Perspectives on the use of Light in Alternate and Common Spaces

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Disclosures

- The views expressed in the presentation do not necessarily represent the views of the Department of Veterans Affairs
- Have been PI or Co-I on several funded projects/donated material related to environmental disinfection (Private Industry: Xenex & EOS through a cooperative research and development agreement, NIH/NINR, AHRQ, VA MERIT)
- None of the research funding is used to support my salary
- Don't have any non-governmental relationship with any of the private entities. All projects and participation are VA ethics reviewed and approved
- VA owns a patent related to "Methods of organizing the disinfection of one or more items contaminated with biological agents". I am the inventor of record for this technology

Defining Alternate and Common Space

- Typical usage areas of UV device: patient rooms (living space and bathrooms)
  - Acute care
  - ICU
  - Long term care
  - Skilled nursing
  - BMT Units
  - Spinal Cord Units
  - Burns units
  - Emergency Rooms or urgent care rooms
- Everything else is an alternate and or common space

Alternate & Common Spaces

- Operating Rooms (OR) /Minor procedure rooms
- Hemodialysis rooms/units (HD)
- Clean and Dirty rooms that contain portable medical equipment (PME)
- Waiting areas especially pediatric waiting areas (WR) or ambulatory clinic areas
- Pharmacy clean rooms (PC)
- Public bathrooms (in the lobby)
- Breakrooms for nursing/providers

Organisms Outside Human Body

Microbe	Survival time outside human body
Clostridium difficile (spores)	5 months
Acinetobacter spp.	3 days to 5 months
Enterococcus spp. including VRE	5 days – 4 months
Pseudomonas aeruginosa	6 hours – 16 months
Klebsiella spp.	2 hours to > 30 months
Staphylococcus aureus, inc. MRSA	7 days – 7 months
Norovirus (and feline calicivirus)	8 hours to > 2 weeks[1]
SARS Coronavirus	72 hours to >28 days[2]
Influenza	Hours to several days[3]

Adapted from Kramer *et al. BMC Infect Dis* 2006;6:130.

1. Doultree *et al. J Hosp Infect* 1999;41:51-57.
2. Rabenau *et al. Med Microbiol Immunol* 2005;194:1-6.
3. Bean *et al. J Infect Dis* 1982;146:47-51.

Evidence Linking Spaces to Transmission: OR

Volume 33, Issue 9 September 2012 , pp. 897-904

Decreasing Operating Room Environmental Pathogen Contamination through Improved Cleaning Practice

L. Silvia Munoz-Price [a1] [a2] [a3], David J. Birnbach [a2] [a4], David A. Lubarsky [a4], Kristopher L. Arheart [a2] [a5] ...

DOI: https://doi.org/10.1086/667381 Published online by Cambridge University Press: 02 January 2015

Surgical Infections, Vol. 15, No. 6 | Review Articles

Surface Contamination in Operating Rooms: A Risk for Transmission of Pathogens?

