



Regione Toscana



Convegno

Antimicrobico-resistenza: cure e ambiente

Firenze, 6 -7 giugno 2019

Istituto Stensen, viale Don Minzoni n. 25/C, Firenze

Focus sul *Clostridium difficile* INFECTION CONTROL



Beatrice Casini

Dip. Ricerca Traslationale, N.T.M.C., Università di Pisa



U.O. Igiene ed Epidemiologia, AOUP

RESEARCH ARTICLE

Burden of Six Healthcare-Associated Infections on European Population Health: Estimating Incidence-Based Disability-Adjusted Life Years through a Population Prevalence-Based Modelling Study

Alessandro Cassini^{1,2}*, Diamantis Plachouras¹*, Tim Eckmanns³, Muna Abu Sin³, Hans-Peter Blank³, Tanja Ducomble³, Sebastian Haller³, Thomas Harder³, Anja Klingenberg³, Madlen Sixtensson³, Edward Velasco³, Bettina Weiß³, Piotr Kramarz¹, Dominique L. Monnet¹, Mirjam E. Kretzschmar^{2,4}, Carl Suetens¹

1 European Centre for Disease Prevention and Control, Stockholm, Sweden, **2** Julius Center for Health Sciences and Primary Care, University Medical Center Utrecht, Utrecht, The Netherlands, **3** Robert Koch Institute, Berlin, Germany, **4** Centre for Infectious Disease Control, National Institute for Public Health and the Environment, Bilthoven, The Netherlands

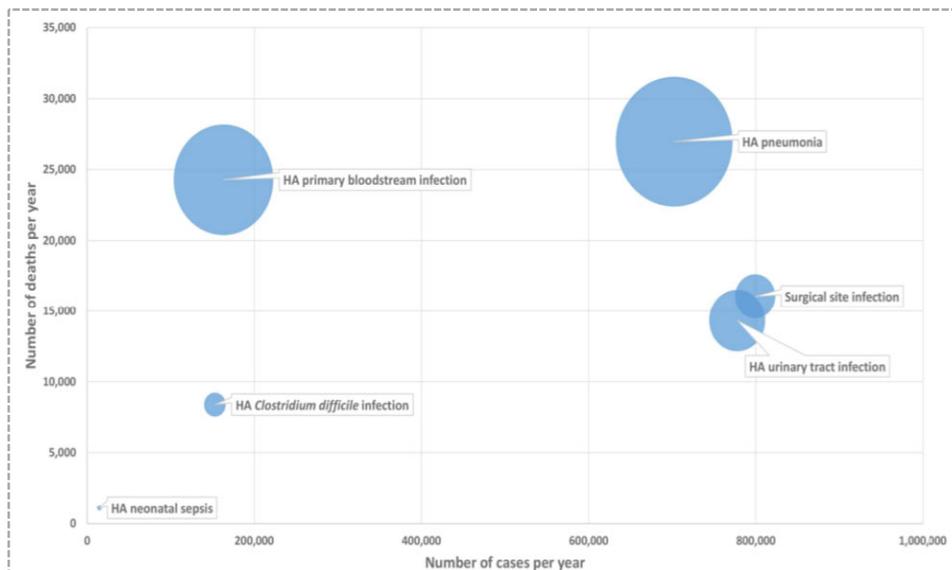


Fig 1. Six healthcare-associated infections according to their number of cases per year (x-axis), number of deaths per year (y-axis), and DALYs per year (width of bubble), EU/EEA, 2011–2012 (time discounting was not applied). DALY, disability-adjusted life year; HA, healthcare-associated.

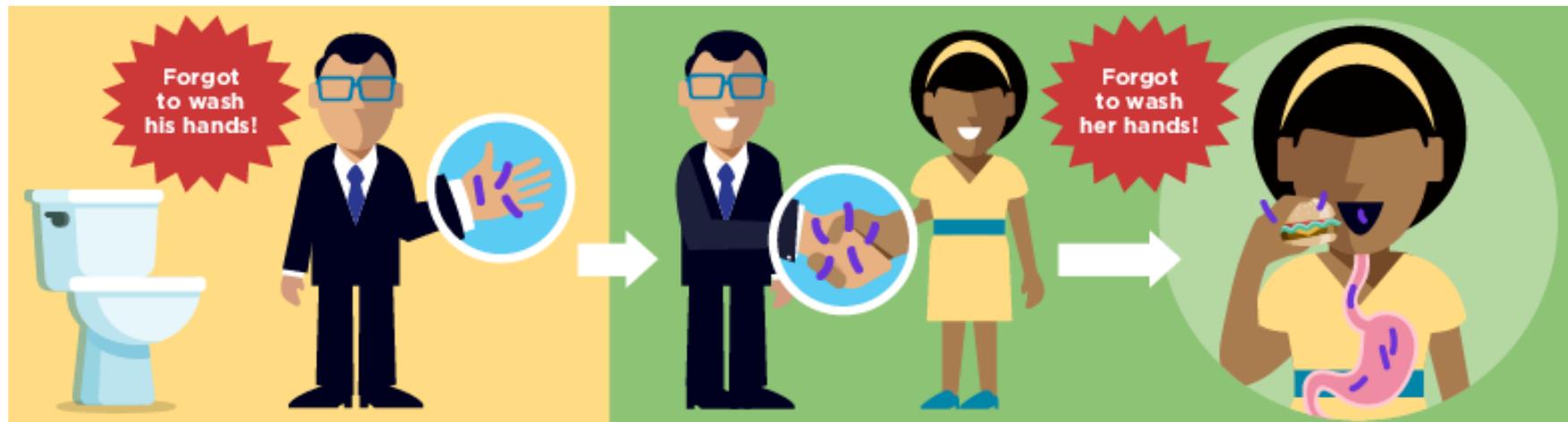
Il burden in termine di DALY (anni di vita persi) di 6 infezioni correlate all'assistenza (urinarie, sito chirurgico, polmonite, batteriemia, *Clostridium difficile*, sepsi neonatale) è quasi il doppio (501/DALY/100.000) rispetto a tutte le 32 malattie infettive notificabili (260 DALY/100.000)



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

Clostridioides difficile (C. diff)

CDC is working with the Centers for Medicare and Medicaid Services (CMS) and other federal partners **to reduce *C. diff* infections by 30% by 2020.**



Quali azioni includere nel bundle

CID 2018:66 (1 April)
 IDSA GUIDELINE

IDSA **hivma**
 Infectious Diseases Society of America by medicine association

Clinical Practice Guidelines for *Clostridium difficile* Infection in Adults and Children: 2017 Update by the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA)

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ESCMID EUROPEAN SOCIETY OF CLINICAL MICROBIOLOGY AND INFECTIOUS DISEASES
 Clinical Microbiology and Infection

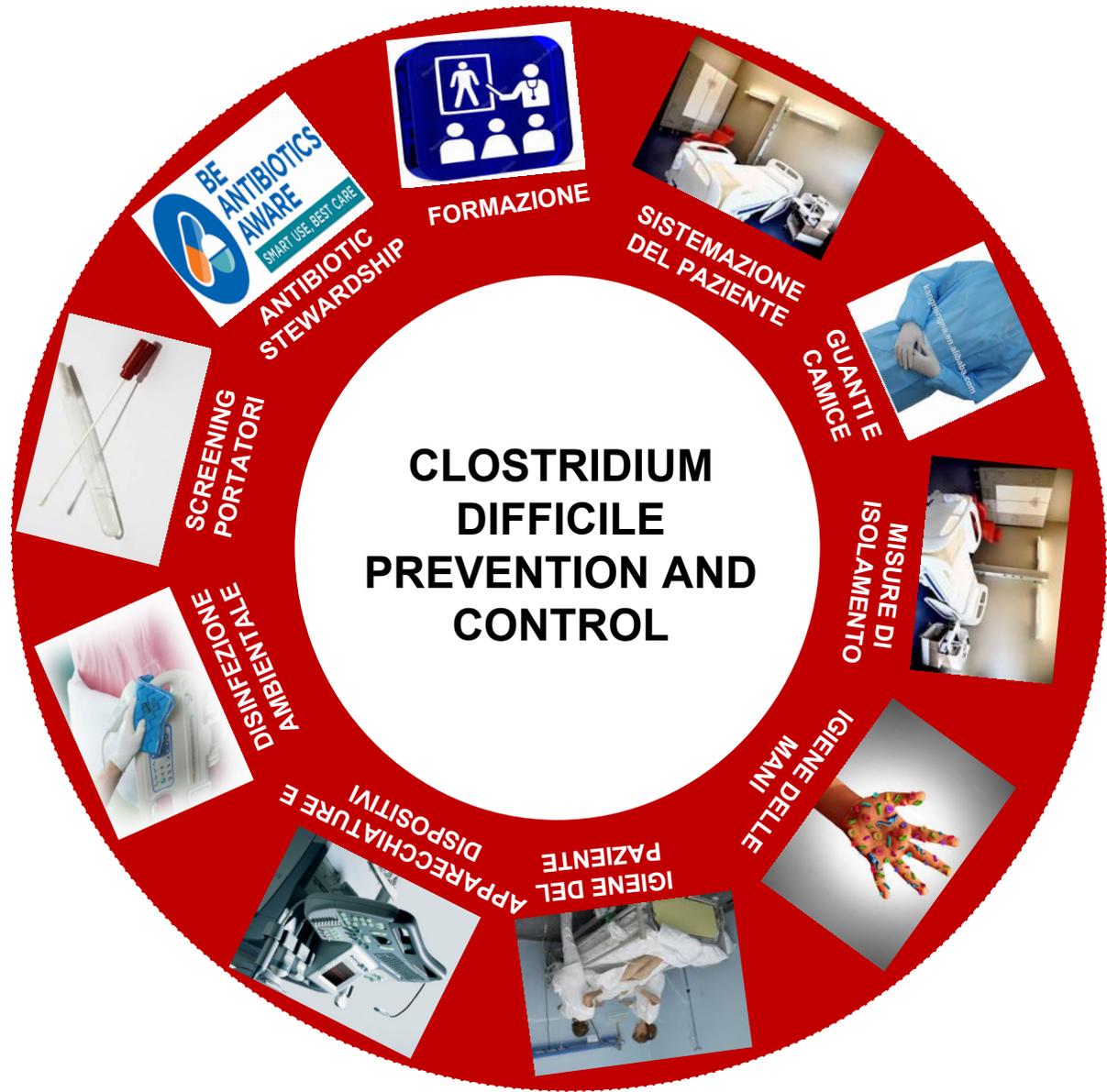
Guidelines
 Guidance document for prevention of *Clostridium difficile* infection in acute healthcare settings

S. Tschudin-Sutter^{1,2}, E.J. Kuijper^{3,4}, A. Durovic⁵, M.J.G.T. Vehreschild⁶, F. Barbut⁷, C. Edert⁸, F. Fitzpatrick⁹, M. Hell¹⁰, T. Norén¹¹, J. O'Driscoll¹², J. Coia¹³, P. Gastmeier¹⁴, L. von Müller¹⁵, M.H. Wilcox¹⁶, A.F. Widmer¹⁷ on behalf of the Committee

INSPQ INSTITUT NATIONAL DE SANTÉ PUBLIQUE DU QUÉBEC

Guide for the Management of Outbreaks of *Clostridium difficile*-Associated Diarrhea (CDAD) in Hospitals

COMITÉ SUR LES INFECTIONS NOSOCOMIALES DU QUÉBEC December 2014



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**SISTEMAZIONE
DEL PAZIENTE**

PREVENTION AND CONTROL

Isolation Measures for Patients With CDI

Should private rooms and/or dedicated toilet facilities be used for isolated patients with CDI?

Recommendations

1. Accommodate patients with CDI in a private room with a dedicated toilet to decrease transmission to other patients. If there is a limited number of private single rooms, prioritize patients with stool incontinence for placement in private rooms (*strong recommendation, moderate quality of evidence*).

2. If cohorting is required, it is recommended to cohort patients infected or colonized with the same organism(s)—that is, do not cohort patients with CDI who are discordant for other multidrug-resistant organisms such as methicillin-resistant *Staphylococcus aureus* or vancomycin-resistant *Enterococcus* (*strong recommendation, moderate quality of evidence*).

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**USO DI
GUANTI E CAMICE**

PREVENTION AND CONTROL

Isolation Measures for Patients With CDI

Should gloves and gowns be worn while caring for isolated CDI patients?

Recommendation

1. Healthcare personnel **must use gloves** (*strong recommendation, high quality of evidence*) and **gowns** (*strong recommendation, moderate quality of evidence*) on entry to a room of a patient with CDI and while caring for patients with CDI.

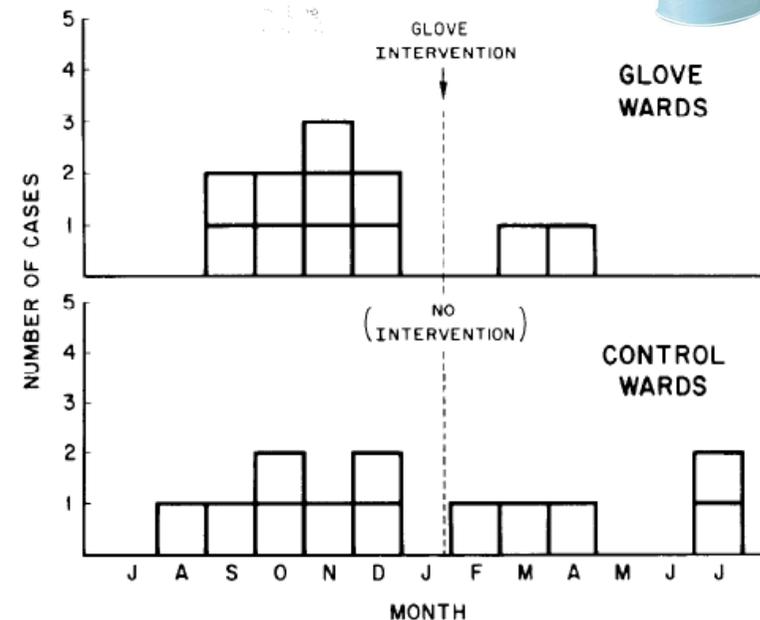
Prospective, Controlled Study of Vinyl Glove Use to Interrupt *Clostridium difficile* Nosocomial Transmission

STUART JOHNSON, M.D., DALE N. GERDING, M.D., MARY M. OLSON, R.N., MARY D. WEILER, R.N., RITA A. HUGHES, M.T., CONNIE R. CLABOTS, M.T., LANCE R. PETERSON, M.D. *Minneapolis, Minnesota*

Am J of Med, 1990; 88:137-140.



