



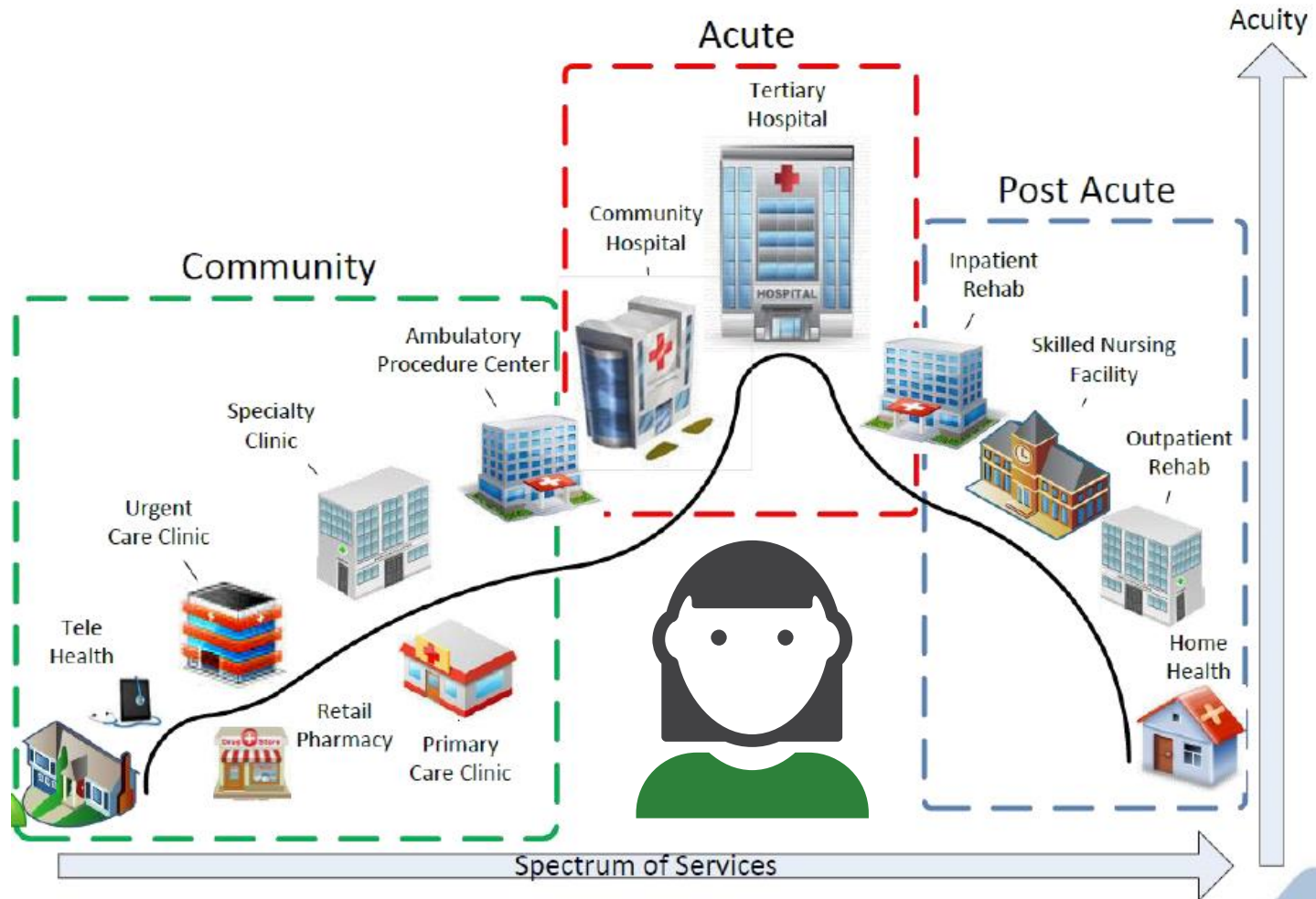
***HOW CLEAN IS CLEAN?
STRATEGIES FOR ENVIRONMENTAL
CLEANLINESS IN THE AMBULATORY SETTING***

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DISCLOSURES

- » Employee of Medline Industries, Inc.
- » Opinions expressed are my own and not necessarily representative of Medline Industries, Inc.

