0.02%
CAPTURED
Hand hygiene events captured
by direct observation*

# Electronic Monitoring of Hand Hygiene Compliance

99.98%
MISSED
Hand hygiene events missed
by direct observation*

BREAKING THE COMPLIANCE ILLUSION

- Quit missing out on data
- Eliminate the Hawthorne effect
- Learn of the latest in Hand Hygiene monitoring

Official Publication of

ipac
Infection Prevention
and Control Canada

Improve the QUALITY of CARE with more Actionable and Robust Data

< 3%
Direct Observation
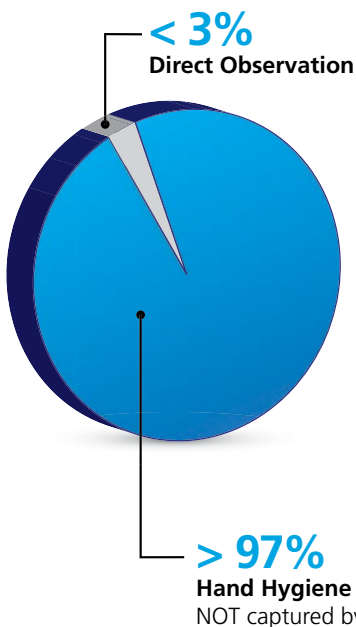
97% OF HAND HYGIENE OPPORTUNITIES ARE MISSED IN DIRECT OBSERVATION[1]

PURELL SMARTLINK™ electronically monitors hand hygiene 24/7. When combined with clinical interventions, scientifically proven PURELL formulations, and advanced dispensing platforms, our solution is proven to increase hand hygiene performance 82% over baseline.[2]

For more information on how you can more effectively measure hand hygiene as a first step in getting results, call 1-800-321-9647 or visit www.GOJOCanada.ca/SMARTLINK

> 97%
Hand Hygiene Opportunities
NOT captured by Direct Observation

1. Boyce JM. Measuring healthcare worker hand hygiene activity: Current practices and emerging technologies. Infect Control Hosp Epidemiol 2011;32(10)000-000.
2. GOJO Customer Data on File – January 2015 – July 2016

PURELL®
SMARTLINK™

INDUSTRY INNOVATIONS

IPAC CANADA – THE SMART WAY TO ADVANCE INFECTION PREVENTION AND CONTROL BEST PRACTICE EVERY DAY.

VISION
IPAC Canada – No preventable infections. Ever.

MISSION
IPAC Canada – we inspire, nurture and advance a culture committed to infection prevention and control.

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Contents

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THINK GREEN
This document is printed on paper certified to the standards of the Forest Stewardship Council® (FSC®).

Foreword

"I firmly believe the future of Canadian healthcare will be driven by technology assisting and measuring the very human aspects of clinical medicine delivery."

Dear IPAC Canada members,

Thank you for opening the premier issue of *Industry Innovations*, IPAC Canada's new publication showcasing new and innovative technologies, and how their implementation can assist our activities preventing, controlling, and monitoring infectious diseases in healthcare settings.

On this issue's theme:

Volume 1, Issue 1: "Electronic Monitoring of Hand Hygiene Compliance," features industry whitepapers showcasing the benefits and implementation considerations of a tempting technology-assisted auditing tool assisting the challenge of achieving robust hand hygiene compliance surveillance within the limitations of our human resources.

IPAC's faithful direct observational audits of hand hygiene compliance has served us well as actionable and temporal data aiding infection prevention and control efforts; but has suffered from inherent limitations in human resources alongside astute healthcare staff quickly invalidating 'covert' observer studies. Additionally, observational rates have perpetually been scrutinized for the oft-cited Hawthorne effect (of course), a known confounder and ammunition for critics of reported institutional rates. Integrating a robust and autonomous 24/7 hand hygiene monitoring program has the potential to quantify our expected gaps in institutional hand hygiene compliance and provide a data framework for illuminating insights and trends in hand hygiene behaviours we may not have considered.

On the future:

I firmly believe the future of Canadian healthcare will be driven by technology assisting and measuring the very human aspects of clinical medicine delivery. Passive and active surveillance automation will become a new standard for the contextual and directed evidence necessary to implement progressive practice changes. The whitepapers contained in this volume demonstrate how technology automation, principles of surveillance, and evidence-based implementation sciences can converge and support our practice. Contextualizing the implementation steps for industry products to assist infection prevention and control departments on this transformational journey is the basis of the *Industry Innovations* publication. I hope that our premier volume and future thematic issues will be useful to departments and facilities in consideration of the capabilities of industry partnerships to enhance our shared mission of infection prevention and control.

Some due gratitude:

- To the industry partners showcased in this publication for entrusting *Industry Innovations* to exhibit their innovative technologies supporting our shared goal of preventing and controlling infections.
- To publishing partners Craig Kelman and Associates, especially Al Whalen whose tireless coordination efforts and keen business sense brought this publication together.
- To IPAC Canada, especially Executive Director Gerry Hansen, the 2018/2019 Board of Directors, and former Editor-in-Chief of the *Canadian Journal of Infection Control* Chingiz Amirov for their support in bringing this publication to life.
- To my IPAC UHN team for their ceaseless support of my peripheral endeavors, with special thanks to my fellow ICP's Vish and Kelsey at Princess Margaret Cancer Centre for allowing me to abuse "editors are never on time" as an excuse for sleeping through my alarm.

Madison Moon, MPH, CIC
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Madison.Moon@uhn.ca
Follow *Industry Innovations* on twitter *@innovateIPAC*

ECOLAB®

Ecolab Hand Hygiene Compliance Monitoring System: Protecting Patients With Accuracy

ABSTRACT

Every year, millions of patients globally acquire a healthcare-associated infection (HAI).[1,2] In fact, 7% to 10% of all patients will acquire a HAI in a single year, and more than one million of those patients will die from their infections.[1,2] These infections could be greatly reduced if healthcare workers performed appropriate hand hygiene when interacting with patients. Leading health organizations have stated that hand hygiene is the simplest, most effective measure for preventing healthcare-associated infections, yet studies show that hand hygiene compliance levels are frequently below 50%.[3]

Ecolab has defined a patient monitoring space in which care is likely to be performed on a patient called a "Patient Zone." This is where the Ecolab Hand Hygiene Compliance Monitoring System monitors hand hygiene compliance levels, holding each healthcare worker accountable for their own compliance. Each person attains actionable feedback on how they can improve their compliance, allowing the hospital to deliver better patient outcomes.

This system monitors the Patient Zone: an invisible, electronically monitored area surrounding the patient's bed (or stretcher, crib, infusion chair, etc.) that detects every interaction and hand hygiene opportunity between an individual patient and healthcare worker. When fully implemented at a hospital, each bed is installed with a bed kit, creating zones around individual patients to detect if a healthcare worker washes or sanitizes their hands before and after patient contact. This ensures multi-bed patient rooms have compliance tracking enabled in individual Patient Zones within that room.

How the system works:

A caregiver is given a badge to wear above the waist. As they approach a Patient Zone, they wash or sanitize their hands using a monitored hand hygiene
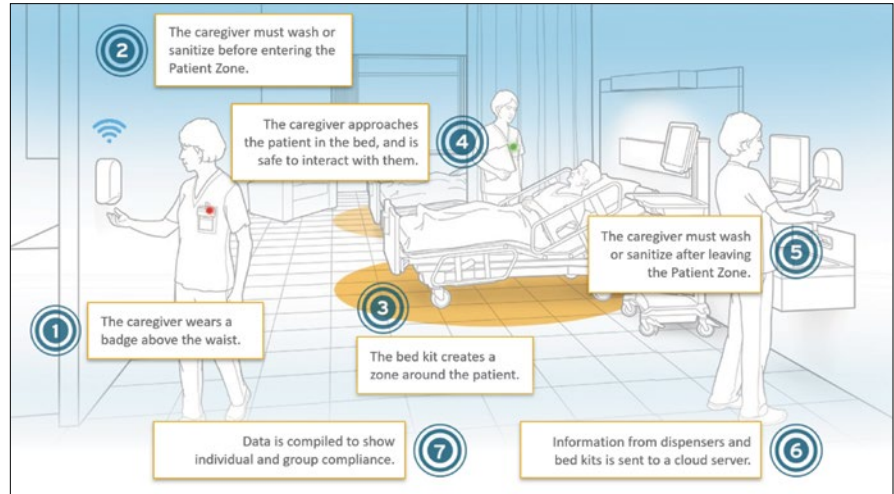

Figure 1 – Patient Zone

dispenser prior to patient contact, causing lights on the system badge they are wearing to turn green. Upon entering the Patient Zone, their badge light will remain green, as the bed device recognizes that hand hygiene has been performed and it is safe to make contact. When the healthcare worker is done interacting with this patient, they leave the zone and their badge turns yellow, reminding them to perform an "after patient contact" hand hygiene event before approaching another Patient Zone. Once they perform this hand hygiene event, the badge light turns green once again to confirm compliance. Should they forget to perform hand hygiene at this stage, the badge light turns red and the device can be programmed to emit an audible beep, serving as a further reminder to perform hand hygiene. This immediate feedback reminds individuals of hand hygiene opportunities in real-time.

The system collects numerous data points around these hand hygiene events from the in-room dispensers, bed devices and badges and delivers them through a wireless network to the cloud. The system does not utilize hospital infrastructure, private or public Wi-Fi and does not require

hardwiring. As a result, there is little to no hospital IT support needed. From the cloud, the information is compiled onto customizable digital dashboards that enable visibility, measurement and analysis of current practices, providing hospitals with reporting and allowing them to predict outcomes. This provides actionable insights at the system, hospital, unit or individual levels. Compliance trends are reported as well as equipment status, battery life, and sanitizer or soap levels. In addition, the system allows customization to the Patient Zone size, badge timers and feedback. All of these can be adjusted to best suit the specific needs of the hospital, allowing the Ecolab technology to fit within a healthcare worker's normal workflow.

The Compliance Monitoring System, a part of the complete Ecolab Hand Hygiene Program, helps hospitals monitor hand hygiene to encourage positive change. As hand hygiene compliance increases, healthcare-associated infections (HAIs) decrease.[4]

SPECIFICATIONS
System Overview
Each healthcare worker is assigned a badge with a unique identifier that is

specific to them and used across the Ecolab technology-enabled areas of a healthcare institution for reporting. This badge (which weighs less than 1 oz.) must then be worn by that employee and only that employee to ensure an individualized compliance metric. When the employee interacts with either a hand hygiene dispenser (with a dispenser beacon) or a bed (with a bed beacon) the badge uses radio waves to communicate with these components and record whether and when an employee performs hand hygiene, and whether and when they performed hand hygiene while interacting with a patient.

The Patient Zone is an invisible, electronically monitored area surrounding the patient that is created by specially designed bed beacons attached to beds, stretchers, cribs, chemo chairs, etc. This virtual zone can communicate with both the hand hygiene dispenser beacons and healthcare worker badges to determine all hand hygiene opportunities that are tracked by Ecolab technology in and around that zone. The badge that each healthcare worker wears communicates with the dispenser beacons to note when hand hygiene has occurred for a specific employee. The bed beacon communicates with the healthcare worker's badge when they enter the Patient Zone (signifying a hand hygiene opportunity) and can immediately identify whether that badge has recently communicated with a dispenser (signifying hand hygiene compliance). Each of these transmitted messages work with the other system components to receive acknowledgement and finalize the processing of the message – this holds true at each step through the entire system to ensure consistency in communication.