Vinyl glove use was **associated with a reduced incidence of *C. difficile* diarrhea** and is indirect evidence for hand carriage as a means of nosocomial *C. difficile* spread.



Since spores may be difficult to remove from hands even with hand washing, **adherence to glove use, and Contact Precautions in general, should be emphasized** for preventing *C. difficile* transmission via the hands of healthcare personnel (*Clostridium difficile* Infections Toolkit, CDC 2009)

Asymptomatic Carriers Are a Potential Source for Transmission of Epidemic and Nonepidemic *Clostridium difficile* Strains among Long-Term Care Facility Residents

MAJOR ARTICLE

CID 2007, 45:992-98

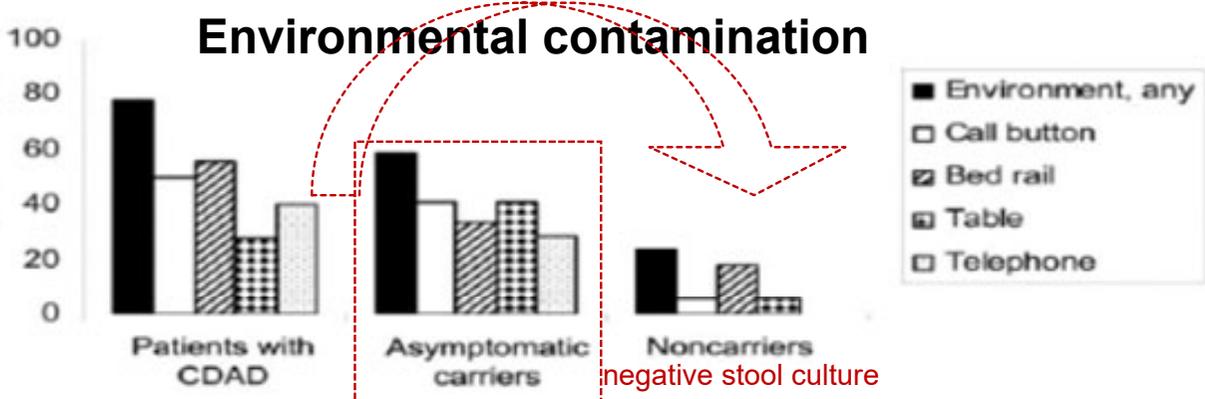
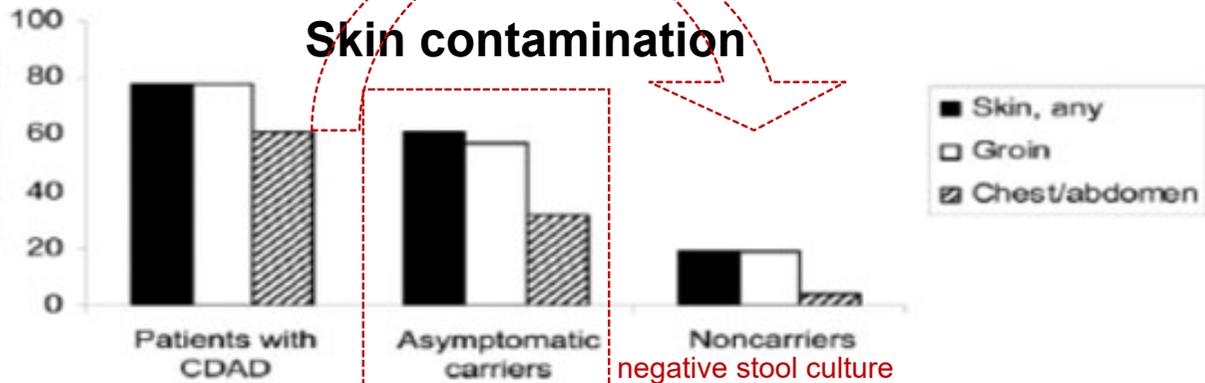
Michelle M. Riggs,¹ Ajay K. Sethi,³ Trina F. Zabarsky,² Elizabeth C. Eckstein,² Robin L. P. Jump,¹ and Curtis J. Donskey¹

¹Research Service and ²Infection Control Department, Louis Stokes Cleveland Department of Veterans Affairs Medical Center, and ³Department of Epidemiology and Biostatistics, Case Western Reserve University School of Medicine, Cleveland, Ohio

Role of asymptomatic carriers?

Rationale for universal glove use on units with high CDI rates

Hand imprint cultures from a subset of patients confirmed that *C. difficile* spores could easily be acquired on sterile gloves



Sterile gloves after contact with a CDAD-affected patient's groin



Clin Microbiol Infect. 2018 Oct;24(10):1051-1054.

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**USO DI
GUANTI E CAMICE**

How effective is the additional use of personal protective equipment in reducing C. difficile infection/transmission, compared to standard precautions only?

Recommendation for the outbreak setting

Use PPE (gloves and gowns/disposable aprons) to decrease transmission of C. difficile or incidence of CDI (**strong recommendation, very low quality of evidence**).

Recommendation for the endemic setting

Use PPE (gloves and gowns/disposable aprons) to decrease transmission of C. difficile or incidence of CDI (**conditional recommendation, very low quality of evidence**).

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MISURE DI ISOLAMENTO

PREVENTION AND CONTROL Isolation Measures for Patients With CDI

When should isolation be implemented?

Recommendation

1. Patients with suspected CDI should be placed on preemptive contact precautions pending the *C. difficile* test results if test results cannot be obtained on the same day (*strong recommendation, moderate quality of evidence*).

How long should isolation be continued?

Recommendations

1. Continue contact precautions for at least 48 hours after diarrhea has resolved (*weak recommendation, low quality of evidence*).
2. Prolong contact precautions until discharge if CDI rates remain high despite implementation of standard infection control measures against CDI (*weak recommendation, low quality of evidence*).



Clostridium difficile Skin Contamination in Patients with *C. difficile*-Associated Disease

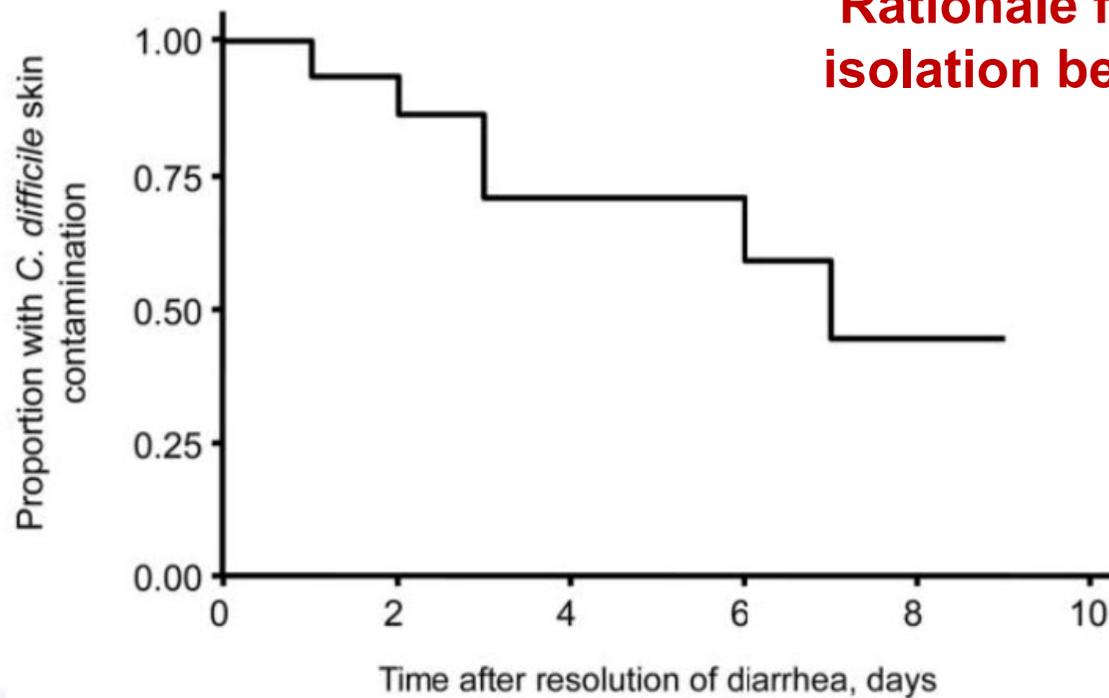
Greg S. Bobulsky,¹ Wafa N. Al-Nassir,² Michelle M. Riggs,¹ Ajay K. Sethi,³ and Curtis J. Donskey¹

¹Research Service, Louis Stokes Cleveland Veterans Affairs Medical Center, ²Department of Infectious Diseases, University Hospitals of Cleveland, and ³Department of Epidemiology and Biostatistics, Case Western Reserve University School of Medicine, Cleveland, Ohio

Clin Infect Dis 2008;46:447-50.



Rationale for considering extending isolation beyond duration of diarrhea



The median time from **resolution of diarrhea** to detection of **negative skin cultures** was **7 days** (95% CI, 3 to >9 days)



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**MISURE DI
ISOLAMENTO**

Are contact precautions for CDI-patients effective in reducing the CDI rate/transmission of C. difficile in hospital settings?

Recommendation for the outbreak setting

Use contact precautions to decrease the transmission of *C. difficile* and reduce the incidence of CDI (**strong recommendation, very low quality of evidence**).

Recommendation for the endemic setting

Use contact precautions to decrease the transmission of *C. difficile* and reduce the incidence of CDI (**strong recommendation, very low quality of evidence**).

Persistence of Skin Contamination and Environmental Shedding
of *Clostridium difficile* during and after Treatment
of *C. difficile* Infection

Ajay K. Sethi, PhD; Wafa N. Al-Nassir, MD; Michelle M. Nerandzic, BS; Greg S. Bobulsky, BS; Curtis J. Donskey, MD



Oltre il 50% dei pazienti continuano a eliminare CD fino a 4 settimane dopo la terapia

52 patients with CDI, CD to undetectable levels in stool samples during treatment; however, 1-4 weeks after treatment, 56% of patients who had samples tested were asymptomatic carriers of *C. difficile*.

The frequencies of skin contamination and environmental shedding remained high at the time of resolution of diarrhea (60% and 37%, respectively), were lower at the end of treatment (32% and 14%, respectively), and again increased 1-4 weeks after treatment (58% and 50%, respectively).



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American Journal of Infection Control

journal homepage: www.ajicjournal.org



State of the Science Review

Clostridium difficile contamination of health care workers' hands and its potential contribution to the spread of infection: Review of the literature



Ingrid Jullian-Desayes^a, Caroline Landelle PharmD, PhD^{a,b,*}, Marie-Reine Mallaret MD^{a,b}, Christian Brun-Buisson MD^{c,d}, Frédéric Barbut PharmD, PhD^e

^a Infection Control Unit, Centre Hospitalier Universitaire Grenoble Alpes, Université de Grenoble, Grenoble, France

^b University Grenoble Alpes/CNRS, THEMAS TIM-C UMR 5525, Grenoble, France

^c Infection Control Unit, Centre Hospitalier Universitaire Albert Chenevier-Henri Mondor, Assistance Publique-Hôpitaux de Paris, Université Paris-Est Créteil, Paris, France

^d Medical Intensive Care Unit, Centre Hospitalier Universitaire Albert Chenevier-Henri Mondor, Assistance Publique-Hôpitaux de Paris, Université Paris-Est Créteil, Paris, France

^e National Reference Laboratory for *Clostridium difficile*, Hôpital Saint-Antoine, Assistance Publique-Hôpitaux de Paris, Groupe de recherche clinique EPIDIFF, Université Pierre et Marie Curie, Paris, France

0% and 59% of HCWs' hands were found contaminated with *C.difficile*

Only 2 *C.difficile* outbreaks implicating HCWs (contamination of blood-pressure cuffs and lack of decontamination; physicians' movements in between clean and infected patients source of cross-transmission) and **6 series of cases of transmission from patients to HCWs have been reported.**

Frequently, **HCWs failed to remove their stool-contaminated gloves prior to touching clean surfaces.**

HCWs' hands could play an important role in the transmission of *C. difficile*.

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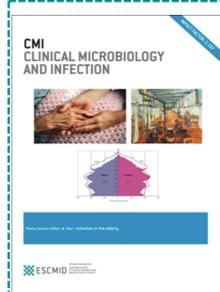
IGIENE DELLE MANI

What is the recommended hand hygiene method (assuming glove use) when caring for patients in isolation for CDI?

Recommendations

1. In routine or endemic settings, perform hand hygiene before and after contact of a patient with CDI and after removing gloves with either soap and water or an alcohol-based hand hygiene product (*strong recommendation, moderate quality of evidence*).
2. In CDI outbreaks or hyperendemic (sustained high rates) settings, perform hand hygiene with soap and water preferentially instead of alcohol-based hand hygiene products before and after caring for a patient with CDI given the increased efficacy of spore removal with soap and water (*weak recommendation, low quality of evidence*).
3. Handwashing with soap and water is preferred if there is direct contact with feces or an area where fecal contamination is likely (eg, the perineal region) (*good practice recommendation*).

PAZIENTE IN ISOLAMENTO DA CONTATTO:
lavarsi le mani con acqua e sapone dopo contatto con il paziente o ambiente circostante, anche dopo aver tolto i guanti



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IGIENE DELLE MANI

Which are the most effective techniques/products for removal of *C. difficile* or its spores from hands?

Recommendation for outbreak and endemic settings

No specific recommendations regarding the most effective technique/product for removal of *C. difficile* spores can be made.

