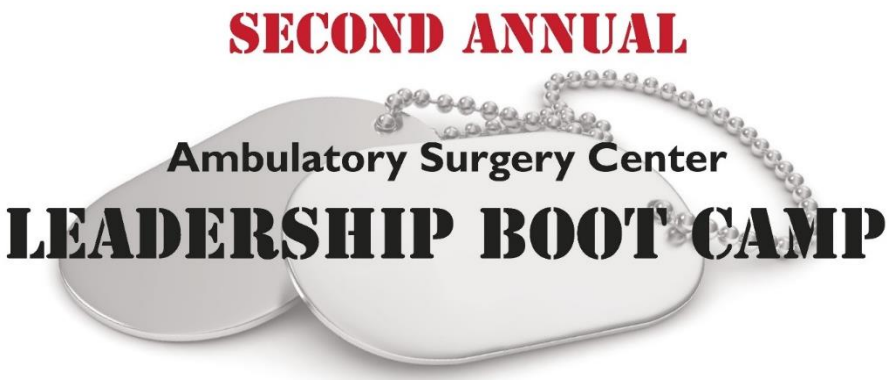

Diving Deep Into Your Environmental Hygiene Program

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Disclosure

Faculty

- Carol Calabrese, RN, BS, T-CSCT, CHESP, CIC

No conflict

Commercial Support: None

Sponsorship: None

Learning Objectives

- Identify key considerations in the process of disinfectant selection
- State 3 Properties of an Ideal Disinfectant
- State the different types of cleaning/disinfecting in the Surgical Suite
- Review cleaning of Point of Care devices

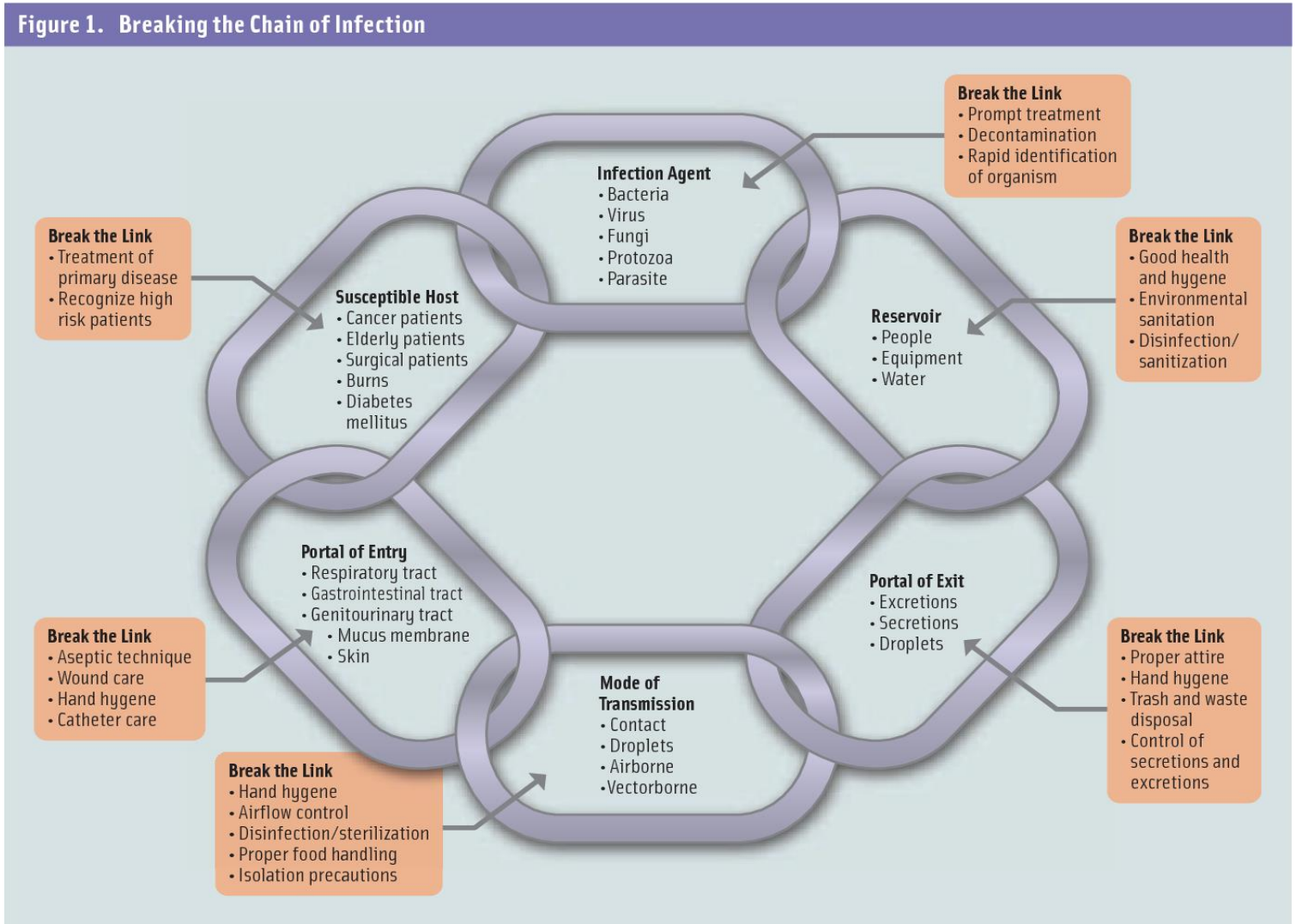
Terminology

- **Antimicrobial** – capable of killing microorganisms. Does not specify the type or quantity of pathogens killed
- **Bactericidal** – capable of killing bacteria. See label for specific claims
- "cidal" versus "static"
  - **"cidal"** claims means that the product is capable of killing the organism – i.e., bactericidal kills bacteria
  - **"static"** means it prevents the growth – i.e., fungistatic prevents the growth of fungi
- **Fungicidal** – capable of killing fungi. See label for specific claims
- **Germicidal** – older term meaning the same as antimicrobial
- **Virucidal** – capable of killing viruses. See label for specific claims
- **Sporicidal** – capable of killing bacterial spores. See label for specific claims

Key Terminology

- **ATCC** – American type culture collection. Standard samples of organisms that are used for testing. The ATCC number is unique for a bug ensuring that future testing is done against the same sample
- **Bloodborne pathogen** compliant – per OSHA's Bloodborne Pathogen Standard - capable of killing HIV and HBV OR TB Claim. US specific claim. Not used in Canada.
- **Epidemiology** – the study of the spread of disease
- **FIFRA** – Federal Insecticide, Fungicide and Rodenticide Act. A US law that grants authority to EPA to register pesticides including antimicrobials
- **Hospital disinfectant**– Kills staph (Gram positive), pseudomonas (Gram negative)
- **Infection Prevention and Control**– policies and practices to prevent or control the spread of disease
- **Microorganisms** – single cell organisms too small to see with the naked eye
- **Pathogen** – Any organism capable of causing disease in people
- **Pesticide** – anything capable of killing other things. May be single cell organisms or insects

Chain of Infection



How to Break A Chain of Infection – bogspot.com

Polling Question

- What level of disinfection is needed in an operating room?

  A) Sanitizing

  B) High Level Disinfection (HDL)

  C) Low/Intermediate

Spaulding Classification System

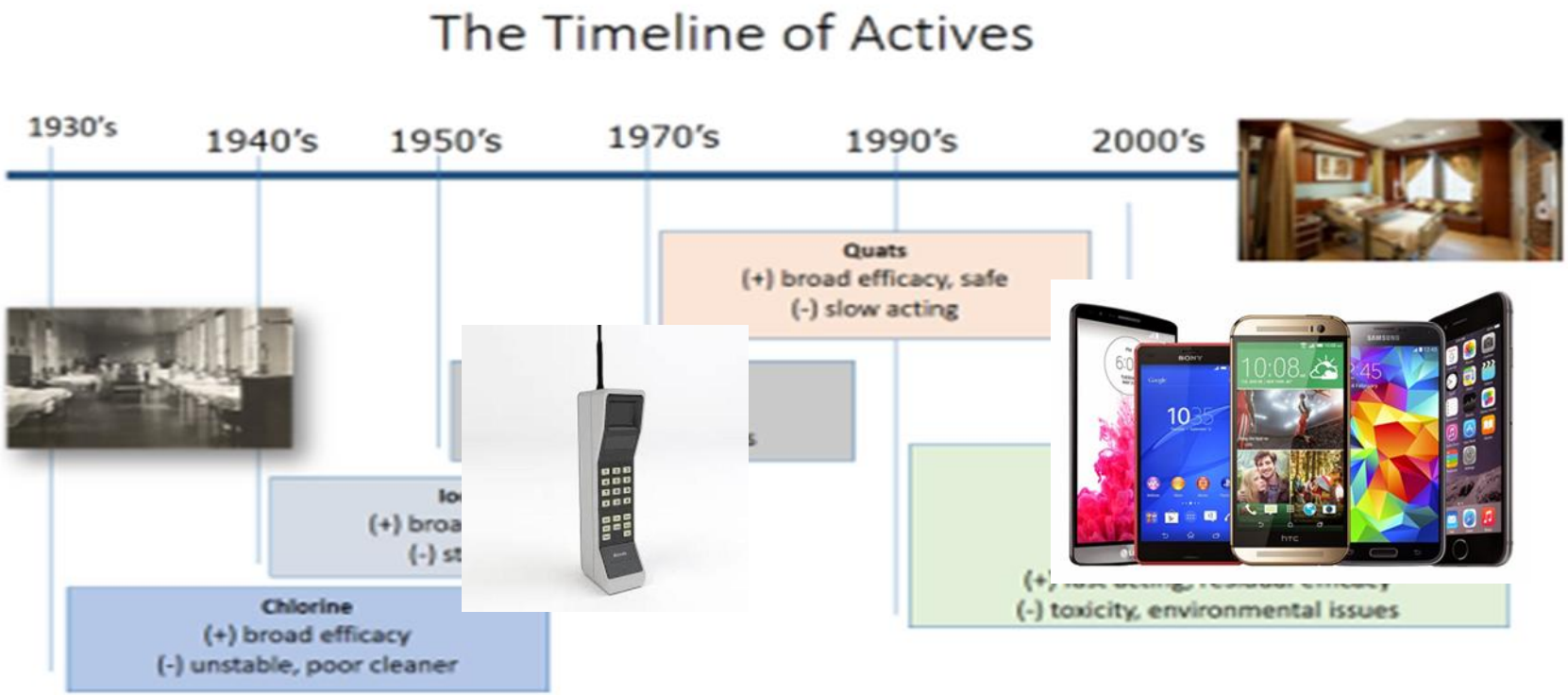
Classification of devices, processes, and germicidal products			
Device classification	Device (examples)	Spaulding process classification	EPA product classification
Critical (enters sterile tissue or vascular system	Implants, scalpels, needles, other surgical instruments, etc.	Sterilization - sporicidal chemical prolonged contact	Sterilant/disinfectant
Semicritical (touches mucous membranes [except dental])	Flexible endoscopes, laryngoscopes, endotracheal tubes, and other similar instruments	High-level disinfection- Sporicidal chemical; short contact	Sterilant/disinfectant
Noncritical (touches intact skin)	Thermometers, hydrotherapy tanks	Intermediate-level disinfection	Hospital disinfectant with label claim for tuberculocidal activity
	Stethoscopes, tabletops, bedpans, etc.	Low-level disinfection	Hospital disinfectant without label claim for tuberculocidal activity

