

Protection Within Reach: Hand Hygiene Friction in Hospitals and Home Care

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Executive summary

Hand hygiene fails most often at the moment of access, not the moment of knowledge. Nurses and caregivers know why they should sanitize; the evidence shows they do it less than half the time, and less still as a shift wears on.

Three frictions drive the gap. In hospitals, the nearest wall dispenser may be down the hall, out of sight, or empty. In home care, there is no wall at all, so the caregiver digs through a bag that studies show is usually contaminated on the outside. And across every setting, compliance erodes as fatigue builds over a 12-hour shift.

The common thread is distance. Every step, search, or dead dispenser between a care moment and clean hands is a chance to skip it. Removing that distance is the most direct lever available.

Safe Band Pro puts a refillable sanitizer reservoir on the wrist, dispensed with one press into the opposite palm. It needs no wall, no bag, and no search. This paper sets out the evidence for why that matters and proposes a measured pilot to test it in hospital and home care settings.

The scale of the problem

On any given day in 2023, about 1 in 38 U.S. hospital patients had at least one healthcare-associated infection (HAI), an estimated 518,000 infections that year ([CDC, 2026](#)). That is real progress from 1 in 31 in 2015, when about 72,000 patients with HAIs died during their hospital stay ([CDC HAI data](#)).

Most of these infections are not tied to a device. In the 2023 survey, 61% of HAIs had no link to a medical device or procedure, and pneumonia, surgical site infections and gastrointestinal infections led the list. Those are infections where ordinary hand contact is a plausible route.

Hands are the constant. Health workers' hands carry microscopic contamination and act as a transmission vector across every major HAI type, from bloodstream infections to *C. difficile* ([Hand Hygiene Compliance: Are We There Yet?](#)). Yet the World Health Organization estimates that health workers follow hand hygiene protocols only about 38% of the time on average ([UNC Kenan-Flagler](#)).

Hospitals: the walk to a dispenser that may be empty

When a dispenser is far away or empty, clinicians skip the step rather than go looking. Qualitative research finds that when dispensers are broken, empty or distant, health workers do not seek out a working one ([Are We There Yet?](#)).

The same review reports the top deterrents named in a survey of U.S. and Canadian health workers:

Deterrent to hand hygiene	Share of respondents
Dispenser or sink not in a convenient location	41%
Being too busy	36%
Empty product dispensers	33%
Product dries out hands	32%

More than half of respondents said they would clean their hands more often if sanitizer were closer to the patient. Placement studies agree: adding dispensers in patient rooms on a 38-bed German surgical ward, from 53 to 82 units, raised hand rub use across the whole ward ([J Hosp Infect, 2023](#)).

But adding wall units has a ceiling. Every fixed dispenser is still a place the clinician must go to, it still has to be refilled by someone else, and it is never where the hands are at the exact moment of care.



Home care: when the search itself contaminates

In a patient's home there is no wall dispenser. The caregiver's sanitizer lives in a bag, a pocket or a car, and reaching it means touching surfaces that are rarely clean.

The bag is the problem. In a study of 126 home health nurses' bags from four agencies, 83.6% tested positive for human pathogens on the outside, and 15.9% of those included multidrug-resistant organisms such as MRSA ([Bakunas-Kenneley and Madigan, AJIC 2009](#)). The authors describe the bag as a potential reservoir for resistant organisms traveling from home to home.

That creates a loop that defeats its own purpose:

1. The caregiver finishes a task and needs to sanitize.
2. Hands go into the bag to find the bottle, touching the contaminated exterior and contents.
3. The bottle cap and bottle surface, handled all day, add more contact.
4. Hands are sanitized, then return to the bag or bottle to put it away.

Best-practice guidance for home care, known as bag technique, exists precisely because of this risk. It asks clinicians to plan ahead, remove only what is needed and close the bag promptly ([Medbridge](#)). Guidance also advises leaving the bag outside the care area entirely for patients with MDROs or C. difficile ([Home Healthcare Now](#)). In those homes, sanitizer stored in the bag is unavailable when it matters most.

The results show in practice. Researchers who observed 400 home visits by 50 nurses found average hand hygiene adherence of 45.6%, lowest after touching a patient at 29.5% ([Observation of Hand Hygiene Practices in Home Health Care; AJIC](#)). The authors note these rates mirror hospital and outpatient settings.