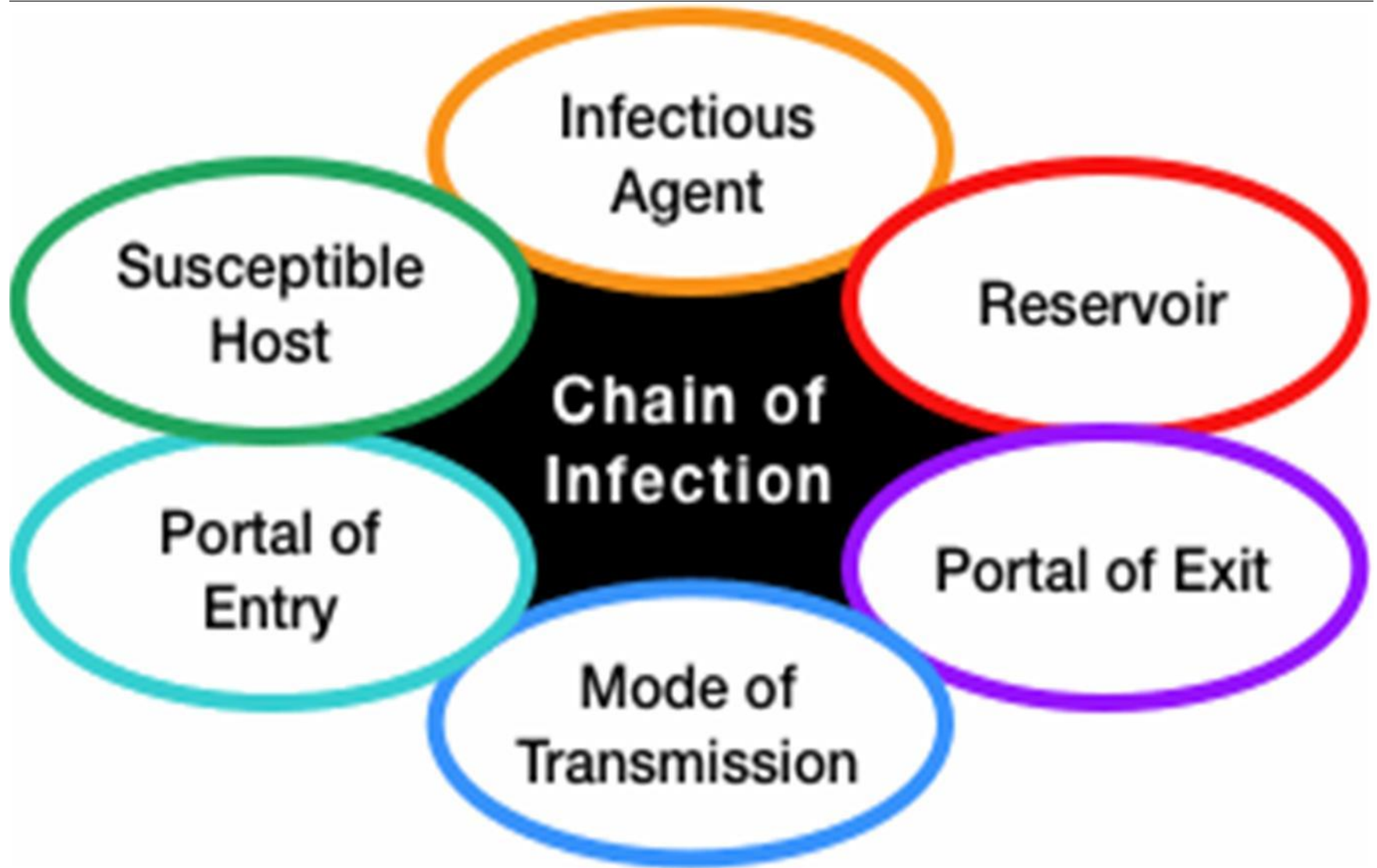
TRANSMISSION ACROSS THE CONTINUUM



All healthcare settings,
regardless of the level of
care provided, must make
infection prevention a
priority

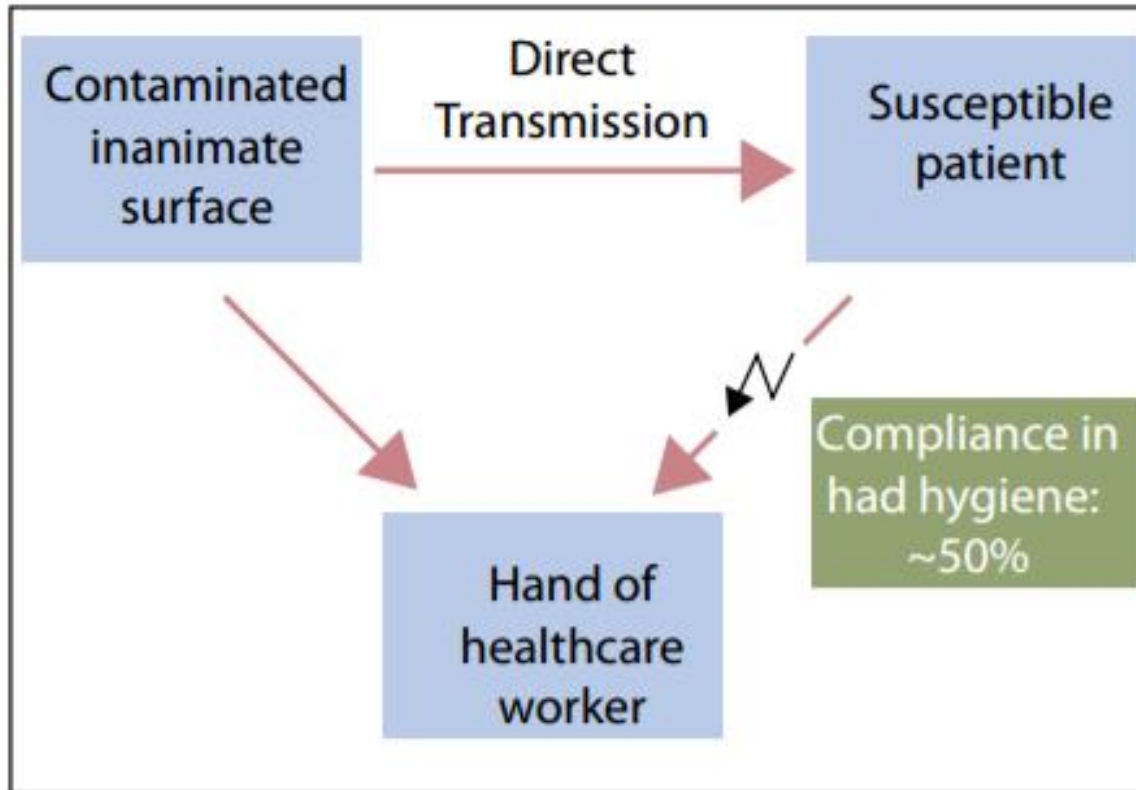
Foundational Components IP & C





CROSS CONTAMINATION

Common Modes of Transmission



From: Kramer A, Scwebke I, Kampf G. How long do nosocomial pathogens persist on inanimate surfaces? A systematic review. *BMC Infectious Diseases* 2006;6:130. <http://www.biomedcentral.com/1471-2334/6/130>

