



Hand Drying at Medical Treatment Facilities

Technical Information Paper No. 59-030-0914

PURPOSE. To provide recommendations for designating hand drying methods within the military treatment facility (MTF).

REFERENCES. See Appendix A for a list of reference information.

POINTS OF MAJOR INTEREST AND FACTS

Hand Hygiene

Hand hygiene (HH) is one of the most important ways to prevent the spread of infections in the healthcare, childcare, and food service industries. Hand hygiene is a general term that applies to—

- Hand washing: washing hands with plain soap and water.
- Antiseptic hand washing: washing hands with water and soap or other detergents containing antiseptic agents such as alcohols, chlorine, iodine, etc.
- Antiseptic hand rub: applying an antiseptic hand rub product to all surfaces of the hands.
- Surgical hand antisepsis: Antiseptic hand wash or antiseptic hand rub performed preoperatively by surgical staff to eliminate transient and reduce resident hand flora (microorganisms).

Hand drying after hand washing with plain or antimicrobial soap and water is a very important part of the HH process. Studies show that infection transmission is more likely to occur from wet skin than dry skin because the moisture droplets are more easily transferred from one surface to another, and they allow microorganisms to survive better in their new environment. Unfortunately, the importance of hand drying is not emphasized in the Center for Disease Control and Prevention's (CDC) HH guidelines.

HAND DRYING METHODS

There are three general methods used to dry hands at MTFs: paper towel, warm air, and jet drying. Paper towels were introduced by the Scott® Paper Company in 1907. The first electric, warm air, hand dryer was invented by George Clemens from Chicago in 1948. This method evaporated the water off the hands. The first jet dryer, displacing the water off the hands rather than evaporating it, was introduced by Mitsubishi Electric® in 1993. (Scott® products is a registered trademark of Kimberly-Clark Worldwide, Inc.; Mitsubishi Electric® is a registered trademark of Mitsubishi Electric Corporation.)

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Comparing Hand Hygiene Drying Methods

In 2012, the Mayo Clinic published a paper titled "[The Hygienic Efficacy of Different Hand-drying Methods: A Review of the Evidence.](#)" This paper analyzed 12 separate studies conducted between 1970 and 2011 that compared four common hand drying methods: cloth towels, paper towels, warm hand dryers, and jet air dryers. The criteria used to determine the effectiveness of each hand drying method were: speed of drying, degree of dryness, effective removal of bacteria, and prevention of cross-contamination. The Mayo Clinic concluded that when it comes to hand drying, paper towels are superior to the electric air dryers because paper towels dry hands more efficiently, remove microorganisms from the hands more effectively, and cause less contamination of the washroom. The Mayo Clinic also recommended that paper towels be used in healthcare facilities where infection control and HH are crucial to patient safety.

Cost and Sustainability

The following assumptions were used to compare the cost of hand drying methods: (1) a 5-year life cycle serving 350,000 pairs of hands; (2) an electric cost of \$0.0648 per kilowatt hour (kWh); and (3) two towels used per pair of hands. Table 1 shows a life-cycle comparison of two types of jet dryers, a standard warm air dryer, and two types of paper towel dispensers. The paper towels were the most expensive. In terms of sustainability, the warm air dryer had the highest sustainability impact, due to the longer drying times and higher rated power usage, and the jet dryers the lowest based on data from "Life Cycle Assessment of Hand Drying Systems," 19 September 2011, by the Materials Systems Laboratory, Massachusetts Institute of Technology.

Table 1. Cost and Sustainability of Hand Drying Methods

Methods	Capital Purchase Cost per Device	5 Year Operational Cost	Life Cycle Global Warming Potential [g CO2 eq]
Dyson Airblade [®] for 12 seconds per pair of hands	\$1200	\$100	4
Xlerator [®] for 20 seconds per pair of hands	\$400	\$200	8
Warm air dryer for 31 seconds per pair of hands	\$440	\$460	19
Touch-less paper dispenser with 40 D batteries	\$89	\$11,730 + waste disposal	17
Manual single towel dispenser	\$25	\$5,250 + waste disposal	15

Notes: (Dyson Airblade[®] is a registered trademark of Dyson Research Limited)
(Xlerator[®] is a registered trademark of Excel Dryer, Inc.)