These interactions are transmitted through hubs located throughout the hospital, and then sent to a cloud server using a proprietary cellular network.
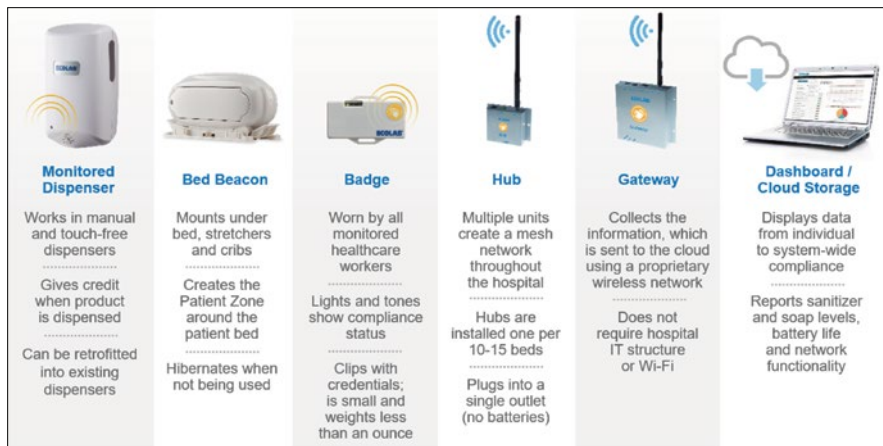

Figure 3 – System Components

This data is then processed and stored through the Microsoft Azure Cloud computing platform and can be accessed through Ecolab's digital dashboards and reporting functions or shared through emailed reports.

Product Specifications

The Ecolab Compliance Monitoring System is not tied to the hospital's IT network. It operates independently from any hospital infrastructure or system and requires little to no hospital IT involvement. Based on an independent wireless network, the system transmits hand hygiene and device status data from the various system devices through a series of hubs placed throughout the hospital. The only requirement for these hubs is a standard electrical outlet communicating at 433 MHz. Other components of this wireless network include a gateway panel, a cellular modem and a power strip. The gateway is installed in an area with good cellular signal strength and requires access to one standard electrical plug – all power requirements may require healthcare Facilities/Fire and Life Safety Departmental involvement. All wireless components within the system

are FCC and IC certified. More about each component is detailed in Figure 3.

Hospital IT Support Requirements

The Ecolab team coordinates and executes nearly all aspects of the Ecolab Hand Hygiene Compliance Monitoring System implementation at the hospital; however, hospital IT involvement is necessary for the following:

1. Ensuring the digital dashboard is accessible to those responsible for reviewing system data or those who administer or issue badges to employees. The dashboard is accessed through standard web browsers such as Internet Explorer or Google Chrome.
2. Allowing those who administer or issue badges to have access to a USB port on their computer in order to plug in the badge configuration POD.
3. Installing the badge configuration application on the computer of the person administering or issuing badges.

METRICS
Moments of Hand Hygiene
The Ecolab Hand Hygiene Compliance Monitoring System is designed to measure hand hygiene compliance at point of patient care. The algorithm of the system is centered around the entry and exit of a Patient Zone. Hospitals can receive customized data around every interaction with their patients. Data is collected around 2 moments of hand hygiene: before and after patient contact.

Accuracy
In an evaluation completed by an independent third party specializing in assessments of health technologies, the

Figure 2 – Little IT Involvement

Ecolab Hand Hygiene Compliance Monitoring System was given an "Excellent" score. Notable findings include:

- The Ecolab system captures manual and automatic dispenser hand hygiene events with a mean accuracy of 98.8%
- The system captures hand hygiene in a single-patient room with a mean accuracy of 94.7%
- The system captures hand hygiene opportunities in an open bay with a mean accuracy of 97.1%

Actionable Insights and Digital Dashboard

Customizable dashboards collect data to measure compliance and pinpoint precisely where. These actionable insights allow department managers, clinicians and other authorized users to lead process improvements in hand hygiene moments where they are needed most. Secure online access to real-time and historical data can be accessed from any standard web browser.

The dashboard home page displays compliance trends in several different ways, including active employees on shift with their individual compliance scores, a 7-day shift compliance comparison graph, a 7-day role compliance comparison chart, as well as missed hand hygiene opportunities overall over the past 7 days. An option to issue individual employee report cards is available, reflecting an individual compliance score at 7, 30, or 90-day intervals. Reporting is an integral part of this system and can be customized to meet each hospitals' specific needs, for example:

- Real-time data showing detail at the individual, role, unit and hospital level
- 7-day compliance comparison
- Day and night shift historical trends for the whole hospital, month over month
- Individual report cards emailed on a weekly or monthly basis
- Contact investigator reports for staff exposure risk
- Bed, stretcher and crib location information
- Isolation room-specific hand hygiene tracking and designation to ensure hospital protocol is followed (e.g. *C. difficile*)

In addition, a variety of reports may be programmed to automatically email designated mailing lists including

Figure 4 – Hand Hygiene Digital Dashboard

daily, weekly, monthly shift and facility compliance level reports, low badge battery or low device battery reports, and inactive employee reports.

PRACTICE CHANGES

The Ecolab Compliance Monitoring System is designed to work in sync with the hospital's daily operations and workflow, rendering interruption to frontline practice minimal so that staff can stay focused on providing care and ensuring patient safety. Aside from wearing a new badge, healthcare workers will continue to follow their facility's compliance guidelines as usual, but with the added opportunity to make improvements when and if a hand hygiene event is missed. Primary device components and software features include:

Bed Beacons

Bed beacons are sensors that attach to the underside of beds, stretchers, and cribs to create a Patient Zone which is especially useful for multi-patient or open bay configurations. Because beds can move throughout the facility, every bed and stretcher (or crib) is equipped with its own bed beacon. It is mounted under the frame of the bed as close to the center as possible and creates an invisible, electronically monitored area surrounding the patient.

The Badge

Each employee is assigned a badge with a unique identifier that is specific to them. This badge must be worn by that employee and only that employee to ensure an accurate compliance metric. The badge communicates with the monitored beds and dispensers to report hand hygiene status (whether the healthcare worker recently washed or sanitized). These communications between the Badge, Bed Kits and Dispensers are called "events." The badge includes:

1. RF emitter to communicate with RF receivers in monitored Ecolab dispensers and bed beacons.
2. Battery.
3. Three LED lights that convey the hand hygiene status of a healthcare worker (green, yellow, or red). LED brightness can be set to high, low, or off.
4. Audible tones for hand hygiene compliance alerts. Badge alert audio volume can be set to high, low or off.

The Monitored Soap and Sanitizer Dispensers

The monitored soap and sanitizer dispensers communicate with badges to report when healthcare workers wash or sanitize their hands. Monitored dispensers can be found in all patient rooms, hallways and nurses' stations and can be either hand soap or sanitizer, manual or touch-free. These monitored soap and sanitizer dispensers can be identified by a gold Wi-Fi symbol on the dispenser label. They also have an indicator light on the dispenser cover.
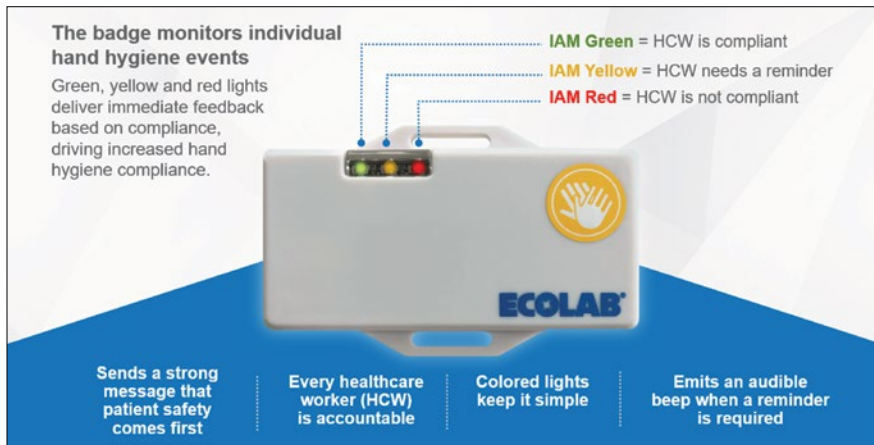
Figure 5 – Badge

Dashboard Reporting

The information from the dispensers and bed beacons is collected by hubs installed throughout the hospital. These hubs form a mesh network that channels the data to a single gateway using low frequency radio waves. Information is then sent out using a proprietary wireless network, stored on a cloud server and reported through the digital dashboard.

IMPLEMENTATION

Ecolab coordinates and executes all aspects of the system implementation at the hospital, from initial meetings to setup and installation, badge assignment to training and ongoing support. No matter the size or structure of the facility, hospitals will be supported by Ecolab at every step of implementation.

Ecolab provides all hardware associated with the system, including the badges needed for staff. There is no charge for extra badges, installation or maintenance such as battery changeouts.

The implementation process begins with an internal meeting at the hospital with key stakeholders to outline the implementation plan, set expectations and answer any questions from healthcare facility staff. Simultaneously, Ecolab staff will be conducting a walk-through site survey of the hospital including an assessment of where the gateway and hubs will be placed as well as the number of beds that need to be furnished with beacons.

During setup and installation, the implementation team will work to install the mesh network in the hospital. This will require little to no IT involvement from the hospital as the system does not require access to facility networks in order to gather hand hygiene events and opportunities. Ecolab will manage the dispenser changeout as well as the installation of dispenser beacons, bed beacons and metadata entry, which begins the process of populating the dashboard.

After the equipment is installed, Ecolab will complete a baseline compliance analysis to gauge the compliance of the hospital before the staff receives their badges. Next, Ecolab will come on-site for comprehensive badge training and distribution, armed with all the necessary resources to support implementation, dashboard reporting and perform any necessary troubleshooting.

COST ESTIMATE

Figure 6 shows what the Ecolab Hand Hygiene Compliance Monitoring System includes.

All technology, information, service and training are included in the $800/bed/month fee.

*This document does not represent an agreement or an offer. Only a final written contract, signed by both parties containing all terms of our relationship will represent our contract.

CONTACT INFORMATION

For more information on the Ecolab Hand Hygiene Program, please contact:
Website: *www.ecolab.com/ compliancemonitoring*
Call: 800.824.3027
Marketing: Stephen Crump
stephen.crump@ecolab.com

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4. World Health Organization Table: Key studies assessing the effect of hand hygiene interventions on MDROs' transmission and/or infection http://www.who.int/gpsc/5may/MDRO_literature-review.pdf ▪

Figure 6 – Program Components

Accurately measure compliance where it matters most.

At the patient.

The Ecolab® Hand Hygiene Compliance Monitoring System ensures that healthcare workers are washing or sanitizing before and after every patient interaction. **And we help ensure that protection for each and every patient.**

Learn more at www.ecolab.com/compliancemonitoring

ECOLAB®

Transform your Hand Hygiene Program with the PURELL SMARTLINK™ Activity Monitoring System

ABSTRACT

The brand that created PURELL® hand sanitizer now provides a complete solution with efficacious hand hygiene (HH) products, advanced monitoring technologies and clinical support designed to help improve patient safety. The PURELL SMARTLINK™ Activity Monitoring System (AMS) collects HH performance data 24/7 at the group level. This system is well-suited for healthcare facilities that prefer a team approach to improving HH with the entire group or unit accepting responsibility for HH performance.

In healthcare, the adoption of technology is rapidly replacing the manual gathering of data for more efficient and accurate measurement of quality of care. However, when it comes to gathering HH data, we still rely on direct observation (DO) as the gold standard.

The challenges of DO are indisputable. Only a small portion of HH opportunities that occur are captured. Published literature has shown that data gathered through DO yields less than 3% of all opportunities.[1] This implies that we cannot speak with certainty to the HH practices of healthcare providers (HCP) for about 97% of all opportunities – rendering the data generated from DO as statistically insignificant. Additionally, the results are skewed by the Hawthorne effect. One study found that HH compliance rates were threefold higher in hallways where a covert observer was visible.[2] The mere presence of even a covert observer can produce data that is inaccurate and misleading. Given the inherent challenges of DO, a rate of 95% would be best interpreted as: 95% of the time when there is an observer watching, HCP clean their hands.

