

Surgical Attire, Laundry and Environment of Care Issues in the Peri-operative Setting

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- ❖ Objectives
- ❖ After this presentation, the attendee will be able to:
 - Identify Factors that influence Air Quality
 - Identify Factors that influence Watery Quality
 - Identify and mitigate risks associated with construction and renovation
 - Identify factors related to high quality laundry process
 - Discuss appropriate use and laundering of surgical attire

Surgical Attire, Laundry and Environment of Care Issues in the Peri-operative Setting

- ❖ The environment in which health care is provided is critically important to the positive outcome of care
- ❖ CMS requires a functional and sanitary ASC environment for surgery
- ❖ Important to prevent the health care environment from becoming a reservoir of unwanted microorganisms which can become an exogenous source of infection

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- ❖ The needs of facilities vary
- ❖ Policies and procedures that address cleaning schedules, methods and agents are important
- ❖ Training of environmental services staff is critical to an effective environmental program
- ❖ Be prepared to address unexpected situations

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Issues in the Peri-operative Setting**

- ❖ The healthcare environment includes all physical objects such as equipment, furniture, devices, fixtures, environmental surfaces, textile materials, and waste, and also encompasses air and water quality, ventilation
- ❖ Effective cleaning, disinfection, HVAC monitoring, laundry, waste removal, pest control provide a clean and healthy environment

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Issues in the Peri-operative Setting**

Common Citations

- Dust on doorways, surfaces, lights, hinges of OR tables
- Ceiling tiles discolored/stained
- OR floors cuts, pits, nicks,
- Tears in protective coverings, chairs, mattress pads, arm boards
- Baseboards dirty, walls cracked or dings
- Insects in light fixtures

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Air quality and air handling

Air in the perioperative area contains dust and other contaminants. A properly functioning HVAC system dilutes and removes contaminants from the air. Key components are

- ❖ Air volume changes
- ❖ Air flow direction
- ❖ Air quality

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Ventilation in the surgical suite

- ❖ Air should be filtered through 2 sets of filters. The first should be 30% efficient and the second 90%
- ❖ Air pressure in the surgical suite is positive relative to surrounding areas
- ❖ Air should enter the OR at the ceiling and exit near the floor

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- ❖ Avoid disrupting direction of air flow
 - Keep door closed
 - No free standing fans*
 - No free standing air humidifiers*
- ❖ At least 15 air exchanges per hour of which at least 20% are outdoor air
- ❖ Humidity between 30-60%
- ❖ Temperature 68-73°
- ❖ Avoid shutting down entire HVAC system
- ❖ Regular preventive maintenance essential
- ❖ *Also applies to sterile processing area

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❖ Other areas of the facility that should have positive air pressure (clean areas)

- Sterile processing preparation and packaging area
- Sterilizer unloading area
- Clean and sterile storage areas
- Clean linen storage
- Clean utility room

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❖ Areas of the facility that should have negative air pressure relative to surrounding areas

- Soiled linen area
- Dirty Utility Room
- Decontamination room
- Restroom and housekeeping
- Anesthesia gas storage
- Waiting room

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Water Quality and Infection Control

- ❖ Water can be source of organisms that cause HAI
 - Legionnaire's Disease
 - Pseudomonas and other "hydrophilic" organisms
 - Acinetobacter, Enterobacter
 - Non tuberculous mycobacteria
- ❖ Water storage temperatures and stagnation in the system affect proliferation of organisms

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- ❖ Water is received from treated municipal water supply
- ❖ Proper water storage temperatures
 - Cold water stored and distributed <68°
 - Hot water stored > 140°
- ❖ Safe water temperature at point of use achieved with mixing valves
- ❖ Patient care areas no greater than 105-120°
- ❖ Temperature boosters for kitchen 120° and Laundry 160°

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- ❖ Be Prepared for disruptions of water supply
- ❖ Plan for potable water needs
 - Drinking water
 - Ice
 - Manual flushing toilets
 - Patient hygiene
 - Fire Prevention
 - Surgical Area
 - Laundry
 - Sterile processing
 - Cooling tower or heat generation

