Soft Surface Fabrics:
THE OTHER HIGH TOUCH SURFACES

ACTION STEPS FOR INCORPORATING SOFT SURFACE BACTERIAL MANAGEMENT IN A COMPREHENSIVE INFECTION PREVENTION BUNDLE

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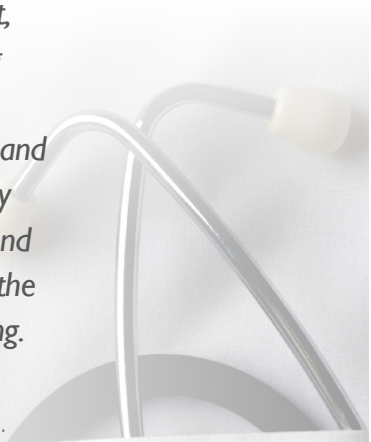
Even though she was having a busy day, a CNA in a step down ICU unit, was glad to help her favorite patient with her basin bath. While cleaning up afterwards in a hurry she tipped the basin of dirty water and spilled some on the front of her uniform. She wiped it off as well as she could and continued her day of direct patient care activities. She often nonchalantly touched her hands to the contaminated gown and then hard surfaces and other patients. At least one time she touched the contaminated part of the uniform and grabbed tape out of her pocket to seal up a wound dressing.



The above scenario is just one example of a breakdown in infection prevention practice. Everyone in the healthcare setting is responsible for patient safety; however, the infection preventionist has the duty of educating the larger staff on how we can collectively save lives through effective reduction of healthcare associated infections. I recently read that the number of lives lost each year from HAIs is equivalent to one passenger airplane crashing and killing everyone on board every day. Looking at this problem from this perspective is appalling! Why should we stand by and allow 99,000 people each year to die needlessly from our care in hospitals? While we have made great strides in improving hand hygiene and hard surface disinfection, these surfaces only constitute 10 percent of the immediate patient environment. We are leaving the rest – soft surface fabrics – unprotected.

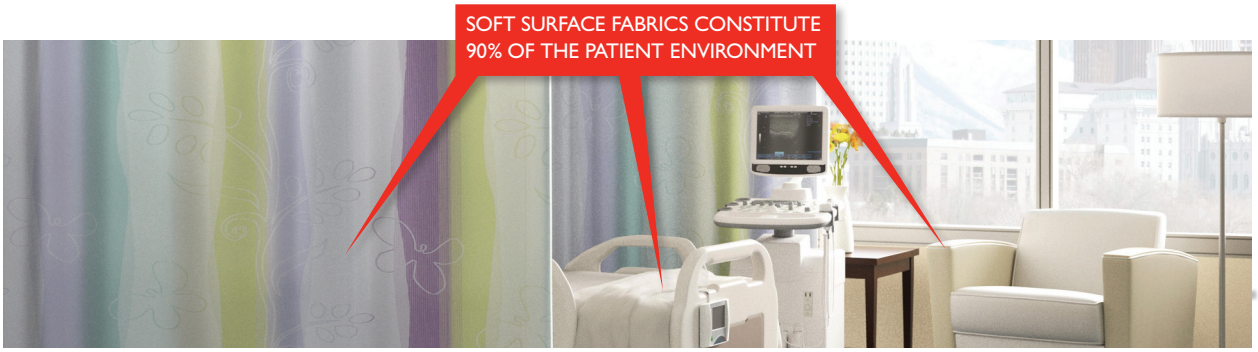
BACTERIAL CONTAMINATION OF SOFT SURFACE FABRICS IS PROVEN

Multiple studies have shown that soft surfaces—lab coats, scrubs, uniforms, privacy curtains, patient apparel and bed linens— in the healthcare environment are contaminated[i ii iii] and cross contamination from other surfaces to skin and other surfaces are proven to frequently occur[iv v] This evidence underscores the important role soft surfaces can play in the transmission of microorganisms in the healthcare environment and reveals a potentially dangerous gap in our current infection prevention practices.

