

White Paper

Is hand hygiene enough?

The simple answer is no ...
despite great advances, large gaps remain



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The search is on for other sources of cross-contamination

Executive Summary

For more than a decade, researchers and healthcare professionals have been fighting an uphill battle against healthcare acquired infections (HAIs). The impacts go well beyond the financial costs of having to treat patients who got sicker in the hospital. The toll in human terms is staggering when tallying the suffering and death of patients.

One of the critical lines of defense is something your mother taught you: Wash your hands. But, the research shows hand hygiene isn't 100%, especially in terms of healthcare worker compliance. Some authors have opined that 80% compliance may be the best we can hope for. And there is a dearth of hard science showing that all that soap and water or hand gel is really reducing HAIs.

A growing body of research has revealed that surfaces in hospitals and other healthcare facilities – specifically, privacy curtains and surface touchpoints – are hotbeds of contamination. Even with protocol-driven laundering and housekeeping, gaps remain and re-contamination happens. This leads us to conclude that R&D into safeguarding these surfaces may be the next battleground.

Over the past decade, healthcare professionals and researchers have been tackling the epidemic of healthcare acquired infections (HAIs). Despite greater awareness and tracking and some gains, the numbers are still staggering.

According to the Centers of Disease Control (CDC), 1.7 million patients are infected each year during hospitalizations in the U.S. Sadly, more than 99,000 people die each year. And the financial burden runs as high as \$40 billion a year. *For a further glimpse into HAIs, see www.cdc.gov/hai.*

How we got here: The “bugs”

When one looks at the rogue's gallery of bacteria responsible for HAIs, one finds many pathogens that simply exist in nature. For instance *Escherichia coli* – or *e. coli* for short – is a bacteria we all carry in our intestines. So do animals. These bacteria are effective and essential organisms needed for digestion of the food we eat. But, if we ingest *e. coli* on, say, some unwashed lettuce, the outcome can cause serious illness and even death.

For almost 70 years, antibiotics have greatly reduced illness and death from infectious diseases. All of us have to tip our hats to the three Nobel laureates who discovered penicillin in the 1940s – Alexander Fleming, Ernst Chain and Howard Florey. Thanks to this discovery, millions of people worldwide lead healthier lives.

Unfortunately, another challenge in combating healthcare-acquired infections is that Mother Nature allows bacteria to adapt. Unfortunately, antibiotics have turned into a two-edged sword, and when people demand that their doctor give them an antibiotic for every sniffle or minor ailment, they help bacteria “learn.” Several strains have increasingly shown resistance to antibiotics, including some medicines that are the medical equivalent of atomic bombs.

Methicillin and Vancomycin are two such medicines, and they're reserved for serious infections that don't respond to traditional antibiotics. These bacterial strains are now called “superbugs.” But there is nothing cute or “super” about that nickname. The problem is that staph microbes have shown resistance to methicillin, and another genus of bacteria called enterococci are resistant to vancomycin. These superbugs are abbreviated MRSA and VRE.

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Acquiring an infection in a hospital runs counter to one of the key precepts of the Hippocratic Oath: First, do no harm. So, researchers in government, academia and in the hospitals themselves have been looking for ways to identify and then employ the best methods to reduce HAIs. One of the first goes back to something your mom told you.

First line of defense: Wash your hands

One of the oldest methods to prevent the spread of disease is simply to wash your hands. During cold and flu season, public health officials turn to the media, and in addition to urging people to cover their mouth and nose when they sneeze, they also remind people to wash their hands more frequently.

It is simple then for healthcare workers (HCW) to turn to this tried-and-true method in the fight to reduce the incidence of HAIs.

It has been a decade since the Centers for Disease Control published its "Guideline for Hand Hygiene in Health-Care Settings (2002), and the question is: Does all that hand washing and gelling work?

It depends on how you define "work."

The benefit of hand washing or using "sanitizing" hand gels in reducing HAIs is predicated on two key factors: Did the HCW actually wash/gel their hands between patients and 2) did their hands get truly sterile by doing so?

