Surgical Attire: New AORN Guidelines Haunting IP's in Your Neighborhood!

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Objectives

Participants will be able to:

- Discuss the history of surgical attire & adoption of appropriate attire
- Identify common areas of concern & evidenced based literature that relates to surgical attire
- Discuss previous AORN guidelines versus new updated Surgical attire Guidelines & impact on infection control

A short history

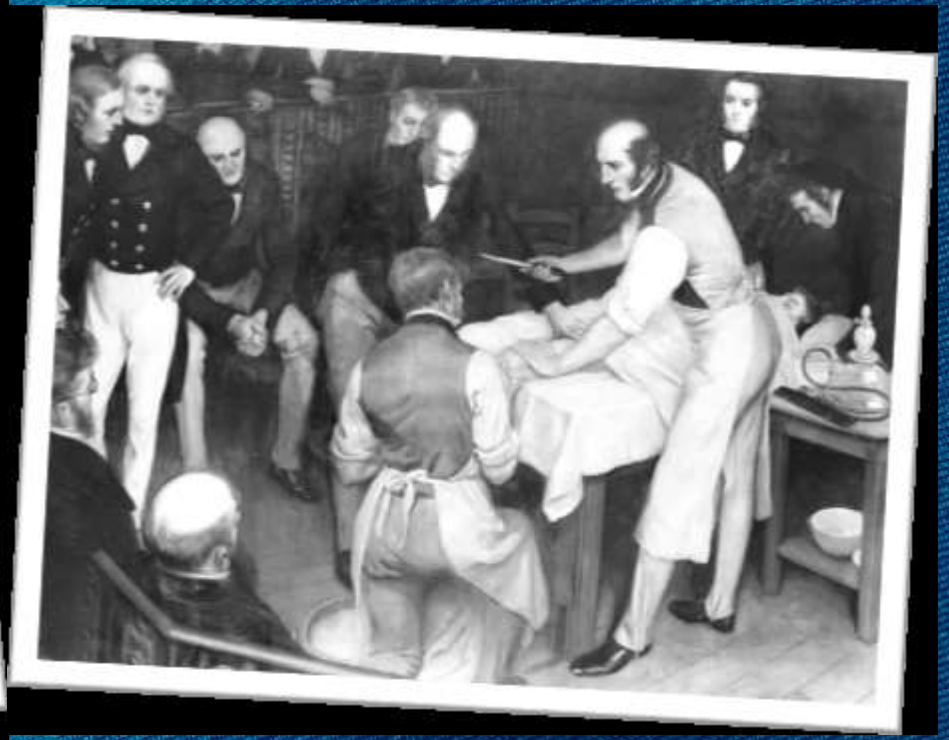
Not so long ago surgeons wore everyday clothes in the operating theatre…

A short history

Samuel Gross, 1875

A short history

Samuel Gross, 1875



Robert Liston, 1846

A short history

William Henry, 1875

Discovered dry-heating clothing for 1 hour to 204ºF prevented scarlet fever.

It took 50 more years before widely adopted.

A short history

First surgeon to use a sterilized gown.

Proposed separate septic and non-septic operating rooms and wrote about antiseptic wound treatment.

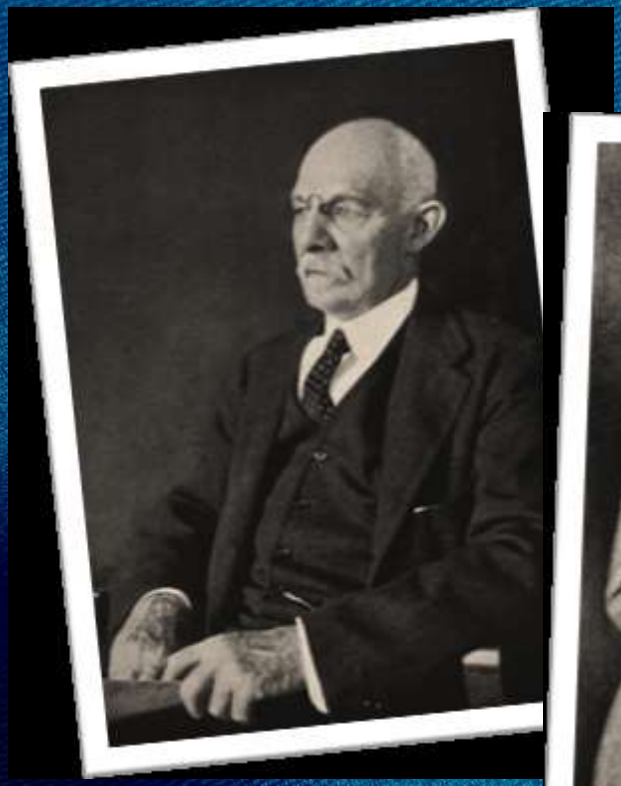
Gustav Neuber, 1883

A short history

Gown similar to one used by Neuber (1889)

Eakins' 1889 painting of Pennsylvania Hospital surgeon, Professor Hayes

A short history



William Halstead

Caroline Hampton

Halstead had gloves made for his scrub nurse to prevent her dermatitis (from mercuric chloride)[2].