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- ❖ Bottled/sterile water
 - Surgical Scrub
 - Emergency Surgery
 - Medication/pharmaceutical preparation
 - Patient care equipment

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With water service disruption or a boil advisory:

- Disconnect ice machine
- Consult manufacturer's instructions for automatic endoscopic reprocessing equipment
- If potable water isn't contaminated can use steam autoclave
- Post advisory notices about water consuming tap-water, ice, beverages made with water
- Cover water fountain

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After water supply is resumed or boil advisory lifted:

- Clean of fixtures and equipment attached to the water system, flush for several minutes
- Run water softener through regeneration cycle
- Drain, disinfect, refill water storage tanks if needed
- Flush point of use sources, faucets, showers, plumbed eye wash stations

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Construction and Renovation

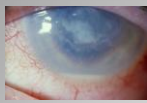
When planning construction and renovation consider:

- ❖ Design and function of new structure or area
- ❖ Assessment of environmental risks for airborne disease and opportunities for prevention
- ❖ Measures for containment of dust and moisture during repairs or construction

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- ❖ Consider dust that can become airborne when disturbed by routine maintenance and minor renovation
 - Installation of conduits
 - Installation of cable or sprinkler systems
 - Exposure of ceiling spaces to inspection
 - Rewiring
 - Structural repairs or replacement
- ❖ Air quality is affected by projects that allow entry of large amounts of raw unfiltered outdoor air or dampen any structure

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Why is there a concern about molds?

- Molds can cause local or systemic infections
- Immune suppressed persons at greatest risk

Aspergillus Keratitis following removal of metallic foreign body



Cerebral Aspergillosis: The patient developed disseminated aspergillosis after a prolonged stay in intensive care after contracting severe community acquired pneumonia.

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An Infection Control Risk Assessment should be done before repairs, demolition, construction and renovation.

- ❖ Identify potential exposures to dust and moisture
- ❖ Determine need for dust and moisture containment measures.
- ❖ Infection Control Risk Assessment Matrix (handout) is standard tool

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External Demolition and Construction

- ❖ Considerable dust and debris generated by external demolition, planned building implosions and dirt excavation, can contain airborne micro-organisms
- ❖ Take into consideration:
 - Proximity of air intakes to work site
 - Adequacy of window and door seals
 - Proximity to patient areas
 - Location of underground facilities

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- ❖ Prevent intrusion of dust and moisture during the external demolition and construction:
 - Keep facility air pressure positive relative to the outdoors
 - Keep doors closed as much as possible
 - Seal and caulk windows
 - Store construction materials away from air intakes
 - If possible seal off affected air intakes
 - Closure of entry ways if needed to prevent intrusion

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Internal Demolition, Construction, Renovations, & Repairs

- Educate construction workers about importance of infection control measures
- Prepare the work site
- Notify staff, patients, and visitors
- Relocate patients and staff if needed
- Monitor adherence to infection control measures
- Monitor HVAC Performance
- Daily clean-up, terminal cleaning and removal of debris at end of project

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- Ensure integrity of water system during and after project
- Suitable physical barrier that can confine dust and dispersed fungal spores to the work zone
- Negative air pressure in work zone
- Isolate HVAC system in work zone
- HEPA filtration device outside of work zone
- Dispose of debris via chute (away from air intake)
- Establish traffic pattern for workers

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At end of project:

- ❖ Clean and terminally clean/disinfect area
- ❖ Ensure HVAC systems and water can be safely turned on
- ❖ Walk through inspection
- ❖ Make sure area is in acceptable condition before "accepting"

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Pest control

- ❖ Pests harbor and transport micro-organisms
- ❖ Effective pest management is required
- ❖ Pests are drawn to moisture and food



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Waste management

- ❖ Trash is removed from the surgical suite **after each case** and end of day
- ❖ Remove trash from other areas daily or more often if needed
- ❖ Regulated waste



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- OSHA requires regulated waste to be separated at the point it is generated (**frequent citation!**)
- Used sharps must be placed in impervious leak proof container
- Regulated waste is placed in containers labeled with biohazard symbol or is color coded
- Regulated waste is handled using standard precautions and wearing appropriate PPE
- ❖ Regulations about storage, transport, disposal of regulated waste vary by state.

