

Environmental Services and Infection Prevention

Moderator

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Panelists

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Program Goals

- Recognize factors that may contribute to infection risk in the healthcare environment
- Learn to minimize infection risks through the adoption of prevention practices

Significance of HAIs

- Healthcare-associated infections (HAIs) cause significant morbidity and mortality
 - Sicken >2 million people annually
 - Kill approximately 23,000 people annually, with an additional 15,000 dying from *Clostridium difficile*
- Healthcare environments are important reservoirs for infectious microorganisms and are critical to address
- Targeted prevention efforts can reduce the rate of some HAIs by 70%
- All healthcare personnel play a critical role in targeted prevention efforts

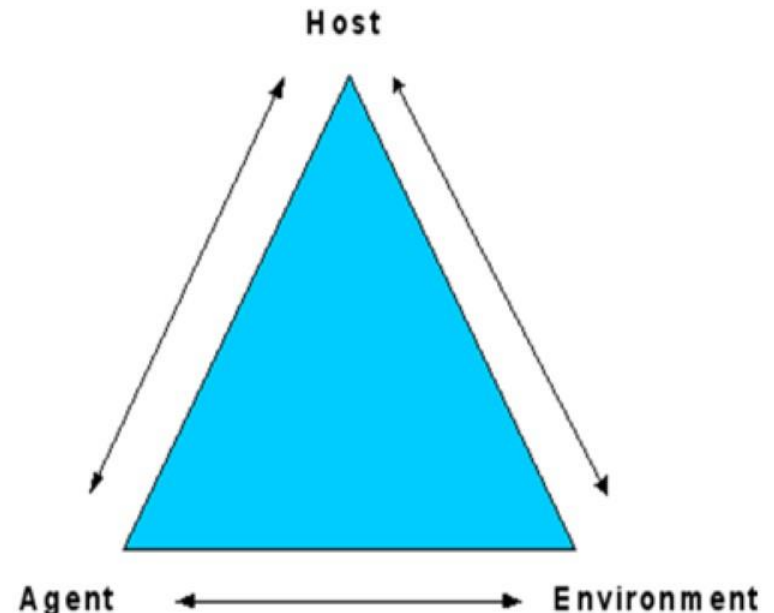
Magill SS, et al. *N Engl J Med*. 2014;13:1198-1208.

CDC. 2014 National and State Healthcare-Associated Infections Progress Report. 2016.

CDC Winnable Battles PowerPoint.

Spread of HAIs

- HAIs spread via interactions between the agent, host, and environment
 - *Agent* is the microbe causing the infection
 - *Host* is the person harboring the disease or a person who can become infected with the disease
 - *Environment* comprises the external factors allowing disease transmission



- Items in patient rooms and antibiotic use by previously admitted patients can influence HAI risk and are important considerations

Role of Environmental Surfaces

- Surfaces can be classified as high-, medium-, and low-touch, but any surface that is touched poses a risk of HAI transmission
- Just because a surface is less high touch, does not mean that it does not have a very high contamination level (eg, toilets, sinks/sink surrounds are less high touch, but VERY high contamination. Risk can exceed that of bed rails)

Examples of High-Touch Surfaces

- Bed rails/bed surfaces
- Call buttons
- Doorknobs
- Intravenous pumps
- Light switches
- Over-bed tables
- Supply carts

Examples of Medium- and Low-Touch Surfaces

- Toilets
- Sinks/sink surrounds
- Control panels and electronic equipment, such as mounted monitors, mobile workstations, and personal cell phones

Addressing Surfaces

- All items in a patient room need to be cleaned and disinfected regularly
- Consideration should be given to what is happening in the environment and to the activities that might follow
- Environmental disinfection is everyone's responsibility
- Need to resolve key environmental cleaning/disinfection questions:
 - How do we assign responsibility?
 - How do we ensure it is being done?
 - How do we monitor it?