Benefits of Single-Use, Disposable Paper Towels

While based on cost and global warming potential, the jet dryers are both more economical and sustainable; however, drying hands with single-use, disposable paper towels is the recommended hand drying method in healthcare, child care, and food service because paper towels—

- Effectively remove transient microorganisms, for example *Staphylococci*, *Klebsiella* spp., and *Candida* spp., among others from the superficial layers of skin. Workers' hands can become contaminated with these microorganisms through direct contact with patients and contaminated environmental surfaces located within close proximity of the patients. Transient microorganisms are most frequently associated with healthcare acquired infections (HAIs). Hand washing separates the transient microorganisms from the skin, and the disposable towels remove the excess water along with the suspended contaminants that remain after rinsing. According to an article published by the *Journal of Applied Microbiology* ("Comparative Evaluation of the Hygienic Efficacy of an Ultra-Rapid Hand Dryer Vs. Conventional Warm Air Hand Dryers"), thorough hand drying with disposable towels after hand washing reduces the number of microorganisms transferred to skin, food, and other surfaces by 99 percent.
- Increase compliance with HH procedures. According to the Mayo Clinic paper, most (55-62 percent) of people prefer to dry their hands with disposable towels. If paper towels are no longer available, it is likely that compliance with HH guidelines will decrease. Another consideration is that access to an air dryer is limited to one person at a time, and when there is a back-up, workers may not wait to use them. The time taken to dry hands with an air dryer is longer than that needed with disposable towels. Most people spend 3.5–5.2 seconds drying their hands with disposable towels. Hand drying with disposable towels reduces residual water to 4 percent with 10 seconds of drying time and 1 percent with 15 seconds of drying time. Air dryers require 10 - 40 seconds drying time to reduce residual water to 4 percent. Using disposable towels will protect workers' hands from recontamination when workers use them to turn off the sink faucets and to open the bathroom doors. (Note: Disposable paper towel dispensers should be hands-free or designed so that only the disposable paper towel is touched during removal).
- Reduce cost. On the surface, using disposable towels appears to be more costly than using air dryers. However, the costs to treat HAIs or foodborne illnesses can exceed an organization's annual budget for the purchase of HH products. A recent CDC survey found that on any given day, about 1 in 25 hospital patients has at least one HAI. In 2011, there were an estimated 722,000 HAIs in U.S. acute care hospitals, and about 75,000 of those hospital patients with HAIs died during their hospitalizations. The CDC estimates that the average cost to treat a central line-associated infection is \$45,000 per case; pneumonia is \$40,000 per case; a surgical site infection is \$20,000 per case; a *C. difficile* infection is \$11,000 per case; and a

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urinary tract infection is \$900 per case. The National Restaurant Association estimates that just one foodborne illness can cost a restaurant upwards of \$75,000, and the reputational costs can be high enough to drive a restaurant out of business. Adhering to good HH is a low-cost preventative action and contributes significantly to preventing the spread of many of the microbes that cause HAIs and foodborne illnesses.

Proper Place for Jet Air Dryers

Jet air dryers are clearly more sustainable and economical than using paper toweling. Yet, there are prevailing HH compliance issues surrounding these devices. So how can the MTF support sustainability and cost efficiency without compromising health care? The MTF can utilize jet air dryers in support service areas such as administration, warehousing, and maintenance – areas where HAIs are of lesser concern.