https://pubmed.ncbi.nlm.nih.gov/21664533

Levels of Hygiene

Levels of Hygiene		
Category	**Description**	**Log Reduction**
Sterilization	Kills all pathogens, including spores	6
Disinfection (High Level)	Kills all vegetative pathogens	6
Disinfection (Intermediate)	Kills *Mycobacterium tuberculosis*/non-enveloped viruses	6
Disinfection (Low Level)	Kills vegetative bacteria, larger viruses and fungi	6
Sanitizing (Food Contact)	Kills high percentage of vegetative bacteria	5
Sanitizing (Non-Food Contact)	Kills high percentage of vegetative bacteria	3
Cleaning	Removes dirt; unrelated to pathogen reduction	NA

Disinfectant Timeline



Cell Phone History timeline | Timetoast timelines

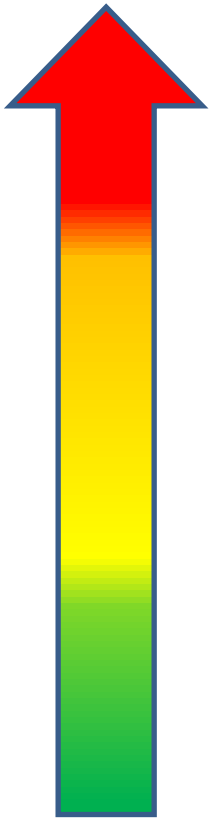
Regulatory and Guiding Organizations

- **Food and Drug Administration** - US agency responsible medical devices and their care, including disinfection and sterilization (also responsible for hand sanitizers)
- **Centers for Disease Control and Prevention** - publishes guidance documents on disinfection and sterilization, which impacts governmental regulations that follow
- **The Joint Commission –TJC** surveys and accredits facilities to receive federal reimbursements
- **Environmental Protection Agency** (EPA)

Clarification of Tuberculocidal

- CDC clarified their view on this point in their 2004 HICPAC Guidelines for Environmental Control in Healthcare (Sehulster 2004, p 73).
- "A common misconception in the use of surface disinfectants in health-care settings relates to the underlying purpose for use of proprietary products labeled as a "tuberculocidal" germicide. Such products will not interrupt and prevent the transmission of TB in health-care settings because TB is not acquired from environmental surfaces. The tuberculocidal claim is used as a benchmark by which to measure germicidal potency.
- Because mycobacteria have the highest intrinsic level of resistance among the vegetative bacteria, viruses, and fungi, any germicide with a tuberculocidal claim on the label (i.e., an intermediate-level disinfectant) is considered capable of inactivating a broad spectrum of pathogens, including much less resistant organisms such the bloodborne pathogens (e.g., hepatitis B virus [HBV], hepatitis C virus [HCV], and HIV).
- It is this broad spectrum capability, rather than the product's specific potency against mycobacteria, that is the basis for protocols and OSHA regulations indicating the appropriateness of using tuberculocidal chemicals for surface disinfection."

Effect of Disinfectants on Microorganisms



Organism	Type	Examples
Bacterial Spores	Spore	*Bacillus anthracis, Clostridioides difficile*
Mycobacteria	Bacteria	*M. tuberculosis*
Small non-enveloped virus	Virus	Norovirus, Hep A, Rhinovirus, Enterovirus
Fungal spores	Fungus	Aspergillus, Penicillium, Trichophyton
Gram negative bacteria	Bacteria	*E. coli*, Neisseria, Pseudomonas, Acinetobacter
Fungi (Vegetative)	Fungus	Candida
Large Virus (non-enveloped)	Virus	Adenovirus, Rotavirus
Gram positive bacteria	Bacteria	Staph, Group A Strept, MRSA, VRE
Virus (enveloped)	Virus	HIV, Hep B, Hep C, Influenza, SARS, RSV, Mumps, Measles, Rubella, Mono

^*Resistant*
* *Sensitive*

Adapted from Rutala et al. ICHE 2014;35(7):862

OSHA Amendment 1997

- However, in February 1997, OSHA amended its policy and stated that EPA-registered disinfectants labeled as effective against HIV and HBV would be considered as appropriate disinfectants ". . . provided such surfaces have not become contaminated with agent(s) or volumes of or concentrations of agent(s) for which higher level disinfection is recommended."

2008 Guideline for Disinfection and Sterilization Healthcare Facilities

Multi-disciplinary Committee

- Infection Preventionist
- Environmental Services
- Director Operating Room
- Employee Health
- Purchasing

Pro’s and Con’s of Disinfectant Categories

Phenolics

- Bactericidal, tuberculocidal, fungicidal, virucidal
- Inexpensive (in dilutable form)
- Non-staining
- Not flammable
- EPA registered

- Not sporicidal
- Absorbed by porous materials and irritate tissue
- Depigmentation of skin caused by certain phenolics
- Hyperbilirubinemia

Quaternary Ammonium

* Bactericidal, fungicidal, virucidal against enveloped viruses (e.g., HIV)
* Good cleaning agents
* Surface compatible
* Persistent antimicrobial activity when undisturbed
* Inexpensive (in dilutable form)
* Not flammable

* Not sporicidal
* In general, not tuberculocidal and virucidal against non-enveloped viruses
* Longer Contact Time
* Residue left on surfaces
  * High water hardness and cotton/gauze can make less microbicidal
  * A few reports documented asthma as result of exposure to benzalkonium chloride
  * Multiple outbreaks ascribed to contaminated benzalkonium chloride

Sodium Hypochlorite

Advantages

- Bactericidal, tuberculocidal, fungicidal, virucidal
- Sporicidal – effective against *C. difficile*
- Fast acting
- Inexpensive (in dilutable form)
- Non-flammable
- Unaffected by water hardness
- Reduces biofilms on surfaces
- Relatively stable (e.g., 50% reduction in chlorine concentration in 30 days)
- Used as the disinfectant in water treatment
- EPA registered

Disadvantages

Reaction hazard with acids and ammonias

Leaves salt residue on surfaces

Corrosive to metals (some ready-to-use products may be formulated with corrosion inhibitors)

Short shelf life - unstable active (some ready-to-use products may be formulated with stabilizers to achieve longer shelf life, but maximum of 12 months)

Affected by organic matter

Discolors/stains fabrics

May cause skin / eye irritation; irritating at high concentrations

Odor (some ready-to-use products may be formulated with odor inhibitors)

Rutala, Weber; Am J Infect Control 2019

Hydrogen Peroxide

- Bactericidal, tuberculocidal, fungicidal, virucidal
- Fast efficacy
- Easy compliance with wet-contact times
- Safe for workers (lowest EPA toxicity category, IV)
- Benign for the environment
- Surface compatible
- Non-staining
- Not flammable

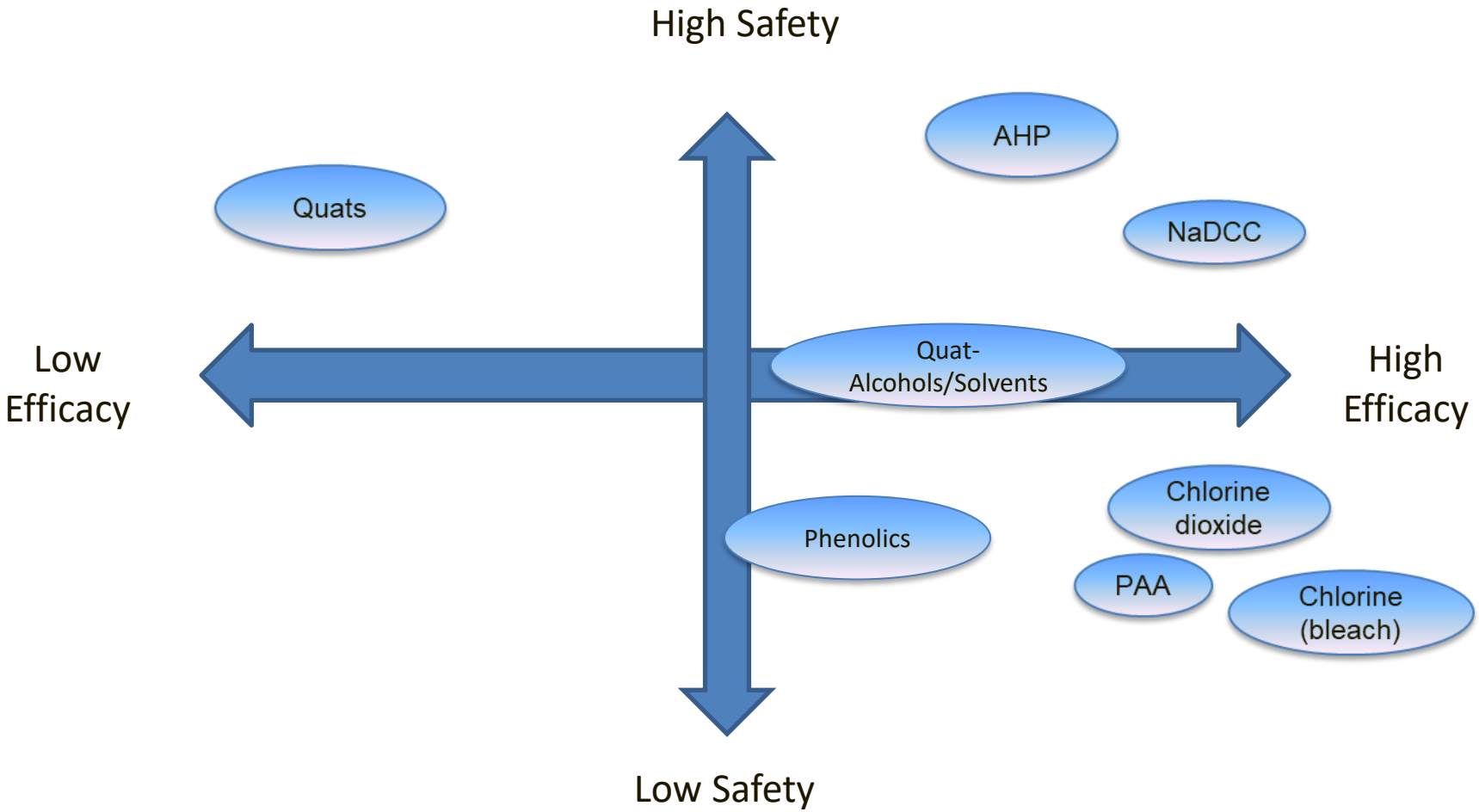
- More expensive than some other disinfecting actives
- Not sporicidal at low concentrations

Peracetic Acid

* Rapid activity against microorganisms and are bactericidal, fungicidal, virucidal, tuberculocidal , and sporicidal.
* Remains active in the presence of organic material and lacks harmful decomposition materials (e.g., oxygen, hydrogen peroxide).