Current practice does little to address the issue of soft surface bacterial management in a standardized, effective way. One way we do address fabrics is through laundering; however, evidence shows that laundering alone is not a complete, permanent solution. Many facilities rely on staff to wash uniforms at home, where it isn't possible to regulate proper practice like washing between every use. In some cases, home laundering using just a washing machine has also been proven to be ineffective at rendering clothing hygienically clean – or free from pathogens . In addition, recontamination of fabrics is proven to happen quickly after being put back in use[vii]

Even with proper laundering, if you think about how frequently healthcare staff touch soft surface fabrics like privacy curtains in the process of patient care, or the frequency with which soft surface fabrics, like bed linens, are touching the patient, it's really eye opening. It's easy to imagine a nurse who washes her hands, but then pulls back a contaminated curtain or reaches into her pocket before touching a patient.

For a comprehensive look at clinical studies discussing contamination of soft surface fabrics, download this free whitepaper at http://www.infectioncontroltoday.com/whitepapers/2012/07/soft-surface-bacterial-contamination.aspx



While the evidence is clear, there is still a lack of guidance from regulatory agencies in this area and standardized best practices are sparse among infection prevention, patient/employee safety, industrial hygienists and environmental services professionals. It will require collaboration between these departments to close this gap in infection prevention protocol.

ACTION STEPS TO INSTITUTING SOFT SURFACE BACTERIAL MANAGEMENT

Soft surface bacterial management can help reduce environmental contamination and mitigate the risk for infection transmission when included with proper hand hygiene, routine hard surface disinfection practices, isolation precautions and proper use of PPE. This, in turn, ensures a safer environment for patients, visitors and healthcare staff. A reduction in the overall bacteria load in the environment is associated with a reduction in the overall risk for infection. As we know, lowering infection rates saves lives. Not only that, it also alleviates the cost burden of treating these infections on the facility and contributes to reducing healthcare costs nationwide.

Below outlines immediate action steps toward implementing a soft surface infection prevention protocol in the healthcare facility.

CONDUCT A SOFT SURFACE FABRIC RISK ASSESSMENT

Most formal risk assessment processes such as Failure Mode and Effects Analysis (FMEAs) have been hard to implement effectively since they are cumbersome, quantitative, detail oriented and time consuming. One formal process that is gaining acceptance is the "Structured What If Technique," commonly known as the "SWIFT" risk assessment. In this method, a team of involved staff evaluate a "normal operation" and subject the system to "What If" situations to identify failures and risks quite quickly.

For example, let's look at an example of what a "SWIFT" risk assessment could look like conducted from a high level perspective for soft surface bacterial management in a healthcare setting. While this example outlines a risk assessment for uniforms, it's important to conduct the same analysis for privacy curtains, patient gowns and bed linens.

What are the steps in the normal operation of a certified nurse assistant (CNA) in a hospital setting, wearing a personal uniform? Daily activities wearing this uniform might look like this:

- Puts on uniform
- Attends to morning home activities (feeds children, dog, etc.)
- Travels to work in car
- Gives patient care (bathing, toiletry, feeding etc.) to multiple patients
- Takes a break in employee break room
- Continues patient care (bathing, toiletry, feeding etc.)
- Goes to lunch in facility cafeteria
- Continues patient care (bathing, toiletry, feeding etc.)
- Travels to grocery store for dinner supplies
- Picks up children at daycare/school
- Cares for children
- Takes off uniform
- Washes uniform
- Puts on clean uniform next day

Now let's look at a couple of "What Ifs" and the associated causes, consequences, controls and recommendations with the risk of contaminating her uniform at work.

WHAT IF...	CAUSES	CONSEQUENCES	CONTROLS	RECCOMENDATIONS
While bathing patient, CNA splashes bloody basin water on uniform	• CNA in a hurry • Patient moves unexpectedly • Basin too full of water • Not wearing proper PPE's • Wound care not timely enough to avoid contact with bloody skin	• Uniform contaminated with pathogen • Uniform acts as a fomite to transmit pathogen to CNA's hands, other people, hard surfaces and other fabrics (i.e bed linen, privacy curtains)	• Use basin-less bathing • Wear antimicrobial fabrics which reduces 99.9% of bacteria on the surface of the fabric within one hour; providing ongoing, permanent protection • Wear PPEs while doing every bath • Stop work after contamination to change into clean clothes – clothing cleaned by facility per OSHA BBP Standard • Removes gloves/washes hands if touched dirty uniform	• Educate employees to techniques to avoid splashes while bathing • Investigate use of antimicrobial fabrics to act as an engineering control thereby not depending upon employee to follow proper procedure • Evaluate soft surface products incorporating antimicrobial technology currently on the market
CNA wears uniform more than one day before washing	• Can't afford to buy more uniforms or washer/dryer • Doesn't have time to go more than once a week to the laundromat	• Uniform more likely to become contaminated • Uniform may act as a fomite at work, at home and in-between (car, store, restaurant)	• Wear antimicrobial fabrics which reduces 99.9% of bacteria on the surface of the fabric within one hour; providing ongoing, permanent protectionwear • Wear PPE when in contact with patients and body fluids • Removes gloves/washes hands if touched a dirty uniform • Place a barrier between contaminated uniform and driver's seat of car, restaurant seat etc. • Remove uniform and wash hands prior to coming in contact with children	• Educate employees for proper aseptic technique and proper use of PPEs and avoiding touching of contaminated uniform • Investigate use of antimicrobial fabrics to act as an engineering control thereby not depending upon employee to follow proper procedure

