett MD[b,c], John J. Lowe PhD[a,b,*]



Centers for Disease Control and Prevention

CDC 24/7: Saving Lives, Protecting People™

CDC A-Z INDEX

Ebola (Ebola Virus Disease)

Ebola (Ebola Virus Disease)

About Ebola

2014 West Africa Outbreak

Interim Guidance for Environmental Infection Control in Hospitals for Ebola Virus

- **EVD is transmitted by contact with infected blood or bodily fluids with an infectious dose of <10 viruses and high virus concentrations in blood 10^8 virus particles/mL**
- **Although negative for virus by molecular testing (quantitative polymerase chain reaction [qPCR] assay), discharged NBU patients successfully treated for EVD are at risk of touching EVD contaminated surfaces within the patient room and may serve as a disease vector to areas outside of isolation on discharge from the unit.**
- **Additionally, EVD patient remains are infectious and require safe and respectful infection control measures.**
- **To manage risks posed by EVD, the NBU uses infection control protocols that guide all steps of patient release, removal of patient remains, waste disposal, and systematic environmental decontamination that involves waste removal, surface cleaning, and multiple steps of disinfection.**

American Journal of Infection Control 43 (2015) 286-8

Contents lists available at ScienceDirect

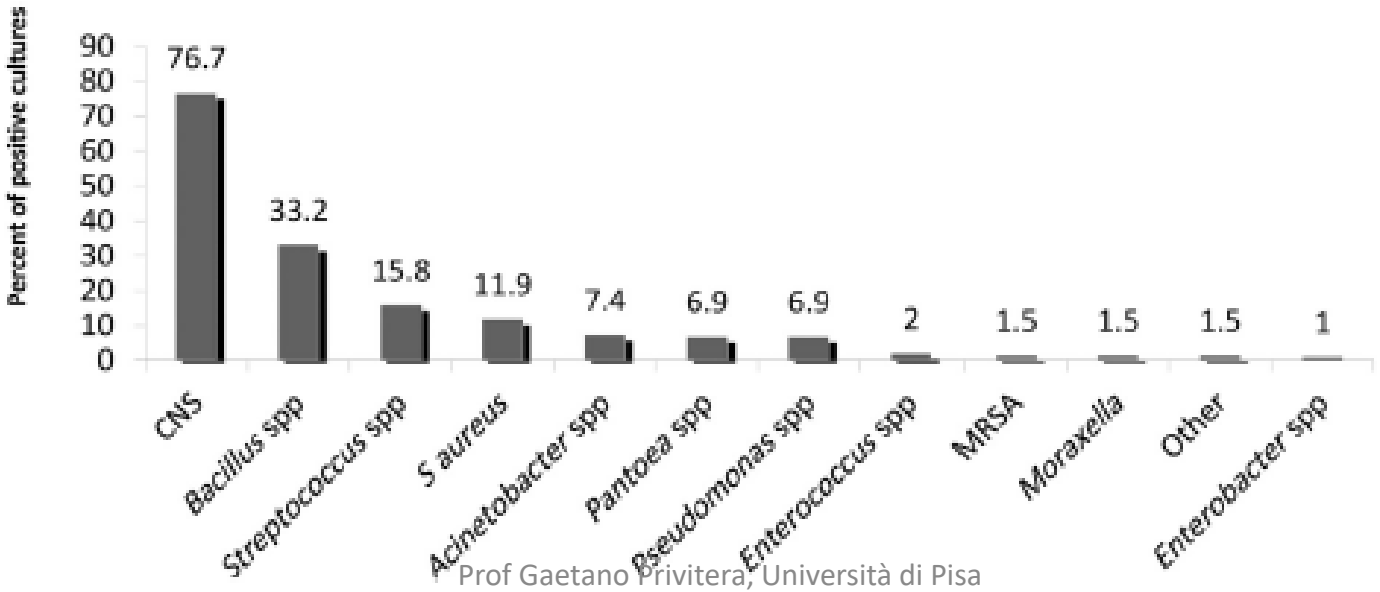
American Journal of Infection Control

journal homepage: www.ajicjournal.org

Brief report

Use of portable electronic devices in a hospital setting and their potential for bacterial colonization

Amber Khan MD [a,b,*], Amitha Rao MD [c], Carlos Reyes-Sacin MD [d], Kayoko Hayakawa MD, PhD [e], Susan Szpunar PhD [f], Kathleen Riederer MT [f], Keith Kaye MD, MPH [b,g], Joel T. Fishbain MD [h], Diane Levine MD [a,b]



American Journal of Infection Control xxx (2014) 1-3

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Brief report

Effectiveness of stringent decontamination of computer input devices in the era of electronic medical records and bedside computing: A randomized controlled trial

Shlomi Codish MD[a,b,c,*], Ronen Toledano BmedSc[a,b], Victor Novack MD, PhD[a,b], Michael Sherf MD, MPH[b,c], Abraham Borer MD[b,c,d]

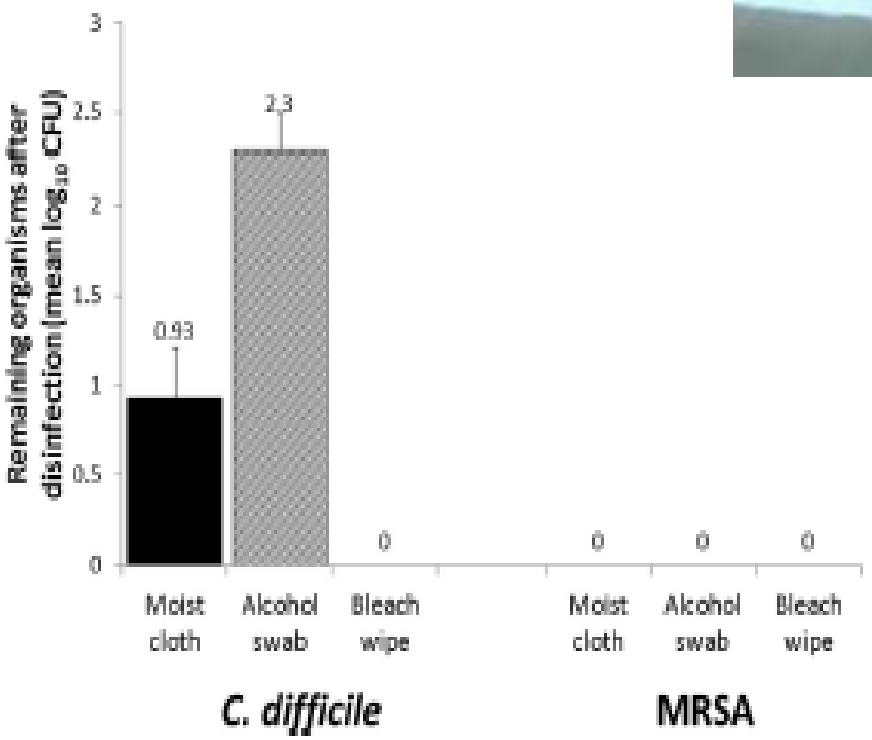
- **Bedside computing may lead to increased hospital-acquired infections mediated by computer input devices handled immediately after patient contact.**
- **We compared 2 decontamination methods in 2 types of wards.**
- **We found high baseline contamination rates, which decreased following decontamination, but the rates remained unacceptably high.**
- **Decontamination was more effective in intensive care units compared with medical wards and when using alcohol-based impregnated wipes compared with quaternary ammonium-based impregnated wipes**

American Journal of Infection Control xxx (2013) 1-2

Letter to the editor

Disinfection of iPad to reduce contamination with *Clostridium difficile* and methicillin-resistant *Staphylococcus aureus*

To the Editor:



3 su 20 (15%) IPad sono risultati positivi per *C.difficile* o GRAM-, nessuno per *S.aureus*

Efficacia di differenti metodi di disinfezione (IPad artificialmente contaminati)

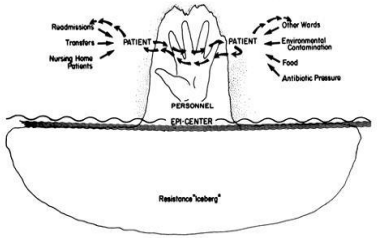
INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY NOVEMBER 2016, VOL. 37, NO. 11

ORIGINAL ARTICLE

Healthcare Personnel Attire and Devices as Fomites: A Systematic Review

Nicholas Haun, MD;[1] Christopher Hooper-Lane, MA;[2] Nasia Safdar, MD, PhD[3,4]

- **Twenty-four studies analyzed contamination of stethoscopes, with MRSA contamination prevalence of 0–42% and GNR prevalence of 0–31%.**
- **Twentyeight studies analyzed digital communication devices; 21 of these evaluated mobile phones explicitly. The range of MRSA contamination for phones was 0–20% and the range of GNR contamination for phones was 0–75%.**
- **One study of tablets had MRSA contamination of 50%.**
- **Eight studies on white coats yielded rates of MRSA contamination of 0–16%, with GNR contamination of white coats ranged from 0 to 42%.**
- **Neckties had a reported MRSA contamination rate of 3%–32% and GNR contamination of 11%–23% in 5 studies.**