* Lack of stability – after dilution
  Potential to corrode metals such as copper and brass
* In concentrate, HCW needs eye protection, gloves and room needs proper air exchanges
* Respiratory irritant

Balancing Tradeoffs



Properties of an Ideal Disinfectant

1. Broad spectrum
2. Fast acting
3. Remains wet
4. Unaffected by environmental factors
5. Non-toxic and non-irritating to the user
6. Compatible with surfaces
7. Persistence
8. Easy to use
9. Acceptable odor
10. Economical
11. Soluble in water
12. Stable
13. Cleaner
14. Nonflammable

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY · JULY 2014, VOL. 35, NO. 7

COMMENTARY

Selection of the Ideal Disinfectant

William A. Rutala, PhD, MPH,[1] David J. Weber, MD, MPH[2]

Healthcare-associated infections (HAIs) remain an important source of morbidity and mortality, with an estimated 1.7 million infections and 99,000 deaths annually.[1] A major source of nosocomial pathogens is thought to be the patient's endogenous flora, but an estimated 20%–40% of HAIs have been attributed to cross infection via the hands of healthcare personnel.[2] Contamination of the hands of healthcare personnel could in turn result from direct patient contact or indirectly from touching contaminated environmental surfaces. Healthcare personnel have frequent contact with the environmental surfaces in patients' rooms, providing ample opportunity for contamination of gloves and/or hands.[3] Two recent studies demonstrated that contact with the environment was just as likely to contaminate the hands of healthcare workers as direct contact with the patient.[4,5] Donskey[6] reviewed the scientific literature and found that improving surface cleaning and disinfection reduces HAIs. Another recent article showed that daily disinfection of surfaces (vs standard cleaning of surfaces when visibly soiled) with a sporicidal disinfectant in rooms of patients with *Clostridium difficile* and methicillin-resistant *Staphylococcus aureus* (MRSA) reduced acquisition of pathogens on gloved hands after contact with room surfaces.[7] While disinfectants are used to prevent transmission of pathogens from both noncritical and semicritical items, the purpose of this article is to assist the user in the selection of the optimal disinfectant for use with environmental surfaces and noncritical patient care items (devices that contact only intact skin, such as stethoscopes). The same characteristics for an ideal low-level disinfectant shown in Table 1 would be used for high-level disinfectants; however, the contact time would be longer, and the antimicrobial spectrum would be broader (eg, may include *C. difficile* spores). To date, the perfect product for healthcare disinfection has not been introduced; however, there is a wide array of disinfectants that offer a range of characteristics. The remainder of this article will review the 5 key criteria that should be used when evaluating disinfecting products available today.

While the process of selecting an optimal healthcare disinfectant used for low-level disinfection of noncritical items is commonplace in healthcare facilities, there are no articles in the peer-reviewed literature on this topic. Disinfectant selection, or the product, is one of the 2 components essential for effective disinfection. The other component, the practice, is thorough application such that the disinfectant contacts all surfaces, as well as proper training of hospital staff (especially environmental services and nursing) and adherence to the manufacturer's label instructions (except in the cases where an institution may prepare a formal risk assessment to follow alternate contact times, such as more than or equal to 1 minute for vegetative bacteria). The combination of product and practice results in effective surface disinfection—or reduction of patient risk—and improved patient outcomes. The 5 key considerations when selecting a disinfectant are summarized below (Table 2).[8,9]

1. KILL CLAIMS FOR THE MOST PREVALENT HEALTHCARE PATHOGENS

To keep patients as safe as possible, healthcare facilities must consider what pathogens are the most common causes of HAIs, the most common causes of outbreaks and ward closures, and the unique pathogens in their facility. The product selected should be effective against the microorganisms that are the most common causes of HAIs and outbreaks (see Table 3), according to nationally reported data. Since vegetative bacteria (such as *S. aureus*, *Enterococcus*, *Escherichia coli*, coagulase-negative *Staphylococcus*, *Pseudomonas aeruginosa*, *Klebsiella species*, *Enterobacter species*) are the pathogens that cause the vast majority of HAIs (79.1%),[10,11] healthcare disinfectants should be effective against these pathogens. It is reasonable to check the product label to ensure that the disinfectant under evaluation is Environmental Protection Agency (EPA) registered to kill as many of the pathogens listed in Table 3 as possible.

When evaluating a disinfectant, it is important to note that disinfectant testing for antibiotic-resistant pathogens (eg, MRSA) is not necessary, as antibiotic-resistant pathogens are not more resistant to disinfectants than antibiotic-sensitive pathogens at the manufacturer's recommended use dilution.[12,13] However, there are some pathogens that are

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Centers for Disease Control

Table 2. Properties of an ideal disinfectant

- Broad spectrum: should have a wide antimicrobial spectrum
- Fast acting: should produce a rapid kill
- Not affected by environmental factors: should be active in the presence of organic matter (e.g., blood, sputum, feces) and compatible with soaps, detergents, and other chemicals encountered in use
- Nontoxic: should not be harmful to the user or patient
- Surface compatibility: should not corrode instruments and metallic surfaces and should not cause the deterioration of cloth, rubber, plastics, and other materials
- Residual effect on treated surfaces: should leave an antimicrobial film on the treated surface
- Easy to use with clear label directions
- Odorless: should have a pleasant odor or no odor to facilitate its routine use
- Economical: should not be prohibitively high in cost
- Solubility: should be soluble in water
- Stability: should be stable in concentrate and use-dilution
- Cleaner: should have good cleaning properties
- Environmentally friendly: should not damage the environment on disposal

Guideline for Disinfection and Sterilization in Healthcare Facilities (2008) Revised 2017

Ideal Disinfectant Characteristics

Updated HICPAC/CDC Guidance for Selection of an Ideal Disinfectant - *Infection Control and Hospital Epidemiology* (Vol. 35, No.7 (July 2014), pp. 855-865)
Kill Claims for the most prevalent healthcare pathogens
Fast Kill times and acceptable wet contact time to ensure proper disinfection of non-critical surfaces and patient care equipment
Safety
Ease of Use
Other Factors - manufacturer support; overall cost

Properties of an Ideal Disinfectant

- **Broad spectrum**
  - Should have a broad spectrum of kill, including kill claims for all pathogens that are common causes of HAIs and outbreaks
- **Fast acting**
  - Should have a rapid kill and short kill/contact times listed on the label
- **Remains wet**
  - Should keep surfaces wet long enough to meet listed kill/contact times with a single application

Properties of an Ideal Disinfectant

- **Not affected by environmental factors**
  - Should remain active in the presence of organic matter (e.g., blood, body fluids) and compatible with soaps, detergents, and other chemicals encountered in use.
- **Non-toxic**
  - Should be non-irritating to users, visitors, patients and other healthcare workers. Should not induce allergic symptoms (especially asthma, eye irritation, and dermatitis). The toxicity ratings for disinfectants are danger, warning, caution, and none. Ideally choose products with the lowest toxicity rating.
- **Surface compatibility**
  - Should be compatible with common healthcare surfaces and devices.

Properties of an Ideal Disinfectant

- **Persistence**
  - Should have sustained antimicrobial activity or residual antimicrobial effect on the treated surface.
- **Easy-to-use**
  - Should be available in multiple forms, such as wipes (large and small), sprays, pull tops, and refills; directions for use should be simple and contain information about required personal protective equipment.
- **Acceptable odor**
  - Should have an odor deemed acceptable by users and patients.

