



WHITE PAPER

5 CORE DISCIPLINES TO REDUCE HEALTHCARE ASSOCIATED INFECTIONS (HAI) AND IMPROVE THE PATIENT EXPERIENCE

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"A patient's perception of hospital cleanliness is highly correlated with multiple safety, quality and experience measures."

– Press Ganey Environmental Services White Paper 2016

"Crothall's greatest difference is our specialized, leading-edge, best practices delivery model. Our focused, innovative performance within a single skill set ensures our robust environmental hygiene program is the best in class."

– Bobby Kutteh, CEO

MISSION STATEMENT

In the markets we serve, we will be recognized as the premier provider of the highest quality, customer-focused support services.

THREE KEY TAKE-AWAYS

1. HAI incidence can be mitigated with focus on 5 critical areas. Focusing on 1) hand hygiene, 2) processes, 3) measurement, 4) augmentation, and 5) emerging solutions can mitigate HAI. All five must work together in an integrated program fueled by people, process, products and partnerships. Possibly the most important element is people – highly trained, engaged, disciplined and passionate people committed to patient safety and environmental hygiene. This synergistic approach ensures optimization of all resources for a safe patient environment and reduced risk of an HAI event. The impact of such discipline on HAI incidence has been proven in multiple Case Studies.

2. HAI focus must be maintained in spite of the difficult healthcare environment. As hospitals struggle to reduce costs, clinical staffs have expressed concerns about over-work and stress. In such an environment protocols can be undermined and HAI

risk can grow. Complicating this situation hospitals have applied more pressure on patient flow to improve revenues, but it reduces the amount of time to effectively clean and disinfect a patient room. Meanwhile, pathogens have grown more resistant, regulatory requirements have intensified and CMS no longer reimburses for preventable events.

3. The Patient experience is more than a smile and kind words – safety is paramount.

An HAI incident impacts the Hospital's reputation as that Patient complains to the world in social media. A hospital's caring, engaged environment is over shadowed by a breakdown in safety. Financial risks expand as CMS relies more heavily on HCAHPS scores each year. Press Ganey's 2016 White Paper "Environmental Services-Delivering on the Patient-Centered Promise" demonstrates that Patient perceptions of "clean" are highly correlated with HAI incidence. Patient perception is reality.

EXECUTIVE SUMMARY

As the healthcare world struggles with drastic internal, external and regulatory changes, Patient, staff and visitor safety must remain mission critical. In this disrupted world a disciplined approach to Environmental Services is the only way to mitigate Hospital Associated Infections (HAI) incidence. Crothall Healthcare operates under a 5 Pillar strategy based on 5 integrated areas that evidence has proven can mitigate HAI.

TO REDUCE HAI INCIDENCE ALL 5 CRITICAL AREAS MUST BE ADDRESSED.

The five critical areas are:

1. Hand hygiene
2. Processes
 - People
 - Protocols
 - Products
3. Measurement
4. Augmentation
5. Emerging solutions

However, it's important to note that all of these must be executed by trained, engaged Staff who share the caring mission of the hospital. Discipline is key — there are no shortcuts. Patient safety must be "job #1".

Hand hygiene protocols, disciplined processes and measurement is the foundation but more is needed. Even these protocols must be augmented with more aggressive solutions on a case by case basis. Ultraviolet-C, or UV-C, when used in the appropriate manner, is a premier solution to augment the mitigation of HAI risks. In light of multiple published studies related to UV and like technology, it is clear that when UV-C is used, both proximity and time must be considered. That is,

moving a single emitter around a high-risk room can take hours and delay patient flow. Thus, the triple emitter system best addresses distance effectiveness, process shadowing and time constraints. Additionally, safely placing an emitter in the patient's bathroom daily also contributes to disinfection efforts and patient satisfaction.

Technologies continue to evolve and each must be reviewed for HAI impact. In addition to emerging technologies it is important to track emerging pathogens, e.g., Carbapenem-Resistant Enterobacteriaceae, *Candida auris*, etc. As the industry continues to evolve and new challenges arise, it is critical to review, evaluate and collaborate with solution-driven vendors and adhere to evidenced-based practices to determine the safest, most effective and best in class solutions available. Research and adherence to the latest evidence-based practices is critical. Exploration can never stop.

THE DISRUPTERS IN HEALTHCARE TODAY CAN UNDERMINE FOCUS ON HAI REDUCTION.

Pressure on reimbursements, regulatory changes and razor thin margins can distract hospitals from "mission critical" Patient, staff and visitor safety. While cost cutting is paramount in healthcare it should be applied according to the health risk profile to Patients, Families and Clinical Staff. Improving patient flow doesn't mean protocols can be skipped. Completing electronic health records or rounds on time does not mean that hand-washing can be cursory or even skipped. Protocols that affect HAI are non-negotiable.

The financial risks have expanded in the form of CMS and private insurers' penalties; they no longer reimburse for procedures that have been deemed preventable. The negative impact that HAI incidents have on reputation and brand also cannot be discounted.

In such pressurized environments it is possible basic protocols can be skipped or forgotten...like hand washing. Even the most disinfected environment cannot compensate for failure in hand hygiene. Crothall firmly believes HAI reduction starts with hand hygiene—both performance and compliance are critical. Crothall has aligned with GOJO as the hand hygiene provider and the Handwashingforlife® Institute to access industry best practices, training and the latest in awareness and compliance initiatives. Our staff is trained in the techniques and disciplines we learn from Handwashingforlife® Institute, and we gladly share those best practices with our clients and their staff.

The process of disinfecting every high touch surface is critical in HAI reduction. The appropriate process must be followed time after time and every time without variation – discipline is critical. In concordance with the implementation of hand hygiene processes, effective HAI reduction requires a disinfected environment for patients, staffs and visitors. Both visual and scientific surface measurements must be included in an aggressive quality management program to ensure performance compliance is maximized. Adenosine triphosphate or ATP testing is the standard scientific methodology used to provide the best measure of cleaning/disinfection efficacy.

PATIENT SAFETY OVER-RIDES ALL OTHER ELEMENTS OF A PATIENT'S EXPERIENCE.

Environmental hygiene can impact both HAI and patient perception. Today, perception impacts many facets of healthcare operations from the traditional, such as word of mouth, to current means, such as HCAHPS (Hospital Consumer Assessment of Healthcare Providers and Systems) scores, and social media. With HAI incidence rates published in many states and over 700,000 HAI events/75,000 HAI deaths a year,¹ there is significant, credible information available in addition to perception-based sources. As consumerism expands in healthcare and patients feel empowered, their healthcare decisions are less about what they are told to do by healthcare professionals and more about what they want.

HCAHPS scores for cleanliness are affected by both the reality of clean and the perception of clean. As patients and family members perceive the facility, so goes the ratings and the financial consequences. Small things, such as a perception of "clutter," can create a perception of "unclean" regardless that the room may be completely disinfected. Perception becomes reality.

In joint efforts with Compass One Healthcare's Positive Impressions Team Press Ganey released a White Paper "Environmental Services-Delivering on the Patient-Centered Promise." In that study MRSA and C. diff incidences correlated with the perceptions Patients had of their experience as measured by HCAHPS. It appears that "...Patients can, at some level, judge actual cleanliness." Thus, it is critical that Environmental Service departments address the perceptions of clean as aggressively as removing pathogens from the environment.

THIS WHITE PAPER

Discusses the association among hospital environmental contamination, pathogen transmission, and patient safety.

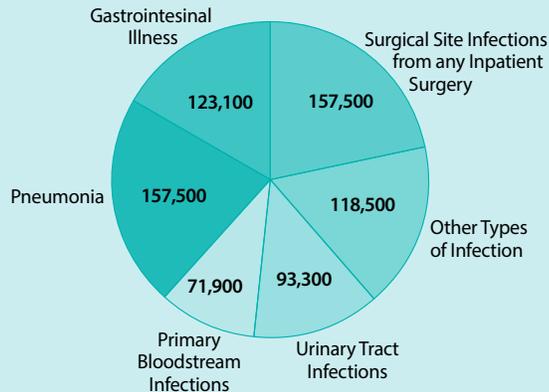
Describes Crothall's 5 Pillar strategic initiatives for reducing environmental contamination, decreasing healthcare-associated infections, and promoting improved patient outcomes.

Demonstrates Crothall's ongoing commitment to continually being the industry leader and setting the standard for providing specialized housekeeping services to hospitals.

INTRODUCTION

THE RISING COST OF HAIs

Figure 1:
Estimates of healthcare-associated infections occurring in acute care hospitals in the United States, 2011 (2)



There are 5,564 hospitals in the United States with 35 million annual patient admissions.² Daily, about 1 in 25 hospitalized patients has at least one HAI, with 722,000 HAIs in acute care hospitals. About 75,000 patients with HAIs died during their hospitalization.¹

82% of the infections originate from 5 areas. Twenty-one percent of the infections are the result of surgery; 21% of the infections are pneumonia; 17%

originate from the gastrointestinal tract; 13% originate from the urinary tract; and 10% are bloodstream infections (Fig.1).¹

The annual cost for the five major infections is \$9.8 billion. Surgical site infections contribute the greatest to overall expenditures.³ The five infections include central line-associated bloodstream infection, ventilator-associated pneumonia, surgical site infection, *Clostridium difficile* infection, and catheter-associated urinary tract infection. Infection prevention and control interventions can result in savings of \$5.7 to \$31.5 billion dollars annually.⁴

Reimbursement for preventable infections is declining. The rising costs of treating infection coupled with the knowledge that certain infections can be prevented has led the Center for Medicare and Medicaid's (CMS) Inpatient Prospective Payment System and some private insurers to no longer reimburse for several preventable HAIs.⁵

- › Catheter-associated urinary tract infections
- › Surgical site infection following spine, neck, shoulder, and elbow surgery
- › Surgical site infections after coronary artery bypass surgery
- › Surgical site infection following bariatric surgery for obesity
- › Vascular catheter-associated infection
- › Surgical site infection following cardiac implantable electronic device

Clearly, HAIs result in a mounting personal, medical, economic, and legal toll, especially impacting patients who are immuno-compromised, in addition to their families.

Patients are routinely exposed to microorganisms that are ubiquitous in the complex healthcare environment. Increasingly resilient and opportunistic bacteria, spores, and viruses are shed from patients and staff, and these pathogens:

- › Can contaminate the hospital environment, e.g., *Clostridium difficile*
- › May be transmitted between patients and the healthcare provider through unclean hands and contaminated equipment, e.g., *Acinetobacter baumannii*

- › May lead to potential infection with significant morbidity and/or mortality
- › May put visitors at risk for acquiring these organisms

Microorganisms are progressively more adept at surviving and reproducing on environmental surfaces.⁶ They are also developing increased resistance to available treatments,⁷ posing a challenge to the infection prevention and control and medical teams. Annually, at least 2 million persons become infected with antibiotic resistant organisms, with at least 23,000 individuals dying as a result.⁷

Healthcare leaders need to consider novel and emerging management strategies to achieve operational efficiency. Crothall specialized response to environmental hygiene, combining passion, precision, and performance, results in an unwavering commitment to patient and employee safety. Our proactive, proven approach to disinfection cleaning processes sets the industry standard for thoroughness and effectiveness with reducing potential infection risk in the healthcare environment and resulting in improved patient outcomes and satisfaction.

BACKGROUND

PATIENTS' PERSPECTIVE

Patients expect their hospital room to be clean to reduce the risk of infection;⁸

It is critical that the hospital room is meticulously cleaned and disinfected prior to patient admission and on a daily basis during hospitalization. Additionally, patients anticipate a satisfactory and uneventful outcome, and do not want to become ill with an HAI, potentially resulting in additional morbidity, extended hospital admission, and possible mortality.

Many variables impacting pathogen transmission are associated with infection prevention and control practices: environmental cleaning, hand hygiene, staffing challenges, antibiotic stewardship processes, disinfection/sterilization practices, employee vaccination compliance, shared equipment, equipment shortages, hospital census, patient acuity, and facility design may all affect total outcomes. Lack of adherence, breakdowns and failures with practice can put the patient at risk for acquiring a pathogen and possible infection. All of these variables must be proactively and rigorously addressed to be able to meet patient expectations of a safe hospital experience, while staying in a clean room, in today's competitive marketplace.

CONTAMINATED ENVIRONMENTAL SURFACES

An estimated 20% to 40% of HAIs have been attributed to transmission by the hands of Health Care Personnel (HCP). They have become contaminated from direct patient contact or by indirect contact with contaminated environmental surfaces.⁹ While hand hygiene is the most important way to reduce pathogen transmission in the healthcare environment, it is exceptionally challenging to measure adherence, with varying compliance rates across studies.¹⁰

Pathogens responsible for healthcare-associated infections can be widely found in the hospital environment¹¹⁻¹⁴. They can be readily acquired on the hand by touching surfaces¹⁵ demonstrates the importance of decontaminating hands before every patient contact.¹⁶

Environmental surfaces and equipment can harbor pathogens and bioburden.

Patients are the prime source for environmental contamination; surfaces within the patient’s vicinity, also known as the “patient zone”¹⁷ that are frequently touched by the patient and HCP have an increased contamination frequency than other sites.¹⁸ This contamination may contribute to the spread of disease-causing, multidrug-resistant organisms (MDROs), such as MRSA (Methicillin resistant *Staphylococcus aureus*), VRE (Vancomycin resistant *Enterococcus*), and *Clostridium difficile*.^{18,19}

SURFACE CONTAMINATION AND PATHOGEN ACQUISITION RISK

Contamination risk from previous patients is significant. Epidemiological studies have shown that patients admitted to rooms previously occupied and contaminated by patients with these pathogens are at significant risk of acquiring these organisms from contaminated environmental surfaces that were not properly cleaned and disinfected and upon discharge of the previous patient.¹⁸

MICROORGANISM TRANSMISSION

Patients—and sometimes HCP—will shed bacteria, spores and viruses into the hospital environment, creating potential threats to other staff members, patients and visitors.¹⁸ Microorganisms may be attached to droplets, skin scales or other particles, and disperse through the hospital environment, where they have the ability to survive for hours to days to months (Fig. 2).

Transmission of many healthcare-associated pathogens is related to contamination of near-patient surfaces and equipment.^{12,20,21} Environmental contamination depends on the following:¹⁸

LINGERING CONTAMINATION

Pathogen	Length of Survival
<i>Acinetobacter</i>	3 days – 5 months
<i>Clostridium difficile</i>	5 months
<i>Enterococcus</i> , including VSE ¹ and VRE	5 days – 4 months
<i>Klebsiella</i>	2 hours –>30 months
<i>Staphylococcus aureus</i> , including MRSA	7 days – 7 months

- › The ability to culture the organism
- › The degree of patient shedding; infected patients shed more organisms than those colonized
- › The number of culture-positive body sites
- › Sampling methodology
- › Difficulty of cleaning the environment
- › Presence of an ongoing outbreak
- › Diarrhea, with widespread contamination
- › Patient characteristics, e.g., incontinence

In addition, horizontal surfaces have a greater number of microorganisms and more contamination than vertical surfaces, ceilings, and intact walls.

Figure 2: Length of pathogen survival on environmental surfaces

IMPORTANCE OF CLEANING AND DISINFECTION

Cleaning, the removal of soil and contaminants from surfaces, is recognized as a vital component of the intervention package required to reduce hospital infection.^{21,22} Friction is used to remove surface contamination. Disinfection results in destroying pathogens. In addition to the thoroughness, efficiency, and time spent cleaning the room, the type of materials used in environmental surfaces and the design/amount of equipment in a patient's room will impact cleaning effectiveness.

Effective, daily cleaning and disinfection will decrease the number of environmental pathogens. In turn it reduces the risk of transmission and potential infection, and be an integral part of a hospital's infection prevention and control plan. It is highly likely that cleaning practice plays a larger role in positive outcomes than does the product used.²²

DAILY CLEANING AND DISINFECTION CHALLENGES

Numerous clinical studies indicate thoroughness of disinfection cleaning may be suboptimal and can be significantly improved.²³ Environmental surface contamination may contribute to the spread of disease¹⁸ and potential infection by contaminating HCP hands, gloves, uniforms, gowns and equipment. Several significant pathogens, including MRSA, VRE, *Clostridium difficile* spores and *Acinetobacter baumannii*, can survive under certain conditions for four to five months or more.¹⁸ Norovirus, a pathogen known for causing severe gastroenteritis, can survive for a week or more.¹⁸

The number of microorganisms on a surface is impacted by:

- › Amount of surface moisture
- › Amount and type of activity taking place in the immediate vicinity
- › Amount of air flow
- › Prevailing ambient temperature
- › Number of people interacting with the environment
- › Type of environmental surface and its ability to foster microbial growth
- › Biofilm development on equipment and furnishings

Hospital environments are complex and may result in cleaning and disinfection challenges. A surface may appear "clean" but still harbor pathogens due to their invisibility. Resultantly, visual inspection alone is not a reliable indicator of cleanliness. Environmental cultures, fluorescent markers, and Adenosine Triphosphate (ATP) bioluminescence can be used to assess cleanliness.²¹

Environmental contamination has been proven to be a significant risk. Frequent environmental contamination has been implicated as a contributing factor during protracted outbreaks of MRSA, *Clostridium difficile*, VRE, *Acinetobacter baumannii*, and Norovirus.¹⁸ Evidence exists that improved cleaning regimens are associated with the control of outbreaks²⁴ and bacterial transmission.²⁵

Hand hygiene is critical. Environmental surface contamination with pathogens can be transmitted onto the hands of HCP and may spread disease-causing organisms like MRSA, VRE and *Clostridium difficile* to the patient.¹⁸

Figure 3. The CMS and Joint Commission regulatory requirements.

§482.42 Condition of Participation: Infection Control⁽²⁴⁾

"... The hospital must provide and maintain a sanitary environment to avoid sources and transmission of infections and communicable diseases."

Standard EC.02.06.01

"Areas used by patients are clean and free of offensive odors" (The Joint Commission. Accreditation Program: Hospitals)⁽²⁵⁾

REGULATORY AND GOVERNMENTAL AGENCIES' PERSPECTIVES

Regulatory agencies recognize the importance of environmental hygiene to reduce infection.

Those agencies include the Centers for Medicare and Medicaid Services (CMS)²⁶ and The Joint Commission²⁷ (Standards and National Patient Safety Goals), in conjunction with the United States Department of Health and Human Services (HHS) and the Centers for Disease Control and Prevention (CDC). These organizations are increasing their recommendations and standards to improve environmental hygiene. The regulatory agencies are requiring data to demonstrate hospitals that are focusing ongoing efforts with reducing

HAIs. The evolving regulatory and governmental healthcare emphasis is to supervise, inspect, analyze and optimize the thoroughness of cleaning and disinfection to ensure safe patient care. Refer to Figure 3.

IMPORTANCE OF A CLEAN ENVIRONMENT

There is generalized agreement that a clean environment is necessary to provide both good standards of hygiene and maintain patient and staff confidence.^{24,28}

Patient satisfaction surveys also question the hospital's cleanliness. Patients may subjectively consider a hospital to be less clean and then associate that to a general lack of care.^{8,28} The news and social media also have a heightened interest in environmental hygiene, with reporting on "dirty hospitals."²⁹ Many states now have public reporting of hospital infection rates, with diminished reimbursement in some situations, for having higher-than-expected infection rates. The hospital must strive to meet community standards and exceed expectations to avoid negative outcomes. The impact of negative media coverage can adversely affect the bottom line.

A clean, disinfected environment may promote a healthier workforce.

HCP who work in close proximity to patients, including those who provide either direct or indirect patient care, need to stay healthy to come to work, to minimize the potential of spreading illness to patients and co-workers, and reduce the infection risk to their families.

MISSION STATEMENT

In the markets we serve, we will be recognized as the premier provider of the highest quality, customer-focused support services.

MEETING THE CHALLENGES

Healthcare providers must align their operations to more efficiently meet HAI challenges.

Effective administration and management of environmental services resources are critical for improving processes and maintaining a safe and clean environment for patients, visitors, and healthcare personnel.

THE FIVE PILLARS

CROTHALL'S FUNDAMENTAL APPROACH TO ENVIRONMENTAL HYGIENE

Crothall's evidenced-based, integrated program to promote patient safety is built on the 5 areas identified as the most effective in reducing HAI incidence.

The Crothall Healthcare approach is a critical factor in support the mitigation of HAI events within the hospitals we provide services to.

The ultimate goal of the 5 Pillars is to improve Patient safety and *The Experience*.

Ultimately patient safety is more important than even a smile or kind words from an engaged staff member. They are important to the overall experience but cannot override an HAI event. The 5 Pillars address the *reality* of clean and also recognize the importance of *perception* of clean to impact The Experience of every stakeholder:

- › Patient
- › Family/Guest
- › Clinical Staff
- › Community

The Crothall Healthcare 5 Pillars program to reduce HAI incidence was developed into a staple of the supporting infection prevention focus, through practical performance outcomes, regulatory adherence, scientific validation as well as the escalation of proven differentiation optimizing the overall patient experience:

1. Hand hygiene
2. Process Solutions
3. Measurement
4. Ultraviolet (UV) Augmentation
5. Emerging Solutions

THE FIRST PILLAR: HAND HYGIENE

Many pathogens that are responsible for infection are transmitted on the hands of healthcare personnel (HCP). The CDC notes that HCP practice hand hygiene about half the time they should.³⁴ Effective hand hygiene can clean contaminated hands and prevent pathogen transmission to others. When HCP do not perform hand hygiene as indicated, they put themselves, their patients, and their co-workers at risk for serious harm.

The patient is the prime source for environmental room contamination.

Frequently touched surfaces by both the patient and HCP, such as siderails, bedside tables, etc., within the "patient zone," have increased contamination than other surfaces within the hospital room. Bacteria and their spores can survive for days to weeks to months on patient care equipment and other surfaces. While gloves can prevent hand contamination, they do not provide an absolute barrier and are not considered a substitute for hand hygiene. Additionally, the hands can become contaminated during the glove removal, or doffing process.