Hand Hygiene with Soap and Water Is Superior to Alcohol Rub and Antiseptic Wipes for Removal of *Clostridium difficile*

Matthew T. Oughton, MD, FRCPC; Vivian G. Loo, MD, FRCPC; Nandini Dendukuri, PhD; Susan Fenn, MLT, RT; Michael D. Libman, MD, FRCPC

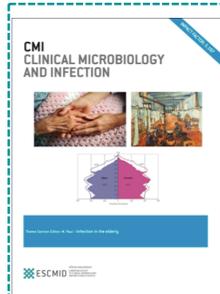


IGIENE DELLE MANI

Rationale for Soap and Water: Lack of efficacy of alcohol-based handrub against *C. difficile*

Interventions compared		Mean log reduction (95% CI), log ₁₀ CFU/mL
Intervention 1	Intervention 2	
Warm water and plain soap	No hand hygiene	2.14 (1.74–2.54)
Warm water and plain soap	Alcohol-based handrub	2.08 (1.69–2.47)
Cold water and plain soap	No hand hygiene	1.88 (1.48–2.28)
Cold water and plain soap	Alcohol-based handrub	1.82 (1.43–2.22)
Warm water and plain soap	Antiseptic hand wipe	1.57 (1.18–1.96)
Warm water and antibacterial soap	No hand hygiene	1.51 (1.12–1.91)
Warm water and antibacterial soap	Alcohol-based handrub	1.46 (1.06–1.85)
Cold water and plain soap	Antiseptic hand wipe	1.31 (0.92–1.71)
Warm water and antibacterial soap	Antiseptic hand wipe	0.94 (0.55–1.34)
Warm water and plain soap	Warm water and antibacterial soap	0.63 (0.23–1.02)
Antiseptic hand wipe	No hand hygiene	0.57 (0.17–0.96)
Antiseptic hand wipe	Alcohol-based handrub	0.51 (0.12–0.91)
Cold water and plain soap	Warm water and antibacterial soap	0.37 (–0.03 to 0.76)
Warm water and plain soap	Cold water and plain soap	0.26 (–0.14 to 0.66)
Alcohol-based handrub	No hand hygiene	0.06 (–0.34 to 0.45)

Handwashing with soap and water showed the greatest efficacy in removing *C. difficile* and should be performed preferentially over the use of alcohol-based handrubs



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IGIENE DELLE MANI

Is ethanol-based hand rub associated with increased CDI rates as compared to hand washing?

Recommendation for the outbreak setting

Switch from alcohol-based hand rub (AHR) to hand washing due to the lack of in vitro activity of AHR against spores (conditional recommendation, very low quality of evidence).

Recommendation for the endemic setting

Do not switch from AHR to hand washing with soap and water to reduce the incidence of CDI (conditional recommendation, very low quality of evidence).

Hand Hygiene Soap vs. Alcohol gel

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY MAY 2006, VOL. 27, NO. 5

ORIGINAL ARTICLE

Lack of Association Between the Increased Incidence of *Clostridium difficile*-Associated Disease and the Increasing Use of Alcohol-Based Hand Rubs

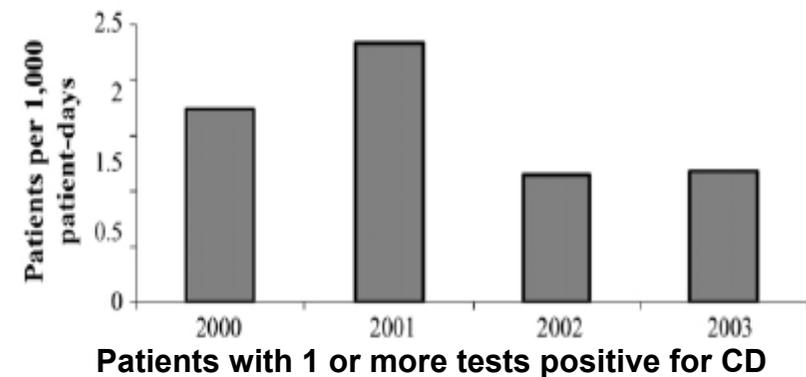
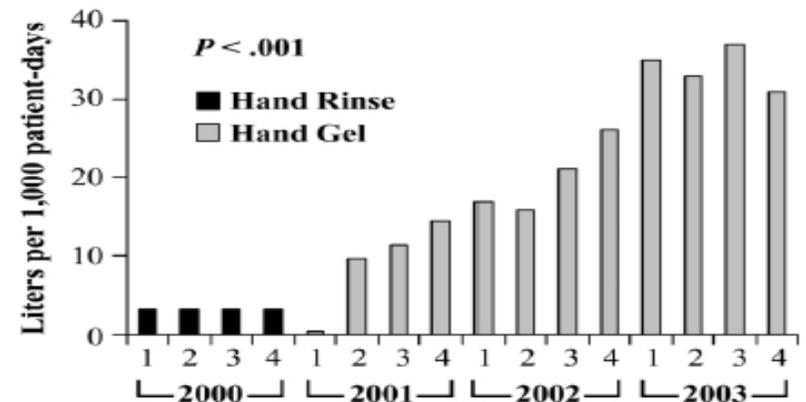
John M. Boyce, MD; Cathy Ligi, BSN; Cindy Kohan, MS; Diane Dumigan, BSN; and Nancy L. Havill, MT

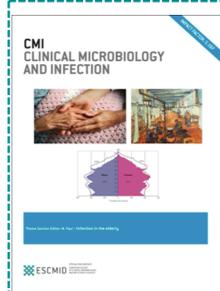
During 2000-2003,, despite increasing use of alcohol hand rub from (3 to >30L/1000 patient-days, and hand hygiene episodes increased from 10% to 85%), there was no concomitant increase in CDI rates

Discouraging alcohol gel use may undermine overall hand hygiene program with untoward consequences for HAs in general.



IGIENE DELLE MANI





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L. von Müller¹¹, M.H. Wilcox¹², A.F. Widmer¹ on behalf of the Committee†



IGIENE DELLE MANI

Is hand hygiene compliance associated with CDI transmission?

Recommendation for outbreak and endemic settings

Initiate interventions to **increase hand hygiene compliance** (conditional recommendation, very low quality of evidence).

RESEARCH ARTICLE

Open Access

Impact of sink location on hand hygiene compliance after care of patients with *Clostridium difficile* infection: a cross-sectional study



Alexander Deyneko¹, Fernanda Cordeiro¹, Laurie Berlin¹, Debby Ben-David^{1,2}, Silvana Perna¹ and Yves Longtin^{1,3*}

247 hand hygiene opportunities following care of a CDI patient were observed.

Glove use compliance: 85.4% (211/247)

Hand washing compliance after care of CDI patients: 14.2% (35/247)

Hand rubbing: 33.2% (82/247).

The distance from the nearest sink: 13.1m (± 7.6 -23.2).

An increasing distance between the patient zone and the nearest sink was inversely associated with hand washing compliance (adjusted OR, 0.90, 95 % CI, 0.84-0.97; P=0.008).

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IGIENE DEL PAZIENTE

Should patient bathing interventions be implemented to prevent CDI?

Recommendation

1. Encourage patients to wash hands and shower to reduce the burden of spores on the skin (*good practice recommendation*).

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APPARECCHIATURE E DISPOSITIVI

Should noncritical devices or equipment be dedicated to or specially cleaned after being used on the isolated patient with CDI?

Recommendation

1. Use disposable patient equipment when possible and ensure that reusable equipment is thoroughly cleaned and disinfected, preferentially with a sporicidal disinfectant that is equipment compatible (*strong recommendation, moderate quality of evidence*).



American Journal of Infection Control

Volume 38, Issue 7, September 2010, Pages 581-582



Is gastrointestinal endoscopy a risk factor for *Clostridium difficile* associated diarrhea?

Christian P. Selinger
Shaun Greer



Retrospective case-control study: 287 patients positive for *Clostridium difficile* toxin (CDT) A and/or B, matched with control patients with diarrhea and negative CDT A and B tests.

The risk of developing CDAD was slightly increased within the first 60 days after endoscopy due to a possible contamination via the instrument, alterations in gut flora because of bowel cleansing, and endoscopy-related antibiotic exposure

OR of 2 for endoscopy seems small and clinically less significant, and the **absolute risk of developing CDAD after endoscopy is in any case very low.**

Transmission of Infection by Flexible Gastrointestinal Endoscopy and Bronchoscopy

Julia Kovaleva,^a Frans T. M. Peters,^b Henny C. van der Mei,^c John E. Degener^a

Department of Medical Microbiology, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands^a; Endoscopy Center, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands^b; Department of Biomedical Engineering, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands^c

Commonly used high-level disinfectants have been studied to assess whether the vegetative cells and endospores of *C. difficile* are destroyed during different exposure times. Two percent glutaraldehyde and peracetic acid are capable of destroying large numbers of *C. difficile* endospores using exposure times of 5 to 20 min

Il reprocessing è efficace?



ERIC Report 2018: Il fallimento del reprocessing: una delle 10 maggiori minacce per la sicurezza del paziente



The FDA Continues to Remind Facilities of the Importance of Following Duodenoscope Reprocessing Instructions: FDA Safety Communication

FDA Safety Communication, April 12, 2019: Postmarket surveillance studies, to evaluate the percentage of clinically used duodenoscopes which remain contaminated:
High concern organisms >5.4% (3% increase from previously 2015 Report)



Infection control during GI endoscopy

GASTROINTESTINAL ENDOSCOPY
Volume ■, No. ■ : 2018

Prepared by: ASGE QUALITY ASSURANCE IN ENDOSCOPY COMMITTEE

Audrey H. Calderwood, MD, Lukejohn W. Day, MD, V. Raman Muthusamy, MD, James Collins, RN, Ralph David Hambrick, III, RN, Andrew S. Brock, MD, Nalini M. Guda, MD, Jonathan M. Buscaglia, MD, Bret T. Petersen, MD, Navtej S. Buttar, MD, Lauren G. Khanna, MD, Vladimir M. Kushnir, MD, Aparna Repaka, MD, Nicolas A. Villa, MD, Glenn M. Eisen, MD, MPH, Chair

This document was reviewed and approved by the Governing Board of the American Society for Gastrointestinal Endoscopy (ASGE).

Precautions in the endoscopy unit

Maintenance of a clean and sanitary environment for patients and personnel must be ensured. After the endoscopic procedure, exposed surfaces should be thoroughly cleaned of visible contaminants and then disinfected with an Environmental Protection Agency–registered hospital disinfectant.^{65,129} Rigorous cleaning of the endoscopy unit with a bleach-containing disinfectant for environmental disinfection is needed when patients with, or suspected of having, *C difficile* or norovirus undergo an endoscopic procedure. Also, isolation precautions that are otherwise indicated in patients who are potentially infected should be maintained when patients are transported to endoscopy units. For some patients, convenience or isolation requirements may require performance of an endoscopy at the bedside, rather than in the endoscopy unit. Finally, each endoscopy unit should have a plan in place for the cleaning and disinfecting of the procedural space at the end of the day.⁴



Accurata sanitizzazione terminale dedicata all'ambiente dove viene fatta l'endoscopia ai pazienti con CDI oltre che dell'endoscopio



OPEN ACCESS

European consensus conference on faecal microbiota transplantation in clinical practice

Giovanni Cammarota,¹ Gianluca Ianaro,¹ Herbert Tilg,² Mirjana Rajilić-Stojanović,³ Patrizia Kump,⁴ Reetta Satokari,⁵ Harry Sokol,⁶ Perttu Arkkila,⁷ Cristina Pintus,⁸ Ailsa Hart,⁹ Jonathan Segal,⁹ Marina Aloj,¹⁰ Luca Masucci,¹¹ Antonio Molinaro,¹² Franco Scaldaferri,¹ Giovanni Gasbarrini,¹ Antonio Lopez-Sanroman,¹³ Alexander Link,¹⁴ Pieter de Groot,¹⁵ Willem M de Vos,^{5,16} Christoph Högenauer,⁴ Peter Malfertheiner,¹⁴ Eero Mattila,¹⁷ Tomica Milosavljević,¹⁸ Max Nieuwdorp,^{12,15,19} Maurizio Sanguinetti,¹¹ Magnus Simren,²⁰ Antonio Gasbarrini,¹ The European FMT Working Group

BMJ

Cammarota G , et al.
Gut 2017;66:569–580.
doi:10.1136/gutjnl-2016-313017

Trapianto fecale

Statement: Specific national rules for the classification of FMT should be followed to implement an FMT centre.

Quality of evidence: low.

Strength of recommendation: strong.

Comment: A commonly acknowledged regulatory classification for FMT has not been established yet in Europe. Several countries have introduced some national rules and others require to be compliant to the European directive 2004/23 on quality and safety of tissues and cells.⁹⁴

As FMT falls under the category of 'Substance of Human Origin' like cells, tissues, milk, etc., the most important requirements should be followed, as for example an adequate facility.

Activities and responsibilities for processing and testing the raw material, for use of equipment, for preservation and storage and for release and distribution of FMT, should be described in SOPs.



CID 2018:66 (1 April)

IDSA GUIDELINE



Clinical Practice Guidelines for *Clostridium difficile* Infection in Adults and Children: 2017 Update by the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA)

L. Clifford McDonald,¹ Dale N. Gerding,² Stuart Johnson,^{2,3} Johan S. Bakken,⁴ Karen C. Carroll,⁵ Susan E. Coffin,⁶ Erik R. Dubberke,⁷ Kevin W. Garey,⁸ Carolyn V. Gould,¹ Ciaran Kelly,⁹ Vivian Loo,¹⁰ Julia Shaklee Sammons,⁶ Thomas J. Sandora,¹¹ and Mark H. Wilcox¹²



DISINFEZIONE AMBIENTALE MANUALE

What is the role of manual, terminal disinfection using a *C. difficile* sporicidal agent for patients in isolation for CDI?

Recommendation

1. Terminal room cleaning with a sporicidal agent should be considered in conjunction with other measures to prevent CDI during endemic high rates or outbreaks, or if there is evidence of repeated cases of CDI in the same room (*weak recommendation, low quality of evidence*).

What is the role of daily sporicidal disinfection?

Should cleaning adequacy be evaluated?

Recommendation

1. Incorporate measures of cleaning effectiveness to ensure quality of environmental cleaning (*good practice recommendation*).

Recommendation

1. Daily cleaning with a sporicidal agent should be considered in conjunction with other measures to prevent CDI during outbreaks or in hyperendemic (sustained high rates) settings, or if there is evidence of repeated cases of CDI in the same room (*weak recommendation, low quality of evidence*).



