

Health Care Workers' Use and Cleaning of X-Ray Aprons and Thyroid Shields



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ABSTRACT

We evaluated the use and cleaning of x-ray aprons and thyroid shields by surveying rural hospital system health care workers who wear x-ray aprons and thyroid shields. One hundred fifty-five of the 173 respondents were RNs (89.6%), and 94 respondents were from inpatient or outpatient surgical settings (54.3%). One hundred thirty-five respondents (78.0%) reported soiled x-ray aprons or thyroid shields, and 52 (30.1%) reported shield odors. Eighty-three participants (48.0%) indicated they never spot cleaned. Standard department cleaning never occurred for 37 x-ray aprons or thyroid shields (21.4%); and 114 x-ray aprons or thyroid shields (65.9%) contacted a patient or patient item 1 to 10 times per shift. Twenty-six participants (15%) specified there were policies and procedures for cleaning x-ray aprons and thyroid shields. Use of evidence-based cleaning guidelines and manufacturer's requirements for effective spot and standard cleaning of the protective aprons and thyroid shields are warranted. *AORN J* 106 (December 2017) 534-546. © AORN, Inc, 2017. <https://doi.org/10.1016/j.aorn.2017.10.002>

Key words: x-ray apron, thyroid shield, cleaning, contamination, radiation exposure.

X-ray aprons and thyroid shields are medical equipment used to protect health care workers (HCWs) from the potentially harmful effects of radiation exposure. The Joint Commission standards require that health care facilities comply with the equipment manufacturers' recommendations for the frequency and care of equipment.¹ The Centers for Disease Control and Prevention infection control guidelines recommend that when cleaning fabric products, HCWs should implement and adhere to the manufacturers' recommendations.² The World Health Organization (WHO) classifies medical equipment as a device, including the accompanying accessories that serve the purpose of providing protection for personnel during diagnostic procedures.³

Nurses at the health care system where we conducted this project observed inconsistencies in the policies for spot cleaning and standard cleaning of x-ray aprons and thyroid shields. Of concern was the potential for the spread of infections via the shared use of aprons and shields by HCWs and inadvertent contact with the patient or a patient item. Further, some cleaning processes may alter the ability of the x-ray aprons and thyroid shields to protect HCWs from radiation exposure. The fabric covering x-ray aprons and thyroid shields and the lead or protective materials on the inside of the aprons and thyroid shields collectively provide barriers for protection. When either of these barriers becomes damaged, there may be an increased risk for the aprons' and shields' effectiveness to be compromised.

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The Joint Commission states that medical equipment can put HCWs at risk when failure occurs.¹ Failure of medical equipment is considered to be a high-risk event in the care environment.¹ The effects of exposure to higher levels of radiation in humans are well documented and include hair loss, skin redness, cataracts, infertility, circulatory disease, and cancer.^{4,5} Wearing x-ray aprons or thyroid shields is one method for HCWs to help ensure radiation protection. Manufacturers provide clear recommendations on the care and storage of these x-ray aprons and thyroid shields, and failing to follow manufacturers' care instructions may result in failure to protect HCWs. These aprons and thyroid shields generally have a porous, fabric outer surface; the use of a cleaner that is recommended by the manufacturer but not recommended for a porous material could potentially result in risk to HCWs.

We evaluated the x-ray apron and thyroid shield manufacturers' information and conducted a literature review regarding best practices for the use, spot cleaning, and routine cleaning of these x-ray aprons and thyroid shields. Spot cleaning in this context refers to the immediate cleaning of areas of gross soil or the immediate removal of stains when they occur. Routine cleaning in this context refers to the standard cleaning process or practice followed by a hospital or facility.

MANUFACTURERS' INFORMATION AND RECOMMENDATIONS

We obtained information from the manufacturers of x-ray aprons and thyroid shields through written communications, a web site review, and a survey. We asked the manufacturers marketing these x-ray aprons and thyroid shields to complete a survey regarding their recommended spot-cleaning processes and products, and we asked that they provide the web site URL for the recommendation. We also asked whether their products were porous. Of the seven manufacturers who were approached about the survey, five responded (71.0%). Cleaning recommendations differed between the manufacturers.

Spot Cleaning and Standard Cleaning

Recommended cleaning processes and products vary. One manufacturer completing the survey stated, "protective aprons should never be machine laundered, dry cleaned, or autoclaved," and provided the following cleaning instructions for x-ray aprons:

- Use a soft-bristle brush and a mild soap solution such as a hand soap or laundry detergent to clean the surface of an apron.
- Never use bleach or solvents (eg, mineral spirits, paint thinner) to clean an apron because they may damage the interior lining and compromise the protective properties of the apron.
- Rinse with water and hang to dry; never fold or crease an apron.
- Hang the apron on an apron hanger or apron rack when drying and when not in use to prevent damage to the interior lining material.
- X-ray aprons periodically to check for cracks.
- Consider replacing these aprons and thyroid shields every 18 to 24 months, depending on the amount of use and general wear and tear.⁶

A second manufacturer provided the following cleaning instructions:

- Remove dirt and water-soluble stains (eg, blood, body fluids, barium contrast media) using mild household dishwashing liquid soaps or detergents diluted in cold water and a soft-bristle brush.
- Rinse with water and hang to dry.
- Quaternary ammonium cleaners and disinfectants may also be used.
- Avoid using petroleum-based cleaning solvents or solutions containing bleach.
- Test for colorfastness in an inconspicuous area.
- Do not machine wash or machine dry.⁷⁻⁹

A third manufacturer provided the following cleaning instructions:

- Use only warm water and mild detergent or our specially-formulated apron cleaner.
- Never use harsh chemicals or a commercial washing machine or dryer to dry aprons.
- Never use a steam autoclave to clean the aprons to avoid heat-induced, severe damage to the protective substrate.
- Aprons and gloves can be sterilized with ethylene oxide gas or disinfected with manufacturer-provided spray or disinfectant.¹⁰

Thus, depending on the manufacturer of the shield, the cleaning process or product recommended may or may not be effective against common microorganisms isolated from surgical site infections (SSIs). The most common pathogens connected to SSIs reported in one study were *Staphylococcus aureus* (25.8%), *Enterobacteriaceae* (12.4%), *Streptococcus* species (11.2%), coagulase-negative staphylococci (10.1%), *Enterococcus* species (7.9%), *Pseudomonas aeruginosa* (6.7%), and methicillin-resistant *S aureus* (4.5%).¹¹ Some manufacturer-recommended

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