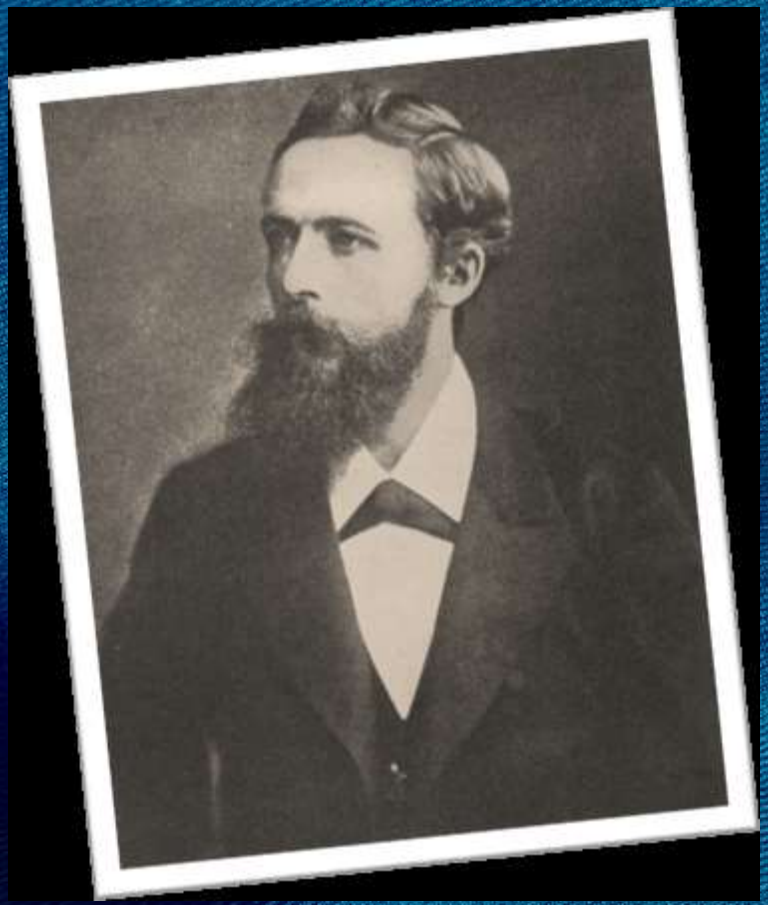
A short history

Joseph C. Bloodgood, 1899

First to promote the use of gloves for surgeons as a way of preventing infection.

"Why was I so blind not to have perceived the necessity for wearing them all the time?[2]"

A short history



Jan Mikulicz-Radecki, 1897

Introduced facemasks. Became widespread during flu pandemic of 1918.

Contamination of Surgical Attire

Textiles are Reservoirs of Pathogenic Organisms:

- **Clostridium difficile (C. diff)**
- **Vancomycin-resistant enterococci (VRE)**
- **Methicillin-resistant Staphylococcus *aureus* (MRSA)**

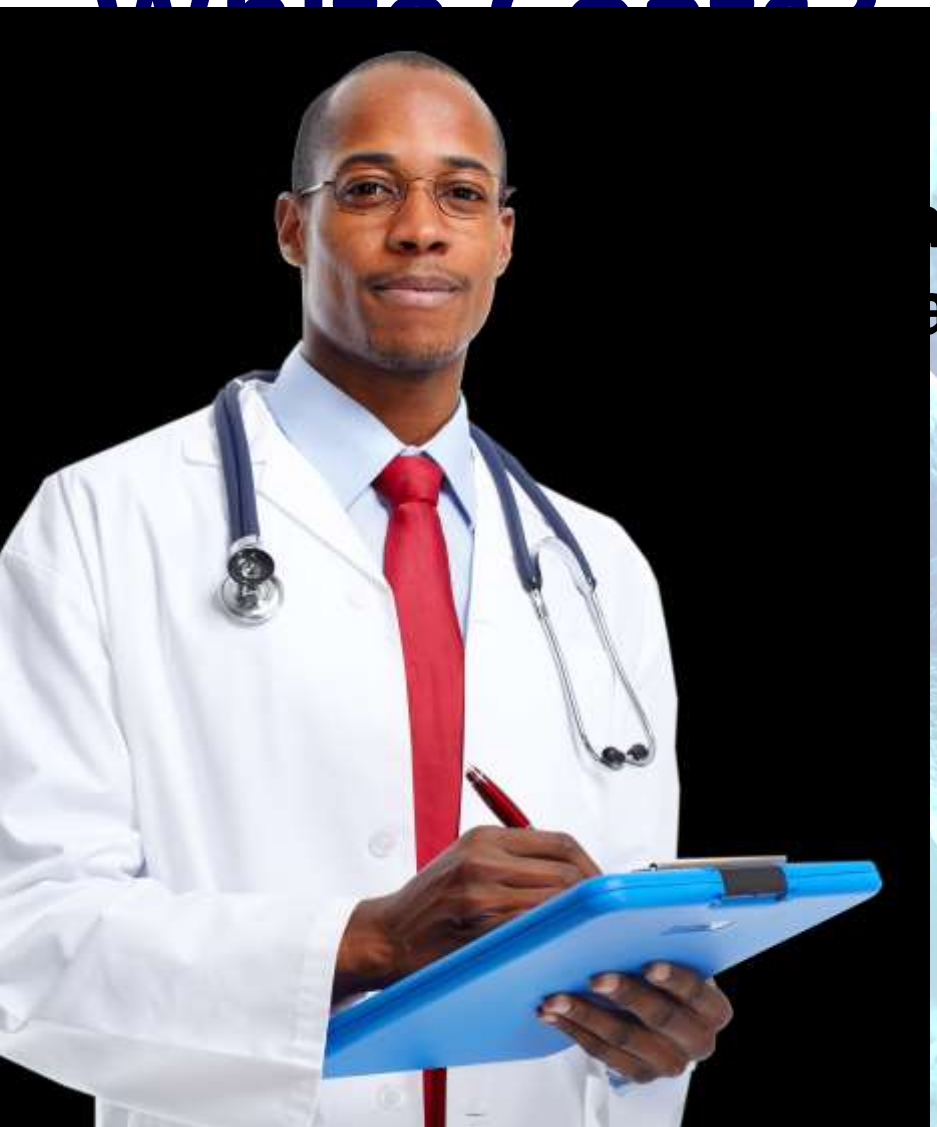
Up to **92%** of privacy curtains may be colonized with pathogenic bacteria[10]

Textiles are Reservoirs of Pathogenic Organisms:

- ***Acinetobacter baumannii***
- ***Pseudomonas aeruginosa***
- **Norovirus**

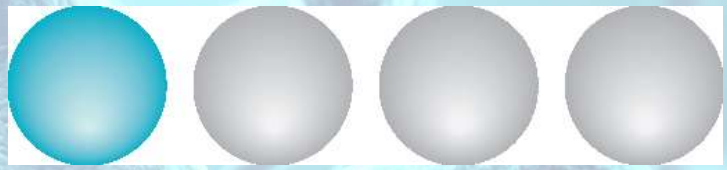
Up to **92%** of privacy curtains may be colonized with pathogenic bacteria[10]

How Clean are White Coats?



aminated white coats arge teaching hospital:

- Nearly one in four (23%) were contaminated with *S. aureus*[4]



- 18% of these were contaminated with MRSA[4]

How Clean are Fabric Scrubs?

bs harboring bacteria:

41% of unworn scrub samples[5]

89% of worn scrub samples[5]

"…because of the significant increase in common skin flora on post-call residents' scrubs, we believe it would be prudent for post-call personnel to be required to change into fresh scrubs before surgical cases[5]."

How Clean is Surgical Eyewear?