Quick risk assessments such as these can help identify the risks, consequences and controls that can be effective in minimizing exposure to pathogenic bacteria. It's time to start incorporating these into practice to identify weak areas, such as soft surface bacterial management.

EDUCATE STAFF ON PROPER LAUNDERING AND STANDARDIZE LAUNDERING PRACTICE

Regulatory guidelines for soft surface fabrics are very limited and out of date. One of the only recent guidelines that talks about fabrics comes from the Association of periOperative Registered Nurses (AORN) and it addresses uniforms . It does recommend prohibiting home laundering and having an accredited laundry facility for washing healthcare textiles worn in a surgical setting, changing scrubs on a daily basis and ensuring that fabrics for surgical attire be tightly woven of a thread count of 560 x 395 threads/10 cm or greater. [viii]

If a facility does not utilize an outside laundry facility for healthcare uniforms, staff education becomes paramount. Consider incorporating uniform cleanliness expectations and best practices into new hire manuals and orientation conversations. It's not uncommon for healthcare staff to go a few days without changing or washing their uniform or lab coat. However, best practices recommend that uniforms be washed after each day's wear and that if contact with body fluids does occur to change uniform immediately according to OSHA's BloodBorne Pathogen Standard. Since pockets are identified as one of the most bacterial laden places on a uniform, one should also avoid touching inside pockets with dirty hands and avoid cross contamination by placing both dirty and clean items in uniform pockets. The frequency with which nurses and doctors reach into their pockets, even after washing hands, is cause enough to reinforce this message by posting reminders of the dangers of contaminated uniforms in places like the locker room. It's important to create a culture of cleanliness from the top to the bottom and across all departments.

Aside from uniforms, other soft surface fabrics are even less regulated. Although they can be touched hundreds of times a day, some facilities may only clean privacy curtains every quarter, unless there is obvious contamination or if they came in contact with a patient who was known to have an MDRO. In other facilities, they may be changed even less frequently, which seems to be very common. Without a standardized system in place or best practice guidance it also becomes cumbersome to keep track of laundered items and the varying contamination rate across different departments. Privacy curtains and bed linens in critical care areas like surgical departments, the Emergency Room or ICU will have more bacteria load and should be changed more frequently and identified as priority for soft surface engineering controls, which we'll discuss further below.

An evaluation of current laundering procedures throughout the facility will reveal gaps in practice that increase the risk for contamination. Find out the answers to the below questions in your facility to highlight weak points and where you should focus efforts initially. Use these toward creating standard procedures for all kinds of soft surface fabrics.

- Who is responsible for laundering this soft surface fabric (privacy curtain/bed linen/uniform? How is this tracked?
- How often is this soft surface fabrics changed or washed? Do we have a protocol already written for this? Does it need to be updated given current best practice?
- How many uniforms does our staff own on average? What are their laundering habits?
- What is the staff's level of awareness/education regarding contamination of soft surface fabrics?
- Do we contract with an accredited laundry facility?
- Are we evaluating soft surface fabrics during outbreak investigations or HAI reduction campaigns? How do we incorporate these?
- Is this included in our financial models projecting the cost burden of HAIs?

EVALUATING THE USE OF ANTIMICROBIAL FABRICS

The Occupational Health & Safety Administration (OSHA) mandates the use of engineering controls; primary products or technologies used to mitigate risk away from the employee. These can include anything from the design of a facility to the use of antimicrobial fabrics in protective clothing or uniforms. As we now know, when facing contamination risk of soft surface fabrics, proper laundering practices cannot be the only line of defense for patients and healthcare workers because recontamination is proven to occur quickly, minimizing the overall effectiveness of other infection prevention measures.