CROSS CONTAMINATION

- » 28-58%: Surface contamination and cross transmission(MRSA and CDI)
- » 20-40%: cross contamination via health care personnel (hands)
- » Hospital patients shed pathogens into their surrounding environments
- » Organisms persist on environmental surfaces for many days

Type of bacterium	Duration of persistence (range)
Acinetobacter spp.	3 days to 5 months
<i>Clostridium difficile</i> (spores)	5 months
<i>Escherichia coli</i>	1.5 hours – 16 months
Enterococcus spp. including VRE and VSE	5 days – 4 months
Klebsiella spp.	2 hours to > 30 months
<i>Mycobacterium tuberculosis</i>	1 day – 4 months
<i>Pseudomonas aeruginosa</i>	6 hours – 16 months; on dry floor: 5 weeks
<i>Staphylococcus aureus</i> , including MRSA	7 days – 7 months
HBV & HIV	> 1 week
Influenza virus	1 – 2 days

ROOM LOTTO



Patient infected or colonised with a pathogen (e.g. *C. difficile*, MRSA, VRE, *A. baumannii* or *P. aeruginosa*)



Patient is discharged and the room is cleaned / disinfected; surfaces in the room remain contaminated with the pathogen



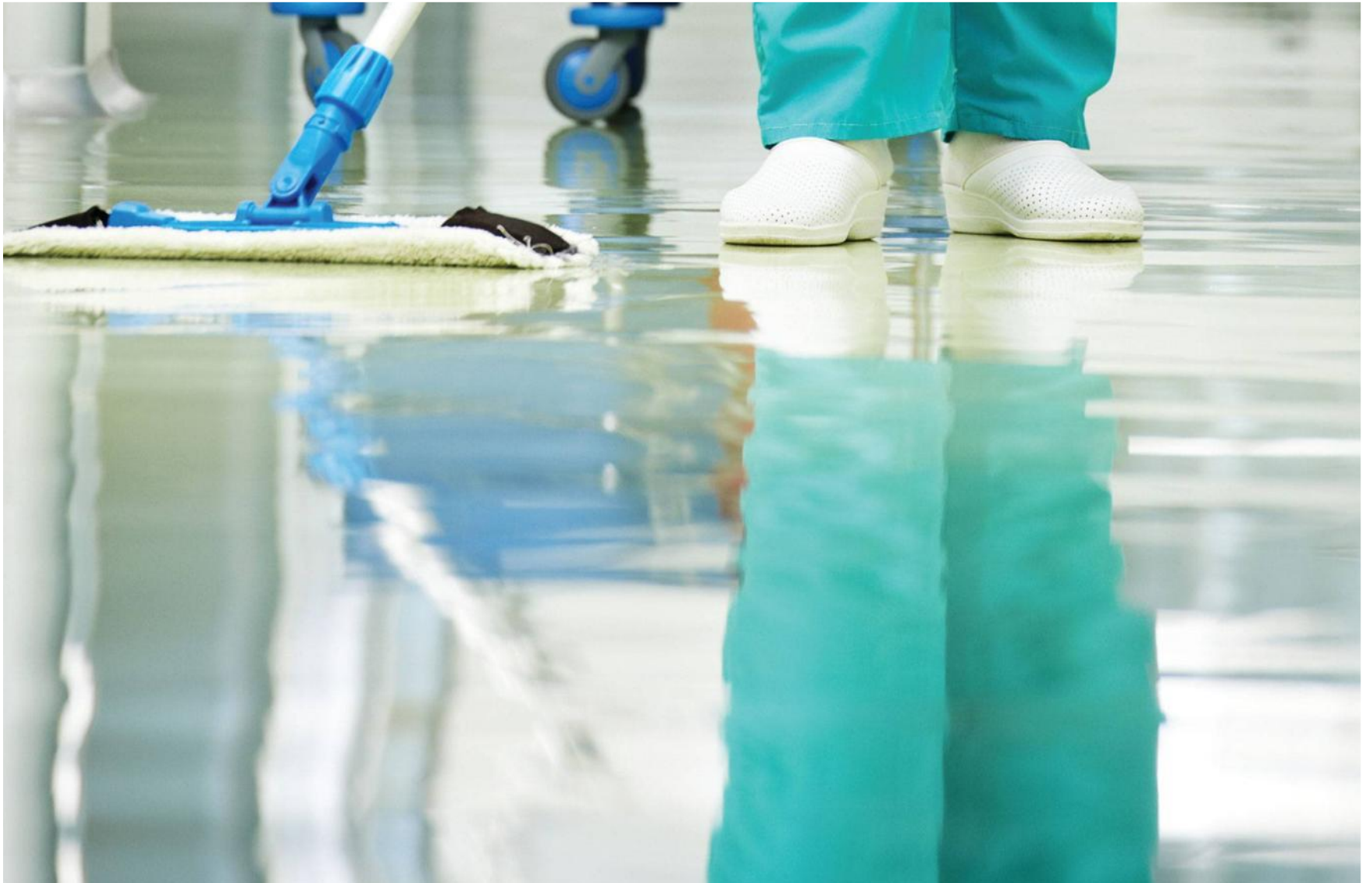
The next room occupant is at an increased risk of acquiring the pathogen

