

PREVENTING THE SPREAD OF C.DIFF WITH AUTOMATED HAND HYGIENE SOLUTIONS

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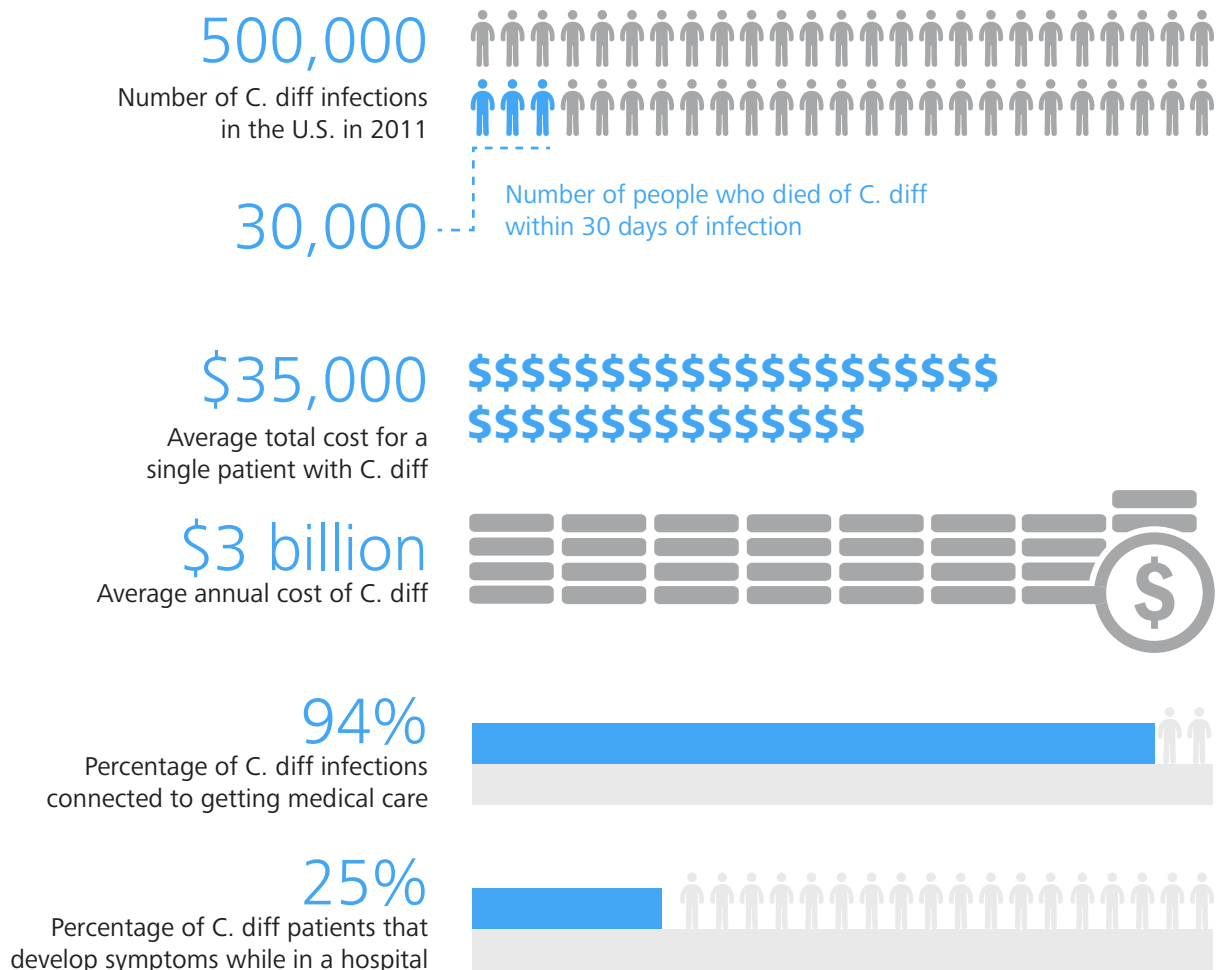
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Executive Summary

The increasing frequency and severity of *Clostridium difficile* (C. diff or CDI) infections in the United States is a public health crisis that costs tens of thousands of lives and billions of dollars.

This case study reviews how one Midwestern hospital used BioVigil's automated hand hygiene compliance (HHC) and awareness system to understand and quantify how C. diff is spread within a hospital and then to decrease transmission rates.

C. Diff Fast Facts



Introduction

Clostridium difficile (C. diff) infection is a public health crisis that is growing in frequency and severity. C. diff caused almost half a million infections in the United States in 2011, and nearly 30,000 people died within 30 days of the initial diagnosis. Research estimates that 94% of C. diff infections are connected to getting medical care, and 25% of patients develop symptoms while in a hospital, making health-care facilities a key battleground in the fight to control the spread of C. diff (source: Centers for Disease Control).