Isolation Room Surfaces

1

2

Exposure

Known Infection or Colonization

Portable Equipment

Hands of Healthcare Personnel

Susceptible Patient

Antibiotic pressures

4

Unidentified Carrier

Skin, Bedding, and Clothing

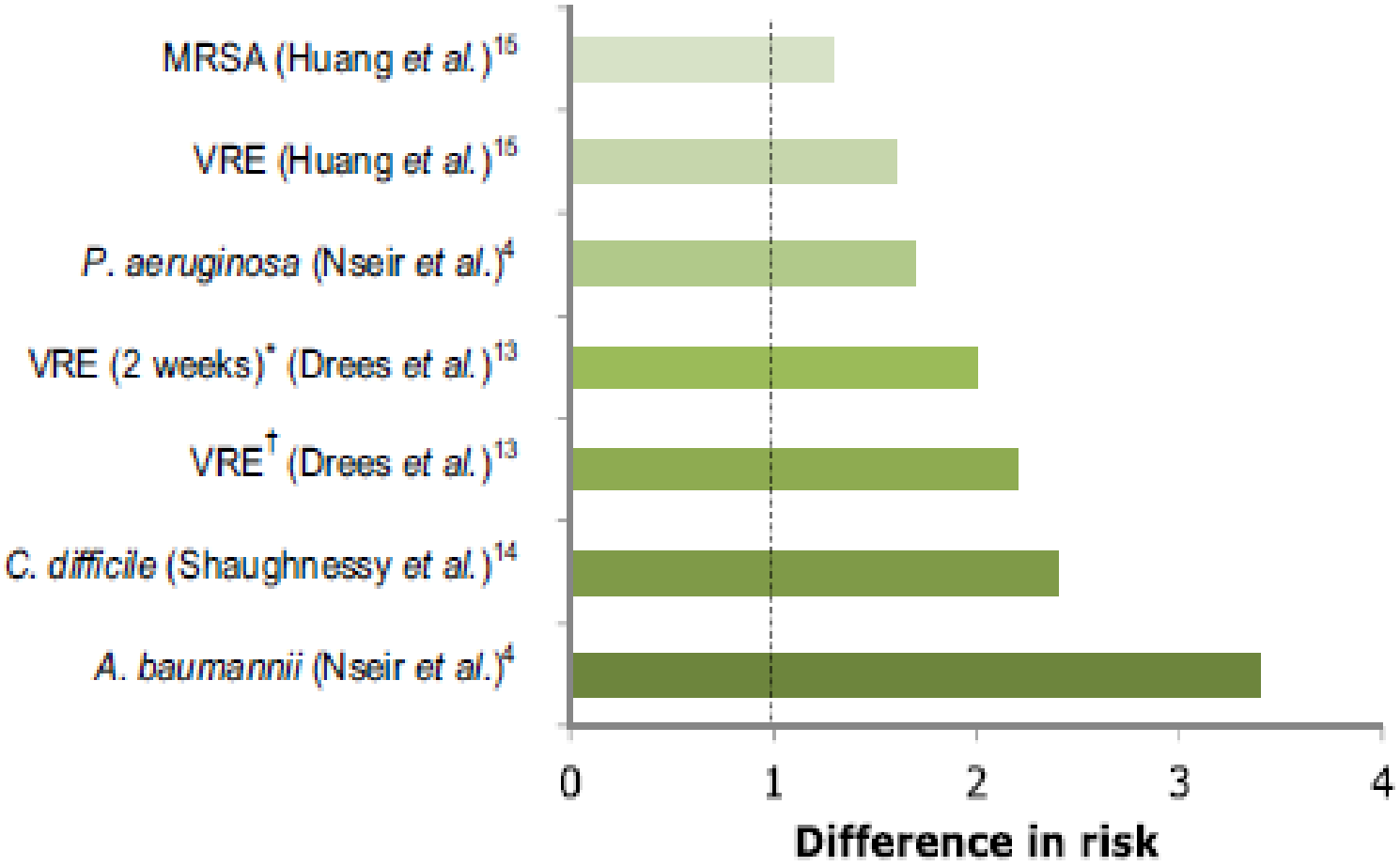
3

Properties of hospital pathogens

	Survival time	Infectious dose
MRSA	7 days to >7 months	4 cfu's
Acinetobacter	3 days to >5 months	250 cfu's
C.difficile	>5 months	7 spores
VRE	5 days to >4 months	$<10^3$ cfu's
Norovirus	8 hours to 7 days	10-100 virions

Kramer, BMC Infect Dis, 2006; Wagenvoort, JHI 2000; Chiang, Crit Care Med 2009; Wilcox M, 2010; Larson, Lancet 1978; Kjerulf et al, APMIS 1998

Aumento del rischio associato con la condivisione di una stanza dove precedentemente è stato ricoverato un paziente:



J.A. Otter et al. / American Journal of Infection Control 41 (2013) S6-S11

COME DECONTAMINARE?

Giugno 2019: Un cluster di infezioni da *Bacillus cereus* in TI

Journal of Hospital Infection xxx (2018) 1–7

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevier.com/locate/jhin

Is there an association between airborne and surface microbes in the critical care environment?

J. Smith [a], C.E. Adams [b], M.F. King [c], C.J. Noakes [c], C. Robertson [d,e,f], S.J. Dancer [a,g,*]

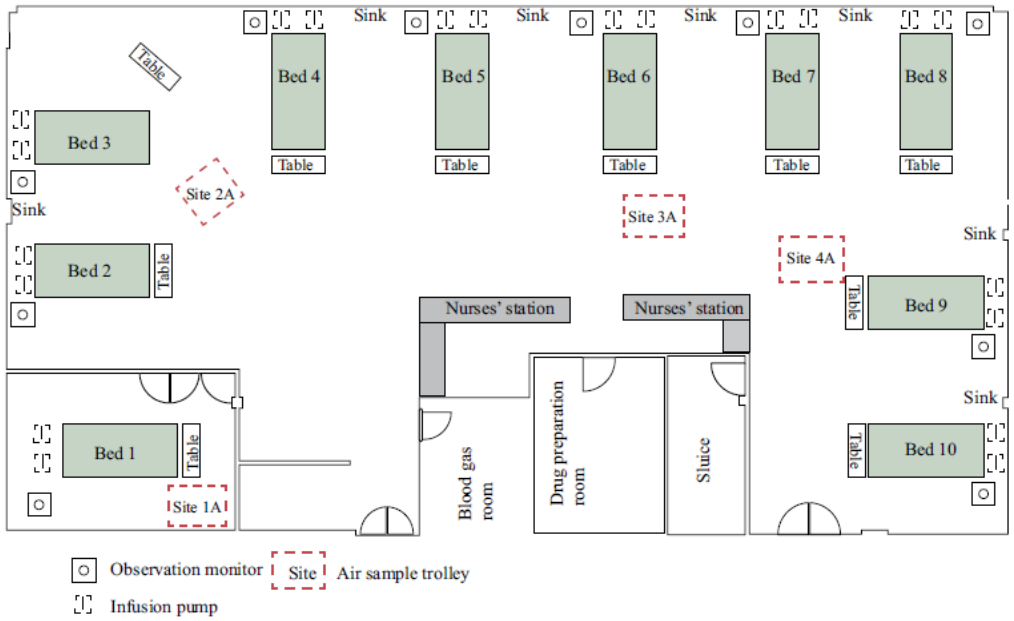


Figure 1. Intensive care unit (ICU) layout.

Background: There are few data and no accepted standards for air quality in the intensive care unit (ICU). Any relationship between airborne pathogens and hospital-acquired infection (HAI) risk in the ICU remains unknown.

Aim: First, to correlate environmental contamination of air and surfaces in the ICU second, to examine any association between environmental contamination and ICU acquired staphylococcal infection.

Conclusion: Passive air sampling provides quantitative data analogous to that obtained from surfaces. Settle plates could serve as a proxy for routine environmental screening to determine the infection risk in ICU.

RAPID RISK ASSESSMENT

Regional outbreak of New Delhi metallo-beta-lactamase-producing carbapenem-resistant Enterobacteriaceae, Italy, 2018–2019

4 June 2019

Summary

A large outbreak of New Delhi metallo-beta-lactamase (NDM)-producing carbapenem-resistant Enterobacteriaceae (CRE) has been reported from the Tuscany region in Italy. Between November 2018 and May 2019, seven Tuscan hospitals notified a total of 350 cases. Due to its size and the resulting change in the epidemiology of CRE, the reported outbreak is a significant event, despite previous endemicity of *Klebsiella pneumoniae* carbapenamase (KPC)-producing CRE in this geographic area. The change in the type of carbapenemase further reduces treatment options because NDM-producing CRE are not susceptible to some of the new beta-lactam/beta-lactamase inhibitor combinations such as ceftazidime-avibactam and meropenem-vaborbactam.

Numerous reported outbreaks and examples of cross-border transmission of NDM-producing CRE in the European Union/European Economic Area (EU/EEA) demonstrate the transmission potential of NDM-producing CRE in European healthcare systems. Outbreaks such as the one in Tuscany present a risk for cross-border transmission and further spread to other EU/EEA countries, especially since the affected area is a major tourist destination. Given the previous rapid establishment of KPC-producing CRE in Italy (which resulted in an endemic situation), the risk for further spread of NDM-producing CRE from the current outbreak is considered to be high for Italy and moderate for cross-border spread to other EU/EEA countries.

Sporadic cases of community acquisition of NDM-producing CRE have also been described for other European countries. However, the introduction and dissemination of these bacteria have mainly been associated with healthcare settings. Therefore, the risk of acquisition of NDM-producing CRE related to this outbreak is likely restricted to persons with recent healthcare contact.

Event background

Italy reported an outbreak of NDM-producing CRE affecting seven hospitals in the northwestern area of Tuscany, with 350 cases reported between November 2018 and 23 May 2019. Among these cases, there were 50 with bloodstream infection, 43 with isolation in the urine, 15 with isolation in respiratory tract samples and 242 with gastrointestinal tract carriage. The isolates are resistant to aminoglycosides but retain susceptibility to fosfomycin and colistin. The presence of NDM has been confirmed by molecular testing. Preliminary results of pulsed-field gel electrophoresis show that the involved NDM-producing *K. pneumoniae* isolates are mostly clonal. The source of the outbreak remains to be determined. In the same geographic area, KPC-producing CRE have been endemic since

Suggested citation: European Centre for Disease Prevention and Control. Regional outbreak of New Delhi metallo-beta-lactamase producing carbapenem-resistant Enterobacteriaceae, Italy, 2018–2019 – 4 June 2019. ECDC: Stockholm; 2019.

RAPID RISK ASSESSMENT

Carbapenem-resistant Enterobacteriaceae - first update

4 June 2018

Conclusions and options for response

Carbapenem-resistant Enterobacteriaceae (CRE) pose a significant threat to patients and healthcare systems in all EU/EEA countries. CRE infections are associated with high mortality, primarily due to delays in administration of effective treatment and the limited availability of treatment options. New antibiotics capable of replacing carbapenems for their main indications are not likely to become available in the near future. CRE are adapted to spread in healthcare settings as well as in the community, and measures should address both routes of transmission.

Options for actions to reduce identified risks

1. Actions related to limited treatment options and high mortality

Timely and appropriate laboratory investigation and reporting is essential in order to avoid a delay in appropriate treatment, which is associated with increased morbidity and mortality. Patients with CRE infections will benefit from consultations with specialists in infectious diseases or clinical microbiology, which would ensure the best possible outcome, given the limited treatment options.