The goal of any quality metric is to obtain reliable data to improve patient safety. Quality and safety leaders acknowledge that a gap exists between reported compliance rates and HH behaviors taking place and are questioning whether this gold standard is sufficient to manage risk in the wake of the growing burden of healthcare-associated infections. Over the past decade, healthcare facilities have been introduced to electronic monitoring systems (EMS) that have been designed to provide standardized collection of data across multiple units and facilities on a 24/7 basis.[1,3]

PURELL SMARTLINK™ AMS was developed to serve as a metric for capturing HH data and managing risk associated with HH behaviors. However, data alone is not enough to improve HH, and implementing an EMS without also initiating complementary interventions may not result in sustained behavior change.[4] An important part of the solution is to provide tools and support needed to build and sustain improvement. PURELL℠ Clinician-Based Support can assist customers in achieving the full potential of the system.

Performance improvement of any kind begins with having a valid number. PURELL SMARTLINK™ AMS provides data for managing risks associated with HH behaviors and can be a value-added tool in any multimodal strategy. This whitepaper will provide a review of the technology along with the implementation and improvement processes.

SPECIFICATIONS

The PURELL SMARTLINK™ AMS operates via radio frequency technology between the devices and the stand-alone network infrastructure. The system is comprised of five main components: touch-free dispensers (soap and sanitizer), activity counters, repeaters, network gateways and a secure web-based dashboard (Figure 1).

Soap and sanitizer dispensers that are designated to be a part of the monitoring system are internally equipped with an electronic communication module that contains a proprietary sensor transmitter. Each dispenser event is captured and wirelessly sent near-real time through the gateway to Microsoft Azure Cloud Services. Each dispenser is equipped with a blue LED light which is located on the front of the dispenser. Each time a dispenser is actuated, the light illuminates which serves as an indicator that the HH event has been captured by the system.

The activity counters are battery-powered devices equipped with passive infrared heat sensing technology and a built-in proprietary sensor transmitter. Each activity counter is placed inside a monitored room, usually near the entrance. When a person enters or exits the room, the movement is picked up by the infrared sensor, and the data are wirelessly sent via the transmitter through the gateway to Microsoft Azure.

Gateways and repeaters establish an independent self-contained network that have one-way communication between monitoring devices and the gateway, communicating across an ethernet connection. The network gateway requires an available outbound connection across the hospital network. Typically, one gateway is required per clinical unit (20 patient rooms) with a series of up to four repeaters per gateway. All network devices require line power (120VAC).

The gateway collects the device data (from dispensers and activity counters) and passes it along to Microsoft Azure through an outbound-only connection. Microsoft Azure provides a scalable global infrastructure which allows efficient collection and processing of HH data with secure encryption protocols. The data

transmitted is aggregated and processed within Microsoft Azure providing metrics that can be accessed through the PURELL SMARTLINK™ software.

The PURELL SMARTLINK™ software provides a secure, web-based platform which presents 24/7 near-real time data in actionable reports and visual displays for authorized users. Data can be formatted into customizable reports at the facility, unit, and room level.

PURELL SMARTLINK™ Service Alerts help simplify dispenser maintenance, reduce unnecessary service trips and product waste, and ensure HH products are always available for HCP. Service Alerts also provide on-line reports for all PURELL SMARTLINK™ AMS devices. The PURELL SMARTLINK™ software web portal allows users to customize alerts and alarms and include data on dispenser usage, estimated refill replacement dates and alarm status and history. This is a key benefit to direct environmental services and maintenance staff to only those dispensers that need attention. Additional support provided by the healthcare facility over time will include maintenance of devices that utilize batteries (dispensers and activity counters).

METRICS

PURELL SMARTLINK™ AMS aggregates data for feedback based on the activity of HCP and also non-HCP (patients, visitors and others). Dispenser use by any person is captured; similarly, entering or exiting a monitored room by any person is considered an opportunity for HH. Compliance rates are calculated by dividing the number of soap and sanitizer actuations (events) by the number of room entries and exits (opportunities).

Across Canada, the indications for HH can be simplified into four Moments: 1) before initial patient/patient environment contact, 2) before an aseptic procedure, 3) after body fluid exposure risk, and 4) after patient/patient environment contact. PURELL SMARTLINK™ AMS serves as a surrogate for Moments 1 and 4.

Boyce conducted a review of 28 studies that assessed the compliance rates for the WHO 5 Moments for Hand

Figure 1
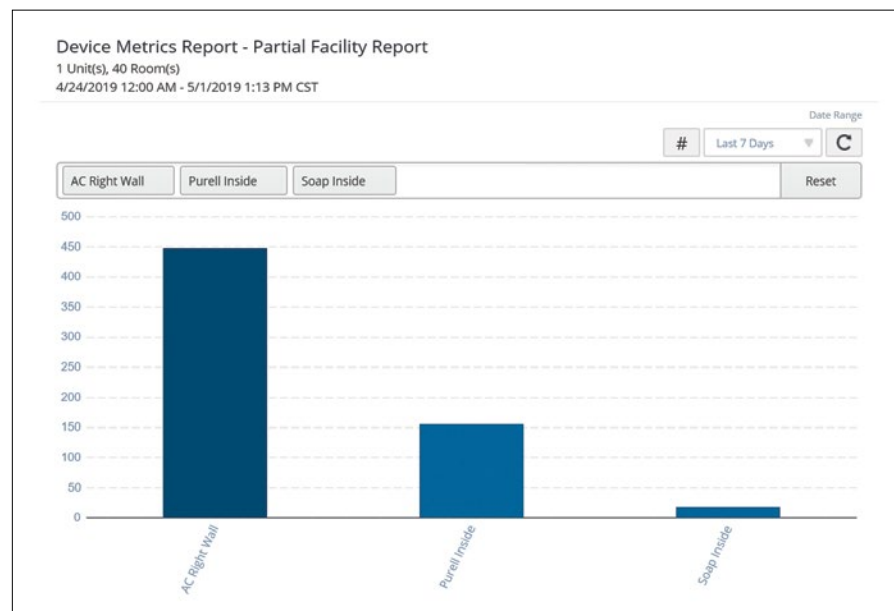
Figure 2

Hygiene: 1) before touching the patient, 2) before a clean/aseptic procedure, 3) after body fluid exposure risk, 4) after touching the patient, and 5) after touching the patient surroundings. The analysis revealed that Moments 1, 4 and 5 (Canada's Moments 1 and 4) accounted for 81.3% of all 5 Moments.[3] These data suggest that measuring room entry/exit captures the majority of the moments for HH.

PURELL SMARTLINK™ AMS is not meant to be a replacement for DO, but a complement to it. With the implementation of PURELL SMARTLINK™ AMS, DO will continue to be valuable as a qualitative measure to evaluate glove use and assess whether HH is performed with the recommended product (soap or sanitizer) at the right time using the

South Building
4 South
Room-Level Hand Hygiene Metrics Report

| Floors: 0 | Units: 1 | Rooms: 10 | Date Range: 04/14/2019 12:00 AM - 04/22/2019 12:00 AM EST |

| 7945 EVENTS | 16077 OPPORTUNITES | 49.4% PERFORMANCE |

Showing 11 results

Room	Δ	UNIT	EVENTS	OPPORTUNITIES	PERFORMANCE
4S01		4 South	1360	2147	63.3%
4S02		4 South	357	971	36.8%
4S03		4 South	677	1029	65.8%
4S04		4 South	416	613	67.9%
4S05		4 South	1013	1541	65.7%
4S06		4 South	808	2862	28.2%
4S07		4 South	1139	1929	59.0%
4S08		4 South	450	955	47.1%
4S09		4 South	991	1203	92.3%
4S10		4 South	734	2827	26.0%
TOTAL			7945	16077	49.4%

Figure 3

South Building
6 South
Hand Hygiene Performance Bar Graph Report

| Floors: 0 | Unit: 1 | Rooms: 28 | Date range: 04/14/2019 12:00 AM - 04/14/2019 11:59 PM EST |
Generated: 04/22/2019 4:24 EST

| 3889 EVENTS | 8627 OPPORTUNITIES | 45.1% PERFORMANCE |

Figure 4

correct technique.[3] DO also creates the opportunity to observe workflow and determine barriers to HH, provide real-time coaching and gather valuable insight from a frontline perspective.[3,5]
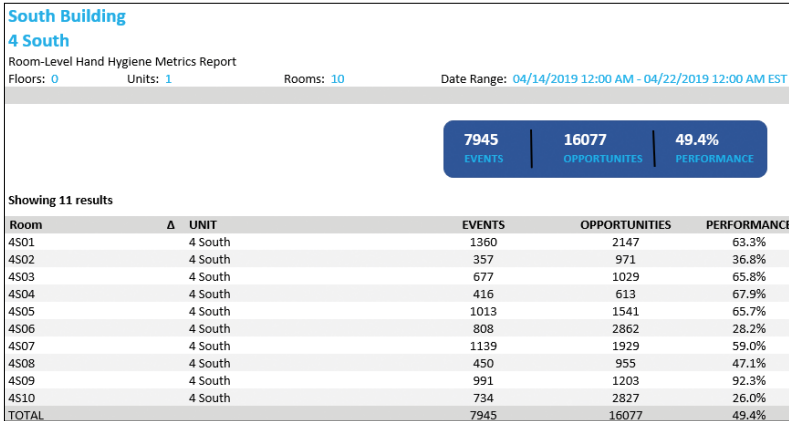
The PURELL SMARTLINK™ dashboard provides authorized users a portfolio of customizable reports, several are included in this publication. The Device Metrics Report (Figure 2) provides a view of room level device metrics (soap, sanitizer and activity counters). This report can provide valuable insight on soap usage inside patient rooms that have been flagged as Contact Precautions (e.g. Clostridioides difficile or Norovirus) requiring handwashing with soap and water prior to exiting.

The Room-level Metrics Report (Figure 3) can be customized to include all rooms or only select rooms. The information in this report includes the events and opportunities as well as compliance rate by room.

The Performance Bar Graph (Figure 4) is customizable by time periods and displays color-coded bars to allow for quick visualization of baseline and goal metrics along with compliance rates.

The software includes a slide show feature which allows for display of reports via feedback monitors. Many of the report options described may be included in the customized slide show. These reports are updated in near-real time providing feedback to HCP.

PRACTICE CHANGE
The implementation of PURELL SMARTLINK™ AMS will not require HCP to do anything different from their current practice. HCP will need to understand how the system captures and reports activity.

PURELL SMARTLINK™ AMS reports HH metrics at the group level, and the impact of opportunities generated from non-HCP (e.g., patients, visitors and others) may be overestimated, and it is important that HCP understand the impact that non-HCP have on the shared data. An observational study was performed to determine the percentage of patient room entries and exits that could be attributed to HCP and non-HCP. The data revealed that HCP were responsible for 83.6% of patient room entries and exits.[6]

IMPLEMENTATION
Project initiation begins with a conference call between the PURELL SMARTLINK™ project team and the facility project team. The purpose of the call is to create a shared understanding of the conditions of satisfaction for the project and to determine the degree of involvement, participation and support of the members on the PURELL SMARTLINK™ project team and on the facility project team. Key stakeholders on the facility project team include a project leader, infection prevention and/or quality professionals, a clinical leader from the involved nursing unit(s) along with representatives from information technology, environmental services and facility services. During this call, system operation and technology requirements are communicated. The Project Plan and timeline are also reviewed with emphasis placed on the alignment of the scope, objectives and important milestones.