Saber Yezli, Frédéric Barbut, and Jonathan A. Otter

Published Online: 15 Dec 2014 | https://doi.org/10.1089/sur.2014.011

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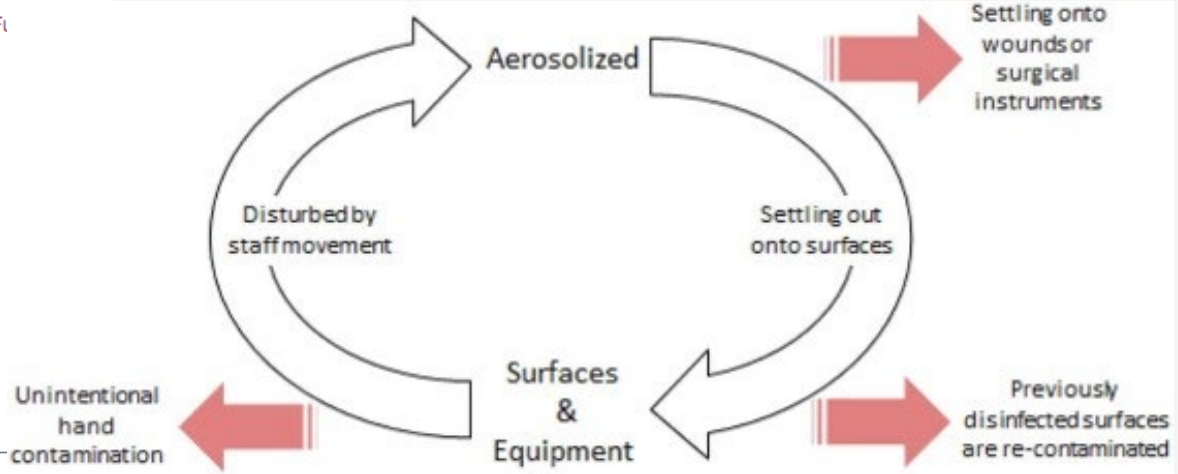

AJIC: 2018-09-01, Volume 46, Issue 9, Pages 1003-1008

Use of UV in OR

FULL TEXT ARTICLE

Influence of a visible-light continuous environmental disinfection system on microbial contamination and surgical site infections in an orthopedic operating room

Lynnelle J. Murrell BSN, RN, CIC, Erin Kinzel Hamilton PhD, Helen Boehm Johnson MD and Maureen Spencer BSN, RN, MEd, CIC, FAPIC

AJIC: American Journal of Infection Control, 2019-07-01, Volume 47, Issue 7, Pages 804-810, Copyright © 2018 Association for Professionals in Infection Control and Epidemiology, Inc.

Influence of a total joint infection control bundle on surgical site infection rates

Lori Fornwalt RN, CIC, David Ennis MD and Mark Stibich PhD

AJIC: American Journal of Infection Control, 2016-02-01, Volume 44, Issue 2, Pages 239-241, Copyright © 2016 Association for Professionals in Infection Control and Epidemiology, Inc.

BMC Infectious Diseases

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Research article | Open Access | Open Peer Review | Published: 10 October 2017

Evaluation of a pulsed xenon ultraviolet disinfection system to decrease bacterial contamination in operating rooms

Lynn El Haddad, Shashank S. Ghantoji, Mark Stibich, Jason B. Fleming, Cindy Segal, Kathy M. Ware & Roy F. Chemaly

BMC Infectious Diseases **17**, Article number: 672 (2017) | Cite this article

2427 Accesses | **14** Citations | **0** Altmetric | Metrics

Disinfection of *Acinetobacter baumannii*–Contaminated Surfaces Relevant to Medical Treatment Facilities with Ultraviolet C Light

Vipin K. Rastogi, PhD, Lalena Wallace, MS, Lisa S. Smith, MS Author Notes

Military Medicine, Volume 172, Issue 11, November 2007, Pages 1166–1169,
https://doi.org/10.7205/MILMED.172.11.1166
Published: 01 November 2007

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FULL TEXT ARTICLE

Comparative evaluation of operating room terminal cleaning by two methods: Focused multivector ultraviolet (FMUV) versus manual-chemical disinfection

Article in Press: Corrected Proof

Donna Armellino RN, DNP, Kristine Goldstein RN, Linti Thomas RN, Thomas J. Walsh MD, PhD and Vidmantas Petraitis MD

Evidence Linking Spaces to Transmission: PME

Volume 38, Issue 10 October 2017 , pp. 1247-1249

Contaminated Portable Equipment Is a Potential Vector for Dissemination of Pathogens in the Intensive Care Unit

Amrita John [a1] [a2], Heba Alhmidi [a2], Jennifer L. Cadnum [a2], Annette L. Jencson [a2] ...