The CDC has clear recommendations when hand hygiene should be performed.³⁵

Crothall endorses these recommendations and additionally believes hand hygiene should occur, at a minimum, upon entry and exiting the patient's room and during the "high profile cleaning protocol." To continually ensure their extensive employee training with evidenced-based practices coupled with alcohol-based hand rub (ABHR) products that exceed current requirements with proven, third-party in vivo testing-validated efficacy, Crothall has partnered with both Handwashingforlife[®] Institute and GOJO Industries.

Crothall has chosen GOJO Industries (www.gojo.com), the inventors of PURELL, as their preferred hand hygiene provider.

ABHR, or hand sanitizer, kills bacteria more effectively and efficiently than washing with soap and water (when the hands are not visibly soiled). These products are less damaging to the skin, resulting in less irritation and dryness. The CDC recommends ABHR use unless the hands are visibly dirty or contaminated.³⁵ PURELL is the #1 hand sanitizer in hospitals around the country today.

GOJO Industries has been working to improve hand hygiene around the world.

In fact, their stated corporate purpose is to "Save Lives and Make Life Better through Well-Being Solutions." GOJO's primary focus is on making proper hand hygiene compliance easy for healthcare workers, patients and visitors. To do this, they focus on 4 key principles:

1. **Develop formulas of soaps, sanitizers and lotions that people like using** – Their PURELL[®] and PROVON[®] soap, sanitizer and lotion formulas are both efficacious and well-liked by users to help to maintain healthy skin.
2. **Make these formulas available when and where they are needed** – The product comes in reliable dispensers and bottles conveniently placed throughout a hospital.
3. **Provide education for staff, patients and visitors that's easy and understandable** – Leveraging the CDC and WHO guidelines and best practices, GOJO offers a wide range of education tools.
4. **Make it easier to track actual hand hygiene compliance rates** – Delivering cutting-edge compliance monitoring technology and clinician-based support via their Smartlink[®] solutions.

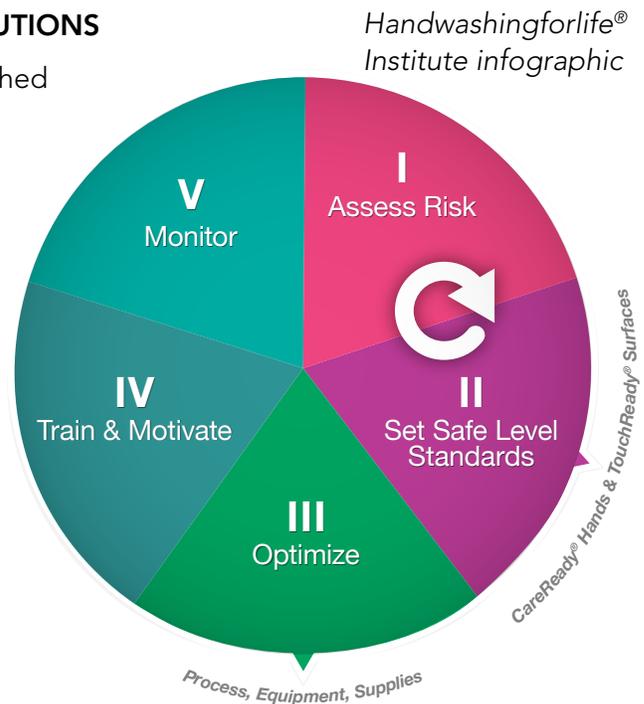
GOJO relies upon a “3 Leg Strategy”. To achieve clinical benefit GOJO focuses on 1) Formulation, 2) Dispensing and 3) Compliance Programs. Formulation and dosage will achieve antimicrobial efficacy but compliance on when, how and how often hand washing occurs achieves true clinical benefit. Skin health and skin feel promote usage.

The Handwashingforlife® Institute (www.handwashingforlife.org) is devoted to advancing the science of hand hygiene. Their clear purpose is to reduce the incidence of HAIs and foodborne illness caused by poor hand hygiene practices. Their strategic solutions with “overcoming underwashing” includes assessing the risk, setting safe level standards, optimizing the conditions for success, education, and monitoring performance, with the intent of creating a “new cleanliness culture”; refer to Handwashingforlife® Institute infographic.

The HandsOn™ System establishes risk-based standards and process control to reduce the risk of foodborne outbreaks. Managers get the tools to assess their risk and implement sustainable solutions in protecting customers, staff and the very business itself.

THE FIVE STRUCTURED STEPS TO SUSTAINABLE SOLUTIONS

- I. **Assess Risk** Identify and verbalize the risk of the unwashed hand. Rank surfaces at highest risk for cross contamination.
- II. **Set Safe Level Standards** Establish clear standards for individual and team level success.
- III. **Optimize** Ensure the conditions for success are in place before training. If compliance isn’t convenient and isn’t user friendly, it isn’t done.
- IV. **Train & Motivate** Convert to a culture of cleanliness. This step introduces best practice tools, techniques and materials to motivate behavior change.
- V. **Monitor** What gets measured and rewarded gets done. Rewarding the good and disciplining the less than acceptable behaviors are key to sustainability.



For more than five years, Crothall has partnered with Handwashingforlife® to reduce the risk of HAIs and person-to-person illness. Resultantly, the science of hand hygiene, correct gloving technique, and the importance of high-touch surface cleanliness is continually taught to all housekeeping specialists.

Hand hygiene is the simplest and one of the most effective methods to prevent pathogen transmission. It’s clear these strategic partnerships assist Crothall with providing world class resources to promote patient safety and reduce the infection risk.

THE SECOND PILLAR: PROCESS SOLUTIONS

The Crothall environmental services program addresses both the reality of clean and the perception of clean. Patient safety and infection prevention and control is the reality of clean, while the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) and the results from third party research survey providers such as Press Ganey, NRC Picker, etc. reflect the patient's perception of clean. Crothall's comprehensive and specialized strategy consists of processes and protocols to ensure a thorough cleaning and disinfection of the patient's environment.

Crothall's EVS Process goes beyond basic cleaning to disinfect surfaces and interrupt microorganism transmission. Crothall EVS staff implement specially designed protocols that consist of evidenced-based practices to protect patients, staffs and visitors from acquiring pathogens. To be healing environments, hospitals must not only look visibly clean; they must also be free of microbial contamination.

The hospital environment has wide-ranging surfaces, equipment, and intricate designs. Crothall's thorough, goal-driven, integrative environmental cleaning and disinfection approach, with continuing employee education (Fig. 4), reduces HAIs and leads to positive patient outcomes, accomplished through multiple systems and processes.

THREE CORE ELEMENTS OF CROTHALL'S PILLAR #2 - PROCESS

1. People
2. Protocols
3. Products

PEOPLE - THE HUMAN FACTOR

Every day, HCP perform thousands of interventions and actions that have the potential to transmit infection and/or cause environmental contamination. To address the problem, there is a focus on technical solutions—re-engineering protocols, adopting new products and researching new technology. But what cannot be overlooked is the human factor: the front-line housekeeping staff, whose daily cleaning and disinfecting activities help to protect the patient.

Crothall believes successful Environmental Services (EVS) program depends upon:

- › Acknowledging EVS Department as a key player in infection prevention
- › Partnering with the Infection Prevention and Control Department
- › Clinically involving the EVS staff
- › Viewing EVS as full-fledged health care team members
- › Breeding empowerment with team cooperation

Fig. 4: Continuing Employee Education

- ✓ New hire orientation
- ✓ Weekly “Mindings” (weekly reminder training that entails a task and safety topic)
- ✓ CHAT sessions (that include a monthly topic)
- ✓ Annual refresher training
- ✓ Training, including hand hygiene, PPE, *C. difficile* modules, VRE, MRSA, isolation room cleaning, and safe work practices

The cultural divide between the environmental services and clinical staff is a resultant theme impeding hospital cleanliness.³²

Optimal performance barriers include:³²

- › Gaps in training, education and understanding of their role
- › Separation from traditional hospital clinical team
- › Potential for language or understanding barriers
- › Pressure from nursing and admitting staff to clean a room under the allotted time
- › Feeling of disempowerment to challenge hospital staff
- › Clinical staff using clean rooms for staff breaks, lunch, etc. requiring re-cleaning

This results in hospital equipment and furniture not being appropriately cleaned and disinfected and an increase in pathogen transmission risk to patients, visitors, and HCP.

Crothall proactively responds to these human factor challenges and promotes a hygienically clean environment by:

- › **Ongoing and direct employee training**, coaching, engagement, feedback, partnership, accountability and empowerment of staff members to ensure they are clear about their individual responsibility for promoting environmental hygiene, through correct cleaning/disinfection processes and proper personal protective equipment (PPE) use, which leads to improved and sustained outcomes
- › **Educating** the environmental services and healthcare teams in the proper use of hospital-grade chemical agents
- › **Designing comprehensive, specific and integrative protocols** and strategies, including a “High Profile Cleaning” systematic process that focuses on cleaning and disinfecting of high-touch points in the patient zone and cultivates patient engagement
- › **Auditing** staff to ensure strict adherence to standard protocols that have a high-touch point focus
- › **Actively measuring Adenosine Triphosphate (ATP)**, an objective indicator of whether a surface is clean or not, using the Hygiene performance improvement technology. Immediate employee feedback can be given to ensure service quality and thoroughness. Both short-term and long-term trending is performed, with findings shared with the infection prevention and control and hospital leadership teams.
- › **Fluorescent marking systems** are also used to objectively evaluate cleaning practices
- › **Checklists** to ensure all procedures are being followed
- › **Competency testing** to assess worker performance

- › **Partnering with the hospital’s Infection Prevention and Control Team**, e.g., analyzing ATP results, disinfection selection, outbreak termination, etc., serving on the Infection Prevention and Control Committee, and participating in regular multi-disciplinary environmental rounds performed with Environment of Care and Infection Prevention and Control colleagues
- › **A multi-faceted approach towards quaternary binding (“quat binding”):** specialized protocols and quaternary test strips are used to check product potency and ensure the appropriate amount of disinfectant is delivered. Refer to page #21 - “Using one-step EPA registered quaternary (“quat”) hospital disinfectants.”
- › **Conducting periodic independent consultant assessment surveys** to ensure compliance with protocols and assist with regulatory preparedness
- › **Ensuring compliance with evidence-based policies and procedures based on:**
 - › **The Centers for Disease Control and Prevention (CDC)**, World Health Organization (WHO), Canadian and British infection prevention guidelines and recommendations
 - › **Regulatory agencies (e.g., OSHA, Department of Public Health, CMS)**, accrediting agencies (e.g., The Joint Commission, Healthcare Facilities Accreditation Program [HFAP], National Integrated Accreditation for Healthcare Organizations [NIAHO])
- › **Partnering with a board-certified infection preventionist** to ensure best practices with reducing HAIs
- › **Incorporating well-designed research** from medical literature
- › **Implementing industry studies** and recommendations
- › **Adopting best practices** from other leading organizations (e.g., AORN, APIC)
- › **Evaluating an organization’s specific and unique needs** when recommending proper cleaning procedures, products and new technologies
- › **Adopting protocols based on Crothall’s research and scientific experience.** Fast expansion of life-saving protocols across all Crothall Clients is critical such as the Ebola Virus Disease (EVD) patient handling at Bellevue Hospital in New York City.
- › **Partnering with the Positive Impressions Team and Press Ganey** to discover the best paths to create a caring and personalized healthcare experience.

The “High Profile Patient Room Cleaning QA” metric is used by both the customer and the Crothall Leadership Team to assess if the following high-touch surfaces were cleaned/disinfected properly to meet Crothall’s high standards:

- | | |
|-------------------------|-------------------------------|
| 1. Light switches | 6. Bedside table |
| 2. Sink faucets | 7. Shower handle/rail |
| 3. Restroom door handle | 8. Telephone |
| 4. Toilet and flusher | 9. Remote control/call button |
| 5. Bed hand rail | 10. Overbed table |

Crothall consistently maintains an extraordinary 95% satisfaction score with the “High Profile Patient Room Cleaning” process.

NURSING ENGAGEMENT

Crothall conducts rounds with the nursing leadership to evaluate cleaning quality. A true gauge of an Environmental Services Department’s relationship with nursing lies in the interaction with line nurses and nurse assistants. A constructive, friendly relationship is critical to create an environment where everyone embraces their personal role in reducing HAI incidence.

The patient experience audit confirms that a Nursing Engagement program is in place. The audit proves the program is active to improve Patient experiences through collaboration. Evidence of nursing engagement includes logs, pictures, e-mails, thank you cards and joint celebrations.

The operational “Picture Perfect Program” is a key component of Nursing collaboration. The program must be customized to the preferences of the nursing staff in each unit. Regular discussions with nursing leadership will identify their specific preferences following discharge cleaning. Any and all elements must be consistent with every HAI reduction protocol.



EVS Customer Survey Inspection

Facility: _____ **Inspection Date:** _____
Building: _____ **Interviewee:** _____
Floor: _____ **Employee:** _____
Room: _____ **Supervisor:** _____

<i>Customer Survey</i>	<i>Comments</i>
1. Rate the cleanliness of your area. SAT UNSAT NA	
2. Rate the responsiveness of our staff to your requests. SAT UNSAT NA	
3. Rate the availability of restroom and patient area supplies. SAT UNSAT NA	
<i>Quality Tour</i>	<i>Comments</i>
1. Patient Room 1 (please enter room number for each item in the comments field) SAT UNSAT NA	
2. Patient Room 2 SAT UNSAT NA	
3. Patient Room 3 SAT UNSAT NA	

REGULATORY ADHERENCE

The Joint Commission’s spot inspection of non-clinical departments is demanding. Even a small violation by a member of our team can potentially lead to vast problems for the hospital. Understanding and enforcing standards is vital to our success.

We know the issues surveyors demand for review. Our training and operating procedures are designed to establish and update the critical record sets so that adherence is readily demonstrable and inspections are easily accommodated, facilitated, and satisfied. We train all department members on the array of local, state, and federal regulations and requirements. We also ensure complete compliance with the gamut of agency-mandated training topics, and document the completion of this training by each employee.

Crothall also works with Safety and Disaster Solutions, Inc. to evaluate our program elements and site performance (<http://www.safetydisaster.net>). SDS is an independent consulting firm specializing in healthcare environmental hygiene, safety, and infection prevention and control. This provides a “fresh eyes” approach and gives Crothall the perspective needed to maintain and improve. Crothall is the first support services vendor to use an outside consultant to verify performance, and it demonstrates proactive willingness to find problems before a survey occurs and do what is necessary to fix them.

The Crothall track record is unblemished. After over 70 unannounced Joint Commission surveys at client hospitals, Crothall has not earned a single Requirement for Improvement (RFI) in any of the departments it manages. On the Crothall watch, every department, every day, is run as “Survey-Ready, Every Day”—Crothall guarantees it.

CMS reporting data on C diff confirms the efficacy of the Crothall process.

Crothall monitors the quarterly CMS data on C-Diff events. With a lag of ~12 months from December 2017, 90% of Crothall Clients meet or beat the CMS National benchmark for C-Diff results.

PROTOCOLS - DOING THE RIGHT THINGS

The CDC divides housekeeping surfaces into two distinct groups:

1. **Minimal Hand Contact** Areas that have minimal hand contact (e.g., floors and ceilings) require thorough cleaning but at a lower level of intensity.
2. **Frequent Patient Contact** Areas with frequent hand contact (“high-touch surfaces”)³⁰ have the potential to become reservoirs for infection. High-touch surfaces can quickly become contaminated; pathogen transmission is related to the contamination of near-patient surfaces and equipment.³¹

The CDC notes the surfaces in the patient’s room such as bedrails, bedside tables and call buttons may be a contributing factor in the transmission of disease from one patient to another.³⁶

High-touch housekeeping surfaces include:^{21,30,31}

- › doorknobs
- › bed rails
- › light switches
- › wall areas around the toilet in the patient's room
- › edges of privacy curtains
- › sink
- › bedside table
- › side/bed rail
- › call box
- › telephone
- › bathroom handrails

The CDC recommends that high-touch housekeeping surfaces should be cleaned and/or disinfected more frequently than surfaces with minimal hand contact³⁰ and that programs be developed that optimize cleaning thoroughness.²¹

PRODUCTS – THE RIGHT PRODUCT FOR EVERY SITUATION

Highly trained Crothall EVS staff must have the most efficacious products.

Regular product testing and evaluation ensures that EVS staff is applying the latest technologies to clean and disinfect every risk point.

Crothall follows these core Product strategies:

- › **Develop strategic relationships with cutting edge Manufacturers.** Leverage their technologies and product development protocols to identify the best products to reduce HAI incidence.
- › **Apply a severe due diligence discipline of testing all products.** Products identified for potential application in healthcare are submitted to Crothall Technical Services for Beta testing, Pilot Testing and finally Field testing before national introduction.
- › **Use only appropriate one-step EPA-registered hospital disinfectants** for cleaning and disinfecting high-touch, environmental surfaces
- › **Cleaning/disinfecting *Clostridium difficile* rooms** with CDC-recommended Environmental Protection Agency (EPA)-registered disinfectants with a *Clostridium difficile* sporicidal label claim
- › **Implementing premium microfiber products** and hydrogen peroxide liquid agents
- › **Enhancing standard protocols with “no-touch” automated room disinfection** (NTD) highly efficient technologies, e.g., ultraviolet (UV) technology and hydrogen peroxide vapor technology to eradicate microbes
- › **Using High Efficiency Particulate Air (HEPA) filtration** in selected clinical situations

Diversey is a strategic partner to Crothall in developing cutting edge products.

Diversey (<https://www.diversey.com>) is a pioneer in the hygiene business and provides expertise and products to reduce HAIs and improve patient outcomes with a diverse, comprehensive product line including:

Oxivir is a one step hospital disinfectant cleaner powered by hydrogen peroxide technology. The synergistic combination of cleaning and disinfectant properties results in effective and fast cleaning and disinfection performance that is gentle to surfaces and does not require personal protective equipment (PPE) use.

Additional quaternary-based broad spectrum one-step agents that are also fungicidal and tuberculocidal are applied as appropriate.

- › **MedStar Washington Hospital Center - 923-bed facility, in Washington, D.C.** Crothall and Diversey recently partnered to implement a thorough environmental hygiene program resulting with positive infection prevention outcomes, increased patient and caregiver satisfaction, and operational efficiency; refer to “Enhanced Products and Processes Improves HCAHPS, Reduces HAIs” for additional information. https://www.crothall.com/files/8315/1915/4774/Diversey_MedStar_Word.docx
- › **Parkland Health & Hospital System - 870 bed hospital in Dallas County.** Crothall and Diversey implemented a “High Profile Cleaning” program to drive increases in HCAHPS scores. In addition the HPC program decreased room cleaning time and an approximately 50 percent ATP testing improvement; refer to “Parkland Health & Hospital System Improves Patient Satisfaction with IP” to learn more. https://www.crothall.com/files/3815/1915/3546/Diversey_Parkland_Word.docx
- › **St. Anthony’s Medical Center St. Louis - 767 bed hospital.** This facility experienced better performance from Diversey products and procedures; refer to “Hospital Disinfection Improves with help of TouchPoint Support Services and Diversey.” https://www.crothall.com/files/3215/1915/2768/Diversey_St_Anthonys_Word.docx
- › **Inova Fairfax - 923 bed hospital.** The introduction of several Diversey products with the High Profile Cleaning (HPC) process resulted with improved customer satisfaction coupled with HCAHPS scores above the state average-refer to “Inova Fairfax Hospital Teams with Crothall Healthcare and Diversey.” https://www.crothall.com/files/8915/1915/3946/Diversey_Inova_Fairfax.docx
- › **Saint Luke’s Hospital of Kansas City - 442 bed magnet facility.** Use of Diversey products combined with Crothall’s HPC process resulted in increased patient satisfaction scores and reduced HAIs; refer to “Crothall Healthcare, Diversey Send Patient Satisfaction on the Rise.” https://www.crothall.com/files/6815/1915/3775/Diversey_St_Lukes_Word.docx

Clorox Healthcare is another strategic Partner to Crothall Healthcare. Building on a century-long legacy in cleaning and disinfecting, Clorox Healthcare offers a wide range of products to help stop the spread of infection in healthcare facilities. Clorox Healthcare’s products are fast-acting, EPA-registered, cleaner disinfectants intended for use upon environmental surfaces and medical equipment to help reduce the spread of pathogens such as *Clostridium difficile* that can cause HAIs. The Clorox Healthcare ready-to-use (RTU) method has demonstrated improved environment

cleaning and disinfection, faster cleaning and disinfection process, and potential time-related cost savings. For more information, visit www.CloroxHealthcare.com.

There are multiple studies that have demonstrated the value of using bleach (sodium hypochlorite) disinfectants. These products have been successful reducing *Clostridium difficile* transmission in hospital settings.