To be fair and honest, sometimes merely educating HSWs on the risks of poor hand hygiene in healthcare setting can help begin changing behaviors and habits. Programs like the "100,000 Lives" campaign have done much to raise general awareness of medical errors in general, as well as HAIs in particular. But, after the education and the writing of new protocols and work rules, then begins the hard work of compliance measurement.

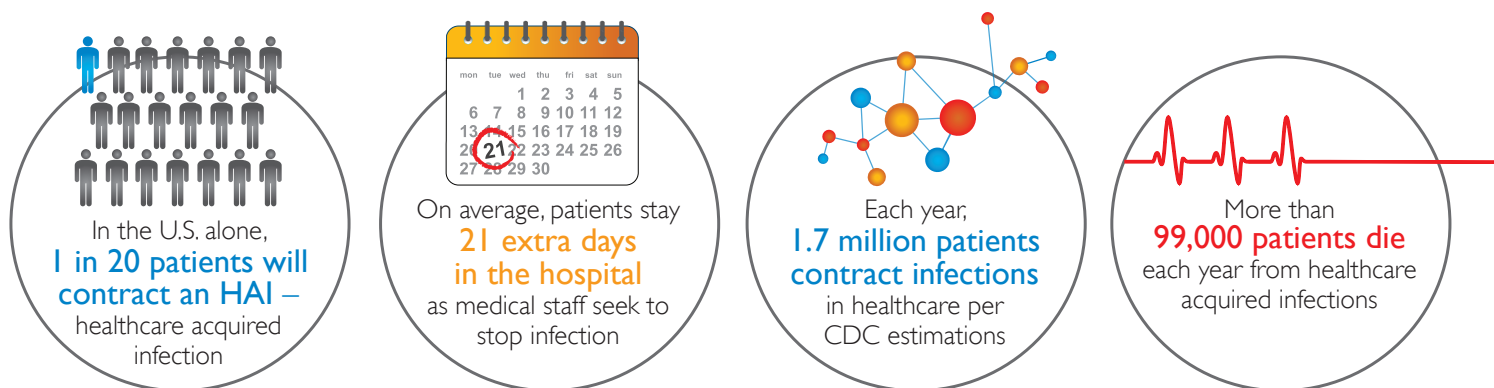
Several methods have been employed to drive greater hand-washing compliance, including measuring the amount of soap and hand sanitizer used, but that's a very poor measure – just because more soap or gel is used doesn't prove an HSW's hand are "clean."

Another hospital employed the equivalent of "secret shoppers" to monitor compliance.¹ Of course the downside here, besides the expense of employing the "shoppers," is if the HSW being observed notices they're being observed, then they exhibit greater compliance (i.e., they wash their hands to be seen as either being a "good" employee, or they do it to avoid a black mark for non-compliance.)

We're human ... take away the "shopper" and one likely outcome is the HSW may be less diligent in hand washing. And there's proof this happens.

Camera surveillance to gain compliance.

The *New York Times* reported in November 2011 on the efforts of North Shore University Hospital in Manhasset, N.Y., to track hand washing compliance through video monitoring. Cameras were installed in the ceiling and pointed at sinks and sanitizer dispensers inside and outside the patient room. According



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to *The Times*, "A monitor at each door tracks when someone enters or leaves the room — anyone passing through a door has 10 seconds to wash hands."

Three years ago, North Shore University Hospital used the same 10-second rule and recorded an appalling 6.5% compliance rate. And as proof of the effect of being watched by a secret shopper, that program turned in about a 60 percent compliance rate ... when someone was watching.

When the video system was turned on, hand washing compliance shot up to as high as 91% for some shifts. The system was designed and is sold by a company called Arrowsight, and features digital displays in nurse's stations showing hand-washing compliance. *The Times* story indicated compliance rates seem to be settling in around 80-85% at North Shore.

When viewed more broadly, large gaps remain

The incidence rates of HAIs still remain at high levels, even with the increased amount of hand-washing going on. Robert Wachter, a physician at the Univ. of California San Francisco Medical Center, was quoted in *U.S. News and World Report*, saying, "many hospitals, including my own, have seen hand-cleansing rates skyrocket, from previously mortifying levels of 20 to 30 percent to merely embarrassing rates of 60 to 80 percent."² It's that missing 20 to 40% that is troubling.

