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مبادرات صاحب السمو رئيس الدولة

مدينة الشـيخ خليفـة الطبية | عجمان

Infection Control in Operation Room

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Objectives

- Identifying hazards that could potentially compromise patient care at operation theater
- Implementing proper controls to reduce risk and minimize the impact of hazards in operation theater

Patient Story

Patient Safety Action Network
Patient Driven, Patient Led

Where did event occur? Acute Care General Hospital
What type of medical harm did you experience or witness? Healthcare-Acquired Infection
Please describe what happened. Knee replacement ended in Right Leg Removal. My husband had a knee replacement back in 2008. In July of 2011 the cement failed in the replacement. He had to have the replacement replaced and during this hospital stay he got a Staph infection. He had 14 operations between July of 2011 until the last one on June 5, 2013 which was to remove his right leg half-way between where his knee was and his hip. They did a total of 4 additional knee replacements on him and each time they took one out, they had to chisel it out and each time they put one back in it was by hammering it in. Each time loosing more bone. Between each replacement, they gave him antibiotics thru the heart at a cost of $22,000 every three days for 8 Weeks - 5 different times! We had countless emergency room visits that ended up as hospital stays..
What was the outcome of the medical harm issue? Permanent disability

Is Operation Room a safe environment ?

AORN,2019

J Perioper Pract. 2012 Oct;22(10):318-22.

Infection control in operating theatres.

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Abstract

The operating theatre complex is the heart of any major surgical hospital. Good operating theatre design meets the functional needs of theatre care professionals. Operating theatre design must pay careful consideration to traffic patterns, the number and configuration of nearby operating rooms, the space required for staff, administration and storage, provisions for sterile processing and systems to control airborne contaminants (Wan et al 2011). There have been infection control issues with private finance initiative built operating theatres (Unison 2003, Ontario Health Coalition 2005). The aim of this article is to address these issues as they relate to infection control and prevention.

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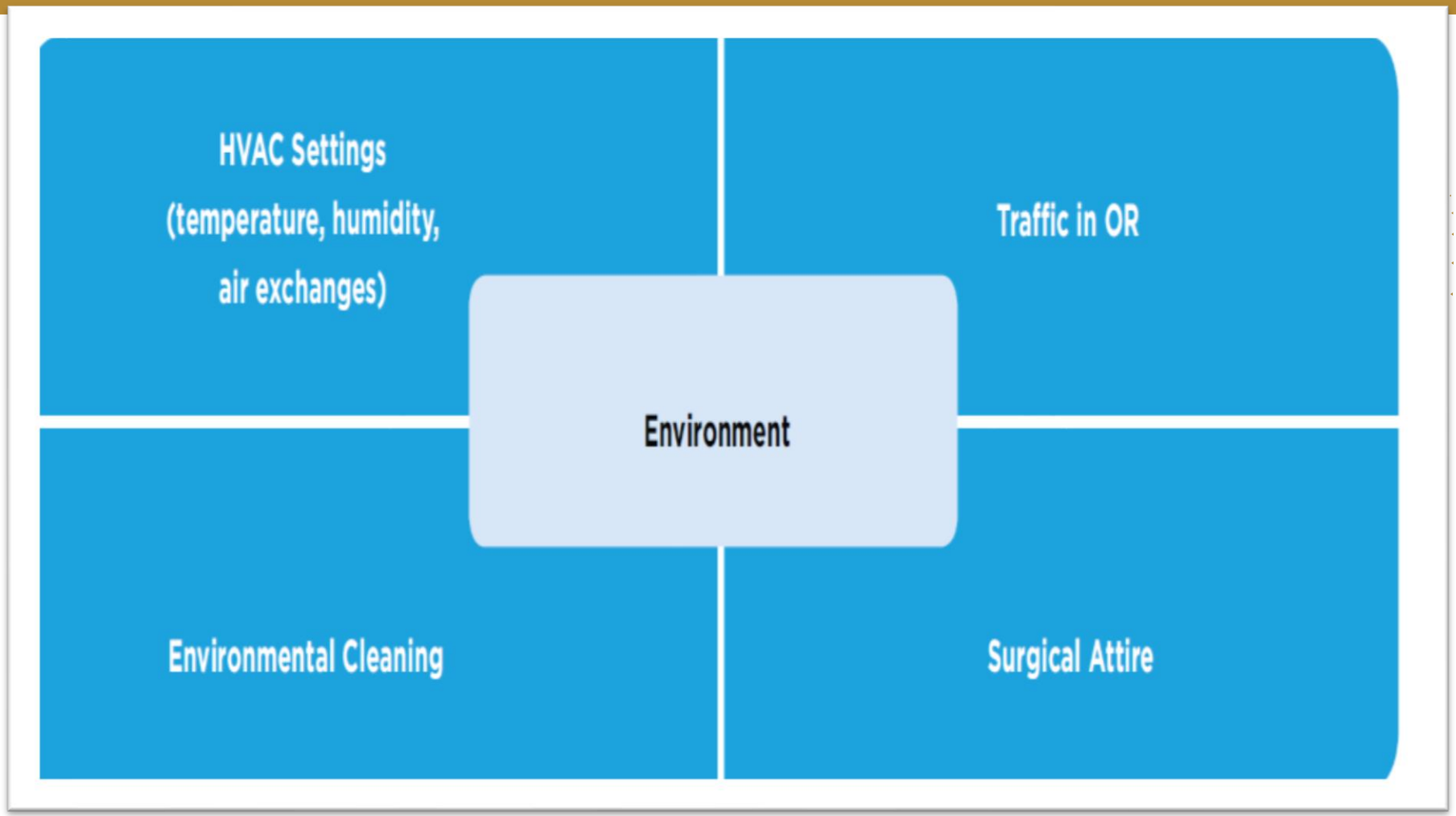
[Indexed for MEDLINE]