Following acceptance of the Project Plan, a site survey is conducted at the facility beginning with a brief meeting including members from both project teams. A unit walkthrough is performed to allow for technology analysis and assessment. After the walkthrough is completed, the Project Plan is updated and reviewed with team members.

During the installation and validation phase, all system components are installed by the PURELL SMARTLINK™ Project Manager and qualified third-party installation team. System performance is validated per acceptance standards. During this phase, a Clinical Specialist on the PURELL SMARTLINK™ project team plays a key role with clinical leadership and frontline HCP.

Post installation, PURELL℠ Clinician-Based Support led by the Clinical Specialist is available as agreed upon within the statement of work to provide ongoing clinical engagement with the facility. This support can include a variety of value-added services which can assist the facility with achieving project objectives.

Technical support programming options are also available as agreed upon within the statement of work. Ongoing maintenance will vary with each customer depending on the level of technical support requested. Typical activities managed by the healthcare facility will include management of the dispensers, such as replacements due to breakage, replacing of batteries and verifying that network devices are maintaining line power and network connection. A combination of facility

> "One of the most **important advantages** of gathering HH data through **PURELL SMARTLINK™ AMS** is the ability to quickly identify units or time periods of **greatest risk**."

Figure 5

and vendor supplied support activities will be required to ensure continuous ongoing system health for reporting HH data.

NARRATIVE

Figure 5 illustrates how PURELL SMARTLINK™ AMS works post-implementation. All movement by any person in and out of patient rooms is captured by activity counters as well as all HH events (soap and sanitizer) from monitored dispensers. Data is then sent near-real time from the devices to the gateway and then to Microsoft Azure for processing. Once the system is up and running, it is important to ensure that HCP understand how the system collects data and provide HCP with an opportunity to ask questions, express concerns and address barriers to HH. Unit leadership may have responsibility for the HH project once PURELL SMARTLINK™ AMS is installed. Review and acceptance of baseline data is the starting point of the HH improvement process.
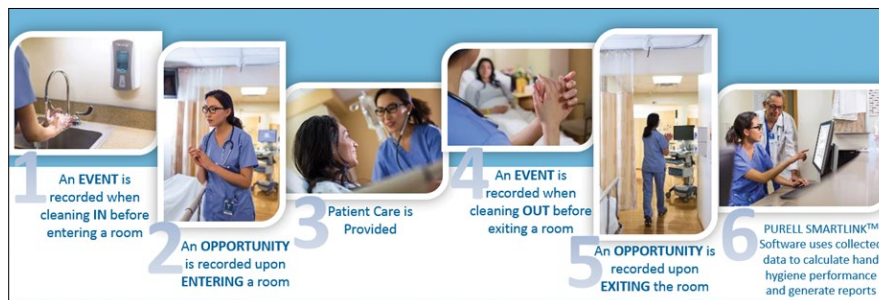
Authorized users can access the dashboard at any time for reporting purposes and sharing data with frontline HCP. The continuous 24/7 capture and sharing of data allows for frequent feedback. One of the most important advantages of gathering HH data through PURELL SMARTLINK™ AMS is the ability to quickly identify units or time periods of greatest risk (e.g., low compliance), allowing HH leadership to rapidly observe workflow and HH behaviors, provide education and HH reminders, and importantly seek input from HCP. Impact from interventions can be seen quickly in the data; as well, lack of effect can also be identified quickly allowing for correction of course. Additionally, HH leadership will have immediate access to robust HH data for examination and dissemination in response to infections caused by multidrug-resistant organisms and other organisms of epidemiological significance.

COST ESTIMATE

Pricing is customizable to meet the specific end-user needs and may vary per deployment (Table 1). Offers are typically budgeted as a higher year-one upfront capital purchase with lower recurring annual program agreement fees. Annualized payment structures are also available typically across a multi-year contract requirement. The primary focus areas for monitoring are typically in-patient rooms.

CONTACT INFORMATION

Company: GOJO Industries, Inc.
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e-mail: *SMARTLINK@GOJO.com*

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2. Srigley, JA, Furness CD, Baker GR, Gardam M. Quantification of the Hawthorne effect in hand hygiene compliance monitoring using an electronic monitoring system: a retrospective cohort study. BMJ Qual Saf 4014;23:974-80.
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Item	Description	Acute Care/LTC
1	**Program Package Includes:** Hardware/Installation Software Program Agreement Maintenance Plan	Customized per request
2	**OPTIONAL** **Clinician-Based Support** **Per Hour billing** based on approved statement of work with minimum of 24 hrs. Services provided according to the Guideline for Delivery of Clinician-Based Services	Customized per request

Table 1

Buddy Badge™

The Buddy Badge System can result in the immediate doubling of hand hygiene.

Clean hands help protect patients, staff and their families too!
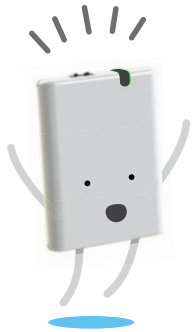
Smart prompts

Badges issue intelligent prompts to clean hands only when hand hygiene opportunities have been missed.
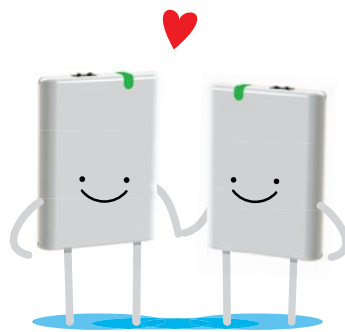
Safe patient care

The Buddy Badge System is a friend helping provide safe patient care. The system produces continuous estimates of individual patient exposure to risk of infection.
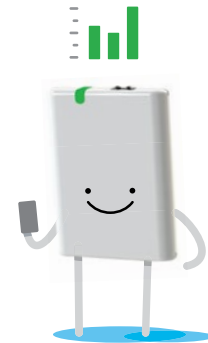
Instant reports

Individual and group reports along with dispenser actuation counts are instantly available on any mobile device. Staff can choose to be anonymous.

www.buddybadge.ca

The Buddy Badge System by Hygienic Echo

Geoff Fernie PhD, Pamela Holliday MSc, Majid Janidarmian PhD, Steven Pong PhD, Simon Rustin MSc, Amirhossein Shahshahani MSc

ABSTRACT

The Buddy Badge System stands out as an innovative solution to electronic monitoring of hand hygiene compliance in healthcare facilities as it effectively addresses two fundamental challenges in this area:

1. Proven technology to increase hand hygiene performance,[1] while being cost effective and scalable.
2. The technology is designed to empower and engage hospital care workers to increase and sustain adoption.

a) **The Technology: Instant prompting provided by the Buddy Badge can double hand hygiene.** The Buddy Badge provides an instant prompt that is felt only by the wearer on entry to or exit from a patient room or other monitored zone. The prompt is only provided when a hand hygiene opportunity has been missed. Clinical trials have shown that the real-time prompt to clean hands of 20 seconds duration is the most effective feature and wearing the badge can immediately almost double hand hygiene activity and causes hand hygiene to be performed sooner after entering the room.[1] Removal of the badge after 4 weeks of use has been shown to be followed by a decline to baseline activity over a period of 8 to 12 weeks. Reintroduction of the badge causes the hand hygiene rate to increase again.[2]

The system collects background data from all dispensers with Hygienic Echo's technology installed, recording the time and location of each use, whether they wear the Buddy Badge or not. This background data can provide information on the effectiveness of the Buddy Badge System as well as any other hospital hand hygiene promotion programs.

The Buddy Badge System uses no radio-frequency transmissions. All communications between the Buddy Badges and other components in the system use near infrared light. The use of invisible light avoids interactions that can occur with other electronic equipment and defines clear boundaries that are not affected by the presence of metal and do not penetrate walls.

The system is easily installed and scalable. The Buddy Badge System is battery-powered. No additional hospital staff time is required for installation or operation and there are no hidden costs. Healthcare institutions can install the system on one nursing unit and expand across multiple nursing units as desired.

b) **Customization, Empowerment and Engagement: Customized reports are instantly available anytime.** Users can view their performance on a personalized dashboard on their own mobile devices or on any computer. Users can make their identity anonymous or can display their name and photo.

Buddy Badge can display a coloured LED signal in rooms that have been designated by hospital infection prevention and control professionals to require special precautions.

Buddy Badge can be customized to specific protocols for different professions (e.g. environmental services personnel) and for different zones (e.g. common dining spaces in long term care facilities).

The Buddy Badge includes additional sensors that will enable increased capabilities to support staff in the future through a planned series of software updates.

SPECIFICATIONS

The Buddy Badge is lightweight (17gm) and includes a microcomputer that enables it to provide prompts to help the wearer not miss opportunities for hand hygiene. The Buddy Badge also collects background data on the actuation of dispensers by everyone whether wearing badges or not.

Users are automatically assigned a badge when they tap the charging station with their hospital ID card or a key fob given to them by Hygienic Echo. Extra blank ID cards are also provided for visitors and others without hospital ID cards. The Buddy Badge reminds wearers to clean their hands by vibrating discreetly if a boundary is crossed without performing hand hygiene. The Buddy Badge glows green when an alcohol-based hand rub or soap dispenser is used.

Zone boundaries are defined with high precision. The zone markers project 'curtains' of coded infrared light that are positioned in consultation with infection control staff to define the boundary of the patient environment. All of the zone markers and dispenser activation counters are battery-powered and easy to install.

When the Buddy Badge is returned to the charging station at the end of a shift it automatically uploads all of the collected data to privacy-protected cloud storage. Currently, 9 styles of reports are available to authorized users on their mobile devices. Each style of report allows the users to select different parameters such as date ranges, disciplines, locations, etc. on graphic menus.

We have published 19 peer-reviewed papers on technology to support hand hygiene. Those studies have shown us that the key to the success of this system is the instant prompting provided by the Buddy Badge.[1] We found that when a user misses a hand hygiene opportunity the reminder has to be immediate to be effective. These recent findings are in agreement with an earlier study where we conducted one trial with the prompt completely disabled and the badge was used only to record hand hygiene performance. There was no change observed in hand hygiene compliance without the use of the prompt.[5]

The Buddy Badge System captures all dispenser actuations by all users whether they are wearing the badge or not. This background data provides independent measures of the overall impact of the Buddy Badge System or any other hand hygiene intervention (e.g. a hand hygiene promotional campaign) on all users.

When staff log into their Buddy Badge account on their own phone or other mobile device they are offered the opportunity to participate anonymously or to display their name and photo on the Buddy Badge performance dashboard. Users can toggle between anonymity and being identified at any time. All users can see their own hand hygiene performance compared to the overall performance of their unit on their smart phones or laptops. Authorized managers can see hand hygiene performance at various levels such as specific nursing units, departments, and hospital sites. Data can also be grouped to show comparison between various professional disciplines such as physicians, nurses, environmental service workers, etc. Management can benefit from the insight provided by the detailed reports generated from Buddy Badge data as well as the changes in the background counts of dispenser use.

The Buddy Badge System requires one power outlet and an internet connection for the charging station on each nursing unit. The system works with any make of dispenser and the results and reports can be seen on any type of computer or mobile device. The system is customizable to any size and type of healthcare facility.

METRICS

The Buddy Badges automatically upload their data to the cloud when they are returned to the charging station. Reports are always instantly available.

The dashboard is customized for individual users and authorized managers at every level in the organization. For example, Figure 1 is a screenshot of a typical dashboard layout that is displayed when a nursing unit manager visits the web application on an iPad.

The 4 colour-coded blocks at the top of the screen display the aggregate performance on this nursing unit over the previous 30 days, the aggregate entry performance, the aggregate exit performance and the number of active badge users.

