



Our Commitment to Patient Safety: Annual Data Insights

Executive Summary

Astonishingly, every year in the U.S., hospital-acquired infections (HAI) take nearly twice as many lives as fatal car crashes do. Yet these infections are avoidable. The Centers for Disease Control and Prevention (CDC) reports Americans suffer more than 700,000 HAI annually, and more than one in ten, 75,000 die during their hospitalizations.¹

In contrast, the Insurance Institute for Highway Safety recorded 35,000 driving deaths for 2015, down 31% from 51,000 in 1980.² Remarkable, new life-saving technologies made the most dramatic impact. Regulators have mandated everything from visible/audible safety belt reminders and smart airbags ³/₄ to antilock brakes and electronic stability control.

In healthcare, 100% commitment to proper hand hygiene guidelines is the best way to stem deadly HAI. Yet, the National Center for Biotechnology Information says global compliance is less than 50%.³ Its time for health care to achieve remarkable results. How do we break through and stop spreading infections?

BIOVIGIL Healthcare Systems, Inc., (BIOVIGIL) has a proven answer: user-friendly, hand hygiene technology that helps medical professionals, patients and families prevent the transfer of disease ³/₄ potentially sparing thousands of lives, vital resources and billions of dollars in healthcare costs every year by increasing hand hygiene compliance.

BIOVIGIL, headquartered in Ann Arbor, Michigan, is exclusively dedicated to developing effective and compelling hand hygiene technologies. Our electronic innovations are different because of unique patents within our solution for hand hygiene reminder and reassurance capabilities. BIOVIGIL's solution is easily deployed in any circumstance where monitoring and compliance to hand hygiene policies are essential to protecting, or improving patient and/or staff safety. Thousands of medical professionals use BIOVIGIL.

BIOVIGIL utilizes room sensors and small, electronic personnel badges to detect and monitor hand-washing events every time caregivers enter and exit patient rooms. It signals and reminds them to wash their hands. Compliance information is automatically communicated to base stations within the facility that securely forward data for compliance reporting. Illuminated "green hands" on badges tell patients and families their caregivers have just now washed with alcohol-based hygiene solution or soap and water.

"We're coming in to the 21st century with infection prevention, partnering with technology to help us be a global leader in children's health," said Amber R. Phipps, CIC Children's Hospital & Medical Center. "Parents often comment that with this system, this is one less thing they have to worry about."

In CY2016, the BIOVIGIL System collected data on tens of millions of hand hygiene opportunities at U.S hospitals. This revealing information has been aggregated and analyzed to provide some profound general insights into overall trends and behaviors related to hand hygiene across thousands of BIOVIGIL users. The results tell a powerful success story.

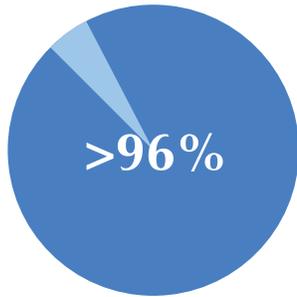
Sources:

1. <https://www.cdc.gov/hai/surveillance/>
2. <http://www.iihs.org/iihs/topics/t/general-statistics/fatalityfacts/overview-of-fatality-facts>
3. <http://www.ncbi.nlm.gov/books/MBK133371/>

“Since we initiated the program, our hand hygiene observations went from approximately 200 manual observations per month to over 170,000 actual opportunities,”

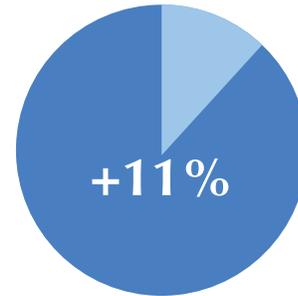
**BRENDA HEYBROCK, RN, CIC
CHILDREN’S HOSPITAL & MEDICAL CENTER
OMAHA, NEBRASKA.**

Overall BIOVIGIL Users Results Summary



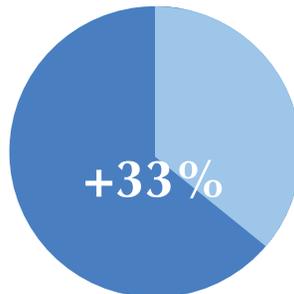
>96% sustained hand hygiene compliance rate based on entry/exit protocol.

[See Section 1: Summary of Overall Hand Hygiene Compliance Behavior.]



11% of patient zone entries where at least one (1) "extra" hand hygiene event is recorded. This activity is indicative of additional in-room hand hygiene opportunities (HHO) moments.

[See Section 2: In-Room Additional HHO Moments.]



+33% increase in hand hygiene activity attributable to the BIOVIGIL reminder function.