CROSS CONTAMINATION

» There is a **greater risk** of infection with various **drug-resistant** organisms and **C. difficile** for patients who are housed in **rooms previously occupied** by others with these organisms.



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***ENVIRONMENTAL CLEANLINESS &
PATIENT SATISFACTION***

PATIENT SATISFACTION

SURVEY OF 1000 PATIENTS

- Visible commitment to infection prevention
- Facility accessibility
- Amenities
- Up-to-date medical equipment
- Up-to-date technology
- Compassion / empathy of provider personnel
- Quality of medical products
- Time spent with patient during visit

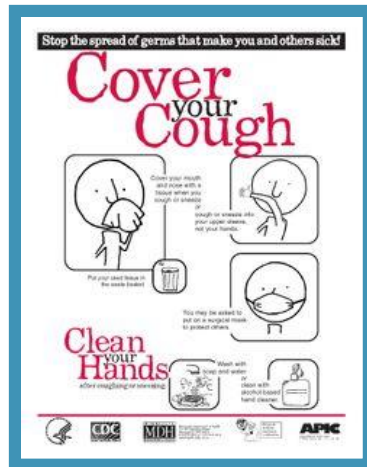
REASON PROVIDERS IMPRESS PATIENTS

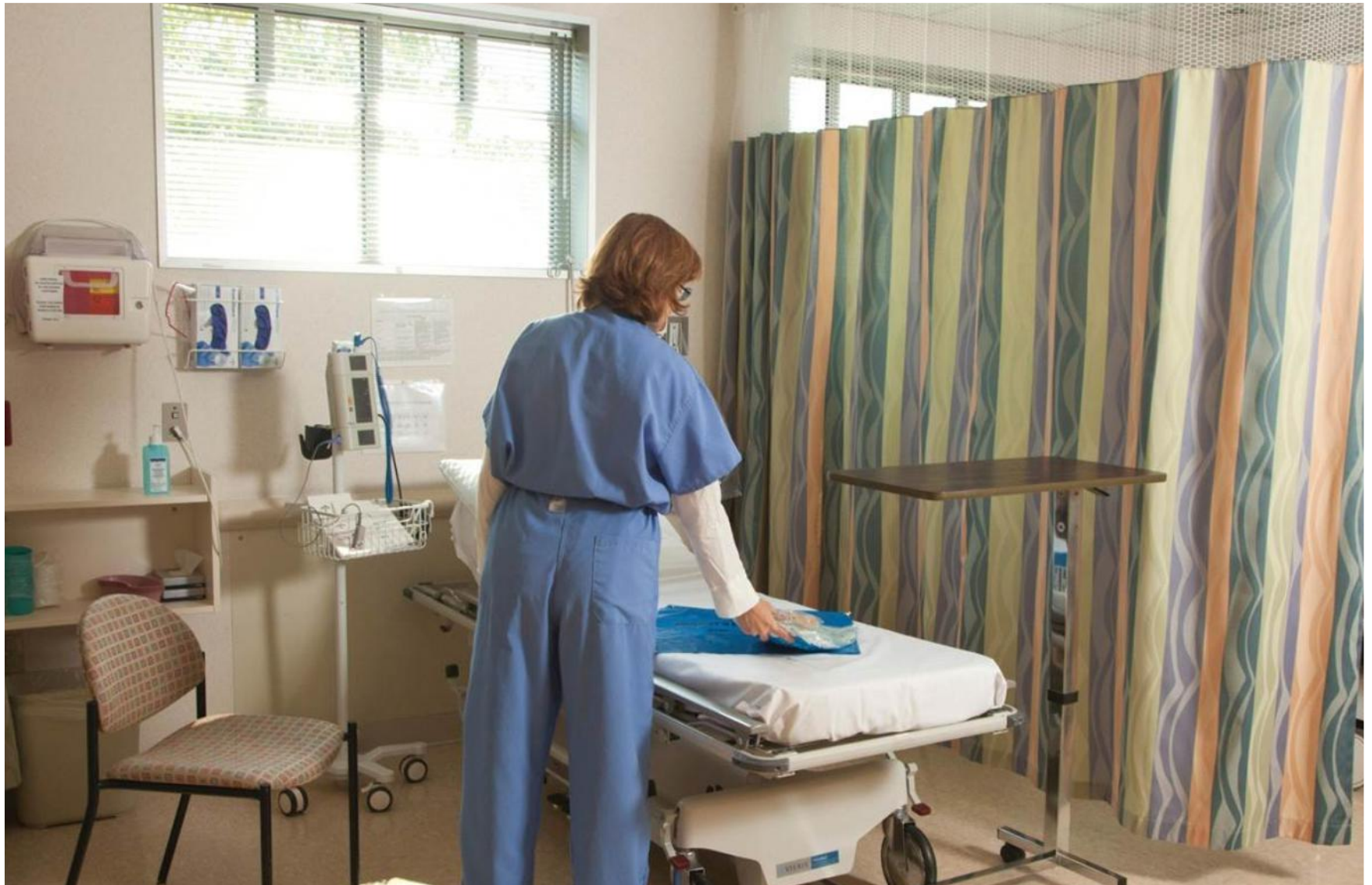
- » 48% - Visible commitment to infection prevention
 - Hand sanitizer and other cleaning and sterilization products are plentiful throughout the facility
 - Staff is seen frequently washing hands, especially before and after doing procedures or touching patients
 - Masks are issued quickly to patients who need them, and made available to anyone who wants them