C. diff is not only dangerous for patients; it is expensive for hospitals. The Centers for Medicare and Medicaid Services (CMS) reduces payments and implements penalties when patients are readmitted to the hospital within 30 days or if their length of stay is extended due to a hospital-acquired condition like C. diff. Patients with C. diff are three times more likely to get readmitted to a hospital within 30 days, and their average stay is 4–6 days longer (source: American Journal for Infection Control). The average total cost for a single patient with C. diff is more than \$35,000, and the health-care system has an annual cost burden in excess of \$3 billion (source: MedPage Today).

It is widely accepted that one of several critical ways to control the spread of C. diff in hospitals is through proper hand hygiene, (specifically both the proper use of sanitizer and sink/soak events), and automated hand hygiene awareness and compliance (HHC) systems are proving to be an invaluable tool in the effort to track and prevent the spread of C. diff in hospitals.

BioVigil is an automated HHC awareness and compliance system being used in U.S. hospitals to help not only with improving overall hand hygiene awareness and compliance but also in monitoring high-risk patients (such as those with C. diff) and preventing cross-contamination. BioVigil has critical, proprietary features that enable

“Advanced technologies to monitor hand hygiene electronically may serve as a reminder to perform hand hygiene any time a provider enters the room. Electronic devices provide useful information on frequency, time, and location of its use, and also reveal trends in hand disinfection events over time...”

— APIC’s *Implementation Guide to Preventing Clostridium difficile Infections*

our unique ability to track C. diff and related compliance protocols, including the capability to measure different kinds of hygiene events (sanitizer vs. soap and water) and provide cross-contamination alerts to healthcare workers.

BioVigil has gathered data from multiple system implementations around the country and has repeatedly confirmed exceptional results. This particular case study shares how one Midwestern hospital (MW Hospital) used BIOVIGIL data to understand and control the spread of C. diff through:

- **Tracking usage of hand sanitizer vs. sink hand washing:** MW Hospital was able to record and report what type of hand hygiene occurs in Contact Plus protocol rooms. **Analyzing**
- **cross-contamination:** MW Hospital used BIOVIGIL data to analyze which specific health-care workers (by name, job title, or function) were potentially cross-contaminating and spreading C. diff. spores to other patient care areas and to develop a way to alert them in order to safeguard against such events.
- **Reminding staff to perform the proper type of hand hygiene:** MW Hospital tested the efficacy of a public and audible reminder functionality and found that compliance was significantly higher when the reminder function was enabled.

ROOM	LENGTH OF STAY	# OF ROOM EXITS	# OF USERS	% OF COMPLIANT EXITS (ACCOMPANIED BY SOAP AND WATER SINK WASH)	% OF NONCOMPLIANT EXITS (ACCOMPANIED BY USE OF ALCOHOL-BASED HAND SANITIZER)	% OF EXITS WHERE NO HAND HYGIENE OCCURRED
A2	10	215	18	90%	7%	3%
B1	2	14	5	58%	42%	0%
C1	5	14	5	58%	42%	0%
C2	20	282	57	48%	52%	0%
C3	4	30	15	65%	35%	0%
Average				64%	36%	1%

Note: Room numbers have been anonymized to protect private data from MW Hospital.

Track Usage of Sanitizer vs. Soap

C. diff Contact Plus protocols require health-care workers to perform hand hygiene using soap and warm water upon room exit since alcohol-based hand sanitizers do not effectively destroy C. diff spores. BIOVIGIL badges are able to differentiate a hand sanitizer event from a sink event using both chemical sniffing and proximity technology.

Using BioVigil System functionality, infection control specialists at MW hospital were able to determine how often health-care workers used soap and water versus hand sanitizer in rooms with C. diff patients. The following data is from February 2015 and reflects all the rooms in MW Hospital with C. diff patients. The data shows that on average, more than one-third of users (36%) were performing hand hygiene using sanitizer instead of soap and water, as C. diff protocols require. In room C2, 52% of room exits (146 exits) were accompanied by use of hand sanitizer instead of a soap and water wash. MW Hospital understood that this presented a significant cross-contamination risk.

After reviewing this data, MW Hospital then enabled BioVigil's proprietary C. diff integration capability. After the BioVigil C. diff integration, which involves special cross-contamination alerts, **MW Hospital saw the average number of noncompliant exits fall from 36% of room exits to 2% of room exits.**

For the small number of exits that were still noncompliant, MW Hospital was able to identify the names of specific health-care workers who were improperly sanitizing and give them extra education about the importance of using soap and water when exiting a room with a C. diff patient.

