# Evidence-Based Approaches to Mitigating Infection Transmission Risk: A Focus on Contaminated Hands and Environmental Surfaces

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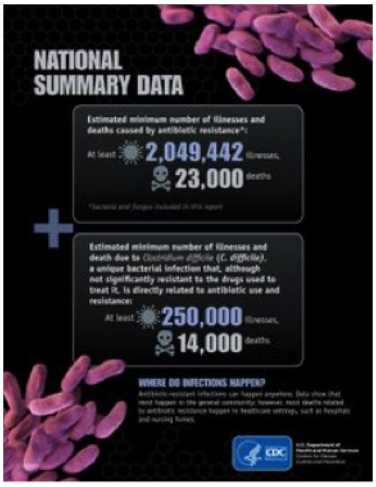
## Background

The US Centers for Disease Control and Prevention (CDC) recently released new figures related to progress around Healthcare Associated Infections. It is estimate that one in every twenty-five hospitalized patients will contract a Healthcare Associated Infection (HAI)[1]. This risk is unknown in outpatient settings such as ambulatory care clinics. In addition, recent estimates cite that over fifty percent of hospitalized patients receive some type of antimicrobial therapy, which could then result in antimicrobial resistance[2]. Community pathogens and inappropriate use of antibiotics plays a tremendous role in the development of antimicrobial resistance. Many of these resistant pathogens are spread through the hands of healthcare providers and patients, but also through environmental surfaces. Especially in outpatient healthcare environments, which are the future of the healthcare delivery model with healthcare reform, drug resistant pathogens and HAI transmission is of great concern to protect both patients and the healthcare provider team.

*Figure 1: CDC Estimates of Illnesses and Deaths Associated with Antimicrobial Resistance*

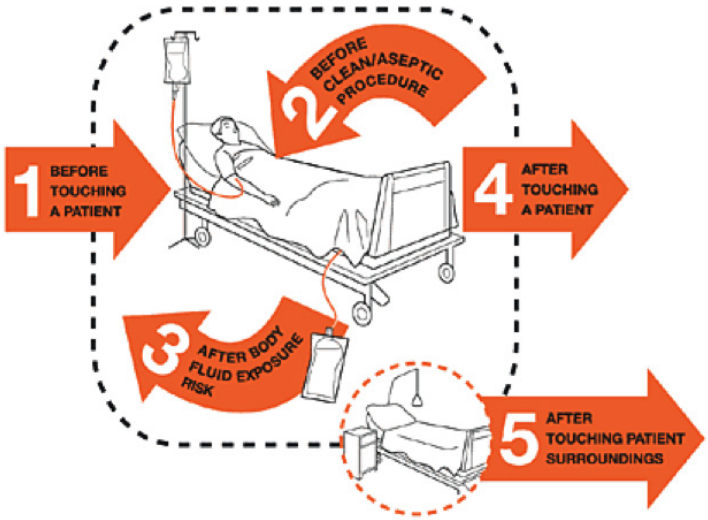



Hand Hygiene is recognized by Infection Prevention and Control experts as the single most important intervention to decrease the spread of infection in both healthcare and community settings[3]. Because the hands are vectors for transmission between people as well as inanimate objects such as environmental surfaces, it is critical to frequently practice Hand Hygiene using the traditional soap and water or an alcohol-based product as appropriate. In outpatient environments, high touch items are frequently used between patients to perform basic tasks such as vital signs and other types of patient monitoring. During the patient intake process, it is the standard protocol to check the patient's weight, blood pressure, pulse oximetry and blood glucose reading (if medically appropriate), and temperature. These high touch items are used daily between patients hundreds of time, and can easily serve as a reservoir for bacterial and viral growth. Studies have demonstrated that deadly bacteria and viruses can survive on these surfaces for periods of hours to months in some circumstances. *Clostridium difficile*, for example, has been cultured on environmental surfaces for up to six months. Given that the major causative reason for *Clostridium difficile* is inappropriate use of antibiotics, and the organism in many cases comes from community settings, this is additional justification to ensure that regular hand hygiene takes place within the facility. Additional disinfection steps with a 1:10 dilution of sodium hypochlorite are also necessary when there is evidence of an ongoing transmission of this organism.

The US Centers for Disease Control and Prevention and World Health Organization both maintain extensive Hand Hygiene guidelines to guide healthcare providers in the proper practice of Hand Hygiene. In addition, various quality and patient safety organizations such as the Institute for Healthcare Improvement (IHI) and The Joint Commission have published ancillary resources to assist facilities with implementation of the latest evidence based practices for hand hygiene. A solid Hand

Hygiene program with documented compliance will reduce risk for transmission of microorganisms to patients, reduced risk for healthcare worker colonization, and also reduce the mortality, morbidity, and costs associated with treatment of healthcare acquired infections. The World Health Organization has created a pictorial guide to reinforce the appropriate opportunities for healthcare providers to practice hand hygiene (see Figure 2 below).

