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What Every Phlebotomist MUST Know About Hand Hygiene



Venipuncture is the most commonly performed medical procedure in healthcare. So just how critical is it that phlebotomists and other healthcare workers drawing blood samples keep their hands clean? Consider this: more patients die each year from infections received from those who care for them than they do from being misidentified. You may be properly identifying every patient, but are you protecting them from the bigger risk that comes with being hospitalized? If not, here's what you must know.

Each year, an estimated two million healthcare-associated infections (HCAI) are transmitted in the U.S., leading to 90,000 deaths among Americans and an estimated \$6.5 billion in medical expenses.^{1,2} That translates into one in 136 patients hospitalized in the U.S. becoming seriously ill as a result of an acquired HCAI.² Although difficult to measure, the global impact of HCAs in developed and developing countries is estimated to be 1.4 million affected patients at any given time.² Proper hand hygiene is critical to the prevention of these infections.

In this article, we discuss what every phlebotomist must know about hand hygiene, including: pathogen transmission, when to sanitize hands, a comparison of cleansing agents, practices that promote skin irritation, prevention strategies, barriers to hand hygiene compliance, glove use, tourniquets, and World Health Organization (WHO) recommendations

regarding fingernails and jewelry. To increase awareness of the collector's role in infection control and reinforce proper hand hygiene practices, incorporate these concepts into your staff meetings and in-services.

A Hand in Transmission

Do you always wash your hands when you should? What about your coworkers who draw blood? According to a study evaluating hospital infection control practices during venipuncture and tourniquet use, the answer is most likely "No". Of survey participants, only 26.9% reported that they always washed their hands both before and after performing a venipuncture.³ When behaviors were directly observed, hands were washed both before and after blood specimen collection only 45% of the time.



So, how does transmission occur? According to the World Health Organization's *Guidelines on Hand Hygiene in Health Care* released in 2009, transmission of pathogens from patient to patient via the hands of a healthcare worker (HCW) requires five steps:²

1. Organisms are present on the patient's skin or on contact surfaces;
2. Organisms must be transferred to the hands of healthcare personnel;
3. Organisms must be able to survive for at least several minutes on the employee's hands;
4. Handwashing or hand hygiene must be omitted or insufficient, or the agent used ineffective;
5. Staff must come in contact with another patient, or with an inanimate object with which another patient will come in contact.

Blood collection personnel should be aware that pathogens can be recovered from not only patient wounds that are infected or draining, but also from normal intact skin. Due to the body's normal shedding of skin cells, it is not unusual for viable microorganisms to be present on a patient's gown, bedding, bedside furniture as well as other items in the patient's immediate surroundings.²

Culturing the hands of healthcare personnel after various activities has shown contamination following



patient contact and after contact with body fluids. One study revealed a glove contamination rate of 17% after contact with a MRSA colonized patient.

In another study, staff caring for patients with vancomycin-resistant enterococci (VRE) demonstrated a hand/glove contamination rate of 70%. A 52% contamination rate of gloves/hands of employees was shown after entering the room of a patient with VRE and touching environmental surfaces, although no direct patient contact occurred. Additional studies have revealed that VRE can survive on gloved and ungloved fingertips for at least 60 minutes.² Contamination of other inanimate surfaces beyond the patient's immediate environment has also been demonstrated, including ward handwashing stations, with the faucet/tap handles more likely to be contaminated than other parts of the station.²

What you must know: Pathogenic organisms present on the patient's skin and on other surfaces in the patient's immediate environment can survive on the gloves/hands of the collector for several minutes. If inadequate hand hygiene is performed, patient-to-patient transmission can occur.

When to Cleanse

OSHA's Bloodborne Pathogens Standard requires employees who may come into contact with blood or other potentially infectious materials to wash their hands immediately or as soon as feasible after removal of gloves or other personal protective equipment.⁴ For phlebotomists who draw patients continually throughout their shifts, adhering to hand hygiene protocols is an important aspect of infection control and assuring patient safety. Indications for hand hygiene are as follows:^{2,5}



- Wash hands with soap and water when hands are visibly dirty or contaminated with blood or body fluids, before eating, or after using the toilet.
- If exposure to potential spore-forming pathogens is strongly suspected (i.e., outbreaks of *Clostridium difficile*), handwashing with soap and water is required.
- If hands are not visibly soiled, use an alcohol-based handrub for routine hand hygiene, decontaminating hands:
 - before and after direct contact with patients;
 - after contact with inanimate objects and surfaces in the immediate vicinity of the patient;

- after removing gloves.