Fatigue: compliance erodes as the shift wears on

Hand hygiene compliance falls steadily across a 12-hour shift, and the drop grows when the work gets more intense. The largest study on this question tracked 4,157 caregivers in 35 U.S. hospitals across more than 13.7 million hand hygiene opportunities. Compliance fell by a regression-estimated 8.7 percentage points from the start to the end of a typical shift ([Dai, Milkman, Hofmann and Staats, J Appl Psychol 2015; PubMed](#)).

In raw terms, compliance went from 42.6% in the first hour to 34.8% in the last ([UNC Kenan-Flagler](#)). That is roughly one in five hand hygiene events that would have happened at the start of the shift and no longer does by the end.

Three further findings matter for design:

- **Intensity amplifies the decline.** Busier periods produced steeper drops.
- **Rest restores it.** Longer breaks between shifts raised compliance on return.
- **Heavy weeks compound it.** Both the decline and the recovery grew as workers logged more hours in the prior week.

The infection cost is modeled, not directly measured, in this study. Using prior estimates linking compliance to infection rates, the researchers projected that this end-of-shift decline could account for roughly 600,000 additional infections and about \$12.5 billion a year across U.S. hospitals ([ScienceDaily](#)). Separately, compliance drops significantly once hand hygiene opportunities exceed 30 per hour ([Infect Control Hosp Epidemiol](#)), which is exactly when a tired clinician has the least time to walk to a wall.

Fatigue cannot be engineered away, but friction can. Each extra step costs more willpower at hour eleven than at hour one. A tool that takes one press, wherever the hands are, asks the least of a depleted person.

Less friction, more action

Putting sanitizer on the body shortens the path to clean hands, and the studies that have tested body-worn dispensers report more hand hygiene and fewer infections.

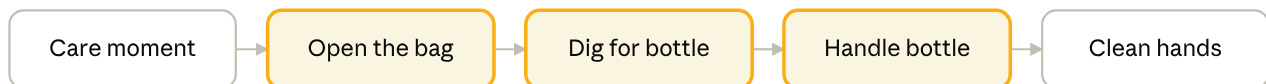
Every step between a care moment and clean hands is a chance to skip it

☐ Touches a surface or may fail ☐ One press, wherever the hands are

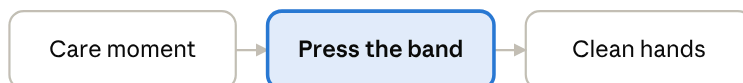
Hospital wall dispenser



Home care bag



Safe Band Pro on the wrist



Paths to clean hands in three settings

The length of each path is the point: every added step, surface or failure point is one more chance for a busy or tired caregiver to skip the step.

The clinical evidence for personal, body-worn dispensers is encouraging but limited:

Study	Setting and design	Result
Koff et al., J Crit Care 2011	Mixed ICU, body-worn dispenser within a multimodal program; 1,262 vs 1,331 patients over two consecutive 12-month periods	Ventilator-associated pneumonia fell from 6.9 to 3.7 per 1,000 ventilator days ($P < .01$); bloodstream infections fell from 2.6 to 1.5, not significant; no mortality difference
Petty, J Perianesth Nurs 2013	Review of body-worn dispensers for anesthesia, PACU and ICU staff	Body-worn units linked to fewer ICU infections and less contamination of the anesthesia workspace; one-handed and always accessible
Marburg ward study, J Hosp Infect 2023	38-bed surgical ward, dispensers added at points of care	Hand rub use rose across the whole ward

Two honest caveats. First, the published body-worn studies used belt or waist units, not a wrist band, and ran them alongside reminders and feedback, so the device alone cannot claim the full effect. Second, Safe Band Pro itself has not yet been studied in a clinical setting. The design logic is strong; the outcome data still has to be earned.

Safe Band Pro: sanitizer that is already there

Safe Band Pro is a patented, refillable wristband dispenser from WearSpray. A press on the reservoir face releases a stream of sanitizer from the valve into the opposite palm, with no bag, bottle or wall involved.



What it changes for each setting:

Friction	Wall dispenser	Bag or pocket bottle	Safe Band Pro
Distance to sanitizer	Down the hall or across the room	In the bag, outside the care area	On the wrist
Surfaces touched to get it	Pump or lever shared by everyone	Bag exterior, contents, bottle, cap	The band's own face
Hands needed	One or two	Two	One press, one palm
Chance it is empty	Depends on facility restocking	Depends on the carrier	Wearer sees and refills their own reservoir
Works in a home with no wall unit	No	Yes, with the bag risks above	Yes



Product facts today: the reservoir holds about 1 ounce (roughly 30 mL) and refills by twisting off the cap and pouring from any bulk bottle. The same platform dispenses sunscreen and insect repellent, and the mechanism streams rather than atomizes, which suits gels and lotions. Roughly 2,000 units have sold to consumers, with about four or five returns.