Environment in OR



Surgical Attire

- Normal individuals shed more than 10 million particles from their skin every day.
- Approximately 10% of skin squames carry viable microorganisms and it's estimated that individuals shed approximately **1 million microorganisms** from their bodies each day.
- AORN "Recommended practices for surgical attire" section IV.a. states that:

"a clean, low-lint surgical head cover or hood that confines all hair and covers scalp skin should be worn. The head cover or hood should be designed to minimize microbial dispersal.

AORN ,2019

Figure 2. Surgical Attire

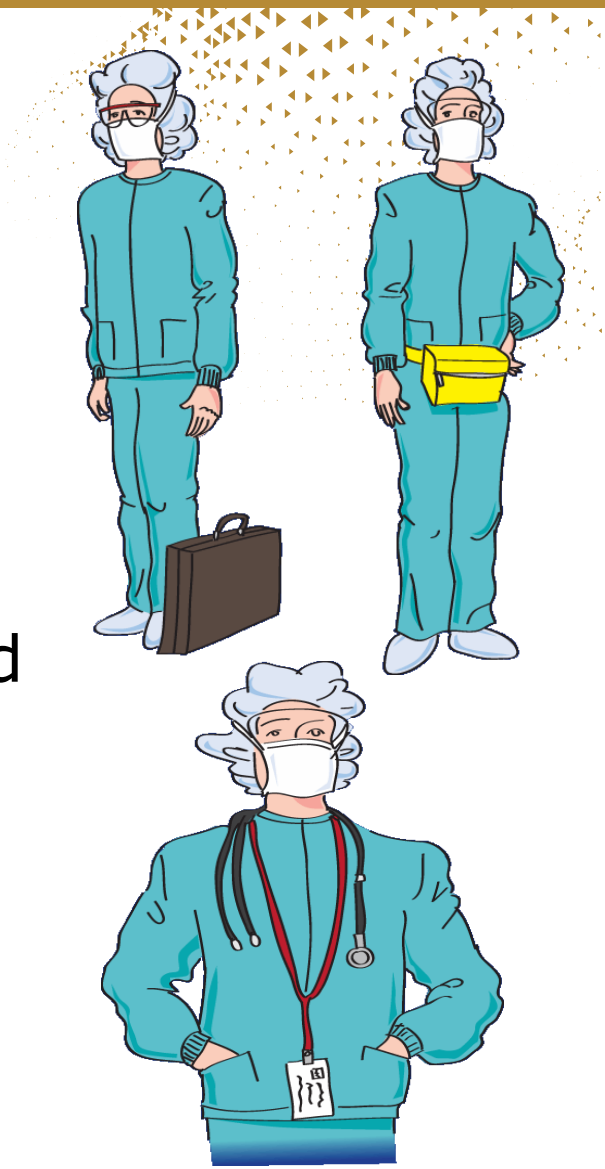
Surgical attire and personal protective equipment are worn to provide a high level of cleanliness and hygiene within the perioperative environment, and to promote patient and worker safety.

