Guide

American College of Emergency Physicians®

ADVANCING EMERGENCY CARE

POLICY STATEMENT

Approved April 2021

Guideline for Ultrasound Transducer Cleaning and Disinfection

Revised April 2021

Originally approved June 2018

Recent literature highlights the need for improved education on processes and material for transducer (probe) cleaning and disinfection.[1-5] The clinician sonographer must be aware of the various disinfection protocols with each associated transducer type to ensure patient safety.

According to the American Institute of Ultrasound in Medicine (AIUM), "Infection control is an integral part of the safe and effective use of ultrasound in medicine."[6] In recognizing the importance of infection control, this ACEP statement provides membership with recommendations for the use of ultrasound gels, protective covers, probe cleaning and disinfection. More information may be found in the chapter on ultrasound safety and infection control within the *Ultrasound Program Management* textbook.[7]

The American College of Emergency Physicians (ACEP) does not endorse or recommend any specific commercial products. It recommends following manufacturer instructions, local law and institutional infection control regulations, as well as knowledge of Centers for Disease Control and Prevention (CDC), *Occupational Safety and Health Administration (*OSHA) and The Joint Commission guidelines along with Environmental Protection Agency (EPA) and the Food & Drug Administration (FDA) disinfectant classifications. The ACEP Clinical Ultrasound Accreditation Program (CUAP) ensures that quality and safety processes are demonstrated by accredited programs.[8]

1. Definitions regarding types of ultrasound transducers:[9]
    a. Critical Devices: intra-operative probes placed in sterile body cavities or intravascular transducers (not commonly utilized in emergency medicine applications, eg, intracardiac ultrasound probes).
    b. Semicritical Devices: transducers that come into contact with mucous membranes but do not penetrate membranes (eg, endocavitary/endovaginal probes and transesophageal probes)
    c. Noncritical Devices: instruments that come into contact with intact skin, but not mucous membranes (eg, external use linear, curvilinear and phased array transducers)

2. Definitions of cleaning vs. disinfection:[9]
   a. Cleaning is the removal of visible soiling from the surfaces and lumens of equipment by a manual or mechanical process, commonly with water and detergent or an enzymatic cleaner. Cleaning prepares the items for safe handling and/or further decontamination.
   b. Disinfection is the thermal or chemical destruction of pathogenic and other types of microorganisms. Disinfection is less lethal than sterilization as it destroys most recognized pathogenic microorganisms, but not necessarily all microbial forms (eg, bacterial spores).

3. Definition of types and categories of disinfectants:[9]
   a. Low-Level Disinfectants will destroy most bacteria, excluding tubercle bacilli, some viruses and some fungi. Examples include:
      i. Ethyl or isopropyl alcohol
      ii. Quaternary ammonium agents without mycobacterial labeling
   b. Intermediate or Mid-Level Disinfectants will destroy vegetative bacteria including tubercle bacilli and many viruses, but not bacterial spores. Examples include:
      i. Quaternary ammonium agent with mycobacterial labeling
      ii. Phenolic germicidal agents
   c. High-Level Disinfectants are able to remove bacterial spores when utilized in adequate concentrations and appropriate conditions. Examples include:
      i. Chemical sterilants or germicides, such as glutaraldehyde formulations
      ii. Hydrogen peroxide

*The level of disinfection provided by some agents is based on the concentration, method and time of exposure.

4. Protective barriers
   a. Protective barriers such as medical gloves, condoms and probe covers are regulated by the use of an "acceptable quality level" (AQL)for quality management.
   b. Probe covers with pore sizes < 30 nm are available and block most viruses including human papillomavirus (HPV) (50 nm).
   c. Adhesive barriers and covers designed for transducers are available and can be utilized instead of traditional sleeve type covers.
   d. Sterile film dressings could be utilized as a barrier and would be effective against organisms larger than its reported pore size of 27 nm. Referral to manufacturer recommendations is warranted.

5. Ultrasound gel
   a. Gel products are available as non-sterile, bacteriostatic and sterile. Non-sterile gel is available as single use or multidose products. Bacteriostatic and sterile gel generally are available as single use products.
   b. Multidose gel containers should be discarded when empty (eg, do not refill containers)
   c. Care should be taken with multidose gel containers to avoid contact between the dispensing tip and the transducer or skin surfaces to prevent contamination.
   d. Multidose gel containers should be discarded after a set time once opened, some sources advocate a 28-day life-cycle.
   e. Gel used on patients under droplet or contact precautions should be discarded after use, regardless if it is a multidose container.

f. Sterile gel should be utilized when potential infection is a concern such as sterile percutaneous guided procedures, contact with non-intact skin or mucosal surfaces and fresh surgical sites.
g. Bacteriostatic gel can be utilized on intact mucosal surfaces.