2. Actions to prevent transmission of CRE in hospitals and other healthcare settings

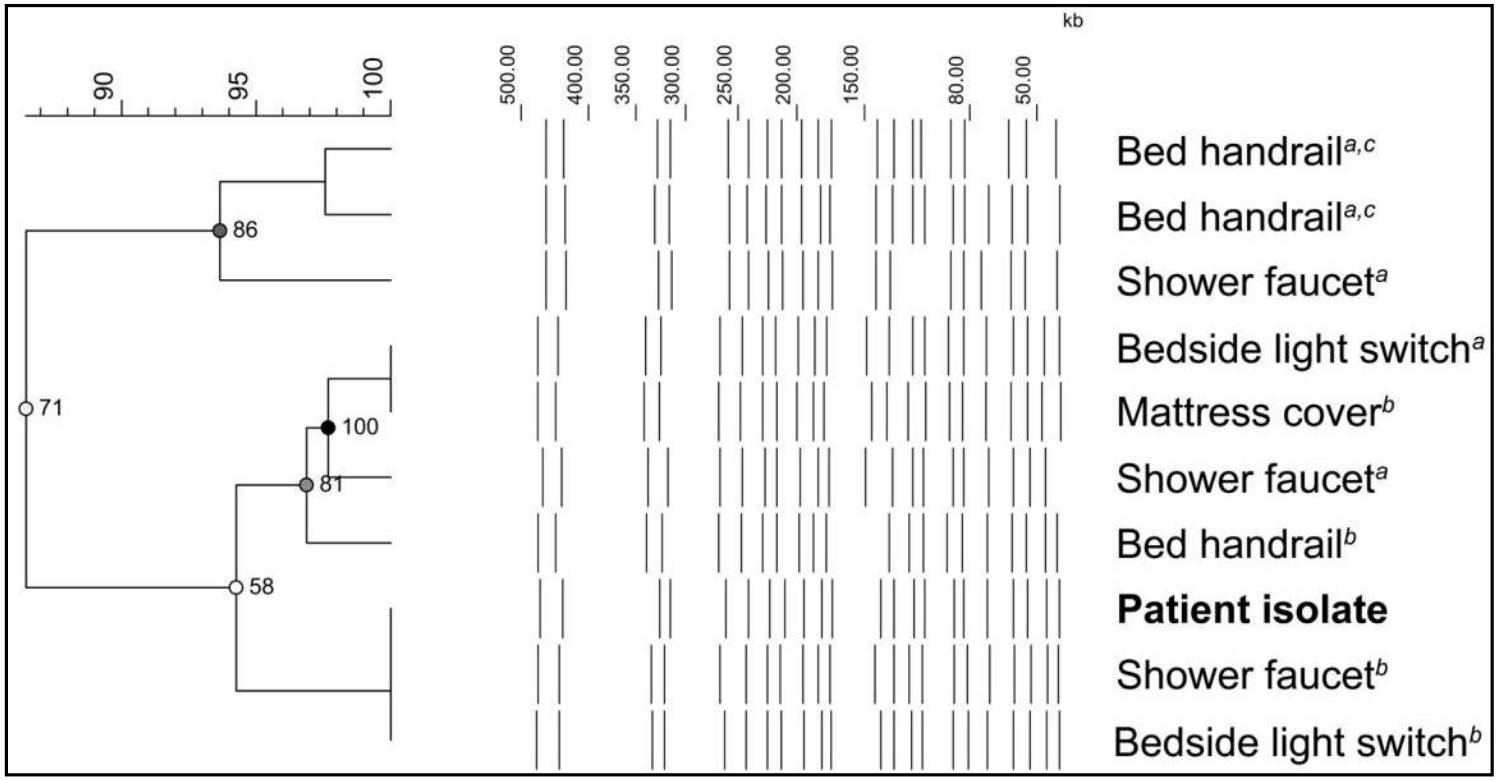
Implementation of and strict adherence to infection control measures - including hand hygiene, contact precautions, environmental cleaning, proper reprocessing of medical devices, adequate microbiological laboratory capacity and sufficient capacity for contact isolation - are the basis for preventing transmission of multidrug-resistant bacteria such as CRE for both infected and colonised patients. Prompt notification of the clinical team and of the infection prevention and control/hospital hygiene team is essential in order to implement timely infection control precautions. For healthcare settings other than acute care, the control measures implemented should be proportionate to the risk of CRE transmission to other patients.

Targeting patients at high risk of CRE carriage

Patients who have recently been hospitalised in a country or region known as having a high CRE prevalence – or who have been transferred from an individual hospital with a high CRE prevalence – should be considered at high risk of CRE carriage in their digestive tract. Screening these patients for digestive tract CRE carriage and implementing pre-emptive contact precautions and pre-emptive isolation should be considered. Hospitals could also consider pre-emptive isolation and screening for digestive tract CRE carriage in accordance with national guidance for patients who may recently have travelled to countries/regions known for high CRE prevalence, even if they were not in contact with a healthcare institution/service.

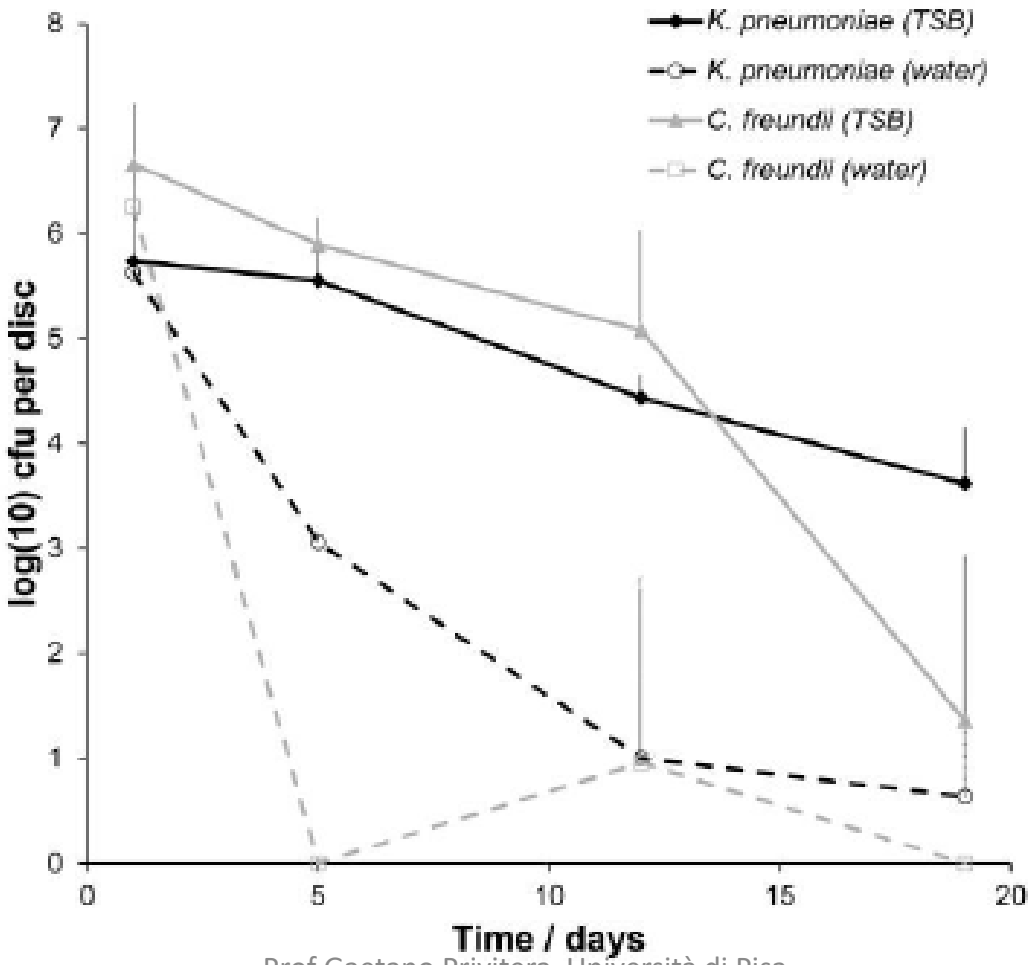
Suggested citation: European Centre for Disease Prevention and Control. Rapid risk assessment: Carbapenem-resistant Enterobacteriaceae - first update 4 June 2018. Stockholm: ECDC; 2018.

Search and You Will Find: Detecting Extended-Spectrum β-Lactamase–Producing *Klebsiella pneumoniae* from a Patient's Immediate Environment



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

Extended Survival of Carbapenem-Resistant Enterobacteriaceae on Dry Surfaces
Author(s): Nancy L. Havill, MT(ASCP), CIC; John M. Boyce, MD; Jonathan A. Otter, PhD
Source: *Infection Control and Hospital Epidemiology*, Vol. 35, No. 4, Special Topic Issue: Carbapenem-Resistant Enterobacteriaceae and Multidrug-Resistant Organisms (April 2014), pp. 445-447



Actions to prevent transmission in healthcare facilities

Appropriate hand hygiene compliance is considered fundamental to all good infection prevention and control (IPC) programmes and the control of cross-transmission of many pathogens, including CRE [33]. Contact precautions are also an important component of the IPC measures necessary to control HAI and other infections. Contact precautions include appropriate patient placement, use of personal protective equipment (including gloves and gowns), limitation of transport and movement of patients, use of disposable or dedicated patient care equipment, and prioritisation of cleaning and disinfection of patient rooms.

Preventing transmission from CRE-positive patients

Enhanced control measures (for example contact precautions, isolation or cohorting) and a dedicated nursing staff should be considered for hospitalised patients with confirmed digestive tract CRE carriage or confirmed CRE infection. In addition, screening of contacts will enable early identification of carriers and implementation of control measures.

Preventing spread of CRE in specific wards/units

In units/wards where patients are at high risk of infection (e.g. intensive care units and onco-haematology units), pre-emptive isolation and active surveillance (screening) for CRE by rectal swab on admission should be considered, depending on the risk of digestive tract CRE carriage and the local prevalence of CRE. Regular review of appropriate device use is an important infection prevention measure in high-risk settings. The role of the environmental reservoir of epidemic CRE strains and/or carbapenemase-encoding plasmids should be investigated, and relevant control measures should be implemented accordingly. Compliance with environmental cleaning protocols for the immediate surroundings ('patient zone') of patients colonised or infected with CRE should be ensured.

Further control measures are outlined in the updated ECDC rapid risk assessment on carbapenem-resistant Enterobacteriaceae [34] and an ECDC guidance document [35].

AUSTRALIAN COMMISSION
ON SAFETY AND QUALITY IN HEALTH CARE

Recommendations for the control of carbapenemase-producing *Enterobacteriaceae* (CPE)

A guide for acute care health facilities

May 2017

3 Strategies to reduce CPE transmission

3.4 Cleaning and disinfection as part of contact precautions

Statement of intent

The intent of the recommendations in this section is to provide a clean and hygienic environment, to minimise the risk of transmission of CPE to patients and the workforce. These recommendations are consistent with the information on cleaning and disinfection in the *Australian guidelines for the prevention and control of infection in healthcare*.[1]

Recommendations 1.3.1 and 1.3.2 provide an overview for a health facility cleaning program. The implementation of contact precautions for CPE-positive patients means that cleaning and disinfection of environmental surfaces and equipment are important risk management strategies. Disinfection can be achieved using thermal or chemical agents following cleaning, to destroy any remaining infectious agents.