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Linens and Laundry

- ❖ Contaminated textiles and linens contain a large number of micro organisms from blood and body substances
- ❖ Infections transmitted from linens and laundry often result from improper handling
- ❖ Laundry facilities in health care facilities are in-house or off site commercial laundry

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Laundering of surgical attire

❖ Home laundering of surgical attire

- Not supported by AORN
- No recommendations for or against from CDC
- If home laundering is practiced clear policies outlining laundry procedure and transport needed

- ❖ OSHA requires the facility to launder attire contaminated with blood, body fluids and other potentially infectious materials; also clothing considered Personal Protective Equipment.

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All About Laundry

- ❖ Healthcare Laundry Accreditation Council Accredits Laundry Facilities
- ❖ Survival rates:
 - Staphylococci 1-56 days on polyester and up to 90 days on polyethylene plastic.
 - Enterococci survival rate on textiles 11 days

Home Laundry Studies

- ❖ Uniforms were cultured at the beginning of the shift
 - 39% had one or more microorganism identified.
- ❖ A second study proved adenovirus, rotavirus, hepatitis A remained on fabric strips that were home laundered

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In yet another study:

- ❖ 5 patients were cultured and it was found 3 of them were colonized with the same strain of microorganisms that were cultured from the employees "clean attire" = inappropriate laundry practices was the conclusion .
- ❖ Additionally at least 3 other studies are quoted in the new recommendation all ending in the same conclusion = disposable or facility laundry is the recommendation.

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Health Care Accredited Laundry

- ❖ Healthcare Laundry Accreditation Council Accredits Laundry Facilities
- Functional separation of clean and dirty laundry
- Controlled air flow and ventilation
- Work surfaces cleaned and disinfected
- Hand hygiene facilities through facility, employees follow hand hygiene guidelines
- Employee training provided and documented
- Quality control monitoring
 - Water quality testing
 - Data for wash cycles, water temp, chemical use
- Storage and transport of clean laundry in manner that preserves cleanliness

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Process begins with removal of used contaminated linens, clothing textiles from the area of use

- ❖ Handle with minimum of agitation
- ❖ Do not sort in patient care areas
- ❖ Place in bags or containers at the point of use
- ❖ Leak resistant if wet items are contained
- ❖ Items contaminated with blood, body fluids must be in leak proof container that is clearly marked or color coded
- ❖ Bag or container is to be securely closed
- ❖ Handle using standard precautions

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Linens, clothing textiles are disinfected during the laundering process, are hygienically clean but not sterile

- ❖ Laundry cycle
 - Flushing
 - Main wash
 - Bleaching
 - Rinsing
 - Souring

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- ❖ Clean wet laundry is
 - Dried
 - Pressed as needed
 - Folded and packaged

- ❖ Clean linens/laundry from off site facility must be packaged before transport to prevent soiling or contamination

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Antimicrobial action of the laundering process results from a combination of mechanical, thermal and chemical factors

- ❖ Dilution and agitation remove micro-organisms
- ❖ Soaps and detergents suspend oils and have some antimicrobial properties
- ❖ Hot water destroys organisms, 160° for minimum of 25 minutes for hot water cycle
- ❖ Chlorine bleach with 50-150ppm availability, activated at temperature of 135-145 ° (chemical germicide)

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- ❖ Series of rinses
- ❖ Mild acid added to last rinse neutralizes alkalinity and soap, rapid shift in pH neutralizes some micro-organisms
- ❖ Lower temperature laundry cycles rely heavily on chlorine or oxygen activated bleach to reduce microbial contamination
- ❖ Dryer temperatures and ironing provide microbe reduction

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Clean laundered textiles, linens and clothing are stored in a manner that prevents contamination

- ❖ Clean textiles and soiled textiles must be kept separately from soiled contaminated textiles
- ❖ "separate clean and dirty"

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Updated Recommendation from AORN:

Surgical Attire is required in

- ❖ Semi restricted ,
- ❖ Restricted areas
- ❖ and
- ❖ Invasive procedure settings

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Further research indicates :

It is not as important *how* the attire is designed but rather *what fabrics* are used.