- › **Beth Israel Medical Center’s Dr. Brian Koll spearheaded a hospital collaborative to interrupt Patient-to-Patient *Clostridium difficile* transmission and reduce infection.** Clorox Healthcare products were used in many cases; refer to “Prevention of Hospital-Onset *Clostridium difficile* Infection in the New York Metropolitan Region Using a Collaborative Intervention Model” for additional information. <https://www.crothall.com/files/2515/1603/4011/Summary- Koll at Beth Isreal on C. diff Intervention APIC 2011 NI-18568 Bleach.pdf>
- › **The Raimondi study was able to successfully reduce MRSA transmission and infection,** implementing several interventions, including the use of Clorox products; refer to “Infection-Prevention Bundle — Including Use of 1:10 Bleach (DISPATCH®) — Decreases MRSA Incidence by 57%.” <https://www.crothall.com/files/3315/1603/4009/Clorox Crothall white paper Summary- Raimondi at Beth Isreal on Bleach for MRSA Reduction SHEA 2011 NI-18793.pdf>
- › **The Mermel et al study implemented six major interventions to curtail *Clostridium difficile*,** including an emphasis with improving decontamination of the environment in patient rooms, other care areas, and patient care equipment, which resulted in decreased *Clostridium difficile* infection rate and reduced mortality; refer to “Reducing *Clostridium difficile* Incidence, Colectomies, and Mortality in the Hospital Setting: A Successful Multidisciplinary Approach.” <https://www.crothall.com/files/7715/1603/4011/Summary - Multidisciplinary C. diff Reduction Approach Mermel Joint Commission Journal 2013 Bleach 1 1.pdf>
- › **Saint Mary’s Hospital in Rochester, Minnesota, developed a targeted strategy using Clorox bleach wipes** which was found to be an effective component in reducing *Clostridium difficile* infection and generated cost savings; refer to “A Targeted Strategy to Wipe Out *Clostridium difficile*.” <https://www.crothall.com/files/8015/1603/4012/Summary- Targeted Strategy Study St. Marys Mayo Clinic Bleach 1.pdf>
- › **The Wiemken et al study demonstrated how the Ready-To-Use (RTU) method resulted with improved environmental cleaning and disinfection compliance rates;** refer to “The Value of Ready-to-use Disinfectant Wipes: Compliance, Employee Time, and Costs.” <https://www.crothall.com/files/8515/1603/4011/Summary - Weimken on Benefits of RTU Bleach Wipes AJIC March 2014 3.pdf>

Triple S is another Crothall strategic partner. Triple S created Perisept - a sporicidal, broad spectrum disinfectant cleaner (<https://triple-s.com/products/sss-navigator-62-perisept-sporicidal-disinfectant>). This non-bleach, non-alcohol alternative for killing *Clostridium difficile* spores has a two-minute sporicidal claim at

99.9999% efficacy. This rapid acting product leaves no harmful or corrosive residues and is compatible with many different surfaces (without leaving an undesirable film). Refer to "PERISEPT Sporicidal Disinfectant Cleaner" https://www.crothall.com/files/1815/1915/2866/PersiptCase_Study_v_2.docx.

Microfiber does a superior job reducing bioburden, e.g., *Clostridium difficile* spores, MRSA, dirt, debris, etc., than standard cotton cloths. By removing the bioburden and using the EPA-hospital grade disinfectant, the patient's risk of exposure to life threatening pathogens is reduced. Not all microfiber is the same. Crothall's evidenced-based microfiber program uses Medline's top quality microfiber in hospitals. After use, CDC-recommended laundry practices are applied that will extend the life of the microfiber by a factor of two (https://www.crothall.com/files/5315/1603/4009/Crothall_Medline_microfiber_environmental_hygiene_IP_write_up.docx).

Proper handling and laundering is essential for control of pathogenic microorganisms via laundry. Removal of pathogenic microorganisms during laundering is achieved by a combination of 1) physical, 2) chemical and 3) temperature factors. The action of the washing machine, addition of detergent/disinfectants and wash water temperatures above 40 C can play a significant role in the removal of microorganisms. Microfiber mops and cleaning cloths have been shown to have better removal capabilities in removing dirt and bacteria from contaminated surfaces but must be decontaminated. The Miele PW 6101 washing machine and PT 7251 NI EL dryer demonstrated that they were effective in disinfecting all of the antibiotic resistant bacteria; refer to https://www.crothall.com/files/8515/1915/4774/Miele_white_paper_8_8_2017.pdf.

When using one-step EPA-registered quaternary ("quat") hospital disinfectants, it is critical to ensure potency at the "patient zone." Crothall has been closely following the research surrounding quat binding upon microfiber and cotton cloths and the potential for decreased potency at the bedside. Resultantly, Crothall has calibrated their policy to only allow a certain number of microfiber and/or cotton cloths to set in the quaternary disinfectant container to reduce risk. This remedy, coupled with a routine quat potency test using approved quat disinfectant test strips, in addition to a prescribed quaternary disinfectant chemical change during the working shift, has allowed our services to continue to serve our patients in the safest and most environmentally efficient manner without an escalation of infection rates.

PILLAR 3: MEASUREMENT

The CDC states the transmission of pathogens is related to contamination of near-patient surfaces and equipment. While the actual standard of contamination still needs to be defined,²¹ Crothall has always believed a clean hospital is critical to prevent HAIs, and having a clean, safe “patient zone” is critical for patient wellness. Measuring cleanliness by appearance alone is simply not the optimal metric; environmental microbial contamination can still occur, be invisible to the naked eye, and pose a potential infection risk to a patient. Resultantly, objective measurement of surface cleanliness using ATP (adenosine triphosphate) cleaning verification provides instant feedback on cleaning/disinfection effectiveness.

The Hygiena ATP verification system is one of the leading methods recommended by the CDC. The scientific detection of adenosine triphosphate (ATP), the universal unit of energy in all living cells, immediately determines if surfaces are truly clean and safe.

The Hygiena ATP verification system gives actionable results in only 15 seconds. Thus, Crothall’s implementation of Hygiena provides hospitals with an affordable, objective, easy-to-use method for verification of surface cleanliness. This user-friendly monitoring system will not only improve hospital cleanliness and reduce infection risk, but also will ensure the cleaning budget is used more efficiently. Crothall has ATP technology in over 200 locations nationally.

Hygiena ATP technology is aligned with Crothall TeamCOACH software. Users can know immediately if surfaces have been cleaned/disinfected properly. ATP results during quality assurance inspections are entered into TeamCOACH. Problem areas can be quickly remediated. This verification ensures the room is safe for the current, or next patient, to occupy. Cleaning thoroughness results can be benchmarked and trended over time. Reports can be generated for hospital committees, record keeping, and employee evaluations.

Visual inspection is being replaced by quantifiable, objective methods upon the recommendation of the CDC. Hygiena notes there are many different ways to evaluate cleanliness of the healthcare environment, and each comes with pros and cons. Managers need reliable data collection and objective measurement techniques to truly know if a surface is clean.

Multiple Hygiena studies demonstrate strong linkage to reduced infection rates. Research presented at national conferences or published in the peer review literature in recent years have shown that the implementation of a monitoring program immediately improves compliance to cleaning procedures, resulting in a cleaner hospital, correlating with decreased healthcare-associated infection rates, and improved patient experiences as reported in HCAHPS scores.

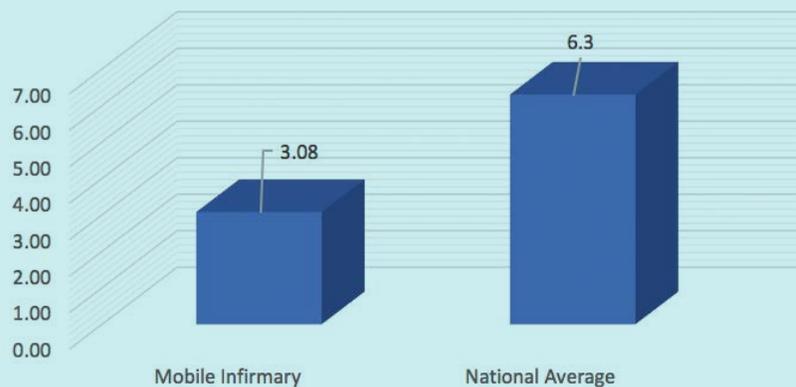
Hospitals that use Hygiena have very positive comments. Clients are impressed with the product’s effectiveness and the favorable impact upon patient safety. Refer to the remarks made by Crothall support staff at Alabama Mobile Infirmary Medical Center and data from Parkland Hospital.

Other technologies do not meet Crothall standards. Blacklight detection of fluorescent gels is an excellent training tool but fails to measure the actual removal of biological matter. Microbiology testing gives the most quantitative, specific results for pathogens or bacteria on a surface, but results are slow and tests are expensive. EVS and Infection Prevention and Control need quick results to turn beds over faster, verify instrumentation is clean, and collect quantifiable data for meaningful analysis.

ALABAMA MOBILE INFIRMARY MEDICAL CENTER

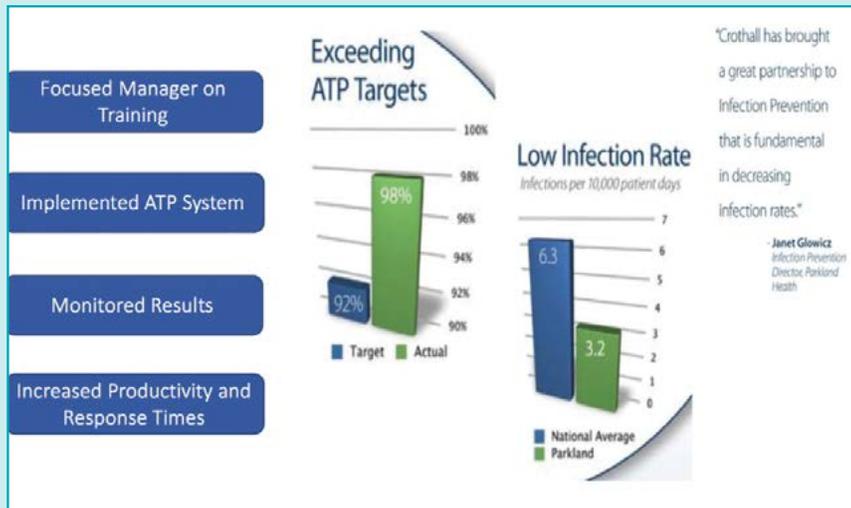
“Using the Hygiena ATP system in our facility has allowed us to track our process effectiveness, trend our successes and target our opportunities for improvement. It keeps us constantly aware of training needs and makes our daily huddles more practical by utilizing real-time data. For example, one month we trended low on our over bed table cleaning. During our investigation of the significant drop we were able to determine that a new patient information place mat was not allowing our disinfectant to kill germs sufficiently. We suggested different placement of the mats during discharge cleans and saw those numbers immediately bounce back. The Hygiena information is also reported out to the client’s Infection Prevention Committee on a regular basis keeping them well informed of our evidence-based efforts to keep HAI’s at a minimum.” – *Amanda Holcomb Assistant Director EVS*

Infection/10,000 Patient Days (CDI)



PARKLAND HOSPITAL ATP CASE STUDY

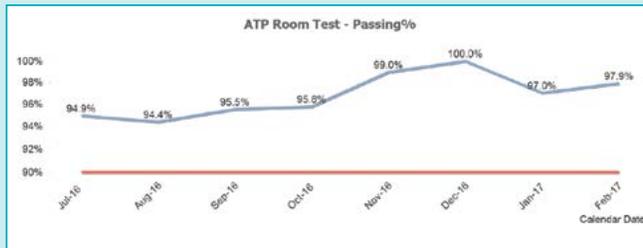
Parkland Hospital has demonstrated a favorable association between elevated ATP passing scores and reduced HAIs; refer to the “Parkland ATP Case Study.”



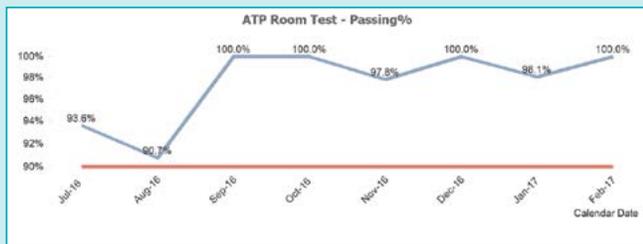
FAVORABLE ATP OUTCOME DATA

Amita Health, St. Alexius Medical Center, and Alexian Brothers Medical Center demonstrate the effectiveness of ATP ([https://www.crothall.com/files/5215/1603/4009/Amita Health ATP PDF Report 2017-03-09.pdf](https://www.crothall.com/files/5215/1603/4009/Amita_Health_ATP_PDF_Report_2017-03-09.pdf)).

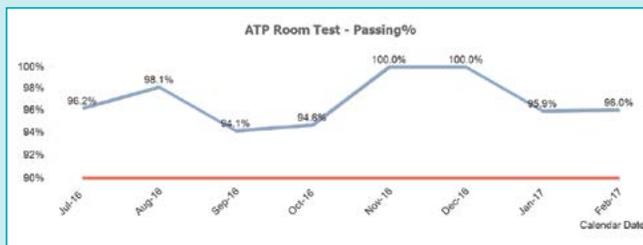
ATP Room Testing Results: Amita Health



ATP Room Testing Results: St. Alexius Medical Center



ATP Room Testing Results: Alexian Brothers Medical Center



PILLAR 4: AUGMENTATION

In high risk situations cleaning/disinfecting disciplines need assistance. The CDC recognizes ultraviolet (UV) radiation kills bacterial spores, e.g., *Clostridium difficile*, and its application will destruct airborne organisms or inactive microorganisms on surfaces.³⁷

Crothall has a strategic partnership with Surfacide (<http://www.surfacide.com>). Surfacide is an evidenced-based, automated UV-C hard surface disinfection system with multiple emitters, allowing disinfection of all areas of the healthcare environment in a single cycle, including the bathroom. This results in the destruction of *Clostridium difficile* spores, MRSA, and other multidrug-resistant organisms.

Single emitter systems cannot reach all high touch surfaces in a single disinfection cycle. Relying upon reflected energy to measure, analyze, and determine the proper dose of UV energy is flawed. With Surfacide's three emitters operating simultaneously during the same disinfection cycle, no exposed surface is left untouched and eliminates "shadows." This results in a more efficient delivery of energy and a faster room turnaround time (TAT).

Surfacide implementation has driven positive outcomes at multiple sites:

- › **Jersey Shore University Medical Center** experienced fewer HAIs and improved patient experiences. Within 4 months of introducing UV technology HAI occurrences fell to zero; refer to "Clean at the Speed of Light." https://www.crothall.com/files/8715/1915/4774/Jersey_Shore_Case_Study_-_Surfacide.docx
- › **Hackensack Meridian Health** was able to experience a catheter-associated urinary tract infection (CAUTI) decrease; refer to "Effect of UV-C Light Disinfection as an Addition to a CAUTI Bundle." https://www.crothall.com/files/2915/1603/4012/Surfacide_Crothall_Meridian_-_JSUMC_2017-Research_Day_Poster.pdf
- › **Wexner Medical Center**, after terminal cleaning had been performed, demonstrated a significant reduction with microorganisms' burden with Surfacide implementation; refer to "Ultraviolet Light for Patient Room Disinfection Post-Terminal Clean." https://www.crothall.com/files/7915/1603/4012/Surfacide_Crothall_SHEA.poster.UV-C_for_post-terminal_clean.pdf
- › **Shriners Hospitals for Children in Cincinnati** studied how the Surfacide system significantly reduced the number of bacterial pathogens not eradicated by the cleaning process alone; refer to "UV-C Light as an Adjunct to Infection Control in a Pediatric Burn Hospital." https://www.crothall.com/files/3415/1603/4010/Crothall_Shriners_Shriners_Julie_Weitz_UVC_light_ABA.2017.sm_Actual_Poster.pdf
- › **Medstar Union Memorial and Good Samaritan.** A multicenter study demonstrated that the addition of Surfacide to traditional terminal cleaning of enteric isolation rooms resulted in a 46.2% and 29.2% reduction in hospital acquired C diff infections. Refer to "Effect of terminal cleaning with ultraviolet light disinfection (Surfacide) on reducing hospital onset *Clostridium difficile* infections in 2 community hospitals." https://www.crothall.com/files/2715/1916/4220/Medstar_Surfacide_Crothall_Abstract_Cdiff.docx

Surfacide offers the option to position an emitter in the patient's bathroom daily to kill pathogens. In tandem, the patient is informed with how the organization is striving to make the room as safe as possible. This strategic approach not only disinfects the bathroom but has shown to increase HCAHPS scores.

PILLAR 5: EMERGING SOLUTIONS

Crothall forms strategic partnerships to access cutting-edge technology. These companies share the Crothall passion of promoting environmental hygiene and patient safety. As the leader in healthcare support services, we never accept status quo. Our specialists "turn over every rock," challenge every process, and study the market for new ways that work better and faster than our current "best."

New protocols are developed, standardized, and shared nationally. Metrics are created and applied to identify opportunities for improvement in the process itself. Even the metrics themselves are subject to constant review for a better, more sensitive tool. Crothall's protocols work because of frequent auditing, making adjustments, auditing again, and making adjustments again.

Crothall's strategy to identify emerging solutions includes:

- › **Allocating significant resources for piloting and studying the results** of emerging innovative technologies
- › **Scientific testing of emerging antimicrobial product technology** for reducing environmental contamination in the patient zone and publishing findings in the peer-review literature
- › **Closely following emerging pathogens**, e.g., Carbapenem-Resistant Enterobacteriaceae, *Candida auris*, etc., and adhering to CDC cleaning and disinfection recommendations
- › **Researching optimally constructed hospital furniture and equipment surfaces** to reduce environmental contamination
- › **Understanding that the implementation of newer technologies** will always complement basic environmental cleaning and disinfection
- › **Staying current** with emerging and novel chemicals and technology

Crothall was the first in the industry to standardize the use of ultraviolet (UV) technology. Crothall quickly identified UV as an innovation to destroy microorganisms and fight HAs. After passing Crothall due diligence standards UV was added to the protocols. First, as part of the hospital patient room or operating room terminal disinfection process, the room is manually cleaned and disinfected. Then, UV technology is launched, with the Ultraviolet Germicidal Irradiation (UVGI) destroying airborne and surface microorganisms.

The National Action Plan to Prevent Health Care-Associated Infections recognizes the importance of using technology to prevent HAIs.³⁸ Crothall actively pursues emerging and novel antimicrobial product technology for safely reducing environmental contamination in the patient zone:

- › **GR-AD Pro Clean surface technology** (<http://gr-adpro.com>) is a patented polymer that provides persistent protection that enables improved efficiency in standard cleaning, resulting in consistently low ATP results. This non-toxic clean surface treatment does not promote adaptive organisms. A clinical study performed in two hospital settings demonstrated consistently low ATP levels on high touch surfaces; refer to “GR-AD Pro Clean Surface Technology.” https://www.crothall.com/files/4715/1603/4010/GR-AD_Crothall-GR-AD_Pro.SingleSheet.pdf
- › **Trinity Guardion™ Protective Patient Barrier** (www.trinityguardion.com): 29 studies document that cleaned/disinfected mattresses are still contaminated after terminal cleaning, and 12 studies document mattress failures while still in use. The US FDA issued an advisory in November 2017, reporting 700 mattress failures discovered by hospitals over a four-year period. Thousands of patients may have been exposed to these mattresses during that time. Contaminated hospital mattresses are not being adequately addressed by current protocols. The Trinity Guardion microbarrier provides a compliant **alternative equipment maintenance** protocol that: doesn’t impact the therapeutic benefits of the mattresses; protects current patients from previous occupants; offers a significantly shorter turnover time; requires no damaging hard-surface disinfectants for mattress cleaning; requires no inspection protocol for EVS teams (validated inspection, disinfection and documentation performed by laundry); is shown to reduce C-diff rates by 50% and can extend the useful life and integrity of patient mattresses and mattress skins: refer to https://www.crothall.com/files/2215/1915/1853/Trinity_Guardion_Micro_Barrier_Mattress_Cover.docx
- › **Garratt Callahan Water Treatment** (www.garrattcallahan.com) The Centers for Medicaid and Medicare Services (CMS) requires facilities to develop and adhere to policies and procedures that inhibit microbial growth in building water systems to prevent Legionella Infections. The rate of reported cases of legionellosis has increased 286% in the US during 2000–2014. Garratt Callahan offers a response team of experts that can implement a Water Management Program (WMP) that meets the ASHRAE 188-2015 Standards; refer to “CMS Mandates Water Management Programs in All Healthcare Facilities” https://www.crothall.com/files/4615/1915/4774/G_C_Water_Safety-Crothall-CaseStudy.pdf

PATIENT PERCEPTIONS AND HAI INCIDENCE

Crothall’s Positive Impressions Team in conjunction with Press Ganey research demonstrates that Patient perceptions of clean can be accurate. Some argue that “clean is in the eye of the beholder” and you can’t react to varying human perceptions of clean. That thinking is not consistent to the ever-increasing role of Patient perceptions as measured in HCAHPS results impacting CMS reimbursements.

Press Ganey analysis found that Patient perceptions are linked to HAI incidence.

New research emerging from a strategic partnership between Press Ganey and Compass One Healthcare Positive Impressions Team suggests that patients' perceptions of environmental factors are highly correlated with specific safety, quality and experience outcomes, and as such, they are an essential variable in the improvement equation.⁸

Press Ganey analysis shows clear correlations. The data shows correlations between patients' perceptions of room cleanliness, the risk of hospital-acquired infections, and scores on HCAHPS. The data indicates that patients are more likely to recommend a hospital they perceive to be clean suggests that cleanliness is an outcome that matters to them, and as such, is an important improvement target."⁸

Hospitals that scored high for cleanliness, had, on average, the lowest number of infections--see figures 5 & 6. Similarly, hospitals where patients reported lower cleanliness scores tended toward higher infection rates.