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

CDI rate: 2,34 to 2,52 per 10 000 occupied bed-days

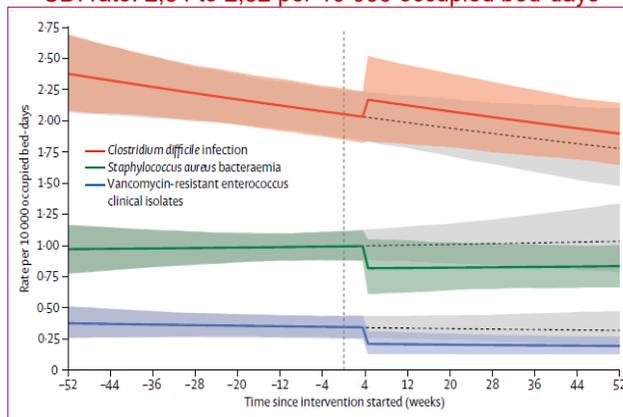


Figure 3: Estimated changes in health care-associated infection rates before and after the intervention. Ribbons are 95% prediction intervals. Grey shading shows expected infection rates with no intervention.

The percentages of frequent touch points cleaned increased

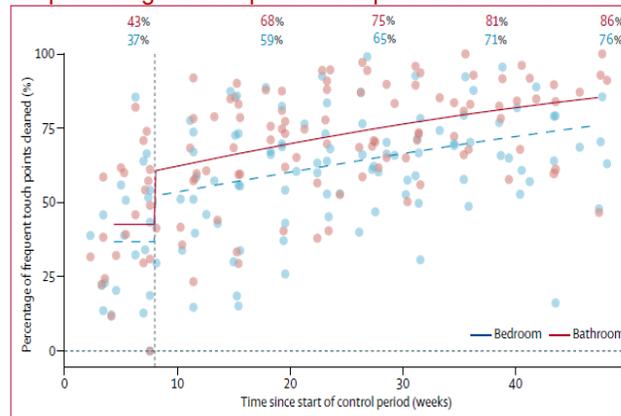


Figure 4: Percentage of frequent touch points cleaned in patient bathrooms and bedrooms. Percentages are model-based predictions of the outcome. Dotted line shows the start of intervention.

Multicentre, randomised trial done in 11 acute care public hospitals in Australia, to evaluate the effectiveness of an environmental cleaning bundle to reduce HAI

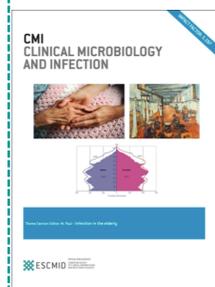
The incidences of CDI did not change significantly ($p=0.4655$)

Comment

Can cleaning REACH further in reducing hospital infections?

Jonathan A Otter

It's more probable that the lack of focus on the use of an effective sporicidal agent for environmental hygiene related to *C difficile* explains why the intervention had no effect on *C difficile* infection.



 **ESCMID** EUROPEAN SOCIETY
OF CLINICAL MICROBIOLOGY
AND INFECTIOUS DISEASES

Clin Microbiol Infect. 2018 Oct;24(10):1051-1054.

Contents lists available at ScienceDirect

Clinical Microbiology and Infection

journal homepage: www.clinicalmicrobiologyandinfection.com



Guidelines

Guidance document for prevention of *Clostridium difficile* infection in acute healthcare settings

S. Tschudin-Sutter^{1,4}, E.J. Kuijper², A. Durovic³, M.J.G.T. Vehreschild³, F. Barbut⁴,
C. Eckert⁴, F. Fitzpatrick⁵, M. Hell⁶, T. Norèn⁷, J. O'Driscoll⁸, J. Coia⁹, P. Gastmeier¹⁰,
L. von Müller¹¹, M.H. Wilcox¹², A.F. Widmer¹ on behalf of the Committee†



DISINFEZIONE AMBIENTALE MANUALE

- **Does environmental disinfection of rooms of patients with CDI decrease the transmission of *C. difficile* compared to routine cleaning?**

Introduce **daily environmental sporicidal disinfection and terminal disinfection** of rooms of patients with CDI to decrease the transmission of CDI (**strong recommendation, very low quality of evidence**).

- **Does specific education enhance thoroughness of cleaning in the context of CDI-prevention?**

Education of environmental service personnel proved to be of particular importance.

Environmental service personnel require repeated training and regular quality control measurements (e.g. **by labelling of surface areas before cleaning with a fluorescence marker**) to ensure sustained high quality cleaning.

**Guide for the Management of
Outbreaks of *Clostridium difficile*-
Associated Diarrhea (CDAD) in
Hospitals**



COMITÉ SUR LES INFECTIONS NOSOCOMIALES DU QUÉBEC

December 2014

3. Environmental cleaning – rooms with CDAD patients

Cleaning of soiled items or surfaces	3.1	Clean any visibly soiled items or surfaces and wipe up body fluids as quickly as possible prior to disinfection.	1	Refs [3, 5]
Type of disinfectant	3.2	Choose a chlorine-based product with an adequate concentration (5 000 ppm). If a lower concentration is used (e.g., 1 600 ppm), it is necessary to respect the recommended contact time (generally 20 minutes).	1	Refs [3, 5] Table 4 in Ref. [3]
Contact time	3.3	Respect the dilutions and contact time recommended by the manufacturer to destroy bacterial spores. If a lower concentration is used, review the literature to determine the required contact time.	1	Refs [3, 5]
Frequency of disinfection	3.4	Clean the environments of patients with CDAD at least once a day (daily). Use a routine one-step germicidal detergent on all surfaces.	1	
	3.5	Consider increasing the frequency of daily environmental cleaning for patients with CDAD to twice daily or three times daily at the most .	2	
Number of cleaning steps	3.6	Clean high-touch surfaces in the room and washroom daily using a 1-step sporicidal product with combined cleaning and disinfecting properties (a chlorine product, a commercially available chlorine product combined with a detergent or a commercially available hydrogen peroxide product combined with detergent). It must be a recognized and proven product. Homemade mixtures must not be used. It is important to respect the recommended concentrations and contact time. The product must have a Health Canada DIN number.	1	Ref. [5] Appendix 2 in Ref. [5] Ref. [10]
Disinfection procedure	3.7	Ensure that the disinfection protocol uses a systematic approach, with a list of clearly defined tasks, so that all contaminated surfaces are cleaned.	1	Ref. [3] Appendix 4
Cleaning on patient discharge or when additional precautions are discontinued	3.19	Perform three-step terminal sporicidal disinfection using a chlorine product on all accessible room surfaces (furniture, floor, patient's bed, etc.). A hydrogen peroxide product with proven sporicidal activity may be used if chlorine is contraindicated. If a "detergent + sporicide" combination product or hydrogen peroxide product is used, a 2-step procedure is acceptable (i.e., the rinsing step can be skipped).	1	Refs [3, 5] Table 5 in Ref. [3] Appendix 2 in Ref. [5]

**Patient discharge:
3-step protocol**
(cleaning, rinsing,
disinfection) or 2-step
(detergent+sporicidal)

**High-touch surfaces:
1-step** (detergente+
disinfettante,
cloro o H₂O₂)

5000 ppm cloro-attivo
se inferiore (1600 ppm)
rispettare il **tempo di
contatto** (20 min)

2-3 volte al giorno

**Guide for the Management of
Outbreaks of *Clostridium difficile*-
Associated Diarrhea (CDAD) in
Hospitals**



Preventive measures	Description	Level of intensity of measure	References and related documents
	3.8 Start the procedure in the room and finish in the washroom.	1	Ref. [5]
	3.9 During 3-step disinfection, change gloves after each step (cleaning, rinsing, disinfection).	1	Ref. [5]
	3.10 Preferably use microfibre cloths. Never dip the cloth in the solution more than once.	1	
	3.11 Check chairs, pillows and mattresses to ensure they are intact. Follow the institution's procedure for the repair or replacement of damaged material or equipment.	1	
	3.12 Ensure that surfaces are free of any sticky residue (adhesives, adhesive bandages, plasters) that could prevent proper decontamination.	1	
	3.13 Avoid cross-contamination of patient care areas (e.g., by using different-coloured cloths for the room and washroom).	1	
	3.14 Discard water that was used for disinfection immediately after use in an appropriate room; put the cloths and mop in a plastic bag and send them to the laundry.	1	Ref. [3] Table 5 in Ref. [3]
	3.15 Perform hand hygiene with soap and water and change gloves between rooms.	1	Ref. [5]
Disinfection of reusable mobile equipment	3.16 Make sure reusable material and equipment is properly disinfected with a chlorine solution on exiting the room.	1	Refs [3, 5, 8] Appendix 4 Procedure in Appendix 2 in Ref. [5]
	3.17 Consider using chlorine wipes to disinfect small devices; ensure that the proper amounts of product and contact time are respected.	2	Ref. [11]
	3.18 Preferably disinfect equipment inside the room before taking it out. If equipment must be cleaned outside the room, make sure it is properly identified for sporicidal disinfection and transported safely.		

Iniziare dalle aree più pulite per finire in quelle più sporche (toilette)

Utilizzare la microfibra, di diverso colore. Mandarla in lavanderia separatamente

Utilizzare salviette a base di cloro per disinfettare piccoli dispositivi in stanza

I PRODOTTI PRONTI ALL'USO

Salviette pre-impregnate monouso: EN ISO 16615

Journal of Hospital Infection 91 (2015) 319–325



Available online at www.sciencedirect.com
Journal of Hospital Infection
journal homepage: www.elsevierhealth.com/journals/jhin



Disinfectant wipes are appropriate to control microbial bioburden from surfaces: use of a new ASTM standard test protocol to demonstrate efficacy

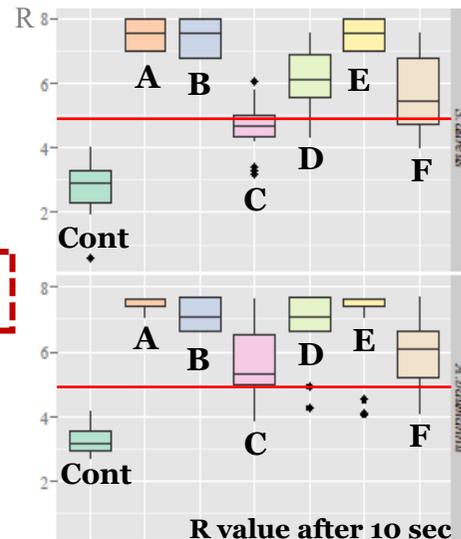
S.A. Sattar^a, C. Bradley^b, R. Kibbee^a, R. Wesgate^c, M.A.C. Wilkinson^b, T. Sharpe^d, J-Y. Maillard^{c,*}

L'efficacia e il trasferimento nelle aree attigue dipendono dalla formulazione della salvietta e dalla modalità d'uso

ONE WIPE, ONE SURFACE, ONE DIRECTION

ACTIVE INGREDIENTS

Wipe code	Active ingredient(s)
A/B	0.5% accelerated H ₂ O ₂
C	0.45% benzalkonium chloride; 0.4% didecyl dimethyl ammonium chloride; 0.1% polyhexamethylene biguanide
D	40–50% sodium percarbonate; 5–10% citric acid
E	Sodium hypochlorite solution <3%, to give 1000 ppm free available chlorine 1000 ppm cloro attivo
F	10–20% Isopropanol; 7–4% ethanol, 2-butoxyethanol <0.125% benzyl-C12-18-alkyldimethyl ammonium chlorides <0.125% quaternary ammonium compounds, C12-18-alkyl [(ethylphenyl) methyl] dimethyl chlorides



EFFECTIVENESS (R) TRANSFER OF BACTERIA

Test micro-organism	Test	Control	Total number of carriers/number positive ^a					
			A	B	C	D	E	F
<i>Staphylococcus aureus</i>	Removal	15/15	15/0	15/0	15/15	15/13	15/0	15/12
	Transfer	15/15	15/0	15/0	15/15	15/6	15/0	15/6
<i>Acinetobacter baumannii</i>	Removal	11/11	15/0	15/0	15/12	15/9	15/11	15/13
	Transfer	11/11	15/0	15/0	15/0	15/0	15/0	15/3

^a '0' indicates that there were no viable bacteria left on the surface of the disc.

■ No transfer
■ Transfer

Studio comparativo tra Protocollo Operativo Standard e utilizzo di salviette pronte all'uso a base di cloro

Protocollo Operativo Standard: Servizio in appalto e personale OSS, Soluzione detergente-disinfettante (cloro attivo 2,8%, tensioattivi 0,5 gr) e disinfettante (cloro attivo 2,8%).

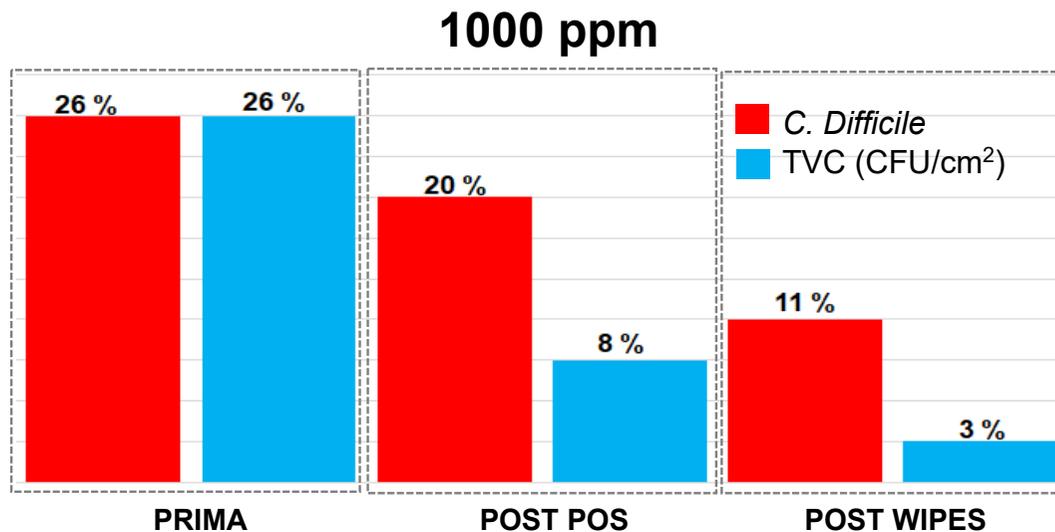
Procedura ordinaria 1000 ppm, terminale 5000 ppm.