REASON PROVIDERS IMPRESS PATIENTS

- » 48% - Visible commitment to infection prevention
 - Infection control signage and information is present in facility
 - Each area of the building is kept at exceedingly high standards of cleanliness
 - Staff is seen by patients doing cleaning and sterilization tasks



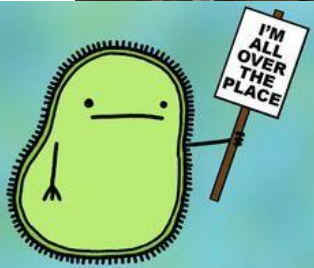


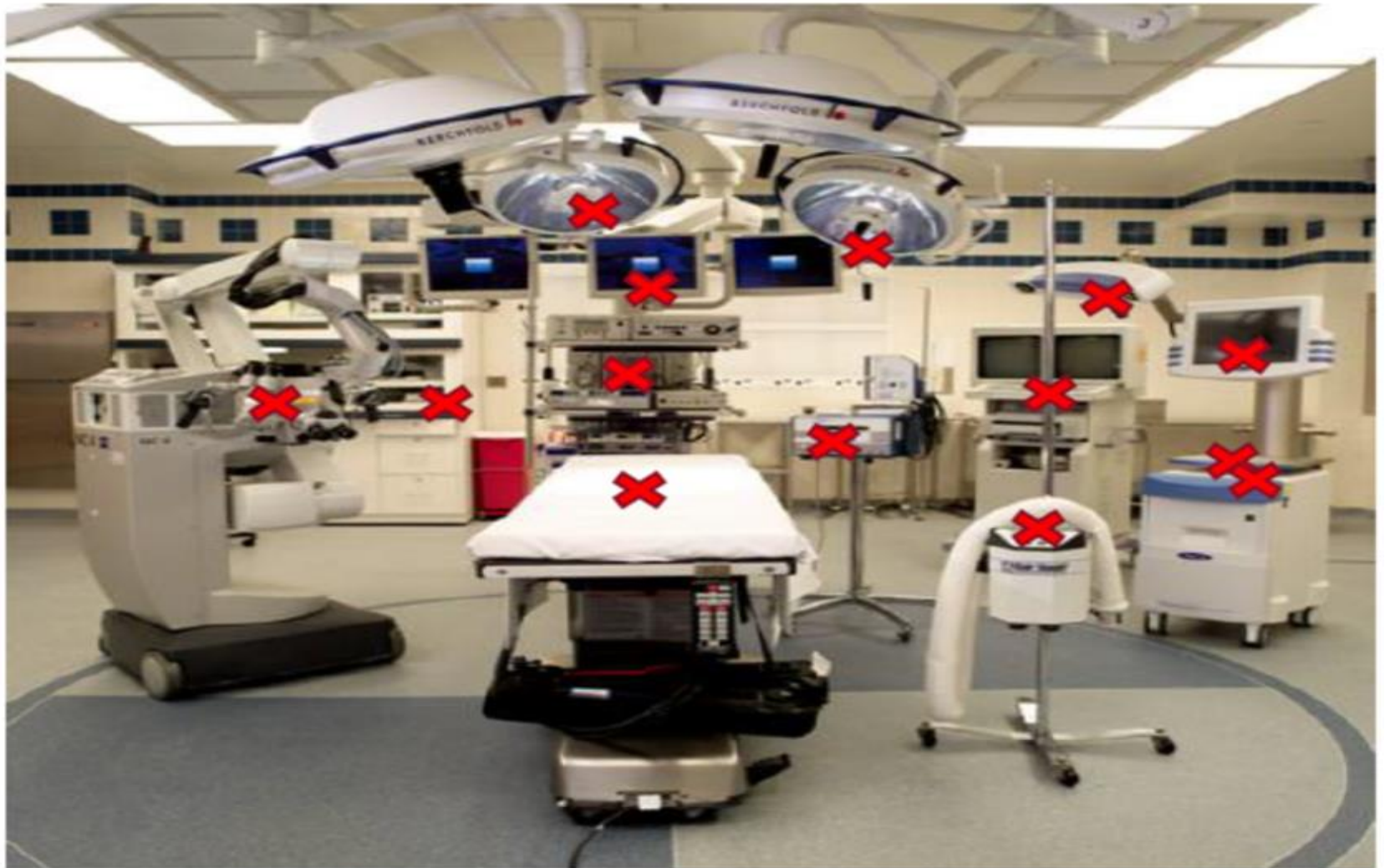
HOW CLEAN IS CLEAN?



HOW CLEAN IS CLEAN?

HOW CLEAN IS CLEAN?