MILITARY TREATMENT FACILITY BEST MANAGEMENT PRACTICES

- Utilize paper towels for hand drying in food preparation, child care, and direct patient care areas.
- Replace any restroom paper towel dispenser or warm air dryer in non-patient care areas like contracting, logistics, and waiting areas, etc. with jet air dryers.
- Provide in-service training during the launching of the program. As part of the Infection Control Program, educate staff on the types of activities that can result in hand contamination, the various methods that they can use to clean their hands, and proper hand washing and hand drying techniques. Monitor the staff's adherence to HH practices and provide staff with feedback regarding their performance.
- Refer to the Proper Hand Drying Techniques in Appendix B.
- Display posters in Appendix C in hand washing and hand drying areas.

Prepared by: Waste Program and Industrial Hygiene and Medical Safety Management Program

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Appendix A

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Appendix B

Proper Hand Drying Techniques

Disposable Towels

After washing and rinsing their hands well under running water, workers should—

- Remove a single-use, disposable paper towel from preferably a hands-free dispenser or a dispenser that is designed so that only the disposable paper towel is touched during removal.
- Pat hands with the paper towel to remove the excess water.
- Rub the backs and the palms of hands with the disposable towel.
- Rub all sides of each finger and thumbs with the disposable towel, and carefully dry the spaces between fingers.
- Discard the disposable towel and repeat with a fresh disposable towel if necessary to make sure hands get thoroughly dry. Spend a total of about 20 seconds drying all the surfaces on hands.
- Avoid contact with contaminated surfaces such as the sink faucet handles, towel dispenser cranks or levers, and exit door handles that can result in cross-contamination. Use a dry disposable towel to turn off faucets and open exit doors.
- Discard used towels in a waste receptacle.

Air Dryers

After washing and rinsing hands, workers should—

- Shake excess water from hands into the sink.
- Put hands palms up under the air flow and tilt them slightly downward to allow the water to run off.
- Leave hands palm up under the air flow until they are dry, then slowly move hands backwards and forwards through the air, turning them over so both back and front are exposed to the airflow. Pay attention to the wrinkles in the palms and between the fingers where a lot of moisture will remain.
- Do not rub hands together while drying them under the air flow.
- Do not give up and wipe hands on clothing to complete the drying process.

Note: Based on the manufacturer's instructions, hand drying technique may vary slightly from one device to another

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Appendix C
Copy of Posters

SAVE YOUR PATIENTS

Dry your hands thoroughly with disposable towels to reduce the transmission of bacteria up to 99%

DRY YOUR HANDS



<http://phc.amedd.army.mil>

TA ### ####

Download and order poster from the Health Information Products eCatalog at:
<https://usaphcapps.amedd.army.mil/HIOShoppingCart/viewItem.aspx?id=670>

A poster with a white background and a dark blue border. At the top, the words "Jet Dryers" are written in a large, stylized, 3D font with a blue and white gradient. Below this, the text "BETTER FOR THE EARTH" is displayed in a bold, blocky font, with "EARTH" in green and "BETTER FOR THE" in black. Underneath, a line of text states: "Using a jet dryer contributes only one half of the global warming potential of paper towels". The second section features "BETTER FOR THE BUDGET" in a similar font, with "BUDGET" in green and "BETTER FOR THE" in black. Below it, text reads: "Using a single jet dryer instead of paper towels can save more than \$10,000 over 5 years." At the bottom, a bold statement says: "Dry your hands thoroughly: bacteria are spread more easily from wet skin." The footer contains the URL "http://phc.amedd.army.mil", the USAPHC logo (U.S. Army Public Health Command), and the code "TA-###-####".

Jet Dryers

BETTER FOR THE EARTH

Using a jet dryer contributes only **one half** of the global warming potential of paper towels

BETTER FOR THE BUDGET

Using a single jet dryer instead of paper towels can **save** more than **\$10,000** over 5 years.

Dry your hands thoroughly:
bacteria are spread more easily from wet skin.

<http://phc.amedd.army.mil>  TA-###-####

Download and order poster from the Health Information Products eCatalog at:
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