The graph below shows the performance of the viewer (nursing unit manager in this case) compared to the fluctuations of aggregate performance for the particular nursing unit. The horizontal timeline axis of the graph can be changed by selecting dates in the calendar tool. The colour-coded dials on the right display the user's aggregate performance for the selected date range versus the aggregate performance of the nursing unit.

Any user can customize their own dashboard. In this screenshot we see that the top three achievers on the unit are displayed. Note that one of the users has elected to be anonymous on their profile.

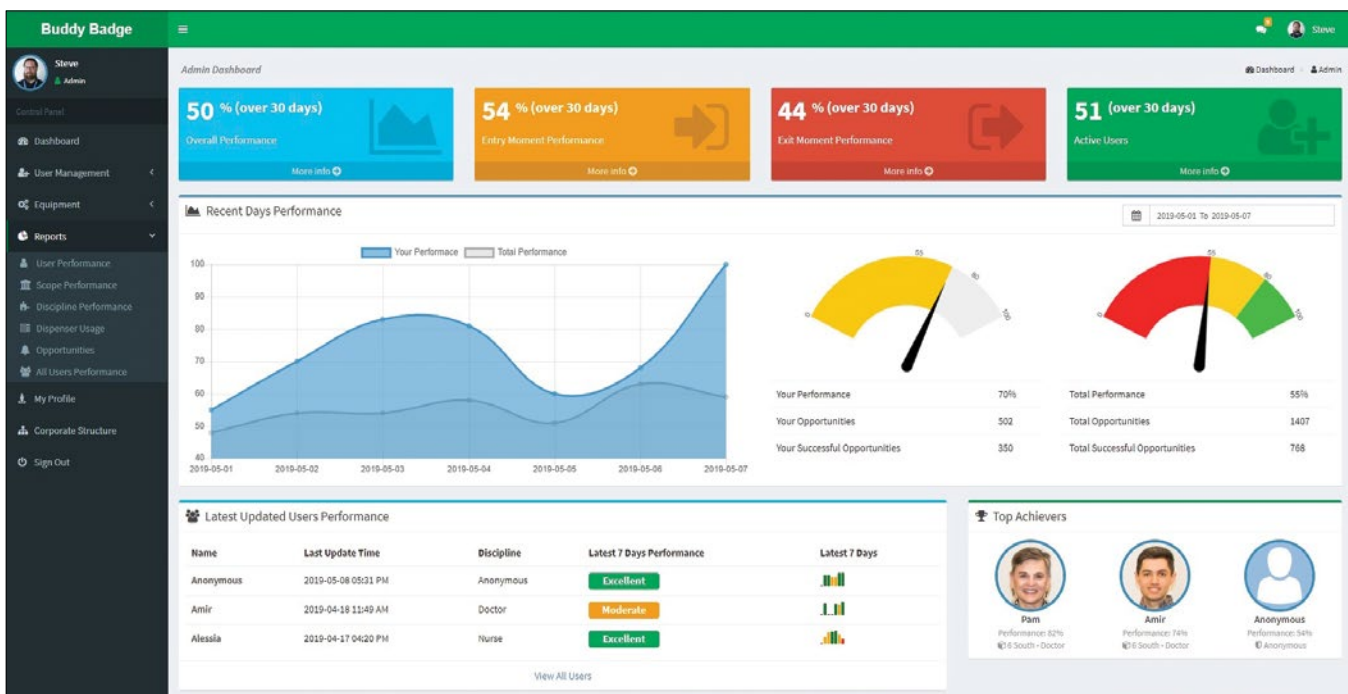A wide variety of reports can be generated and reviewed. Any group

Figure 1 – Buddy Badge dashboard as seen by a nursing unit manager

"**Hygienic Echo** can work with healthcare facility infection control professionals to **customize software** to accommodate **special protocols** for specific professional groups such as environmental services and others requiring different hand hygiene protocols to **minimize impact on their regular practice**."

of staff who have worn the Buddy Badges can be compared with any other group over any timeframe of use. For example, nurses could be compared with doctors or night shifts could be compared with day shifts. Any group of zones or dispensers can be compared with any other group. For example, performance on a surgical unit can be compared with performance on a rehabilitation unit. Comparisons can also be viewed of background dispenser counts in different areas of the hospital over different periods of time. For example, the counts of dispenser use can be compared before and after introduction of the Buddy Badge System, or to gauge the effectiveness of any hand hygiene campaign.

Data is available for all dispensers and all users over any time frame. Reports are easily generated on the web application. Specific reports can be configured, for example, to identify cases where consecutive hand hygiene opportunities were missed.

Time-stamped background count data is available for every dispenser. Therefore, accurate measures of changes in total background count are available. In addition, individual performance data is available for staff and visitors immediately after they have returned their Buddy Badge to the charging station.

At present, we do not provide a prompt specifically associated with Moments 2 and 3. In our studies, we have noted that Moment 3 is often coincident with Moment 4 and Moment 4 is often coincident with Moment 1 marking exit from one space and entry into the next space. The timing of the green LED accommodates these combinations since the badge glows green for 60 seconds following dispenser actuation and permits entry or exit from a zone without prompting during that time interval. We anticipate

that future software upgrades will include specific real-time estimates of Moments 2 and 3 performance based on current research using machine learning methods applied to additional signals available from the badge.

PRACTICE CHANGES

The only requirement is that the Buddy Badge has to be worn in order for the frontline staff to benefit from the instant hand hygiene opportunity prompting. Staff simply place their hospital ID card or key fob against the pad on the charging station and pick up the active Buddy Badge indicated by a flashing light. The Buddy Badge should be worn on the chest (not at waist level) so that it can communicate effectively with the zone markers on the ceiling. Similar to shared equipment at a gym, we encourage staff to wipe the Buddy Badge clean with disinfectant wipes before and after use.

Managers can remotely designate areas requiring special precautions. Hygienic Echo can work with healthcare facility infection control professionals to customize software to accommodate special protocols for specific professional groups such as environmental services and others requiring different hand hygiene protocols to minimize impact on their regular practice.

One major practice change is that wearing of the Buddy Badge produces an immediate increase in hand hygiene performance.[1] We have shown that if the Buddy Badge is withdrawn after 4 weeks of use then performance will drop back to the pre-badge level over a period of about 8 to 12 weeks. It is possible to alternate periods of wearing the Buddy Badge with respite periods if the background count is monitored and an acceptable decline in performance is defined as a threshold for re-introduction of the Buddy Badge.[2]

IMPLEMENTATION

Installation begins with Hygienic Echo meeting with nursing unit staff to explain how the Buddy Badge System works and to gather feedback on areas to be instrumented. We will engage staff at all levels. The engagement process will be transparent and inclusive.

A big part of our implementation and engagement model has to do with our philosophy of the Buddy Badge System being a true Buddy to the staff, their managers, and their patients. We emphasize the concept of working together, helping each other save lives. We also emphasize that staff control the release of their identified data by being able to self-identify as anonymous at any time using their own mobile device.

Once we have jointly determined where and when installation for the Buddy Badge System will take place within your hospital or long-term care facility, the installation is performed by Hygienic Echo staff. Each patient/resident room will be fitted with Buddy Badge zone markers and dispenser actuation counters.

Each user needs to be registered on the system and be given a username. Their hospital ID security card can be used for this purpose. If the organization does not use security cards then Hygienic Echo can supply key fobs without charge. Company staff will provide this registration service initially and hospital staff can be trained to easily add new staff at any time.

Training on how to use the Buddy Badge System will be provided initially by Hygienic Echo staff. The health care institution is encouraged to identify Buddy Badge Champions to be responsible for introducing new staff to the system and providing training in its use.

Hygienic Echo staff visit at regular intervals to maintain the system and support users. Most system inspection activities can be performed remotely.

Our Hygienic Echo team will always be available to help, and to answer all questions that care unit staff and managers have. Our goal is to work together with our hospitals to improve hand hygiene performance.

Nursing unit managers or infection prevention and control staff can designate specific patient rooms to require special precautions. These rooms can be designated on their computer or remotely on their mobile devices. The new high-risk information for specific rooms is automatically uploaded to Buddy Badges when they are checked out of the charging station. The Buddy Badges display red LEDs when in these designated rooms. These red indicators change to green only after hand hygiene has been performed and return to red until an exit opportunity is completed successfully. Nursing staff may also call our Hygienic Echo team to help with "designating" high-risk rooms to further simplify implementation.

No other support is required from the hospital staff.

NARRATIVE

When a Buddy Badge wearer enters a marked zone (in a hospital this is usually a patient room) the Buddy Badge checks to see if the user has performed hand hygiene within the last 60 seconds. If hand hygiene was performed then the Buddy Badge records a successful Moment 1 opportunity was complied with on entering the particular zone at the particular time. If hand hygiene had not been completed then the Buddy Badge vibrates for a period of 20 seconds or until an alcohol-based hand rub or soap dispenser is used. Feedback from staff during clinical trials led to the use of gentle vibration so that only the wearer can feel it and to avoid disturbing sleeping patients. If hand hygiene is performed within the prescribed time then the Buddy Badge glows green and records this event as a successful Moment 1 hand hygiene opportunity that followed prompting. If hand hygiene is not performed then the badge records this as a missed opportunity.

A similar sequence occurs on exiting the area. The prescribed time intervals of 60 seconds and 20 seconds have been selected following considerable experimentation during clinical trials and can be customized in the software to meet healthcare institution needs.

We conducted a study with a prototype of the current system.[1] This study included over 459,000 opportunities in 5 nursing units with 511 staff involved. Hand hygiene activity almost doubled immediately after the system was turned on and gradually returned to baseline when the prompt was removed.[2] The real-time prompting was also shown to cause caregivers to perform hand hygiene sooner after entry into a room.[1]

The Buddy Badge System offers many advantages and additional capabilities.[3] For example, the Buddy Badge System can monitor other areas such as exiting the dirty utility room. The dirty utility room is an example of a potentially important source of infection. We have also shown how the personalized continuous hand hygiene record produced by the Buddy Badge System allows chains of consecutive missed opportunities to be measured.

Staff have the opportunity to see how they have been performing in comparison to the aggregate performance of their colleagues in the same nursing unit on any computer or mobile device at work or at home. We published a study in 2008 which reported that staff would prefer to be anonymous at least for the first 2 months while they become familiar with the system.[4] In order to increase staff's ownership of their data and acceptance of the system, we have implemented that recommendation and taken it further by enabling staff to self-elect to be anonymous or to display their name and photo in any reports at any time. Fully flexible reports that respect anonymity where requested are instantly available to management and infection prevention and control staff anywhere.

The system is built on research, development, and testing conducted in Canada at the University Health Network (UHN) over 15 years and documented in 19 scientific peer-reviewed journal publications. Hygienic Echo Inc. has licensed the technology for manufacture and distribution worldwide. The Buddy Badge System is protected by patents and trademarks in Canada and internationally. Additional applications are pending.

COST ESTIMATE

There are no installation or equipment costs. Pricing ranges between $4 and $7 CDN per day per bed. The exact cost depends on local requirements. We will be pleased to work out the most cost-effective system configuration for your needs. Our pricing is in Canadian dollars.

There are no hidden costs of additional hospital staff to manage the system.

CONTACT INFO

Please contact *info@hygienicecho.com*.

REFERENCES

Studies referenced below were all completed prior to the decision to launch Hygienic Echo and make the technology available on the market. No funding for the research was obtained from industry and there was no collaboration with industry. Potential conflicts of interest were disclosed in recent publications when it became a possibility that some of the authors might receive royalties in the future according to institutional policies.