Surgical eyewear pieces contaminated after use:

- **37.7% of disposable[12]**
- **94.9% of reusable[12]**

Following disinfection **74.4%** of reusable eyewear pieces cultured positive.[12]

Apparel Contamination and Outbreaks

The Harm of Home Laundry

Case Study[8]

- *Gordonia bronchialis* sternal infections
- A nurse anesthetist was identified as source of the outbreak
- The nurse had home laundered her scrubs
- Her washing machine had a persistent odor
- Following washing machine replacement, the nurse was *G. bronchialis* –negative.

Home Laundry Risks

- *CDC recommends: Water temperatures at least 160°F, using 50-150 ppm of chlorine bleach.[19]*
- *Most domestic washing machines do not exceed 110°F.[3]*
- *Adenovirus, rotavirus, and hepatitis A virus survived home laundering.[18]*
- *Home-laundered scrubs were not as clean as single-use scrubs.[18]*
- *Contamination of home-laundered scrubs, prior to use, was not significantly different to contamination after use.[18]*

Single-Use Attire vs. Reusable Attire

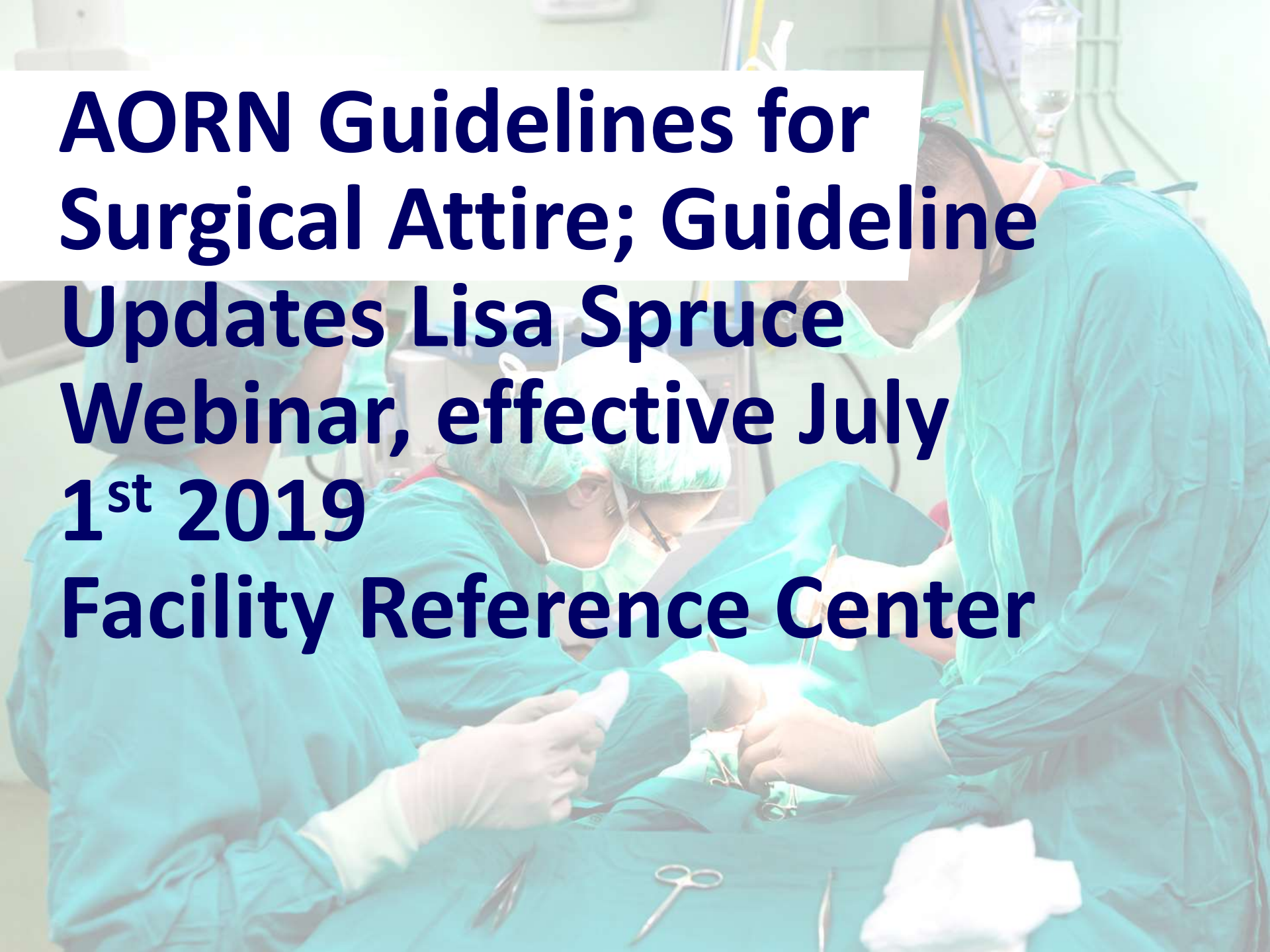
Results of a randomized trial of 102 women undergoing implant-based breast reconstruction[24]

Infection rates 30 days postoperative (p=0.012)

- **Reusable: 5 out of 43 patients (12%)**
- **Disposable: 0 out of 59 patients (0%)**

Showalter, et. al. The Effect of Reusable Versus Disposable Draping Material on Infection