DOI: https://doi.org/10.1017/ice.2017.160 Published online by Cambridge University Press: 07 August 2017

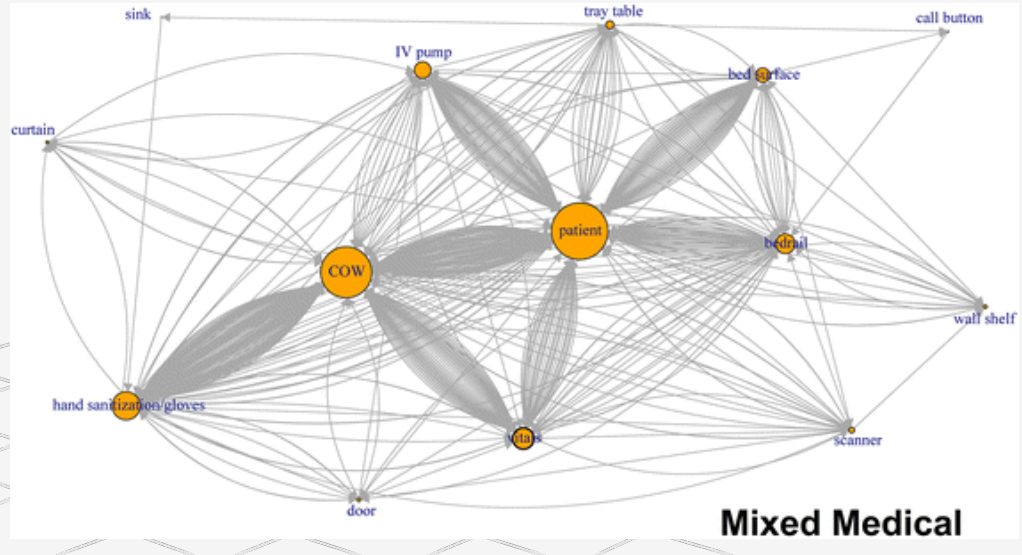
The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

A *Candida auris* Outbreak and Its Control in an Intensive Care Setting

David W. Eyre, D.Phil., Anna E. Sheppard, Ph.D., Hilary Madder, F.A.N.Z.C.A., Ian Moir, Ruth Moroney, M.Sc., T. Phuong Quan, M.Sc., David Griffiths, B.Sc., Sophie George, M.Sc., Lisa Butcher, M.Sc., Marcus Morgan, M.Sc., Robert Newnham, Mary Sunderland, B.Sc., Tiphanie Clarke, B.A., Dona Foster, Ph.D., Peter Hoffman, B.Sc., Andrew M. Borman, Ph.D., Elizabeth M. Johnson, Ph.D., Ginny Moore, Ph.D., Colin S. Brown, F.R.C.Path., A. Sarah Walker, Ph.D., Tim E.A. Peto, F.R.C.P., Derrick W. Crook, F.R.C.Path., and Katie J.M. Jeffery, Ph.D.

ABSTRACT



BMC ID: volume 17, Article number: 800 (2017)
N Engl J Med 2018;379:1322-31

Use of UV to Disinfect PME

FULL TEXT ARTICLE

Germicidal irradiation of portable medical equipment: Mitigating microbes and improving the margin of safety using a novel, point of care, germicidal disinfection pod

Deb Reid BS MT(ASCP) CIC, Karen Ternes BS MPH CIC, Linda Winowiecki RN BSN, CIC, Cheryl Yonke MS SM(ASCP), Brian Riege BS, Fabian Fregoli MD, Deborah Passey PhD, Mark Stibich PhD FID FAPIC

AJIC: American Journal of Infection Control, 2020-01-01, Volume 48, Issue 1, Pages 103-105, (
in Infection Control and Epidemiology, Inc.

Evidence Linking Spaces to Transmission: HD

FULL TEXT ARTICLE

An investigation of an outbreak of hepatitis C virus infections in a low-resourced hemodialysis unit in Vietnam

Cuong Minh Duong MD, MMed and Mary-Louise McLaws DipTropPubHlth, MPHlth, PhDMed.