Protocollo salviette pronte all'uso: Personale OSS, procedura "one wipes, one direction, one surface". Salviette impregnate con **1000 ppm cloro attivo**, efficacia sporicida in 2 min (EN 13704, EN 16615)



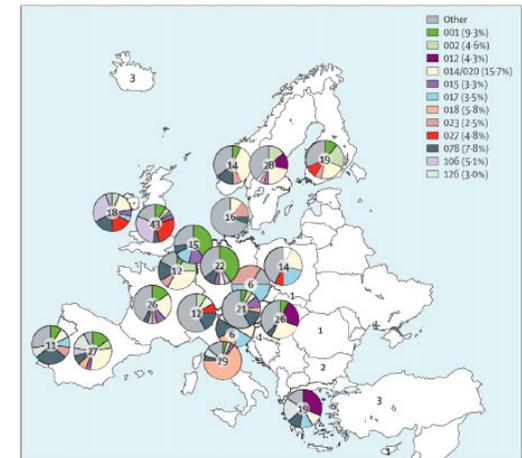
Percentuale siti positivi per *C.difficile* e per TVC superiore al limite di 125 CFU/24cm²



Hypervirulent *Clostridium difficile* PCR-Ribotypes Exhibit Resistance to Widely Used Disinfectants

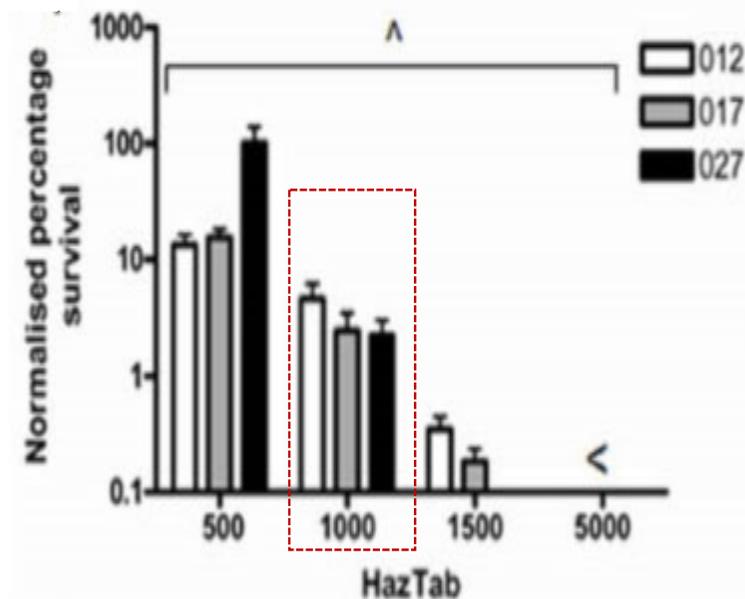
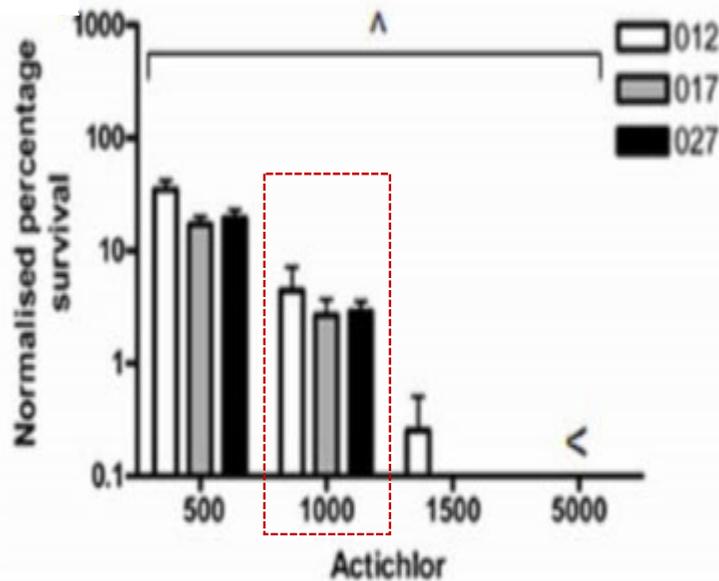
Lisa F. Dawson, Esmeralda Valiente, Elizabeth H. Donahue, George Birchenough[‡], Brendan W. Wren^{*}

Department of Infectious and Tropical Diseases, London School of Hygiene and Tropical Medicine, London, United Kingdom



The PCR-ribotype and concentration dependent differences in the efficacy of the disinfectants

Jones A.M., JHI 2013



sodium dichloroisocyanurate 1000 ppm

I PRODOTTI PRONTI ALL'USO

Salviette pre-impregnate monouso

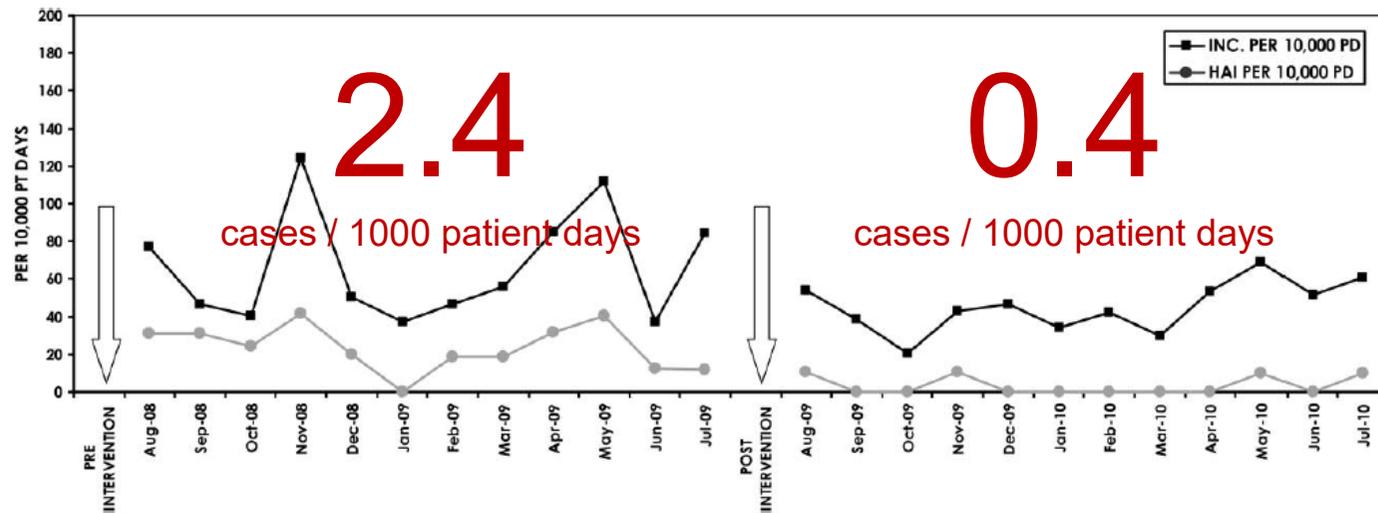
A Targeted Strategy to Wipe Out *Clostridium difficile*

Robert Orenstein, DO;^{1,2} Kimberly C. Aronhalt, MA, RN;²
James E. McManus, Jr;³
Leslie A. Fedraw, PMP, MA, MT(ASCP)⁴

This study evaluated daily cleaning with germicidal bleach wipes on wards with a high incidence of hospital-acquired *Clostridium difficile* infection (CDI). The intervention reduced hospital-acquired CDI incidence by 85%, from 24.2 to 3.6 cases per 10,000 patient-days, and prolonged the median time between hospital-acquired CDI cases from 8 to 80 days.

Infect Control Hosp Epidemiol 2011;32(11):1137-1139

**Riduzione
delle infezioni da *C.difficile*
passando all'uso delle
wipes (0,55% cloro attivo, 5500ppm).
Efficacia del 97-98% (ATP <250 RLUs).**



I PRODOTTI PRONTI ALL'USO

Salviette pre-impregnate monouso



Detergent and disinfectant wipes used on reusable medical devices with plastic surfaces – risk of degrading plastic surfaces

(All manufacturers) Ensure detergent and disinfectant wipes are compatible with the device. (MDA/2013/019)

Published 17 December 2014

From: [Medicines and Healthcare products Regulatory Agency](#)

Issued: 27 March 2013

Alert type: [Medical device alert](#)

Medical specialty: [Critical care](#), [Dentistry](#), [General practice](#), [Infection prevention](#), [Physiotherapy and occupational therapy](#), [Theatre practitioners](#)

In Italia, D.Lgs. 46/1997, emendato col D.Lgs. 37/2010) recepimento della Direttiva 2007/47/CE

Nel Regno Unito, la Medicines and Healthcare products Regulatory Agency (MHRA), ha pubblicato nel 2010 e successivamente nel 2013, un avviso dove si sottolinea che la **mancata osservanza delle istruzioni del fabbricante per la decontaminazione dei dispositivi medici tramite l'uso delle salviette**, può essere considerata uso **“off-label“**; devono essere utilizzati solo i prodotti raccomandati dal produttore per evitare il danneggiamento del dispositivo e alterazioni della funzionalità



Superficie di acciaio trattata con salviette impregnate di cloro attivo (1000ppm)

**Guide for the Management of
Outbreaks of *Clostridium difficile*-
Associated Diarrhea (CDAD) in
Hospitals**



COMITÉ SUR LES INFECTIONS NOSOCOMIALES DU QUÉBEC

December 2014



**Identificare chi
(operatore formato)
fa che cosa, quando e
in quanto tempo**

**Audit: tracciabilità di
ogni fase del processo**

**Controllo di qualità:
Monitoraggio
dell'efficacia attraverso
ATP-testing, markers
fluorescenti**

**Etichettare i
dispositivi
disinfettati**

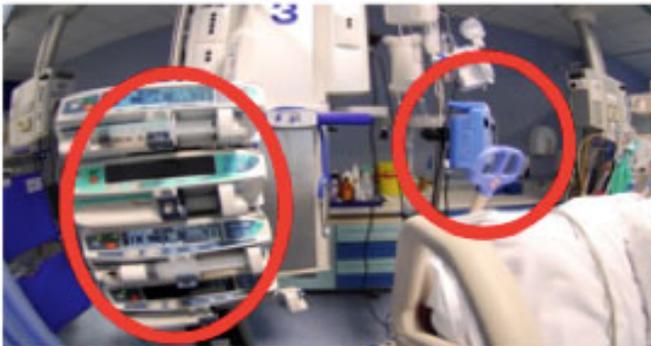


Preventive measures	Description	Level of intensity of measure	References and related documents
Allocation of tasks and grey zones	3.24 Ensure that the individuals responsible for the cleaning and disinfection of all surfaces and equipment are clearly identified for every work shift.	1	Ref. [5]
	3.25 Ensure that internal procedures clearly identify the people responsible for cleaning and disinfection, determine the frequency of cleaning and disinfection and the products to be used.	1	
Human resources	3.26 Ensure there are adequate numbers of housekeeping staff and orderlies to meet needs, 7 days a week, 24 hours a day.	1	Ref. [5]
	3.27 Ensure that a person trained in the disinfection of rooms with patients placed on additional precautions is available on site at all times .	2	Ref. [5]
	3.28 Allow sufficient time for cleaning and disinfection procedures to be carried out fully and properly.	1	Ref. [5]
	3.29 Consider establishing a team dedicated solely to the cleaning and disinfection of rooms with CDAD patients.	3	
Staff training	3.30 Ensure that housekeeping staff are trained in the specific cleaning procedures for surfaces in CDAD cases.	1	Ref. [3]
	3.31 Ensure that orderlies and nurses aides are given basic training on the disinfection of patient care equipment.	1	
	3.32 Adopt a program to document activities (log) performed by housekeeping staff and orderlies to ensure that interventions can be tracked.	1	Ref. [5]
Audits and quality assessment	3.33 Ensure that disinfection protocols and procedures are up to date.	1	Ref. [3]
	3.34 Adopt a housekeeping quality control program that complies with the Ministère de la Santé et des Services sociaux's program (MSSS) [Ministry of health and social services], including visual inspections, fluorescent markers or ATP testing.	1	Ref. [6]
	3.35 Consider using fluorescent markers periodically on items considered essential.	2	
	3.36 Label as "disinfected" equipment that has been properly disinfected.	3	
Checklist	3.37 Consider using a checklist to ensure that all surfaces have been treated.	2	Ref. [8]

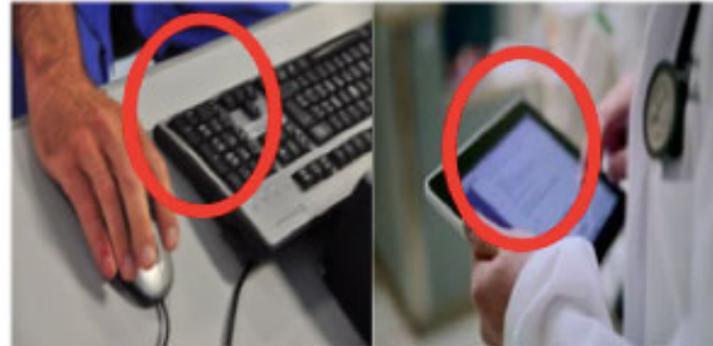
Critical issues in cleaning and disinfection practices: the outsourcing of hospital cleaning services



No Man's Land: who performs cleaning and disinfection?



Infusion pumps, monitors, and other medical devices



Keyboards and tablets



Reusable devices



Shared equipment

Critical issues in cleaning and disinfection practices: the outsourcing of hospital cleaning services



Social Science & Medicine 174 (2017) 64–69



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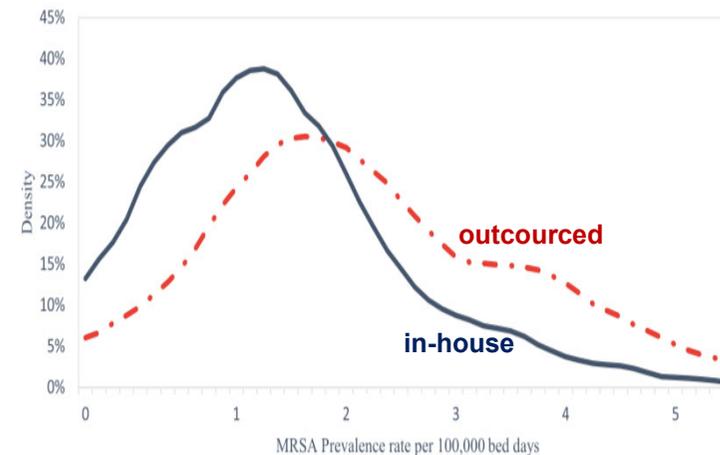
Outsourcing cleaning services increases MRSA incidence: Evidence from 126 English acute trusts

Veronica Toffolutti ^{a,*}, Aaron Reeves ^b, Martin McKee ^c, David Stuckler ^{a,c}



Lower hygiene standards and more infections

In 126 English acute hospital Trusts during 2010-2014, we find that outsourcing cleaning services was associated with greater incidence of MRSA, fewer cleaning staff per hospital bed, worse patient perceptions of cleanliness and staff perceptions of availability of handwashing facilities.