[See Section 3: Impact of Real-Time Reminder Function on Hygiene Behavior]

Please see the corresponding sections of this report for the details behind the summary of results.

The data presented in this report is not specific to any BIOVIGIL client. Aggregated data was used to create a benchmark performance profile representative of the median across all data sets.

Section 1: Overall Hand Hygiene Compliance

Background

Each time a BIOVIGIL user enters or exits an area that is being monitored for hand hygiene, the BIOVIGIL System analyzes a user's workflow pattern and hand hygiene history to determine the state of hand hygiene compliance.

Generally, each entry and subsequent exit from a patient area represents two (2) hand hygiene opportunities ("HHOs"). An entry/exit HHO is considered non-compliant if the user does not perform hand hygiene (or some other allowable action in accordance with the policy rules) within an allowable amount of time immediately before or after the entry/exit. The BIOVIGIL System delivers a real-time reminder to prompt users to perform hand hygiene, whenever they forget to do so. In this way, BIOVIGIL can help medical staff achieve and sustain high levels of hand hygiene compliance.

Analysis

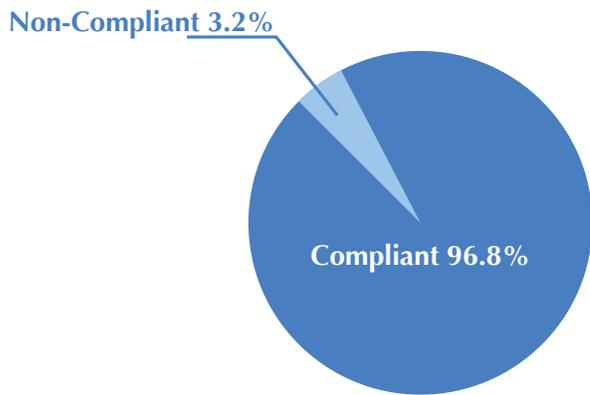
The Total Compliance Rate represents the percentage of all HHOs (unique entries plus exits) for which the user was determined to be compliant with the applicable hand hygiene policy rules while using the BIOVIGIL System. In order to be credited with a compliant HHO, a user must either perform hand hygiene within an allowable period of time immediately before or after the entry/exit or satisfy an applicable workflow allowance (for example, when permitted by the policy rules, the user can invoke an "exception button" on the BIOVIGIL badge to exempt the entry/exit event from a pending HHO. There are multiple common workflow scenarios where this is appropriate. Exceptions and other workflow allowances are tracked by the BIOVIGIL System and can be counted as compliant HHO's or disregarded from the compliance calculation).

Summary of Results

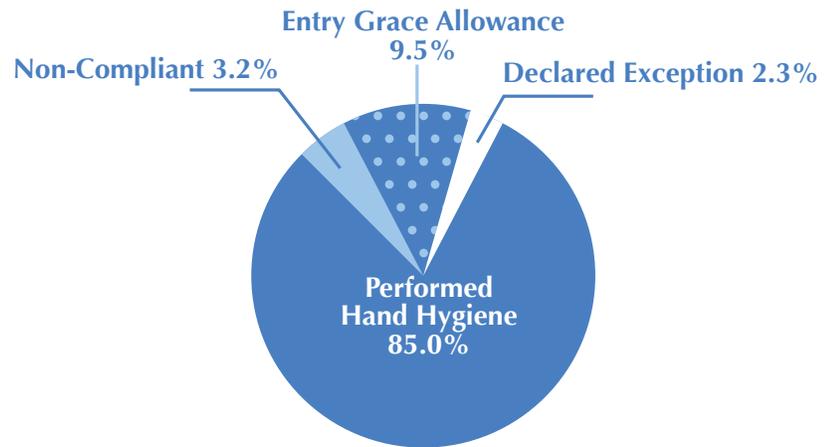
The median Total Compliance Rate across all data sets was 96.8%

Exit compliance was consistently higher than entry compliance by approximately 1%

Total Compliance Rate (median)



Compliance Resolutions



* Based on 21,628,079 HHO's from July - Dec 2016

Section 2: In-Room Hand Hygiene - Additional HHO Moments

Background

In accordance with accepted hand hygiene practices, there are other moments in the course of patient care where hand hygiene may be required in addition to the “gel in/gel out” opportunities (the additional “In-Room HHO Moments”). Although the BIOVIGIL System does not know when a user is about to perform an aseptic procedure or if they have contacted bodily fluids $\frac{3}{4}$ the System does record 100% of hand hygiene events occurring in the environment. Extra hand hygiene registrations occurring inside a patient room and not associated with the entry/exit requirement are considered to be associated with other HHO moments. The frequency of these extra hand hygiene events is another indicator of hand hygiene behavior.