Illustration by Kurt Jones.

Association of periOperative Registered Nurses (**AORN),2019**

Personal Items Don’t Belong in the OR

- Items may harbor pathogens and be difficult to clean or disinfect adequately.
- Pathogens have been shown to survive on fabrics and plastics.
- Microorganisms may be transported from one location to another.



AORN,2019

Jewelry and Personal Clothing Doesn't Belong in OR

- Wearing jewelry increases bacterial counts on skin surfaces.
  - Removing watches and bracelets allows for more thorough hand washing
- Personal clothing should be completely covered by surgical attire

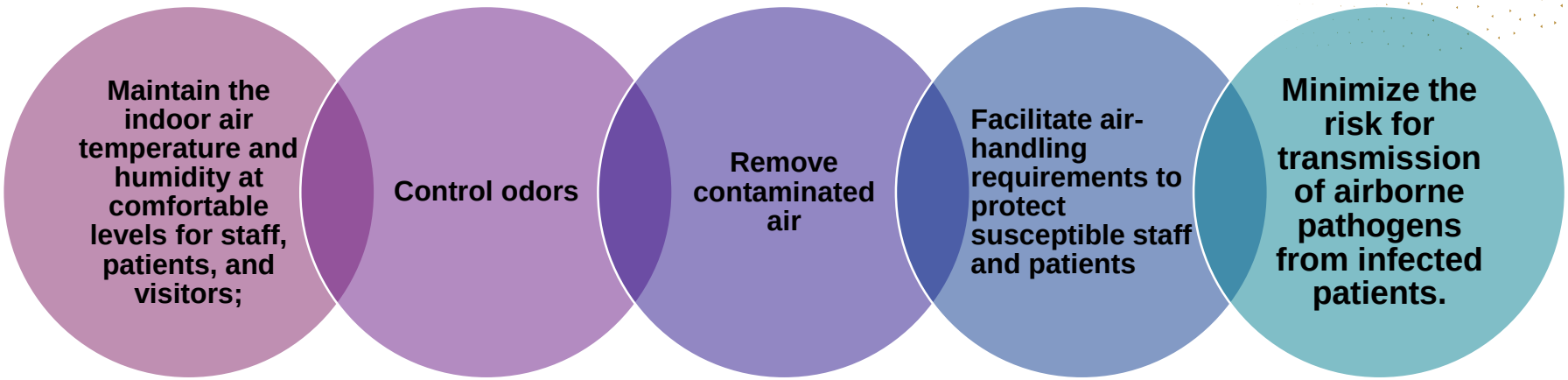
Scrubs and Jackets in OR

AORN – Surgical Attire 2019

- "Facility approved, clean, and freshly laundered surgical attire should be donned in a designated dressing area of the facility upon entry or reentry to the facility.
- If scrubs are worn into the institution from outside, they should be changed before entering semi-restricted or restricted areas to minimize the potential for contamination (eg, animal hair, cross contamination from other uncontrolled environments)
- **Home laundering of surgical attire is not recommended**
- Non scrubbed personnel should wear long sleeved jackets that are buttoned or snapped closed during use
- Complete closure of the jacket avoids accidental contamination of the sterile field
- **Long-sleeved attire is advocated to prevent bacterial shedding from bare arms and is included in the Occupational Safety and Health Administration (OSHA) regulation for the use of personal protective equipment (PPE)"**