What a clinical version must still answer:

- **Doses per fill.** German hospital monitoring recorded about 2.0 to 3.6 mL per hand rub ([NosoEx study](#)). At that rate one fill covers roughly 8 to 15 rubs, so heavy-use roles would refill several times per shift. The dose per press needs to be measured and set.
- **Bare below the elbows.** SHEA guidance lets facilities adopt a policy of no wristwatches or jewelry during clinical care ([SHEA](#)). Wear position, such as the forearm, and facility acceptance must be tested before any hospital rollout.
- **Cleanability.** A clinical band likely needs a wipeable, non-absorbent strap and a housing that tolerates hospital disinfectants.
- **Product compatibility.** Reservoir and valve materials must be validated against the specific alcohol-based rubs a facility uses.

Recommendations and pilot proposal

The right next step is a small, measured pilot in one hospital unit and one home health agency, designed to show whether wrist access raises hand hygiene and holds it steady late in the shift.

For infection prevention leaders, three practical moves follow from the evidence regardless of product:

- Treat distance and empty dispensers as compliance failures, and audit them like any other safety defect.
- Give home care staff a sanitizer source that does not live inside the nursing bag.
- Report compliance by hour of shift, not only by unit, so fatigue-driven decline becomes visible.

Proposed pilot, 8 to 12 weeks:

1. **Sites.** One medical-surgical unit and one home health agency, each with a comparison group using current practice.
2. **Primary measure.** Directly observed compliance using the WHO 5 Moments tool, split into early-shift and late-shift hours.
3. **Home care measure.** How often caregivers open the bag during a visit, and adherence after touching the patient.
4. **Secondary measures.** Refill frequency and volume, skin tolerance, strap cleanliness, and wearer acceptance.
5. **Policy check.** Confirm wear position and attire-policy fit with each site's infection prevention committee before launch.

6. **Success threshold.** A late-shift compliance rate that holds within a few points of the early-shift rate, against the 8.7-point decline seen in the Dai study.

Infection outcomes need a larger, longer study. A positive pilot on compliance and late-shift stability is the evidence that would justify one.

References

1. CDC. [New CDC Data Shows Decline in Healthcare-Associated Infections](#). July 2026.
2. CDC. [HAIs: Reports and Data](#).
3. [Healthcare Personnel Hand Hygiene Compliance: Are We There Yet?](#) Current Infectious Disease Reports.
4. Dai H, Milkman KL, Hofmann DA, Staats BR. [The Impact of Time at Work and Time Off from Work on Rule Compliance: The Case of Hand Hygiene in Health Care](#). J Appl Psychol. 2015;100(3):846-862.
5. UNC Kenan-Flagler. [Safety Not Guaranteed](#).
6. ScienceDaily. [Hospital workers wash hands less frequently toward end of shift](#). November 2014.
7. [The impact of workload on hand hygiene compliance: Is 100% compliance achievable?](#) Infect Control Hosp Epidemiol.
8. Bakunas-Kenneley I, Madigan EA. [Infection prevention and control in home health care: the nurse's bag](#). Am J Infect Control. 2009;37(8):687-688.
9. McGoldrick M. [Bag Technique: Preventing and Controlling Infections in Home Care and Hospice](#). Home Healthcare Nurse.
10. Medbridge. [Bag Technique Home Health: Best Practice Guide](#). October 2025.
11. [Observation of Hand Hygiene Practices in Home Health Care](#). J Am Med Dir Assoc. 2020.
12. [Nurse hand hygiene practices in home health care](#). Am J Infect Control. 2018.
13. Koff MD, Corwin HL, Beach ML, Surgenor SD, Loftus RW. [Reduction in ventilator associated pneumonia in a mixed intensive care unit after initiation of a novel hand hygiene program](#). J Crit Care. 2011;26(5):489-495.
14. Petty WC. [Closing the hand hygiene gap in the postanesthesia care unit: a body-worn alcohol-based dispenser](#). J Perianesth Nurs. 2013;28(2):87-97.
15. [Tailored positioning and number of hand rub dispensers](#). J Hosp Infect. 2023.
16. [Workflows and locations matter: electronic hand hygiene monitoring of hand rub dispensers](#).

17. SHEA. [Infectious Diseases Experts Issue Guidance on Healthcare Personnel Attire.](#) 2014.