CLEANING, STERILIZATION & DISINFECTION

» Cleaning

- Removal of visible soil and organic contamination
- Requires using the physical action of scrubbing with a surfactant or detergent and water
- Process removes large numbers of microorganisms from surfaces and must always **precede** disinfection.



CLEANING, STERILIZATION & DISINFECTION



CLEANING, STERILIZATION & DISINFECTION

- » **Disinfection** - Process of eliminating or reducing harmful microorganisms from inanimate objects and surfaces
- » **Sterilization** - process of killing all microorganisms



CMS: IC SURVEYOR WORKSHEET

IV. Environmental Infection Control

Observations are to be made of staff performing environmental cleaning (e.g., surgical technicians, cleaning staff, etc.)

If unable to observe is selected, please clarify in the surveyor notes box why it was not observed and attempt to assess by means of interview or documentation review.

Unless otherwise indicated, a "No" response to any question below **must** be cited as a deficient practice in relation to 42 CFR 416.51(a).

Practices to be Assessed	Was Practice Performed?	Surveyor Notes
A. Operating rooms are cleaned and disinfected after each surgical or invasive procedure with an EPA-registered disinfectant	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> <i>Unable to observe</i>	
B. Operating rooms are terminally cleaned daily	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> <i>Unable to observe</i>	
C. <i>Environmental surfaces in patient care areas are cleaned and disinfected, using an EPA-registered disinfectant on a regular basis (e.g., daily), when spills occur and when surfaces are visibly contaminated.</i>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> <i>Unable to observe</i>	
D. The ASC has a procedure in place to decontaminate gross spills of blood.	<input type="radio"/> Yes <input type="radio"/> No	

CDC Checklist for Outpatient Settings

X.a. Environmental Cleaning

Elements to be assessed	Assessment	Notes/Areas for Improvement
A. Facility has written policies and procedures for routine cleaning and disinfection of environmental surfaces, including identification of responsible personnel.	<input type="radio"/> Yes <input type="radio"/> No	
B. Personnel who clean and disinfect patient care areas (e.g., environmental services, technicians, nurses) receive training on cleaning procedures: <ul style="list-style-type: none"> i. Upon hire, prior to being allowed to perform environmental cleaning ii. Annually iii. When new equipment or protocols are introduced <i>Note: If environmental cleaning is performed by contract personnel, facility should verify this is provided by contracting company.</i>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Yes <input type="radio"/> No	
C. HCP are required to demonstrate competency with environmental cleaning procedures following each training.	<input type="radio"/> Yes <input type="radio"/> No	
D. Facility regularly audits (monitors and documents) adherence to cleaning and disinfection procedures, including using products in accordance with manufacturer's instructions (e.g., dilution, storage, shelf-life, contact time).	<input type="radio"/> Yes <input type="radio"/> No	
E. Facility provides feedback from audits to personnel regarding their adherence to cleaning and disinfection procedures.	<input type="radio"/> Yes <input type="radio"/> No	
F. Facility has a policy/procedure for decontamination of spills of blood or other body fluids.	<input type="radio"/> Yes <input type="radio"/> No	

CDC Checklist for Outpatient Settings

X.a. Environmental Cleaning (*continued*) – Operating room

Elements to be assessed	Assessment	Notes/Areas for Improvement
G. Operating rooms are terminally cleaned after last procedure of the day.	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not applicable	
H. Facility regularly audits (monitors and documents) adherence to recommended infection control practices for surgical infection prevention including: <ul style="list-style-type: none"> i. Adherence to preoperative surgical scrub and hand hygiene ii. Appropriate use of surgical attire and drapes iii. Adherence to aseptic technique and sterile field iv. Proper ventilation requirements in surgical suites v. Minimization of traffic in the operating room vi. Adherence to cleaning and disinfection of environmental surfaces 	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not applicable	
I. Facility provides feedback from audits to personnel regarding their adherence to surgical infection prevention practices.	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not applicable	

Direct Observation of Facility Practices

X.b. Environmental Cleaning

Elements to be assessed	Assessment	Notes/Areas for Improvement
<p>A. Supplies necessary for appropriate cleaning and disinfection procedures (e.g., EPA-registered disinfectants) are available.</p> <p><i>Note: If environmental services are performed by contract personnel, facility should verify that appropriate EPA-registered products are provided by contracting company</i></p>	<input type="radio"/> Yes <input type="radio"/> No	
<p>B. High-touch surfaces in rooms where surgical or other invasive procedures (e.g., endoscopy, spinal injections) are performed are cleaned and then disinfected with an EPA-registered disinfectant after each procedure.</p>	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not applicable	
<p>C. Cleaners and disinfectants are used in accordance with manufacturer's instructions (e.g., dilution, storage, shelf-life, contact time).</p>	<input type="radio"/> Yes <input type="radio"/> No	
<p>D. HCP engaged in environmental cleaning wear appropriate PPE to prevent exposure to infectious agents or chemicals (PPE can include gloves, gowns, masks, and eye protection).</p> <p><i>Note: The exact type of correct PPE depends on infectious or chemical agent and anticipated type of exposure.</i></p>	<input type="radio"/> Yes <input type="radio"/> No	

ENVIRONMENTAL CONTROL

- » OR / Procedure rooms cleaned/disinfected after each case
- » OR Procedure rooms terminally cleaned daily
- » High touch surfaces in patient care areas
 - Pre-op
 - Post-op
 - Exam rooms
- » When surfaces are contaminated
- » Procedure for gross spills of blood and body fluids