Figure 5: MRSA Infections are Highest in the Hospitals Viewed as Least Clean

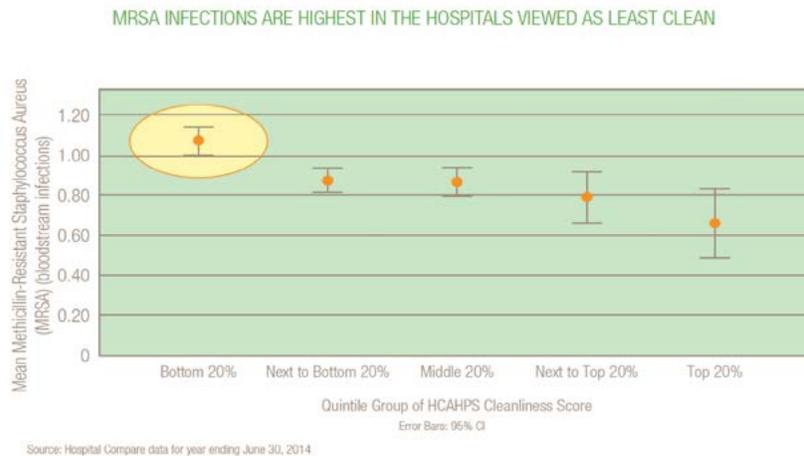
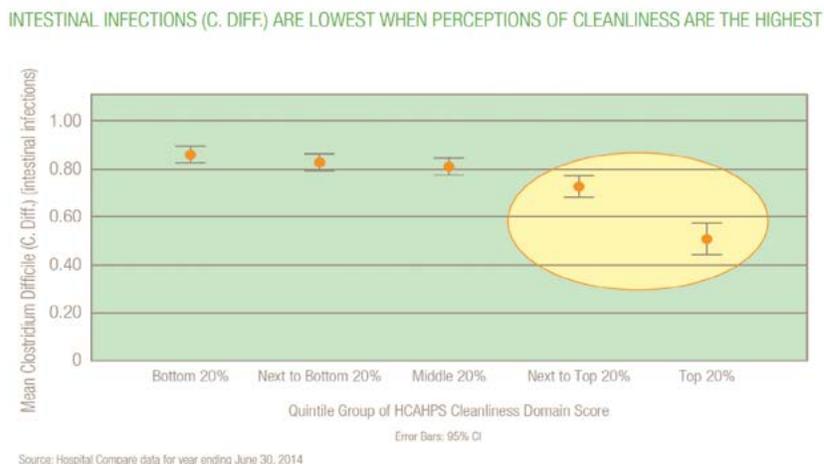
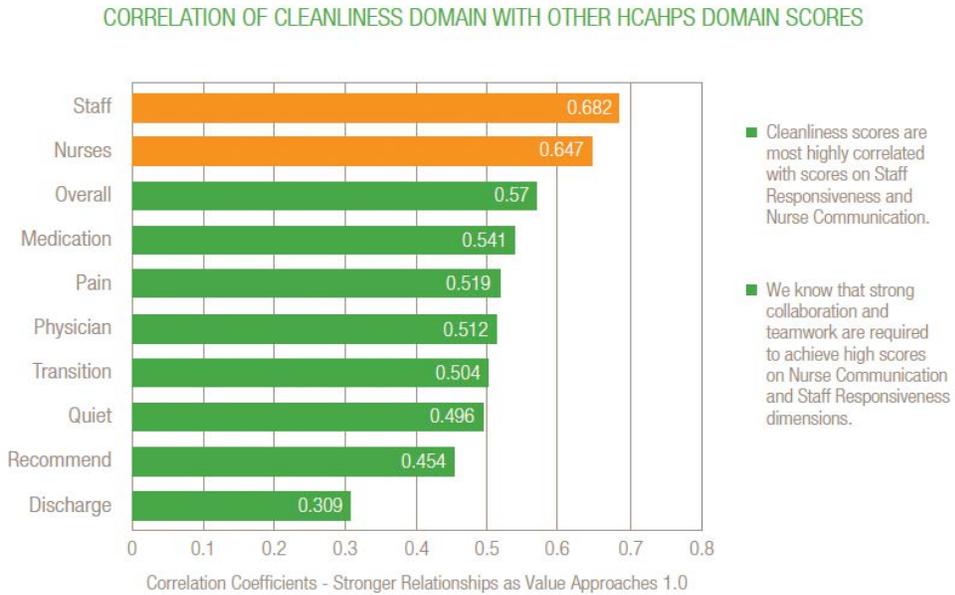


Figure 6: Intestinal Infections (C. difficile) are lowest when perceptions of cleanliness are the highest.



Hospital cleanliness scores are also correlated with staff responsiveness and nurse communication scores--see figure 7. Patients believe that the “staff working together to care for them” enhances their perception of their overall experience. When the patients believe that the nurses and doctors effectively listen to them, there is a greater chance that they would rate the cleanliness of the environment much more favorably.

Figure 7: Correlation of Cleanliness Domain with Other HCAHPS Domain Scores



Press Ganey research indicates the importance of teamwork and offers recommendations. The report offers several recommendations to assist hospitals with recognizing the importance EVS staff members have upon the patient experience and distinguishing themselves from the competition--refer to table 1.

Press Ganey Recommendation	Crothall Response
1. Recognize and value EVS workers as stakeholders in the delivery of safe, effective, quality care	Compliant-Positive Impressions protocols
2. Consistently identify and employ evidence-based guidance and practices in EVS to optimize the cleanliness and perceived cleanliness of hospital rooms and common areas	Compliant-Positive Impressions protocols
3. Reinforce accountability for service excellence among the EVS staff	Compliant-Positive Impressions protocols
4. Foster a culture of teamwork, communication and collaboration between the EVS staff and the rest of the caregiving team	Compliant-Positive Impressions protocols

Table 1: Press Ganey recommendations and the Crothall gap analysis results

SUMMARY

We must ensure a safe and healthy environment in which to heal.
–Crothall Healthcare

Over the years, countless new technologies have emerged. As part of our ongoing journey to continually improve and expand our support services, Crothall has put significant resources into piloting and studying the results of each new technology or innovation.

Clinical testing is always done in conjunction with our clients. We add third-party infectious disease and infection prevention and control experts to the testing protocol. And, it is an ongoing process to exhaust all avenues in the search for better solutions.

In summary, Crothall Healthcare’s approach to patient safety is our number one priority. This is done by:

- › Increasing the focus on patient safety and care
- › Preventing HAIs
- › Embracing innovative technologies
- › Ensuring consistently high levels of cleanliness
- › Employing environmentally conscious cleaning practices
- › Raising patient and staff satisfaction
- › Meeting regulatory compliance
- › Guaranteeing service outcomes
- › Keeping staff up to date with ongoing training programs
- › Reducing supply costs
- › Remaining customer-focused (e.g., provides independent continuous readiness audits)
- › Focusing on standardization in protocols, quality assurance and management tools

CROTHALL OVERVIEW

Crothall was founded in 1991 to address the need for a specialized, high-quality, innovative and responsive support services company, exclusively serving the unique needs of the healthcare industry. With more than 1,307 healthcare clients accompanied by an unblemished Joint Commission survey record, Crothall provides excellence with every delivered solution.

As the industry front-runner, Crothall continually integrates scientifically proven, evidence-based recommendations, tools and industry best practices to reduce environmental contamination and provide a safe environment for patients and HCP. This synergistic approach, coupled with ongoing, extensive research and testing, assists with identifying many innovative, exciting, cutting-edge technologies that offer significant, unified advantages to augment our infection prevention and efforts.

Infection prevention and control is a constant battle that must be waged daily for the health and safety of patients and HCP. Crothall's people and processes deliver sustainable outcomes that meet high standards of quality and safety resulting in total customer satisfaction.

Crothall remains in the forefront and will continue to pioneer new solutions for our healthcare customers. No other company has the training, technology, and, most importantly, thorough processes, that have made Crothall Healthcare the industry leader. ■

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WHITE PAPER

5 CORE DISCIPLINES TO REDUCE HEALTHCARE ASSOCIATED INFECTIONS (HAI) AND IMPROVE THE PATIENT EXPERIENCE

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Enhanced Products and Processes Improves HCAHPS, Reduces HAIs

MedStar Washington Hospital Center Teams with Crothall Healthcare and Diversey

MedStar Washington Hospital Center, a member of MedStar Health, is one of the top District of Columbia (DC) hospitals that have been serving patients in Washington DC, Virginia and Maryland for over 50 years with research, education and care. As the largest healthcare provider in the region, MedStar Washington serves an enormous population with health services in primary, secondary and tertiary care offered to adult and neonatal patients. It also serves as a teaching hospital for Georgetown University School of Medicine. The busy facility houses 923 beds, with slightly more than 200 discharges per day.

Challenge

With an ideal business model of a “Culture of Cleanliness”, MedStar Washington Hospital Center was looking for a partner to provide them with a consistent, improved cleaning protocol and disinfection results across the hospital system. **MedStar administration sought to develop a program of products and procedures to ensure increased patient satisfaction and a reduction in Hospital Associated Infections (HAIs).**

MedStar Washington Hospital Center engaged healthcare support services provider, Crothall Healthcare, in a discovery phase to help find a solution that would improve results and be consistent with its mission and vision; to be a trusted leader dedicated to delivering exceptional, patient-first healthcare. Tony Gill, Crothall Regional Manager, examined MedStar’s program to understand the organization’s situation, identify what was missing, and customize a new program that would drive the improved outcomes that MedStar needed. Gill led the effort with a thorough audit that included assessing staffing levels, training needs, cleaning protocols, management oversight, HAI mitigation and infection prevention collaboration. **Development of a program that included quality products and repeatable procedures would ensure increased patient satisfaction and a reduction in HAIs, according to Gill.**

Solution

The implementation of the **Crothall High Profile Cleaning (HPC) process**, consistent with MedStar Washington Hospital Center’s values, was identified as a solution for the organization’s unique needs. The HPC process focuses on cleaning and disinfection, while being centric on the patient and EVS (Eyes, Voice, Smile) as patient interaction has the highest impact on HCAHPS scores.

Based on the HAI performance of MedStar member hospitals using Diversey’s disinfectants, in conjunction with outstanding EVS attention to high touch surface disinfection, Crothall Healthcare was selected as the system contractor over others who were using less effective chemicals. Diversey healthcare sales executive, Jim Taffetani, provided guidance and made recommendations for the best, most successfully proven chemicals and solutions.

After an extensive evaluation of disinfectants that worked best for the facility’s operations, **a sustainable product, Oxivir Five 16, was selected for its fast, effective performance. Oxivir Five 16 is a five-minute disinfectant cleaner concentrate, virucide, bactericide, fungicide and mildewcide, powered by Accelerated Hydrogen Peroxide (AHP®) that will break down to oxygen and water after use.** The chemistry in Oxivir Five 16 will not bind with cleaning tools, and proper use will kill organisms associated with



Enhanced Products and Processes Improves HCAHPS, Reduces HAIs

HAIs including MRSA, Norovirus, Hepatitis B, Hepatitis C, VRE and more. **Taffetani developed product procedure cards, team training, and implementation tools as elements of a standardized approach to HPC.**

Gill introduced several components to the program to increase productivity and operational efficiency, reduce room turnover time, and better proactively manage infection rates. The resulting program includes chemicals, clearly defined roles and responsibilities, and standardized procedures. Training staff members to embrace the comprehensive regimen and put it into daily practice is critical to its success. Gill incorporated staff profiling and skills assessment to ensure those with the strongest customer service skills are assigned to occupied patient room cleaning. He also implemented Operational Mitigation of Infectious Transmission (OMIT), a program that segments workers to be focused solely on isolation or *Clostridium difficile* rooms for the purpose of ensuring cross-contamination does not occur.

Results

The program achieved many successes for MedStar Washington Hospital Center including infection prevention and compliance, standardization of procedures and operational efficiency, and improved caregiver and patient satisfaction. MedStar administration is excited about the steady increase in HCAHPS scores since the program was implemented earlier this year. In June 2017, they received their highest score in two years with a result of 67.4 percent. Additionally, ATP test pass rates increased from 75 percent to 84.3 percent quarter over quarter.

Infection Prevention & Compliance

EVS personnel consistently use **Oxivir Five 16** to increase effectiveness and efficiency, while eliminating all potential for cross contamination. **Staff satisfaction increased and overall infection rates decreased with the use of a disinfectant that is pleasant to use, and remains wet for the required label dwell time, improving compliance and effectiveness, as validated through ATP readings.**

Standardization of Procedures & Operational Efficiency

Cleaning and disinfection with a programmatic approach was successfully on-boarded with a formalized approach using best practices shared by Diversey, makers of Oxivir Five 16. Crothall's measurement tools, with encouraged feedback for continuous improvement, are critical for the on-going performance success and overall efficiency that is realized.

Satisfaction

With the HPC program in place, EVS staff members greet patients, describe what they are doing to care for them, and clean high touch surfaces in the room including items close to the patient such as bed rails, television remotes, and other hard surfaces and objects within patient reach. The caregiver to patient engagement is a key component to a continued increase in HCAHPS scores.

Diversey's passion for infection prevention success for its customers is evident in the trusted relationship with Crothall Healthcare and its solutions for MedStar. **As a result of the program, Crothall Healthcare expanded similar programs throughout the MedStar hospital system.**



Parkland Health & Hospital System Improves Patient Satisfaction with IP

Better disinfection products and practices engages employees, raises HCAHPS and ATP scores

Parkland Health & Hospital System has been caring for Dallas County's most vulnerable residents since 1894 and is now one of the largest public hospital systems in the country. Today, Parkland is licensed for 870 beds and averages more than one million patient visits annually. The hospital is an integrated health system comprised of a new, state-of-the-art acute care facility and outpatient clinics located throughout the county, a health plan for those who qualify and many educational and outreach programs. As a preeminent public academic medical center, Parkland has developed countless innovations that save lives, improve access to services and reduce healthcare costs. Services include a Level I Trauma Center, the second largest civilian burn center in the U.S. and a Level III Neonatal Intensive Care Unit. The ER sees three times more patients than the next closest hospital, and the labor and delivery department is estimated to be four times busier than any hospital.

Challenge

Parkland Health & Hospital System worked with healthcare support services provider, Crothall Healthcare, to develop and implement a disinfection protocol that would improve its hospital safety scores including Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scores. It was important to incorporate a daily system that would **be simple for staff to consistently execute while reducing expenditures on cleaning and disinfection tools and equipment.** Crothall began by administering an employee engagement survey that included questions about whether or not staff felt they were provided with the appropriate tools to perform their cleaning and disinfection responsibilities. While engagement scores were high overall, 100 percent of respondents stated that they did not have an adequate number of microfiber cloths to effectively clean the required areas. It was also discovered that costs for the cloths were on the rise because they were not being returned from the laundry facility.

Alan Williams, general manager at Crothall Healthcare, saw the need to create a tailor-to-fit program that would improve employee engagement and productivity and address concerns over use of microfiber cloths. For the program to be successful, it needed to align with Parkland's service excellence standards – to provide the best possible care for patients and assimilate the organization's Behavioral Standards called CIRCLES (Compassion, Integrity, Respect, Collaboration, Leadership, Excellence and Stewardship) that guide team members' actions and interactions. Team members at Parkland were excited to participate in a Crothall-led employee engagement summit to initiate the process.

Solution

After evaluation of Parkland's disinfecting products and methods, Crothall implemented use of disposable Oxivir Tb Wipes in patient rooms at the end of 2015. Incorporating use of the sustainable hospital disinfectant has resulted in improvements in productivity, lowered costs, increased procedure compliance and helped



Parkland Health & Hospital System Improves Patient Satisfaction with IP

Parkland to achieve the Best Practice Star Award from The Joint Commission, an organization that accredits and certifies nearly 21,000 health care organizations and programs in the U.S.

Oxivir® Tb Wipes are powered by Accelerated Hydrogen Peroxide (AHP®) technology and effective against a broad spectrum of pathogens with a surface dwell time of just one minute – important when turning over patient rooms quickly. Use of Oxivir Tb Wipes improves compliance because surfaces remain wet for the required label contact time, ensuring disinfection while streamlining the process. The wipes are tough enough to clean and disinfect surfaces and equipment, while being gentle on staff, equipment and surfaces.

In addition, Crothall evaluated Parkland's cleaning procedures and products for operating rooms (OR) to ensure the ORs were properly disinfected. They identified an opportunity to upgrade to Virex® Plus, a one-step, quaternary ammonium chloride (quat)-based disinfectant cleaner specially formulated to cut cleaning time and quickly wipe out bacteria, viruses and fungi.

Virex Plus provides a three-minute contact time to ensure the quick and effective turnaround necessary in ORs.

Results

Since implementation of a new program that includes products, processes and procedures, Parkland has seen impressive results including HCAHPS scores that increased from 58 to 72. Cleaning time decreased by 12 minutes for discharges and 20 percent for daily cleaning. ATP testing showed improvement on high touch cleaning by approximately 50 percent.

Engaging employees

After staff members on-boarded the High Profile Cleaning program using Oxivir Tb Wipes for three months, a follow-up survey indicated that **99 percent of employees had the tools necessary to complete their work.** With the help of Diversey®, makers of Oxivir Tb Wipes and Virex Plus, Williams trained Parkland staff to focus on team cleaning and the simplicity of use that Oxivir Tb Wipes provide for the Zone Cleaning disinfection program. With over 700 full time employees and a 20-percent rate of turnover, employee engagement and easy training is critical for success. Collaboration was important for quick, successful adoption of tools like easy-to-understand procedure cards, created in collaboration with Diversey and Parkland for guidance on use of the wipes in zoned areas within rooms. According to Williams, the disposable disinfection wipes have improved both cleaning performance and Parkland's bottom line.

“Utilizing Oxivir Tb disposable wipes has eliminated my daily headaches managing the laundry process,” he stated. “We no longer have to manage the laundering procedures for the microfibers and rags, and employees have the tools they need to do their jobs every day.”

Eliminating this pain point and expense allows Parkland management to focus on its most important job of reducing Hospital Associated Infections (HAIs). Williams reports that expenditures ranged between \$1,000 and



Hospital Disinfection Improves with help of TouchPoint Support Services and Diversey

St. Anthony's Medical Center sees better performance from improved products, procedures

As the third-largest medical center in the St. Louis metropolitan area, St. Anthony's Medical Center serves families throughout St. Louis County, St. Louis City, Jefferson County, and several counties in southwest Illinois. The well-respected medical center offers advanced treatment in a number of specialties, including acute rehabilitation, cardiology, maternity services, oncology/cancer care, orthopedics, neurology/stroke, surgery and emergency medicine and offers a 767 bed hospital.

St. Anthony's Medical Center is committed to strong customer service with a formal customer service initiative called "Service from the Heart" with the intention to provide care to each patient with respect, dignity and compassion. The organization strives to offer quality medical care which includes the cleanliness of its facilities and patient rooms, important to patient satisfaction.

Challenge

St. Anthony's partners with TouchPoint Support Services for its similar mission; to provide patients, residents, customers and clients with "compassion at every point of human contact." TouchPoint, a Compass Group company, is the industry's first combined healthcare food service and environmental services provider. St. Anthony's drew upon the expertise of Eric Sullivan, director of environmental services at TouchPoint, to **increase cleaning compliance, reduce turn-around time and increase effectiveness at the facility he manages.** St. Anthony's housekeeping staff was using a quat-based disinfecting product and found that a ten-minute dwell time was not fast enough to meet their objectives. **The hospital was also experiencing pressure from the Joint Commission to reduce overall dwell time, and meet product dwell times in daily disinfection.** Sullivan sought an evidence-based strategy to improve overall results and reached out to Diversey sales executive, Jessica Tenschert, for assistance in evaluating new product and procedure options.

Amplifying concerns over dwell time was the issue of [quat binding, or quat absorption](#), a topic of concern throughout the healthcare industry. [Quat binding](#) is gaining attention because of its potential to negatively impact cleaning results. The phenomenon occurs when the active ingredient (quaternary ammonium chloride) becomes attracted to fabric fibers and absorbs into them. The result is that a portion of quat disinfectant does not end up on the surface it is supposed to clean and disinfect.

Solution

Sullivan led a team to compare the performance of a quat disinfectant to AHP® or Accelerated Hydrogen Peroxide product. Side-by-side testing was conducted on high-touch surfaces such as bed rails, door handles and toilet seats with a goal to review dwell time, quat binding and cleaning performance by evaluating ATP scores on the surfaces before and after cleaning. Alpha HP Disinfectant Cleaner was included in the evaluation; however, the product's required ten-minute kill time was a concern because it is difficult to keep a



Hospital Disinfection Improves with help of TouchPoint Support Services and Diversey

surface wet for that length of time. Due to these product performance concerns, the team included Diversey's Oxivir® Five 16 disinfectant, with a five-minute dwell time, in the evaluation.

Results

Oxivir Five 16 performed far better in ATP scores than the quat disinfectant did. To gain more information about this, Jim Gauthier, senior clinical advisor at Diversey, met with St. Anthony's infection prevention team to elaborate on the test and results. Sullivan and his team from TouchPoint convened St. Anthony's key stakeholders including the EVS department, nursing directors, and infection prevention team to review the findings of the tests and results. **The group was confident they had achieved the desired dwell time reduction and improved results that Sullivan set out to solve. In September 2016, TouchPoint transitioned all daily and discharge cleaning at St. Anthony's to Oxivir Five 16 disinfectant.** They continued to use Diversey's Virex II 256 broad spectrum disinfectant on surgery area floors.

The change in product use and procedures included a team discharge cleaning process which, coupled with the use of Oxivir Five 16, **reduced overall cleaning time from 122 minutes to 47 minutes in six months.** This includes a team of two who clean the left and right sides of rooms, meeting at the patient bed in the middle. **Daily cleaning cycles lowered to 10 to 15 minutes per room, a two- to five-minute reduction that has increased productivity. To disinfect C. diff isolation rooms, the team uses bleach first, followed by a round of Oxivir Five 16 to remove the strong odor. Using Oxivir Five 16 ensures another level of cleaning and disinfecting, while also reducing the odor from the bleach product, allowing the room to be immediately ready for the next patient to occupy.**

St. Anthony nursing team members observed that **Oxivir Five 16 provided far better cleaning results** than the quat product used previously. **Additionally, the housekeeping staff increased cleaning compliance because they liked working with the product and it was evident to them that Oxivir Five 16 was a better cleaner.** Although the new disinfectant increased costs minimally, the hospital's risk of infection and total costs to the facility has been reduced. Sullivan will publish complete results after a full year of findings have been gathered.

"TouchPoint Support Services enjoys being on the cutting edge of industry trends and technologies," said Sullivan. "I continually monitor new innovations in the industry by being involved in associations, and regularly working with peers and vendors like Tenschert and Gauthier from Diversey."

As a result of his hard work and dedication, Sullivan and his team received the Centers for Excellence Award from the Compass Group in September 2017. This prestigious award honors teams that demonstrate innovation, growth and sharing of best practices. With over 12,000 accounts, the Compass Group presents the award to only 53 locations and Sullivan is one of only three individuals who have received the award for TouchPoint Support Services.



Inova Hospitals Exceed State HCAHPS Scores and Three-star Rating

Inova Fairfax Hospital Teams with Crothall Healthcare and Diversey

The Inova hospital network serves more than two million people each year throughout the Washington DC metro area and beyond. Inova's five hospitals include more than 1,700 licensed beds and 16,000 employees in its integrated network of hospitals, primary and specialty care practices, emergency and urgent care centers, outpatient services and destination institutes.