Many Lists

United States Environmental Protection Agency

Search EPA.gov

Environmental Topics | Laws & Regulations | Report a Violation | About EPA

Pesticide Registration

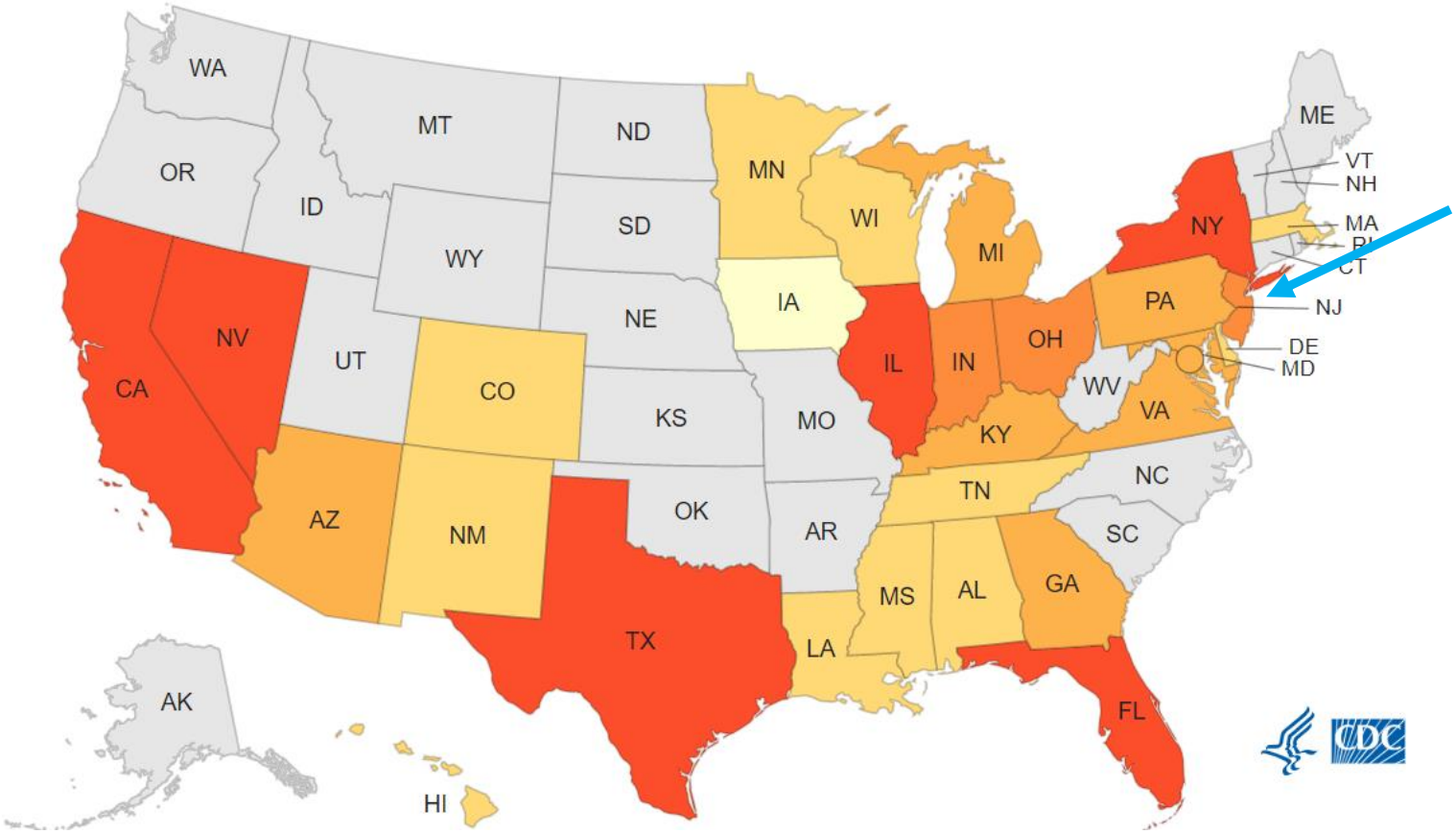
CONTACT US

List K: Antimicrobial Products Registered with EPA for Claims Against Clostridium difficile Spores

On this page:

- Products on List K
- How to use List K products effectively
- How to read Registration Numbers
- How to check if a product is on List K
- Additional Resources

Candida *auris*



Product Labels

How to Read Registration Numbers

Disinfectant products may be marketed and sold under different brand and product names. To determine whether EPA expects a given product to kill C. diff, check whether its registration is on this list.

- Registration numbers will have two or three parts.
  - The **first two parts** of this registration number reflect the **primary registration**, while the **third part** of the registration number **identifies the distributor's EPA company number**.
  - If your product's registration number has two parts (ex. 1234-12), it has a **primary registration number**. If this number is on List K, the product is qualified for use against *C. diff*
  - If your product's registration number has **three parts** (ex. 1234-12-123), you have a **supplemental distributor product**. These products have the same chemical composition and efficacy as primary products, but often have different brand or product names. If this number is on List K, the product is qualified for use against *C. diff*.

https://www.epa.gov/pesticide-registration/list-k-antimicrobial-products-registered-epa-claims-against-clostridium

Master Labels

- EPA Registration number
- Active ingredients
- Cautions
- First aid
- Environmental Hazards
- Claims – Non- FIFRA
- Claims – FIFRA
- Usage claims
- Directions for Use

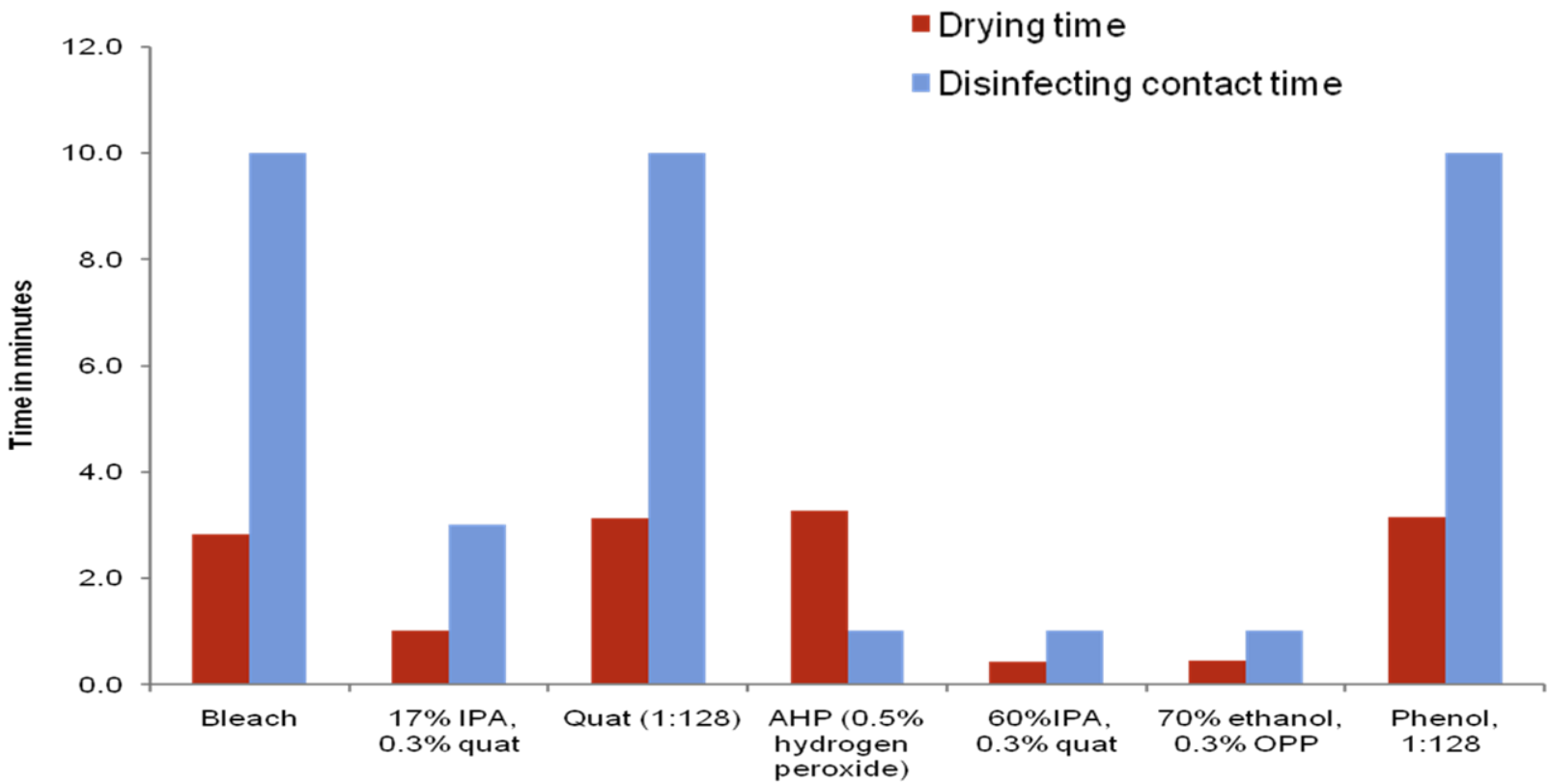
Emerging Viral Pathogen

The National Institute of Allergy and Infectious Diseases defines "emerging infectious diseases/pathogens" as those "that have newly appeared in a population or have existed but are rapidly increasing in incidence or geographic range."

One Step or Two Steps

- One step = detergent/disinfectant
- Two step = Clean with detergent followed by the disinfectant

Dry Time vs Contact Time



Safety

Product Safety

- HMIS (Hazardous Material Identification System) rating
  - Health
  - Flammability
  - Physical Hazard

Best is 0/0/0 or EPA Toxicity Rating of IV

NIOSH

Notes from the Field

Respiratory Symptoms and Skin Irritation Among Hospital Workers Using a New Disinfection Product — Pennsylvania, 2015

Brie Hawley, PhD[1]; Megan L. Casey, MPH[1]; Jean M. Cox-Ganser, PhD[1]; Nicole Edwards, MS[1]; Kathleen B. Fedan[1]; Kristin J. Cummings, MD[1]

Symptom	Reported symptoms No. (%)	Reported work-related symptoms* No. (%)
Watery eyes†	31 (46)	20 (29)
Nasal problems†	28 (41)	15 (22)
Asthma-like symptoms§	19 (28)	10 (15)
Shortness of breath	11 (16)	5 (7)
Skin problems†	10 (15)	7 (10)
Wheeze†	10 (15)	5 (7)
Chest tightness†	9 (13)	2 (3)
Cough	3 (4)	1 (1)
Asthma attack†	2 (3)	1 (1)

Tools

- Ready – to – use (RTU)
- Dilutable
- Disposable cloths
- Reusable cloths
- Disposable wipes
- Buckets
- Flat mops vs string mops

Reusable Cleaning Cloths

Microbial Load of Reusable Cleaning Towels used in Hospitals

Laura Y. Sifuentes[1], Peter K. Raisanen[1], Charles P. Gerba[1], David W. Koenig[2] and Ilona Weart[3]
[1]Department of Soil, Water and Environmental Science, University of Arizona, Tucson AZ, and
Kimberly-Clark Corporation, [2]Neenah, WI and [3]Roswell, GA

ABSTRACT

Hospital cleaning practices play a critical role in the prevention of nosocomial infection transmission. To this end, reusable towels soaked in disinfectants are commonly used to clean and disinfect hospital surfaces. There are reports linking reusable cleaning towels to the outbreak of *Bacillus cereus*. It is known that reusable towels can interfere with the action of commonly used quaternary ammonium disinfectants. It is therefore important to understand if reusable towels can increase the risk for the transmission of pathogens in the hospital. The objective of this study was to investigate the prevalence of bacteria and fungi in reusable cleaning towels.

Reusable towels used for cleaning hospital rooms contained high numbers of microbial contaminants. Hospital laundering practices in this study appear to be either insufficient to remove microbial contaminants or even add contaminants to the towels. Furthermore, towels are known to interfere with the action of common hospital grade disinfectants. Independently and together these two factors may increase the risk for transmission of pathogens in the hospital. Importantly, these observations point to the need to critically re-evaluate current hospital cleaning practices associated with the use of reusable towels.

MATERIALS AND METHODS

Hospital survey. Ten hospitals were surveyed regarding their cleaning practices after terminal discharge and the use of disinfectants.

