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Brief Report

Needleless connector drying time—how long does it take?

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Allowing needleless connectors (NCs) on vascular catheters adequate drying time after cleaning with antiseptic is essential. Drying time instructions on antiseptic pads/wipes relate to skin use, not inanimate objects. Needleless connector drying times after a 15-second scrub with isopropyl-alcohol, isopropyl-alcohol/chlorhexidine, or povidone-iodine varied from 5 seconds to >6 minutes.

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BACKGROUND

International experts agree that adequate needleless connector (NC) drying time after disinfection is essential to reduce microbial load and potential for entry into the bloodstream, thus reducing bloodstream infections.¹ However, little evidence exists on how long it takes NCs to dry after decontamination or how drying times for different antiseptic solutions vary. The purpose of this study was to compare drying times of 3 currently used antiseptic solutions. Recommended antiseptic solutions for NC decontamination include 70% isopropyl-alcohol, povidone-iodine, and >0.05% chlorhexidine in isopropyl-alcohol, or a combination of these.^{2,3} Some studies have suggested that 2% chlorhexidine gluconate (CHG) in alcohol is the most effective.¹ Scrub time also likely influences decontamination effectiveness, but recommendations vary from 5 to 60 seconds, with little comparative data available.⁴ The Epic 3: National Evidence-Based Guidelines for Preventing Health-care Associated Infection in NHS Hospitals in England as well as several other studies recommend at least a 15-second NC scrub.^{5,6}

The Infusion Nursing Society states that NC drying time depends on both the design of the NC and the antiseptic properties.² Therefore, we clearly identified the products used in our study, since our results may not be replicatable for all NCs. Most NC manufacturers do not provide drying time information or instructions in an easily accessible format for healthcare workers to view. For example,

CareFusion (Chicago) states that the SmartSite NC should be allowed to dry for approximately 30 seconds after decontamination with alcohol,⁷ but experimental data to confirm this have not been published. A drying time of 30 seconds is often used in clinical simulation studies.⁸

A variety of antiseptic preparation pads/wipes is available on the market. These pads/wipes are for the most part low-cost, high-volume use products, with limited uniformity between multiple manufacturers. They differ in terms of antiseptic agent, size of pads/wipes, manufactured material, and whether or not they are marked as sterile. Importantly, most instructions for use relate to skin cleansing, which is a different application than NC decontamination, where required drying times are likely to be quite different. Most prep pads/wipes purchased by hospitals in developed countries are now used for decontaminating vascular access devices rather than for skin cleansing.

METHODS

The aim of this study was to ascertain, in a hospital environment, how long it takes NCs to dry after a 15-second disinfection scrub (as recommended by Epic 3) with commonly used products. The study was conducted in an air-conditioned hospital meeting room with environmental temperature of 22.8°C and relative humidity of 72.3% (measured using Vaisala Humicap handheld humidity and temperature meter HM40 series). A SmartSite NC (product specified, since results may be specific to this NC) with short extension tubing was connected to an intravenous catheter, secured with a dressing and attached to the forearm of a healthy person (not in the actual vein) for 1 hour prior to testing. Body temperature of the healthy person was 36.1°C.

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Conflicts of Interest: None to report.

Table 1

SmartSite needleless connector drying time (in seconds) after completion of a 15-second vigorous scrub

Product	Prep Pad Size	Fluid Volume	Drying Time
70% isopropyl alcohol (Reynard Health Supplies, Sydney)	6 cm x 6 cm	0.6 + /- 0.05 ml	5 seconds
70% isopropyl alcohol and 2% CHG (3M, Sydney)	3.5 cm x 6.2 cm	0.65 ml	20 seconds
10% povidone-iodine Mini Liv-Wipe (Livingstone, Sydney)	3.3 cm x 5.8 cm	0.63 ml	>6 minutes (still moist at 6 minutes)

Table 2

Dryness Testing. The underlying of the connectors when wet has been removed from what was submitted

	Number of Tests Performed											
	1	2	3	4	5	6	7	8	9	10	11	12
70% isopropyl-alcohol	15	10	5	5	5	5	5					
70% isopropyl-alcohol with 2% CHG	15	20	20	20	20	20						
10% povidone-iodine	15	60	75	90	120	150	180	240	270	300	330	360

seconds shown; underlined numbers indicate wet connector at this timepoint; non-underlined numbers indicate dry connector at this timepoint

Note. Bold numbers indicate wetness.

Three prep pads/wipes that are commonly available in hospitals, containing antiseptics recommended in guidelines for NC decontamination, were tested (Table 1). Prep pads/wipes were unfolded and placed over the entire NC. A vigorous scrub of the NC was performed by a clinical nurse for 15 seconds (timed by an assistant). The NC was then held at the base and allowed to dry.

The NC was considered to be dry when tissue paper (white for povidone-iodine and blue/purple for alcohol, and alcohol with CHG) was placed firmly on and around the NC with moisture no longer being visible on the paper. Observations for dryness commenced at 15 seconds after completion of the 15-second decontamination scrub. Experiments were repeated with 5-second increases or decreases in the commencement of observations, until drying time was established for each pad/wipe (each experiment involved a new 15-second decontamination scrub). The observation interval was increased to 30 seconds for povidone-iodine because it was visibly wet even after 60 seconds. Once NC drying time was established for each pad/wipe (no moisture visible on the tissue paper), the procedure was repeated 4 times to ensure reliability of dryness testing.

RESULTS

After the 15-second scrub was completed with 70% isopropyl alcohol, the NC was consistently dry after 5 seconds (Table 2); with 70% isopropyl and 2% CHG scrub, the NC was consistently dry after 20 seconds. The NC scrubbed with 10% povidone-iodine did not have a drying time established: it remained wet at 6 minutes, and the experiment was abandoned at this timepoint, since such drying time would be clinically unfeasible.

DISCUSSION

Well-established guidelines advise healthcare workers to vigorously scrub NCs and allow them to dry before accessing vascular catheters.¹⁻³ The results of this experimental study demonstrate that antiseptic type significantly affects NC drying time, in the context of almost identical fluid volumes in the pads/wipes, and standardized techniques and times for the preceding NC scrub.

NC decontamination with 70% isopropyl alcohol alone appears to be the most efficient, since dry time was achieved at 5 seconds, which was quicker than many guidelines state, and which is more

likely to be complied with in clinical practice. Some facilities now routinely use alcoholic CHG for NC decontamination. According to our results, this means that staff need to wait 4 times as long (20 seconds) after NC decontamination before using the intravenous catheter or risk injecting microbes or antiseptic solution. NCs disinfected with povidone-iodine were still not dry at 6 minutes, which would preclude most healthcare facilities from considering its use, and calls into question why clinical practice guidelines include this as an option for NC decontamination.

Prep pad/wipe packaging includes manufacturer instructions typically for skin (not NC) decontamination and does not include drying time. It is unlikely that required NC drying times are consistent between products, since a variety of products is available. This variation, coupled with the large number of existing NC devices of varying designs, makes the likelihood of one universally correct drying time almost impossible, and our results may not be generalizable to other NCs, to other antiseptic pads/wipes, or to scrub times other than 15 seconds. This is a study limitation. NC manufacturers should publish similar experiments to provide clear guidance for healthcare workers and standardization of practices for their products so healthcare workers can effectively disinfect NCs. Healthcare workers need to be provided with clear instructions for use, by both the NC device and prep pad/wipe manufacturers.

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