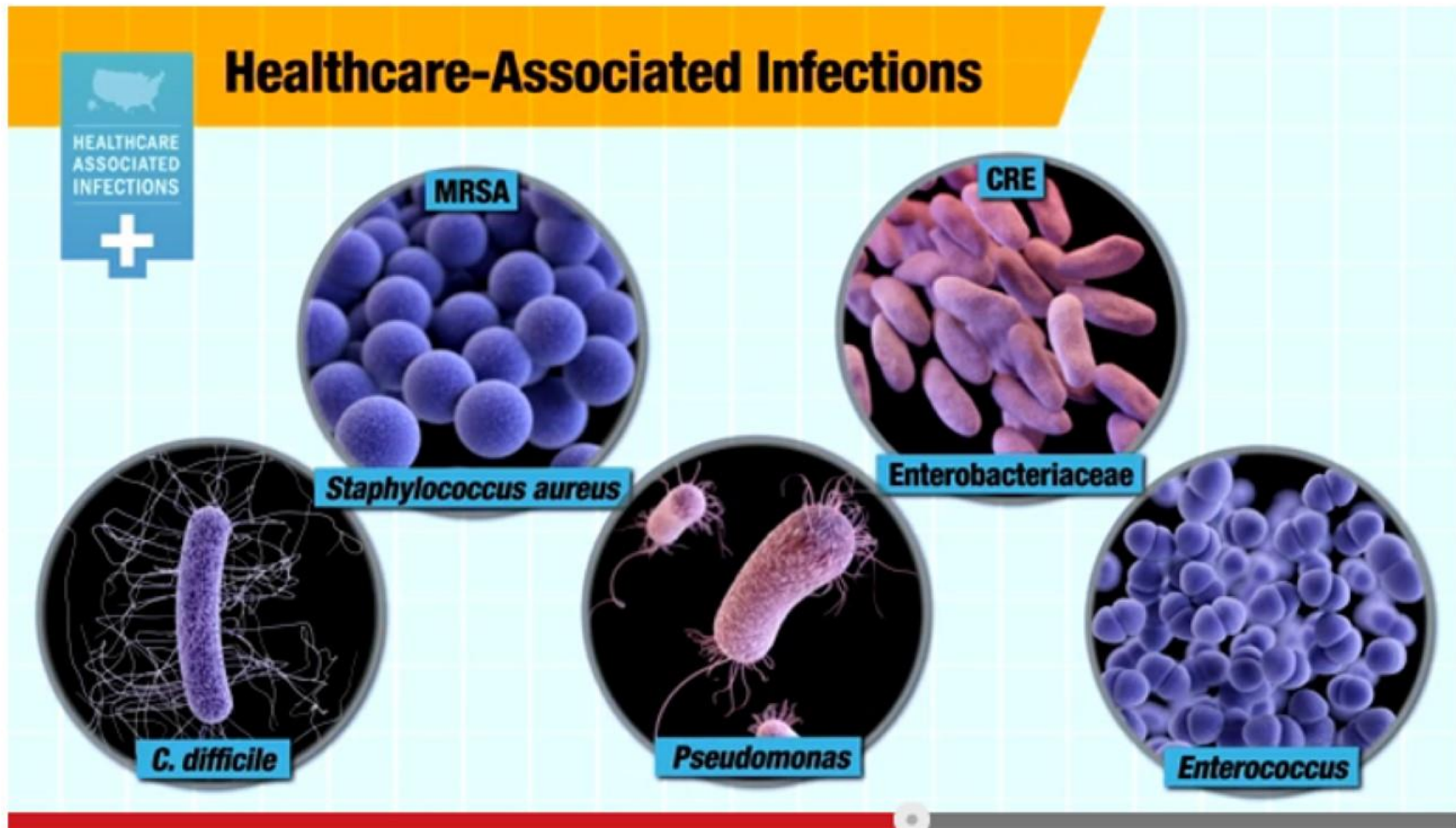
Microbes of Concern

- HAIs can be caused by bacteria, viruses, fungi, parasites, and prions
- Pathogens of particular concern include those that are difficult to treat, life-threatening, or cause severe illness

Bacteria Causing HAI by CDC's Level of Concern

Hazard Level	Pathogen
Urgent	Carbapenem-resistant <i>Enterobacteriaceae</i> <i>Clostridium difficile</i>
Serious	Multi-drug resistant <i>Acinetobacter</i> Vancomycin-resistant <i>Enterococcus</i> Drug-resistant <i>Pseudomonas</i> Methicillin-resistant <i>Staphylococcus aureus</i>
Concerning	Vancomycin-resistant <i>Staphylococcus aureus</i>

Microbes of Concern (cont)



Microbe Survival

Survival of Select Pathogens on Environmental Surfaces

Pathogen	Survival Time
<i>Bacteria</i>	
<i>C. difficile</i>	≥1 year
MRSA	7 days–7 months
VRE	5 days–4 months
<i>Viruses</i>	
Hepatitis B	≥1 month
Norovirus	8 hours–7 days