Inova Fairfax Hospital, Inova's flagship hospital located in Falls Church, Virginia, is a 923-bed, nationally-recognized, regional medical center serving Northern Virginia and the Washington DC metro area. The hospital is ranked among the top healthcare providers in the U.S. and serves as Northern Virginia's only Level 1 Trauma Center. The medical campus is home to Inova Children's Hospital, Inova Women's Hospital, and the Inova Heart and Vascular Institute.

Challenge

Kristi Kelly, Crothall regional director for the Inova system, was in pursuit of the latest disinfectant technology to utilize for the hospital system when she engaged Diversey sales executive, Jim Taffetani, to evaluate the most effective and efficient products. Taffetani and Kelly presented Diversey's Oxivir® Five 16 disinfectant to the Infection Prevention department to introduce the benefits of a reduced kill time, increased safety and an effective claim package. Kelly previously tested a product that had a peracetic acid base that was not accepted by the housekeeping staff, and she was very concerned for their safety with its use.

The support services team at Crothall Healthcare experienced floor care issues, particularly with black spots appearing from the use of alcohol-based hand sanitizers that dripped during dispensing and application. The appearance of floors is important in patient perception and how hospital facilities are evaluated on cleanliness.

Solution

Like many healthcare organizations across the country, Inova Fairfax Hospital is zeroing in on the issue of patient harm by focusing on outcomes-related data. Crothall's **High Profile Cleaning (HPC) process was identified as a solution** for the organization's unique needs. The HPC process focuses on cleaning and disinfection, while being centric on the patient and EVS (Eyes, Voice, Smile) as patient interaction has the highest impact on HCAHPS scores.



Inova Hospitals Exceed State HCAHPS Scores and Three-star Rating

Kelly initiated implementation of Oxivir Five 16 in November 2016 due to the reduced contact time, increased efficacy and acceptance by her staff. Taffetani was on site to assist with training staff members to ensure onboarding was successful. Kelly found that Oxivir Five 16 integrates well with the HPC program, as the housekeepers can confidently disinfect high touch surfaces with it while patients are in beds. In addition, patients offer complementary remarks on how fresh the Oxivir Five 16 smells.

Taffetani worked with Kelly on a recent requirement requested by Inova Fairfax Hospital to disinfect floors. By integrating the simplicity of Diversey's RTD dilution control system with Oxivir Five 16, the hospital's goal can be achieved without harming floor substrates. The successful program progress is attributed to teamwork with the nursing staff. Training included discovery of responsibility for cleaning each of the different floor surface types. Continual training for the staff with Kelly's management team ensures that the Diversey products and Crothall HPC procedures are continually followed. The efforts have resulted in continuous **high HCAHPS scores in the 80s – scores that exceed the state average.**

Another area Taffetani assisted Kelly with **resolving was unsightly black spots on floors** from hand sanitizer use. Taffetani suggested testing **Diversey's StandOut™ Durable Floor Finish**, a new product that's designed specifically to resist damage from hand sanitizers. They found this finish to be **extremely durable** as well as not resulting in spots from sanitizers. The ProSpeed™ applicator system also assists with **low odor during application**, which is always appreciated by the staff and patients. StandOut floor finish can also be easily maintained, repaired and stripped when necessary. The success realized from StandOut finish has resulted in increasing the areas it's used in throughout the facility.

Results

Working together with Taffetani and her staff, Kelly expresses pride in the results achieved within Inova Fairfax Hospital. The facility's HCAHPS scores have averaged 83 since implementation of training, use of Oxivir Five 16 and the new floor care program. The success includes identifying opportunities for improvements in roles and responsibilities as well as overall product application, and training accordingly. The staff feels vested and empowered, resulting in fewer issues, and patient satisfaction has improved accordingly. The results are well above the Virginia average of 72 in HCAHPS scores. In addition, four hospitals in the Inova system are above a three-star rating. The team continues to strive for continuous improvement and build upon this success.



Crothall Healthcare and Diversey Send Patient Satisfaction on the Rise

Improving HCAHPS scores is team effort for Saint Luke's Hospital of Kansas City

Saint Luke's Hospital of Kansas City is one of the largest tertiary care hospitals in the region—offering many specialized programs and services. The 442-bed general medical and surgical facility is recognized for excellent patient outcomes, patient satisfaction, and nurse satisfaction by the American Nurses Credentialing Center's Magnet Recognition Program. This achievement is the organization's third-consecutive designation, something attained by only one percent of all U.S. hospitals. Saint Luke's Hospital of Kansas City is part of Saint Luke's Health System which includes twelve hospitals and campuses across the Kansas City region, home care and hospice, behavioral health care, dozens of physician practices, and more.

Challenge

Saint Luke's Health System Quality Department and Saint Luke's Hospital (SLH) of Kansas City identified the **opportunity to improve its quality, implementation and outcome of products and procedures that directly impact its Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scores.** Amir Jahansouz, Crothall Healthcare EVS director of Saint Luke's Hospital and 13-year veteran of successful EVS program implementation, and his team of 124 housekeepers, are responsible for over 1.4 million cleanable square feet at SLH and helped lead improvement initiatives for the hospital.

A multifunctional SLHS Kaizon team focusing on infection prevention programs and efficiencies was chartered and met as a group over a three month period. The Saint Luke's Health System Green Team was included in the review and decision process with the purpose of identifying products and processes to customize and improve across the entire hospital organization. Jahansouz worked with John McReynolds, Saint Luke's system director of hospitality services and Green Team member. Jahansouz led the review of cleaning and disinfecting products and procedures and called upon local Diversey sales executive Jessica Tenschert, to assist with the process. The Kaizon committee included members from EVS, materials management, Infection Prevention (IP), nursing and safety with a goal to discover a process that would provide improved kill claims, decreased dwell times and a sustainable profile. Jahansouz also reached out to fellow Crothall Healthcare directors including Alan Williams, general manager for Parkland Health & Hospital System, to gain a better understanding of the successes implemented at other organizations.

Tenschert aided Jahansouz in evaluating all products utilized throughout the hospital and helped develop a recommendation to standardize the cleaning chemicals and processes. The team evaluated numerous products including quats, hydrogen peroxide and peracetic acid-based disinfectants to measure their claims against safety, kill times, shelf life and sustainability aspects.



Crothall Healthcare and Diversey Send Patient Satisfaction on the Rise

SLH Infection Prevention practitioner, Cheryl Davis, had already been investigating disinfection attributes of products that contained hydrogen peroxide and was intrigued by the benefits she discovered. In addition to being safe and effective, sustainability benefits were of key interest. Davis liked the idea of reducing human error by providing a ready-to-use disinfectant, as well as simplifying the amount of the products and procedures. The team also conducted a Kaizen event, focusing on *clostridium difficile* or *C diff.* infection rates, to make improvements by adding a cleaning product with sporicidal activity that could be used for daily cleaning.

During this discovery phase, [concerns over quat binding](#) surfaced including the impact that the phenomenon had on pathogens in rags and microfibers the housekeeping staff was using as well as the cleanliness of surfaces they were used on, even after being laundered. Some facilities sent out their rags and microfibers to be washed while others were laundered on site, increasing the concerns over potential contamination.

The facility was utilizing Virex II 256, a quat-based disinfectant cleaner concentrate from Diversey, and bleach wipes for terminal cleaning.

Solution

The implementation of the Crothall High Profile Cleaning (HPC) process, which focuses on cleaning and disinfection while being centric on the patient and EVS (Eyes, Voice, Smile), was identified as the best disinfection protocol. The HPC process has been proven to have the highest impact on increasing hospital safety scores including the HCAHPS scores SLH was looking to improve.

As a result of the extensive product evaluation, **Oxivir Tb Disposable Wipes were selected and implemented into the HPC program in November 2016.** This solution provided a product that has a three-year shelf life, a one-minute kill time, and meets all of the key disinfectant claims required. Oxivir Tb is effective against the most common healthcare-associated pathogens such as Hepatitis B, Hepatitis C, Norovirus, and multi-drug resistant organisms such as MRSA and VRE – in just 60 seconds. **In addition, the sustainable benefit of Oxivir Tb breaking down into water and oxygen was very important to Estes. While disinfectants are not Green Seal Certified, the EPA rates AHP as Category IV, the safest level, as it is non-toxic, is non-irritating to skin and eyes, and contains no VOCs.**

“Members of the Infection Prevention team, Nursing Council, and the Green Team, noted that the accelerated hydrogen peroxide in the **Oxivir wipes was a better cleaner than they were using before,**” said **Jahansouz.** “**The convenience of a pre-moistened wipe was another important factor in the decision because it ensures the product is always diluted correctly and the wipes are clean and fresh with each use, important in discouraging transmission of pathogens through the rags.**”



Crothall Healthcare and Diversey Send Patient Satisfaction on the Rise

The committee's evaluation for alternatives to the use of bleach wipes for *C diff.* disinfection resulted in the selection of Diversey's Avert Sporidical Disinfectant Cleaner Wipes. Use of Avert Sporidical wipes provides the convenience and consistency of utilizing a pre-moistened wipe that kills *C diff.* spores in four minutes and is effective against a broad spectrum of other disease-causing pathogens in one minute. The committee discovered the **wipes also have a more pleasant fragrance than the product that was previously used.**

Results

The Oxivir Tb Disinfectant Wipes and Avert Spricidal wipes were combined with the Crothall HPC program to increase patient satisfaction and reduce HAIs. Employees are comfortable using the wipes when patients are present and by observing the housekeeping staff cleaning with the disinfectant wipes, patients have a positive impression that's reflected on their satisfaction scores.

When Davis indicated that increased studies show floors can contribute to cross contamination, Alpha HP Disinfectant Cleaners were identified for use. The added protection of disinfecting the hospital floors with a sustainable product was important to the organization.

SLH converted to full use of Diversey products and disinfecting protocol at the end of March, 2017. Since then, HCAHPS scores increased over 4.5 percent and SLH feels a key element is the ability to use Oxivir Tb Wipes around patients, combining cleaning and disinfection with a pleasant scent. The hospital has also been able to reduce turn-around time on discharges by several minutes.

Prevention of Hospital-Onset *Clostridium difficile* Infection in the New York Metropolitan Region Using a Collaborative Intervention Model

(Koll, B. MD, FACP, FIDSA, Medical Director and Chief, Infection Prevention, Beth Israel Medical Center, New York, N.Y., Study Presented at APIC 2011)

Scope: Dr. Brian Koll, of **Beth Israel Medical Center (New York, N.Y.)**, implemented and assessed the impact of a CDI Intervention Model with his CDI collaborative, a broad-based partnership with the Greater New York Hospital Association (GNYHA). The Collaborative's CDI Intervention Model was implemented and tested among 47 hospitals and consisted of infection-prevention bundles and compliance checklists to reduce the incidence of hospital-onset¹ CDI. As part of the infection-prevention bundle, environmental cleaning was performed for daily and terminal cleaning using a 1:10 sodium hypochlorite-based disinfectant.

Results: 80% of the hospitals that participated and reported results in the Collaborative's CDI Intervention Model experienced a reduction in hospital-onset CDI. The mean incidence of hospital-onset CDI decreased by 20% (10.7 to 8.6 per 10,000 patient days). It is estimated that the hospitals that participated in this study will collectively experience 1,084 fewer cases of hospital-onset CDI, which implies cost savings amounting to \$2.7M–\$6.8M.

Background Discussion: Previous research has shown that *C. difficile* spore cultures are found facilitywide:

- *C. difficile* spore cultures have been recovered from up to 58% of individual samples from high-touch areas in patient rooms.
- Hand and glove cultures yielded *C. difficile* in 59% of healthcare workers caring for CDI patients.
- **33% of non-CDI rooms have ≥ 1 positive culture!**

Summary of Findings: CDI Intervention Models help interrupt patient-to-patient transmission of CDI and reduce the incidence of hospital-onset CDI.

- ✓ Maintain consistent use and monitoring of infection-prevention bundles and compliance checklists.
- ✓ Support implementation of CDI Intervention Models by gaining frontline staff “buy-in.”

Study Details: The study was conducted in partnership with the Greater New York Hospital Association (GNYHA), which is made up of 140 hospitals in the New York metropolitan region. 47 hospitals participated in the study, 35 of which contributed data, between the months of March 2008 and December 2009.

¹ Hospital-onset (hospital-associated) is defined as patients with onset of diarrhea and diagnosis of CDI more than 48 hours after hospital admission or within 48 hours after hospital discharge.

Infection-Prevention Bundle — Including Use of 1:10 Bleach (DISPATCH®) — Decreases MRSA Incidence by 57%

(Alexis Raimondi, MS, RN, CIC, Beth Israel Medical Center. Study Presented at SHEA 2011)

Scope: The Beth Israel Medical Center (Brooklyn, N.Y.), to reduce hospital-associated methicillin-resistant *Staphylococcus aureus* transmission and infection in six intensive care units (ICUs) across a network of five hospitals, implemented an infection-prevention bundle consisting of hand hygiene, contact precautions, active surveillance and environmental decontamination. The environmental decontamination steps included the use of 1:10 diluted bleach and checklists to monitor compliance.

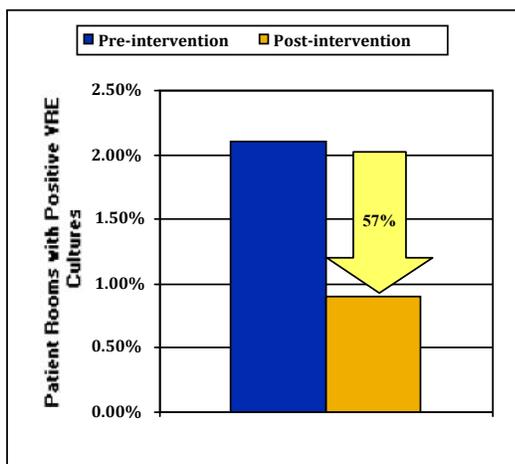
Results: A bundled infection-prevention program that included 1:10 bleach solution for terminal cleaning, 1:100 bleach solution for occupied patient room cleaning and 1:10 DISPATCH® wipes for equipment cleaning and disinfection, reduced hospital-associated MRSA detection rates by 57%. Data was collected over a 12-month period.

Summary of Findings: Study found that as compliance with environmental decontamination protocols increased, the MRSA HAI rate decreased from 2.1% to 0.9% (among the entire population studied).

- ✓ Checklists were used to monitor compliance with the bundle and environmental protocols.
- ✓ Active surveillance of cultures was done within 24 hours of admission; BBL CHROMagar was used for MRSA identification; strain typing of isolates performed to determine if MRSA transmission occurred.

Study Details: Data was collected following 5,568 patients over 12 months across a five-hospital network and six intensive care units (ICUs). Compliance to the overall MRSA infection-prevention bundle ranged from 91% to 100%. There were significant differences between ICUs regarding adherence to the MRSA decontamination environmental protocols ranging from 54% to 100%.

Levels of MRSA Pre- and Post-Intervention Depicted:



Study summary provided by Clorox Professional Products Company.



Reducing *Clostridium difficile* Incidence, Colectomies, and Mortality in the Hospital Setting: A Successful Multidisciplinary Approach

SCOPE:

- The authors developed a hospital-wide multidisciplinary approach to control *Clostridium difficile* infections (CDIs) at Rhode Island Hospital, a 719 bed tertiary care hospital in Providence, Rhode Island.
- The *C. difficile* hospital infection-control plan (Table 1) engaged hospital administrators and hospital staff at all levels and involved six major interventions over a five-year period.
- The plan included infection-control education for healthcare workers and environmental services (EVS) staff as well as enhanced daily and discharge cleaning of patient rooms.
 - Starting in Q3 2008, sodium hypochlorite-based cleaning agents including "Dispatch Disinfectant" were used for daily and discharge cleaning for isolation rooms.
 - In Q3 2009, the facility expanded use of sodium-hypochlorite-based products for Discharge cleaning of all patient rooms.
 - The facility created an equipment-cleaning index (Table 2) to assign cleaning and disinfection responsibilities. Cleaning frequency and cleaning product information was also included for each item.

RESULTS:

- **70.4% decrease in CDI rates** — CDI rates decreased from a peak of 12.2/1000 discharges (Q2 2006) to 3.6/1000 discharges (Q3 2012).
- **63% decrease in CDI-associated mortality** — Yearly mortality in patients with healthcare-associated-CDI decreased from a peak of 52 in 2006 to 19 in 2011.

SUMMARY OF FINDINGS:

The authors concluded, "We believe that a robust reduction is best afforded by interventions that involve education of staff regarding *C. difficile* infections and their impact on patient outcomes; more sensitive *C. difficile* detection methods of patient stoolspecimens; improved hand hygiene; compliance with contact precautions; reduced exposure to antimicrobial agents; and, particularly, improving decontamination of the environment in patient rooms, other care areas, and patient care equipment."

STUDY DETAILS:

- The authors measured CDI rates using standardized case definitions and reported rates as CDI cases per 1000 hospital discharges.
- Primary and secondary *C. difficile* diagnosis data was used to measure the number of *C. difficile*-associated colectomies and the number of deaths in patients with *C. difficile* infection.
- Data was analyzed using a six-segment piecewise binomial regression to model changes in CDI rates over the course of the intervention implementation.
- The authors noted the following study limitations:
 - The study was completed at a single hospital (limited sample size) with no control group.
 - Compliance monitoring was not conducted for all interventions, and some interventions may have a lag phase, which could cause imprecise correlations between intervention strategy and CDI rates.
 - There was no independent assessment of CDI cases, which could lead to ascertainment bias.

Table 1. Summary of *Clostridium difficile* Prevention Strategies

Intervention	Timing	Key Elements
1. Develop <i>C. difficile</i> hospital infection control plan on the basis of a risk assessment.	Q4 2007-ongoing	<ul style="list-style-type: none"> Written plan development Frequent communication between hospital administrators and infection-control committee
2. Monitor morbidity and mortality associated with <i>C. difficile</i> infection.	Q1 2008-ongoing	<ul style="list-style-type: none"> Used standardized infection and mortality definitions Shared infection data with hospital administrators
3. Improve sensitivity of <i>C. difficile</i> toxin detection in stool specimens using a polymerase chain reaction (PCR)-based assay.	Q1 2010-ongoing	<ul style="list-style-type: none"> Introduced faster, more sensitive testing method Changed nursing protocol to empower nurses to initiate contact precautions and order <i>C. difficile</i> toxin assay on patients with diarrhea
4. Enhance environmental cleaning of patient rooms and equipment.	Q2 2008-ongoing	<ul style="list-style-type: none"> Surveyed hospital staff to determine cleaning frequency for patient-room items and equipment facilitywide Educated administrators on importance of environmental cleaning and disinfection in <i>C. difficile</i> prevention Hired more EVS workers to enable enhanced environmental cleaning and disinfection Monitored environmental cleaning compliance weekly utilizing fluorescent marker removal
5. Develop a <i>C. difficile</i> infection treatment plan.	Q1 2009-ongoing	<ul style="list-style-type: none"> Recommended specific pharmacologic and surgical interventions Regular communication between surgeons, infectious disease specialists and pharmacists
6. Conduct other interventions.	Q3 2008-ongoing	<ul style="list-style-type: none"> Patient bathing interventions Antibiotic stewardship efforts Monitored hospitalwide hand hygiene compliance

Table 2. Abbreviated Equipment Cleaning Chart

Equipment	Location	Frequency	Responsibility	Daily Room Cleaning Product	Daily Isolation Room Cleaning Product	Discharge Room Cleaning Product	Monitoring
Bathroom	Patient room	Daily and discharge	EVS	Dimension 11 (quat-based disinfectant)	Dispatch Disinfectant	Dispatch Disinfectant	EVS
Commode	Patient room	After use and between patients	Nursing	Disinfectant Wipes	Dispatch Disinfectant	Dispatch Disinfectant	Nursing
Beds	Patient room	Daily and discharge	EVS	Dimension 11	Dispatch Disinfectant	Dispatch Disinfectant	EVS
Bedside and overbed tables	Patient room	Daily and discharge	EVS	Dimension 11	Dispatch Disinfectant	Dispatch Disinfectant	EVS
Blood pressure cuffs in room	Patient room	Daily and discharge	Nursing	Dimension 11	Dispatch Disinfectant	Dispatch Disinfectant	Nursing
Trash	Patient room	Daily and discharge	EVS	Dimension 11	Dispatch Disinfectant	Dispatch Disinfectant	EVS
Hallway handrails	Unit	Daily	EVS	Dimension 11	Dispatch Disinfectant	N/A	EVS



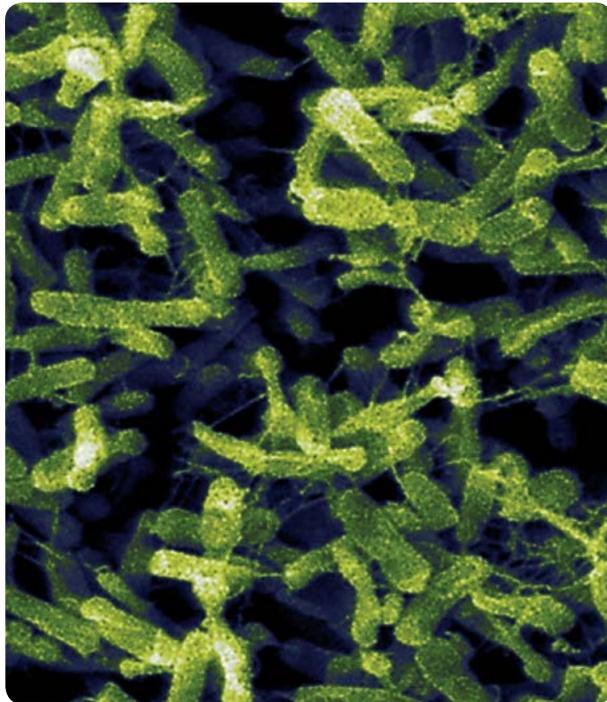
A targeted strategy to wipe out *Clostridium difficile*

SCOPE:

Saint Marys Hospital, Mayo Clinic (Rochester, MN) conducted a study to determine whether a targeted strategy using a cleaning and disinfecting protocol with a sodium hypochlorite (bleach) based active ingredient could reduce rates of hospital-acquired *Clostridium difficile* infection (CDI) incidence in units where CDI was highly endemic. As part of this two-year study, housekeepers replaced their quaternary ammonium compound product with 0.55% sodium hypochlorite active ingredient for daily room and discharge cleaning.