**Guide for the Management of
Outbreaks of *Clostridium difficile*-
Associated Diarrhea (CDAD) in
Hospitals**



Check list

Procedures and cleaning checklist

Checklist - CDAD management					
Procedures	Yes	No	N/A	Person responsible	Comments
Is the additional precautions sign visible at the entrance to the room?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Is the personal protective equipment easily accessible at the entrance to the room?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Is the soiled linen receptacle placed near the patient's bed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Is the commode chair in the patient's environment if the patient does not have dedicated toileting facilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

Is the following equipment, which is required by the patient, dedicated?

Is the equipment always disinfected in accordance with standards when it is taken out of the room?

Procedures	Yes	No	N/A	Person responsible	Comments
Is the equipment always disinfected in accordance with standards when it is taken out of the room?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Are additional precautions always applied and complied with during patient transport?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
After patient transport, is the equipment always disinfected?					
Wheelchair	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Stretcher	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Plastic sleeves for the patient's records	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Other (indicate here)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Cleaning of equipment during hospitalization					
Procedures	Yes	No	N/A	Person responsible	Comments
Is the fabric of the patient lift cleaned before use by another patient?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Are small devices properly cleaned before use by another patient, including:					
High toilet seat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Wheelchair	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Monitor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
IV pole	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Stethoscope	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Sphygmomanometer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Pulse oximeter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Bladder scanner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Pump	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Mini inpatient	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Other (indicate)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

Checklist - CDAD management					
Cleaning of surfaces	Yes	No	N/A	Person responsible	Comments
Are clean cloths and mops and freshly prepared disinfectant solutions used to clean the room?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Is the chlorine disinfectant solution prepared at the right concentration?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

Are the following high-touch surfaces cleaned and is the appropriate contact time respected?

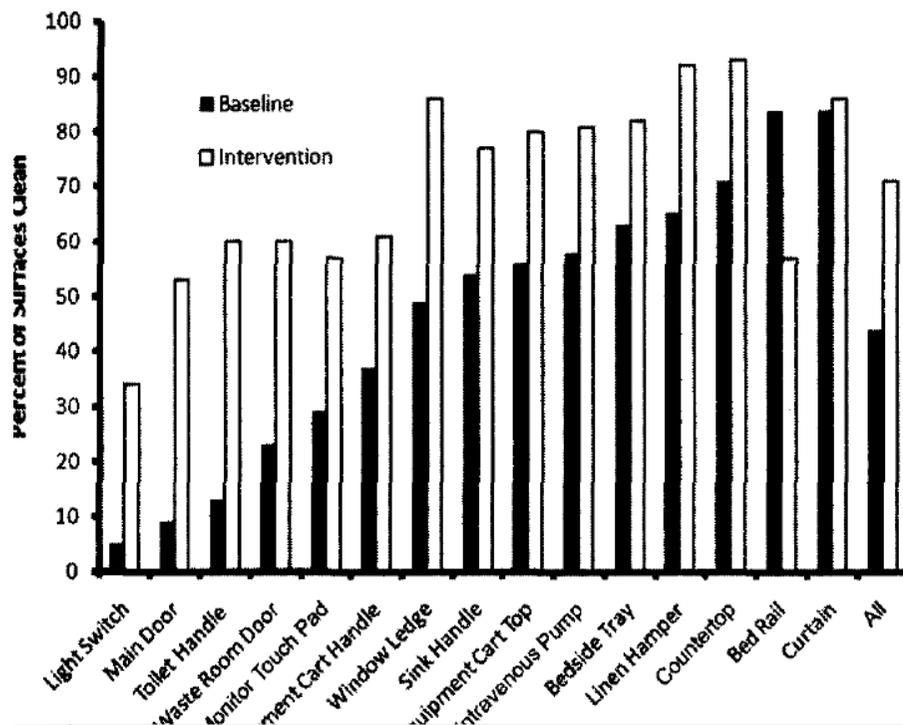
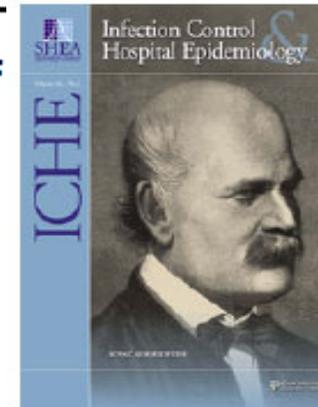
Alcohol-based hand rub dispenser

Emergency pull cord in the bathroom	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Oxygen regulator	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Biohazard container	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Alcohol-based hand rub dispenser	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Bedside table	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Extra chairs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Stool	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Integrator of drawers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Clothes locker handle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Cleaning of surfaces					
Procedures	Yes	No	N/A	Person responsible	Comments
Television and television stand	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Television control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Door handles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Light switches	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Telephone (handset and cord)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Other (indicate)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Cleaning of surfaces on discharge or discontinuation of additional precautions					
Procedures	Yes	No	N/A	Person responsible	Comments
Are sheets always removed prior to disinfection?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Are the following items disposed of prior to disinfection of the room:					
Bar soap	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Toilet paper	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Box of gloves (in the patient's immediate environment)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Disposable patient care equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Are curtains taken down and cleaned?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Are the following used and soiled items always changed on patient discharge?					
Suction containers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Other (indicate)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Is the bathroom properly disinfected?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

Impact of an Environmental Cleaning Intervention on the Presence of Methicillin-Resistant *Staphylococcus aureus* and Vancomycin-Resistant Enterococci on Surfaces in Intensive Care Unit Rooms

P. C. Carling, M. F. Parry, S. M. Von Beheren and Healthcare Environmental Hygiene Study Group

Volume 29, Issue 1, January 2008, pp. 1-7



THE OVERALL CLEANING COMPLIANCE WAS ONLY 49% (range, 35% to 81%), expressed as a percentage of evaluated surfaces.



Can measuring environmental cleanliness using ATP aid in the monitoring of wards with periods of increased incidence of *Clostridium difficile*?

Katherine Hardy^{1,2}, Gill Abbott³, Sarah Bashford³, Helen Bucior⁴, Jane Codd³, Madelaine Holland³, Mandy Reynolds³, Avril Simms³, Diane Thomlinson^{3*}

1. West Midlands Public Health Laboratory, Heart of England NHS Foundation Trust, Birmingham, UK

2. School of Immunity and Infection, University of Birmingham, Birmingham, UK

3. Infection Prevention Team, Heart of England NHS Foundation Trust, Bordesley Green East, Birmingham B9 5SS, UK.

Email: Diane.tomlinson@heartofengland.nhs.uk

4. Infection Prevention team, Mid Staffordshire NHS Foundation Trust, UK

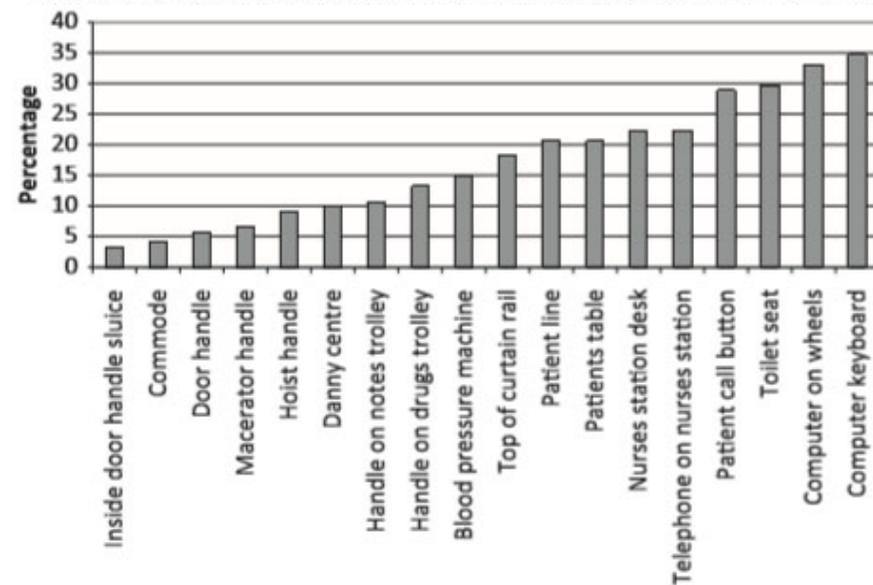
*Corresponding author

J Infect Prevent, 2014, 15: 31-35



Weekly environmental audit: ATP monitoring provided the staff with **non-subjective results** and **immediate feedback** that facilitated discussions about cleaning regimes, particularly in **highlighting areas that require either more frequent cleaning or a change in cleaning regime.**

Percentage of times each of the sites failed (>1,000 RLU) adenosine triphosphate monitoring



CID 2018:66 (1 April)

IDSA GUIDELINE



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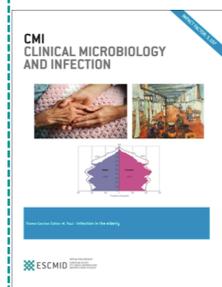
L. Clifford McDonald,¹ Dale N. Gerding,² Stuart Johnson,^{2,3} Johan S. Bakken,⁴ Karen C. Carroll,⁵ Susan E. Coffin,⁶ Erik R. Dubberke,⁷ Kevin W. Garey,⁸ Carolyn V. Gould,¹ Ciaran Kelly,⁹ Vivian Loo,¹⁰ Julia Shaklee Sammons,⁶ Thomas J. Sandora,¹¹ and Mark H. Wilcox¹²



**DISINFEZIONE
AMBIENTALE
AUTOMATIZZARA**

What is the role of automated terminal disinfection using a method that is sporicidal against *C. difficile*?

1. There are limited data at this time to recommend use of automated, terminal disinfection using a sporicidal method for CDI prevention (*no recommendation*).



 **ESCMID** EUROPEAN SOCIETY OF CLINICAL MICROBIOLOGY AND INFECTIOUS DISEASES

Clin Microbiol Infect. 2018 Oct;24(10):1051-1054.

Contents lists available at ScienceDirect

Clinical Microbiology and Infection

journal homepage: www.clinicalmicrobiologyandinfection.com

Guidelines

Guidance document for prevention of *Clostridium difficile* infection in acute healthcare settings

S. Tschudin-Sutter ^{1,*}, E.J. Kuijper ², A. Durovic ³, M.J.G.T. Vehreschild ³, F. Barbut ⁴, C. Eckert ⁴, F. Fitzpatrick ⁵, M. Hell ⁶, T. Norèn ⁷, J. O'Driscoll ⁸, J. Coia ⁹, P. Gastmeier ¹⁰, L. von Müller ¹¹, M.H. Wilcox ¹², A.F. Widmer ¹ on behalf of the Committee†



Hydrogen peroxide vapour (HPV)

Aerosolised hydrogen peroxide (AHP)

Ultraviolet radiation (UVC)

Pulsed-xenon UV (PX-UV)

DISINFEZIONE AMBIENTALE AUTOMATIZZATA

Are no-touch disinfection systems as effective as hypochlorite to reduce the environmental contamination in rooms of patients with CDI?

Recommendation for outbreak and endemic settings

The panel concludes that both in the outbreak and the endemic setting, **no touch disinfection systems may be as effective in reducing transmission/incidence of CDI as hypochlorite** (very low quality of evidence).

Automated disinfection technologies

Two methods:

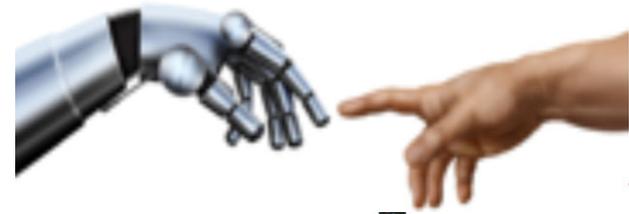
1. Use of **BIOCIDE PRODUCTS**
2. Use of **ELECTROMAGNETIC WAVES**

ADVANTAGES

- High repeatability, **not dependent on operator accuracy**
- Operator not required after treatment activation
- Dispersion of the active agent even on **difficult to reach sites**
- Also **effective on microorganisms with environmental persistence**

DISADVANTAGES

- Applicable only **after cleaning**
- Need to operate in the **absence of operator/patient**
- Need to **confine the environment** for systems that use biocides and to respect the times for **access to the room** (safety for patients and operators)
- **Material compatibility** must be checked
- **Specific training** is required for the operators
- **Acquire or rent dedicated equipment** (organizational and economic aspects).
- There is still **limited evidence** on decontamination efficacy and HAIs reduction



Efficacia del vapore di perossido di idrogeno



Journal of Hospital Infection 94 (2016) 185–187



Available online at www.sciencedirect.com

Journal of Hospital Infection

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



Short report

Reduction in *Clostridium difficile* infection associated with the introduction of hydrogen peroxide vapour automated room disinfection

J. McCord^{a,*}, M. Prewitt^a, E. Dyakova^b, S. Mookerjee^b, J.A. Otter^b

^aNorth Mississippi Medical Center, Tupelo, MI, USA

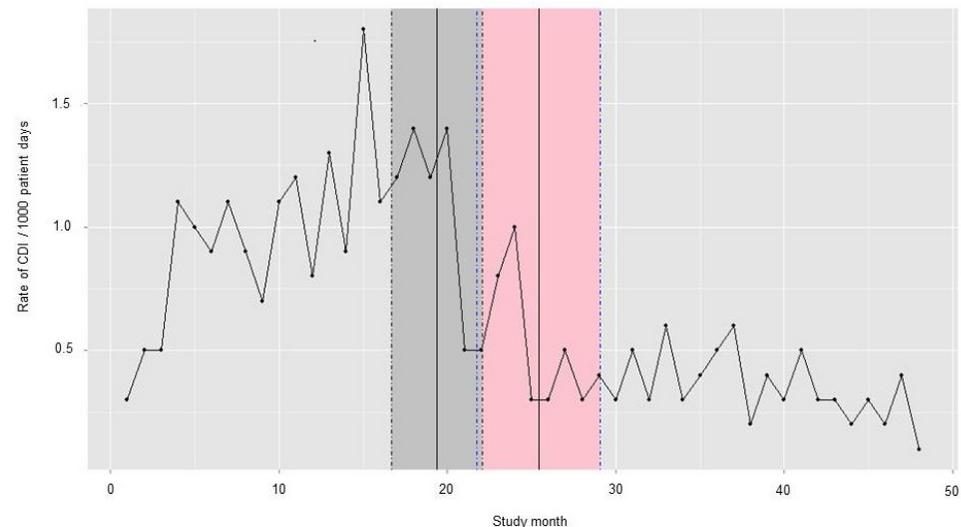
^bImperial College Healthcare NHS Trust, London, UK