AORN Guidelines for Surgical Attire

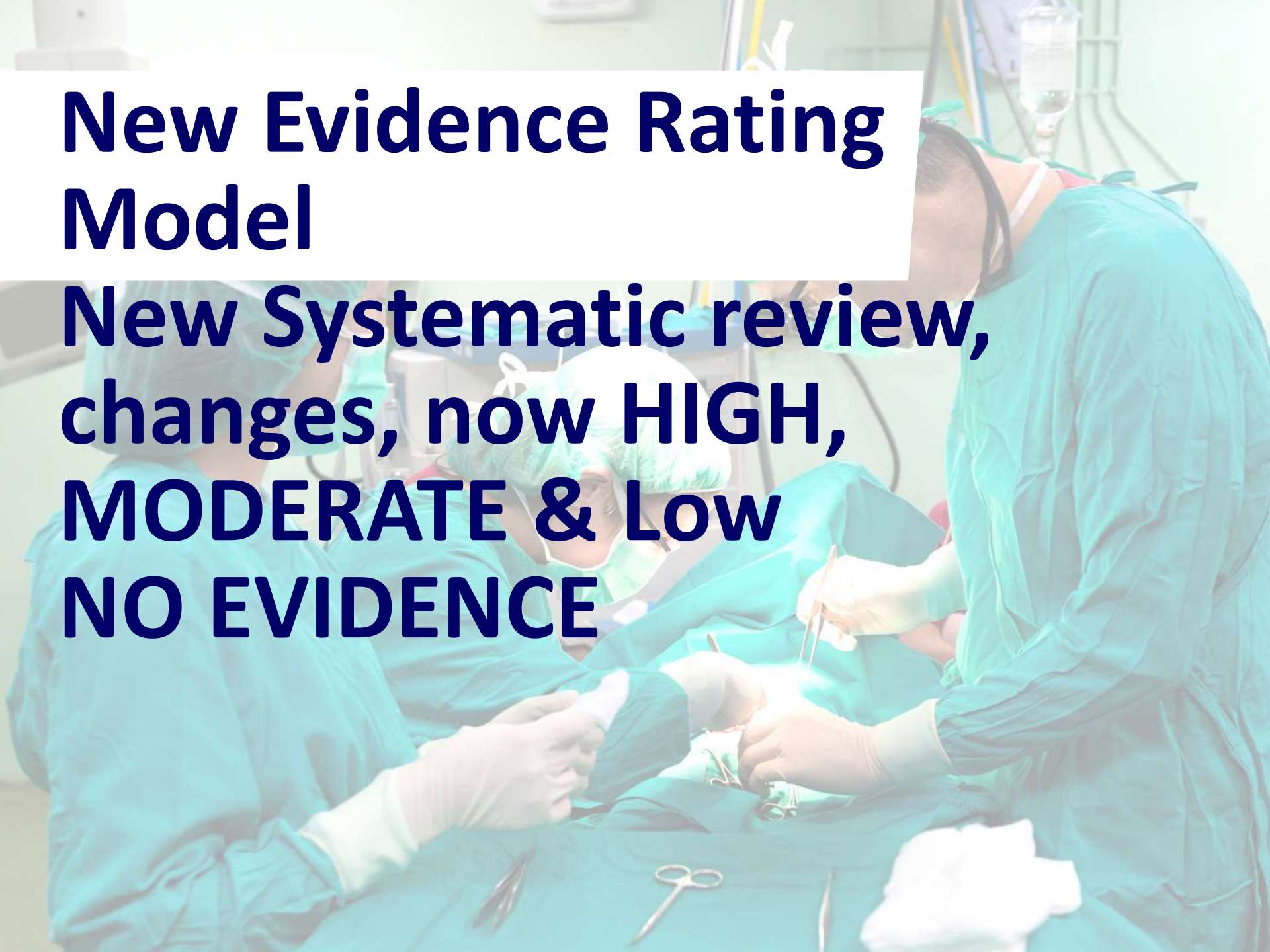


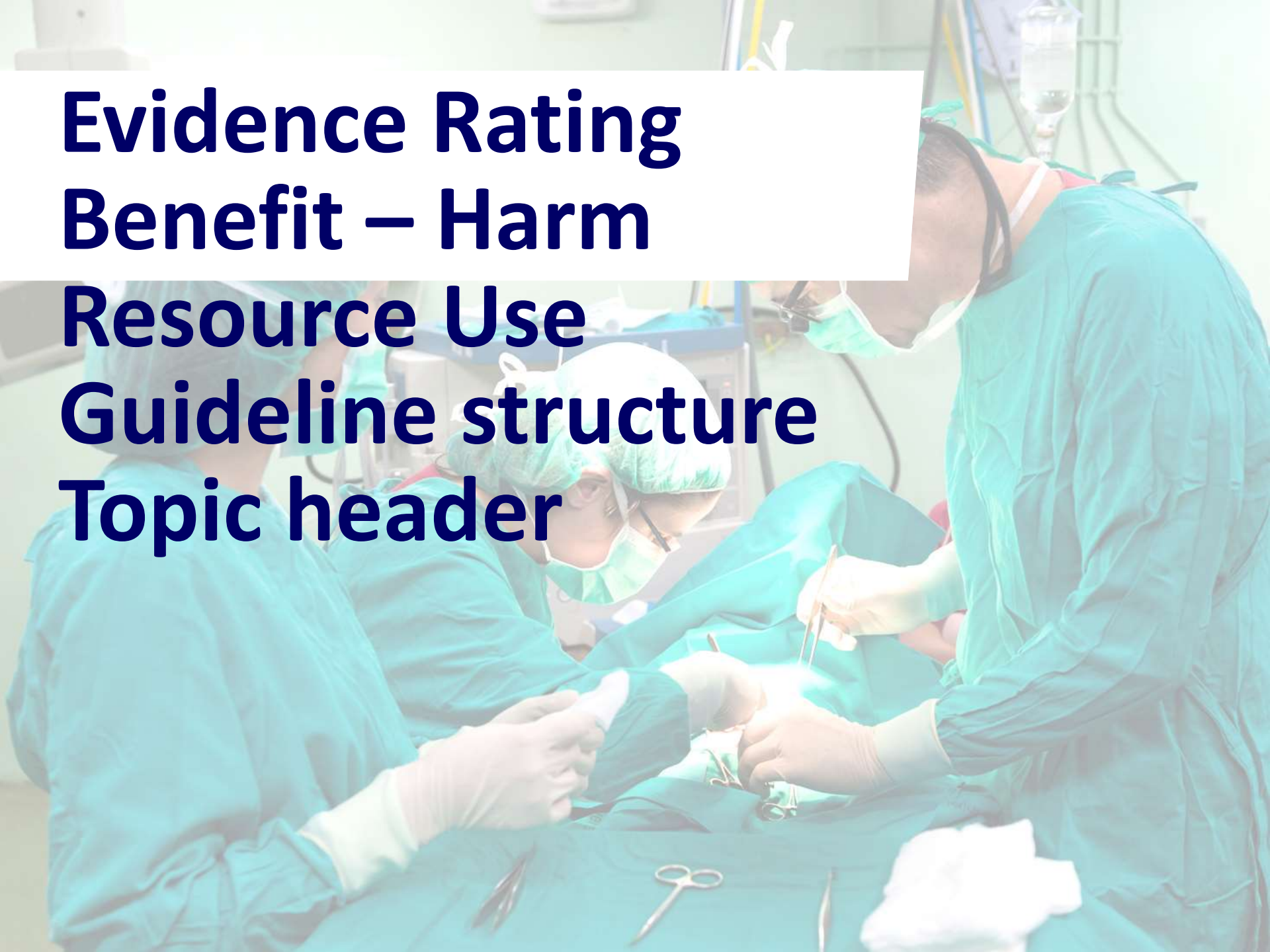
AORN Guidelines for Surgical Attire; Guideline Updates Lisa Spruce Webinar, effective July 1st 2019 Facility Reference Center

New Evidence Rating Model

New Systematic review, changes, now HIGH, MODERATE & Low

NO EVIDENCE





Evidence Rating
Benefit – Harm
Resource Use
Guideline structure
Topic header

AORN Rec

Surgical attire wo
restricted areas[14]

- Surgical attire should
  low-linting, stain-resi
  changed on a daily ba
- All non-scrubbed per
  completely cover the
  sleeved scrub tops or
- All persons entering
  restricted areas shou
  surgical attire that co
  their personal appare
- Personnel should cha
  clothing whenever th
  healthcare facility.