AJIC: American Journal of Infection Control, 2016-05-01, Volume 44, Issue 5, Pages 560-566, Copyright © 2016

Highlights

- Sharing hemodialysis machines did not attribute to the hepatitis C virus outbreak.
- Indirect contact was the likely mode of hepatitis C virus transmission.
- Dedicated dialyzer rinsing system must be available for hepatitis C virus–infected patients.
- Infection control audits and a validation system must be a policy.
- Strict adherence to infection control policy prevents hepatitis C virus cross-transmission.

Determinant Roles of Environmental Contamination and Noncompliance with Standard Precautions in the Risk of Hepatitis C Virus Transmission in a Hemodialysis Unit FREE

Emmanuelle Girou ✉, Stéphane Chevaliez, Dominique Challine, Michaël Thiessart, Yoann Morice, Philippe Lesprit, Latifa Tkoub-Scheirlinck, Sophan Soing-Altrach, Florence Cizeau, Celine Cavin ... Show more

Clinical Infectious Diseases, Volume 47, Issue 5, 1 September 2008, Pages 627–633, https://doi.org/10.1086/590564

Published: 01 September 2008 **Article history** ▾

Conclusion. Blood-contaminated surfaces may be a source of HCV cross-transmission in a hemodialysis unit. Strict compliance with hand hygiene and glove use and strict organization of care procedures are needed to reduce the risk of HCV cross-transmission among patients undergoing hemodialysis.

Use of UV in HD

DIALYZING ROOM DISINFECTION WITH ULTRA-VIOLET IRRADIATION

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ABSTRACT

Infections represent a major problem in dialysis treatment, thus the dialyzing room should be kept abacterial as possible.
We have installed 15-watt ultra-violet (U-V.) lamps for every 13.5 m^2 on the ceiling for the purpose of the room disinfection and used them for 16 hours nightly after working hours.
Bacteria were killed with over 10 hours irradiation even at the areas of low U-V. intensity where the irradiation may not be direct. This unexpected effectiveness might be from the influence of reflected rays and O_3 produced. When half the lamps were turned on, the bacteriocidal effect was not sufficient in some areas. Any living organism with nucleic acids must be inactivated by this treatment, for the bacteriocidal effect is due to the nucleic acids injury. Furthermore, safety, readiness after the treatment, easy application and the negligible costs would make this method more advantageous to the other methods in room disinfection.

Journal of Dialysis, 3:2-3, 191-205,

Evidence Linking Spaces to Transmission: WR

ORIGINAL STUDIES

Respiratory Viral RNA on Toys in Pediatric Office Waiting Rooms

Diane E. Pappas, MD, JD, J. Owen Hendley, MD,* and Richard H. Schwartz, MD†*

About 20% of the objects in a pediatric office may be contaminated with respiratory viral RNA, most commonly picornavirus RNA. Cleaning with a disinfectant cloth was only modestly effective in removing the viral RNA from th surfaces of toys, but transfer of picornaviral RNA from toy to fingers was inefficient

Pediatr Infect Dis J. 2010 Feb;29(2):102-4.

cystic fibrosis should not share space in the waiting area and instead should be placed directly in an examination room

Measles Outbreak in a Pediatric Practice: Airborne Transmission in an Office Setting

Alan B. Bloch, MD, Walter A. Orenstein, MD, William M. Ewing, William H. Spain, George F. Mallison, Kenneth L. Herrmann, MD, and Alan R. Hinman, MD

at least one hour. The rarity of reports of similar outbreaks suggests that airborne spread is unusual. Modern office design with tight insulation and a substantial proportion of recirculated ventilation may predispose to airborne transmission. *Pediatrics* 1985;75:676–683; *measles, air microbiology, cross-infection, transmission, vaccination.*

Evidence Linking Spaces to Transmission: PC

FULL TEXT ARTICLE

APIC position paper: Safe injection, infu vial practices in health care

Susan A. Dolan RN, MS, CIC, Gwenda Felizardo RN, BSN, CIC, Sue Barnes R
Marcia Patrick RN, MSN, CIC, Katherine S. Ward RN, BSN, MPH, CIC and Katl

AJIC: American Journal of Infection Control, 2010-04-01, Volume 38, Issue 3, Pages 167-172
in Infection Control and Epidemiology, Inc.