1. Pong S, Holliday P, Fernie G. Effect of electronic real-time prompting on hand hygiene behaviors in health care workers. Am J Infect Control 2018;46:768-774.
2. Pong S, Holliday P, Fernie G. Effect of intermittent deployment of an electronic monitoring system on hand hygiene behaviors in healthcare workers. Am J Infect Control 2019;47:376-380.
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5. Muller MP, Levchenko AI, Ing S, Pong SM, Fernie GR. Electronic monitoring of individual healthcare workers' hand hygiene event rate. Infection Control and Hospital Epidemiology 2014;35(9): 1189-1191. ■

FEATURE YOUR COMPANY IN THE LIGHTS!!!

The winter issue of *Industry Innovations* will feature the very important and topical subject of **UV Disinfection**. Your company can promote your products and services related to this key industry topic by including a white paper and/or advertisement within this issue. It is a credible way to explain to IPAC members how your company's product works and how it can help solve problems within the industry!

We will provide specific guidelines to follow and are here to help your company every step of the way. This is an opportunity you do not want to miss if **UV Disinfection** is your specialty!!!

Here are the rates:

ADVERTISING RATE	
Full Page	$1,500
Half Page	$1,000
White Paper only	$2,000
White Paper & Full Page	$3,400
White Paper & Half Page ad	$2,900

(White papers include up to 3 pages of content. Additional pages are $400 each)

Participation Deadline – September 13

White Paper Submission Deadline – September 27

Ad Material Deadline – November 1

INDUSTRY INNOVATIONS
Where Product Innovation Meets Best Practice
Volume 1, Number 2, Winter 2018

UV DISINFECTION

TOUCHLESS DISINFECTION
• Discover the hardware
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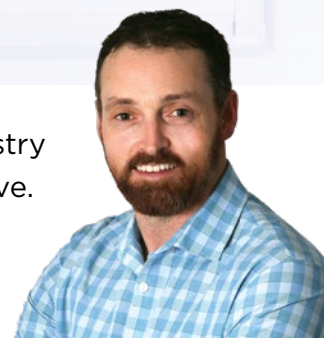
Contact me to be sure you are included in this important industry information or to answer any additional questions you may have.

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UV DISINFECTION
to be featured in the next *Industry Innovations*

Industry Innovations is now accepting whitepapers and case studies for volume 1:2 showcasing innovative technologies related to UV Disinfection!

Ultraviolet germicidal irradiation solutions in their various forms have withstood the test of time as an enticing possibility to enhance germicidal disinfection beyond manual cleaning in healthcare settings. In fact, demonstration of short-wavelength ultraviolet light causing the inactivation of microorganisms by destroying nucleic acids has been documented in scientific literature as early as 1878 – two years before Koch's germ theory of disease reached widespread acceptance in the medical field; and in the same decade as Lister's pioneering research in antiseptics (my apologies to readers who were able to avoid late-1800s epidemiological history until now). I can imagine it was not long afterward before someone considered the possibilities of UV disinfection to reduce transmission of microorganisms from surfaces in healthcare settings!

In the present millennium, adoption of commercial UV disinfection technology by Canadian healthcare facilities has been hesitant. Notable barriers to adoption include the perceived substantial coordination involved in implementation and upkeep of systems, and disappointment from cost-conscious decision makers expecting their investment in UV technology to reduce or replace manual cleaning. UV disinfection's slow entry into Canadian healthcare markets has not deterred the rapid maturation of UV disinfection technology's presence in clinical research studies over the last decade. Nor has it stemmed the recent influx of innovative UV technologies with diverse use cases entering the North American market.

The whitepaper guidelines for volume 1:2 have been drafted with the goal of illuminating the features, processes, and work burden of UV disinfection system implementation. I am excited to see for myself in the next batch of whitepapers how industry partnerships and UV disinfection technology can assist IPAC in ensuring facility sanitation practices are sufficient to combat the increasing resiliency of pathogenic contaminants and new nightmares like persistent contamination of Candida auris. It is time for those of us interested in enhancing our environmental microorganism controls to revisit this 141-year-old technology to marvel at its progress and critically assess its modern day potential in our operations.

Industry Innovations 1:2 UV Disinfection will be published in December 2019.

I would again like to thank everyone who took the time to open up *Industry Innovations* volume 1:1 and to our great industry partners for showcasing a sampling of industry partnership opportunities assisting automated surveillance of hand hygiene compliance. Inquiries, comments, and future suggestions to develop the *Industry Innovations* platform are welcomed by all.

Case studies and experiences related to UV disinfection technology integration submitted by IPAC Canada members are welcomed for inclusion in the winter issue of *Industry Innovations*. As well, **if you or your department have independently developed or collaboratively implemented any technology-enhanced solution to an infection prevention and control need in your facility,** *Industry Innovations* **wants to hear about it!** Please contact me with a brief overview and I will be happy to walk you through the various avenues in which IPAC Canada can showcase your work.

Whether embracing the outdoors this summer or catching brief glimpses of sunlight through an office/hospital window, I hope everyone enjoys their time before we enter what looks like a challenging incoming flu season.

Madison Moon MPH, CIC
Editor, *Industry Innovations*
Madison.Moon@uhn.ca

UV Disinfection submission guidelines

The role of the Editor, *Industry Innovations* is to ensure this publication is a high quality, structured, and comparative resource for Infection Prevention and Control Canada's (IPAC Canada) core membership. All submissions to *Industry Innovations* are subject to curatorial review. Relevance to IPAC Canada membership and integrity of claims will be assessed prior to approval or denial of publication partnership. For whitepapers accepted for publication, the editor will coordinate with the submitting industry partner prior to publication with applicable technical editing requests. The editor and publisher will ensure that the curation and publishing process of whitepapers and advertisements accepted for publication are managed transparently in consultation with authoring industry partners.

Preferred whitepapers for publication in *Industry Innovations* will refrain from subjective and unverifiable claims. They will use a mixture of industry voice, technical specification, and use-case logistics with significant attention to the immediate organizational impact of implementation. The numbered guideline sections below are sequentially ordered to provide a comparable reading flow throughout *Industry Innovations* volumes and must be adhered to during whitepaper development. The suggested word count is included for the whitepaper author's reference to ensure sufficient content is incorporated into each section without exceeding the suggested submission length of 4500 words.

General guidelines:
- Core Focus: *Industry Innovations'* guidelines are structured to provide a comparable summary of considerations to enable IPAC Canada readership to assess their organization's implementation readiness and the immediate use cases of an industry product

- Please refrain from comparing your product's solution to competing solutions
- Where clinical or industry research is referenced; ensure summary description of the research is included rather than generalizations
- For in-text citations, use parenthetical numbers (Vancouver style) and append references to end of whitepaper using the same order of numbers appearing in-text

Whitepaper guidelines:

1. Abstract – ~500 Words:
- What makes your product stand out as an innovative solution to UV disinfection in healthcare facilities?

2. Specifications – ~700 Words:
- Describe the integrated technologies in your solution to **UV Disinfection**
- Provide an overview of the type of ultraviolet light used in your UV Disinfection solution
- Provide an overview of technology features associated with your UV Disinfection Solution
  - If any automated sensor technology and/or manual calibration will be utilized to ensure appropriate coverage of UV disinfection, please explain the mechanism behind this feature
  - If any technology-enhanced solutions to known UV disinfection barriers are applicable to your product please describe the technology integrated into your product that contributes to mitigation of these known barriers (e.g., line-of-site exposure/shadowing, biofilms, healthcare facility cooling systems, etc…)
- Describe any additional technologies located at a healthcare facility that are used peripherally to your product's solution (e.g., on-site electrical power consumption and information technology requirements if applicable)

3. Metrics **–** ~600 Words:
- Describe relevant quantitative research on bioburden reduction and germicidal effectivity against common healthcare pathogens (e.g., MRSA, VRE, C. Difficile, Candida Auris) offered by your UV disinfection solution
- Describe the research methods and controls utilized to demonstrate effectivity
  - If a reduction in healthcare acquired infections has been

demonstrated through case study use of your UV disinfection solution, describe the healthcare setting/patient population in which the study was conducted
- Describe and explain the UV dose and contact time required for optimal UV disinfection in a typical use case of your UV disinfection solution
- Describe known barriers to optimal disinfection that may contribute to suboptimal disinfection results (e.g. line-of-site exposure/shadowing, biofilms)

4. Practice changes – ~600 Words:
- Please describe the frontline practice changes involved in implementing your company's solution (not the pathogen reduction of UV Disinfection described in the previous section).
- Is your UV disinfection solution fixed/integrated into the hospital infrastructure or mobile?
- Is the protocol for use of your UV disinfection technology episodic or continuous?
- If your UV disinfection solution provides episodic room-level disinfection capability, does the room need to be vacant while the UV disinfection occurs?
  - If yes, what is the turnover time including setup/takedown (if applicable) for room scale UV disinfection?
- What is the work and time allotment required to facilitate the UV disinfection process?
- Is there an occupational health risk of overexposure to UV radiation?
- Will environmental service workers be able to reduce their standard daily cleaning practices post-implementation of your company's UV disinfection solution while maintaining facility standards of disinfection?
- Please include a picture alongside a description of the format or user interface (if applicable) depicting how end users interact with the UV disinfection technology

5. Implementation – ~600 Words:
- Please describe the steps involved in implementation of your UV Disinfection solution.
- Which stakeholders are needed from a healthcare facility to facilitate implementation (e.g. Healthcare I.T.,

Facilities/Maintenance, Environmental Services, Infection Control, etc…)?
- What maintenance steps are required to ensure your UV disinfection technology is providing high quality environmental/product disinfection on an ongoing basis (e.g. lamp life)?
- Describe known facility/infrastructure barriers to optimal UV disinfection that may contribute to variable disinfection results and how a healthcare facility can facilitate installation of your UV disinfection solution to ensure the highest yield disinfection results
- What activities involved in initial implementation/ongoing maintenance of your UV disinfection solution will be managed by your company?
- What initial/ongoing maintenance steps of your UV disinfection solution will be managed by the healthcare facility?

6. Narrative – ~600 words:
- Please provide in narrative format the post-implementation use-case of your product including a description of the timing/process of UV Disinfection.
  - Please refrain from advisement of strategies for staff/patient management or specific chemical disinfection cleaning practices of environmental services (hospital specific policies); focus on the immediate use of your product and the steps that healthcare facility staff need to facilitate to ensure optimal disinfection

7. Cost estimate – ~300 words:
- Please outline your cost estimation process for facilities interested in implementing your UV Disinfection solution given typical needs in an acute care setting and a long-term care setting.

8. Contact info – Please provide detailed contact info (phone, email, webpage, etc.) to ensure interested readers are able to reach out for further information and estimates.

Booking Deadline: September 13
Whitepapers and Ads to be booked directly by Al Whalen, *Industry Innovations* Sales Manager
E: awhalen@kelman.ca | P: 866-985-9782

Submission Deadline: September 27
Send to Madison Moon,
Editor, *Industry Innovations*
E: *Madison.Moon@uhn.ca*

The DebMed Hand Hygiene Monitoring System

ABSTRACT

We Are the Pioneers of Electronic Hand Hygiene Compliance Monitoring

- In April 2008, DebMed, now known as SC Johnson Professional, began its journey to create a meaningful innovation in hand hygiene that would lead to enhanced patient safety and healthcare quality. Global, internally driven research in 2008-2009 (in the US, Canada, UK and Japan) along with key publications such as The Joint Commission's Monograph published in 2009 "Measuring Hand Hygiene Adherence – Overcoming the Challenges," revealed a substantial performance gap in the way hand hygiene, a key performance indicator for health care quality and patient safety, is measured.

- To fill this gap, in May 2009, DebMed began the design and development of an electronic hand hygiene compliance monitoring system based on the World Health Organization's (WHO) 5 Moments for Hand Hygiene. This began with designing the hardware needed to electronically measure hand hygiene events by counting the number of actuations, and a plan to create a 5 Moment denominator based on the World Health Organization (WHO) hand hygiene standards.