Cleaning Protocols

- Everybody has responsibility, not just 1 person or group
- Whether it is routine daily cleaning, transfer cleaning, or discharge cleaning, it is important to:
 - Have a plan
 - Use a process that works every day
 - Understand that it is a journey
- Cleaning should always progress from cleanest to dirtiest
- Important to consider the products, process for cleaning, and equipment

Cleaning Protocols (cont)

Logical Pattern of Cleaning, From Cleanest to Dirtiest

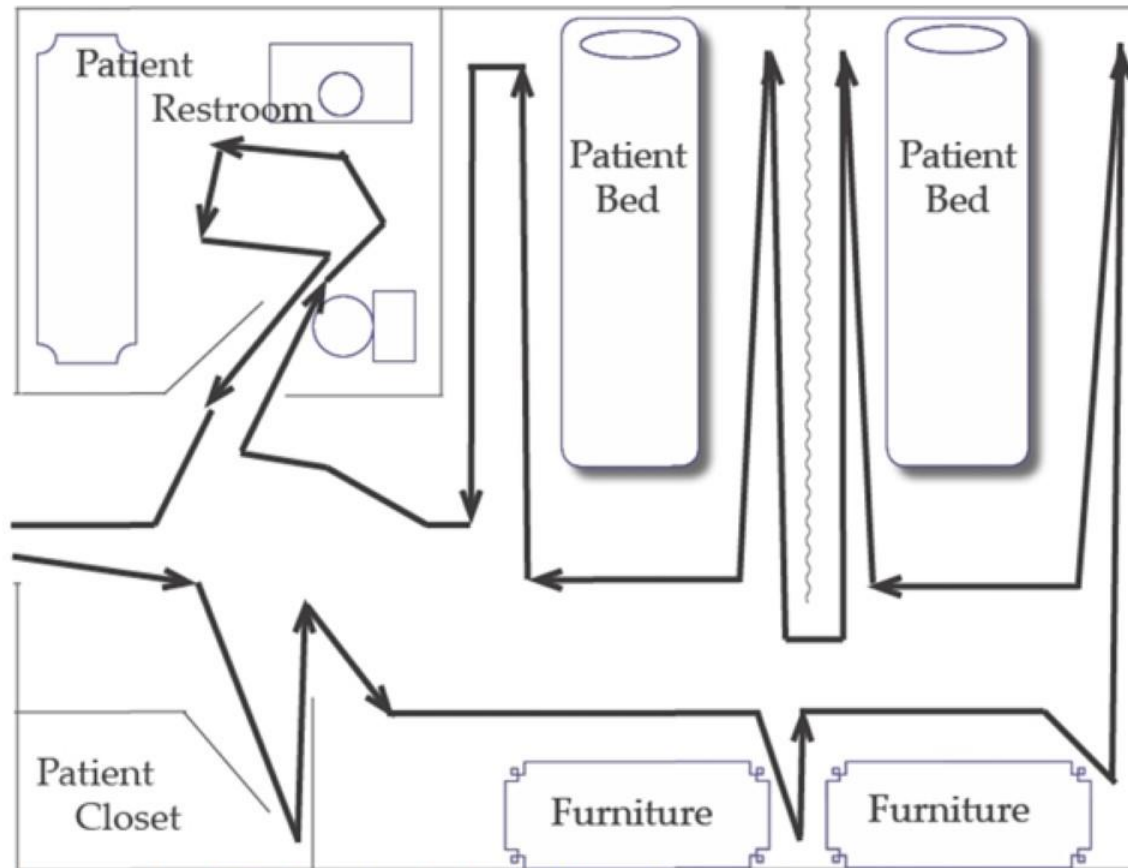


Image courtesy of the Association for the Healthcare Environment

Pattern is specific to private or semi-private rooms,
but approach can be applied to any setting

Selecting Disinfectants

- EPA-registered disinfectants should always be used
- Manufacturer's instructions need to be closely followed
 - Master label provides more detail about product, including pathogens targeted, required contact times, and safety precautions
- Not all products target the same pathogens or require the same contact times for specific organisms
- Different products might need to be used to optimize disinfection
- Disinfectants should be selected based on an institution's current needs and situation

Preparing Disinfectants

- To optimize safety and efficacy, the manufacturer's label should always be followed when preparing and using disinfectants
- Commonly used formulations include concentrates and premoistened wipes
 - Concentrates require adding water and are most often used by environmental services
 - Premoistened wipes are ready to use and are most commonly used by direct care providers
- Concentrates should never be mixed by hand but via a dispensing system
- Personnel should **never** mix disinfectants together to try to target a broader spectrum of pathogens; this practice can be deadly and does not improve efficacy