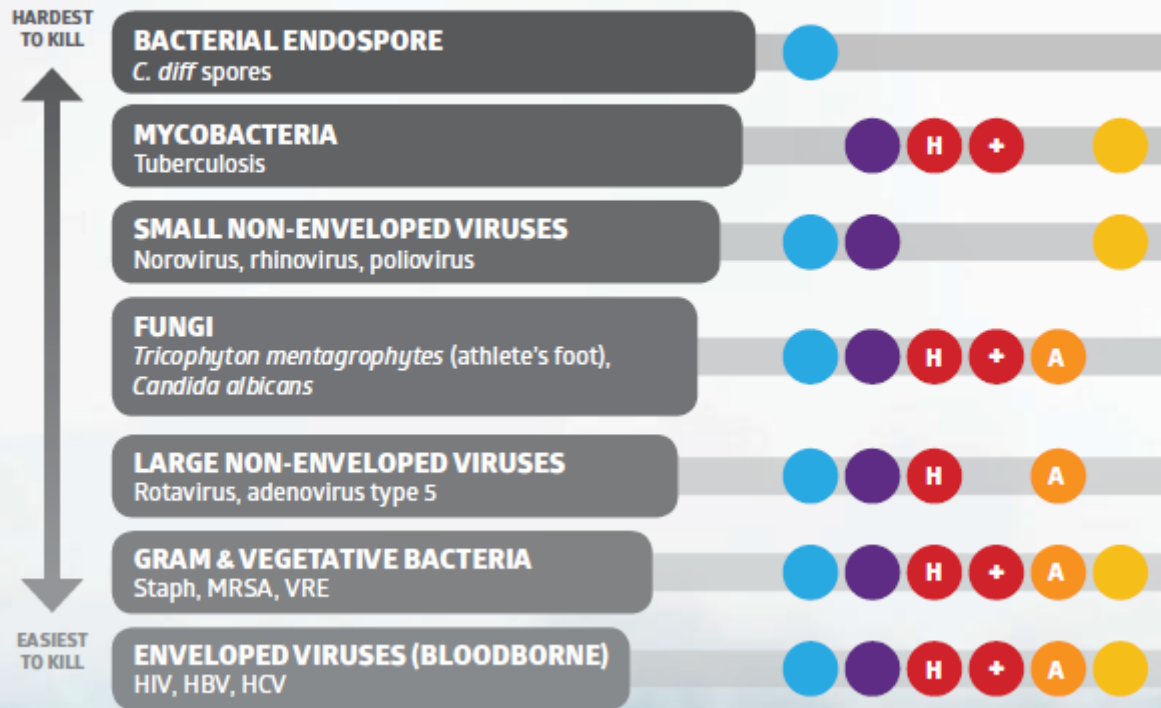
Tools of the Trade



DISINFECTANT CLAIMS

» Disinfectant must be EPA registered.

Microorganisms in Decending Order of Resistance¹ and Corresponding Micro-Kill Product Solution:



¹ Based on APIC Guideline for Selection and Use of Disinfectants.



DISINFECTANTS

» Disinfectant should be used in the manner recommended by the manufacturer

- Contact time
- Dilution
- How to use

» Disinfectants that are “ready to use, or dispensed in pre-measured amounts, are preferred over those that require mixing



FACTORS IN DISINFECTANT EFFICACY

- » Nature of object to be cleaned/disinfected
- » Temperature and relative humidity



EQUIPMENT DISINFECTION

- » Anesthesia machine
- » Stethoscopes
- » IV Equipment
- » Monitors
- » Blood pressure cuffs
- » Blood Glucose Monitors



MEDICAL DEVICES CLEANING & DISINFECTION

- » Follow your manufacturer's instruction to the letter!
- » During vendor training, make sure they are following the IFU
 - If instructions other than in the IFU are given – Ask for documentation!!!!
- » Education
 - Instrument or device specific!
 - Competency should be demonstrate more than during initial training
 - Train to the IFU – Not how Susie does it

WHO'S RESPONSIBLE??



EVS or Nursing ?



Someone else?

EDUCATION & TRAINING

- » All responsible staff - EVS & Nursing
 - Provide job- or task-specific infection prevention education and training.
 - › This includes those employed by outside agencies and available by contract or on a volunteer basis to the facility.
- » Training should be provided upon hire and repeated annually and when policies or procedures are updated/revised.
- » Competencies should be documented following each training.

EVS EDUCATION & TRAINING

» Provide Feedback and Information

- **People:** Focus on Turnover, Attendance, Morale, **Employee of the Month**
- **Service:** Focus on Inpatient and Outpatients Scores (PRC or Press Ganey, HCAPS)
- **Financial:** Focus on Supplies cost, Linen cost, equipment repair (Whatever you want to share that have financial impact on the organization and department)
- **Operational Quality:** Focus on TAT, Black light/ATP results





HOW DO YOU MONITOR CLEANLINESS?

Measure For Cleanliness

- » There is no standard method for measuring
 - Actual cleanliness of surfaces
 - Achievement of certain cleaning parameters (e.g., adequate contact time of disinfectant)
 - Defining the level of microbial contamination that correlates with good or poor environmental hygienic practices.