*Figure 2: World Health Organization Five Moments for Hand Hygiene*




Source: The World Health Organization

## Transmission of Microorganisms via the Hands of Healthcare Workers and Environmental Surfaces

The 2009 World Health Guidelines for Hand Hygiene for Healthcare Settings identifies five clear steps for the nosocomial transmission of pathogens from one patient to another via the healthcare worker's hands. First, microorganisms must be present on the patient's skin or have to be shed into the patient's environment such as nearby inanimate objects such as the bedside table. Next, the microorganisms must be transferred to the hands of the healthcare worker. Third, the microorganism that have contaminated the worker's hands must be able to survive on the hands. Next, the healthcare worker must either omit hand hygiene or inadequately perform it. Last, the healthcare worker's contaminated hands must come in direct contact with either another patient or with an inanimate object that will then come in contact with a patient such as a portable vital signs monitor being shared between patients. The role of the healthcare environment in transmission is evolving, and clinical research has documented the role the environment plays in transmission of HAIs[4–8].

## Evidence-Based Deployment of Infection Prevention Solutions to Ensure Point of Care Availability

Research has shown that for clinicians to appropriately utilize infection prevention product solutions such as hand hygiene and disinfectants, the solutions must be readily available to facilitate point of care usage. This is particularly true for hand hygiene solutions since there are many documented reasons for noncompliance with evidence-based hand hygiene interventions. To combat this, our facility approached hand hygiene using a more customer-centric model that focused on availability for the healthcare provider team, but also for the patient themselves. This was accomplished through providing two different locations for hand hygiene solutions in each patient examination and procedure room. One location was immediately adjacent to the Electronic Medical Record computer used during every visit by the healthcare provider team. The second location was located right inside the entrance to the room, which facilitated initial hand hygiene by the provider upon entry and exit from the room, but also was fully accessible to the patient and family members. This approach captured all opportunities for ensuring hand hygiene was readily accessible during the entire visit. Additionally, the computer keyboards were disinfected at the beginning and end of each day to minimize colonization.

## Indications for Hand Hygiene in Healthcare Settings

The goal of handwashing and hand hygiene is to remove as much of the microorganisms from the hand as possible to avoid transmission. The skin flora is divided into two layers: transient and resident. The transient flora is the layer that colonizes the most superficial layers of the skin (epidermis) and are fairly easily removed from the hand after thorough hand hygiene is performed. The resident flora is found on deeper layers of the skin such as *stratum corneum*. This transient flora is where the majority of the troublesome microbes that cause infection are found, and they can be removed through proper hand washing. Patients, in many cases, are also colonized, and therefore benefit from the opportunity to perform hand hygiene as well.

According to the latest guidelines from the World Health Organization, healthcare workers should concentrate their hand hygiene efforts before touching the patient, after touching the patient, after touching inanimate objects in the patients' surroundings, after exposure to blood fluids and before clean/aseptic procedures.

- Alcohol-based agents may be used in the following situations:
  - When hands are **not** visibly soiled or contaminated with blood or body fluids
  - Before having direct contact with patients
  - After having direct contact with a patients skin
  - After contact with body fluids or excretions, mucous membranes, nonintact skin, or wound dressings
  - If moving from contaminated to clean body site
  - After contact with inanimate environment (equipment or furniture near patient)
  - After removing gloves
  - Emergency situations where sinks are not available (EMS, Police, Fire Rescue) and hands visibly soiled

## CDC Recommendations for Hand Hygiene

Hand Hygiene agents must be carefully selected in order to ensure compliance, efficacy, and safety of the agent for both the healthcare worker and patient. Several factors must be taken into consideration:

1) Cost of the agent
2) Ease of product use for healthcare workers
3) Potential for dermal irritation skin reactions
4) Efficacy of the agent
5) Product availability and accessibility
6) Drying time necessary after application
7) Staff support for the product selected

An evaluation of the agent should be done to evaluate the staff's usage of the product and to ensure a smooth transition to the new agent. In addition, adjuncts to prevent contact dermatitis such as hospital grade lotions must be considered to ensure a low risk for adverse events.[9] The CDC and The World Health Organization recommend the use of an alcohol-based hand rub with an alcohol concentration between 60-90% for healthcare worker hand hygiene. Alcohol-based hand rubs can be used when soap and water are not indicated or readily available.

## A Chronicle of Successful Implementation and Sustainability

In 2007, our facility instituted a comprehensive hand and environmental hygiene program consisting of disinfection of all high touch surfaces with the Super Sani-Cloth disinfectant wipe between all patient visits and also access to the alcohol based hand wipes throughout out ambulatory clinics. The staff concentrated on the high-touch surfaces such as the exam table, patient chair, countertop, door knob, etc. Our goal was to reduce the amount of contamination of the immediate environment. We then focused our efforts on reducing the contamination of the hands of not only our healthcare providers, but also their families. Hand Hygiene was made available in all clinical areas, in each exam room, and at high traffic areas such as elevators, lobbies, and patient entrances. Everyone can serve as a potential vector for transmission of Healthcare-Associated Infections.

