Infection Prevention and Control Guidelines for Anesthesia Care

Chapter XX: Standard Precautions

Introduction

Standard precautions are the basic level of infection control protocols that reduce the risk of disease transmission when providing patient care.[1,2] Basic standard precautions include, but are not limited to:

- Hand Hygiene
- Personal Protective Equipment
- Respiratory Hygiene
- Safe Injection Practices
- Equipment and Environmental Cleaning, Disinfection, and Sterilization

Anesthesia and other healthcare providers should always refer to their facility's policy on infection control standard precautions.

Purpose

This chapter provides recommendations on critical infection prevention and control measures for anesthesia professionals. It covers core principles and protocols related to hand hygiene, use of personal protective equipment, application of transmission-based precautions, respiratory hygiene, skin preparation, aseptic technique, and airway management precautions. By adhering to these recommendations, healthcare facilities and providers can mitigate risks of healthcare-associated infections and support a safer environment for clinicians, ancillary staff, and patients.

Audience

This resource is intended for Certified Registered Nurse Anesthetists (CRNAs), also known as nurse anesthesiologists or nurse anesthetists, other anesthesia providers, members of the interdisciplinary team, administrators involved in policy developed, and other interested stakeholders.

Hand Hygiene

Hand hygiene is the practice of removing microorganisms from hands.[2-9] Performing proper hand hygiene significantly reduces the incidence of infection.[1-10] Hand hygiene is performed in

a manner consistent with hospital infection control practices, policies, and procedures to maximize the prevention of infection and communicable disease.[11] Table 1 describes when hand hygiene is indicated and Table 2 describes specific hand hygiene definitions and protocols.

Table 1. Indications for hand hygiene.[5,9,11-15]

Before	After
• Patient contact. • Donning protective equipment. • Performing a clean or aseptic procedure. • Performing invasive procedures (e.g., catheter insertion, epidurals, surgery).	• Contact with patient's skin and immediate surroundings (e.g., bedside area). • Contamination. • Contact with blood, body fluids, excretions, mucous membranes, wound dressings, nonintact skin, or visibly contaminated surfaces. • Contact with patient's airway. • Removing protective equipment (e.g., gloves). • Contact with the floor or anything that has been in contact with the floor. • Contact with inanimate objects, medical equipment, or monitors. • Exiting the operating room. • Using the restroom.

Table 2. Hand hygiene definitions and instructions.[2,5,6,9,11-15]

Term	Definition	Protocol
Antiseptic Handwashing	Washing hands with water and an antiseptic agent, (e.g., soap, hand rub).	• Wet hands with water, apply antiseptic soap and rub hands together for at least 20 seconds.
Alcohol-Based Handrubbing	Rubbing non-visibly soiled hands with a product that contains alcohol to decontaminate hands.	• Apply manufacturer recommended amount to palm. • Rub hands together covering all surfaces and fingernails until dry. • Refrain from contact until hands are completely dry.
Surgical	Washing hands with an antiseptic	• Remove jewelry (e.g., rings, bracelets,

Hand Antisepsis	agent before a surgical procedure.	wristwatches) prior to performing surgical hand hygiene. • Follow manufacturer guidelines for scrub time. • Clean under fingernails using a nail cleaner. • Keep natural nail length to less than ¼ inch. • Do not wear artificial nails or nail extenders.

Performing adequate hand hygiene while providing anesthesia care can be challenging due to the nature and intensity of care anesthesia professionals provide.[16] Studies of anesthesia professionals in the operating room indicate that there are a high number of missed hand hygiene opportunities during patient care.[16-18] Given the demands of anesthesia care and proportion of missed hand hygiene opportunities, aggressive strategies and education are needed to improve hand hygiene among anesthesia professionals.[14,18,19] Recommended strategies include use of single and double gloving with glove removal after contamination, availability of alcohol-based hand sanitizers in the anesthesia work area, targeted environmental cleaning of the anesthesia area after each case, and ongoing research to design new methods to control bacterial transmission.[5,14,16,17]