What is cleaning and disinfection?

Cleaning: Removal of visible or identifiable contamination from devices or a surface, using either mechanical or physical action with a detergent and water, or with appropriate chemical agents.

Disinfection: Destruction of microorganisms (but not spores) by thermal or chemical means.

Recommendations

3.4.1 Rooms, toilets, and frequently touched surfaces and items should be cleaned and disinfected at least twice per day for the duration of the patient's admission.[1,52,53]

3.4.2 Dedicated medical equipment should be used for care of CPE-positive patients. The equipment should be cleaned and disinfected before it is used with another patient.[54,55]

3.4.3 Following discharge or transfer of the patient, the room, toilet and all other items should be cleaned and disinfected in accordance with the *Australian guidelines for the prevention and control of infection in healthcare*.[1]

3.4.4 Health facilities should monitor and audit cleaning according to state or territory policy.[26]

Note: Standard precautions apply for the management of linen and waste from CPE-positive patients.

Rationale and commentary

- Environmental reservoirs for multidrug-resistant gram-negative bacteria are potentially an important factor in healthcare-associated transmission. Patients colonised or infected with CPE widely contaminate their immediate patient environment.[25,27]
- A relationship exists between the environment and transmission of multidrug-resistant gram-negative bacteria[56] (see Section 1.3).
- For additional information, refer to the *Australian guidelines for the prevention and control of infection in healthcare*[1] (Section B1.4: Routine management of the physical environment, Section B2.2.3: How should contact precautions be applied?, and Section B3.1.2: Core strategies for MRO [multi-resistant organism] prevention and control).

Outbreak management

4

4.5 Additional screening

Staff screening

In the absence of evidence to support screening of staff during an outbreak of CPE, routine screening is not required.[1]

Health facilities may consider screening staff who have worked in overseas hospitals in the previous 12 months.

Environmental screening

Environmental screening is generally not recommended (see Section 2.8). Health facilities may consider environmental screening where there is confirmed local transmission of CPE. If environmental screening is considered necessary, it should be coordinated by the infection control team.

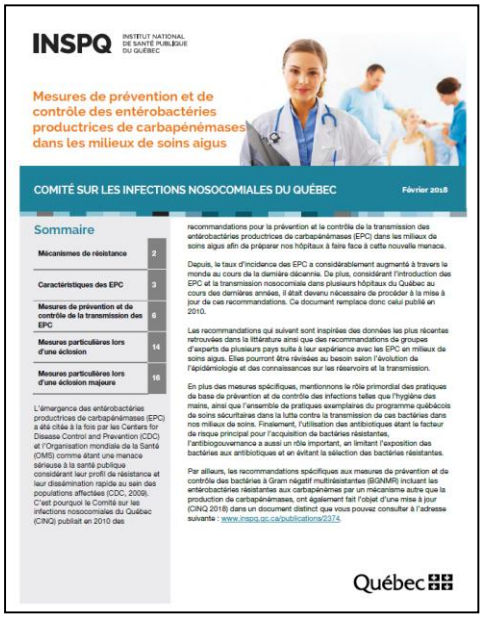
Examples of environmental screening:

- Shared patient equipment.[56]
- Frequently touched surfaces – trolleys, bedside commodes, bedrails, doorknobs, light switches, tap handles, ensuite facilities, drains, sinks, toilets, mobile computer workstations and other shared electronic devices such as tablet computers.[53]

4.6 Staff education

Statement of intent

The intent of the recommendations in this section is to ensure staff education and awareness during an outbreak. See Recommendation 1.1.6 for staff education requirements.



INSPQ INSTITUT NATIONAL DE SANTÉ PUBLIQUE DU QUÉBEC

Mesures de prévention et de contrôle des entérobactéries productrices de carbapénémases dans les milieux de soins aigus

COMITÉ SUR LES INFECTIONS NOSOCOMIALES DU QUÉBEC Février 2018

Sommaire

L'émergence des entérobactéries productrices de carbapénémases (EPC) a été citée à la fois par les Centers for Disease Control and Prevention (CDC) et l'Organisation mondiale de la Santé (OMS) comme étant une menace sérieuse à la santé publique considérant leur profil de résistance et leur dissémination rapide au sein des populations affectées (CDC, 2009). C'est pourquoi le Comité sur les infections nosocomiales du Québec (CINQ) publiait en 2010 des recommandations pour la prévention et la contrôle de la transmission des entérobactéries productrices de carbapénémases (EPC) dans les milieux de soins aigus afin de préparer nos hôpitaux à faire face à cette nouvelle menace.

Depuis, la taux d'incidence des EPC a considérablement augmenté à travers le monde au cours de la dernière décennie. De plus, considérant l'introduction des EPC et la transmission nosocomiale dans plusieurs hôpitaux du Québec au cours des dernières années, il était devenu nécessaire de procéder à la mise à jour de ces recommandations. Ce document remplace donc celui publié en 2010.

Les recommandations qui suivent sont inspirées des données les plus récentes retrouvées dans la littérature ainsi que des recommandations de groupes d'experts de plusieurs pays suite à leur expérience avec les EPC en milieux de soins aigus. Elles pourront être révisées au besoin selon l'évolution de l'épidémiologie et des connaissances sur les réservoirs et la transmission.

En plus des mesures spécifiques, mentionnons le rôle primordial des pratiques de base de prévention et de contrôle des infections telles que l'hygiène des mains, ainsi que l'ensemble de pratiques exemplaires du programme québécois de soins sécuritaires dans la lutte contre la transmission de ces bactéries dans nos milieux de soins. Finalement, l'utilisation des antibiotiques étant le facteur de risque principal pour l'acquisition de bactéries résistantes, l'antibiogouvernance a aussi un rôle important, en limitant l'exposition des bactéries aux antibiotiques et en évitant la sélection des bactéries résistantes.

Par ailleurs, les recommandations spécifiques aux mesures de prévention et de contrôle des bactéries à Gram négatif multirésistantes (BGNMR) incluant les entérobactéries résistantes aux carbapénèmes par un mécanisme autre que la production de carbapénémases, ont également fait l'objet d'une mise à jour (CINQ 2018) dans un document distinct que vous pouvez consulter à l'adresse suivante : www.inspq.qc.ca/publications/2374.

Québec

- MODALITA' OPERATIVE
- Utilizzare i DPI prima di entrare nella stanza da disinfettare.
- Le superfici "high touch" della camera da letto e del bagno devono essere pulite e disinfettate due volte al giorno (mattina e a fine giornata) secondo le procedure previste e con prodotti di riconosciuta efficacia e classificati come Presidio Medico Chirurgico (PMC) o Dispositivo Medico (DM) a seconda della destinazione d'uso.
- Non è necessario usare soluzioni a base di cloro (ICHE 2017). Per la pulizia e la disinfezione di altre superfici nella stanza e il bagno seguire le procedure previste dall'ospedale.
- Assicurarsi che il protocollo di disinfezione utilizzi un approccio sistematico, con un elenco di compiti ben definiti in modo che tutte le superfici contaminate siano pulite e disinfettate. Se possibile destinare personale specifico alla pulizia e disinfezione di queste aree.
- Assicurarsi che la pulizia e la disinfezione siano svolte tempestivamente a seguito di contaminazione ambientale. Quando termina l'applicazione di precauzioni aggiuntive contro la trasmissione microbica o a seguito della dimissione del paziente occorre procedere con la disinfezione terminale della stanza secondo la procedura aziendale.
- Tutto ciò che non può essere pulito e disinfettato deve essere eliminato. Divisori e tende devono essere cambiate (ICHE 2017).
- Eliminare o pulire e disinfettare il materiale utilizzato in modo da evitare la colonizzazione dell'ambiente.
- MATERIALI E DISPOSITIVI MEDICI
- Utilizzare materiali sanitari monouso o riservati ad uso esclusivo del paziente. Limitare i materiali sanitari all'interno della stanza alla quantità necessaria. I dispositivi medici riutilizzabili devono essere puliti e disinfettati prima di essere applicati su un nuovo paziente.
- Se il paziente è portatore di un dispositivo medico invasivo occorre valutarne periodicamente la necessità e rimuoverlo quando non è più necessario al fine di prevenire l'insorgenza di infezioni.
- GESTIONE DEGLI ESCRETI
- E' importante che il paziente possa avvalersi di un bagno riservato.
- Utilizzare sacchi igienici per coprire la padella o il secchio della comoda riservate al paziente.
- Queste devono essere puliti e disinfettati dopo ogni uso. L'impiego di un lavapadelle a termodisinfezione è raccomandato.
- Assicurarsi che tutte le strutture fisse (comoda, supporti per i sacchetti igienici) vengano puliti e disinfettati tra un utilizzo ed un altro tramite l'uso di salviettine disinfettanti. In presenza di sporco visibile, le attrezzature devono essere pulite e disinfettate completamente tramite l'impiego di un lavapadelle.

Quale livello di pulizia vogliamo garantire?

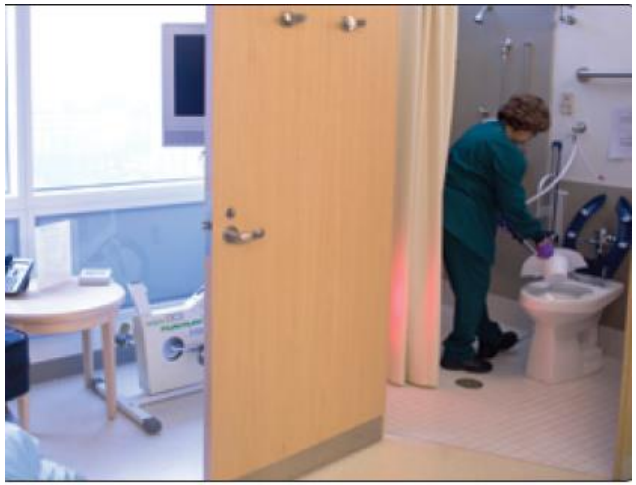


Table I: Achieving the Desired Cleanliness

	Considerations
What is the **desired state** of cleanliness?	What level of cleanliness is warranted or desired? How would it be measured? How will we know when the desired level is attained?
What is the **current state** of cleanliness?	What is the baseline level? What needs to be prevented, removed or inactivated in a particular area (e.g., soil, grease, bacteria, odors, etc.)?
How can the gap be closed, between the current cleanliness and the desired state?	What types of cleaning products or methods are effective for moving from the baseline condition to the desired outcome? What are the cleaning products/methods that address specific needs (e.g., removal of soil, grease, bacteria, odors)? What constraints exist (e.g., physical limitations, occupied space, food preparation surfaces)? How does one find, evaluate and select the products or practices? How does one assess and weigh the merits and shortcomings of the alternative products and practices?