RESULTS:

The authors concluded that targeting the use of bleach wipes for daily cleaning of units with increased *C. difficile* colonization pressure was an effective component of an infection-control strategy.



SUMMARY OF FINDINGS:

In addition to demonstrating that daily cleaning of CDI patient rooms with bleach wipes can be an effective component of an infection-control strategy, the authors observed the following:

- The median time between hospital-acquired CDI cases was increased from eight to 80 days.
- The unit with the highest CDI incidence in the hospital went 318 days without a hospital-acquired CDI case.
- Instituting effective infection prevention measures can save lives and significant expenses estimated to be between \$135,000 and \$216,000 (cost per hospital-acquired CDI is estimated to be between \$5,000 and \$8,000 per incident).
- Methods other than enhanced isolation practices can be effective, and daily cleaning may be more effective than discharge-only cleaning for *C. difficile* in areas where CDI is highly endemic.

STUDY DETAILS:

The study was conducted in two medical units at Saint Marys Hospital, a 1,249-bed facility in Rochester, Minnesota, from Aug. 1, 2008 to July 31, 2010.

The value of ready-to-use disinfectant wipes: Compliance, employee time, and costs

T.L. Wiemken, D.R. Curran, E.B. Pacholski, R.R. Kelley, R.R. Abdelfattah, R.M. Carrico, J.A. Ramirez, *American Journal of Infection Control* 42.3, 2014,329-330. URL: <http://www.ajicjournal.org/article/S0196-6553%2813%2901316-3/abstract>

Scope:

- Wiemken and colleagues at a hospital associated with the University of Louisville School of Medicine (Louisville, KY) compared employee compliance and employee time requirements for two cleaning-disinfection strategies in their facility:
 - **Ready-To-Use (RTU) Method:** Use of a RTU, one-step sodium hypochlorite cleaner/disinfectant pre-moistened wipe.
 - **Bucket Method:** Use of reusable towels saturated with a one-step sodium hypochlorite cleaner/disinfectant solution contained in a bucket.

Background Discussion:

Wiemken *et al.* discussed potential compliance challenges associated with selection of a method for environmental cleaning and disinfection in their facility. The authors noted the following compliance issues related to use of the bucket method in their facility:

- Improper dilution when using concentrated disinfectants.
- Inappropriate reusable towel selection
- Improper disinfectant saturation of towels
- Towel reuse after touching the floor
- Challenges were associated with *Clostridium difficile* infection rates.

To address these issues, the authors investigated the use of RTU cleaner-disinfectant wipes as a way to remove or reduce human error associated with the bucket method.

Results:

The authors reported the following process improvements related to the use of the RTU method:

- Statistically significant 30% improvement in fluorescent marker removal compared with the bucket method.
- Employees completed environmental cleaning and disinfection significantly faster using the RTU method (178.1 seconds vs. 230.9 seconds.)
- Surfaces remained wet for more than 10 minutes vs. 4 minutes when using the bucket method.
- The calculated time-related cost savings associated with the RTU method was \$38.58 per employee per day.

Summary of Findings:

The authors reported that implementation of the RTU method may provide the following operational benefits to a healthcare facility:

- Improvement in environmental cleaning and disinfection compliance rates.
 - Participants did not receive additional training prior to use of the RTU wipes.
- Faster cleaning and disinfection process requiring less personnel time.
- Surfaces may remain wetter longer.
- Potential time-related cost savings.

The authors conclude that enhancing environmental cleaning and disinfection processes, include the use of the RTU method, may reduce environmental bioburden and ultimately reduce healthcare-associated infections associated with “environmentally hardy” pathogens.

Study Details:

- This unblinded randomized study was conducted with 9 environmental services employees.
- Prior to cleaning, the following 6 sites in patient rooms were marked with an invisible fluorescent marker: bedside table, in-room dresser, wall-mounted cabinet, medicine cabinet, sink countertop, and toilet.
- All participants sequentially tested both the RTU method and bucket method on the same 6 sites.
- Compliance was measured using a 3-level quantitative scoring system based on degree of fluorescent marker removal.
- The amount of time needed to implement a cleaning strategy was measured starting with the moment the employee opened the RTU wipe canister or dipped the rag into a bucket containing the disinfectant solution.
- The amount of time a surface remained wet after disinfectant solution application was also measured.
- Time-related cost savings associated with the RTU method were calculated using average employee time needed to complete the cleaning-disinfection strategy (20 min), average number of rooms cleaned per day (n=15), and employee hourly wage (\$10).
 - The authors did not consider waste disposal or other institutional costs associated with switching to the RTU method.

Study Summary prepared by PPD TECH Solutions, Clorox Professional Products Company



STRATEGIC PARTNERS with



PERISEPT Sporicidal Disinfectant Cleaner

PURPOSE

The emergence of life-threatening healthcare associated infections (HAI's) imposes significant economic consequences on the nation's healthcare system. The most comprehensive national estimate of the annual direct medical costs due to HAIs has exceeded over 33 Billion Dollars according to recent studies by the CDC. Healthcare Associated Infections highlighted the need for efficient infection control and Environmental Services programs and processes in all health care settings. Infection prevention and operational efficiency can both be accomplished with a clear protocol along with training, best practice implementation and ongoing monitoring, These program puts together various practices, which when used appropriately restrict the spread of infection.

With the increase in multidrug-resistant organisms, environmental cleaning and disinfection has become an even more important component of infection prevention strategy within healthcare facilities,

FORWARD

The Environmental Services (EVS) Department is as critical to a healthcare facility's survival as rainfall is to the health of a forest. If the mission is to prevent infectious outbreaks, uphold patient safety, improve customer satisfaction, and keep reimbursements flowing, then smart providers know they need strong, capable EVS departments to help make it happen. And this is Crothall's advantage.

Yet, sometimes EVS staffs still struggle to do their jobs as effectively as they would like. Recruitment problems, poor training, failure to follow best practices, lack of time needed to complete tasks, and unresponsive leadership are some of the obstacles EVS departments encounter.

Sounds troubling but the flip side is that more healthcare leaders are starting to listen and respond in positive ways because they believe that taking a facility-wide approach to infection prevention should be the norm, not the exception.

CASE STUDY APPENDIX: PERISEPT Sporidical Disinfectant Cleaner

Maintaining an environment with a low, pathogenic burden is essential for avoiding complications during the care and the recovery of patients. As well as, a fundamental aspect to the avoidance of negative press and a facility's ability to maintain positive public relations. The "do no harm" creed must be the core element of Quality Assurance of for all healthcare organizations.

SOLUTIONS

Controlling Healthcare Associated Infections (HAI's) is recognized as a battle in itself. Until now, Infection Preventionists (IP) and Environmental Services (ES) have unfortunately had to combat sporicidal disinfecting agents that require additional labor (due to their inability to clean) and cause damaging corrosion, leave unsightly residue, and costs healthcare systems a tremendous amount of money in equipment replacement expenses, e.g. medical equipment, clothing, devices, surfaces, etc.

In an effort to provide our associates with the most effective tools possible Crothall began a search for a high level disinfectant with improved efficacy. Our search led us to a new product called PERISEPT, a technologically advanced, EPA registered, sporicidal disinfectant cleaner. PERISEPT provides improved efficacy in that it is effective against C. diff and numerous other MDROs and also because it has been proven effective in only two (2) minutes. The two (2) minute kill claim offers significant real world value due to the commonly accepted challenge of keeping surfaces wet in excess of 5 minutes. PERISEPT will undoubtedly change how Infection Prevention and Environmental Services view high-level disinfectants because of it's ability to clean and provide sporicidal disinfection to a surface in one step. PERISEPT is a relatively cost effective solution to combating current and emerging HAI threats that allows additional cost-savings by 1- streamlining cleaning and disinfecting procedures, 2) by eliminating redundant re-cleaning / rinse steps and (PERISEPT will not leave behind corrosive residue and does not cause streaking).

PERISEPT Sporidical Disinfectant Cleaner eliminates and prevents the spread of C. difficile, MRSA, Enterococcus faecalis (VRE), Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, and Enterobacterspecies, and many other pathogens commonly found in health care settings. PERISEPT contains no alcohol or bleach, requires no rinsing and leaves no film on hard surfaces. As a hospital-grade disinfectant cleaner and sporicide it is ideal for surgical rooms, patient rooms, operating suites, physical therapy departments, nursing services, autopsy facilities, long-term care facilities and nursing homes.

CONCLUSION

The goal at Crothall Healthcare is to define a systems approach to implementing a healthier, patient centric environment. Environmentally sound cleaning, disinfecting practices supported

CASE STUDY APPENDIX: PERISEPT Sporidical Disinfectant Cleaner

by training and monitoring strategies that positions Crothall in the healthcare sector. Our actions are a reflection of the Crothall commitment.

We at Crothall Healthcare, along with our strategic partners, have implemented an Outcome-Based Program. The combination of tested Processes and Products has resulted in proven solutions to combating Healthcare Associated Infections, in particular Clostridium difficile.

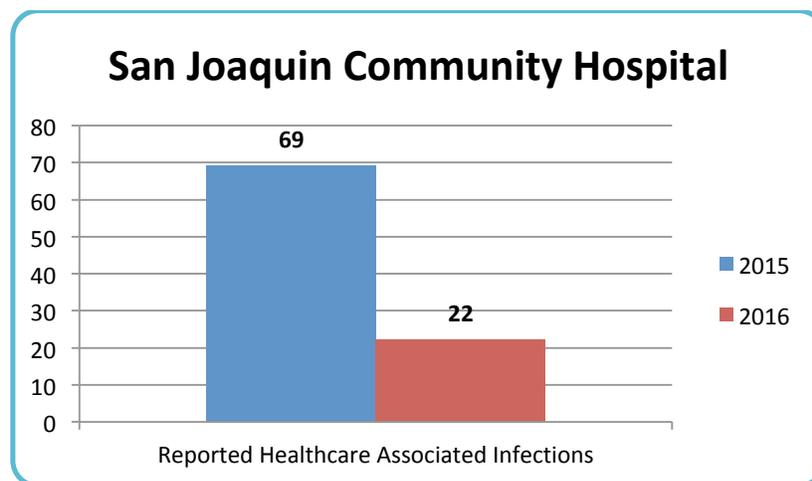
Case Study: Perisept Use at San Joaquin Community Hospital

Perisept Use Decreases C. Diff Outbreaks by 68% (Nicole Vincent, EVS Director San Joaquin Community Hospital)

Scope: In 2016, San Joaquin Community Hospital in Bakersfield, CA implemented the use of Perisept throughout its 250-bed facility. Perisept is a sporidical disinfectant and cleaner that prevents the spread of C. difficile, as well as MRSA and many other common pathogens in healthcare. Perisept has a 2-minute kill claim of C. Diff with a 99.9999% efficacy. The implementation of the disinfectant included training on how to properly dilute the product to its 1:32 ratio and how to safely and efficiently use the product as a cleaner and disinfectant.

Results: With their thorough cleaning regimen and the introduction of Perisept, the new process provided a 68% decrease in C. diff outbreaks at San Joaquin Community Hospital. In 2015, there were 69 C. diff outbreaks at the facility compared to 22 in 2016. This represents the 68% decrease.

Study Details: Perisept was officially introduced facility-wide in the middle of 2016. The 22 C. diff outbreaks represents data collected from the middle of 2016 up until the middle of 2017 (1 full year). Data collected from January 1st- December 31st of 2015 represent the 69 outbreaks in 2015.





Medline Industries, Inc.
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1.800.MEDLINE (633.5463)

medline.com

Medline carries a full line of microfiber products, in-service and programs to ensure proper use. The studies, testing and programs highlighted in this document were conducted by using Medline microfiber with the exception of the EPA study at UC Davis.

Topics to be covered are:

- Impact on bioburden levels on high touch surfaces
- Layout and systematic approach to the Patient Zone
- Transition to Medline Microfiber
- Microfiber life span
- Quat binding and impact on disinfectants

Impact on bioburden levels on high touch surfaces:

Medline has pioneered a systematic cleaning program that uses Medline microfiber products. Bioburden on surfaces are notated as the largest contributor of transfer of micro-organisms from one surface to another. Through field study and trial implementation of this program, Medline has been able to use a patented product to reduce bioburden on surfaces. The microfiber booklet is a key success factor to ensure proper training of disinfecting all high touch surfaces in a daily and discharge cleaning. Through the use of cleaning validation tools like ATP, improvement of bioburden levels on surfaces were able to be tracked and recorded. The Medline Program has been implemented in 6 hospitals and an average of 74.76% reduction in soil levels was recorded. Reduction in HAI in a facility is tagged to various factors like bladder site infection, surgical site infections, and environmental factors. Due to the various factors, the reduction in bioburden on a surface has not been directly connected to reduction of HAIs.

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Layout and systematic approach to the Patient Zone:

Medline's cleaning program puts forth a systematic layout of the patient room to ensure all the high touch surfaces are cleaned and disinfected properly. The program trains the staff to clean each of these areas effectively and to establish a cleaning flow in the room. Each area of the room is identified as either highly soiled or hot zones next to the patient if they are present. Shown below is the layout that Medline uses as part of training to ensure least patient discomfort and highest patient satisfaction.

CLEAN BY SEQUENCE.

Giving your staff a step-by-step system helps ensure thoroughness and consistency. Our clean by sequence process uses a numbered microfiber booklet and "hot spot" map, making it easy to implement and follow. The result? Optimal cleaning. Enhanced outcomes. And reduced throughput times.

PATIENT ROOM

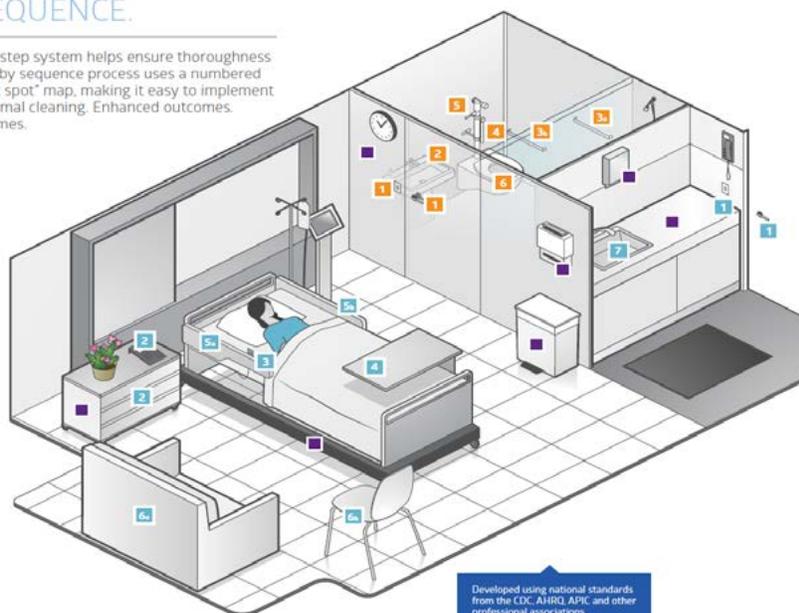
1. Door Knob/Light Switch
2. Bedside Table Handles/Phone
3. Call Button
4. Tray Table
- 5a. Left Bed Rails
- 5b. Right Bed Rails
- 6a. Chair
- 6b. Chair
7. Room Sink

RESTROOM

1. Door Knob/Light Switch
2. Restroom Sink
- 3a. Handrails
- 3b. Handrails
4. Bedpan Cleaner
5. Toilet Flush Handle
6. Toilet Seat

OTHER DISCHARGE ROOM SURFACES

- Counters
- Fixtures
- Walls
- Dressers
- Trash Cans
- Standard Room Equipment
- Bed
- Other



Transition to Medline Microfiber:

Implementation of this Medline program trains the staff to use the tools like Microfiber booklet and mop accurately to achieve low bioburden levels on the surfaces. The focus is on moving staff from old traditional products to Medline Microfiber to achieve proper disinfection. When implementing Medline Microfiber, Medline translates not only the cost savings an account can achieve from the transition but also the bioburden reduction

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needed for proper disinfection. According to the EPA study conducted at UC Davis (study attached to this email), cost savings for management can be captured in 60% lifetime cost savings for mops, 95% reduction in chemical costs associated with mopping tasks, and 20% labor savings per day. According to the same study, Medline builds awareness with the staff about reduction in bioburden between a traditional product and microfiber. Using traditional products will only reduce bioburden 30% versus microfiber will reduce 99.9%.

UCDMC found in testing that microfiber materials were able to penetrate surface pores and remove dust particles that conventional mops missed.



Bacteria culture taken after a traditional wet mop cleaning — only a 30% reduction from precleaning.



Bacteria culture taken after microfiber mop cleaning — a 99% reduction!

Microfiber Life span:

Medline microfiber has been tested to withstand either commercial or in-house laundering. There are many different types of microfiber in the Medline product line that is sold to customers based on price or performance. Useful life of Microfiber is determined in different ways depending on if the product is a cloth or mop. End of life for Microfiber

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cloths can be easily determined based on the fibers on the face of the cloth. After the drying process of the Microfiber cloths, the moisture is taken out of the fibers and the filaments are charged to attract soils on the surface. If the fibers are not damaged, the Microfiber cloth should immediately start attracting dirt or dust when introduced to a surface. If the feel of the cloth is more laminate and the fibers are not attracting, this indicates the end of life for the Microfiber cloth. When determining the end of life for a Microfiber mop, the indication is always on loops at the back of the mop. If the loops are broken, they will not attach to the frame. The other signs that indicates end of life for Microfiber mops are inner foam layer break down or visible tears on the outside of the mop. Most if not all microfiber products in hospitals are used with various types of chemicals with different formulations. Consistent use of these chemicals will over time either diminish the effectiveness of the fibers or break the fibers down. At this time, Medline does not have any scientific findings to determine the end of life of Microfiber cloths or mops, and the rag out process is left up to our customers and the performance of the products.

Quat binding and impact on disinfectants:

Most disinfectants in the market require a two-step process to effectively achieve proper disinfection. Manufacturers recommend that all visible soils are removed and the surface is cleaned before introducing disinfectants to the surface. As our industry has become more stringent on time in turning rooms or cut on labor costs, most our customers are forced to use a one step process for cleaning and disinfecting. This change introduced the numerous amount of materials that are pre-soaked in a one gallon bucket of disinfectant and used to clean and disinfectant the surface. Most of these cloths including microfiber were leading to a new issue of Quat binding and ineffective disinfectants to be used in a facility to clean high touch surfaces. Quat binding occurs when the parts per million of a disinfectant is greatly reduced before the disinfectant is introduced to a surface. Medline conducted an internal study and published a technical data sheet that shows the effects of Quat binding on all types of materials. Shown below is the summary graph of that study (the technical data sheet is attached to this email):

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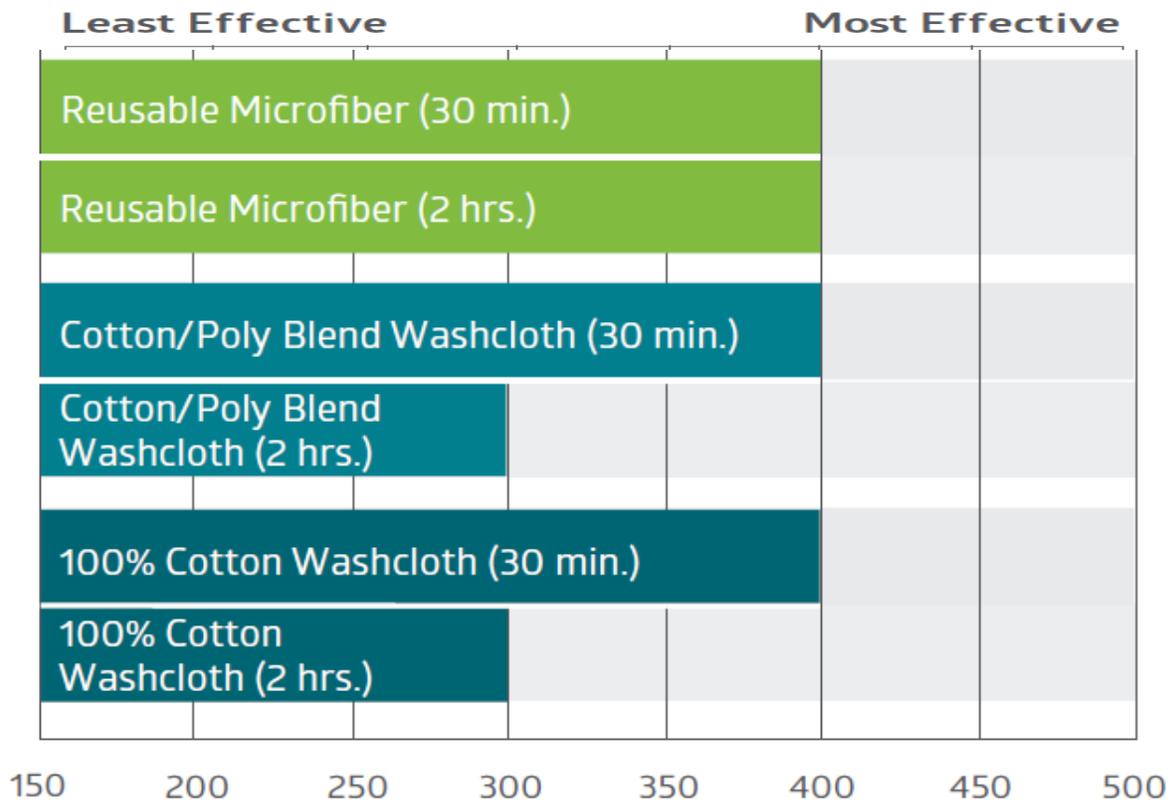


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Figure 4. Quat Absorption, Parts Per Million (ppm)



From this study, it shows that reusable microfiber is the top performer over any other traditional materials over a two hour period. The study also shows that reusable microfiber is also affected by Quat absorption after a 30 minute period. To counteract the potential quat absorption, Medline Microfiber training emphasizes a dip and wipe method moving customers away from pre-saturating their microfiber cloths.