What you must know: When hands are visibly soiled or contaminated, handwashing with soap and water is required. When hands are not visibly soiled, the use of alcohol-based handrubs is acceptable for routine hand hygiene before and after patient contact, after touching patient surfaces, and after removing gloves.



Rubs Versus Wipes Versus Wash

A comparative study of three hand hygiene agents (62% ethyl alcohol handrub, medicated handwipes, and handwashing with plain soap and water) was conducted in a group of surgical ICUs. The results showed that hand contamination was significantly less after use of the handrub as compared to either the medicated handwipe or traditional handwashing with soap and water. Alcohol-based handrubs have demonstrated excellent germicidal activity against Gram-negative and Gram-positive organisms including MRSA and VRE. They have also been shown effective against *M. tuberculosis* and several fungi. Alcohol cleansers containing 60-80% alcohol are most effective. When applied to skin, alcohol-based handrubs have rapid germicidal activity but little residual effect. However, handrubs are not recommended when hands are visibly soiled or contaminated.

When washing hands with soap and water is indicated, it's important that an adequate amount of soap be used covering all skin surfaces, with the entire handwashing procedure taking 20 seconds. When handrubs are properly applied, the process takes 20 to 30 seconds. A palmful of product should be applied according to manufacturer instructions, covering all surfaces of the hands. Hands should be rubbed until dry, as donning gloves while the hands are still wet can lead to skin irritation.

So, do facilities have to provide alcohol-based hand products to their staff? According to The Joint Commission, accredited organizations are required to provide healthcare workers with a readily accessible alcohol-based hand product. However, use of such a product by any individual healthcare worker is not mandatory. The CDC and WHO hand hygiene guidelines describe when this type of hand sanitizer may be used instead of



soap and water. If a healthcare worker chooses not to use it, then soap and water should be used instead. Because antimicrobial handwipes are not as effective at reducing bacterial counts on the hands of healthcare workers, they are not a substitute for alcohol-based handrubs or antimicrobial soap.

What you must know: If performed properly, handwashing with soap and water should take 20 seconds. Applying handrub should take at least 20 to 30 seconds, with the hands rubbed until dry. Don't don gloves while hands are still wet. Medicated handwipes are not an adequate substitute for handwashing or alcohol-based handrubs.

Practices that Promote Skin Irritation

Certain practices can increase skin irritation and should be avoided. When washing hands with soap and water, water temperature doesn't appear to be a critical factor for microbial removal. Most important is avoiding water that is too warm that can lead to skin irritation and damage.

Routinely washing hands with soap and water immediately before or after use of handrubs is also unnecessary and can cause dermatitis. However, when powdered gloves are worn, alcohol-based handrubs may interact with residual powder on the hands, leaving an undesired, gritty feeling, which may necessitate handwashing.

Because wet hands can easily acquire and spread germs, proper drying of the hands is a critical step in the handwashing process. One study compared four methods of drying hands (paper towels, cloth towels, warm air dryers and allowing the skin to air-dry). No significant difference between methods was noted. The use of cloth towels was discouraged due to the potential for cross-contamination from sharing or reuse. However, when using clean or single-use paper towels, it's important to *pat* the skin dry rather than rubbing it, which can cause chaffing and compromise skin integrity.

What you must know: When washing hands, water temperature isn't critical to the cleansing process. Avoid using hot water. Wet hands easily spread germs. If drying hands with a paper towel, pat the skin dry rather than rubbing it to reduce chaffing. Don't use soap and handrubs simultaneously.

Prevention Strategies

Frequent glove use can place phlebotomists and other healthcare professionals at increased risk for skin irritation. Repeated use of hand hygiene products is a



significant cause of irritant contact dermatitis for healthcare workers, with reported rates of skin problems as high as 85% among nurses surveyed.² In terms of skin reactions, alcohol-based handrubs are generally better tolerated than traditional handwashing with soap and water.

Some studies suggest that applying skin moisturizer prior to gloving resulted in improved skin hydration. Also, initial studies of examination gloves coated aloe vera indicate improved skin integrity.² To minimize the risk for hand hygiene-related dermatitis, facilities should select less irritating hand hygiene products, avoid practices that increase skin irritation, and make available moisturizing skin care products for use after cleansing.

However, when selecting skin care products, facilities must evaluate the potential for negative effects on glove integrity, efficacy of the hand cleanser, and as well as the potential for product contamination. Petroleum-based lotions and creams have been shown to damage latex gloves and should be avoided. Employees should refrain from using hand lotions brought from home, as they may contain petroleum compounds and have also been implicated in infectious outbreaks in healthcare settings.⁶

What you must know: In terms of preventing skin irritation, alcohol-based handrubs are better tolerated than soap and water. Applying an approved moisturizer prior to gloving can improve the condition of the skin. Employees should not use hand lotions brought from home, as they may contain ingredients that compromise glove integrity and can become contaminated.