Obbiettivi della Sanificazione

- **Pulizia**
- **Comfort**
- **Manutenzione e integrità delle superfici**
- **Eliminare i serbatoi dei microrganismi**
  - **Limitare la trasmissione dei microrganismi a partire dalle superfici ambientali inerti**

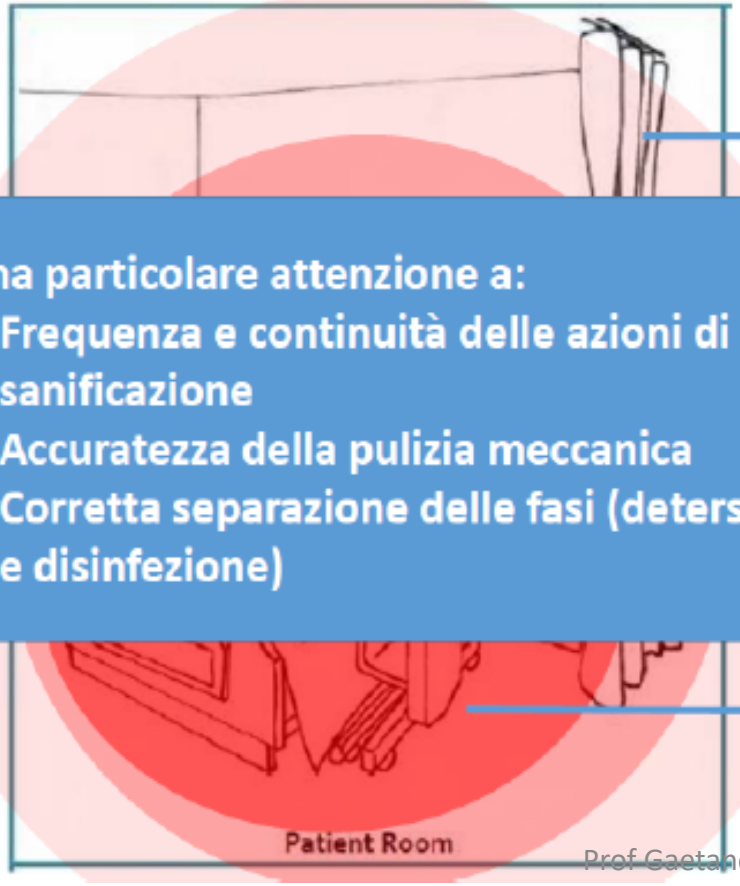
L'appalto dei servizi ambientali

- There is **extensive outsourcing of hospital cleaning services to private sector contractors, in part because of** the potential to reduce costs.
- In this contest, **to implement the cleaning protocols is very difficult: contracted-out services are considered too inflexible** to deal with changing circumstances, including unscheduled cleaning or changes in products and protocols.
- Moreover **the service does not cover all critical environmental surfaces,** devices are sanitized only if they are disconnected from the electricity network.

Passare dalla programmazione delle attività basata sulla valutazione del rischio per aree al rischio situazionale basato sul paziente

RACCOMANDAZIONI PER LA SANIFICAZIONE AMBIENTALE

Guidelines for Environmental Infection Control in Health-Care Facilities - Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC) U.S. Department of Health and Human Services Centers for Disease Control and Prevention (CDC)



Una particolare attenzione a:
- **Frequenza e continuità delle azioni di sanificazione**
- **Accuratezza della pulizia meccanica**
- **Corretta separazione delle fasi (detersione e disinfezione)**

Aree esterne: Pulizia meccanica e prevenzione della contaminazione

Aree non critiche in degenza: detersione/ disinfezione in assenza di patologia infettiva

Aree critiche e superfici high touch: pulizia e disinfezione ad alta frequenza

No Man's Land: chi effettua la pulizia/disinfezione?

Gli elettromedicali

I dispositivi elettronici

I dispositivi ad uso promiscuo

La strumentazione mobile (RX, Ecografi, etc)

Qualità Attese dalle Operazioni di Sanificazione

- **Operazione non contaminante**
  - **per l'ambiente**
  - **per l'operatore**
- **Operazione efficace**
  - **pulizia macroscopica**
  - **pulizia "biologica"**
  - **pulizia microbiologica**
- **Fattibile**
  - **Personale, mezzi, tempo, costi….**

Journal of Hospital Infection

Volume 45, Issue 1, May 2000, Pages 19–28

Regular Article

An evaluation of hospital cleaning regimes and standards

C.J. Griffith[a], R.A. Cooper[a], J. Gilmore[b], C. Davies[a], M. Lewis[b]

113 superfici ambientali sono risultate “pulite” nel:

82-91% ispezione visiva
10-14% determinazione ATP
30-45% analisi microbica

What is clean?.....what an individual thinks it is!

We should not define cleanliness without indicating how we would assess it

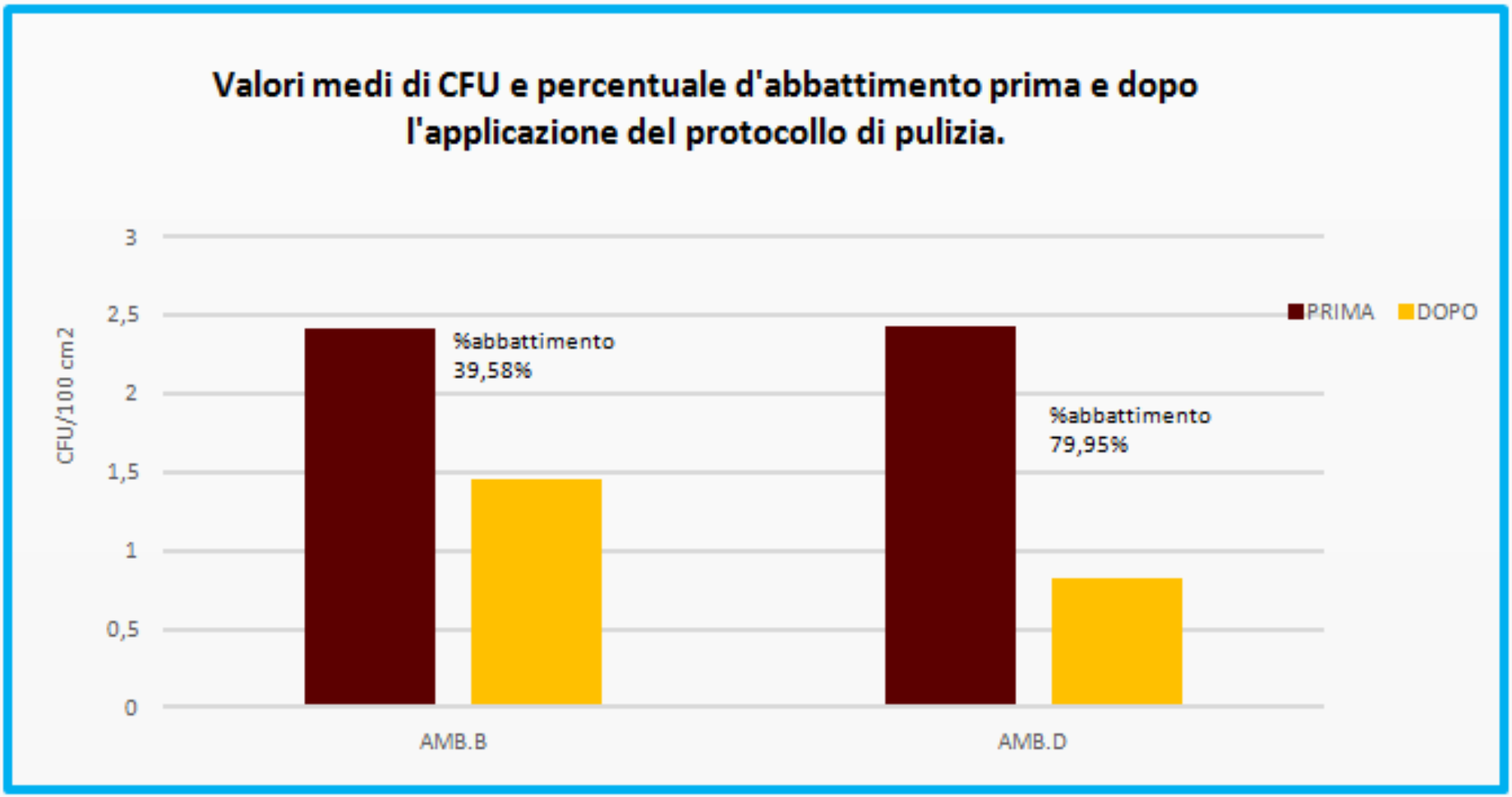
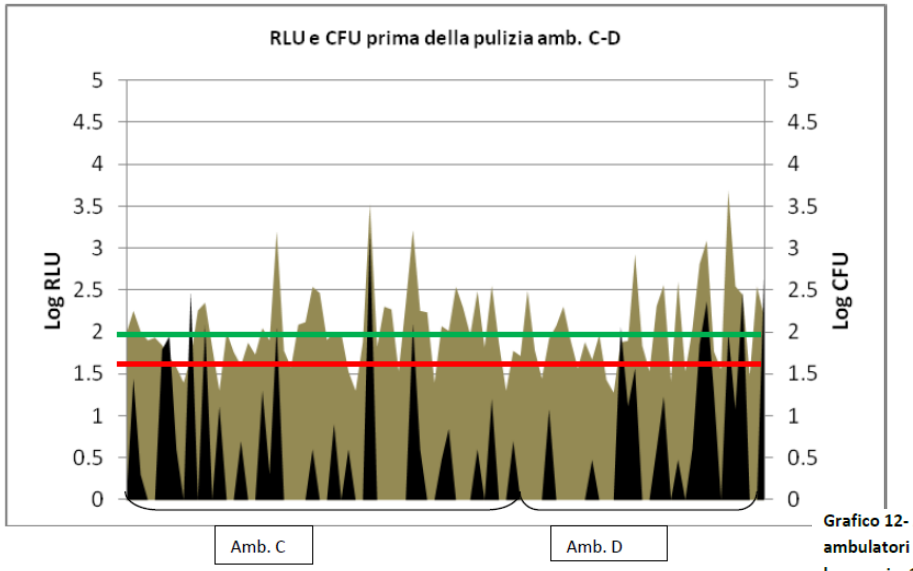
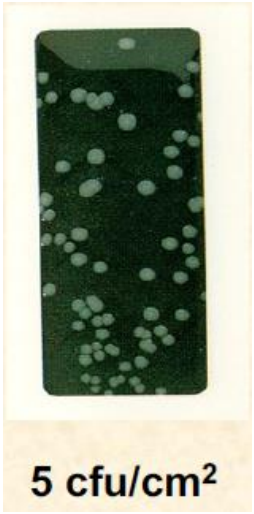