Hydroxyl radical production from 30-35% H₂O₂, removed by active catalytic conversion (H₂O, O₂)

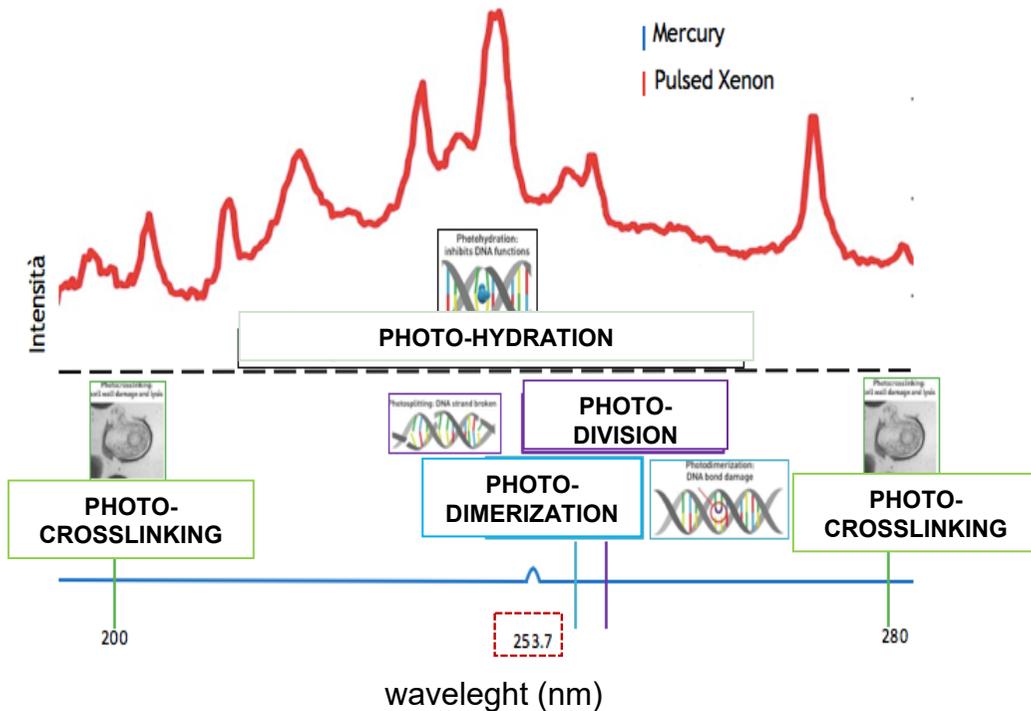
Riduzione del 60% delle infezioni da *C. difficile* dopo l'introduzione del trattamento a vapore di H₂O₂

**2 years before HPV,
2 years during HPV**

Breakpoint model indicated significant reduction in rate of CDI when HPV implemented (1.0 to 0.4 per 1000 patient days).

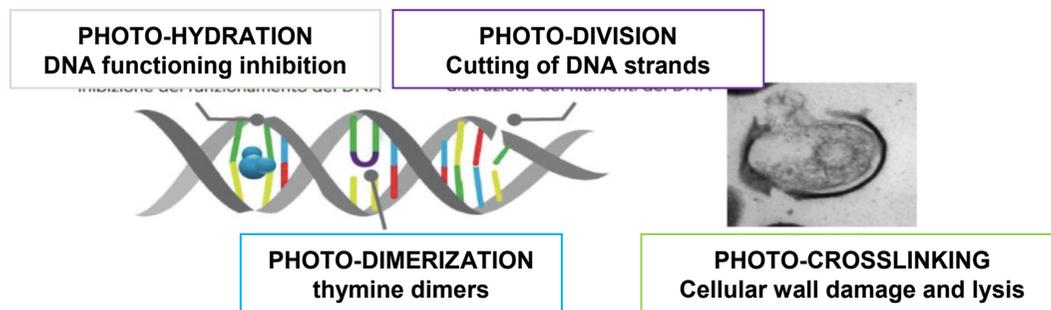


UV-C electromagnetic radiation automated disinfection



QUARTZ LAMPS, CONTAINING ELEMENTARY MERCURY and an inert gas (argon): **UV-C 254 nm, continuous emission.**

XENON GAS LAMPS (PX-UV): **wide spectrum of UV-C radiations (100-280 nm) and visible spectrum radiations (380-700 nm), high intensity pulsed emission. Effective in less time**





Major article

Postdischarge decontamination of MRSA, VRE, and *Clostridium difficile* isolation rooms using 2 commercially available automated ultraviolet-C-emitting devices



Titus Wong MD, MHSc, FRCPC^{a,b,1}, Tracey Woznow BSc, BEd(Sec)^a, Mike Petrie^c, Elena Murzello BScN, MBA^d, Allison Muniak MSc^d, Amin Kadora MBA^e, Elizabeth Bryce MD, FRCPC^{a,b,*}

Adjusted odds of bacterial growth obtained from multivariable model of growth of MRSA or VRE in protein broth after UVC disinfection on stainless steel carriers

Variables	OR	95% Confidence interval
Machine		
1	Reference	—
2	6.96	3.79-13.35
Organism		
MRSA	Reference	
VRE	1.40	0.79-2.50
Surface		
Bed	Reference	—
Closet	2.04	1.06-4.00
Sink	20.50	9.19-49.54
Concentration	3.52	2.49-5.13

Abbreviations: MRSA, methicillin-resistant *Staphylococcus aureus*; OR, odds ratio; UVC, ultraviolet-C; VRE, vancomycin-resistant enterococci.

UVC devices are effective adjuncts to manual cleaning but **vary in their ability to disinfect high concentrations of organisms in the presence of protein.**



Radiazione UVC continua a 254 nm

Dopo Protocollo Standard:
MRSA 27.9%, VRE 29.5% e **CD 22.7%**

Dopo Disinfezione UVC:
MRSA 3.3%, VRE 4.9% e **CD 0%**
(P = .0003)

Esposizione: 14 min per ciclo a 46,000 uWs/cm² (4 cicli: 56min) o 57 min a 22,000 uWs/cm²



Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org



Brief report

Utilization and impact of a pulsed-xenon ultraviolet room disinfection system and multidisciplinary care team on *Clostridium difficile* in a long-term acute care facility



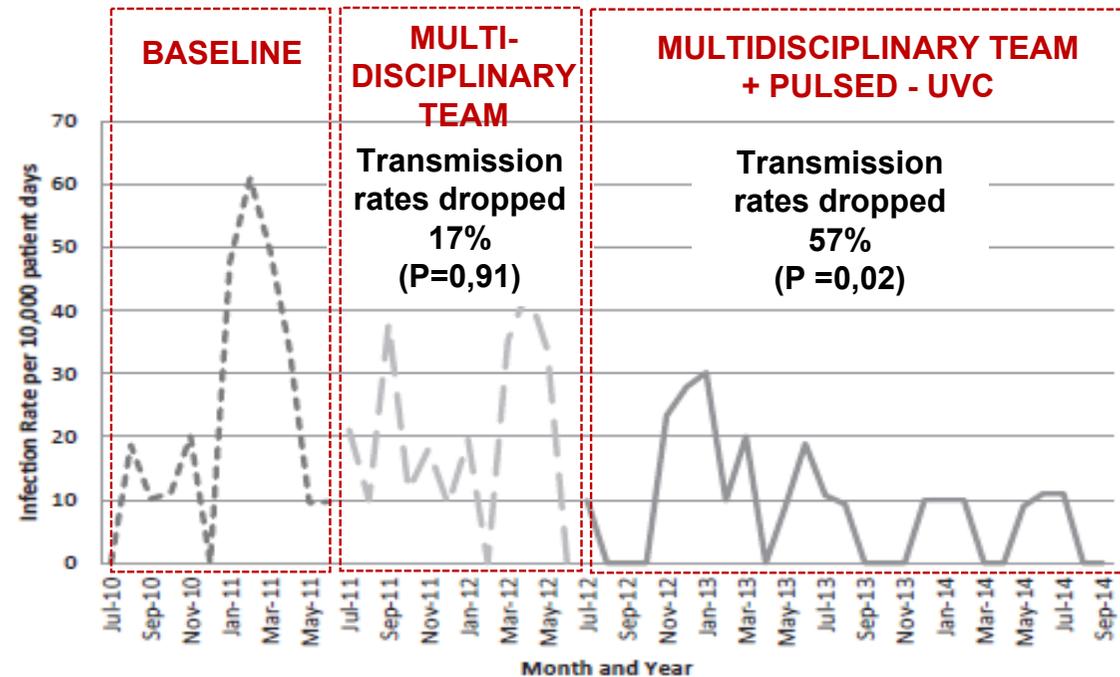
Renee Miller RN, MSN^a, Sarah Simmons BS, MPH, DrPH^{b,*}, Charles Dale BA^b, Julie Stachowiak MIA, PhD^b, Mark Stibich MHA, PhD^b

^aMiller Consulting, Marietta, GA
^bXenex Disinfection Services, San Antonio, TX



Pulsed-xenon UV (PX-UV)

39-month period,
2 interventions were
implemented: **combined use of multidisciplinary teams and pulsed-xenon disinfection can have a significant impact on *C. difficile* transmission rates in long-term care facilities.**





Major article

Clostridium difficile infections before and during use of ultraviolet disinfection



Aarathi Nagaraja MD^a, Paul Visintainer PhD^b, Janet P. Haas PhD^{a,c}, Jonathan Menz MBA^d, Gary P. Wormser MD^a, Marisa A. Montecalvo MD^{a,*}

^a Division of Infectious Diseases, Department of Medicine, New York Medical College, Valhalla, NY

^b Tufts University School of Medicine, Division of Academic Affairs, Baystate Medical Center, Springfield, MA

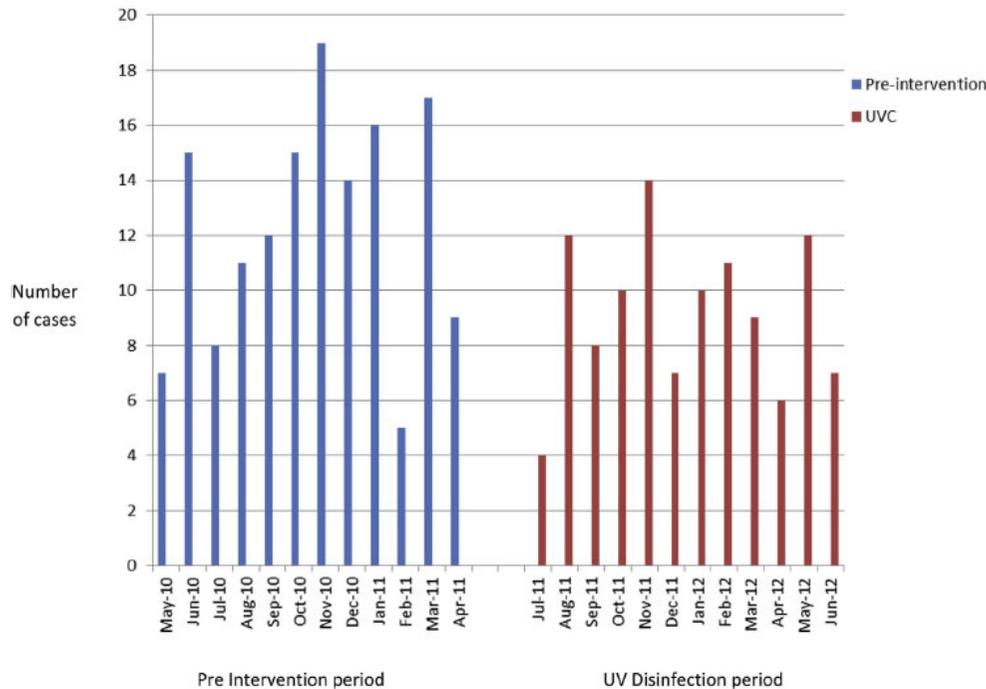
^c Department of Infection Prevention and Control, Westchester Medical Center, Valhalla, NY

^d Department of Performance Management, Westchester Medical Center, Valhalla, NY



Pulsed-xenon UV (PX-UV)

Cases of hospital-acquired CD infection



The same room were studied for the first year of pulsed xenon ultraviolet light disinfection (UVD) compared with the 1-year period pre-UVD. Exposition: 6 min near the foot end of each bed (**12 min**).

70% decrease for the adult intensive care units (ICUs) (P<.001),



The 11th Healthcare Infection Society International Conference

Liverpool, 26-28 November 2018



Pulsed-xenon UV (PX-UV)

Evaluation of an ultraviolet C (UVC) light-emitting device for disinfection of high touch surfaces in hospital critical areas.
E. Casini, B. Tuvo, G. Privitera
University of Pisa, Department of Translational Research, N.EMM

BACKGROUND
High touch surfaces are widely recognized as key locations for nosocomial infections. The use of UVC light-emitting devices for disinfection of high touch surfaces in hospital critical areas is a promising strategy to reduce the risk of infection. The aim of this study was to evaluate the effectiveness of a Pulsed-Xenon UV (PX-UV) light-emitting device for disinfection of high touch surfaces in hospital critical areas.

PURPOSE AND HYPOTHESES
The aim of this study was to evaluate the effectiveness of a Pulsed-Xenon UV (PX-UV) light-emitting device for disinfection of high touch surfaces in hospital critical areas.

MATERIALS AND METHODS
A 100W Pulsed-Xenon UV (PX-UV) light-emitting device was used for disinfection of high touch surfaces in hospital critical areas. The effectiveness of the device was evaluated by measuring the number of colony forming units (CFU) of *C. difficile* on high touch surfaces before and after disinfection.

RESULTS
The use of the Pulsed-Xenon UV (PX-UV) light-emitting device for disinfection of high touch surfaces in hospital critical areas resulted in a significant reduction of the number of CFU of *C. difficile* on high touch surfaces.