But more importantly, it is how the hand washing is actually done that reveals another large gap in the defensive line. Eugene Gordon writing in *Infection Control Today* (Feb. 2012), said:

The current practices and attention to infection control are focused on sanitizing the hands of HCWs as they move from one patient to the next. Handwashing and alcohol handrub to achieve reduction of pathogen contamination of bare hands are the dominate means in use. Nothing is done about exam gloves other than sometime putting on a new pair after washing. Alcohol handrub is faster and more convenient but is ineffective on all endospores, *C. diff* being an example, and on many viruses. Handwashing can be more effective, but is not practical given the time required to sanitize. Moreover, it is difficult or impossible to achieve 100 percent compliance because of time required to implement or skin irritation, and as a result the typical rate of compliance is said to be 40 percent to 50 percent.³

And we have to ask: Does all that hand-washing truly reduce the rate of HAIs? Returning to the New York Times article on North Shore University Medical Center, Dr. Bruce Farber, head of infectious diseases at NSMC says the rates of MRSA "have dropped," but data on infection rates weren't reported in an article on the camera-surveillance program in Clinical Infectious Disease.

To summarize: Most methods used – training, peer-encouragement, secret shoppers, camera surveillance – are laudable in boosting compliance, but hand-washing or use of alcohol gels to clean hands between patients is still spotty. In addition, it seems there just isn't enough time between patients to allow HSWs to "scrub up" in order to achieve the sterile state needed to lower or even eliminate cross contamination.

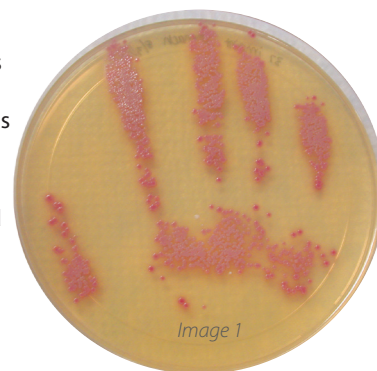
Perhaps the subtitle of an article in the American College of Emergency Physician (ACEP) News said it best: Efforts to cajole health care personnel to clean their hands frequently have just about topped out.⁴

What about everybody else?

One factor that becomes glaringly apparent in almost all of the HAIs and hand-washing research is the fact that it deals with only those workers who interact directly with patients. Common sense says this should be and is rightly so.

But, again, there are other gaps in the defense against HAIs: What about other non-medical staff that moves around in the patient and public spaces? Or what about visitors who may be walking germ farms? Or how about the patients themselves?

In a New England Journal of Medicine article (2009), Dr. Curtis Donskey and Brittany Eckstein, B.S., reported that, after an abdominal exam of a quadriplegic man who had MRSA, the HCWs ungloved hand was imprinted.⁵ Image 1 shows MRSA colonies grown from the handprint.



2. <http://health.usnews.com/health-news/blogs/comarow-on-quality/2008/09/23/watching-the-hospital-hand-washing-watchers>

3. <http://www.infectioncontroltoday.com/news/2012/02/hand-hygiene-issues-and-solutions.aspx>

4. <http://www.acep.org/Content.aspx?id=66144>

5. New England Journal of Medicine (360:3, January 15, 2009)

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Focusing on just the patient-hygiene issue, the logic we're following here goes like this: HSWs should be washing or gelling their hands as they move from patient to patient. The thinking is that if one patient is carrying MRSA, for instance, the nurses, respiratory therapists and others treating this patient should wash up before moving to another patient.

Suppose this patient is post-op and ambulatory, and wants to simply take a walk ... he reaches up to push aside the privacy curtain, maybe steadies himself on a sink or countertop, then uses the handrail as he makes his way down the corridor.

What about the touchpoints?

A review of the literature shows there is risk of contamination for common touchpoints in healthcare environments. We'll confine our search to privacy curtains and common surfaces. The results are not encouraging.