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The Miele logo consists of the word "Miele" in a white, bold, sans-serif font, centered within a dark red rectangular background.

Laundry Disinfection of Microfiber Mops and Microfiber Cloths by the Miele PW 6101 LL Washing Machine and the PT 7251 NI EL Dryer

Christina Morrison, Jessie Rosansky and Charles P. Gerba

The WEST Center
University of Arizona
Tucson, AZ
June 14, 2017

Introduction

Transmission of bacterial, viral and fungal infections by laundry have been documented (Frisby 1957; McNeil 1964; Standaert et al., 1994; Gibson et al., 1999; Borg and Portelli 1999; Duffy et al., 2014). Thus, proper handling and laundering is essential for control of pathogenic microorganisms via laundry. Removal of pathogenic microorganisms during laundering is achieved by a combination of physical and chemical factors as well as temperature. Physical factors include mechanical action by the action of the washing machine. Chemical action includes effects of the detergent and disinfectants (chlorine, activated oxygen bleach i.e. Perborate or TAED (Tetraacetylenediamine)/percarbonate compounds). Wash water temperatures above 40 °C have a detrimental effect on microorganisms and can play a significant role in the removal (killing; inaction) of microorganisms (Bockmuhl 2017).

Proper laundering of institutional (healthcare, nursing homes, hotel) is important in preventing transmission of infectious microorganisms. This is especially true in the healthcare industry where transmission of antibiotic resistant bacteria has become a major problem. These bacteria include methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococcus, and carbapenem-resistant enterobacteriaceae. These bacteria have been identified on hospital fabrics and clothing of healthcare workers (Perry et al. 2001). They have been found to survive for weeks on hospital fabrics (Koca et. al. 2011)

CASE STUDY APPENDIX: Miele Laundry Disinfection of Microfiber Mops and Cloths

Microfiber mops and cleaning cloths have been shown to have better removal capabilities in removing dirt and bacteria from contaminated surfaces (Wren et al. al. 2008). Thus, they were selected to demonstrate the ability of the Miele PW 6101 washing machine and PT 7251 NI EL dryer to decontaminate several types of bacteria responsible for hospital acquired infections in reusable microfiber mops. Bacteria included in the study were:

- Methicillin resistant *Staphylococcus aureus* (MRSA) (ATCC 33592)
- *Enterococcus fecalis* VRE (ATCC 700221)
- *Escherichia coli* CRE (ATCC BA2469)

This study involved testing the reduction of the bacteria in microfiber mop heads and cloths. The mops were 45 cm wide and 13.5 cm in length, before beginning the project. They were washed in the Miele PW 6101 using program cycle 100 to eliminate any naturally occurring bacteria on the mop heads and cleaning cloths.

Cultures of the test organisms were grown overnight and inoculated onto 9 mop sections or microfiber cleaning cloths as described in Appendix 1. Because of the large size of the mop heads, to which the bacteria were added, they were cut into four sections to reduce the size of the mop that had to be processed to recover the bacteria.

The dimensions of the mop head sections used for bacteria testing were 6 by 13.5 cm in size. In addition to the bacterial inoculated mops, 25 intact mop heads were included in the wash load for a total weight of 2.4 kg. To simulate a dirt load, 2 +/-0.02 grams of vacuum cleaner dust was added to each mop head. The wash cycle was then set and the items washed according to the programming of the cycle. Three inoculated mop head sections inoculated with bacteria were removed for testing and the mop heads placed into the Miele 7251 dryer and the remaining inoculated mop head sections processed for bacterial testing.

The microfiber cleaning cloths were composed of 80% polyester and 20% polyamide and measured 30 X 28 cm after washing. A dirt load was simulated by addition of 1 mL of a 1 % solution of fetal calf serum in distilled water to each cloth. Bacteria were recovered as described for the mop heads.

The bacteria were recovered from the mop head sections as described in Appendix 2.

Three types of programmed washing conditions were tested

- 100: Chemical disinfection, with thermal disinfection and souring agent.
- 101: Thermal disinfection and souring agent (no chemical disinfection)
- 102: Thermal disinfection only (no chemical disinfection or souring agent)

CASE STUDY APPENDIX: Miele Laundry Disinfection of Microfiber Mops and Cloths

The programming allows for control of the washing temperature and addition of detergent, souring agent and activated oxygen bleach at various stages of the laundering process.

Thermal disinfection was accomplished by water temperature of 162 °F (72.2 °C) for 25 minutes.

The detergent DERVAL SOLO was added at a dose of 120 ml = 12 ml/Kg, and chemical disinfection was achieved by using Ottalin Peracet, added at a dose of 50 ml = 5ml/Kg for a contact time of 25 min. The souring agent Otalin Citro was added at a concentration of 30 ml = 3ml/Kg for a contact time of 4 min. All of the agents were obtained from Kreussler, Tampa, FL.

Results

The results of bacterial reductions by the different washing programs are shown in Table 1. The maximum log reduction varies between the different bacteria, because they grow to different concentrations, and not always to the same concentration each time. All of the bacteria were reduced in concentration by more than 7 logs. Most of the bacteria were reduced below the detection limit of the assay method, drying usually eliminated the remaining bacteria. A 5 to 6 log reduction is usually considered disinfected.

Discussion

All of the washing cycles used in this study demonstrated that the Miele PW 6101 LL Washing Machine was effective in disinfecting all of the antibiotic resistant bacteria used in this study. The temperature of the wash water was effective alone in achieving disinfection of the mop heads and cloths even in the presence of a dirt load.

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CASE STUDY APPENDIX: Miele Laundry Disinfection of Microfiber Mops and Cloths

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Table 1. Reduction of MRSA in mops (Average of triplicates for each wash condition)

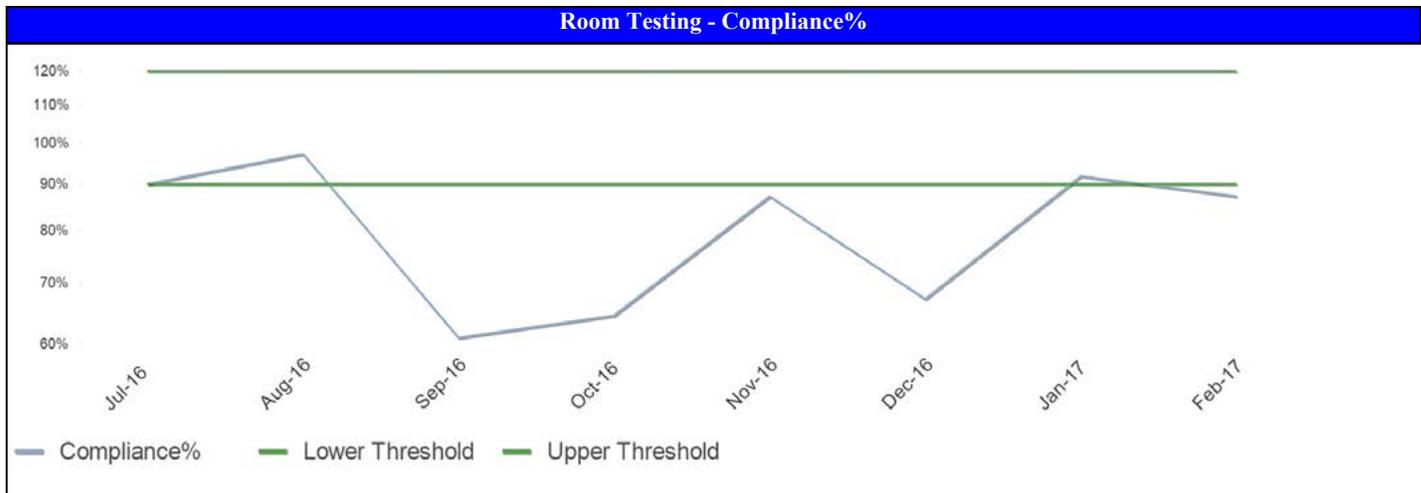
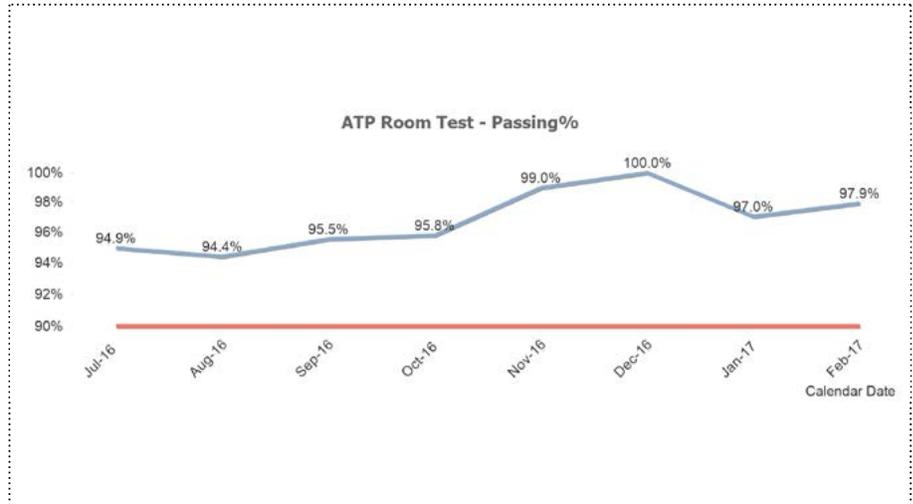
Program	MRSA		CRE		VRE	
	Mop	Cloth	Mop	Cloth	Mop	Cloth
Chemical disinfection, with thermal disinfection and souring agent	>8.30	>7.22	8.40	>8.35	>7.42	7.61
Thermal disinfection and souring agent	>8.24	7.84	7.51	>8.52	7.36	>8.01
Thermal disinfection only	>8.24	7.75	7.92	>8.32	>7.42	>8.11

*Colony forming units in the cloth



Ministry Market: Amita Health

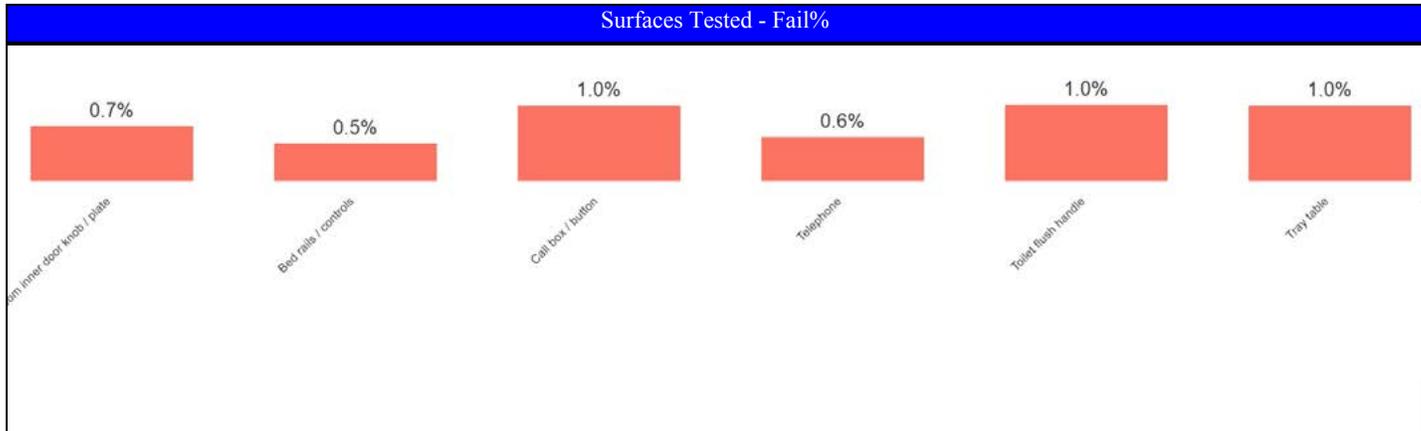
Room - Compliance%	Room - Passing%	Room - ReClean%
80.8%	96.8%	



Room Clean Percentages		
Percentages	Month to Date	AH Fiscal Year to Date
Compliance %	87.3%	80.8%
Passing %	97.9%	96.8%
ReClean %	100.0%	

Volume of Testing		
Test Metric	Month to Date	AH Fiscal Year to Date
Surfaces Tested	437	2,998
ATP Tests	97	711
ReCleaned	2	40

Surfaces - Survey Results		
Survey Metric	Month to Date	AH Fiscal Year to Date
Passed Surveys	435	2,923
Caution Surveys	1	53
Failed Surveys	1	22

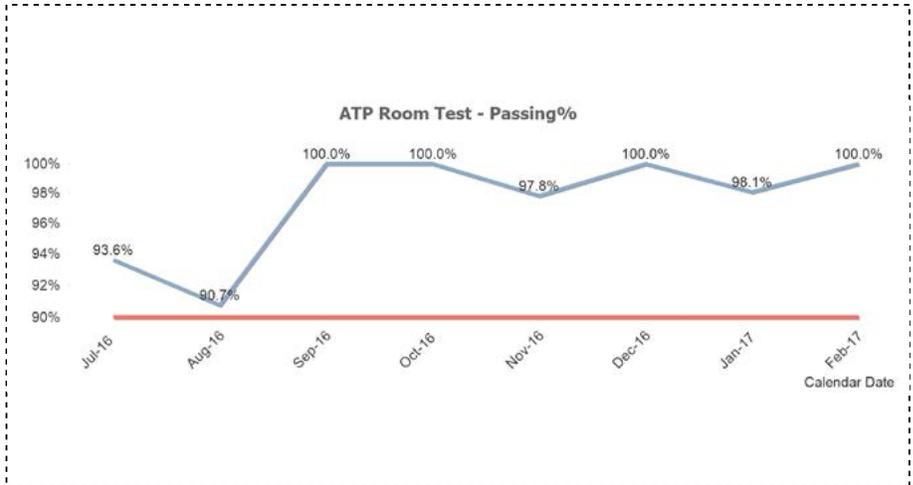




Hospital: ST ALEXIUS MEDICAL CENTER

Date Range: Jul-16 to Feb-17

Room - Compliance%	Room - Passing%	Room - ReClean%
75.3%	96.7%	



Hospital Overview

Ministry	Unit Name	Rooms Tested	Surfaces Passed	Surfaces Caution	Surfaces Fail	Rooms - % Passed	Rooms - Compliance %	Rooms - ReClean %
Amita Health	ES-ST. ALEXIUS MEDICAL CENTER	301	1,295	27	9	96.7%	86.0%	230.0%

Rooms Testing - Compliance%



Room Clean Percentages

Percentages	Month to Date	AH Fiscal Year to Date
Compliance %	92.0%	75.3%
Passing %	100.0%	96.7%
ReClean %		

Volume of Testing

Test Metric	Month to Date	AH Fiscal Year to Date
Surfaces Tested	237	1,331
ATP Tests	47	301
ReCleaned	0	23

Surfaces - Survey Results

Survey Metric	Month to Date	AH Fiscal Year to Date
Passed Surveys	237	1,295
Caution Surveys	0	27
Failed Surveys	0	9

Surfaces Tested - Fail%

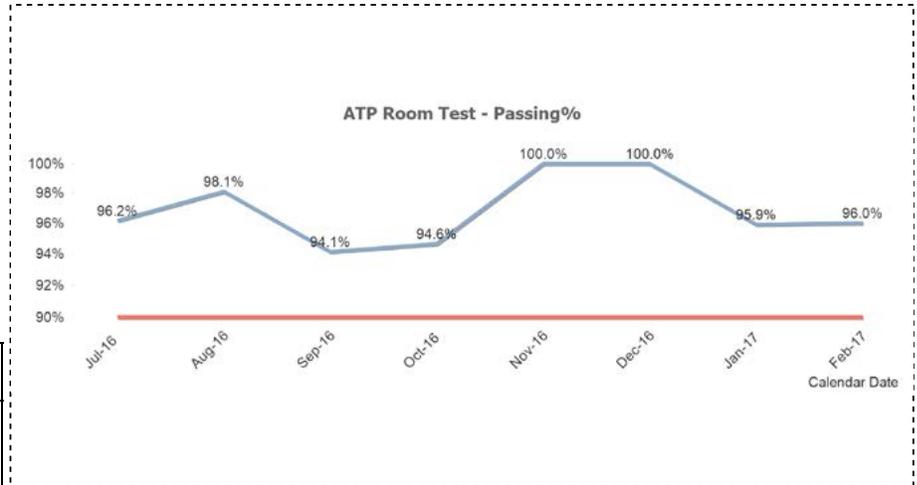




Hospital: ALEXIAN BROTHERS MEDICAL CENTER

Date Range: Jul-16 to Feb-17

Room - Compliance%	Room - Passing%	Room - ReClean%
85.4%	96.8%	



Hospital Overview

Ministry	Unit Name	Rooms Tested	Surfaces Passed	Surfaces Caution	Surfaces Fail	Rooms - % Passed	Rooms - Compliance %	Rooms - ReClean %
Amita Health	ES-ALEXIAN BROTHERS MEDICAL CENTER	410	1,628	26	13	96.8%	97.6%	130.8%

Rooms Testing - Compliance%



Room Clean Percentages

Percentages	Month to Date	AH Fiscal Year to Date
Compliance %	83.3%	85.4%
Passing %	96.0%	96.8%
ReClean %	100.0%	

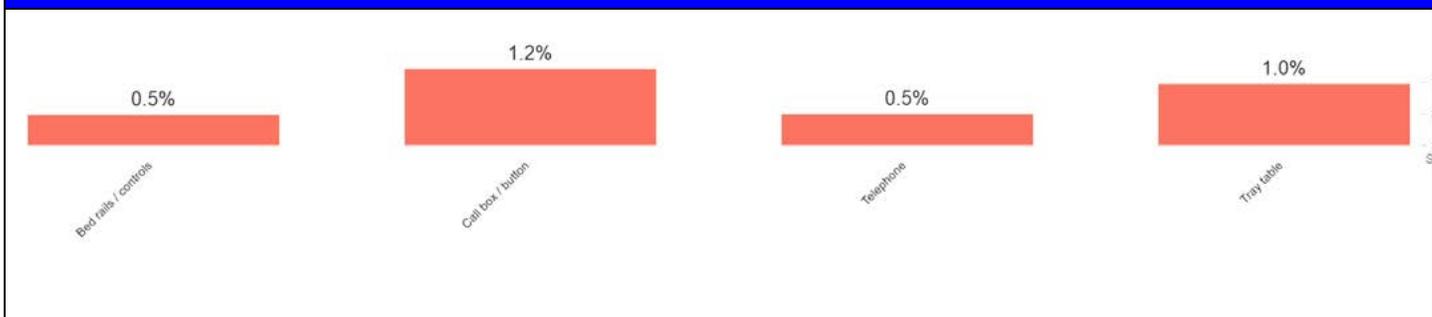
Volume of Testing

Test Metric	Month to Date	AH Fiscal Year to Date
Surfaces Tested	200	1,667
ATP Tests	50	410
ReCleaned	2	17

Surfaces - Survey Results

Survey Metric	Month to Date	AH Fiscal Year to Date
Passed Surveys	198	1,628
Caution Surveys	1	26
Failed Surveys	1	13

Surfaces Tested - Fail%



Clean at the Speed of Light

Jersey Shore University Medical Center

Crothall Healthcare has redefined “patient experience” in hospital settings, with processes that build value into health care activities while improving outcomes and generating more time for patient care. Jersey Shore University Medical Center (JSUMC), a 546-bed hospital and trauma center in the Meridian health family of health care, has partnered with Crothall to fight hospital-acquired infections (HAIs) with capital investment and improved procedures.

Surfacide® is an automatic disinfection system that uses shortwave ultraviolet (UV-C) light to destroy C.Diff, MRSA, and other drug-resistant pathogens. Improving on previous single-emitter designs, Surfacide® utilizes a triple-emitter array to eliminate “shadows” – surfaces UV light cannot reach – and cut disinfection time. Crothall acquired a Surfacide® triple emitter system for JSUMC to fight the medical intensive care unit’s few reported infections.

“The staff did hand-washing promotions and such, but the one big change starting in April was they used Surfacide® after every discharge,” said Chad Haraschak, Crothall Resident Regional Manager of Environmental Services for Meridian Health System. “In four months, we went from a handful of HAIs in the medical ICU to none at all. The results were so convincing that Meridian bought six sets for their five hospitals.”

MAKING SENSE OF SURFACIDE®

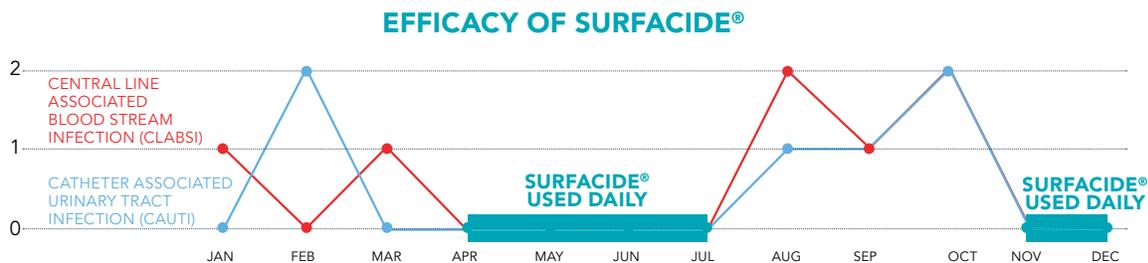
Surfacide® is used in addition to Crothall’s proven ten steps to ensure a clean environment. Housekeepers included the treatment after every discharge in the medical ICU, and new protocols were added to better cooperate with clinical teams. “There are units at other hospitals in the region, though we may be the only system to make Surfacide® part of the daily routine,” said Haraschak.

Patients with risky pathogens are identified by the Infection Control unit, who can request Surfacide® cleaning for specific rooms. The trial Surfacide® unit was successfully deployed to prevent a norovirus outbreak after the infectious agent entered with a patient.

CONSISTENTLY CLEAN

“Surfacide® and Crothall are great at Meridian; we’re all focused on results,” said Susan Hanrahan, Meridian Infection Control Manager at JSUMC. “We all learned together that the key is consistency, using the equipment properly and every day.” Hanrahan’s continuing study with the Centers for Disease Control and Prevention (CDC) on HAIs at JSUMC is showing a statistically significant decrease throughout the ICU with Surfacide®.