CONCLUSIONS
The use of the Pulsed-Xenon UV (PX-UV) light-emitting device for disinfection of high touch surfaces in hospital critical areas is a promising strategy to reduce the risk of infection.

KEYWORDS
UVC light-emitting device, disinfection, high touch surfaces, hospital critical areas, *C. difficile*.

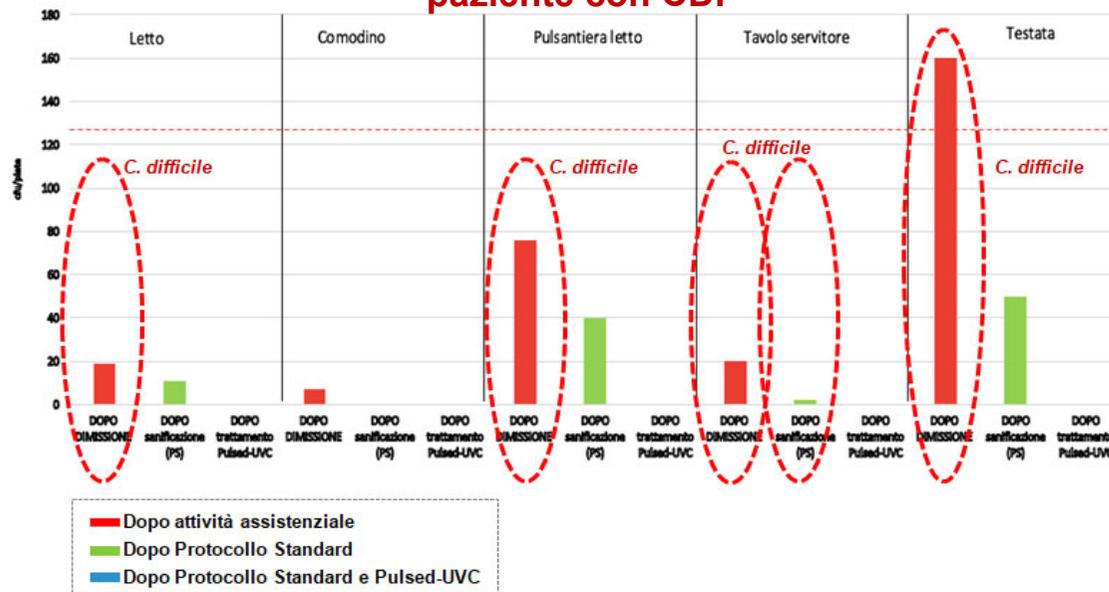
104: Evaluation of an ultraviolet C (UVC) light-emitting device for disinfection of high touch surfaces in hospital critical areas

Casini B¹, Tuvo B¹, Privitera G¹

¹University of Pisa, Department Of Translational Research And New Technologies In Medicine And Surgery

Poster Talk 2 (Mon 26 Nov 17:15 - 18:15), Exhibition Hall

Stanza di degenza occupata da oltre 48h da paziente con CDI



SALE OPERATORIE Non conformità:

16/125 (13%) Protocollo Standard

0/85 (0%) Protocollo Modificato

Lancet 2017; 389: 805-14

Enhanced terminal room disinfection and acquisition and infection caused by multidrug-resistant organisms and *Clostridium difficile* (the Benefits of Enhanced Terminal Room Disinfection study): a cluster-randomised, multicentre, crossover study

Deverick J Anderson, Luke F Chen, David J Weber, Rebekah W Moehring, Sarah S Lewis, Patricia F Triplett, Michael Blocker, Paul Becherer, J Conrad Schwab, Lauren P Knelson, Yuliya Lokhrygina, William A Rutala, Hajime Kanamori, Maria F Gergen, Daniel J Sexton; for the CDC Prevention Epicenters Program

Lancet Infect Dis 2018;
18: 845-53

Effectiveness of targeted enhanced terminal room disinfection on hospital-wide acquisition and infection with multidrug-resistant organisms and *Clostridium difficile*: a secondary analysis of a multicentre cluster randomised controlled trial with crossover design (BETR Disinfection)

Deverick J Anderson, Rebekah W Moehring, David J Weber, Sarah S Lewis, Luke F Chen, J Conrad Schwab, Paul Becherer, Michael Blocker, Patricia F Triplett, Lauren P Knelson, Yuliya Lokhrygina, William A Rutala, Daniel J Sexton, for the CDC Prevention Epicenters Program

HAI_s REDUCTION



Pulsed-xenon UV (PX-UV)

Multicenter cluster randomized controlled crossover trial at nine hospitals in USA
31226 patients

The incidence of target organisms (*C. difficile* e VRE) among exposed patients was significantly lower after adding UV to standard cleaning strategies

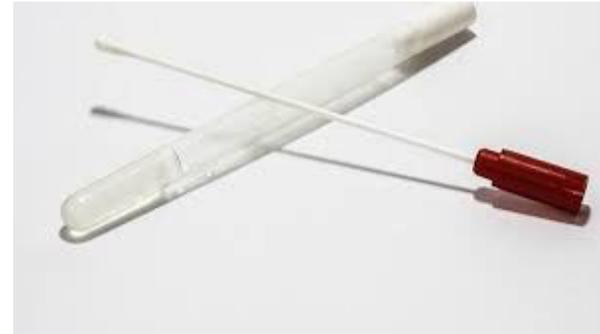
CID 2018:66 (1 April)

IDSA GUIDELINE



Clinical Practice Guidelines for *Clostridium difficile* Infection in Adults and Children: 2017 Update by the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA)

L. Clifford McDonald,¹ Dale N. Gerding,² Stuart Johnson,^{2,3} Johan S. Bakken,⁴ Karen C. Carroll,⁵ Susan E. Coffin,⁶ Erik R. Dubberke,⁷ Kevin W. Garey,⁸ Carolyn V. Gould,¹ Ciaran Kelly,⁹ Vivian Loo,¹⁰ Julia Shaklee Sammons,⁶ Thomas J. Sandora,¹¹ and Mark H. Wilcox¹²

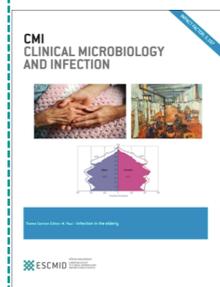


**SCREENING DEI
PORTATORI**

Should asymptomatic carriers of *C. difficile* be identified and isolated if positive?

Recommendation

1. There are insufficient data to recommend screening for asymptomatic carriage and placing asymptomatic carriers on contact precautions (*no recommendation*).



Clin Microbiol Infect. 2018 Oct;24(10):1051-1054.



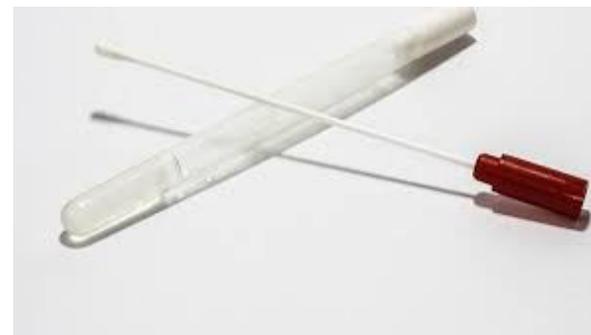
Clinical Microbiology and Infection

journal homepage: www.clinicalmicrobiologyandinfection.com

Guidelines

Guidance document for prevention of *Clostridium difficile* infection in acute healthcare settings

S. Tschudin-Sutter^{1,2}, E.J. Kuijper², A. Durovic³, M.J.G.T. Vehreschild³, F. Barbut⁴, C. Eckert⁴, F. Fitzpatrick⁵, M. Hell⁶, T. Norèn⁷, J. O'Driscoll⁸, J. Coia⁹, P. Gastmeier¹⁰, L. von Müller¹¹, M.H. Wilcox¹², A.F. Widmer³ on behalf of the Committee†



SCREENING DEI PORTATORI

Screening of asymptomatic patients and healthcare workers for C. difficile carriage

We do **not recommend** screening for *C. difficile* as a way of altering the risk of developing CDI in either colonized subjects or other patients and thus reducing CDI-rates (**conditional recommendation, low level of evidence in the endemic setting**).

We do **not recommend healthcare workers** screening for *C. difficile* gut colonization as a routine control measure for CDI (**strong recommendation, very low level of evidence in the endemic setting**).

The potential economic value of screening hospital admissions for *Clostridium difficile*

S. M. Bartsch · S. R. Curry · L. H. Harrison · B. Y. Lee

Screening dei portatori: costo- beneficio

Asymptomatic *Clostridium difficile* carriage has a prevalence reported as high as **51–85%**; with up to **84%** of incident hospital-acquired infections linked to carriers. Accurately identifying carriers may limit the spread of *Clostridium difficile*.

Screening was economically dominant (i.e., saved costs and provided health benefits) with a $\geq 10.3\%$ colonization rate and $\geq 5.88\%$ infection probability when contact isolation compliance was $\geq 25\%$ (hospital perspective).

Under some conditions screening led to **cost savings per case averted (range, \$53–272)**. *Clostridium difficile* screening, coupled with isolation precautions, may be a cost-effective intervention to hospitals and third party payers, based on prevalence.



***Clostridioides difficile* in Neonatal Intensive Care Unit Patients: A Systematic Review**

Alexis Elward, MD^a, Michael T. Brady, MD^b, Kristina Bryant, MD^c, Mahnaz Dasti, MPH, MTASCP^d, Loretta Fauerbach, MS, CIC^e, Kathleen L. Irwin, MD, MPH^f, Martha Iwamoto MD, MPH^g, Gretchen Kuntz, MSW, MSLIS^h, Brian Leas, MA, MSⁱ, Aaron Milstone, MD^j, Jason Newland, MD^a, Amanda D. Overholt, MPH^k, Craig A. Umscheid, MD, MSCE^l, and W. Charles Huskins, MD, MSc^l, for the Healthcare Infection Control Practices Advisory Committee^m

Last updated: August 30, 2018



Routine *C. difficile* testing in neonates and young children: the evidence was not sufficient

NICU patients have frequent exposures that have been identified as CDI risk factors in older children and adults, including exposures to antibiotics and gastric acid suppression medication.

Further, compelling evidence **demonstrates *C. difficile* transmission to neonates in healthcare settings**, often within the first days of life. *C. difficile* spores have been isolated from baby scales, baths, incubators, and refrigerators in NICUs, and *C. difficile* strains known to cause disease in adults have been isolated from asymptomatic neonates.

CID 2018:66 (1 April)

IDSA GUIDELINE



BE
ANTIBIOTICS
AWARE

SMART USE, BEST CARE

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L. Clifford McDonald,¹ Dale N. Gerding,² Stuart Johnson,^{2,3} Johan S. Bakken,⁴ Karen C. Carroll,⁵ Susan E. Coffin,⁶ Erik R. Dubberke,⁷ Kevin W. Garey,⁸ Carolyn V. Gould,¹ Ciaran Kelly,⁹ Vivian Loo,¹⁰ Julia Shaklee Sammons,⁶ Thomas J. Sandora,¹¹ and Mark H. Wilcox¹²

ANTIBIOTIC
STEWARDSHIP

What is the role of antibiotic stewardship in controlling CDI rates?

Recommendations

1. Minimize the frequency and duration of high-risk antibiotic therapy and the number of antibiotic agents prescribed, to reduce CDI risk (*strong recommendation, moderate quality of evidence*).
2. Implement an antibiotic stewardship program (*good practice recommendation*).
3. Antibiotics to be targeted should be based on the local epidemiology and the *C. difficile* strains present. Restriction of fluoroquinolones, clindamycin, and cephalosporins (except for surgical antibiotic prophylaxis) should be considered (*strong recommendation, moderate quality of evidence*).



Clin Microbiol Infect. 2018 Oct;24(10):1051-1054.

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Guidance document for prevention of *Clostridium difficile* infection in acute healthcare settings

S. Tschudin-Sutter^{1,4}, E.J. Kuijper², A. Durovic³, M.J.G.T. Vehreschild³, F. Barbut⁴, C. Eckert⁴, F. Fitzpatrick⁵, M. Hell⁶, T. Norèn⁷, J. O'Driscoll⁸, J. Coia⁹, P. Gastmeier¹⁰, L. von Müller¹¹, M.H. Wilcox¹², A.F. Widmer¹ on behalf of the Committee†



**BE
ANTIBIOTICS
AWARE**

SMART USE, BEST CARE

**ANTIBIOTIC
STEWARDSHIP**

Is restriction of antibiotic agents/classes effective in reducing CDI-rate in hospitals?

Restriction of antibiotic agents/classes is effective in reducing CDI rates (strong recommendation, low quality of evidence).

Is reducing length of antibiotic therapy effective in reducing CDI rates in hospitals?

Reducing the duration of antibiotic therapy is effective in reducing CDI rates (strong recommendation, very low quality of evidence)

Can early treatment of suspected/diagnosed patients with CDI reduce the transmission of C. difficile?

Initiate early treatment in patients diagnosed with CDI (conditional recommendation, very low quality of evidence)

CID 2018:66 (1 April)

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ALTRI FARMACI

What is the role of proton pump inhibitor restriction in controlling CDI rates?

Recommendation

1. Although there is an epidemiologic association between proton pump inhibitor (PPI) use and CDI, and unnecessary PPIs should always be discontinued, there is insufficient evidence for discontinuation of PPIs as a measure for preventing CDI (no recommendation).

What is the role of probiotics in primary prevention of CDI?

Recommendation

1. There are insufficient data at this time to recommend administration of probiotics for primary prevention of CDI outside of clinical trials (no recommendation).



Clin Microbiol Infect. 2018 Oct;24(10):1051-1054.

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Clinical Microbiology and Infection

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Guidelines

Guidance document for prevention of *Clostridium difficile* infection in acute healthcare settings

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FORMAZIONE

Is specific education required to enhance knowledge regarding prevention of CDI?

Educate **Healthcare Workers** on prevention of CDI (strong recommendation, no evidence due to lack of studies).

Educate **Environmental Service Personnel** for reducing environmental *C. difficile* contamination and *C. difficile* prevalence in hospitals (repeated training and regular quality control measurements by labelling of surface areas with a fluorescence marker)

Educate **CDI Patients and Visitors** (strong recommendation, no evidence due to lack of studies).



Grazie per l'attenzione!



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