Collection of towels. Laundered reusable cleaning towels were collected in triplicate from each hospital. Each collected towel was submerged in buffered peptone water (EMD Chemicals, Gibbstown, NJ) to extract microbes. The peptone broth was extracted from the towel by ringing the liquid out. The extract was assayed on selected media for the isolation of the various bacteria and fungi.

Sampling of soak buckets. The buckets used to soak the towels in disinfectants were sampled for 9 of the 10 hospitals. Each soak bucket was swabbed with a Sponge-Stick™ Swabs (3M™, St. Paul, MN) right above the disinfectant liquid line. Microbes were eluted from the Sponge-Stick™ Swabs in leitheen broth with agitation. The extract was assayed on selected media for the isolation of the various bacteria and fungi.

Enumeration of target organisms. Quantitative plate count methods were used to determine the presence of heterotrophic bacteria, total coliform, aerobic spore formers, fungi, *Staphylococcus aureus*, methicillin resistant *S. aureus* (MRSA), *Escherichia coli*, and *Clostridium difficile*.

Identification of organisms. API® strips (bioMerieux, Durham, NC).

Hospital cleaning cart with a soak bucket and

RESULTS

Numbers of Towels and Soak Buckets Positive for Microbes

	Viable Microbes	Total Coliform	*E. coli*	Aerobic Spore Formers	Fungi
Towels	28/30[a] (93%)[b]	7/30 (23%)	1/30 (3%)	17/30 (56%)	4/30 (13%)
Soak Buckets	6/9 (67%)	1/9 (12%)	ND	4/9 (44%)	ND

ND = Not detected
[a] Number positive per number sampled
[b] Percent positive

Microbial Contamination on Reusable Cleaning Towels (Mean log CFU/Towel ± SD; n=3)

Hospital	Heterotrophic Bacteria	Total Coliform	Aerobic Spore Formers	Fungi
1	4.1 ± 0.2	0.5 ± 0.5	3.3 ± 0.2	0.9 ± 1.6
2	1.1 ± 1.9	ND	1.7 ± 1.5	ND
3	3.8 ± 0.8	0.3 ± 0.5	1.0 ± 1.7	ND
4	3.9 ± 0.3	ND	1.0 ± 1.7	ND
5	3.5 ± 0.6	ND	1.9 ± 1.6	ND
6	5.0 ± 0.1	1.3 ± 0.5	3.6 ± 0.3	3.3 ± 0.3
7	3.0 ± 0.1	ND	ND	ND
8	3.7 ± 0.5	ND	1.5 ± 1.3	ND
9	3.8 ± 0.1	ND	3.9 ± 0.6	ND
10	2.3 ± 2.0	ND	ND	ND

ND = Not detected

Microbial Contamination on Soak Buckets (CFU/100cm^2; n=9)

Bacteria Identified on Towels and Soak Buckets

Aeromonas hydrophilica
Escherichia coli
Klebsiella oxytoca
Klebsiella pneumoniae
Micrococcus luteus
Moellerella wisconsensis
Pantoea spp
Pasteurella pneumotropica
Pseudomonas luteola
Serratia plymuthica
Vibrio fluvialis

Methicillin resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile* were not isolated from any of the towels or soak buckets.

Impact of Towel Material on Contamination (log CFU/Towel ± SD)

	Cotton n	Cotton Mean	Microfiber n	Microfiber Mean	*p*-value*
Heterotrophic Bacteria	24	3.17 ± 1.29	6	4.39 ± 0.88	0.0381
Total Coliform	24	0.07 ± 0.23	6	0.78 ± 0.70	0.0002
Aerobic Spore Formers	24	1.66 ± 1.63	6	2.28 ± 1.80	0.4152
Fungi	24	0.12 ± 0.58	6	1.67 ± 1.84	0.0012

*Multiple analyses of variance with a rejection region of 5% using the F distribution

SUMMARY

- Reusable cleaning towels used for cleaning and disinfecting hospital rooms contain microbial contaminants.
  - Both cotton and microfiber towels harbored microbial contaminates.
  - Microfiber towels contained significantly more bacteria than cotton towels.
  - 93% of the towels sampled contained viable microbes.
  - 56% of the towels sampled contained spores.
  - 23% of the towels sampled contained coliforms.
  - 3% of the towels sampled contained *E. coli*.
  - 67% of the soak buckets sampled harbored viable bacteria.
  - 44% of the soak buckets sampled harbored bacterial spores.

Study Demonstrated:

- 93% of reusable cleaning cloths contained pathogenic bacteria
- Typical laundering practices were not sufficient to remove microbial contaminants
- Microfiber cloths were more likely to have higher contamination levels after laundering
- Reusable cleaning towels may spread contaminants

Study Demonstrated:

American Journal of Infection Control 41 (2013) 912-5

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journal homepage: www.ajicjournal.org

Major article

Microbial contamination of hospital reusable cleaning towels

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- 93% of reusable cleaning cloths contained pathogenic bacteria
- Typical laundering practices were not sufficient to remove microbial contaminants
- Microfiber cloths were more likely to have higher contamination levels after laundering
- Reusable cleaning towels may spread contaminants

Polling Question

- What is Quat Binding?

A) When the cleaning cloths get tangled up

B) When the positive charged quats are attracted and absorbed into the negative charged cloths or rags

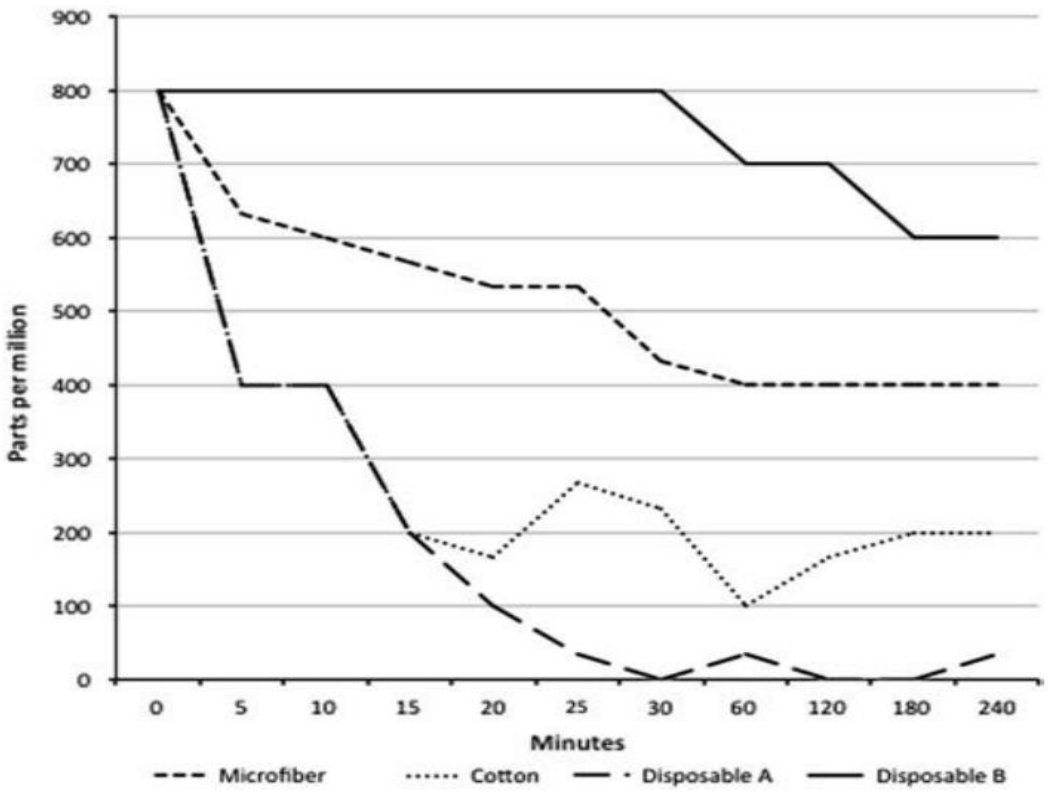
C) When the Quat chemistry is not diluted properly

Quat Binding

Quat binding occurs when the (+) charged quats are attracted and absorbed into (-) charged rags or cloths

John Boyce, MD

Microfiber wipers, cotton towels, and 1 of 2 types of disposable wipes soaked in a Quat disinfectant revealed significant binding of the disinfectant.