Heating, Ventilation, and Air Conditioning Systems in Health-Care Facilities (HVAC systems)

Heating, ventilation, and air conditioning (HVAC) systems in health-care facilities are designed to



Air Quality

- ***Ventilation Issues***

  That can contribute to the spread of health-care–associated infections

Decreased performance of healthcare facility HVAC systems → Poor maintenance → Filter inefficiencies, improper installation → Accumulation of dust and moisture within HVAC systems

HVAC : Heating, ventilation, and air conditioning system

- **Air Quality:**
- The established standard for operating rooms requires 20 air changes/hour, of which at least four come from outdoor air.

- **Air sampling :**
- Outbreak
- Post renovation and construction
- Risk Assessment

https://www.cdc.gov/infectioncontrol/pdf/guidelines/environmental-guidelines-P.pdf

Unresolved issues associated with microbiologic air sampling*

- **Lack of standards linking fungal spore levels with infection rates (i.e., no safe level of exposure)**
- **Lack of standard protocols for testing (e.g., sampling intervals, number of samples, sampling locations)**
- **Need for substantial laboratory support**
- **Culture issues (e.g., false negatives, insensitivity, lag time between sampling and recording the results)**
- **New, complex polymerase chain reaction (PCR) analytical methods**
- **Unknown incubation period for *Aspergillus* spp. infection**
- **Variability of sampler readings**
- **Sensitivity of the sampler used (i.e., the volumes of air sampled)**
- **Lack of details in the literature about describing sampling circumstances (e.g., unoccupied rooms vs. ongoing activities in rooms, expected fungal concentrations, and rate of outdoor air penetration)**
- **Lack of correlation between fungal species and strains from the environment and clinical specimens**
- **Confounding variables with high-risk patients (e.g., visitors and time spent outside of protective environment [PE] without respiratory protection)**
- **Need for determination of ideal temperature for incubating fungal cultures (95°F [35°C] is the most commonly used temperature)**

https://www.cdc.gov/infectioncontrol/guidelines/environmental/background/air.html#c4d accessed OCT, 2019

Air Quality Strategies

- Monitor ventilation systems in accordance with engineers' and manufacturers' recommendations to ensure preventive engineering, optimal performance for removal of particulates, and elimination of excess moisture
- Ensure that heating, ventilation, air conditioning (HVAC) **filters are properly installed and maintained** to prevent air leakages and dust overloads.
- **Monitor areas with special ventilation requirementsand manometer tests for positive- and negative-pressure areas in accordance with nationally recognized standards** (e.g., AII or PE)
- Maintain air intakes and ***inspect HEPA*** filters periodically to ensure proper operation
- Remove **bird roosts and nests near air intakes** to prevent mites and fungal spores from entering the ventilation system.
- Prevent **dust accumulation by cleaning air-duct grilles** in accordance with facility-specific procedures and schedules when rooms are not occupied by patients

Air Flow and Air Pressure

- Air flow:

- ORs are designed so that air flows into the top area of the room and is exhausted at the bottom of the room (Unidirectional airflow), reduce contamination the surgical field.