Personal Protective Equipment

Personal protective equipment (PPE) is specialized clothing or equipment worn for protection against infectious materials and contamination.[20] PPE protects the patient and the healthcare provider from transmitting and contracting infection.[1,3,9,20] Always perform hand hygiene prior to applying PPE, after removing all PPE (except for respirators), and prior to exiting the operating or patient room. Avoid touching surfaces or face when possible during the donning process to prevent contamination. Utilize the appropriate combinations for PPE based on clinical and patient needs. For example, during aerosol-generating procedures on patients with suspected or proven infections transmitted by respiratory aerosols wear a fit-tested N95 or higher respirator in addition to gloves, gown and face/eye protection.[1] Table 3 offers examples of PPE and information on how to properly wear, remove, and dispose of the gear.

Table 3. PPE examples and guidelines.[1,3,9,10,15,16,21-47]

PPE	Indications	Guidelines	Removal Protocol
Disposable Gloves (Non-Sterile)	• Routine patient care. • Shared patient-provider use of a difficult-to-clean	• Remove and replace gloves promptly when contaminated or damaged. This helps keep anesthetizing locations and patient care areas clean. • Remove gloves and perform hand hygiene after caring	• Grasp outer edge of glove near wrist. • Peel away from hand turning inside out. • Hold removed glove in opposite gloved

PPE	Indications	Guidelines	Removal Protocol
	device (e.g., computer keyboard).	for a patient and between patients. • Do not wear the same pair of gloves for more than one patient to prevent cross-contamination. • Special considerations, such as pore size and glove composition (e.g. latex vs non-latex), may apply based on patient, provider or procedure needs. • Glove selection should account for potential allergies, procedures involving hazardous drugs, etc.	hand. • Slide ungloved finger under wrist of gloved hand so finger is inside gloved area. • Peel off the glove from inside creating a 'bag' for both gloves. • Dispose of gloves in proper waste receptacle.
Disposable Gloves (Sterile)	• Surgical procedures. • Vaginal deliveries. • Invasive radiological procedures. • Performing vascular access and procedures. • Preparing total parental nutrition and chemotherapeutic agents. • Regional neuraxial techniques. • Any invasive procedure risking	• Remove and replace gloves promptly when contaminated or damaged. This helps keep anesthetizing locations and patient care areas clean. • Remove gloves and perform hand hygiene after caring for a patient and between patients. • Do not wear the same pair of gloves for more than one patient to prevent cross-contamination. • Special considerations, such as pore size and glove composition (e.g. latex vs non-latex), may apply based on patient, provider or procedure needs.	• Partially remove the first glove by peeling it back with fingers of the opposite hand (all five fingers should still be covered with the glove). • Remove the other glove completely, turning it inside out, only touching the outside of the glove with the covered fingers of the partially gloved hand. • Remove the glove on the partially gloved hand completely, using the inside out removed glove. • Skin is only contacted by the inner surface of the glove. • Dispose of gloves in proper waste receptacle.

PPE	Indications	Guidelines	Removal Protocol
	sterile site or fluid exposure. • High-risk wound dressings. • Care of severely immunocompromised patients.		
Double Gloves	• Airway manipulation. • Increased risk of complications from needle stick injuries (e.g., HIV, Hepatitis C contamination).	• After performing the planned intervention, immediately remove and safely dispose of the outer gloves. • Remove and replace gloves promptly when contaminated or damaged. This helps keep anesthetizing locations and patient care areas clean • Resume urgent patient care activities (e.g., patient ventilation) with sterile, inner gloved hands. • Remove gloves and perform hand hygiene after caring for a patient and between patients. • Do not wear the same pair of gloves for more than one patient to prevent cross-contamination. • Special considerations, such as pore size and glove composition (e.g. latex vs non-latex), may apply based on patient, provider or procedure needs.	• First remove the outer glove by following the protocols for sterile glove removal. • Remove other PPE equipment. • Remove inner glove following the protocols for sterile glove removal. • Perform hand hygiene.
Gowns (non-	• Risk of limb or torso contamination.	• Wear a gown that provides appropriate coverage. • Secure gown in the back of the neck and waist.	• Unfasten ties in back of neck and waist.