- Late 2009, Connie Steed, Director of Infection Prevention at the Greenville Health System (GHS) in Greenville, South Carolina, now known as Prisma Health-Upstate, prepared a team to move forward with what would become a landmark study, the HOW2 Benchmark Study, "Hand Hygiene Opportunities Where and When." The study was published in the February 2011 issue of American Journal of Infection Control (AJIC), and identified – for the first time – how many times staff SHOULD clean their hands based on the WHO 5 Moments for Hand Hygiene. This study served as evidence for the algorithmic denominator utilized in the DebMed System.[1]

- The study was then validated with a second landmark study, "The Video Validation Study,"[2] which discovered a statistical correlation between hand hygiene opportunities on inpatient units and the patient to nurse (healthcare worker) ratio across six variably sized acute care hospitals and 33 diverse inpatient units. This research was published in AJIC in June of 2014[2] and accepted for presentation at the Infection Prevention Society of the UK and International Conference on Prevention and Infection Control in Geneva in 2013.[3]

- An analysis of hand hygiene and MRSA data from 23 GHS inpatient units over a 33-month period found a statistically significant correlation between improvements in hand hygiene compliance (25.5 percent increase); and decrease in MRSA HAI infections (42 percent decrease). This resulted in an estimated $434,000 USD cost savings. This study was published in AJIC in August of 2016.[4]

- In Canada, Dr. Allison McGeer, Director of Infection Control, Mount Sinai Hospital, Toronto Ontario, led a team to co-author a paper, "Canadian Four Moments Versus the WHO Five Moments of Hand Hygiene – What is the Actual Difference?" This research demonstrated that the Canadian Four Moments for Hand Hygiene was associated with an average of 30.6 percent more opportunities than adherence to the WHO 5 Moments guidelines, and lead to an algorithm adaptation that enabled the DebMed System to calculate compliance based on the Canadian Four Moments for Hand Hygiene. This poster was presented at the Canadian Infection Prevention and Control (IPAC) Conference in June 2015.[5]

- Today, this evidence-based system, known as the DebMed Hand Hygiene Monitoring System (DebMed System) continues to provide actionable data and reports to hospital leadership and front-line staff in support of continuous performance improvement. To date, it remains the <u>FIRST</u> and only electronic hand hygiene monitoring system proven to measure, and report hand hygiene compliance based on WHO 5 Moments, Canadian Four Moments and the Centers for Disease Control and Prevention (CDC) guidelines.

SPECIFICATIONS

The DebMed System is a stand-alone system which does not require any integration with healthcare IT infrastructure or access to organizational WiFi. The system consists of four main components shown in Figure 1.

The SC Johnson Professional team installs monitoring equipment inside or adjacent to every soap and sanitizer dispenser in patient care areas, and a mesh network to capture and communicate hand hygiene events

"**DebMed** remains the **FIRST and only** electronic hand hygiene monitoring system proven to measure, and report hand hygiene compliance based on **WHO 5 Moments and Canadian Four Moments**."
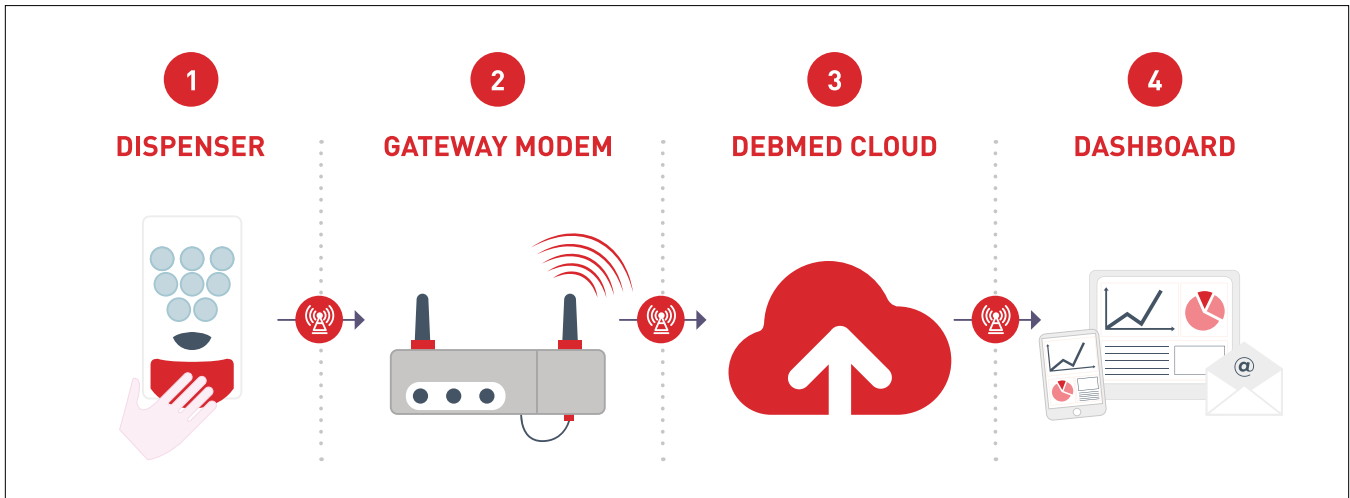
Figure 1

from the dispensers to the DebMed server. The monitoring enabled dispensers capture location and usage information and pass this on through a network of repeaters (hubs) wirelessly via radiofrequency transmissions. A built-in cellular transmitter uses a secured signal to transfer data to the offsite DebMed server. This standalone network frees up the hospital WIFI. This has been valuable to our customers because it eliminates a security threat that can be represented by third party systems operating on hospital networks. The large majority of the DebMed monitoring hardware is battery powered and maintained by SC Johnson Professional. The DebMed System's hubs and gateways require access to standard electrical outlets at healthcare facilities.

With this unique standalone system design, the DebMed System is capable of monitoring all soap and alcohol-based hand sanitizer (ABHR) dispensers from a variety of manufacturers and can accommodate hand hygiene product changes that may be required as part of GPO contracts.

To monitor non-SC Johnson Professional dispensers, DebMed utilizes motion sensor modules, programmed with brand and dispenser-specific algorithms. The motion sensors are securely mounted and held adjacent to a dispenser's unique activation zone. Simply put, these sensors detect actuations and register a hand hygiene event.

MONITORING AT THE POINT-OF-CARE

Figure 2

When paired with SC Johnson Professional's Point-of-Care Dispenser (POC) (Figure 2), the DebMed System is uniquely able to record hand hygiene events in the patient zone. The POC dispenser offers a variety of mounting options, including surface mounts and IV pole clamps, to enable hand hygiene within the patient care workflow and capture actuations in the patient zone. Much like SC Johnson Professional's wall mount dispensers, monitoring equipment is installed within the dispenser to discretely collect and transmit hand hygiene events.

The software component of the system is maintained by SC Johnson Professional with no onsite software or IT infrastructure integration. Unit specific information such as nurse to patient ratio and hourly occupancy, which are key components of the hand hygiene compliance calculation, are supplied by the hospital and pushed to the DebMed server via an automated daily feed. The HHCI calculation is explained in the Metrics section below.

Compliance reports can be accessed securely through an online client portal known as the DebMed Dashboard. All that is required to access the dashboard are user credentials and an internet connection. Alternatively, reports can be automatically emailed or "pushed" to the email account of authorized users on a schedule of their choice.

All communications between the DebMed Dashboard, hospital staff members, and system users are encrypted utilizing a secure socket layer (SSL). SSL is the standard security technology for establishing an encrypted link between a web server and a browser. This link ensures that all data passed between the web server and browsers remains private.

METRICS

The DebMed System software compares actual hand hygiene event data (actuation event data from the monitored dispensers) with an evidence-based estimation of total hand hygiene opportunities based on the Canadian 4 Moments or WHO 5 Moments for Hand Hygiene. These calculations are the "benchmark" used to determine a 4/5 Moment hand hygiene compliance index (HHCI). As detailed earlier in this whitepaper, the compliance calculation is derived from research-based algorithms and customized for the facility. The underlying studies for which were presented earlier in the white paper. Unit specific details
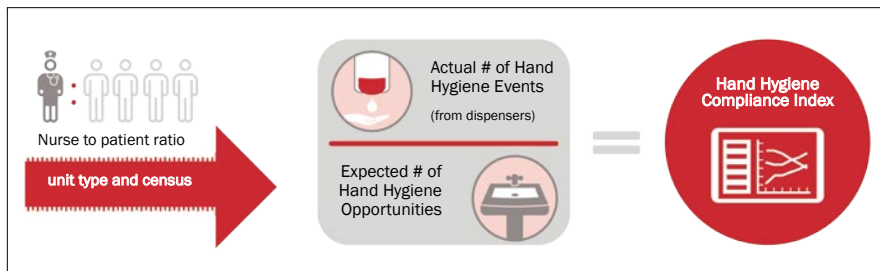
Figure 3

Figure 4

such as nurse-patient ratios and hourly unit census, provided by the healthcare facility, are key elements in the calculation of hand hygiene opportunities, which is the denominator in the HHCI equation (Figure 3).

Authorized staff members can access compliance reports via the Dashboard or subscribe to receive regular automated push reports, directly to their inbox. The Dashboard allows users to view hand hygiene data for a single room, unit or aggregate data for multiple floors, units, whole hospital, or health system. Standardized reporting features in the system include the most commonly requested reports, as well as ad hoc user-generated custom reports.

Ad Hoc Reporting:
The DebMed Dashboard (Figure 4) offers users the ability to define periods for hand hygiene compliance review, as well as the ability to set data points ranging from daily, weekly or monthly granularity.

Room Level Reports:
The Room Report enables monitoring of soap vs. sanitizer usage at the room level, supporting isolation protocol compliance. Robinson et al. produced a paper accepted for presentation at APIC 2014 demonstrating a reduction of C. difficile rates at GHS using group feedback from the DebMed System (APIC, 2014).[6]

Dashboard:
The intuitive DebMed Dashboard utilizes easy to interpret widgets that provide at-a-glance compliance data and greater perspective on facility compliance, all on a single screen. Each unit can set its own goal, and have it represented on HHCI graphs for all unit level report types mentioned above.

PRACTICE CHANGES
The DebMed System is a standalone, discrete monitoring system capable of capturing 100 percent of hand hygiene events without the need for badges and without impacting frontline practice, existing workflows or productivity. The system's design ensures that all members of the healthcare team are included in the data set and does not require that they perform any added tasks, beyond proper hand hygiene.

The DebMed System works in the background to give hospital stakeholders a clear and timely vision of normal hand hygiene behaviours during any time period in which compliance data was collected. Strategies for compliance improvement can be driven by continuously comparing detailed group performance data to generate collaboration among the healthcare team and support the development of a just culture.

IMPLEMENTATION
Our team of experts make implementing the DebMed System a simple and positive experience. Staff engagement begins on day one, when the SC Johnson Professional team meets with individual unit leaders to ensure hand hygiene product dispensers are properly located, and front-line staff understand how they are monitored. The installation process may include hanging of new dispensers with internal monitoring equipment or mounting monitoring hardware next to the existing dispensers (of any type, make and model) on the unit. The team then meets with the hospital teams, including IT, to obtain unit specific information such as nurse to patient ratio and to set up a one-time automated census feed, which the hospital provides. SC Johnson Professional ensures a first-in-class installation process that does not disrupt daily workflow or require unit closures. The typical installation for a 250-bed hospital can be completed by the SC Johnson Professional installation team in roughly one week.

Maintenance of the DebMed System hardware and software is performed by a team of SC Johnson Professional specialists and is included in the annual subscription fee. In some instances, hospitals may opt to have their facilities and maintenance teams involved in system maintenance, but these activities are managed by SC Johnson Professional in most cases. The SC Johnson Professional team includes dedicated account managers and customer support specialists who are available via phone and email, as well as a team of technicians who perform on-site and remote maintenance to ensure hardware components are communicating with the system as expected.