Analysis

The In-Room Hand Hygiene Rate reflects the percentage of patient room entries where at least one additional hand hygiene event was registered in the patient area (an “extra” in-room hand hygiene event). These “extra” hand hygiene events are NOT attributed to the initial entry or exit hand hygiene requirement. For this analysis, room entries of less than two (2) minutes in duration were excluded from consideration and data were analyzed across ICUs/non-ICU inpatient rooms and day/night shifts to look for behavioral differences attributable to those factors. The analysis was also restricted to users with workflows consistent with primary care nursing (e.g. RN/PCA/PCT/etc.).

Summary of Results

For patient zone entries of between two (2) and five (5) minutes, the median In-Room Hand Hygiene Rate was approximately 5%, ranging from 1.2% to 10.8% across all data sets [Figure 2a]

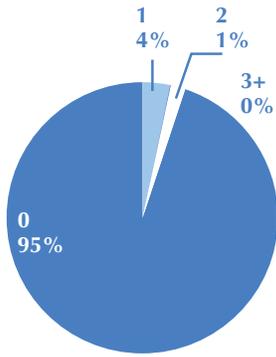
For in patient zone entries of greater than five (5) minutes, the median rate was approximately 11%, ranging from 1.6% to 18.2% [Figure 2b]

The probability of an extra in-room hand hygiene event increases with time spent in the patient room. This probability can vary significantly across different hospitals [Figure 2c]

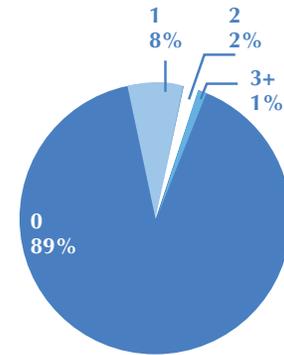
Across the collective data set, there was not a statistically significant difference in day vs. night in-room hand hygiene behavior (However, within some individual hospitals there was a statistically significant difference.)

Across the collective data set, there was not a statistically significant difference between ICU and non-ICU inpatient units (However, within some individual hospitals there was a statistically significant difference.)

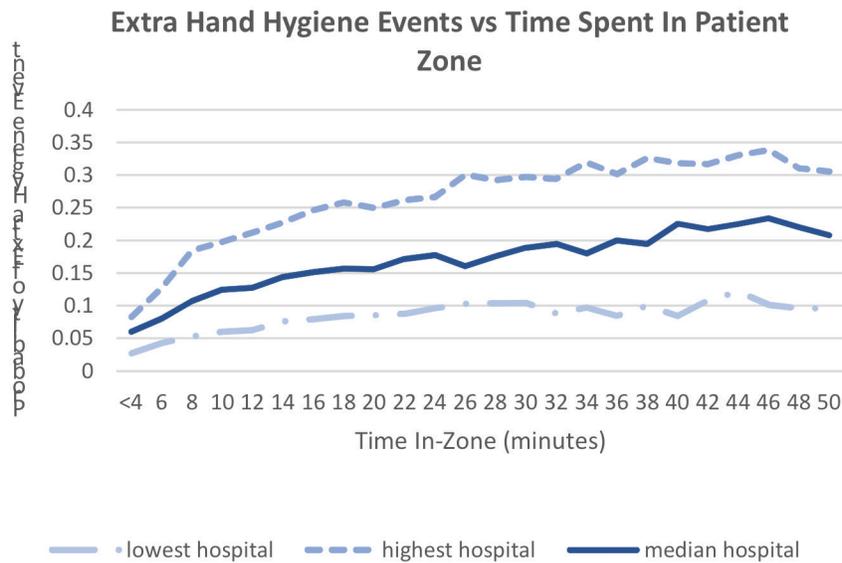
Median # of Extra Hand Hygiene Events for Entries with Time- between 2 & 5 min



Median # of Extra Hand Hygiene Events for Entries with Time-In-Zone > 5 min



FIGURES 2a & 2b: Median # of In-Room Hand Hygiene Events as % of Room Entries



FIGURES 2c: Probability of Extra In-Room Hand Hygiene vs. Time-in-Patient Zone

Section 3: Impact of BIOVIGIL Reminder Function on Hygiene Behavior

Background

A core function of the BIOVIGIL System is an active reminder that prompts a user to perform hand hygiene upon entry/exit from a controlled area if they have not already done so in accordance with the prevailing hand hygiene policy. It has been observed in multiple studies that an active, real-time reminder is imperative to attaining and sustaining high levels of hand hygiene compliance. Without the assistance of the reminder, hand hygiene compliance will decrease by 20-40%. The reminder also impacts the timeliness of performing hand hygiene.