Studies have shown that fabrics in healthcare settings quickly become contaminated with microorganisms while in use. One study notes that the colony counts on uniforms after three hours of wear were nearly 50 of those counted after eight hours. [ix] Adding inherent antimicrobial properties to these fabrics limits bioburden on the surface and reduces the risk for cross contamination. A variety of technologies have been developed in the past decade to accomplish this. X-STATIC® Antimicrobial Technology, which uses metallic silver coated fibers embedded directly into the fabric, is currently on the market in FDA and EPA approved products. It provides permanent, continuous antimicrobial protection that lasts the life of the product and is safe for the environment. The antimicrobial benefits of X-STATIC® have been applied in healthcare by leading wound care companies such as KCI and Systagenix. In the past, healthcare has found benefit in extracting best practices from other industries. The same can apply to antimicrobial textiles that incorporate X-STATIC® technology. It has been proven in extreme environments by the elite military forces and Olympic athletes for its quick, permanent antimicrobial, anti-odor and anti-static protection. It is also used in some the largest consumer brands in the world, like Adidas and Lululemon.

When looking at antimicrobial products it is important to ask the right questions. To be approved under EPA's "non-public health" regulations, these antimicrobial fabric manufacturers have to prove to do the following:

- Decrease microbial growth on the fabrics
- Reduce degradation of the fabric over time
- Be safe for people and the environment

In order for silver to have any antimicrobial properties, it must be in its ionized form.

Positively charged silver ions are attracted to the negatively charged bacteria. The silver ions cross the cell wall and membrane to enter the bacteria where they attack the DNA and disrupt the respiratory function, cell division and the replication process. Ultimately the silver ions drastically inhibit the bacteria preventing mutation and reproduction.

X-STATIC® technology is clinically proven to reduce bacteria on the surface of fabrics in healthcare. In a clinical trial conducted in the UK, on the "See it SAFE" line of products powered by X-STATIC®, "66.7% of patients in the silver fabric active group eradicated MRSA while 0% eradicated MRSA in the control group. The use of "See it SAFE" X-STATIC® fabric is superior to current eradication protocols against heavily contaminated patients". [x]

In another recent study of lab coats powered by X-STATIC® technology at Henry Ford Health system, the most interesting point was that researchers hypothesized the coats hadwhat they called a potential "self-cleaning" effect. They reported that three silver coats grew VRE when cultured immediately after removing the coat. When these coats were swabbed again, three hours later, none of the repeat cultures grew VRE the second time. This certainly warrants further study into whether these antimicrobial fabrics could potentially "self-disinfect" during or after a shift.

Also important is choosing a product that does not lose its antimicrobial efficacy over time through washing. According to test data of privacy curtains, X-STATIC® technology still produced a four log reduction in one hour after more than 200 industrial launderings in an actual hospital laundry system. [xi]

The last consideration when evaluating products is the effect on patients, staff and the environment. X-STATIC® technology has earned the Oeko-Tex Standard 100 accreditation, which certifies that it supports human ecology through bio-compatibility and the absence of harmful substances in the manufacturing process. In addition, X-STATIC® is a registered antimicrobial agent with the U.S. Environmental Protection Agency (EPA) and does not release a significant amount of silver into the environment. Test results show that washing an average X-STATIC® garment in a home washing machine will release less silver ions than a single sterling silver teaspoon in a dishwasher.

An added benefit of having the silver embedded into the fabric is that it requires no staff behavior modification. We know that staff compliance is one of the biggest challenges we have in infection prevention today. Any protection that does not require staff training or adherence deserves a closer look. For additional clinical evidence on X-STATIC®, visit www.InfectionPreventionTextiles.com/evidence.