Compliance Rates and Barriers

Failure to properly sanitize hands is not a problem exclusive to healthcare professionals, as it has been repeatedly demonstrated in the general population. A study conducted at the University of Alabama evaluated at random the hand hygiene habits of 100 students who possessed an understanding of proper hygiene.⁷ Findings of this study included the following:

- 1) female students had a tendency to wash their hands more often than male students while visiting the bathroom (80% vs. 60%);
- 2) science majors were more likely to wash their hands than non-science majors;
- 3) those observed not washing their hands reported being sick more often than those observed performing hand hygiene.



A hand hygiene study commissioned by a pharmacy retail chain in the United Kingdom found that one in three people use a mobile phone while in the restroom and 5% use a laptop. Approximately one-third also reported not using soap after using the restroom.⁸

Compliance rates for handwashing after restroom visits averages 60% or less in most populations, including healthcare settings.⁸ Compliance with hand hygiene protocols after patient contact also varies widely. While compliance in most study groups falls between 40 and 70%, the range is between 20 and 90%. This wide range however, may be attributable to who's doing the observing. According to a study conducted at two hospitals, peers from the same unit reported higher compliance rates than non-unit based observers (79% vs. 58.6%, respectively). The lack of standardized data collection methods may also be a factor in the variation seen in compliance rates.⁹

Another study identified predictors of poor hand hygiene in hospital settings during routine patient care.² Variables measured included the individual's profession and hospital ward, the day/time of week, and the type and level of patient care they provide. Compared to other healthcare workers, doctors had the worst compliance rates and nurses had the best. Proper hand hygiene practices were found to be worst on weekdays than weekends. In terms of patient location, ICUs had the lowest compliance rate for hand hygiene (36%) with the highest being in pediatric wards (59%).



Outbreak investigations suggest an association between the spread of infection and understaffing of nursing personnel, due to decreased hand hygiene compliance when staffing is low. Studies also show that as the intensity of a patient's care goes up, adherence to hand hygiene protocols while providing that care goes down. This information leads to a sobering conclusion: if you're a patient at an understaffed facility experiencing a peak workload, your risk of acquiring a nosocomial infection jumps fourfold.²

Barriers to hand hygiene compliance include:

- Skin irritation caused by the cleansing agent;
- Lack of access to hand hygiene supplies;
- A perception that patient needs are a priority over hand hygiene;
- Wearing gloves;
- Forgetfulness;
- Lack of knowledge of hand hygiene guidelines;
- Insufficient time to cleanse hands;
- High workload and understaffing;

- Lack of scientific evidence showing the impact of proper hand hygiene on HCAI rates.

The good news is that educational efforts do pay off. Several studies have shown when people are presented with the pros and cons of proper hand hygiene, they are more likely to wash their hands.⁷ Studies also indicate that easy access to hand hygiene products at the point of patient care, particularly handrubs, improves compliance.² In one study, 52 physicians examined patients in rooms that were identical in design, with the only exception being the placement of the hand sanitizer. In one room, the hand sanitizer was in plain sight; in the other room it was not. The compliance rate was 53.8% when the hand sanitizer was in the physician's field of view versus 11.5% when it wasn't.¹⁰

What you must know: Hand hygiene adherence rates vary greatly and are negatively impacted by several factors including high workload and understaffing. Both increase the patient's risk of a nosocomial infection. Staff education and making hand sanitizers available at the point of care can improve compliance.

Hand Hygiene and Glove Use

When it comes to the barrier protection provided by gloving, results vary depending on the type and quality of glove material used, manufacturer, length of time worn, and the method of testing for glove leaks. Although studies suggest improvements in glove quality, proper hand hygiene is the most important way to protect patients and blood collection personnel from pathogen transmission and infection. Even when gloves are worn, they do not afford total protection against hepatitis B and herpes simplex viruses. Gloves should never be considered completely impermeable or used as a substitute for proper hand hygiene. Moreover, improper glove use can spread disease. Two reports conclude the failure to remove gloves and wash hands between patients may have contributed to transmission of MRSA during the 2003 SARS outbreak.^{2,3}



According to the CDC's *Guideline for Hand Hygiene in Health-Care Settings*, "Failure to remove gloves after patient contact or between 'dirty' and 'clean' body-site care on the same patient must be regarded as non-adherence to hand-hygiene recommendations."⁴ It also violates OSHA regulations. One study observing proper glove use found healthcare workers failed to remove gloves after a venipuncture 23% of the time.³