- **Positive pressure : how do we monitor?**
- Pressure differentials can be assessed using a tissue test: Hold **a tissue at the edge of the OR door and observe how it moves or smoke test**

- Frequency : at least daily ,Risk assessment

Temperature /humidity

- **Temperature**
- **Cool temperature standards** should maintain 68°F–73°F (**18–23ºC**) in sensitive places such as OT.
- **A warmer temperature** is needed in areas requiring greater degrees of patient comfort use a temperature range of 70°F–75°F **(21°C–24°C)**

- ***Humidity (mixture of water vapor and air).***
- Relative humidity comfort range is **30%–60%**.
- Relative humidity levels **>60%,** in addition to being perceived as uncomfortable, promote fungal growth

Recommendation to resolve humidity issues

- Air sampling is one the parameters for functional and safe operation rooms but it is not the only parameter that can help to decide whether to start using it for our patients.
- Sterile items should be removed all times till the problem is resolved .
- Standardize the method of humidity monitoring to give reliable data and data that we can compare with our baseline.

Dehumidifiers

Dehumidifiers in operation rooms are not recommended:

- **Pressure variances.**

- **Disrupt airflow patterns and, like air conditioners, draw air in much closer to the ground, releasing air at roughly the same height as the sterile field. Moreover, these devices frequently are not filtering the released air, leading to increased circulating contaminants and associated surgical infection risk.**

- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), American Society for Healthcare Engineering (ASHE), Association for the Advancement of Medical nstrumentation (AAMI), Association for Professionals in Infection Control and Epidemiology (APIC), Association of perioperative Registered Nurses (AORN), Facility Guidelines Institute (FGI). Joint interim guidance: HVAC in the operating room and sterile processing department. September 21, 2015. **http://apic.org/Resource_/TinyMceFileManager/Implementation_Guides/PosStat-Safety-HVAC-Interim-Guidance.pdf**. Accessed OCT 2019

Laminar Flow and Exhaust Suits

No data to support reduction in SSIs

- Lipsett PA. Do we really need laminar flow ventilation in the operating room to prevent surgical site infections? Ann Surg 008;248:701
- Der Tavitian J, Ong SM, Taub NA, et al. Body-exhaust suit versus occlusive clothing. A randomised, prospective trial using air and wound bacterial counts. J Bone Joint Surg Br 2003;85:490.
- Pasquarella C, Pitzurra O, Herren T, et al. Lack of influence of body exhaust gowns on aerobic bacterial surface counts in a mixed- ventilation operating theatre. A study of 62 hip arthroplasties. J Hosp Infect 2003;54:2.
- Brown AR, Taylor GJ, Gregg PJ. Air contamination during skin preparation and draping in joint replacement surgery. J Bone Joint Surg Br 1996;78:92.

Actions When HVAC System Affected

- Reschedule or redirect procedures to areas of the Surgery Suite where the HVAC system is functioning within parameters
- Close the affected OR
- Delay elective procedures
- Limit surgical procedures to emergency procedures only

Notice : **multidisciplinary team COORDIANTION**

Foot Traffic and Door Openings

- **The rationale for minimizing traffic in the OR includes the conclusion in the 1999 CDC SSI Prevention guideline that**
- **“the microbial level in operating room air is directly proportional to the number of people moving about in the room; therefore, efforts should be made to minimize personnel traffic during operations.**

- **The impact of multiple door openings was also studied in cardiac surgery; investigators noted a trend among patients who developed SSIs toward increased frequency of door openings.**
- **In addition, a recent quality nitiative (QI) looked at the volume of OR traffic that occurred in selective surgical services, reporting in baseline analysis that average door openings ranged from 33 per hour in general surgery to a high of 54 per hour in cardiac surgery.48**

- **Actions : coordinate supplies and find a way to communicate**

Environmental cleaning

- Evaluate between room cleaning procedures/checklist?
- Terminal cleaning procedures on evening/night shift
- Are there sufficient staff to terminally clean all OR rooms?