PPE	Indications	Guidelines	Removal Protocol
sterile)		• Discard after each use.	• Remove the gown touching only the inside of the gown. • Roll or fold gown inside out. • Dispose of gown in proper waste receptacle.
Gowns (sterile)	• Insertion of pulmonary artery catheters and central venous catheters. • Invasive procedures (e.g., surgery).	• Wear a gown that provides appropriate coverage. • Secure gown in the back of the neck and waist. • Discard after each use.	• If donning double gloves, dispose of outer glove following sterile glove removal protocol prior to removing gown. • Follow removal protocol for non-sterile gowns. • Dispose of gown in proper waste receptacle.
Eye Protection	• Potential for contact with infectious material. • Splash, spray, or droplet hazards. • During procedures and patient-care activities likely to generate splashes or sprays of blood, body	• Select appropriate eye protection based on the type of hazard exposure, the duration of exposure, and the availability of other PPE. • Pretest selected eye protection for suitability and appropriate fit. • Clean and disinfect non-disposable eyewear prior to use (e.g., laser glasses, goggles, N95 respirator, face shields).	• If donning double gloves, dispose of outer glove following sterile glove removal protocol prior to removing eye protection. • Lift head band or ear piece. • Refrain from touching the face shield. • Dispose of eye protection in proper receptacle for reprocessing or disposal.

PPE	Indications	Guidelines	Removal Protocol
	fluids, secretions (e.g., suctioning, endotracheal intubation).		
Surgical Masks	• Invasive procedures (e.g., arterial and central venous access, regional anesthesia). • Regional neuraxial technique. • Potential for contact with infectious material.	• Wear to cover facial hair. • The surgical mask should cover the mouth and nose and be secured in a manner that prevents venting at the sides of the mask. • Remove and discard when wet or soiled, and at the end of a case or procedure. • Perform hand hygiene immediately following mask removal and disposal.	• If donning double gloves, dispose of outer glove following sterile glove removal protocol prior to removing surgical mask. • Undo the ties or grasp the elastics at the top and bottom of the mask and remove without touching the front of the mask. • Dispose of mask in proper waste receptacle.
Hair Coverings	• Upon entry to semi-restricted and restricted areas. • Regional neuraxial technique.	• Cover hair, facial hair, sideburns and the back of the neck using a clean covering. • Launder reusable cloth caps daily and when visibly soiled.	• If donning double gloves, dispose of outer glove following sterile glove removal protocol prior to removing surgical cap. • Remove cap using gloves, refraining from contacting inner part of cap. • Dispose of cap in proper waste receptacle.

PPE	Indications	Guidelines	Removal Protocol
Shoe Coverings	• Risk of splash contamination.	• Slip coverings over shoes prior to donning gloves and other PPE. • Shoe coverings must be changed each time a worker exits the area.	• If donning double gloves, dispose of outer glove following sterile glove removal protocol prior to removing shoe covers. • With already donned gloves, remove shoe coverings. • Dispose of coverings in proper waste receptacle. • Spray shoes with disinfectant if necessary.

Scrubs	• Follow facility policy regarding donning scrubs prior to entering restricted and semi-restricted areas.	• Wear a clean set of scrubs each day and change into clean scrubs if contaminated.
		• Scrubs should be laundered in a healthcare-accredited laundry facility after each daily use and when contaminated.
		  ○ If home laundering is unavoidable, the facility should provide clear instructions on optimal methods using appropriate water temperature, cycle time, disinfectant chemicals, mechanical agitation, and high heat drying
		  ○ Change out of contaminated scrubs promptly and have a process for containing and transporting soiled scrubs to avoid spreading contamination.
			• Follow facility policy regarding removal of scrubs upon exiting restricted and semi-restricted areas.