6. Recommendations
   a. Transducers used on clean, intact skin (commonly external linear, curvilinear and phased array) are considered noncritical devices and require low-level disinfection after each use.[9]
   b. Transducers which are used during percutaneous procedures (vascular access, thoracentesis, paracentesis, arthrocentesis, pericardiocentesis, lumbar puncture, regional anesthesia and other procedures) or on non-intact skin should be covered with a single-use sterile probe cover matching the sterility of the procedure, then undergo low-level disinfection between uses.[10]
   c. If the probe cover fails, the transducer should be considered contaminated with blood or bodily fluids and undergo low-level disinfection with an agent that has activity against bloodborne pathogens (hepatitis B virus, hepatitis C virus, and HIV) and tubercle bacilli.[10]
   d. External transducers that become contaminated by blood or bodily fluid should undergo low-level disinfection with an agent that has activity against bloodborne pathogens (hepatitis B virus, hepatitis C virus, and HIV) and tubercle bacilli.
   e. Internal transducers with mucosal contact (eg, endocavitary transducers for intra-oral procedures or transvaginal examinations and transesophageal probes) are semicritical devices that should be covered with a single-use probe cover, as appropriate, and undergo high-level disinfection between uses. Reusable intra-operative probes placed in sterile body cavities are considered critical devices and are not commonly utilized in the emergency department. Intra-operative probe use should incorporate a single-use probe cover and high-level disinfection between uses.
      i. The operator should be properly gloved while performing internal examinations, removing probe covers, and during cleaning and disinfection of transducers. During probe cover removal, care should be taken to avoid transducer contamination with blood or bodily fluids. After completion of the exam, the operator should perform adequate hand hygiene.
      ii. Operators should be aware of institutional high-level disinfection procedures and workflow processes that may include communication with supply technicians, adoption of equipment covers, transport protocols and equipment tracking systems.
   f. Single-use sterile gel packets should be used when infection is a concern. These include:
      i. Invasive procedures that involve percutaneous puncture.
      ii. Ultrasound examinations performed on non-intact skin or near fresh surgical sites.
      iii. Non-intact mucosal surface contact, alternatively bacteriostatic gel can be used if the mucosal surface is intact.

Summary

1. Transducers used externally on intact skin without contamination of blood or bodily fluids should undergo low-level disinfection between each use.
2. Transducers used externally for percutaneous procedures or non-intact skin should be covered with appropriate single-use protective covers and use sterile gel. They should subsequently undergo low-level disinfection.
3. If a probe cover or barrier fails, the transducer should be considered to be contaminated by blood or bodily fluids.

4. If a transducer for external use or percutaneous guidance is contaminated by blood or bodily fluids it should undergo low-level disinfection with an agent that is active against hepatitis B virus, hepatitis C virus, HIV and tubercle bacilli.
5. Transducers used internally on mucous membranes and internal orifices should be covered with a high-quality single-use probe cover, where appropriate, followed by high-level disinfection between each use.

References

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7. Nomura, J.T. & Nagdev, A.D. (2018). Ultrasound safety and infection control. In V.S. Tayal, M. Blaivas, T.R. Foster (Eds.), *Ultrasound Program Management: A Comprehensive Resource for Administrating Point-of-Care, Emergency, and Clinical Ultrasound* (1st ed., pp. 243-268). Cham, Switzerland: Springer International Publishing AG.
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Addendum
COVID-19: Ultrasound Machine and Transducer Cleaning
Approved April 2020

The ACEP Emergency Ultrasound Section wishes to provide guidance for cleaning and disinfection of ultrasound equipment in the context of the COVID-19 pandemic.

Special guidance regarding COVID-19 includes the following:

1. Removal of all nonessential equipment prior to entering the room of a suspected COVID-19 patient.

This prevents unnecessary items from contamination by droplets and may include removal of non-

essential transducers or extraneous items (eg, peripheral IV cannulas, plastic film dressing, bags holding towels, etc.).

2. ***Clinicians should follow optimal hand hygiene by washing their hands between patients and wearing single-use gloves.***

   We recommend that before cleaning, clinicians remove gel and debris, then use one of the EPA recommended products in between each patient encounter to disinfect the probe.[1] Clinicians may find it advantageous to use a double-glove technique to help avoid cross-contamination from bare hands during the cleaning process.