AORN RP: Environmental Cleaning in the Perioperative Setting 2019

Environmental Disinfection

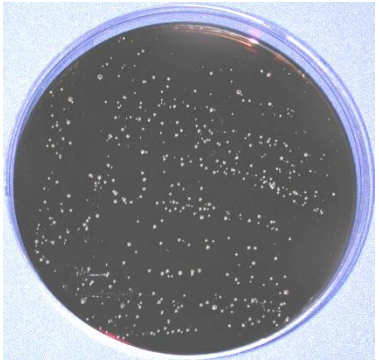
Cleaning Practices Are Often Suboptimal

- Daily cleaning of surfaces near patients is often performed poorly
- Terminal cleaning of rooms after patient discharge is often inadequate
  - Carling et al. found that only 47% of surfaces targeted for terminal cleaning had been cleaned

who should clean what??

Over bed Table Before Cleaning

Over bed Table After Cleaning



VRE on call button after cleaning

Carling PC et al. Clin Infect Dis 2006;42:385Eckstein BC et al. BMC Infect Dis 2007;7:61

Cleaning and Disinfection policies ensure :

- Cleaning ***is a continuous process .***
- Cleaning procedures ***involve*** **the principles of infection** prevention and control.

- Cleaning standards, frequency and accountability for cleaning are clearly defined (i.e., **who cleans, what do they clean and when do they clean it).**

- Cleaning schedules to cover all areas

- *The key to cleaning is the* ***use of friction*** *to remove microorganisms and debris.*

Hot Topic due to recent outbreaks: Cleaning/Sterilization of Instruments

- Inspection of Instruments
  - Lumens, grooves, sorting, hand cleaning, disassembly required – massive kits
  - Many instruments cannot be Disassembled.
  - Correct use of Biologic Indicators
- Pre-soaking and rinsing of tissue and blood from the instruments in the operating room before sent to decontamination

Tosh et al. Outbreak of Pseudomonas aeruginosa Surgical Site Infections after Arthroscopic Procedures: Texas, 2009 Infect Control Hosp Epidemiol 2011;32(12):1179-1186

IP ROLE
IN PERIOPERATIVE SETTINGS

- **Building partnerships with perioperative team.**
- **Engaging surgeon and perioperative leaders in use of SSI data**
- **Acting as a change agent to support surgical infection prevention/speak up**
- **Application of regulatory and accreditation requirements to perioperative care**
- **Serve as a resource for problem investigation, risk mitigation, and response when infection surveillance data suggest a possible cluster or outbreak**
- **Perform regular audit and share the results with the team Using checklist**
- **Education and training**

Sample checklist for IP audit

	Prevention & Control of Infection Environmental Audit Checklist			**Date: 10.6.2019**
	Operation theater			**Time: 1300-**
A. Environment		**YES**	**NO**	**Comments**
1	All areas are dust free, neat and clean.			
2	No items are stored on the floor.			
3	Surfaces, shelves and cupboards are clean and dust free.			
4	The furniture (examination beds, tables, chairs) is clean			
5	Curtains and blinds are free from stains, dust, and cobwebs.			
6	There is no evidence of insect and/or rodent infestation			
B. Equipment, Trolleys, Instruments, and Supplies				
1	Dressing and procedure trolleys are clean.			
2	Blood pressure equipment, weighing scales, and other manual equipment are visibly clean.			

References

- **AORN RP: Environmental Cleaning in the Perioperative Setting2019**
- https://www.cdc.gov/infectioncontrol/guidelines/environmental/background/air.html#c4d

- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), American Society for Healthcare Engineering (ASHE), Association for the Advancement of Medical nstrumentation (AAMI), Association for Professionals in Infection Control and Epidemiology (APIC), Association of perioperative Registered Nurses (AORN), Facility Guidelines Institute (FGI). Joint interim guidance: HVAC in the operating room and sterile processing department. September 21, 2015. **http://apic.org/Resource_/TinyMceFileManager/Implementation_Guides/PosStat-Safety-HVAC-Interim-Guidance.pdf**. Accessed OCT 2019

- https://www.cdc.gov/infectioncontrol/pdf/guidelines/environmental-guidelines-P.pdf
- Association of periOperative Registered Nurses (**AORN),2019**


Thank you!