High Touched Surfaces

T. Link et al. / American Journal of Infection Control 44 (2016) 1350-5

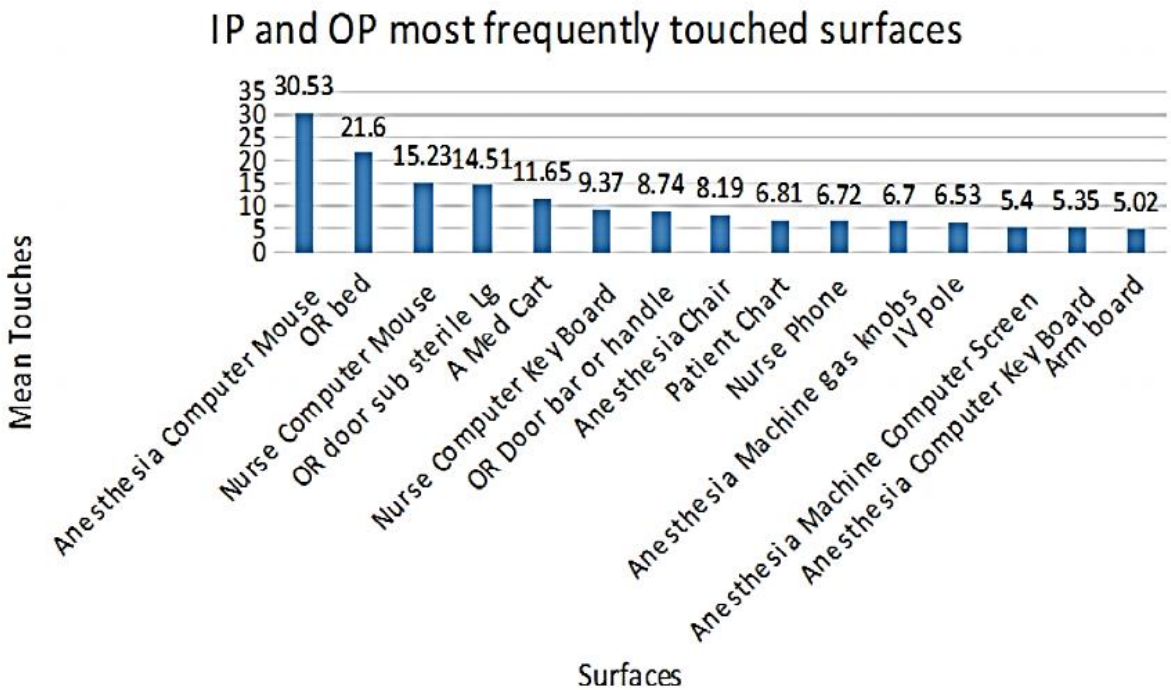


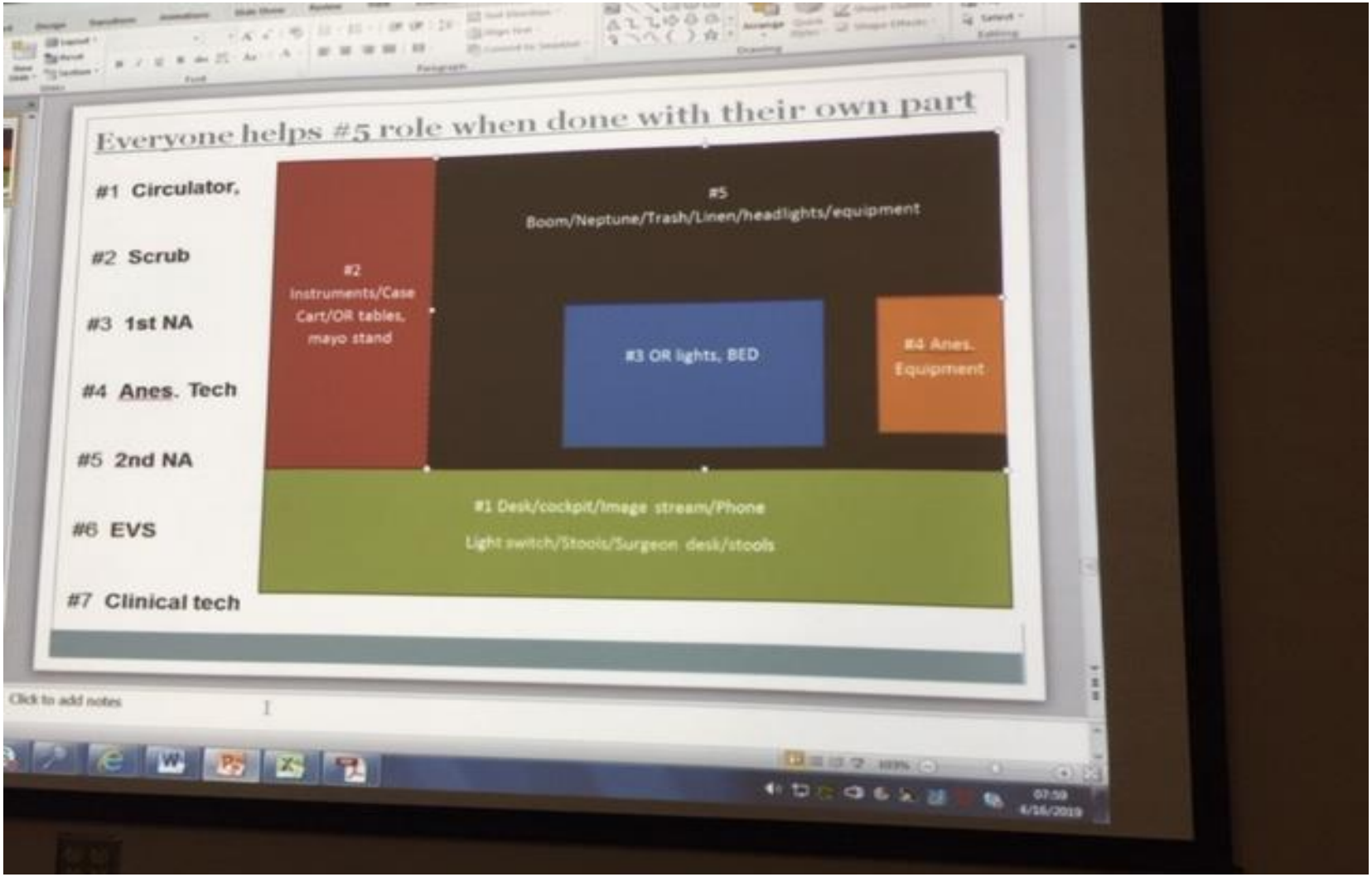
Fig 1. Most frequently touched surfaces in IP and OP ORs. *IP*, inpatient; *IV*, intravenous; *Lg*, large; *Med*, medical; *OP*, outpatient; *OR*, operating room.

T. Link et al. / American Journal of Infection Control 44 (2016) 1350-5

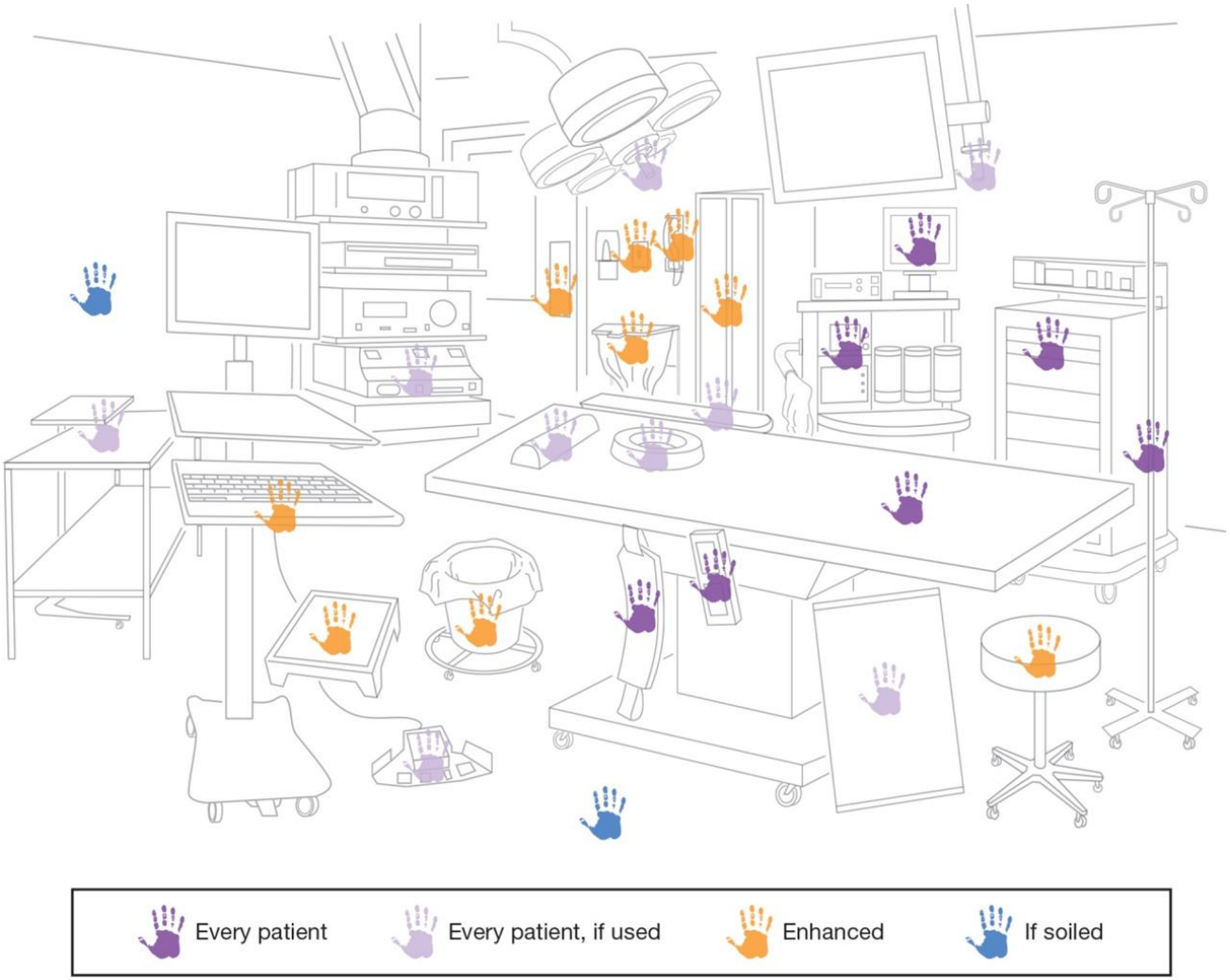
Role and Responsibility

AREA	EVS	FREQ	NURSING STAFF	FREQ	OTHER (Specify)	FREQ
Patient Room						
Bed rail/controls						
Bedside cabinet and other furniture						
Blood Pressure Cuffs/Sphygmomanometer						
Call box/button and cords						
Computer monitor, mouse, keyboard, and cart (if present)						
Corridor railing						
Data Scope						
Dispensers for towels, soap, sanitizer, etc.						
Door knob/handle and push plates (inside and out) to room						
Glove box and gown holders						
Heart Monitor						
Infusion Pumps and control						
ISO Holder						
IV Poles						
Light Switch						
Multi module monitor Controls						
Multi module monitor touch screens						
Multi module monitor wires and cables						
Nurse Server						

U of Iowa


Everyone helps #5 role when done with their own part
#1 Circulator,
#2 Scrub
#3 1st NA
#4 Anes. Tech
#5 2nd NA
#6 EVS
#7 Clinical tech
#5
Boom/Neptune/Trash/Linen/headlights/equipment
#2
Instruments/Case
Cart/OR tables,
mayo stand
#3 OR lights, BED
#4 Anes.
Equipment
#1 Desk/cockpit/Image stream/Phone
Light switch/Stools/Surgeon desk/stools
Click to add notes