Contact Time Considerations

- **Contact time/dwell time:** The amount of time it takes for a disinfectant to kill a particular pathogen, which occurs when the surface is wet and the pathogen is in direct contact with the disinfectant
- Products have varying contact times, ranging from 1 to 10 minutes
 - Agent that targets necessary pathogens and has a contact time matching the process and cleaning time available should be selected
 - If products with longer contact times pose a challenge, switching to EPA-registered products with shortened contact times should be considered
- Contact time is affected by *dry time*, which is the time it takes for a disinfectant to evaporate from the surface
- If a product requires a long contact time but dries quickly, repeat applications might be needed

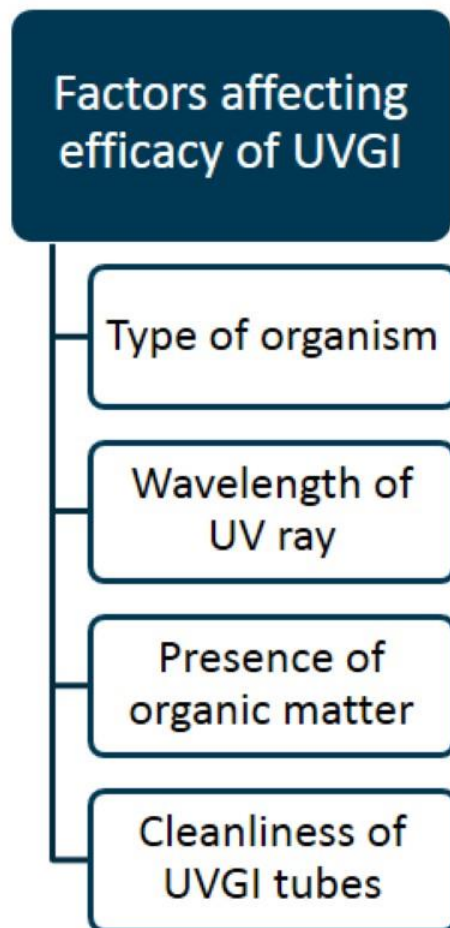
Role of Supplemental Technologies

- Cleaning and application of registered disinfectants are essential for preventing HAIs
- Supplemental technologies might help overcome some of the challenges to optimal disinfection:
 - Hardiness of microorganisms and resistance to antimicrobial products
 - High patient volume and turnover, requiring quicker cleaning and disinfection
 - Increasing volume of equipment and sophisticated equipment in healthcare environments, adding to cleaning burden

Supplemental Technologies

- Most commonly used supplemental technologies for healthcare environment disinfection are “no-touch” technologies
 - Ultraviolet germicidal irradiation (UVGI), which kills pathogens by exposing them to ultraviolet irradiation
 - Hydrogen peroxide (HP) systems, which kill pathogens by exposing them to vaporized HP
- Technologies that are still being researched include self-disinfecting and antimicrobial surfaces

UVGI



- **Benefit:** 20% reduction in VRE, MRSE, and *C. difficile* reported after UVGI was added to the hospital cleaning regimen after discharge of contact precaution rooms and other high-risk areas
- **Drawback:** UVGI added 51 minutes per discharge
- Cost-effectiveness evaluations are still needed
- There is variability among different UV systems

Haas JP. *Am J Infect Control*. 2014;42:586-590.

Otter JA, et al. *Am J Infect Control*. 2013;41(5 Suppl):S6-S11.

Dancer SJ. *Clin Microbiol Rev*. 2014;27:665-690.

Vaporized HP Systems

- Vaporized HP has been shown to reduce levels of environmental contamination and frequency of HAIs
- Vaporized HP appears to be better than UVGI at removing bacterial spores, but efficacy of both systems is influenced by exposure time and intensity of emissions
- Study of 2 hydrogen peroxide systems found both significantly reduced levels of residual bacteria after manual terminal disinfection
 - **Conclusion:** Choice of system should be based on considerations such as cost, convenience, and logistics
- Drawback of vaporized HP is the time needed for vapor to clear the room (sometimes ≥ 2 hours), and cost-effectiveness evaluations are still needed

Fu TY, et al. *J Hosp Infect.* 2012;80:199-205.

Ali S, et al. *J Hosp Infect.* 2016;93:70-77.