AORN Recommendation I

Surgical attire worn in semi-restricted and restricted areas[14]

- No longer required to wear long sleeve jacket
- No Recommendations for personal clothing under scrub attire
- No recommendations on antimicrobial scrubs or fabric (need more evidence)
- Facility driven decision establish & implement

AORN Recommendation I

Surgical attire worn in semi-restricted and restricted areas[14]

- Cover apparel (if worn) should be clean (or single-use) and reusable apparel should be laundered in a healthcare-accredited laundry facility each day.
- Dedicated, clean footwear should be worn in the perioperative area. Clean shoes, absence of dust, soil, debris or blood
- Surgical masks and protective eyewear should be worn whenever there is a risk of contamination.
- ID badges should be worn on scrub attire and cleaned regularly. Lanyards should not be used. May be used

AORN Recommendation I

Surgical attire worn in semi-restricted and restricted areas[14]

- Jewelry should not be worn if it cannot be confined within scrub attire. Amended
- Stethoscopes should not be worn around the neck and should be cleaned regularly. May be worn
- Personal items taken into semi-restricted and restricted areas should be cleaned and not placed on the floor. Additional info
- Cell phones and other hand-held electronics should be cleaned before being taken into semi-restricted and restricted areas.

AORN Hand Hygiene

1. Do not wear jewelry (eg, rings, watches, bracelets) on the hands or wrists in patient care areas.[3,5,6,8,9,18] *[Recommendation]*

   - Wearing jewelry may impede the removal of microorganisms from the hands during hand hygiene.[1,3-5]

   - Moderate-quality evidence and guidance from professional organizations support perioperative team members removing rings, watches, and bracelets before caring for patients in the perioperative setting.[3,5,6,8,9] Wearing jewelry on the hands and wrists has been associated with increased bacterial counts on the hands[6] and ineffective use of alcohol-based hand rubs.[8] Transmission to the patient of microorganisms that are harbored on jewelry worn by perioperative team members may result in the patient developing a health care-associated infection

AORN Recommendation II

Safeguarding clean scrub attire[14]

- Scrubs should be cleaned at a healthcare-accredited laundry facility
- Clean scrubs should be protected in clean packaging and transported in clean vehicles
- Dispensing machines containing scrub attire should be disinfected regularly

AORN Recommendation II

Safeguarding clean scrub attire[14]

- Contaminated scrub attire should be removed and laundered as soon as possible
- Extensive contamination may require the healthcare worker to shower
- Visibly contaminated attire must remain at the healthcare facility or be sent to the accredited laundry facility
- Wet or contaminated attire should not be rinsed
- Reusable or single-use attire should be placed in designated collection containers after use

AORN Recommendation III

Head Covering[14]

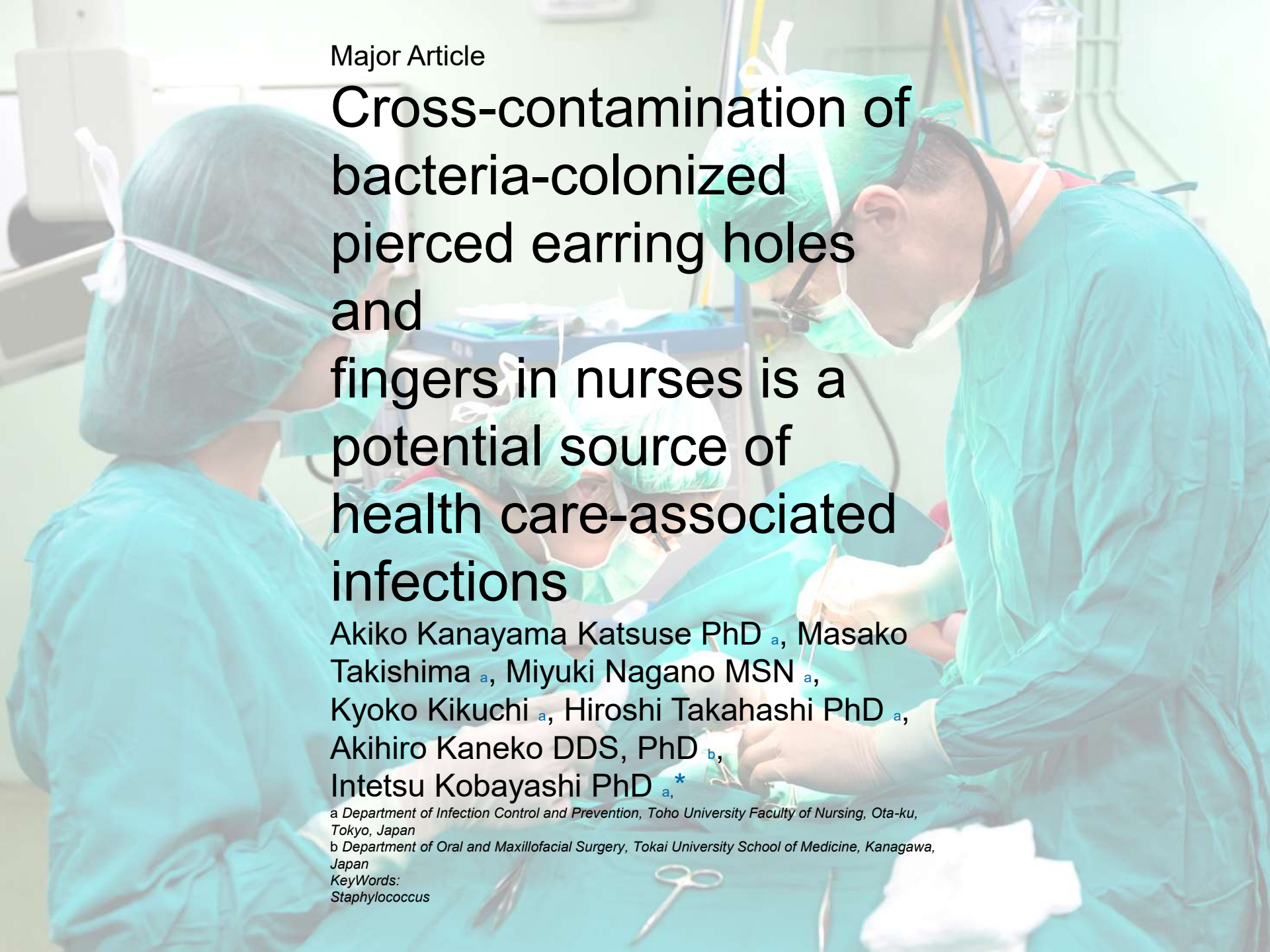
- A clean surgical head cover or hood that confines hair, ears, scalp skin, sideburns and nape of neck should be worn. Cover scalp & hair
- Healthcare workers should n
leaving the perioperative are Can remove
- Head coverings should be re
when changing into street cl
- Single-use coverings should
of after daily use or if contan
- Reusable head coverings are
if they are laundered after us
healthcare-accredited facility FACILITY driven