3. ***When scanning patients who are at low-risk for COVID-19 or are not in droplet precautions, we recommend disinfecting the probe and surfaces that were touched during the examination (screen, keyboard, cable, etc.).***

   Due to recent knowledge that SARS-CoV-2, the causative agent of COVID-19 can be present on surfaces for days, we recommend disinfecting surfaces that either come into contact with the patient (cable and transducer) as well as surfaces that are touched by the clinician (keyboard, screen, handlebar, etc.)[2] We recommend the clinician remove gel and debris, and then use one of the EPA recommended products in between each patient encounter.[1,3]

4. ***In situations when aerosolization or high-risk procedures can occur, probes and machines should be covered (if possible) and disinfected with low-level disinfection (LLD) after every use.***

   We recognize that many clinicians will not have access to transparent covers for ultrasound systems. In those cases, the entire ultrasound system and frequently touched surfaces should be disinfected with LLD solution between each patient.[4]

   When performing an ultrasound examination in critically ill patients requiring active resuscitation where aerosolization is a risk (intubation, medication nebulization, chest compressions, non-invasive ventilation, etc.) the machine and its components should be protected as much as possible.[1,5] This includes use of probe covers (sterile and non-sterile) and may involve draping material such as translucent bags. These covers should be discarded prior to exiting the patient's room taking care to avoid cross-contamination, in keeping with local infection control recommendations.

5. ***High-level disinfection (HLD) is not required when using ultrasound probes on intact skin***.

   Please refer to the current *ACEP Guideline for Transducer Cleaning and Disinfection* to determine when to use HLD.[3] There is no evidence that HLD offers benefit for disinfection from SARS-CoV-2.

   For ultrasound use during procedures (such as peripheral or central venous access), a sterile probe cover should be used, followed by LLD in accordance with the *ACEP Guideline for Transducer Cleaning and Disinfection.*

6. ***Handheld devices may be covered with device covers for both the touchscreen and the probe with its cord. All items should be cleaned with LLD after use on each patient.***

7. ***Innovative cleaning solutions should be discussed with local infection control and the vendors supplying the machine***.

The stocking of different solutions and products vary across the country, and some systems are facing shortages of certain products. We recommend that, in conjunction with Infection Control, physicians and health systems consider common disinfectants for cleaning if there are no alternatives to commercial healthcare products. Examples would include soap and water, diluted bleach, and ammonium chloride derivatives. This should be discussed with the vendor to prevent inadvertent destruction of machine elements.

References

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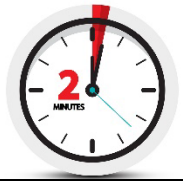
4. Centers for Disease Control and Prevention. Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 (COVID-19) in Healthcare Settings. *2020* Available at: https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fhcp%2Finfection-control.html#infection_control. (Accessed March 24, 2020)
5. Tellier R, Li Y, Cowling BJ, Tang JW. Recognition of aerosol transmission of infectious agents: a commentary. *BMC Infectious Diseases*. 2019 Jan 30;1-9.

PRIOR TO ENTERING ROOM	
	Ensure that all unnecessary materials are removed from the machine and the basket.
For Patients on DROPLET precautions, once the ultrasound is completed, remain inside the room with PPE on. Sanitize gloves and then:	
	Visually inspect the machine for any gel, bodily fluid or debris • Clean with low level disinfectant spray, soap + water, or approved wipe
 For a list of approved wipes check EPA site	Using approved wipe, disinfect all machine surfaces including: • surfaces that either come into contact with the patient • surfaces that are frequently touched by the clinician *** please remember that there is a "wet time" associated with all wipes, check the manufactures recommendation**
For patients on AIRBORNE precautions, once the ultrasound is completed, remain inside the room with PPE on. Sanitize gloves and then:	
	Visually inspect the machine for any gel, bodily fluid or debris • Clean with low level disinfectant spray, soap + water, or approved wipe
	While still in PPE, move the machine as far from the patient as possible. Using approved wipes, disinfect all machine surfaces including: • probes and cords • the keyboard • the screen • the power cord • the lid • the wheels • wells or buckets built into the machine • gel bottles and wipes containers *** please remember that there is a "wet time" associated with all wipes, check the manufacturers recommendation** ****Consider cleaning again immediately after leaving the room**
	Maintain wet for **<u>required amount of time</u>** before considering the device decontaminated *** In addition to the above, follow the policies of institutional infection control**