NARRATIVE
Following installation, SC Johnson Professional's DebMed System support team meets with healthcare facility inpatient unit staff and managers, infection prevention and control leadership, and quality management teams to provide training on the functionality of the system, reporting capabilities, navigation of the dashboard, and strategies to maximize staff engagement. The SC Johnson Professional team offers front-line staff training in the form of in-services to promote proper hand hygiene techniques and the Canadian 4 Moments or WHO 5 Moments guidelines. Live web-based training is also provided and highly recommend as new users come on board, roles

> **"Strategies for compliance improvement** can be driven by continuously comparing **detailed group performance data** to generate collaboration among the healthcare team and **support the development of a just culture."**

change, or refreshers are needed. Online resources are available to you from day one including, downloadable communication templates, huddle checklists, educational and reminder tools, step-by-step navigation guide and online tours within the DebMed Dashboard.

Here's a look at how workflow remains unchanged while data is collected by the DebMed System:

1. Healthcare Provider (HCP) uses the hand hygiene dispenser outside the entrance to a patient room, rubbing product on their hands while approaching the patient zone. (Moment 1 – Before initial patient/patient environment contact) – the DebMed System records this hand hygiene event.

2. The auxiliary staff member who was collecting the patient's meal tray leaves the room and cleans their hands upon exit (Moment 4 – After patient contact/patient environment contact) – the DebMed System records this hand hygiene event.

3. While in the patient zone, the HCP raises the head of the bed and helps the patient adjust their pillow. This patient is due for IV meds and before the nurse opens the venous access line, she uses the alcohol-based hand rub that is located on the overbed table and performs hand hygiene (Moment 2 – Before aseptic procedure) – the DebMed System records this hand hygiene event.

4. After administering the medication, the patient asks if they are voiding properly and the nurse holds up the Foley bag to reassure them. After touching the Foley bag the nurse performs hand hygiene using the dispenser on the wall by the foot of the bed (Moment 3 – After body fluid exposure risk) – the DebMed System records this hand hygiene event.

5. As the nurse is about to leave the room, the patient asks that she shut the bathroom door. The nurse shuts the door, and while leaving the room performs hand hygiene once again (Moment 4 – After patient contact/patient environment contact) – the DebMed System records this hand hygiene event.

This example workflow demonstrates how the DebMed System captures 100 percent of hand hygiene events performed in the patient zone and how all HCP's i.e. doctors, nurses, auxiliary staff are included in the data set.

COST ESTIMATE

Pricing is determined by:

- Overall installation size – number of beds to be monitored
- Use of SC Johnson Professional soap and sanitizer products, or competing products/type of dispensers to be monitored
- Contract length

CONTACT INFO

Contact SC Johnson Professional today to request a demonstration and learn how the DebMed Hand Hygiene Monitoring System will provide your facility with the insights you need to drive sustained hand hygiene culture change and improved patient safety.

Website: *www.debmed.ca* (Canada) or *www.debmed.com* (USA) or *www.debgroup.com* (AU, UK, EU) Canada: *healthcare.proCA@scj.com* USA + others: *marketing.healthcareUS@scj.com*

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Note: Studies referenced below were supported by Deb Worldwide Healthcare, Inc.

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5. Paul Alper BA, Allison McGeer MD FRCPC, Dawn Blackhurst DrPH, Sue Boeker RN BSN CIC, Christine Moore BSC (2015). Canadian Four Moments Versus the WHO Five Moments of Hand Hygiene – What is the Actual Difference? Paper presented at Infection Prevention and Control Canada (IPAC) Conference; June 2015; Victoria, Canada.

6. Robinson, N., Boeker, S., Steed, C., & Kelly, W. (2014). Innovative use of electronic hand hygiene monitoring to control a Clostridium difficile cluster on a hematopoietic stem cell transplant unit. Paper presented at the annual conference of the Association for Professionals in Infection Control. ∎

IMPLEMENTING ELECTRONIC HAND HYGIENE COMPLIANCE MONITORING

How Electronically Measuring Hand Hygiene has given St. Joseph's Robust and Actionable Data

Anne Bialachowski,
RN, BN. MS, CIC

St. Joseph's Healthcare Hamilton (SJHH) has been working on improving hand hygiene of its healthcare workers since 2008. Substantial progress was made throughout the hospital; however management recognized that it was hard to collect enough data in the Emergency Department (ED) because of its physical layout and dynamic workflows. The Manager of Infection Prevention and Control in the Outpatient Department, Anne Bialachowski RN, BN, MS, CIC has been at St. Joseph's Hamilton since 2010 and brings 20 years of infection prevention experience to her position. Anne teamed up with the ED Nurse Manager to champion a pilot to test the effectiveness of using the GOJO SMARTLINK™ Activity Monitoring System (AMS) as a solution.

The Hand Hygiene Problem

Along with her colleagues, Anne was tasked with the overall strategic goal of reducing infections throughout St. Joseph's hospital. Anne knew that hand hygiene plays a large part in reducing infections, especially in the ED where hand hygiene compliance rates were consistently lower than those of the rest of the hospital. When identifying methods of increasing hand hygiene compliance, Anne quickly recognized that their current method of direct observation wasn't enough to help her change behavior and improve hand hygiene within the ED. Prior to implementing SMARTLINK™ AMS, her staff was collecting only 60 hand hygiene observations in the ED per month, and she was not able to provide timely feedback on these observations. "We could not report out until we had a month's worth of data just to make sure we had enough observations to make the feedback valid. By then, it is too late to make an impact, which further justifies why direct observation should no longer be considered the gold standard for hand hygiene monitoring" said Anne.

St. Joseph's
Healthcare ⚡ Hamilton

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> "Not only is it having enough data, but it's also having real-time information to give feedback to the staff every day. We went from collecting 60 opportunities per month to over 300,000 that are visible immediately in the SMARTLINK™ Software."
>
> – Anne Bialachowski RN, BN. MS, CIC

Electronic Compliance Monitoring as a Solution

Once Anne and her team implemented AMS, it didn't take long to see that the system provided much more robust data than they could get with direct observation. AMS captured over 300,000 hand hygiene opportunities per month in the ED – a 5,000% increase in opportunity capture. The data was available immediately within the SMARTLINK Software, making it much easier to analyze and provide feedback to the staff. With hand hygiene rates ranging anywhere from 30% to 80% with direct observation, the overarching goal for the St. Joseph's ED was to improve on these rates by obtaining more data, and giving ED staff ongoing feedback in real-time.

Choosing to continue with SMARTLINK™ AMS was an easy decision, even in a time of budgetary cuts in the hospital. The attention to hand hygiene that the system provides helped to demonstrate St. Joseph's commitment to quality of care and patient safety. The public is becoming more aware of hand hygiene due to legislation and news coverage. "AMS has helped increase everyone's exposure to hand hygiene including patients and visitors," Anne said.

The Future

Anne and her team are forming a plan to install AMS in other areas of the hospital to help expand the culture they built in the ED to other medical units. They are also planning to make the data visible to the staff to provide immediate feedback on their hand hygiene performance.

"The most important thing to understand with electronic monitoring is that it is not the end all be all for increasing hand hygiene. The system can provide you with the data but you still need to work with the staff on changing their behaviors," Anne said. "It's the beginning to developing a culture focused on hand hygiene compliance and patient safety."

Anne's Advice for Infection Preventionists

- Engage leadership early on. Having a champion at the senior level can help you gain the support you need to move forward.
- Pilot systems using a positive deviant (i.e. a clinical unit with a strong hand hygiene culture and baseline compliance data). Test the system to see what outcomes you can drive.
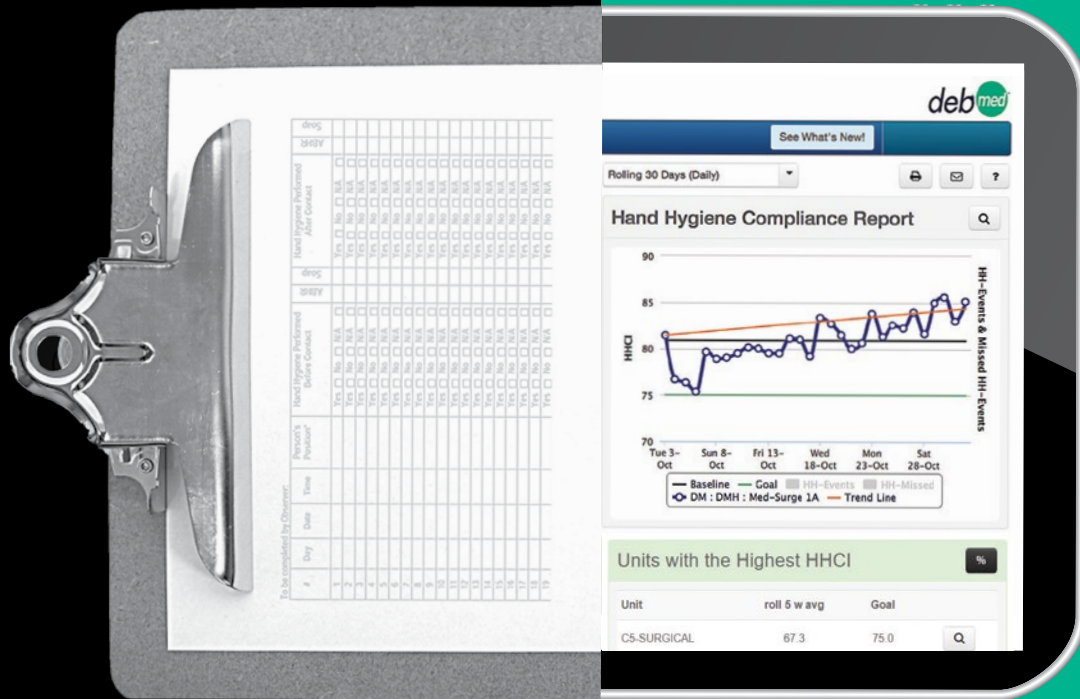- Be a leader. Be an early adopter. Demand better, more robust data.

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- Easy to install with no badges or complicated equipment

- Able to capture 100% of hand hygiene events, based on the 4 Moments for Hand Hygiene[3]

- Sustained performance improvement in as few as 90 days
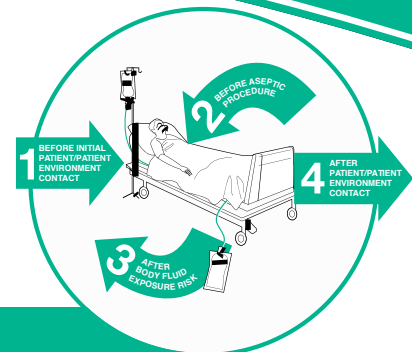
Request a demo today @ www.debmed.ca

Protecting the
PATIENT, CAREGIVER, AND THE HEALTHCARE ENVIRONMENT

[1]. Kelly J, Blackhurst D, McAtee W, Steed C. Electronic hand hygiene monitoring as a tool for reducing healthcare-associated methicillin-resistant Staphylococcus aureus infection. Am J Infect Control 2016;44:956-7. [2]. Robinson N, Boeker S, Steed C, Kelly W. Innovative use of electronic hand hygiene monitoring to control a clostridium difficile cluster on a hematopoietic stem cell tranplant unit. Poster presentation: Association of Professionals in Infection Control (APIC) Annual Conference; June 2014; Anaheim, CA. [3]. Alper P, McGeer A, Blackhurst D, Boeker S, Moore C. Canadian Four Moments Versus the WHO Five Moments of Hand Hygiene - What is the Actual Difference? IPAC Poster, 2015.