After a full facility assessment was conducted identifying key locations for hand hygiene stations, as well as a careful review of the previous hand hygiene compliance data using alcohol-based hand gels, the Infection Prevention Committee implemented an Ethyl Alcohol Hand Sanitizing Wipe (Sani-Hands®) to replace the alcohol-based gel for patient and healthcare provider use. The wipes were mounted in over 650 locations throughout the facility, including every patient exam room, and in all major public areas such as lobbies, elevator banks, and waiting rooms. A full educational program on the correct use of the hand sanitizing wipes was rolled out for all employees of the facility. This campaign ensured that all potential high-traffic areas had readily-available hand hygiene solutions. The use of the environmental disinfectant was also expanded to include traditional germicides and also bleach for potential outbreaks or large blood spills. The facility, also utilizes the CDC's approach to emergent pathogens, which prevent transmission of these microbes which includes the following:

- Hand Hygiene (for healthcare providers, patients, and visitors)
- Cleaning and Disinfection (using hospital grade, EPA-registered disinfectant)
- Proper Adherence to Isolation Precautions and use of Personal Protective Equipment
- Appropriate Use of Antimicrobial Agents

Hand Hygiene Compliance for the healthcare providers more than doubled from 41% to 90% as a result of the introduction of the alcohol-based hand sanitizing wipes. The staff preferred the wipes delivery system over the previously used alcohol gels and foams. We have also received positive reviews from our Joint Commission surveys in regards to our inclusive culture of hand hygiene for not only healthcare providers, but also the patient themselves. In addition, the environment of care has been maintained through a careful collaboration with clinical personnel and our Environmental Services Professionals.

The use of an alcohol-based hand sanitizing wipe was greatly preferred by not only the healthcare providers, but also by the patients over the traditional alcohol gels and foams because of the ease of use, moisturizing effect, and ability to remove more soil from the hands. The key to success in this project was point of care dispensing of the alcohol-based hand wipes to ensure that the chain of infection transmission was broken through the rigorous hand hygiene program that was implemented, as well as senior executive and physician support. Alcohol-based hand sanitizing wipes provide a safe and efficacious delivery system for both patients and healthcare providers that is readily accessible and easily used by all.

## Strategies for Sustainable Compliance

Monitoring of hand hygiene is a key component in process improvement and improving compliance. The use of "secret shoppers" has proven to be an effective measurement tool for some facilities, while others rely on other measures to gauge compliance within their facility. Monitoring should be conducted on a routine basis and documented. Any personnel not compliant with the hand hygiene standards should be immediately counseled without delay to ensure instant remediation. The Institute for Healthcare Improvement has created an entire resource guide centered on the proper methods to monitor hand hygiene and judge compliance. It is also prudent to gain proactive administrative support to deal with employees that continue to violate the Infection Prevention and Control policies.

## Resources for Success

For any infection prevention initiative to demonstrate both initial and sustainable success, executive championship must be present. This C-Suite support is critical to ensuring widespread visibility for the initiative is evident. In addition, the traditional Infection Preventionist role has evolved into more of a system-wide consultant whom serves as a resource to the entire healthcare team. Johns Hopkins University developed the Comprehensive Unit Based Safety Program (CUSP), and this is a similar model to what was deployed throughout our facility. This approach creates unit-based local champions for Infection Prevention, and creates a culture of accountability throughout the organization. Finally, the deployment of evidence-based practices for hand hygiene and environmental disinfection must be part of the infection prevention and control program. Our facility focuses on the prevention of the pathogen vs. simply responding to the transmission of the infection, as well as engagement of the entire care delivery team and patient. This prophylactic approach has demonstrated sustained positive results in the outpatient environment that we serve.

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**About the Author:**

Ms. Pate has over twenty years of experience in healthcare in the fields of Infection Prevention, Employee Health, Patient Safety, Safety, Accreditation, and the Environment of Care. She is a frequent lecture on healthcare engineering and safety standards across the United States. She holds a Juris Doctorate Degree, a Master's Degree in Healthcare Administration, and a Bachelor's Degree in Nursing.

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## References

1. US Centers for Disease Control and Prevention, www.cdc.gov/hai.
2. Vital Signs on Antimicrobial Resistance, US Centers for Disease Control and Prevention, http://www.cdc.gov/vitalsigns/antibiotic-prescribing-practices/.
3. Hand Hygiene in Healthcare Settings, US Centers for Disease Control and Prevention, http://www.cdc.gov/handhygiene/.
4. US Centers for Disease Control and Prevention, www.cdc.gov/hai.
5. Vital Signs on Antimicrobial Resistance, US Centers for Disease Control and Prevention, http://www.cdc.gov/vitalsigns/antibiotic-prescribing-practices/.
6. Hand Hygiene in Healthcare Settings, US Centers for Disease Control and Prevention, http://www.cdc.gov/handhygiene/.
7. Pittet D., Improving compliance with hand hygiene in hospitals, Infec Control Hosp Epidemiol 2000; 21:381-6.
8. WHO Guidelines on Hand Hygiene in Health Care, World Health Organization, 2009.
9. WHO Guidelines on Hand Hygiene in Health Care, World Health Organization, 2009.