Privacy curtains harbor microbes

In a separate study, Dr. Donskey and his colleagues showed that hand contact with privacy curtains transfers some of the worst sources for healthcare acquired infections. Healthcare workers (HCW) transferred MRSA, VRE and c. diff. from infected patients to the curtain, or vice versa.

The findings were published in both the New England Journal of Medicine (360;3, January 15, 2009) and Infection Control and Hospital Epidemiology (Vol. 29, No. 11, November 2008).

Privacy curtains are prime suspects in the spread of infection for several reasons. First, patients and healthcare workers (HCWs) touch them all the time simply because they surround a patient's bed. Second, cleaning or change-outs happen infrequently or at long intervals. Finally, HCWs might not follow hand-washing protocol if they've touched a surface or object versus following direct contact with patients.

Wrapping up their report, the researchers clearly restated the risks while pointing to the need for more research:

In summary, we found that hospital privacy curtains were frequently contaminated with pathogens, and these organisms could be acquired on hands. Further research is needed to evaluate strategies to minimize the risk for patient-to-patient transmission of pathogens from contaminated curtains.

Univ. of Iowa study: Washing curtains helps ... but only for a very short time

In the fall of 2011, researchers from the University of Iowa Carver College of Medicine reported that 92 percent of hospital privacy curtains are contaminated with potentially harmful microbes within a week of being laundered.

As published April 1, 2012 in the American Journal of Infection Control, over a 3-week period, 180 swab cultures were taken two times a week from the leading edge of 43 curtains in 30 rooms in 2 intensive care units and a medical ward. Curtains were marked to determine when they were changed. Contamination with *Staphylococcus aureus*, methicillin-resistant *S aureus* (MRSA), *Enterococcus* spp, vancomycin-resistant *enterococcus* (VRE), or aerobic gram-negative rods was determined by standard microbiologic methods.

The results were concerning, to put it mildly: Twelve of 13 curtains (92%) placed during the study showed contamination within 1 week. Forty-one of 43 curtains (95%) demonstrated contamination on at least 1 occasion, including 21% with MRSA and 42% with VRE. Eight curtains yielded VRE at multiple

time points: 3 with persistence of a single isolate type and 5 with different types, suggesting frequent recontamination.

The Iowa researchers concluded:

Privacy curtains are rapidly contaminated with potentially pathogenic bacteria. Further studies should investigate the role of privacy curtains in pathogen transmission and provide interventions to reduce curtain contamination.⁶

Dr. Carling: Dye-based method shows surfaces are not cleaned properly

As reported by the American College of Emergency Physicians, Dr. Philip Carling of Boston University studied 142 sites in 103 U.S. institutions, including acute hospitals, long-term care facilities, operating rooms, ICU isolation units, physician outpatient clinics, neonatal ICUs, chemotherapy suites, and ambulances.

Of more than 62,500 high-touch surfaces evaluated using a proprietary fluorescent dye-based targeting method, only 34% were actually cleaned in the post-discharge hygienic cleaning session.⁷

As with hand washing, improved monitoring and education of environmental services staff can boost the disinfection rate to as high as 80%. But, again, leaving a 20% gap still means contamination risk exists.

More method and material R&D needed

When we consider the touchpoint scenarios and research cited above, it becomes clear there are other potential sources for cross contamination. And just like spotty hand-washing, the cleaning and laundering protocols and actual operations can be hit or miss. This would seem to indicate the need for further research and field testing of other methods and materials to reduce contamination.

It begs the question: Can material and chemical science be brought to bear such that some form of antimicrobial protection can be in place 24/7 to reduce cross-contamination risk?

The fight against healthcare-acquired infection does, indeed, start with those professionals who care for the patient, as well as the infection prevention professionals tasked with lowering the rates of infection and cross-contamination. It is a daunting task, and some inroads have been made, but much remains to be researched and proven – “what works and what doesn’t” – paraphrasing Dr. Farber.

6. [http://www.ajicjournal.org/article/S0196-6553\(12\)00070-3/abstract](http://www.ajicjournal.org/article/S0196-6553(12)00070-3/abstract)

7. <http://www.acep.org/Content.aspx?id=66144>

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