Turnover

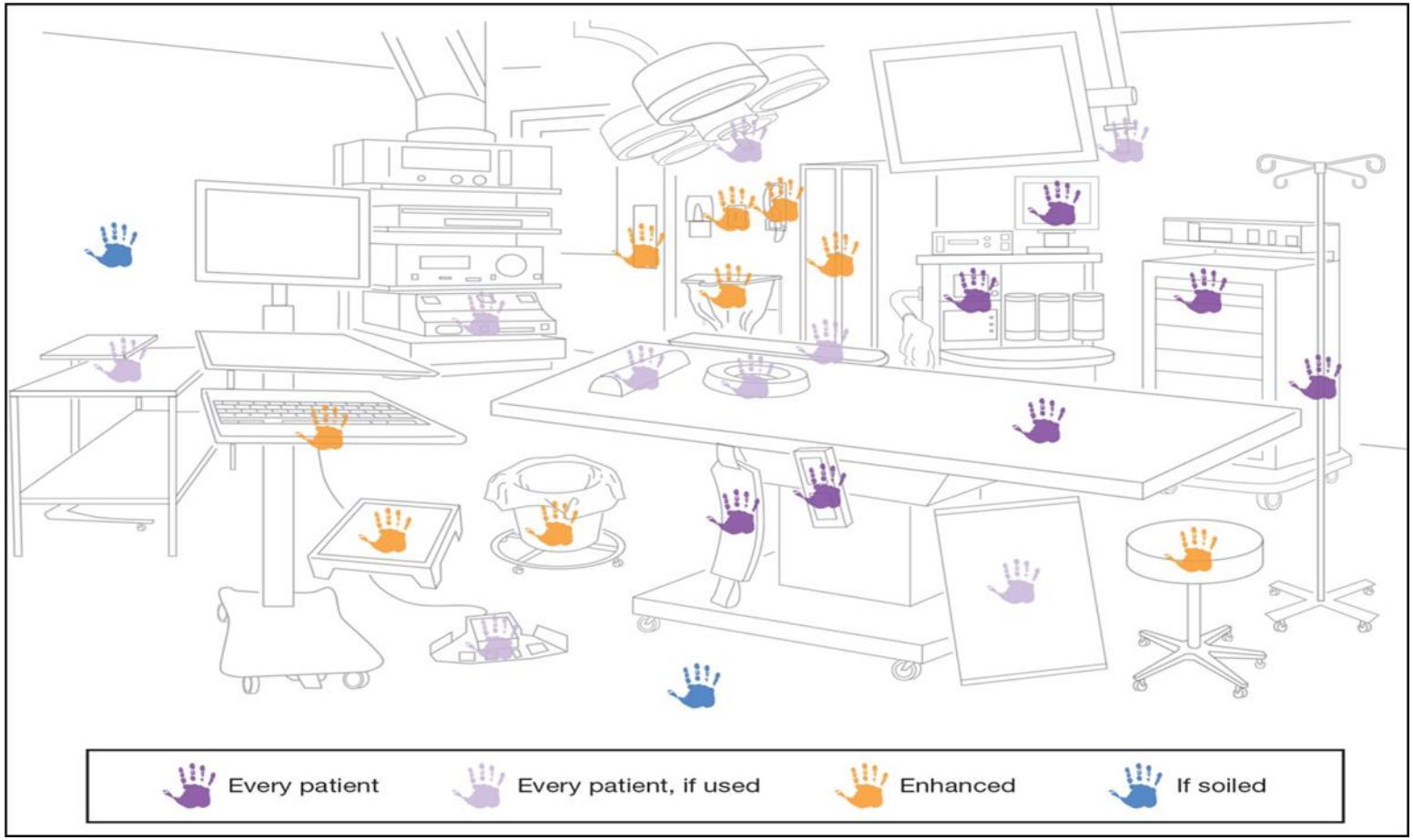


Terminal

- AKA – End of Day

Operating room cleaning procedures | Health Facilities Management

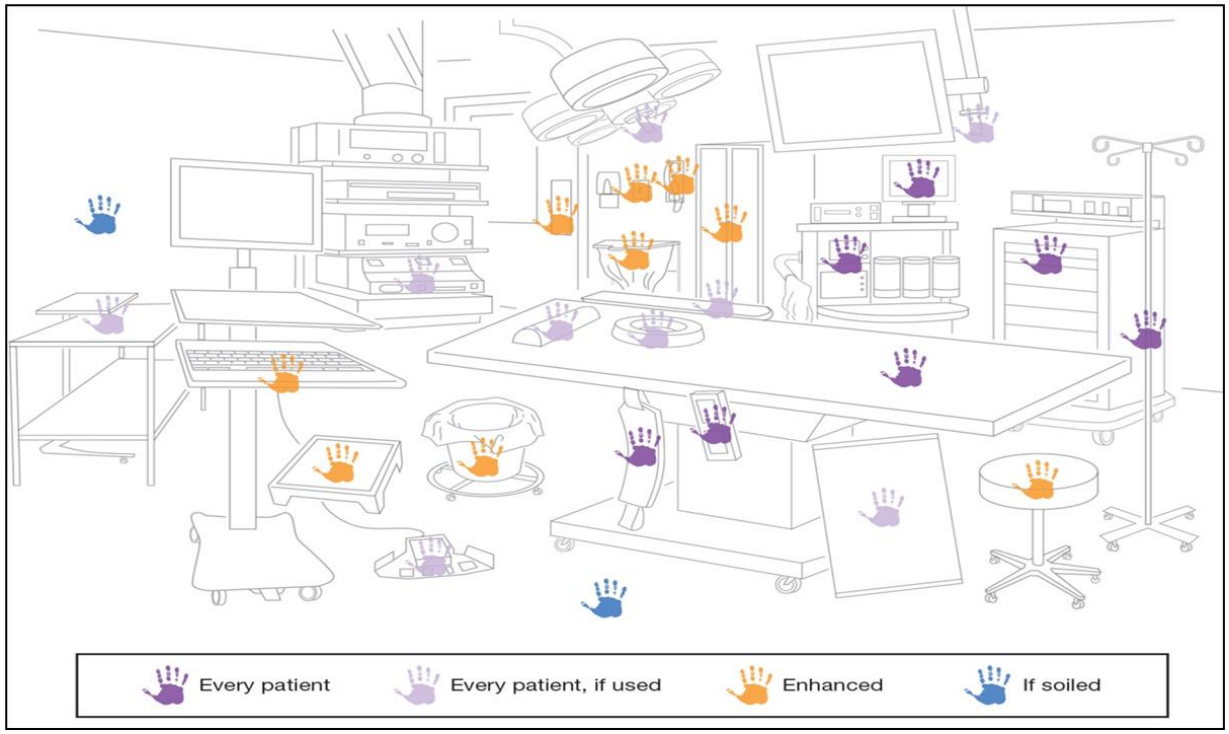
AORN



Terminal cleaning and disinfecting

Enhanced

- This is for after known cases with an Multi-drug resistant organism (MDRO)



Scheduled

- Sinks
- Ventilation ducts & grilles
- Refrigerators & ice machines
- Clean & soiled storage areas
- Sterile storage areas
- Corridors, including stairwells and elevators
- Privacy curtains

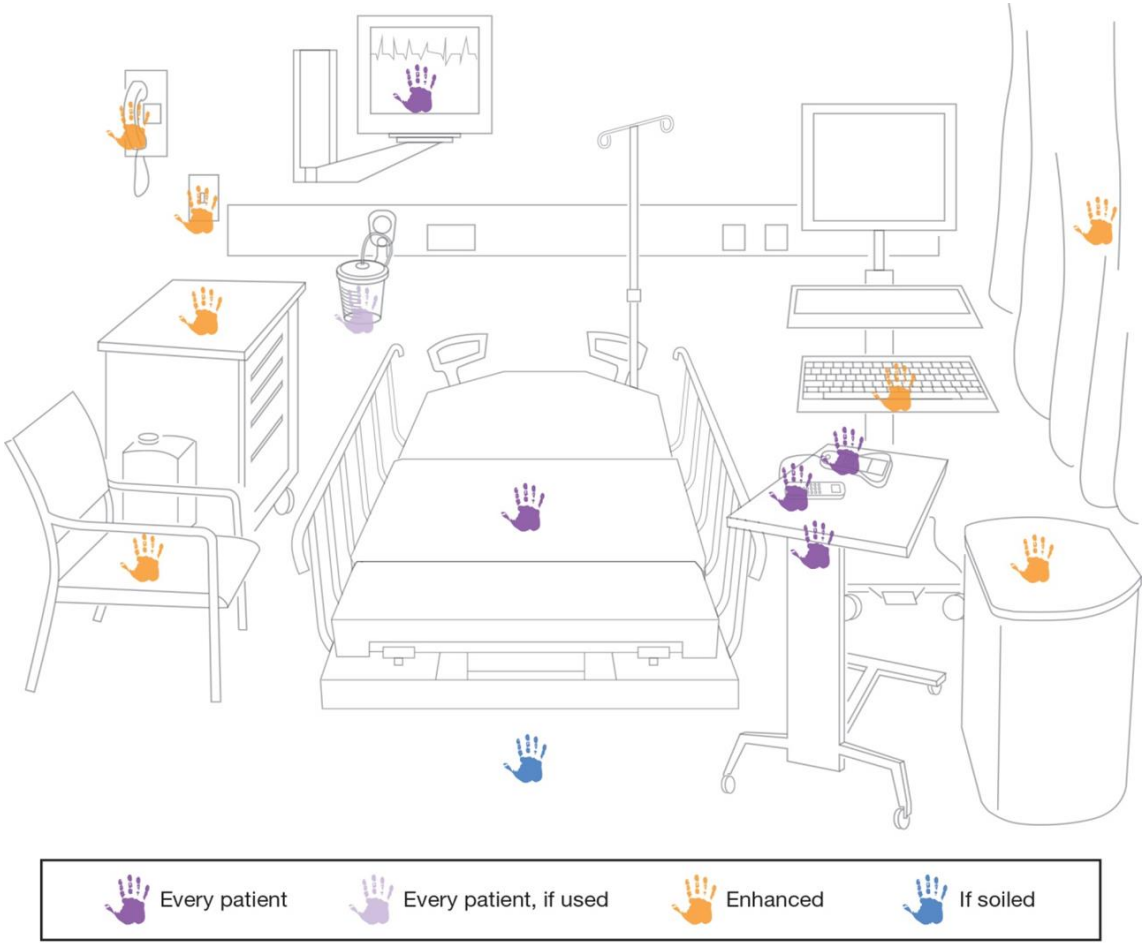
2021 AORN Guidelines

Scheduled Cleaning

- Walls and ceilings
- Pneumatic tubes and carriers
- Sterilizers
- Sterilizer service access rooms
- Unrestricted areas (e.g., lounges, waiting rooms, offices)
- Environmental services closets

2021 AORN Guidelines

Pre-Op



flinthillsvascular.com

Personal Protective Equipment

Processes

- Perimeter
- Center

Environmental Cleaning Supplies and Equipment for the Operating Room (OR):

Have dedicated supplies and equipment for the OR (e.g., mops, buckets).

Use fresh mops/floor cloths and mopping solutions for every cleaning session, including between procedures.

Use fresh cleaning cloths for every cleaning session, regularly replacing them during cleaning and never double-dipping them into cleaning and disinfectant solutions.