Valori medi di CFU e percentuale d'abbattimento prima e dopo l'applicazione del protocollo di pulizia.
CFU/100 cm2
3
2,5
2
1,5
1
0,5
0
PRIMA
DOPO
%abbattimento
39,58%
%abbattimento
79,95%
AMB.B
AMB.D

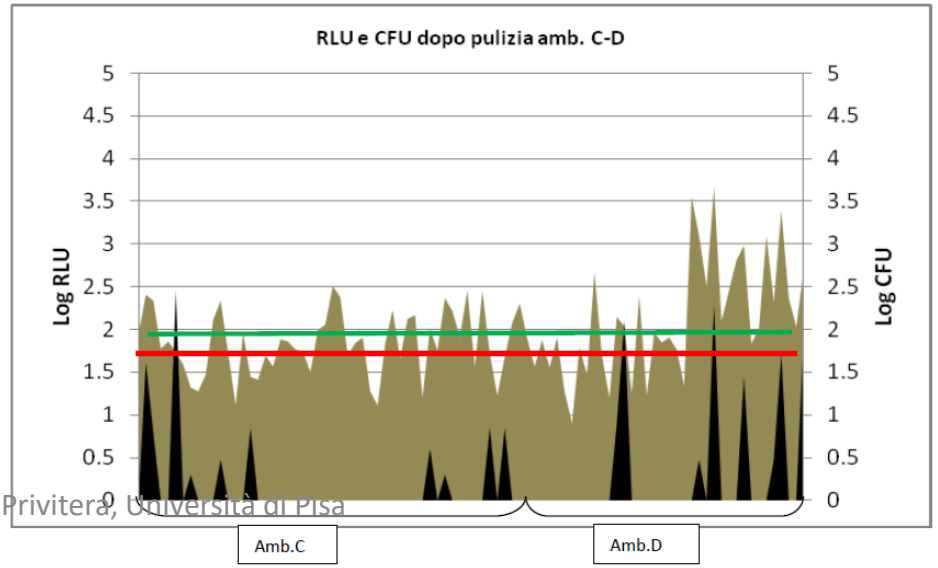
Grafico 10- Andamento dei valori di RLU e CFU (rispettivamente rappresentati nel grafico dall'area beige e dall'are nera), negli ambulatori C-D, durante il periodo della sperimentazione prima della pulizia (la linea rossa indica il benchmark degli RLU, espresso in log , pari a 1,6 ; la linea verde il benchmarch per i CFU pari a 2)



Come misurare il "pulito"?

Grafico 12- Andamento dei valori di RLU e CFU (rispettivamente rappresentati nel grafico dall'area beige e dall'are nera) , negli ambulatori A-B, durante il periodo della sperimentazione dopo la pulizia (la linea rossa indica il benchmark degli RLU, espresso in log , pari a 1.6 ; la linea verde il benchmarch per i CFU pari a 2,5)





Possiamo migliorare il modo di sanificare gli ambienti sanitari

INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY AUGUST 2017, VOL. 38, NO. 8

ORIGINAL ARTICLE

The Iowa Disinfection Cleaning Project: Opportunities, Successes, and Challenges of a Structured Intervention Program in 56 Hospitals

Philip Carling, MD;[1,2] Loreen A. Herwaldt, MD[3,4,5]

OBJECTIVE. A diverse group of hospitals in Iowa implemented a program to objectively evaluate and improve the thoroughness of disinfection cleaning of near-patient surfaces. Administrative benefits of, challenges of, and impediments to the program were also evaluated.

METHODS. We conducted a prospective, quasi-experimental pre-/postintervention trial to improve the thoroughness of terminal room disinfection cleaning. Infection preventionists utilized an objective cleaning performance monitoring system (DAZO) to evaluate the thoroughness of disinfection cleaning (TDC) expressed as a proportion of objects confirmed to have been cleaned (numerator) to objects to be cleaned per hospital policy (denominator) × 100. Data analysis, educational interventions, and objective performance feedback were modeled on previously published studies using the same monitoring tool. Programmatic analysis utilized unstructured and structured information from participants irrespective of whether they participated in the process improvement aspects to the program.

RESULTS. Initially, the overall TDC was 61% in 56 hospitals. Hospitals completing 1 or 2 feedback cycles improved their TDC percentages significantly ($P < .0001$; $P < .005$). Overall, 22 hospitals (39.3%) completed all 3 study phases and significantly increased their TDC percentages to a mean of 89%. Moreover, 6 hospitals maintained the program beyond the planned study period and sustained TDC percentages >90% for at least 38 months. A survey of infection preventionists found that lack of time and staff turnover were the most common reasons for terminating the study early.

CONCLUSION. The study confirmed that hospitals using this program can improve their TDC percentages significantly. Hospitals must invest resources to improve cleaning and to sustain their gains.

Infect Control Hosp Epidemiol 2017;38:960–965

Migliorare la sanificazione nelle strutture sanitarie

American Journal of Infection Control 41 (2013) S12-S19

Contents lists available at ScienceDirect

American Journal of Infection Control

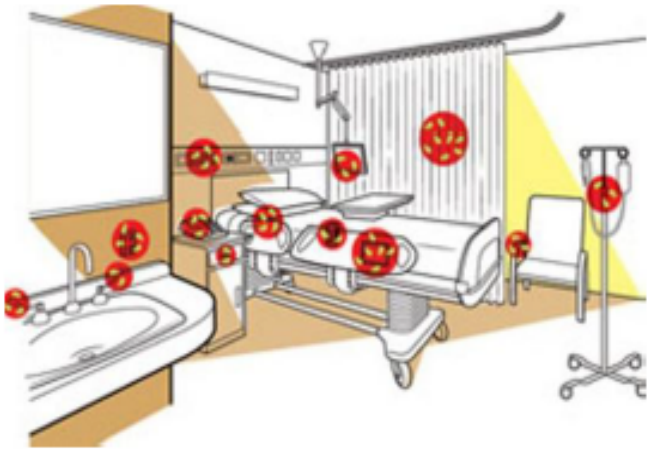
journal homepage: www.ajicjournal.org

Original research article

Does improving surface cleaning and disinfection reduce health care-associated infections?

Curtis J. Donskey MD[a,b,*]

[a] Geriatric Research, Education, and Clinical Center, Cleveland Veterans Affairs Medical Center, Cleveland, OH
[b] Case Western Reserve University School of Medicine, Cleveland, OH



Migliorare non solo la **pulizia/disinfezione terminale**, ma anche quella **giornaliera delle superfici ad alta frequenza di contatto** e dei **dispositivi medici fissi e portatili**.

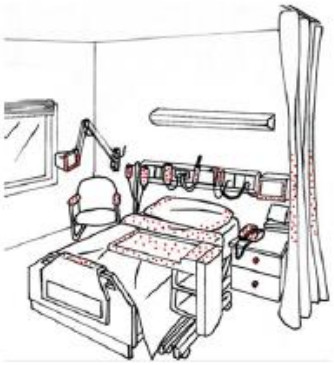
Per migliorare la sanitizzazione si può agire:

1) Sostituendo i **prodotti in uso**, ad esempio microfibre *vs* cotone,
2) Cambiando il **disinfettante** e/o la modalità di **impiego**
3) Migliorando l'efficienza operativa con **attività educative, di monitoraggio, audit e feed-back**, o **aumentando il personale**.
4) Impiegando **tecnologie automatizzate**

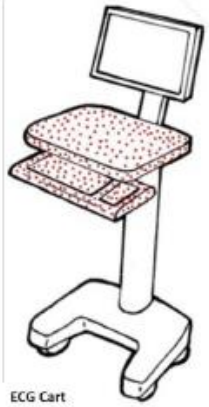
Migliorare le procedure esistenti

Utilizzare nuove tecnologie

Esempi di «High Touch Surfaces»