Cleaning Verification Systems



Swab cultures

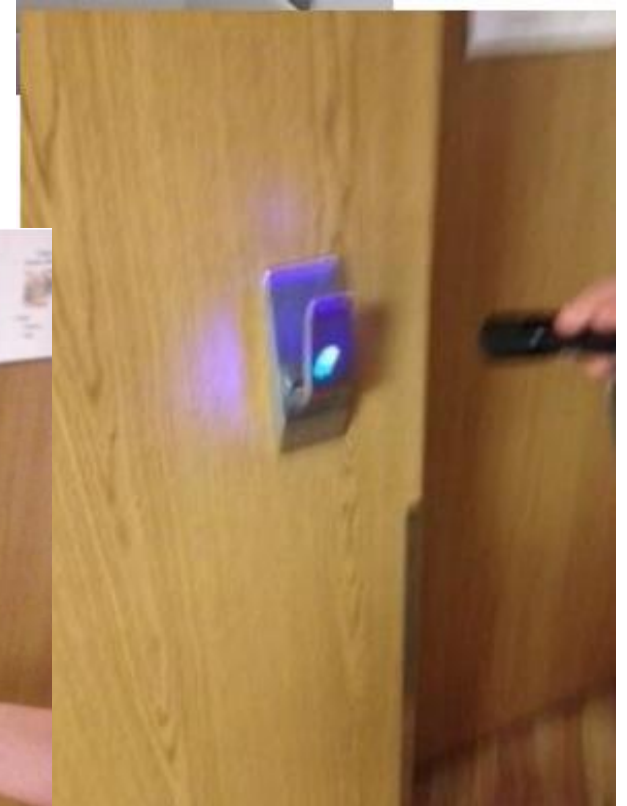


Fluorescent Markers



ATP

FLUORESCENT MARKERS



THE SCIENCE BEHIND ATP SYSTEMS

- » ATP systems measure light output
- » Uses a reaction that produces light
- » Bioluminescence - The Firefly Reaction
- » Combination of Luciferin & Luciferase with ATP produces light



THE SCIENCE BEHIND ATP SYSTEMS

- » ATP is present in blood, skin cells, other bodily fluids and microbes
- » As organic material comes into contact with surfaces, it leaves ATP
- » After cleaning, amount of ATP that remains is a direct indication of how much organic matter is still on the surface



ATP SYSTEMS



Step 1

**Use special swab
to sample surface**



Step 2

**Place swab in
reaction tube**



Step 3

**Place tube in luminometer
Results: Relative Light Units**

NO-TOUCH ROOM DISINFECTION (NTD) SYSTEMS



Hydrogen peroxide vapour (HPV)



Aerosolised hydrogen peroxide (AHP)



Ultraviolet radiation (UVC)



Pulsed-xenon UV (PX-UV)

KEY DIFFERENCES BETWEEN HPV & UV

Characteristics	Hydrogen Peroxide Vapor	UV Systems
Cycle time (For single room)	90 minutes	15min to >1hr
Ease of Use	Door & air vent sealing & leak detection required. Need specific training	No door & air vent sealing & leak detection required Relatively easy to use
Distribution	Homogenous	Affected by line of sight
Microbiological Efficacy	Elimination of pathogens from surfaces; 6-log sporicidal reduction	Does not eliminate pathogens from surfaces; 1-3 log sporicidal reduction
US EPA registration for use against spores	Sterilant	None
Evidence of clinical impact	Published evidence	Published evidence

Adapted from - Otter JA, Yezli S, Perl TM, Barbut F, French GL. Is there a role for "no-touch" automated room disinfection systems in infection prevention and control? J Hosp Infect 2013; 83: 1-13.

Boyce *Antimicrobial Resistance and Infection Control* (2016) 5:10
DOI 10.1186/s13756-016-0111-x

Antimicrobial Resistance
and Infection Control

REVIEW

Open Access

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



John M. Boyce

SUMMARY

- » Cross transmission of organisms from environmental surfaces has been well documented in the literature
- » Patient Satisfaction is Impacted by a Clean Environment
- » Patient Safety is Impacted by Environmental Cleaning and Disinfection

SUMMARY

» Education, Training and Competency are Key

- What tools to use when
- How to use your tools
- Who is responsible for cleaning what

» Monitor for Cleanliness

RESOURCES

- » Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008. CDC website. http://www.cdc.gov/hicpac/Disinfection_Sterilization/3_0disinfectEquipment.html
- » Guide to Infection Prevention in the Outpatient Setting. CDC website. <https://www.cdc.gov/hai/settings/outpatient/outpatient-care-guidelines.html>
- » CMS: Infection Control Surveyor Worksheet. http://cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/som107_exhibit_351.pdf
- » CDC/HICPAC Guidelines and recommendations: http://www.cdc.gov/HAI/prevent/prevent_pubs.html

RESOURCES

- » Guideline for Infection Control in Healthcare Personnel:
<http://www.cdc.gov/hicpac/pdf/InfectControl98.pdf>
- » Occupational Safety & Health Administration (OSHA) Bloodborne Pathogens and Needlestick Prevention Standard:
<http://www.osha.gov/SLTC/bloodbornepathogens/index.html>
- » Guidelines for Environmental Infection Control in Healthcare Facilities:
http://www.cdc.gov/hicpac/pdf/guidelines/eic_in_HCF_03.pdf
- » Options for Evaluating Environmental Infection Control:
<http://www.cdc.gov/HAI/toolkits/Evaluating-Environmental-Cleaning.html>



QUESTIONS