Recommended Characteristics of Surgical Attire Fabric:

- ❖ Tightly woven
- ❖ Low-linting
- ❖ Stain resistant
- ❖ Durable

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- ❖ Prospective study which resulted from an increase in endophthalmitis after cataract surgery found that 100% spunbond polypropylene decreased the bacterial load in the air by 50%!!!!
- ❖ Tightly woven cotton & polyester (50/50) with 560 X 395 threads per 10cm reduced bacteria into the air by 2 - 5 X's

BUT

- ❖ This did not include MRSE from carriers.

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Avoid 100% cotton fleece

The truth about fleece.....

- ❖ Collects and sheds lint
- ❖ Lint harbors microbial-laden dust, skin squames & respiratory droplets
- ❖ It's low density is more flammable
- ❖ Use caution when 10% - 20% polyester added to cotton because it may still need fire-retardant chemical!!!

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- ❖ Do not store attire in lockers and reuse.
- ❖ This has proven to create higher bacterial colony counts .
- ❖ This INCLUDES caps!!

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Other Surgical Attire recommendations

❖ Stethoscopes –

- Do not wear Stethoscopes around the neck
- No inanimate objects including rolls of tape, tags etc.
- No fabric covers
- Cleaned between patients

❖ Diaphragm Culture results:

- 80% grew gram-positive bacilli
- 75% grew Staphylococcus species non-aureus



Conclusion: Cleaning after each patient is your best defense.

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❖ Milam, Pringle, & Buchanan published article - Bacterial contamination of fabric stethoscope covers: the velveteen rabbit of health care?

- Studies have concluded these attachments act as fomites. Gram-positive aerobic bacteria, gram-negative aerobic bacteria, and anaerobes have been found.

❖ In Addition

- The cloth covers are infrequently laundered
- If laundered at all, average is 3.7 months between launderings

Jewelry

- Completely covered or contained within surgical attire
- Remove rings wrist jewelry prior to hand hygiene
- Piercings



Study Facts:

- Bacterial counts more than 21 X higher beneath the earrings than on the earring surface
- 9 X greater under nose rings and finger rings
- 25% of wristwatch wearers positive for Staphylococcus aureus!!!

Environmental and Laundry Issues in the Peri-operative Setting

Recommendations for Shoes:

- Closed toes & backs
- Low heels
- Non skid soles
- Meet OSHA safety regs.
- Must be clean



- ❖ 98% of outdoor shoes were contaminated with coagulase-negative staphylococci, coliform, and bacillus species
- ❖ Found on Only 56% of "Surgical Suite Shoes".



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Other Surgical Attire Recommendations

- ❖ ID badges – secured, visible, clean
- ❖ Note: NO lanyards, chains, beads

Items constructed of porous materials not allowed:

- ❖ Fanny packs, backpacks, briefcases, etc should not be brought into semi or restricted areas.
 - Pathogens survive on fabrics & plastics
 - The issue of cell phones center stage

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Surgical Attire Administrative Requirements:

- Initial and ongoing training about attire
- Competency check
- P & P reviewed and available to staff
- Monitor Laundry Process

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Quality Management Program

- ❖ Compliance
- ❖ Opportunities for improvement
 - Clostridium difficile study non-sporicidal disinfectants vs. sporicidal disinfectants
 - Zygomycosis outbreak -linens vehicle of transmission
 - during laundry process
 - en route?
 - delivery??

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Questions?

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References

CDC HICPAC: Guidelines for Environmental Infection Control in Health Care Facilities

AORN: Recommended Practices for Surgical Attire 2011

HLAC: Accreditation Standards for Processing Reusable Textiles for Use in Healthcare Facilities, April 2006

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