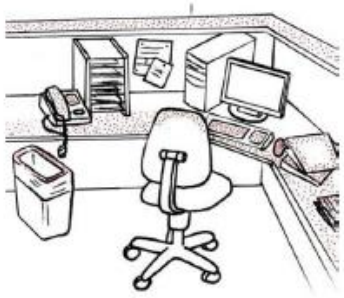
Patient Room



ECG Cart

Patient Bathroom

Hallway on Patient/Resident Floor

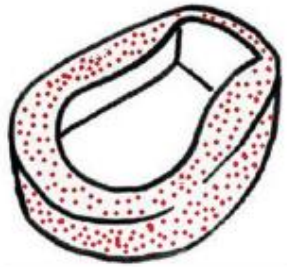


Nursing Station

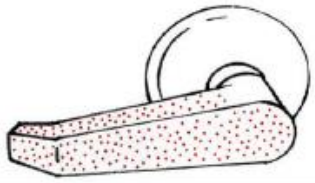
Light Switch

Call Bell

Commode



Bedpan



Door Handle

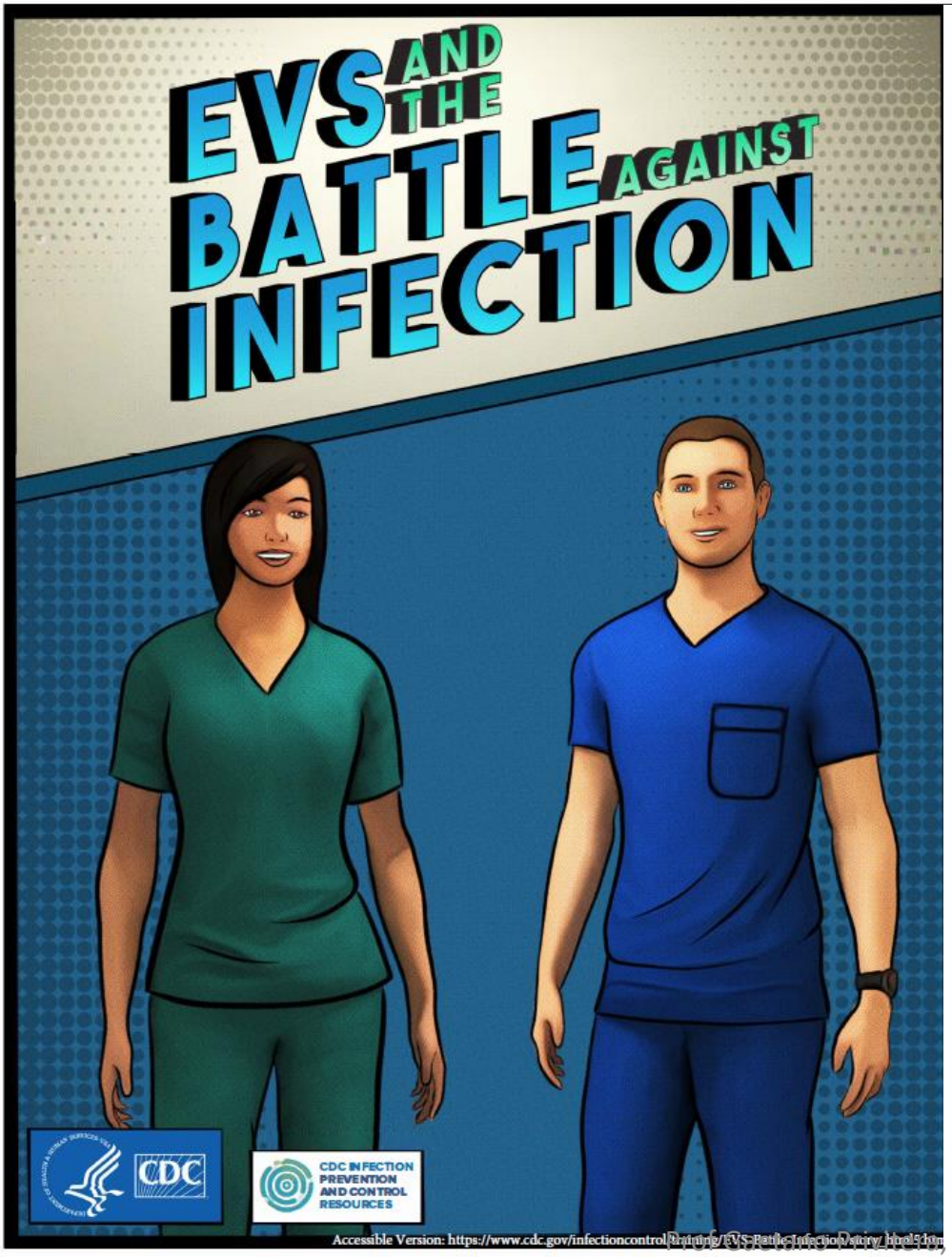
Computer on Wheels

Transport Items

Wheelchair

Environmental services (EVS) personnel have the shared responsibility to help stop healthcare-associated infections (HAIs) from spreading by working with colleagues, prioritizing areas that pose immediate safety risks, and following guidelines for cleaning and disinfecting. This interactive training illustrates the important role EVS personnel have in the prevention of HAIs.

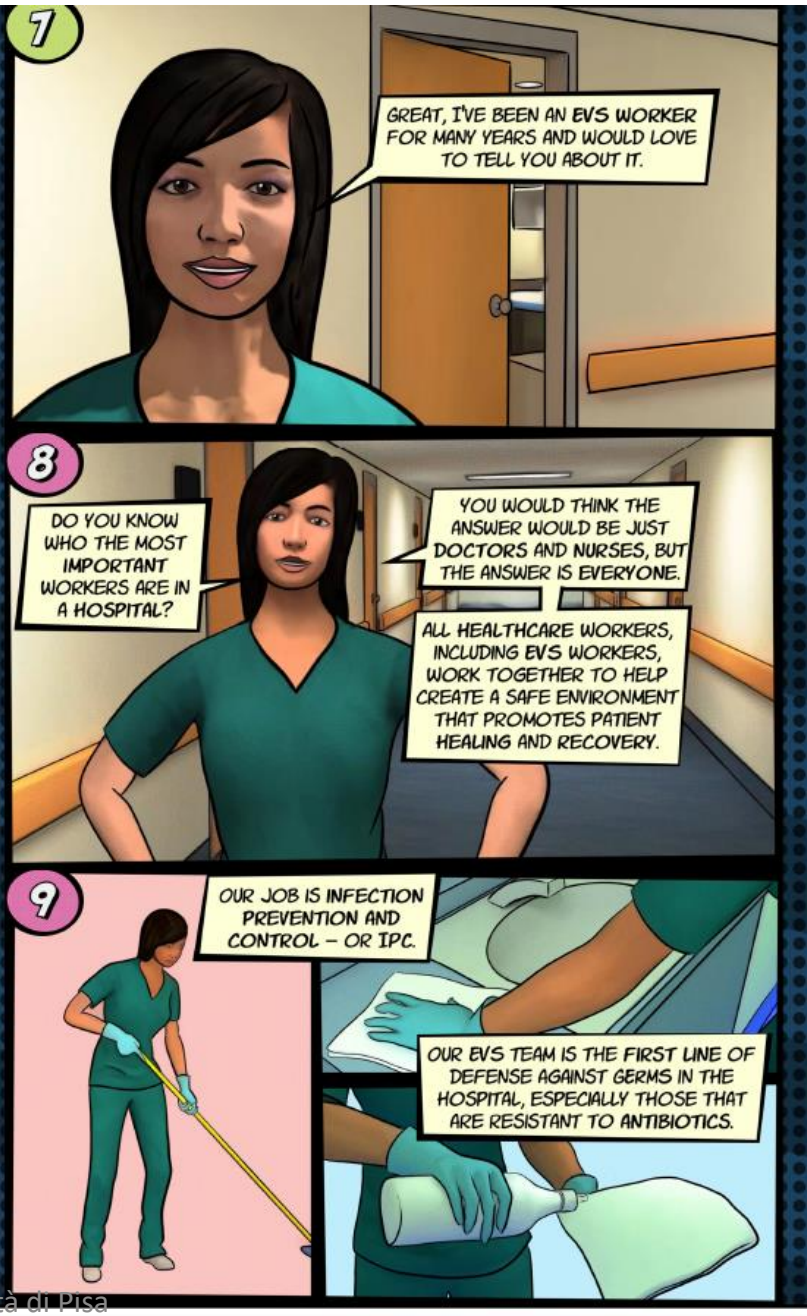
EVS AND THE BATTLE AGAINST INFECTION

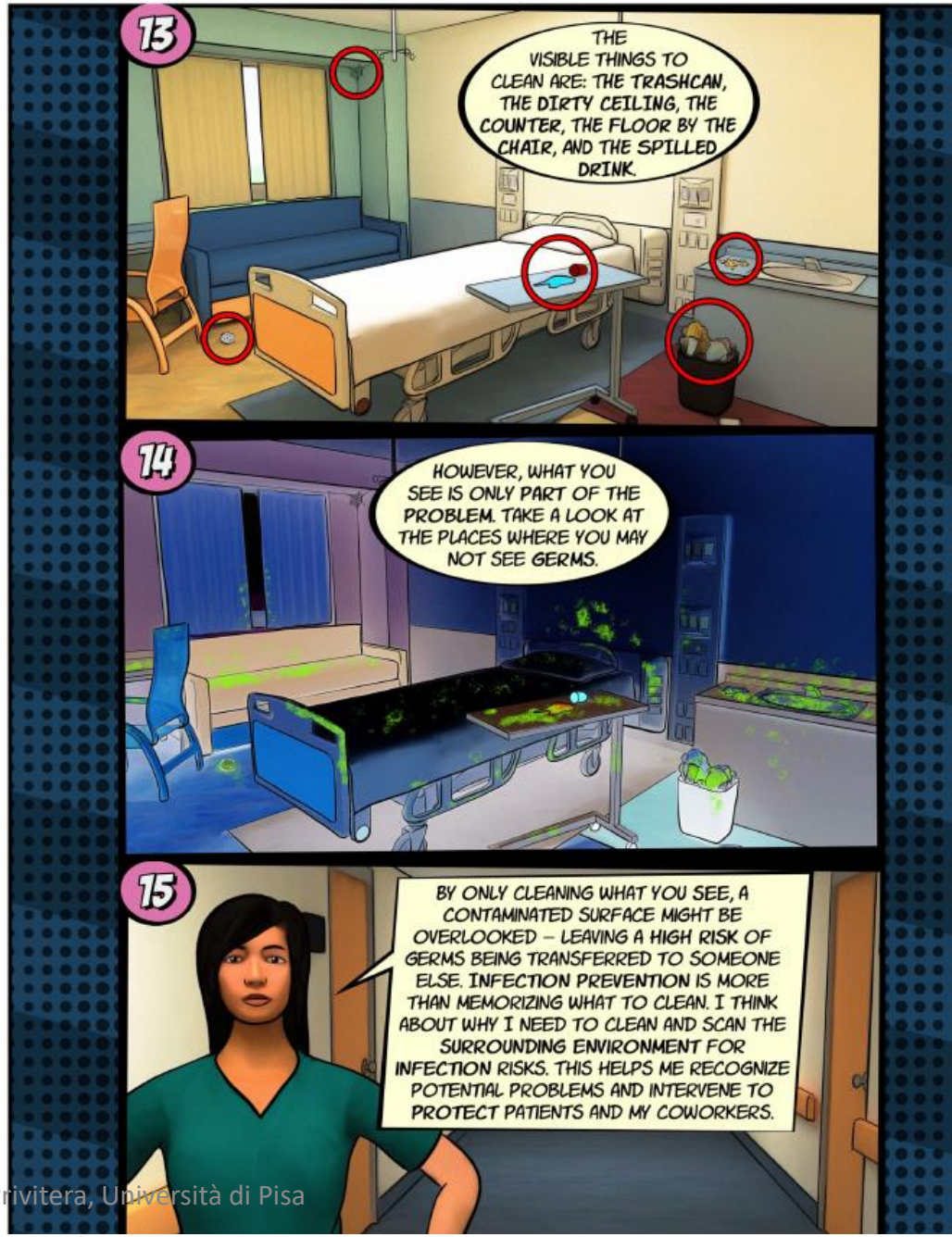


CDC

CDC INFECTION PREVENTION AND CONTROL RESOURCES

Accessible Version: https://www.cdc.gov/infectioncontrol/training/EVS-Battle-Infection/story.html





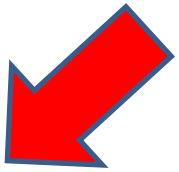
Usare lo strumento dell'accreditamento

CRITERE N°: 7d **INTITULE : Hygiène des locaux.**

1 – Note introductive (chapô)