Dancer SJ. *Clin Microbiol Rev.* 2014;27:665-690.

Who Decides?

- Decisions on “no-touch” technologies are a collaborative team effort involving infection preventionist, environmental services, organizational leadership, and the direct care team
- Environmental services input is critical to determining logistics:
 - Whether the process would work in the setting
 - Whether there are enough people to reliably deploy it
- During decision-making, many questions need to be asked, such as:
 - What problem is the technology trying to address?
 - What level of knowledge is needed to use the technology?
 - What is the organizational commitment to getting the technology?
 - How relevant is the technology to the organization and patient population?

Assessing Disinfection Thoroughness

- Several tools can help check how well a surface has been cleaned, including fluorescent marking and adenosine triphosphate (ATP) meters

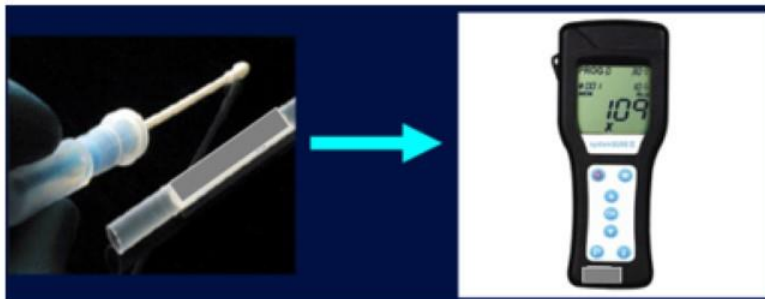
- **Fluorescent marking:**

- Not visible without a black light
- Applied to surface before cleaning
- If marker is visible after cleaning (**above image**), cleaning needs to be repeated



- **ATP meters:**

- Provides a number that indicates level of bioburden on a surface (**left image**)
- Readings above a certain level likely mean cleaning needs to be repeated
- No defined standard for ATP readings



Performance Monitoring

- First step is to assess how well the staff are doing and understanding the necessary tasks
 - Is something preventing them from doing their job properly?
 - Do they understand the processes and products?
- Next step is to use tools, like the florescent marker, to assess performance and provide feedback in real-time
 - ATP monitoring can be used if evaluation cannot otherwise be made
- Important to remember that every product and process has limitations, but assessments can provide insights on ways to improve results

Performance Monitoring (cont)

- No strategy is perfect; all have limitations
 - For example, with the fluorescent marker, team members might learn what is being marked and start cleaning to the mark, forgetting other surfaces in room
- Nevertheless, each strategy can provide useful information
- Establish what your goals are when selecting the method
- Work with your facility's team leader and environmental services leaders to determine if any of these strategies are helpful and to optimize their implementation and use

Educating Personnel

- Need to educate personnel on why certain things are done
- Cleaning a healthcare environment should not be considered the same as cleaning a house
 - All personnel need to have a basic understanding of healthcare cleaning/disinfection and the techniques involved
- Use of experts should be maximized, whether to address questions or to educate about a product or process
- Personnel should be engaged in initiatives to promote a desire to learn more, know more, and be better

Key Messages

- The healthcare environment is a key player in the transmission of infection
- Effective cleaning and disinfection requires:
 - Proper training
 - Proper selection of tools and disinfectants
 - Adherence to product labeling
 - Cleaning and disinfecting all surfaces, progressing from cleanest to dirtiest
- New technologies can supplement decontamination
- Cleaning/disinfection and performance is everyone's responsibility
- Use of experts and recognized authorities in this field should be maximized

Important Resources from AHE

- General AHE Resources (practice guidance, etc)
 - <http://www.ahe.org>
- AHE Certified Healthcare Environmental Services Technician (CHEST) program
 - http://www.ahe.org/ahe/lead/CHEST/images/CHEST_Brochure.pdf
- Certificate of Mastery in Infection Prevention (CMIP) program
 - <http://www.ahe.org/ahe/lead/CMIP/index.shtml>

Abbreviations

AHE = Association for the Healthcare Environment

ATP = Adenosine triphosphate

CHEST = Certified Healthcare Environmental Services Technician

CMIP = Certificate of Mastery in Infection Prevention

CRE = Carbapenem-resistant *Enterobacteriaceae*

EPA = Environmental Protection Agency

HAI = Healthcare-associated infection

HP = Hydrogen peroxide

MRSA = Methicillin-resistant *Staphylococcus aureus*

UVGI = ultraviolet germicidal irradiation

VRE = Vancomycin-resistant *Enterococcus*