Analysis

In a controlled experiment, the exit reminder was disabled for a three-week period during an initial implementation. After this initial baseline period, the reminder was enabled and configured to provide the first of three hygiene reminder alerts approximately two (2) seconds after the exit. The user behavior before and after the activation of the reminder sequence was compared to assess the impact of the reminder function on hand hygiene compliance.

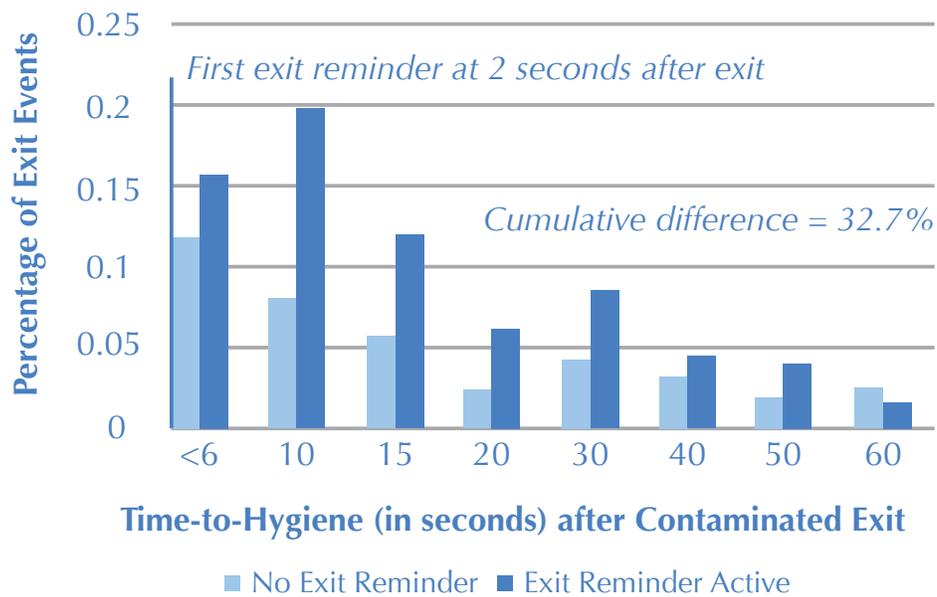
Summary of Results

Enabling the reminder sequence increased hand hygiene activity by 32.7%, with the biggest relative increase occurring shortly after the first reminder alert [Figure 3]

In the absence of an active reminder, the probability of a user performing hand hygiene upon exit drops significantly after the first 10-15 seconds post-exit

Impact of Active Reminder on Hygiene Behavior

Impact of Active Reminder on Hygiene Behavior
upon Exit from Patient Zone



Conclusion

Generating awareness of hand hygiene disease prevention among patients and family may be the sleeping giant in the war on infectious diseases. The “green hands” display on every BIOVIGIL badge enables patients to check and confirm hand hygiene of their caregivers. Doctors ask patients to adhere to drug therapies, diet, exercise and self-administered testing. Why not enthusiastically include them in creating an infection-fighting culture in your medical facilities? They deserve an active role on the team that’s committed to healing and saving lives. There’s much at stake.

Life-Saving Opportunities

The appropriate HHC technology can make a significant difference in patient safety. It can help infection control specialists and front-line caregivers tackle infectious diseases and minimize their potential spread. The standard of care must move more aggressively toward widespread implementation of automated HHC systems in order to reduce HAI risks, especially C. diff.

Fortunately, sharing data and lessons learned from BIOVIGIL’s real-world experience, is making a powerful difference. Improving awareness of the genuine benefits of hand hygiene in controlling the spread of infectious disease is accelerating the adoption of automated HHC systems within hospitals. Imagine adding an advanced, yet simple HHC infrastructure to your infection-fighting team culture ³/₄ and involving patients and families as well.

There’s no time to waste. Just as America has slashed highway fatalities, we can also reduce HAI deaths. The technology is now available to revolutionize hand hygiene in all medical treatment centers to help save more lives.

Biovigil has empowered our patients to have an interactive role in their safety while in our care. The “Glowing hand” provides them with the perfect opportunity to ask questions of the healthcare personnel, & to say “Stop” when someone approaches with a “Red” hand. We have found our patients are very appreciative of the opportunity to be engaged & to know “Shannon Cares about me!”

PEGGY CREEL, RN, CIC
INFECTION PREVENTION COORDINATOR
SHANNON MEDICAL CENTER