CONCLUSION

If we recognize that soft surface fabrics are everywhere in the healthcare environment, that these are proven to be contaminated and that effective assessments of these risks can lead to a safer environment, it is clear that soft surface fabrics should be incorporated as part of an overall bacteria-reduction strategy. As we've discussed, they are largely missing from everyday practice, current guidelines and the overall infection prevention conversation. It's time for this to change as healthcare associated infections are still the fourth leading cause of death in the United States— more than breast cancer, diabetes and influenza.[xii]

Take the time to do a soft surface risk assessment to determine priority areas to address. Find out what your current practices are and how they can be improved, including discussing and reinforcing proper laundering procedures with staff and across departments What's more, products powered by a proven technology such as X-STATIC® should be considered as part of the overall solution. Let's open the dialogue and raise awareness about soft surface bacterial contamination and the benefits of silver. With this technology, patients and healthcare workers can thrive in cleaner, safer hospitals where sliver is actively helping to prevent healthcare associated infections.

Very early on, Infection preventionists are taught that "infectability is directly related to dosage." If we can decrease the contamination in the environment, we can reduce our risk for transmission. We are missing a big opportunity in soft surface fabrics to protect patients and staff. For hand washing and hard surface disinfection to be most effective, we must include soft surface fabrics to ensure a complete infection prevention protocol.

[i] Ohl et al Hospital privacy curtains are frequently and rapidly contaminated with potentially pathogenic bacteria; Am J of Inf Control : on line publication; 2012 http://www.ajicjournal.org/article/PIIS0196655312000703/abstract

[ii] Trullis F 3rd et al. Contamination of hospital curtains with healthcare –associated pathogens. Infection Control and Hospital Epidemiology 2008, 29:1074-6

[iii] Perry C, Marshall R, Jones E. Bacterial contamination of uniforms. Journal of Hospital Infection ¬2001;48:238-41.

[iv] Lidwell OM, Towers AG and Ballard J. Transfer of microorganisms between nurses and patients in a clean air environment. Journal of Applied Bacteriology 1974;37:649-56

[v] 18. Hambreus A.Transfer of Staphylococcus aureus via nurses' uniforms. Journal of Hygiene 1973;71:799-814.

[vi] Lakdawala N, Pham J, Shah M, Holton J. Effectiveness of low-temperature domestic laundry on the decontamination of healthcare workers' uniforms. Infect Control Hosp Epidemiol. 2011 Nov; 32(11):1103-8. Epub 2011 Sep 20

[vii] Perry C, Marshall R, Jones E. Bacterial contamination of uniforms. Journal of Hospital Infection ¬2001;48:238-41.

[viii] AORN's 2011 Recommended Practices: A Summary. http://www.arta1.com/cms/uploads/AORN_2011_Summary.pdf Accessed January 26, 2012

[ix] Burden, M et al. "Newly cleaned physician uniforms and infrequently washed white coats have similar rates of bacterial contamination after an 8-hour workday: a randomized controlled trail. J Hosp Med. 2011 Apri;6(4):177-83

[x] Dr. P Wilson, Lister Hospital, 2009; http://www.infectionpreventiontextiles.com/Evidence.php

[xi] To request data visit http://www.arc-com.com/xstatic/test_data_request

[xii] CDC Data.

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SOFT SURFACE BACTERIAL MANAGEMENT CHECKLIST

- ☐ Is our purchasing team aware that antimicrobial fabrics are available and effective?
- ☐ Am I aware of the manufactures of antimicrobial fabrics and the properties of each of the different formulations or active agents?
- ☐ Do we educate our staff to the risk of cross contamination from soft surface fabrics from their hands or from contaminated hard surfaces?
- ☐ Have we performed formal monitoring of staff habits associated with potential contamination of soft surface fabrics?
- ☐ Is staff aware of the risk associated with contaminated uniforms to their family and environment outside of the healthcare setting?
- ☐ How many uniforms does our staff own on average? What are their laundering habits?
- ☐ Is staff aware of the Bloodborne Pathogen Standard that requires a facility to wash uniforms if they become contaminated with blood or other potentially infected body fluids?
- ☐ Are we evaluating soft surface fabrics during outbreak investigations or HAI reduction campaigns?
- ☐ Is this included in our financial models projecting the cost burden of HAIs?

For each type of soft surface fabric (privacy curtains/bed linens/uniforms), answer the following:

Who is responsible for laundering this soft surface fabric? How is this tracked?

Does our staff know when and how to report this contaminated soft surface fabric for removal?

How often is this soft surface fabric changed or washed? Do we have a protocol written for this?

What is the quantity of this soft surface fabric in the facility?

Do we contract with an accredited laundry facility for this soft surface fabric?

Have I determined the areas/departments where contamination of this soft surface fabric might be greater?

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