PPE	Indications	Guidelines	Removal Protocol
		• Scrubs worn as general work clothes and not intended to function as protection against a hazard or expected to be contaminated by blood or other potentially infectious materials are not considered to be PPE. Therefore, these would nor need to be handled in the same manner as contaminated PPE.	
Cover Apparel (e.g., lab coats)	• Follow facility policy regarding use of cover apparel.	• Cover apparel should be clean or single-use. • Lab coats are not recommended in the operating room, as they have the potential to become contaminated.	• Follow facility policy regarding removal of lab coats upon entering and exiting restricted and semi-restricted areas. • Launder cover apparel after each daily usage and when contaminated.

Transmission-Based Precautions

In addition to standard precautions, transmission-based precautions should always be followed once a patient develops symptoms of an infection to reduce opportunities for disease transmission.[1] The three categories of transmission-based precautions include contact, droplet, and airborne precautions. Because diagnostic tests are often required to confirm an infection and generally require several days for conclusive results, precautionary measures should be taken until the presence or absence of infection is confirmed.[1] Some diseases have multiple routes of transmission, therefore multiple transmission-based precautions may be necessary.[1] Clinicians should also be vigilant and aware of the increasing incidence of vaccine-preventable disease and their impact on patient care and provider safety.[48] Adherence to timely transmission-based precautions will mitigate opportunities for infections to spread, and in certain cases decrease the risk of community outbreaks of infectious diseases.[49] Table 4 describes protocols and examples of transmission-based precautions.

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72 **Table 4.** Transmission-based precautions.[1,15,48-58]

Precaution	Description	Protocol	Examples
Contact	Prevents transmission of infectious agents spread by contact with the patient or environment.	• Use single-patient rooms when possible. • Maintain ≥ three feet spatial separation between beds in rooms with more than one patient. • Wear a gown and gloves for all contact with the patient or the patient's environment. • Wear PPE before entering the patient's room and discard it before exiting the patient's room. • Use disposable single-use or patient-dedicated noncritical care equipment (e.g., blood pressure cuffs, stethoscopes).	Include, but not limited to: • *Clostridium difficile** • *Norovirus** • Scabies • Salmonella • Shigella • Poliomyelitis • Patient with multi-drug resistant organisms
Droplet	Prevents transmission of infectious agents spread by close contact with respiratory secretions.	• Use single-patient rooms when possible. • Use a private patient room, when possible. Maintain ≥ three feet spatial separation and a curtain between beds in rooms with more than one patient. • Wear a gown, gloves, mask, and eye protection for all contact with the patient or the patient's environment. • Wear PPE before entering the patient's room and discard it before exiting the patient's room. • Place a facemask on the patient during transport.	Include, but not limited to: • Influenza • Pertussis • Mumps • Rubella • *Neisseria meningitidis* • Diphtheria • Respiratory syncytial virus • SARS-CoV-2
Airborne	Prevents transmission of infectious agents	• Place patients in an airborne infection isolation room designed with monitored negative pressure, 12 air exchanges per hour, and	Include, but not limited to: • *M. tuberculosis*

Precaution	Description	Protocol	Examples
	that can spread over longer distances when suspended in the air.	air exhausted directly to the outside or recirculated through high-efficiency particulate air filtration. • Facilities should establish a respiratory protection program. • Isolate N95 or higher level masked patients in a private room when airborne precautions cannot be achieved. • Healthcare workers should don gloves, gowns, and N95 mask upon entering an infectious patient's room. • As possible, clinical and non-clinical healthcare staff should maintain ≥ six feet special separation with patients who have or are at risk of infection, • Place a facemask on the patient during transport. Healthcare workers with natural or acquired immunity are the preferred providers for infectious patients with airborne diseases.	• Measles • Varicella • SARS-CoV-2 • Smallpox • Mpox
Bloodborne	Prevents transmission of infectious agents in the blood.	• For anticipated exposure to sprays, splatters, and splashes, use additional PPE such as face masks, goggles, fluid-resistant gowns. • Treat all blood and body fluids as potentially infectious. • Immediately wash exposed skin or flush mucous membranes with water if exposure occurs. • Report and seek medical evaluation for any potential bloodborne pathogen exposures. • Properly handle and dispose of sharps (e.g., needles) in puncture-proof containers.	Include, but not limited to: • HIV • Hepatitis B virus • Hepatitis C virus High-risk bodily fluids include: • Blood • Semen, vaginal secretions