ACS Statement on Operating Room Attire

100+*years*

AMERICAN COLLEGE OF SURGEONS

Inspiring Quality:
Highest Standards, Better Outcomes



Major Article

Cross-contamination of bacteria-colonized pierced earring holes and fingers in nurses is a potential source of health care-associated infections

Akiko Kanayama Katsuse PhD [a], Masako Takishima [a], Miyuki Nagano MSN [a], Kyoko Kikuchi [a], Hiroshi Takahashi PhD [a], Akihiro Kaneko DDS, PhD [b], Intetsu Kobayashi PhD [a,*]

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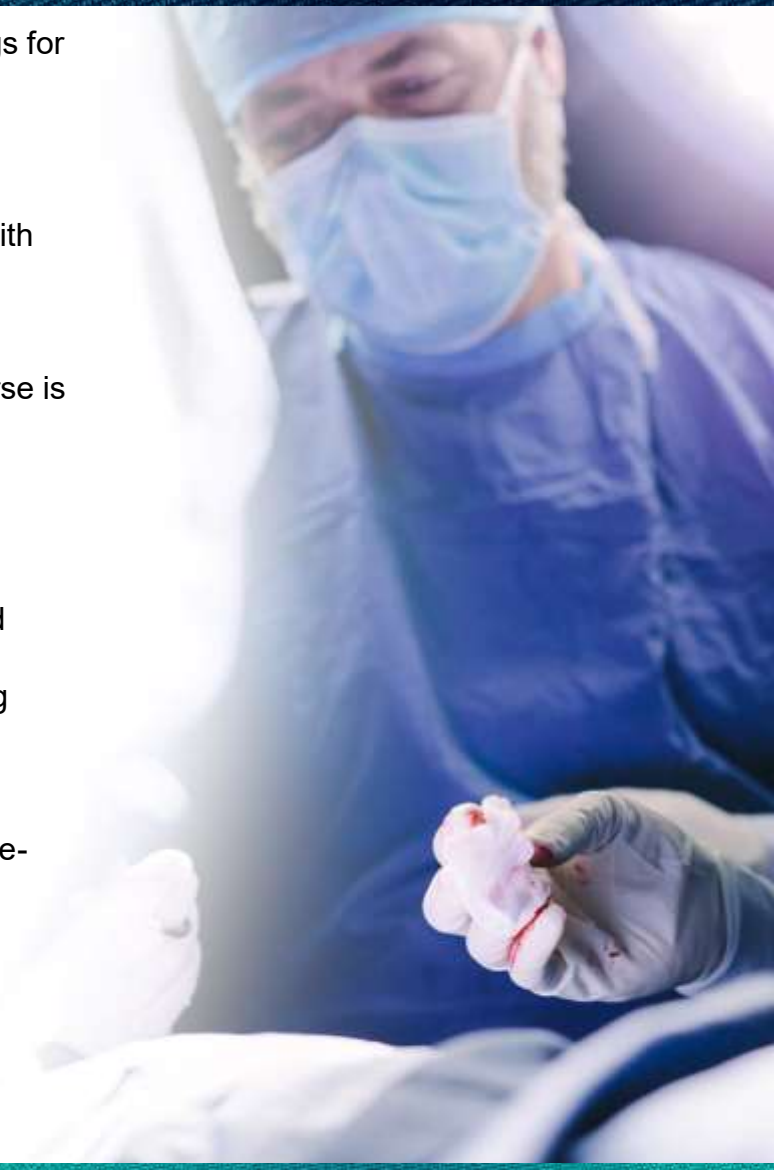
b *Department of Oral and Maxillofacial Surgery, Tokai University School of Medicine, Kanagawa, Japan*

KeyWords:
Staphylococcus

Background: In recent years, the wearing of pierced earrings for personal adornment has increased among health care workers in Japan. However, the transmission dynamics between bacteria in pierced earring holes and fingers has not been clearly shown.
Methods: Earlobes and fingers of 200 nurses (128 nurses with pierced earlobes and 72 nurses with unpierced earlobes) working at a university hospital were sampled to determine whether crosstransmission of bacteria-colonized pierced earring holes and fingers in nurse is possible.
Results: Of 128 nurses who had pierced earring holes, *Staphylococcus aureus* was recovered from earlobes of 24 nurses (18.8%) compared with 7 of 72 nurses without pierced earring holes (9.7%) (P = .09).
Of those 15 nurses yielding *S aureus* from both earlobes and fingers, 12 were from nurses who had pierced earring holes compared with 3 nurses without pierced earring holes. Excluding 1 nurse, antimicrobial susceptibility patterns and genotypes of *S aureus* from both earlobe and fingers of each nurse were identical.
Conclusion: Pierced earlobes can be a source of health care-associated infection via cross-transmission of bacteria from earlobe holes to fingers.



ACS Statement on Operating Room Attire

Head Covering[25]

- The skull cap is symbolic of the surgical profession.
- The skull cap may be worn when close to the totality of hair is covered by it and when only a limited amount of hair on the nape of the neck or modest sideburns remains uncovered.
- Like OR scrubs, cloth skull caps should be cleaned and changed daily.
- Paper skull caps should be disposed of daily and following every dirty or contaminated case.
- Religious beliefs regarding head wear should be respected without compromising patient safety.