To protect against damage, gloves should be kept in their original packaging or box until they are donned. This requires their availability at the point of use, along with alcohol-based hand sanitizers. When removed, gloves should be discarded and should not be washed or decontaminated. This is because disinfecting agents may damage the glove material allowing blood and other substances to come into contact with the hand.⁴ Handwashing with soap and water is required if gloves are removed because of a tear or puncture compromising barrier protection. If a damaged glove results in the collector having contact with blood or other body fluid, it should be treated as a direct exposure.²

What you must know: Gloves are not a substitute for proper hand hygiene and aren't completely impermeable to pathogens. When gloves aren't changed between patients they become a potential means for patient-to-patient microbial transmission. Gloves should not be washed or reused. If a damaged glove results in contact with blood or other body fluid, the incident should be treated as a direct exposure.

Tourniquets

Although not directly tied to hand hygiene, reusable tourniquets may play a role in nosocomial infections. A study conducted at Wilford Hall Medical Center, Lackland AFB, TX, screened used tourniquets for *Acinetobacter baumannii* and *Staphylococcus aureus*.

Tourniquets were collected and cultured after one day's use in an outpatient blood collection center or after being used on inpatients during morning rounds. Although no MRSA was isolated, the overall contamination rate for the screened organisms was 9%. The authors also conclude that instituting a policy for single-use tourniquets would not totally eliminate the risk of transmission since a healthcare worker with poor hand hygiene could transfer pathogens to a new tourniquet.¹¹



[Editor's Note: An article on MRSA and tourniquet contamination was published in the July 2008 issue of Phlebotomy Today.]

What you must know: Reusable tourniquets can potentially harbor bacterial pathogens. Single-use tourniquets can be contaminated before use by poor hand hygiene practices.

Jewelry

Studies have shown that more microorganisms are present on the skin underneath rings than on the skin of fingers without rings. One study found that 40% of nurses had Gram-negative bacteria under their rings, with some harboring the bacteria for months. Another study showed that when an alcohol-based cleanser was used, there was no appreciable difference in the bacterial counts on hands with or without rings. At least one study associated an increase in types of organisms present on the hands with longer fingernails and wearing rings.

There is also the risk that longer nails, nails with decorative stones imbedded into the nails, and jewelry with sharp edges may puncture gloves and compromise protection. If multiple rings are worn, there exists an additional concern that hand hygiene will not be as thoroughly performed.²

What you must know: Wearing rings increases the number of microorganisms on the skin and may damage gloves. Wearing multiple rings may hinder proper hand hygiene.

Nails

Many studies have shown that the area underneath the fingernails harbors high concentrations of organisms. Although freshly applied nail polish does not increase the concentration of organisms present, it does appear that chipped polish may aid bacterial growth. A growing body of evidence has linked artificial nails to the transmission of certain healthcare-associated infections.



Phlebotomists who wear artificial nails are more likely to harbor Gram-negative pathogens than phlebotomists with natural nails, even after handwashing or using an alcohol-based hand gel. Healthcare personnel wearing artificial nails have been implicated in several outbreaks.

The WHO consensus recommendations are that healthcare workers not wear artificial nails or extenders when having direct patient contact. Natural nails should be kept short, approximately ¼ inch long.² In the interest of safety, many organizations following the CDC's hand hygiene guideline, which restricts personnel who care for patients at high risk of acquiring infections (i.e., patients in intensive care units or in transplant units) from wearing artificial nails, have chosen to expand the ban on artificial nails to include all healthcare providers. Each facility should incorporate policies regarding the wearing of jewelry, artificial nails, nail stones

and other accessories, nail polish and nail length in healthcare settings into their hand hygiene protocol, taking into account the transmission risks to patients and employees.

What you must know: Fingernails can harbor high concentrations of organisms and long nails may damage gloves. Natural nails should be kept short (¼ long). Chipped nail polish may encourage bacterial growth. Artificial nails have been linked to several outbreaks. In response, many facilities are restricting all healthcare workers who provide direct patient care from wearing artificial nails or extenders.

In Summary

When healthcare professionals fail to adhere to established hand hygiene procedures between patients, transmission of microorganisms is likely to occur. Resulting healthcare-associated infections (HCAs) can lead to dire consequences for the patient including prolonged hospital stays, long-term disability, soaring financial costs to facilities and families, and patient death. Because phlebotomy procedures require direct and often repeated patient contact, phlebotomists play a fundamental role in infection control by consistently adhering to hand hygiene protocols. When not adhering, they play a fundamental role in spreading deadly bacterial strains.

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