Precaution	Description	Protocol	Examples
		• Decontaminate equipment and surfaces exposed to blood or bodily fluids with EPA-approved disinfectants.	• Cerebrospinal fluid • Synovial, amniotic, pericardial, and pleural fluid Low-risk bodily fluids include**: • Urine, feces • Teams, saliva, vomitus • Nasal secretions

[3]Facilities should consider use of a hypochlorite solution for environmental cleaning as an additional contact precaution.[50]

[4]*Unless blood stained.[15]

During heightened periods of virulent and highly contagious infectious outbreaks (e.g., SARS-CoV-2, Ebola virus disease [EVD], *Enterovirus*), healthcare providers are encouraged to refer to the following resources for supplemental information regarding transmission-based precautions:

- AANA Practice Committee and Infection Control Advisory Panel (www.aana.com and practice@aana.com).
- Local and/or state health departments.
- Centers for Disease Control and Prevention (CDC) (www.cdc.gov).
- Society for Healthcare Epidemiology of America (www.shea-online.org).
- Association for Professionals in Infection Control and Epidemiology (www.apic.org).
- Infectious Diseases Society of America (www.idsociety.org).

Respiratory Hygiene

Respiratory hygiene includes cough etiquette and the appropriate use of isolation precautions to prevent the spread of infection.[59]

Perform the following measures for cough etiquette when afflicted with a respiratory disease:[59]

- Cover mouth and nose with a tissue when coughing or sneezing.
- Dispose of tissue after use in the waste bin.
- Perform hand hygiene following contact with respiratory secretions.
- Do not perform patient care when infected or ill.

Healthcare providers should take droplet precautions and standard precautions, when caring for a patient with symptoms of a respiratory infection, particularly if fever is present.[59] Maintain these precautions until it is determined that the cause of symptoms is not an infectious agent that requires droplet precautions.[59]

During periods of elevated respiratory infection incidence, facilities may offer facemasks to patients who are coughing and take additional transmission-based precautions, as necessary.[59-61]

Skin Preparation

Preparing the patient's skin prior to performing any invasive procedures will reduce the risk of infection.[15] Healthcare providers should follow manufacturer recommendations and facility policy for the proper use of skin prep agents.

An ideal skin prep agent should decrease microorganism count, inhibit rebound and regrowth of microorganisms, activate quickly, and be effective against a variety of microorganisms.[62] Each prep agent has a specific mechanism of action along with specific advantages and disadvantages that should be weighed in all clinical situations.[62] The patient's allergies, skin condition, other contraindications, and the procedure site should be considered prior to applying the agent. Table 5 provides examples of skin prep agents, their descriptions, and recommendations for use.

Table 5. Skin prep agent examples, descriptions and recommendations.[62-70]

Agent	Description and Recommendations
Chlorhexidine gluconate	• Preferred skin prep agent due to immediate action, residual activity, and persistent effectiveness against a wide range of microorganisms.[62-64,66-69] • Available in a wide range of concentrations (0.5% - 4%) and formulations.[66] • Strong tendency to bind to tissue, contributing to extended anti-microbial action.[63] • Highly effective in the presence of blood and organic material. [32] • Addition of alcohol to the disinfectant provides more rapid and effective bacteriostatic germicidal activity.[62-64] • Limited sporicidal activity.[63] • Some fungistatic and fungicidal properties and can neutralize some viruses.[69] • Not recommended for use on eyes, ears, brain and spinal tissues, mucus membranes, or genitalia.[62]
Povidone-iodine	• Suitable alternative when chlorhexidine gluconate is contraindicated.[63] • Highly effective against a broad range of microorganisms and acts immediately.[62-64] • Safe to use on face, head, mucous membranes, vaginal area and during other neuraxial procedures.[63-65] • Lower risk of tissue damage upon direct contact compered to chlorhexidine.[66]