Beards

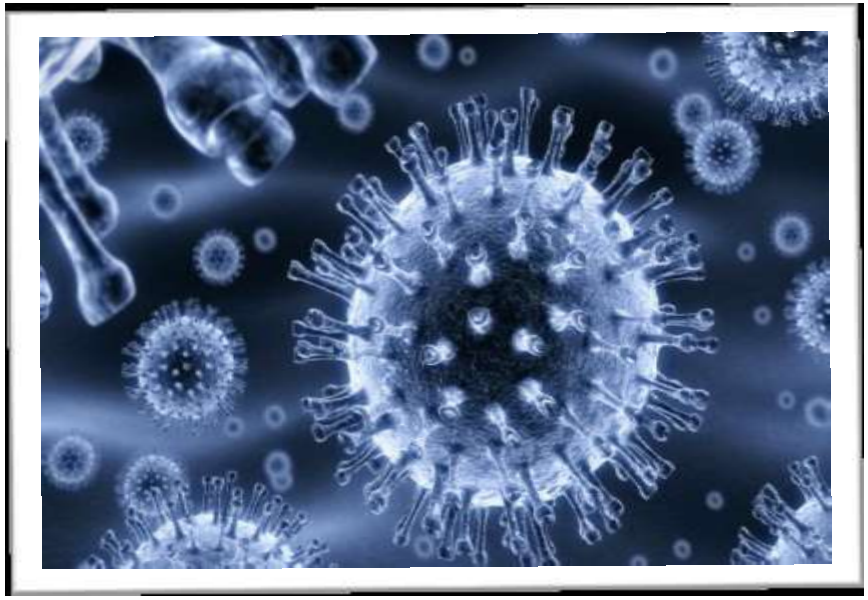
Evidence: Restricted OR

- Sterile processing, prep & pack

Types of Surgical Attire

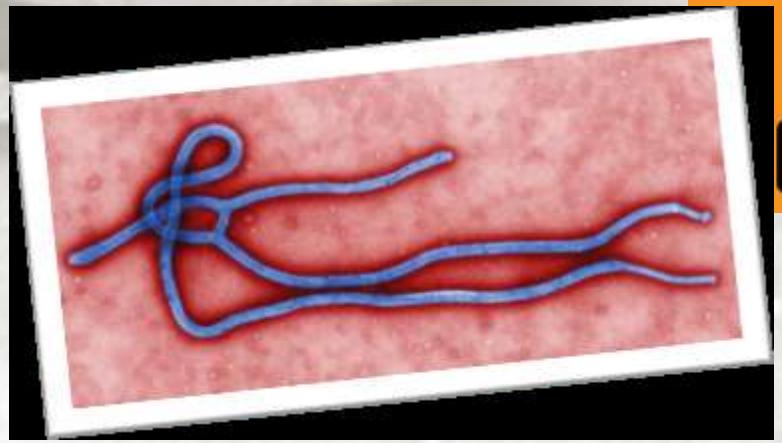
According to the CDC, protective apparel should be guided by scientific understanding of how materials provide protection:

- **Physical and chemical properties of the fabric**
- **Shape, size, and other characteristics of the microorganisms**
- **Characteristics of the carriers**
- **External factors**



Disease Outbreaks

- **Healthcare workers must demonstrate competency in performing all outbreak-related infection control practices**
- **Every PPE donning/doffing procedure must be supervised by a trained observer**
- **While working in PPE healthcare workers should have no skin exposed**



CDC 2015

Personal Protection Equipment for Outbreaks

When there is an infection outbreak in the U.S., the CDC is responsible for making specific recommendations for appropriate PPE and other infection control measures[36].

FDA 2017

Reusable Gowns

1 in 5 surgical gowns are reusable cotton, polyester or a woven blend of these two fibers[30]

Cotton:

- Hydrophilic, draws perspiration providing comfort
- Water molecules discharge static electricity which act as carriers for bacteria
- Absorbent nature facilitates seepage and penetration of blood and body fluid
- Linting is problematic

Polyester:

- Synthetic, durable, hydrophobic
- Can become warm and uncomfortable
- Harder to remove stains

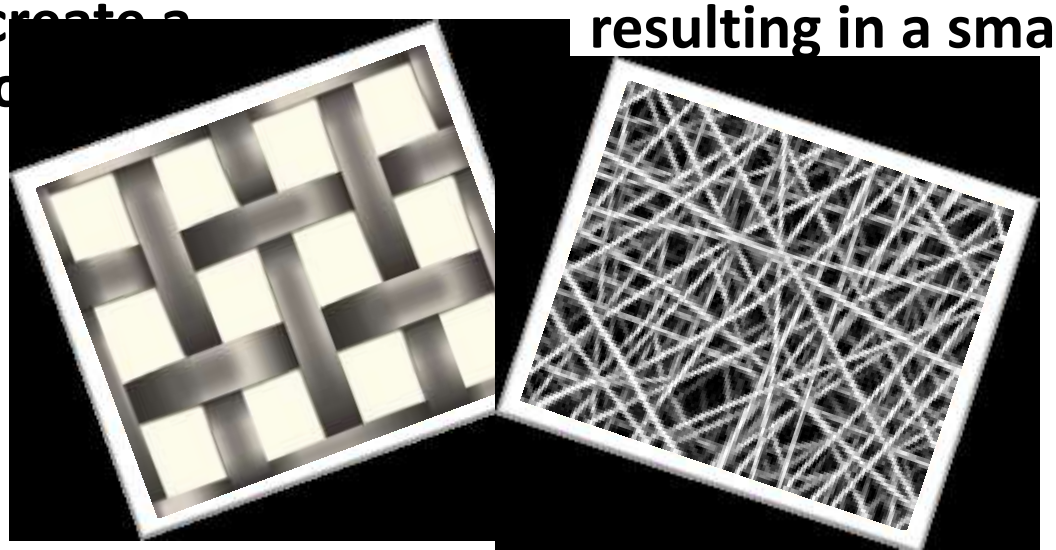
Woven vs. Non-Woven Fabrics

Woven:

- Reusable attire
- Constructed of threads of cotton or polyester
- Threads cross each other to create a cross-hatch pattern

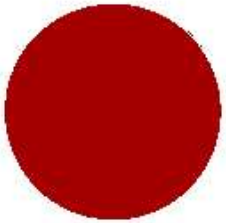
Non-woven:

- Single-use attire
- Constructed of fibers rather than yarns or threads
- Spunbond construction resulting in a smaller pore size



Significance of Pore Size

Bloodborne pathogen strikethrough conversion chart[11]