L'hygiène des locaux est un des maillons de la chaîne de prévention des infections nosocomiales. Afin d'assurer les conditions d'hygiène optimales des locaux, l'établissement s'appuie sur des choix adaptés de matériaux et de produits d'entretien, sur une organisation comportant des procédures d'entretien, sur la formation des professionnels, sur l'évaluation régulière de l'application des protocoles et procédures de bio nettoyage et sur le respect de l'environnement.
Les protocoles et procédures sont régulièrement actualisés et diffusés. La formation et l'accompagnement des professionnels sur le terrain permettent d'adapter leurs connaissances en continu et porte en particulier sur la prévention des risques liés à la manipulation des produits.
Les produits choisis pour assurer l'entretien des locaux doivent combiner efficacité avec toxicité minimale pour l'utilisateur et protection maximale de l'environnement.
En cas de sous-traitance, le cahier des charges comprend notamment les dispositions définissant la conduite à tenir et la tenue des intervenants adaptées au niveau de risque de chaque zone.
Interaction avec les autres critères du manuel :

- 2 e Indicateurs, tableau de bord
- 6f Politique d'achat
- 7b Gestion de l'air
- 7 e Gestion des déchets
- 8b Maîtrise du risque infectieux



2- Objectif(s):

1. ES
   - Garantir des conditions d'hygiène des locaux optimales respectant la réglementation
   - Intégrer la problématique développement durable dans notamment le choix des produits

2. EV
   - Evaluer L'organisation en place pour assurer l'hygiène des locaux

3 – Champs d'application

NA pour les locaux du secteur HAD

Nuove Aree di Attenzione

- **L'impatto ambientale**
- **La sicurezza del personale**
- **La natura delle superfici da decontaminare**
- **Le metodiche innovative**
- **La ridotta suscettibilità ai disinfettanti**

Una nota di cautela:

Attenzione a non prevaricare in nome della salvaguardia ambientale **i principi di efficacia e di cautela** che si impongono nell'ambito della **gestione del rischio biologico** nelle strutture sanitarie.

Metodiche e prodotti alternativi devono essere valutati **prioritariamente** alla luce della riduzione del rischio infettivo per i pazienti, gli operatori sanitari e dei servizi appaltati e i visitatori.

What is the evidence for cleaning as a viable control mechanism for hospital-acquired infections ?

BBC website, 2008

Two matched wards received one extra cleaner (Monday to Friday), with each ward receiving enhanced cleaning for six months in a cross-over design;

Enhanced cleaning led to a 33% reduction in levels of microbial soil at hand-touch sites; and 27% reduction in new MRSA infections, despite higher bed occupancies and MRSA colonisation pressures (p=0.032: 95% CI 7.7%, 92.3%).

Dancer et al, BMC Med, 2009

American Journal of Infection Control 44 (2016) e69-e76

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major article

Monitoring and improving the effectiveness of surface cleaning and disinfection

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IMPROVING ROOM CLEANING AND DISINFECTION AND DEMONSTRATING THE EFFECTIVENESS OF SURFACE DECONTAMINATION IN REDUCING HAIS

We have found that collaboration between infection prevention and environmental services staff and management is critical to an effective environmental cleaning program. This includes ensuring that environmental services staff recognize the importance of their job and the relationship of adhering to proper work procedures to the reduction of microbial contamination and HAIs. The assignment of cleaning responsibility (eg, medical equipment to be cleaned by nursing; environmental surfaces to be cleaned by environmental services) is also important to ensure all objects and surfaces in a patient room are decontaminated, especially the surfaces of medical equipment (eg, cardiac monitors).

An environmental cleaning bundle and health-care-associated infections in hospitals (REACH): a multicentre, randomised trial

Brett G Mitchell*, Lisa Hall*, Nicole White, Adrian G Barnett, Kate Halton, David L Paterson, Thomas V Riley, Anne Gardner, Katie Page, Alison Farrington, Christian A Gericke, Nicholas Graves

Lancet Infect Dis 2019; 19: 410–18
Published Online March 8, 2019
http://dx.doi.org/10.1016/S1473-3099(18)30714-X
See Comment page 345

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Summary

Background The hospital environment is a reservoir for the transmission of microorganisms. The effect of improved cleaning on patient-centred outcomes remains unclear. We aimed to evaluate the effectiveness of an environmental cleaning bundle to reduce health care-associated infections in hospitals.

Methods The REACH study was a pragmatic, multicentre, randomised trial done in 11 acute care hospitals in Australia. Eligible hospitals had an intensive care unit, were classified by the National Health Performance Authority as a major hospital (public hospitals) or having more than 200 inpatient beds (private hospitals), and had a health-care-associated infection surveillance programme. The stepped-wedge design meant intervention periods varied from 20 weeks to 50 weeks. We introduced the REACH cleaning bundle, a multimodal intervention, focusing on optimising product use, technique, staff training, auditing with feedback, and communication, for routine cleaning. The primary outcomes were incidences of health-care-associated *Staphylococcus aureus* bacteraemia, *Clostridium difficile* infection, and vancomycin-resistant enterococci infection. The secondary outcome was the thoroughness of cleaning of frequent touch points, assessed by a fluorescent marking gel. This study is registered with the Australian and New Zealand Clinical Trial Registry, number ACTRN12615000325505.

Findings Between May 9, 2016, and July 30, 2017, we implemented the cleaning bundle in 11 hospitals. In the pre-intervention phase, there were 230 cases of vancomycin-resistant enterococci infection, 362 of *S aureus* bacteraemia, and 968 *C difficile* infections, for 3 534 439 occupied bed-days. During intervention, there were 50 cases of vancomycin-resistant enterococci infection, 109 of *S aureus* bacteraemia, and 278 *C difficile* infections, for 1 267 134 occupied bed-days. After the intervention, vancomycin-resistant enterococci infections reduced from 0·35 to 0·22 per 10 000 occupied bed-days (relative risk 0·63, 95% CI 0·41–0·97, p=0·0340). The incidences of *S aureus* bacteraemia (0·97 to 0·80 per 10 000 occupied bed-days; 0·82, 0·60–1·12, p=0·2180) and *C difficile* infections (2·34 to 2·52 per 10 000 occupied bed-days; 1·07, 0·88–1·30, p=0·4655) did not change significantly. The intervention increased the percentage of frequent touch points cleaned in bathrooms from 55% to 76% (odds ratio 2·07, 1·83–2·34, p<0·0001) and bedrooms from 64% to 86% (1·87, 1·68–2·09, p<0·0001).

Interpretation The REACH cleaning bundle was successful at improving cleaning thoroughness and showed great promise in reducing vancomycin-resistant enterococci infections. Our work will inform hospital cleaning policy and practice, highlighting the value of investment in both routine and discharge cleaning practice.

Funding National Health and Medical Research Council (Australia).

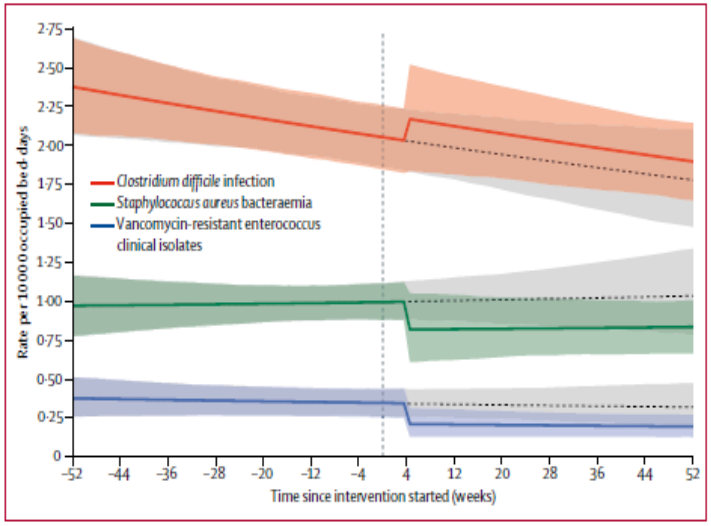

Figure 3: **Estimated changes in health care-associated infection rates before and after the intervention**
Ribbons are 95% prediction intervals. Grey shading shows expected infection rates with no intervention.

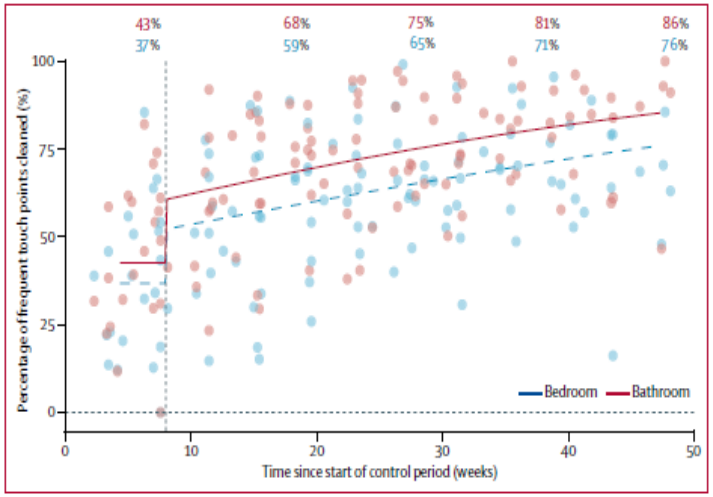

Figure 4: **Percentage of frequent touch points cleaned in patient bathrooms and bedrooms**
Percentages are model-based predictions of the outcome. Dotted line shows the start of intervention.

Was the extra cleaning cost effective?

- The study cleaner earned £12,320 per annum
- Consumables were £1,100
- Average cost of one hospital-acquired MRSA surgical site infection at least £9,000
- Enhanced cleaning spared 5-9 patients MRSA
- The hospital thus saved £45,000-£81,000 minus the costs of cleaners and consumables
- Overall savings estimated as £31,600 - £67,600 for two wards over a 1 year period

Dancer et al, BMC Med 2009

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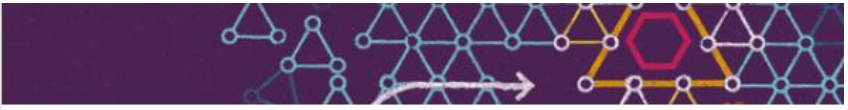

PATIENT ENGAGEMENT

What If Our Care Were Designed by Patients?

TALK *by* STEPHEN SWENSEN, MD, MMM, FACR

Patients have only three wishes when it comes to how they want to be cared for, and they're not as complicated as one might think.

LEARN MORE »

- **Wish 1: Care about me.**
- **Wish 2: Care for each other.**

Patients understood that if health care professionals care for one another — **doctors, nurses, social workers, managers, housekeepers** — that they would get better care, have a better experience and have better outcomes.

- **Wish 3: Put my interests first.**

"Our health care system has 40% waste by the most conservative estimates, and the top three categories of waste we own: overtreatment, failures of care delivery, failures of care coordination."