Collaboration with other departments was essential to the process. “We have to be careful with anything that would add turnaround time, but everyone saw the success was worth it,” said Hanrahan. “Facilities Management saw fewer HAIs, nurse managers saw happier patients, and administration saw a worthy investment.”



REAL RESULTS

The efficacy of Surfacide® was proven starting in August 2015 when other units in JSUMC requested it be moved to their units for application. While it dropped HAI’s in those units the HAI rates returned to the medical ICU. HAI’s dropped to zero again when Surfacide® was reinstated as part of the daily housekeeping routing in the medical ICU.

“We lean on Surfacide® for everything: leaks, surges of communicable illness in the ER, anything of epidemiological importance,” said Hanrahan. “Something that destroys a pathogen’s DNA really sells itself and we feel more confident giving care.”



Effect of UV-C Light Disinfection as an Addition to a CAUTI Bundle

Susan Hanrahan MS, CIC, CRCST, Infection Prevention Manager JSUMC; Chad Haraschak BS, Environmental Services, Crothall Healthcare; Gladys Burak MSN, RN-BC, TICU Nurse Manager; Jeffrey Garland BSN, RN, CNRN, NSICU Nurse Manager

Abstract

Ultra Violet-C (UV-C) light disinfection was consistently applied in the SICU from 09/2016 through 04/2017. This was an adjunct to the routine chemical cleaning and disinfection protocols. NHSN SIR metrics were used to measure the impact on the unit's CAUTI rate. Prior to the intervention, the unit's CAUTI rate was above threshold for the predicted incidence metric from 2015 – 2016 YTD. After 8 months of consistent UV-C light disinfection, the CAUTI rate was performing statistically significantly better than expected with a quantifiable decrease in CAUTI incidence.

Introduction

UV light disinfection is gaining acceptance as a housekeeping best practice strategy to support clinical care at the bed side and improve patient outcomes. UV light systems that can deliver UV-C radiation at approximately 254 nm have been documented to eradicate pathogens by denaturing their nucleotides. Utilizing a triple emitter approach decreases the distance to contaminated surfaces, thereby increasing the energy delivered to destroy these phosphodiester bonds. Several authors have reported using UV-C light disinfection to decrease surface bioburden in patient care areas to improve environmental hygiene and influence HAI reduction.

Objective

The CAUTI Bundle and the High Reliability Organization (HRO) method along with extensive training was provided to adopt a "Goal Zero" target for CAUTI rates in 2016 based on 2015 data. Despite these interventions, the SICU's CAUTI rate continued to be sub-optimal. An automated triple emitter UV-C light disinfection system significantly influenced the MICU's CAUTI reduction with p -value < 0.05 during 2015. The success in the MICU was the impetus for trialing UV-C light disinfection in the SICU. UV-C light disinfection was deployed to enhance the current housekeeping program and measure the effect on CAUTI rates in SICU.

Methods

Each discharge room was terminally cleaned and disinfected with the hospital approved chemical products, curtain changed and disinfected with UV-C light. Housekeeping worked collaboratively with SICU staff and Bed Management to coordinate these processes. This interdisciplinary partnership proved to be instrumental in patient outcomes. NHSN SIR metrics were used to measure the impact of UV-C light disinfection on the unit's CAUTI rate. UV-C light disinfection continues to be used as a daily housekeeping process in the unit.

Results

Prior to implementing UV-C light disinfection in the SICU, there was a statistically significant problem preventing CAUTI in the unit between 2015 -2016 YTD with p -values < 0.05 [Fig. 1]. During the intervention period between 09/2016 - 04/2017 when UV-C light disinfection was consistently used, the SICU experienced a statistically significant reduction in CAUTI (1 observed CAUTI vs. 6 predicted CAUTI, SIR = 0.167, SIR p -value = 0.0198, 95% CI = 0.008, 0.822) [Fig 2]. This intervention contributed to an 83% reduction in CAUTI incidence and safer patient outcomes.

Figure 1. 2016 YTD SICU CAUTI data Pre and Post UV-C Intervention



Figure 2. 2017 MTD SICU CAUTI data Post UV-C Intervention



Key Terms:

CAUTI = Catheter Associated Urinary Tract Infection
 UV-C = Ultraviolet - C
 HAI = Hospital Acquired Infection
 NHSN = National Healthcare Safety Network
 SIR = Standardized Infection Ratio

Acknowledgements:

Adam Buchaklian PhD

Conclusion

Environmental contamination is a contributing factor to HAI incidence and jeopardizes the patient's outcome. Uropathogenic organisms can survive on surfaces for several months, possibly contributing to CAUTI. It was speculated that the dedicated UV-C light disinfection program utilized in the MICU in 2015 was decreasing persistent contamination and providing a safer environment for delivery of bed side patient care. Expanding this automated UV-C light disinfection system to the SICU impacted a significant reduction in the unit's CAUTI rate. CAUTI Bundle practices were optimized with consistent application of UV-C radiation, rendering the environment of care more hygienic than solely using standard chemical housekeeping protocols.

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UV-C Light as an Adjunct to Infection Control in a Pediatric Burn Hospital

Shriners Hospitals for Children® — Cincinnati, Ohio

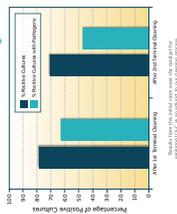
J. Weitz, BSN RN · P. Durkee, BS · A. Dwyer, BS · J. Zembrodt, BS · B. Puthoff, BS · D. Taylor, RN · P. Warner, MD, FACS

Research Education Care

Introduction

Maintaining a clean environment is integral to preventing the transfer of pathogens that may cause hospital-acquired infection (HAI). Patient rooms are cleaned daily and upon patient discharge with the approved hospital disinfectant, a quaternary-based cleaner disinfectant, requiring a ten minute dwell time. Intensive Care Unit (ICU) rooms are cleaned twice daily and upon discharge. Following the transfer of a multidrug-resistant organism (MDRO), the efficacy of our environmental services (EVS) terminal cleaning process was questioned. Can a patient room known to be heavily colonized with bacterial organisms. Culture results revealed potentially pathogenic organisms present on many of the room surfaces. These organisms included Methicillin-resistant *Staphylococcus aureus* (MRSA), *Klebsiella pneumoniae*, *Enterococcus faecalis*, Coagulase-negative staphylococci, and *Bacillus* species. The room was terminally cleaned while reduced, remained present on room surfaces (Figure 1). Organisms recovered included, *Staphylococcus aureus* (MSSA), *Enterococcus faecalis*, Coagulase-negative staphylococci, and *Bacillus* species.

Figure 1. Percentage of Positive Cultures AFTER Terminal Cleaning



To ensure there was not an efficacy problem with the disinfectant, the room was later cleaned with an EPA-approved disinfectant in the patient room. The disinfectant cleaner proved to be bactericidal in all disinfectant assays performed.

The disinfectant cleaner is capable of eradicating bacterial organisms on the laboratory testing, the actual cleaning process is not always a fail-safe method to ensure adequate patient room disinfection. The purpose of this study was to determine if use of an ultraviolet disinfection system (UV-C) would improve bacterial eradication. The Surfacide® Ultraviolet Light Disinfection System (Figure 2) was brought in for a one month product evaluation.



Figure 2. Surfacide® Helios® Ultraviolet Light Disinfection System

Methods

Patient Rooms
Bacterial cultures were taken from twenty-six high-touch surfaces in 3 patient rooms before and after EVS cleaning and after UV-C disinfection was performed in three patient rooms.

Figure 3. Surfacide® System set-up in Patient Room



UV-C Only Room

Additionally, the efficacy of the UV-C was tested in a controlled environment. In an unoccupied room, ten organisms, including 5 MDROs, were randomly selected for this subsequent culture. Ten organisms, including 5 MDROs, were randomly selected for this subsequent culture. The organisms were grown in 5% Sheep Blood Broth (SBB) for 24 hours at 37°C. A 100 µL aliquot was prepared in Peptone Water for each test isolate. Colony count plates were also prepared to determine inoculum density of each test isolate.

A sterile cotton-tipped applicator was used to inoculate the area within the wax ring with the organism control (inoculated from UV light exposure) was included in each test run. The room was then UV disinfectant using the Surfacide® Helios® system. Upon completion of the UV disinfection cycle, cultures were obtained by swabbing the areas within the wax rings. The wax ring areas were allowed to dry before proceeding with the inoculation of the next isolate.

Water and allowed to dry before proceeding with the inoculation of the next isolate. Lethen Broth (Lethen Broth) was used as the culture medium for all cultures. The inoculated Lethen Broth tubes were incubated for up to five days in a room CO₂ incubator at 37°C. The cultures were then plated on 5% Sheep Blood and identified to ensure that the organism was consistent with the test organism. Data were collected as percentage of bacterial eradication.

Results

A total of 234 cultures were obtained from 9 patient rooms under optimal terminal clean and UV-C treatment (Table 2). There was a 37% organism reduction between terminal cleaning and UV-C and total elimination of pathogens (Figure 4) in the controlled UV-C only study, a total of 330 cultures were obtained (320 organism inoculums and 10 positive controls). The Surfacide system demonstrated a 97.5% organism reduction (Table 2). Eight of the 320 surfaces tested positive after UV-C disinfection, four were recovered from a driver handle which contained an adhesive label. We concluded that the organism was able to reach behind the label, and was not eradicated by the UV-C disinfection process. The organisms recovered were *Staphylococcus aureus* (MSSA), *Klebsiella pneumoniae* (ESBL+), and *Moraxella pneumoniae* (ESBL+). No unintended organisms were recovered from any culture (Figure 5).

Table 1. Profile of Cultures from 3 Patient Rooms

Residual Growth Cultures % (n)	Before EVS Terminal Cleaning (n=9)	After EVS Terminal Cleaning (n=9)
Residual Growth Cultures % (n)	91% (7)	47% (3)
Positive Growth Cultures With Pathogens Present (n)	7% (5)	2.7% (1)
After EVS Terminal Cleaning Only (UV-C (n=79))	10.3% (8)	0% (0)

Figure 4. Percentage of Positive Cultures from Patient Rooms

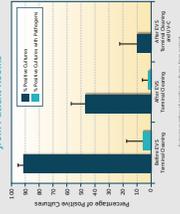
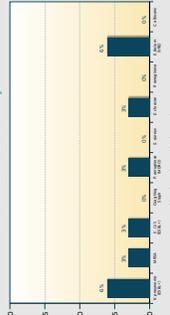


Table 2. Cultures After UV-C Only

Number of Cultures (n)	Positive Cultures After UV-C Treatment Only (n)	Overall Kill Rate of UV-C Treatment Only (%)
320	8	97.5%

Figure 5. Percentage of Positive Cultures by Organism AFTER Treatment with UV-C Only



Conclusions

Culture results from patient rooms after both cleaning and UV-C disinfection demonstrated a 97.5% organism reduction and total elimination of bacterial pathogens not eradicated by the cleaning process alone.

Applicability to Practice

EVS disinfection of the patient room does not guarantee eradication of potential HAI causing organisms. Implementation of touch-free disinfection systems, such as the Surfacide UV-C Helios provide an additional level of security in reducing the risk of HAIs.

CASE STUDY APPENDIX: Surfacide MedStar Case Study

Effect of terminal cleaning with ultraviolet light disinfection (Surfacide) on reducing hospital onset *Clostridium difficile* infections in 2 community hospitals (Medstar Union and Medstar Good Samaritan).

(Debbie Huber, RN, CIC; Shawn Mueller, RN, CIC, Medstar Good Samaritan and Union Memorial hospitals. Submitted for presentation at APIC 2018)

Background:

Clostridium difficile infection (CDI) has rapidly emerged as the leading cause of healthcare-associated infectious diarrhea. A 2015 Center for Disease Control and Prevention study found that CDI caused almost half a million infections among patients in the United States in a single year. *C. difficile* is primarily spread through environmental contamination and is able to produce long-lasting spores that are difficult to kill. We sought to investigate if ultraviolet (UV-C) light disinfection decreased hospital onset CDI as part of the terminal cleaning discharge process in 2 community hospitals.

Results:

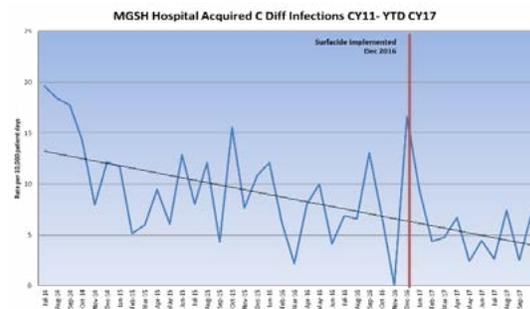
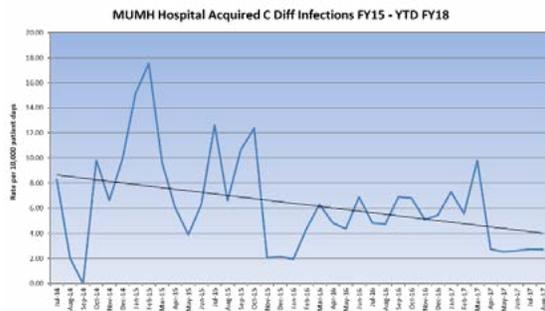
The first hospital decreased the risk of acquiring hospital onset CDI by 46.2% while the second hospital decreased risk by 29.2% after the implementation of UV-C light disinfection in this before and after implementation study comparison.

Methods:

UV-C light disinfection was added to the terminal cleaning process for all enteric isolation rooms upon discharge. The relative risk of hospital onset CDI was calculated for each hospital using data from 11 months of inpatient data before and after UV-C light disinfection was implemented using an online statistical calculator to calculate relative risk.

Conclusions:

This study found by implementing UV-C disinfection during terminal cleaning for enteric isolation rooms at 2 community hospitals, they were both able to reduce their risk of hospital onset CDI for inpatients. These results support adding UV-C disinfection to the terminal cleaning process at hospitals to reduce the burden of CDI and related costs.



GR-AD PRO CLEAN SURFACE TECHNOLOGY

General Resources has created a clean surface technology clinically-proven to provide persistent protection. We have extensive knowledge in multiple industries and work with clients to address the growing demand in healthcare, agriculture, food service, oil and gas, paper and pulp, plastics, textile, and skin care for the next level of clean surface technology.

OUR MISSION

Our team of professionals is dedicated to developing innovative products and providing solutions for our clients.

THE SCIENCE

General Resources' patented polymer has been engineered to provide persistent protection that enables improved efficiency in standard cleaning, resulting in consistently low ATP results.

100% NON-TOXIC

Our solutions are free from volatile organic compounds, arsenic, heavy metals and poly-chlorinated phenols.



FOOD CONTACT

- Complies with 21 CFR 170.39 for use on food prep surfaces without limitation to temperature or food type



INNOVATIVE TECHNOLOGY

- Maintains low ATP levels
- Provides consistent results
- Non-leaching, nonabrasive
- Remains active after drying



SAFETY FIRST

- Free of harsh chemicals, asthmagens, triclosan, sulfate and parabens
- Free of chemical vapors and VOCs



CLINICALLY PROVEN

- Advantages proven in clinical real-world testing
- Forms protective barrier on surfaces



EASY-TO-USE

- Single application
- Quick drying
- No rinse required
- Odorless

2017 GRAD-PRO CLINICAL STUDY

All surfaces were disinfected and sanitized using standard cleaning protocols. GR-AD Pro was then applied immediately after and allowed to dry.

SITE 1 RESULTS: 5-WEEK TEST WITH ONLY ONE APPLICATION

Memorial Hermann Memorial City Medical Center | 921 Gessner Rd Houston, TX 77024

Patient Restroom	Date	ATP #	Date	ATP #	Date	ATP #	Date	ATP #	Date	ATP #
RR Door Knob	Feb 3	1	Feb 9	2	Feb 18	12	Feb 24	2	Mar 2	1
Sink Handle	Feb 3	1	Feb 9	1	Feb 18	6	Feb 24	0	Mar 2	2
Toilet Handle	Feb 3	4	Feb 9	3	Feb 18	4	Feb 24	0	Mar 2	19
Handrails	Feb 3	4	Feb 9	1	Feb 18	2	Feb 24	0	Mar 2	1
Light Switch	Feb 3	3	Feb 9	2	Feb 18	11	Feb 24	3	Mar 2	1

SITE 2 RESULTS: 5-WEEK TEST WITH ONLY ONE APPLICATION

Midstate Medical Center | 435 Lewis Avenue, Meriden CT 06451

Patient Restroom	Date	ATP #	Date	ATP #	Date	ATP #	Date	ATP #	Date	ATP #
Toilet Handle	Jan 30	0	Feb 10	4	Feb 24	9	Mar 3	2	Mar 10	10
Toilet Seat	Jan 30	0	Feb 10	1	Feb 24	12	Mar 3	4	Mar 10	5
Handrail	Jan 30	0	Feb 10	40	Feb 24	10	Mar 3	4	Mar 10	16
Door Handle	Jan 30	2	Feb 10	2	Feb 24	29	Mar 3	12	Mar 10	4
Sink Handle	Jan 30	8	Feb 10	42	Feb 24	7	Mar 3	77	Mar 10	105
Soap Dispenser	Jan 30	4	Feb 10	1	Feb 24	6	Mar 3	15	Mar 10	5

In summary, we have been clinically-proven to maintain consistently low ATP levels.

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To reduce HAI risk and help hospitals improve and shorten bed turnover protocols, there is a proven new ALTERNATIVE EQUIPMENT MAINTENANCE option: a unique fluid-proof, 150-times* launderable/reusable microbarrier cover that protects each patient, mattress and bed deck.

*When used as directed



Challenges to HAI reduction

⇒ Hospitals are discovering that patient mattresses are a significant source of potentially deadly infection, and that one-step disinfection processes have been shown to be ineffective for these soft surfaces.

There are 29 peer-reviewed studies documenting that cleaned/disinfected mattresses are still contaminated after terminal cleaning. Twelve studies have documented mattress failures while they were still in use. The US FDA issued an advisory in November 2017 reporting 700 hospital-documented mattress failures over a four-year period. Thousands of patients could have been exposed to contaminated mattresses.

⇒ Unfortunately, hospital mattress surfaces are losing their integrity (failing) after multiple harsh disinfection cycles. Mattress surfaces are soft and porous. They are no longer vinyl; they are POLYURETHANE, to reduce hospital-acquired pressure ulcers. As disinfection chemicals break down the polyurethane, it becomes more absorbent and requires more re-wetting to meet disinfectant manufacturers' wet contact times. The more re-wetting, the more damage occurs and the sooner the surface fails.

Failed medical mattresses may already have inner cores contaminated with bodily fluids that have seeped in through small fissures, openings and tears in the outer cover. These contaminants can be forced back out through those same openings by someone sitting or lying down on that mattress, which increases the risk of cross-contamination in patient rooms.

⇒ Bed manufacturers' instructions for use now require documented inspections of the mattress skin after each patient discharge, and routine inspections of the interior core. The FDA-compliant unique identifier barcode on each microbarrier cover enables inspections during each laundering and provides process validation documentation.



FDA, CMS and Joint Commission require hospital adherence to the device manufacturer's instructions for use for all medical devices (mattresses are Class II medical devices). Compliant mattress/bed cleaning and disinfection requires 3-9 steps depending on the manufacturer, which can take as long as 30 minutes just for the mattress. Also, manufacturers now have to define a disinfection process that proves efficacy through end-of-life of the device. End of useful life is now defined as only one year by some mattress manufacturers.

This alternative equipment maintenance protocol meets all requirements of Joint Commission EC.02.04.03 EP3, and offers additional clinical, financial and workflow benefits:

- 🌐 Does not impact the clinical benefits of the underlying support surfaces
- 🌐 Prevents microbes, particles and fluids from penetrating inward and outward, protecting current patients from previous occupants
- 🌐 Independently shown to reduce C-diff rates by 50%
- 🌐 Turnover requires fewer steps and significantly less time
- 🌐 Requires no damaging hard-surface disinfectants for mattress cleaning
- 🌐 No inspection, validated disinfection or documentation needed; it's performed by the laundry
- 🌐 Can extend the useful life of mattresses and integrity of mattress skins





Targeted Strategy for Legionella Control in Health Care Facilities

Scope:

The Centers for Medicaid and Medicare Services (CMS) requires facilities to prevent Legionella Infections. Facilities must develop and adhere to policies and procedures that inhibit microbial growth in building water systems that reduce the risk of growth and spread of Legionella and other opportunistic pathogens in water.

Case Summary:

A hospital in Central Pennsylvania was testing positive for Legionella bacteria at water faucets and showers throughout its 500-acre campus. It was determined the current chlorine gas treatment system was insufficient for eliminating positive Legionella readings from their 500 thousand gallon water reservoir.

Results:

The G-C Water Safety Team was able to replace the hazardous chlorine gas product with a Chlorine Dioxide Generator. Once installed, this process produced positive trends within 3 days and the first 100% Legionella-free readings after just one month of treatment.

Study Standards:

CMS expects Medicare certified healthcare facilities to have water management policies and procedures to reduce the risk of growth and spread of Legionella and other opportunistic pathogens in building water systems.

Surveyors will review policies, procedures, and reports documenting water management implementation results to verify that facilities:

- Conduct a facility risk assessment to identify where Legionella and other opportunistic waterborne pathogens (e.g. Pseudomonas, Acinetobacter, Burkholderia,

Stenotrophomonas, nontuberculous mycobacteria, and fungi) could grow and spread in the facility water system.

- Implement a **water management program** that considers the ASHRAE industry standard and the CDC toolkit, and includes control measures such as physical controls, temperature management, disinfectant level control, visual inspections, and environmental testing for pathogens.
- Specify testing protocols and acceptable ranges for control measures, and document the results of testing and corrective actions taken when control limits are not maintained.

Healthcare facilities are expected to comply with CMS requirements. Those facilities unable to demonstrate measures to minimize the risk of LD are at risk of citation for non-compliance with the CMS Conditions of Participation.



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