Outbreaks involving the transmission of bloodborne pathogens or oth various types of health care settings due to unsafe injection, infusion, and medication vial practices are unacceptable. Each of the outbreaks could have been prevented by the us conjunction with basic infection prevention practices for handling parent of injections, and procurement and sampling of blood. This document pr health care facilities on essential safe injection, infusion, and vial practice implemented in such settings.

PP&P: **What should the Infection Preventionist's (IP) role be in the development of cleanroom cleaning P&Ps?**

Barnes: The relationship between IP and pharmacy should be consultative in nature. IPs might denote pharmacy as a high-risk unit that they personally visit. While pharmacy staff should work with their professional organizations (eg, American Association of Colleges of Pharmacy and ASHP) to obtain education and training regarding compliance with USP <797> requirements, they also should call IPs with questions regarding contamination risk as needed. In addition, IP departments should be involved in endorsement/consultation when environmental cleaning and disinfection policies are developed for high-risk areas, whether that process is driven by pharmacy or environmental services. The key to environmental hygiene is ensuring that cleaning is conducted with sufficient friction in order for the next step, disinfection, to be effective.

PP&P: **What is the importance of environmental sampling in ensuring continuous cleanliness in the compounding environment?**

Barnes: According to published guidelines from APIC and the CDC, routine environmental culturing is not recommended except in the event of an outbreak. In contrast, environmental culturing is required by USP <797>. There are other tools in addition to culturing that can be used to monitor the quality of environmental cleaning. These include glow test products and ATP testing kits. A number of glow testing products are available, and these typically include a clear fluid that fluoresces under black light. The glow test product can be applied to high-touch surfaces, and using a black light after the area is routinely cleaned will indicate if the clear fluid has been completely eliminated during the cleaning process. If insufficient friction has been applied to surfaces during cleaning, residual fluid will appear under the black light, indicating that the cleaning methods require improvement.

https://www.pppmag.com/article/1048

Use of UV in PC

American Journal of Infection Control
Volume 46, Issue 2, February 2018, Pages 223-225

Brief Report

Effectiveness of a shielded ultraviolet C air disinfection system in an inpatient pharmacy of a tertiary care children's hospital

Don Guimera MSN, RN, CIC, CCRP, FAPIC [a], Jean Trzil PharmD [a], Joy Joyner RN, CIC [a], Nicholas D. Hysmith MD, FAAP [a, b]

Show more

https://doi.org/10.1016/j.ajic.2017.07.026

Highlights

- Infectious pathogens can be spread via the indoor air.
- Indoor viable air particles are influenced by many factors.
- Germicidal irradiation technologies combat these viable airborne particles.

https://www.xenex.com/resources/revdesinfectie-robots-deploys-xenex-lightstrike-robots-for-contamination-control-in-pharmaceutical-cleanrooms/

UV helps maintain cleanroom air quality

18-Feb-2004 - Last updated on 16-Mar-2017 at 08:00 GMT

RELATED TAGS: Filters

UK firm Hanovia has developed a way of sterilising the air in pharmaceutical cleanrooms - which have standards more stringent than even hospital operating theatres - using ultraviolet light.

The system overcomes the problem of the Hepa (high efficiency particulate arrestance) filters used in the cleanroom industry becoming colonised by microorganisms, particularly bacteria and fungi.

Research at a number of hospitals in the US and Holland revealed extensive fungal colonisation of both the first- and second-line filters, and in several cases the filters had only been in use for a few weeks.

https://www.in-pharmatechnologist.com/Article/2004/02/18/UV-helps-maintain-cleanroom-air-quality

Use of UV in Bathroom & Breakroom

- Literature absent: with involvement in HAI or transmission
- No literature or reports on use of UV in these areas
- My perspective: Use it but not at the expense of another area where it might be more needed