Volume of strikethrough[1] *Approximate size*	100 µL 	10 µL 	1 µL 	0.1 µL 
Number of bloodborne patthogens[2]				
HBV	10,000,000	1,000,000	100,000	10,000
HCV	100-100,000	10-100,000	1-1,000	0.1-100
HIV	6-700	0.6-70	0.06-7	0.006-0.7

[1]Volume of red 40 dyne/cm synthetic blood delivers to white blotter paper
[2]Based on documented whole blood concentrations of infected patients

Antibacterial Finishes

- Controlled-release[30]
  - Long-term durability
  - Skin irritation/dermat
- Regeneration
  - Bleaching needed for regeneration degrades cotton[30]
- Barrier block
  - Bonded surface remains durable[30]

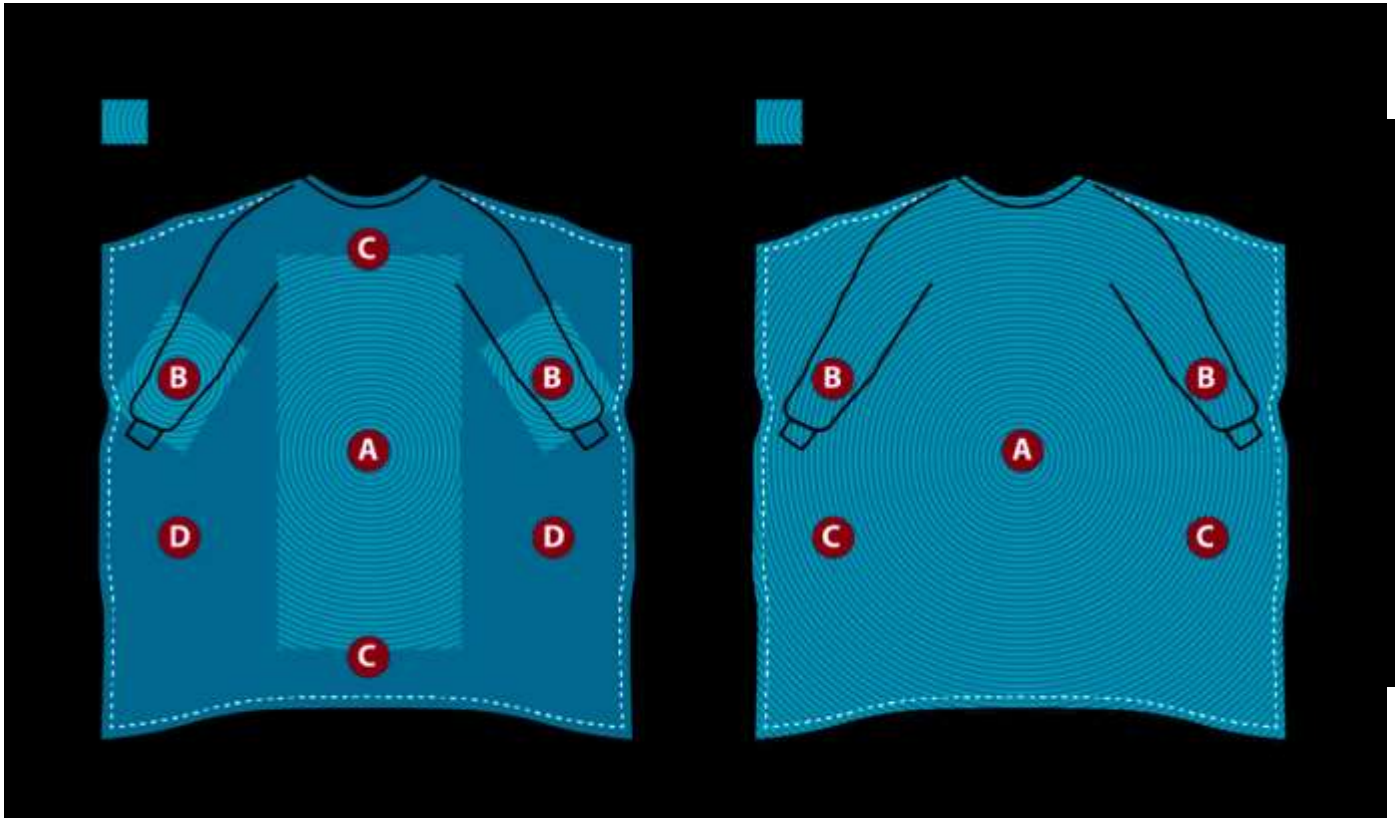
Standards of Protection

ANSI/AAMI PB 70:12 classification of barrier performance of surgical gowns, other protective apparel, surgical drapes and drape accessories.[11]

Level	Test	Liquid Challenge	Result	Expected Barrier Effectiveness
1	AATCC 42 Impact Penetration[2]	Water	≤ 4.5g	Minimal water resistance (some resistance to water spray)
2	AATCC 42 Impact Penetration	Water	≤ 1.0g	Low water resistance (resistant to water spray and some resistance to water penetration under constant contact with increasing pressure)
	AATCC 127 Hydrostatic Pressure[3]	Water	≥ 20cm	
3	AATCC 42 Impact Penetration	Water	≤ 1.0g	Moderate water resistance (resistant to water spray and some resistance to water penetration under constant contact with increasing pressure)
	AATCC 127 Hydrostatic Pressure	Water	≥ 50cm	
4	ASTM F1670 Synthetic Blood Penetration Test (for surgical drops)	Surrogate Blood	no penetration at 2 psi (13.8 kPa)	Blood and viral penetration resistance (2 psi)
	ASTM F1671 Viral Penetration Test (for surgical and isolation gowns)	Bacteriophage Phi-X174	no penetration at 2 psi (13.8 kPa)	

The Correct Protection for the Situation

ANSI/AAMI PB 70:12 classification of barrier performance of surgical gowns, other protective apparel, surgical drapes



AORN: Implementation Model

- **PLAN:** Review the current attire policy and determine revisions based on AORN Guidelines
- **DO:** Implement changes. Ensure there is a consistent message to all stakeholders
- **CHECK:** Develop an audit tool to assess compliance
- **ACT:** Review the policy regularly to incorporate new evidence and address noncompliance

Conclusions

Appropriate Surgical Wear:

- Up to 10% of patients acquire infections while in hospital[32,33]
- Hospital-acquired infections cost up to $45 billion a year[32,33]
- Healthcare apparel has been shown to often be contaminated with micro-organisms or pathogens that can cause infection or illnesses[3]
- Appropriate surgical wear may reduce contamination and the risk of infection

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