Environmental Cleaning Procedures | Environmental Cleaning in RLS | HAI | CDC

ServiceMaster TBS Blog

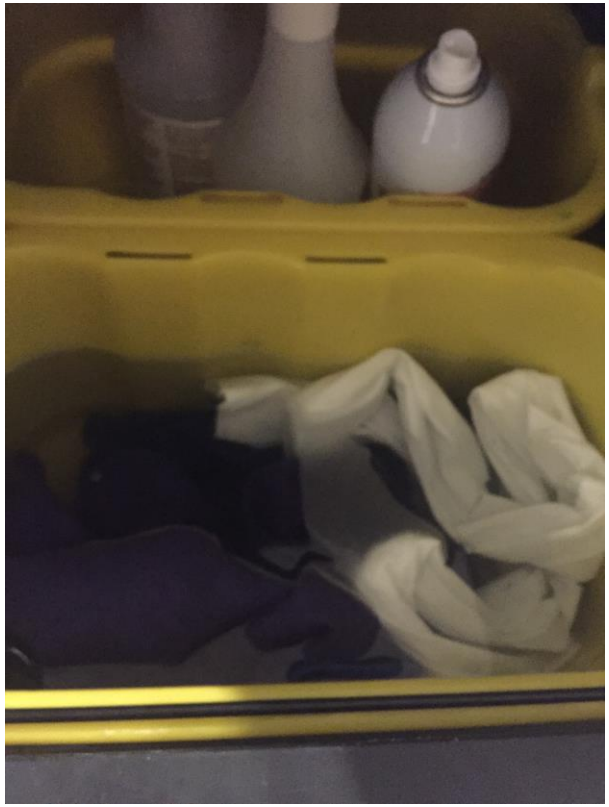
Floors

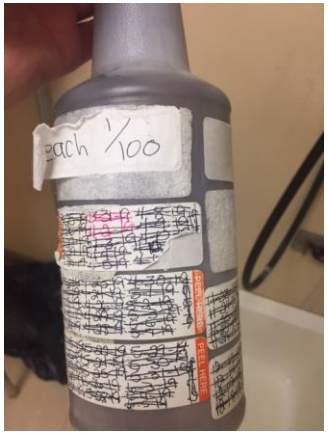
- Floors are disinfected between cases and end of day
- End of day, floors can be flooded or mopped
- Reminder: all disinfectants leave a residue
- Floors should periodically be stripped/burnished, a neutral cleaner applied and then disinfected.

Equipment Maintenance

- Daily inspection
- Method of replacement/repair

What You Should Not See





What You Should Not See

Management of the Environment

- Temperature – 68° - 75°
- Relative Humidity – lower 20% - 30% no higher than 60%
- Air exchanges – 15 ACH

TABLE 1 ASHRAE Standard 170-2017, Table 7.1 Design Parameters–Hospital Spaces.

FUNCTION OF SPACE	PRESSURE RELATIONSHIP TO ADJACENT AREA	MINIMUM OUTDOOR ACH	MINIMUM TOTAL ACH	ALL ROOM AIR EXHAUSTED	AIR RECIRCULATED BY ROOM UNITS	DESIGN RELATIVE HUMIDITY %	DESIGN TEMPERATURE °F
Operating Room	Positive	4	20	NR	NO	20 – 60	68 – 75

Conditioning for the Environment of Critical Care Hospital Operating Rooms (ashrae.org) - 2019

Temperature Range

The Joint Commission | Our Websites: | Search this site. | Login

Can temperatures be outside of established range in operating rooms?

Back to FAQs

Any examples are for illustrative purposes only.

The Joint Commission references NFPA 99-2012 that requires the use of ASHRAE 170-2008, Ventilation Table 7-1. This document provides an allowance to exceed minimum temperature ranges. To use this exception it must be done by following the established organizational policy. If the temperature is set below the established range, then there needs to be an assessment that patient care will not be compromised by the lower temperature level; specifically that the lowered temperature will not adversely affect the relative humidity level in the operating room.

Reference EC.02.05.01 EP 15

Manual: Ambulatory

Chapter: Environment of Care EC

First published date: April 11, 2016

This page was last updated on October 22, 2021

Back to FAQs

Operating Room - Temperature | Ambulatory | Environment of Care EC | The Joint Commission

AAAHC

AAAHC Standards - Ambulatory Health Care

10.I.K.7. Temperature, humidity, and air pressure controls follow nationally recognized guidelines

10.I.K.7. **Temperature**, **humidity**, and air pressure controls follow nationally recognized guidelines

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AAAHC Standards - Medicare Deemed Status

10.I.P.7. Temperature, humidity, and air pressure controls follow nationally recognized guidelines

10.I.P.7. **Temperature**, **humidity**, and air pressure controls follow nationally recognized guidelines

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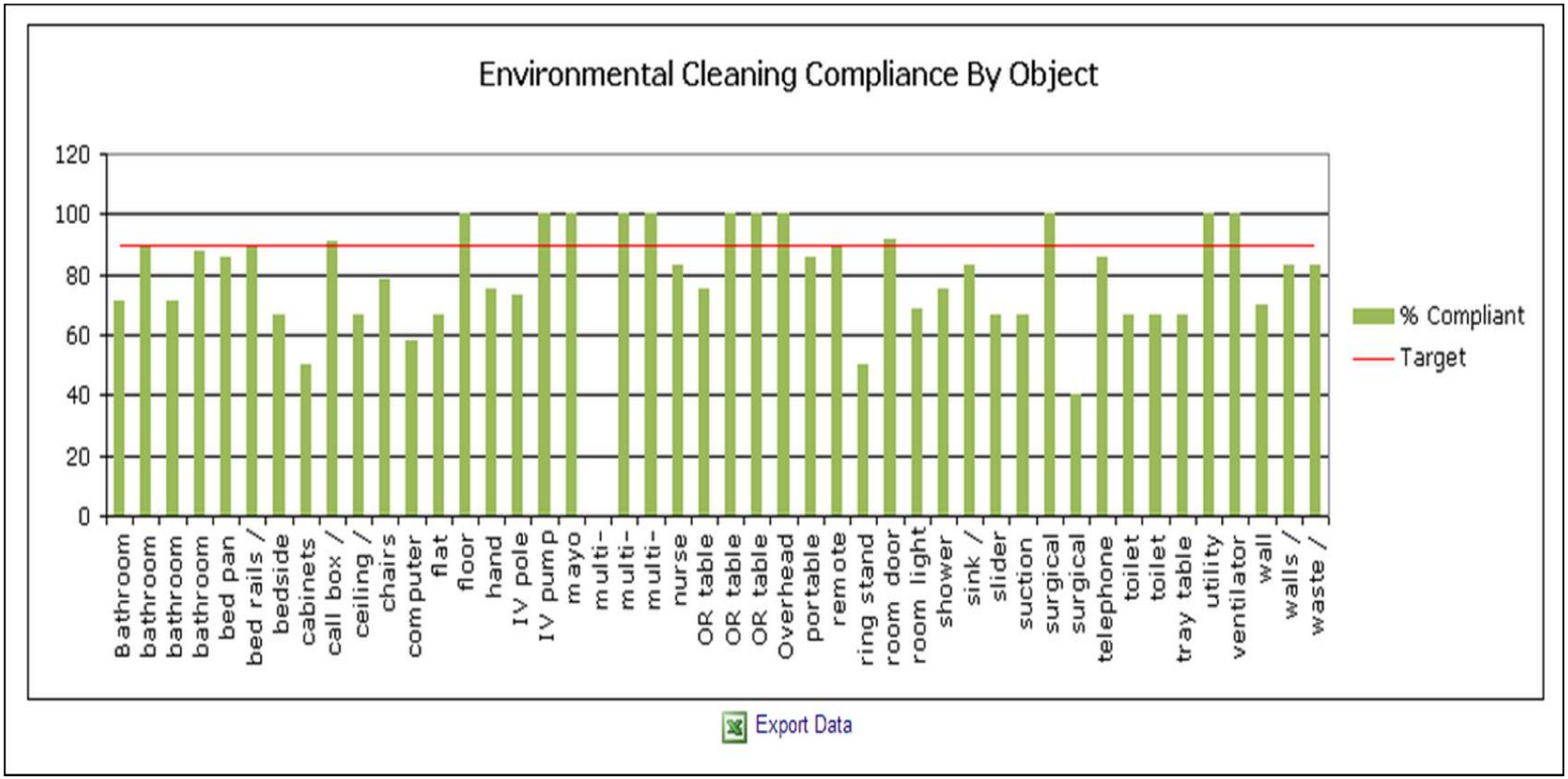
AORN eGuidelines+ (aornguidelines.org)

Validation

Comparison of Methods			
Method	**Visual**	**Fluorescence**	**ATP**
1. What is measured?	impression of cleanliness	whether fluorescent residual has been removed	biological matter remaining on surface after cleaning
2. Can it be used by persons of differing skill levels?	no technical training required	some technical training needed	some technical training needed
3. How objective is the method? (Can results be changed to appear more positive?)	can be subjective	objective, but marks could have been removed prior to reading	very objective
4. Can the amount of time spent on monitoring be minimized?	yes	room must be pre-marked and read after cleaning	yes

California Department of Public Health - State of California

How to Use the Data



Point of Care Devices

- Thermometer
- Glucometer
- INR
- Blood Pressure Cuffs

Summary

- There is more to the cleaning and disinfecting process than most people know about
- It is important to monitor cleaning and disinfecting
- Roles and responsibilities help to decrease missed items
- There are many opportunities for an aspect of the cleaning and disinfecting process to fail

Questions

The only stupid question is the one that is not asked.

Carol Calabrese, RN, BS, T-CSCT, CHESP, CIC
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References

1. CDC, 4. Environmental Cleaning Procedures, Best Practices for Environmental Cleaning in Healthcare Facilities
2. Rutala W, et al, “Selecting an ideal disinfectant”, Infect Con and Hosp Epidem, Vol. 35, No. 7 (July 2014), pp. 855-865
3. Sifuentes, L, et. al., Microbial Load of Reusable Cleaning Towels Used in Hospitals
4. ASHRAE - Conditioning for the Environment of Critical Care Hospital Operating Rooms (ashrae.org)

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5. Boyce, J, et. al, Quaternary Ammonium disinfectant Issues Encountered in an Environmental Services Department, Infect Control & Hosp. Epidemiol. 2016; Vol. 37(3): 340 – 342

6. Society of Gastroenterology Nurses Association - Standard of Infection Prevention_FINAL_2.22.pdf (sgna.org)

7. Selected EPA-Registered Disinfectants | US EPA

- https://www.epa.gov/pesticide-registration/selected-epa-registered-disinfectants#pathogens