Agent	Description and Recommendations
	• Minimally persistent compared to chlorhexidine.[63] • Limited residual activity.[62,64,66] • Decreased effectiveness in the presence of blood and organic material.[62] • Transcutaneous iodine absorption can result in iatrogenic hyperthyroidism or hypothyroidism in adult and pediatric populations.[66]
Parachoroxylenol	• Less effective than chlorhexidine gluconate and povidone-iodine at eliminating microorganisms.[62] • Moderately effective against a broad range of mircoorganisms.[63] • Moderate persistent/residual activity. • Nontoxic with no tissue contraindications.[62] • Remains effective in the presence of blood and organic material and in the presence of saline solution.[62]
Iodine-base with alcohol	• Highly effective against a broad range of microorganisms.[63] • Poor sporicidal activity.[66] • Acts immediately.[62,63] • Highly flammable.[62]

Fire Risk: Agents that are alcohol-based or have flammable properties have the potential to increase the risk of surgical fires.

Aseptic Technique

Aseptic technique requires multiple methods to prevent the transmission of microorganisms from the environment, healthcare provider, and patient. Table 6 refers to recommendations for aseptic procedure.

Table 6. Guidelines for aseptic technique.[15,47]

Precaution	Guidelines
Equipment *(Maximal sterile barriers)*	May include some or all of the following items depending on the procedure: • Sterile gloves • Sterile gowns • Surgical masks

	• Sterile drapes
Preparation	• Antiseptic skin preparation of patient prior to procedure. ○ *Consult manufacturer product instructions for directions and warnings regarding the proper use and application of specific skin antiseptics such as chlorhexidine-alcohol or povidone-iodine.* • Ensure that all instruments, equipment, and devices are sterile.
Environmental Controls	• Recognize and avoid risks in the environment that may increase risk of infection. • Close doors during operative procedures. • Minimize unnecessary staff and traffic in/out of operating room.
Contact	• Precautions should be taken to mitigate contact with non-sterile surfaces and objects.

Airway Management: Considerations Specific to Anesthesia Professionals

Airway management poses unique challenges to anesthesia professionals in limiting or preventing environmental contamination. In order to mitigate disease transmission while ensuring the standard of care for proper airway management, the following practices are recommended:

- Oxygenation and ventilation are top priorities during airway manipulation, verifying that infection control and prevention measures are taken when possible.[15,71,72]
- Immediate ventilation is indicated prior to hand hygiene following airway device placement to oxygenate and assess airway patency.[15,72]
    - CDC guidelines indicate the need to remove gloves, wash hands, and don new gloves, which would conflict with the standard of clinical care for airway instrumentation and maintenance. [1,15,72]
- Following maneuvers to establish a patent airway, the patient should be ventilated manually, the breath sounds auscultated, and the expired breath examined for presence of expired carbon dioxide.

- It is recommended that anesthesia practitioners double glove prior to airway manipulation.[25,73,74]
    - Following tube or device insertion, remove contaminated outer gloves and perform necessary actions to assure airway security and patency.
- When the situation is stable, remove the inner gloves, perform hand hygiene, and don clean gloves to continue with patient care.
- Decontamination of the anesthesia work area after each procedure is crucial to mitigate the risk of bacterial transmission. [16,17,75] Additionally, continuous research efforts are vital to develop innovative strategies that can further enhance infection prevention measures specific to the anesthetizing location and workflow.[16,17,75]

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