Analyzing and Improving Cross-Contamination Behavior

Even less optimal than using hand sanitizer instead of soap and water is failing to perform any hand hygiene at all. At MW Hospital in September 2014, C. diff was transmitted from a patient in room 1234 (who was admitted with C. diff) to room 1235, where the patient contracted C. diff during his or her hospital stay. The possible cause was cross-contamination between rooms.

ROOM	LENGTH OF STAY	# OF ROOM EXITS	# OF USERS	% OF COMPLIANT EXITS (ACCOMPANIED BY SOAP AND WATER SINK WASH)	% OF NONCOMPLIANT EXITS (ACCOMPANIED BY USE OF ALCOHOL-BASED HAND SANITIZER)	% OF EXITS WHERE NO HAND HYGIENE OCCURRED
A1	3	97	18	100%	0%	0%
B3	2	24	12	95%	5%	0%
B4	2	86	17	100%	0%	0%
B5	9	232	41	100%	0%	0%
D1	9	280	41	94%	6%	0%
Average				98%	2%	0%

Note: Room numbers have been anonymized to protect private data from MW Hospital.

BioVigil data showed MW Hospital how many health-care workers had left room 1234 and gone to room 1235 without observing proper hand hygiene protocols. In this way, it becomes possible to track the spread of C. diff in a hospital, a revolutionary capability that could change the way hospital-acquired infections (HAI's) are understood, spread, and controlled.

BioVigil data identified a total of 30 cross-contaminated room entries among nine individual badged users. These data support additional training and educational measures to improve patient safety.

Reminders to Perform Hand Hygiene

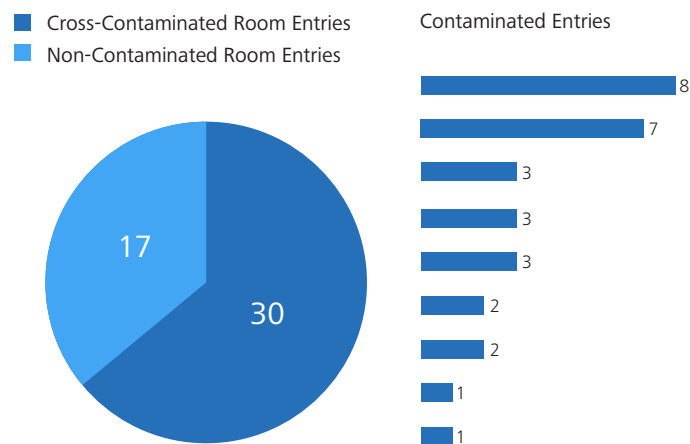
BioVigil data shows that users are less likely to perform hand hygiene when the reminder function is not active.

In one case, compliance behavior rates were observed to immediately drop from 97% to 63.7% when the reminder function was turned off.

MW Hospital used BioVigil data to analyze user behavior in a C. diff room. In this trial, users were NOT specifically prompted for a sink hygiene event upon exit from a C. diff room but were still prompted to perform hand hygiene. Over the course of three days, 26 health-care workers

Potential C. Diff Cross-Contamination from Room 1234 to Room 1235

9/16-9/19 (30 Cross-Contaminated Entries)



NOTE: User exited Room 1234 and entered Room 1235 within 4 hours.

exited the room 178 times but performed a sink hygiene event only on 28% of those occasions. On 32% of exits, the health-care workers used hand sanitizer, and on 2% of exits, they performed no hand hygiene.

These data further highlight the importance of reminders to drive consistent HHC behavior, especially when dealing with vulnerable or at-risk patients.

Conclusion

C. diff presents a significant risk to patient safety and increases the cost of care. The right HHC technology can significantly help both infection control specialists and front-line caregivers tackle the problem and minimize the potential spread of C-diff. The standard of care must move more aggressively toward widespread implementation of automated hand hygiene compliance and awareness systems in order to to reduce HAI risks, especially C. diff. Data like those shared here along with better visibility into how hand hygiene can control the spread of infection is accelerating the adoption process of automated HHC systems within hospitals.

“Preventing CDI transmission and infection continues to represent a serious and difficult challenge in infection prevention and patient safety.”

— APIC’s *Implementation Guide to Preventing Clostridium difficile Infections*

“If nothing is done to try and curb CDI rates, healthcare systems may stand to face financial penalties because of high rates of hospital-acquired CDI and CDI-related readmissions for CMS-reportable conditions.”

—Teena Chopra, M.D., Detroit Medical Center, author of a study published in the *American Journal for Infection Control* on the increase in readmissions and lengths of stay.



BioVigil is the market leader in hand hygiene solutions. Headquartered in Ann Arbor, MI, BioVigil's patented technology enables hospitals to sustain 97% hand hygiene compliance and reduce Healthcare Acquired Infections with a gentle reminder system that increases patient engagement. At the center of the solution is BioVigil's Data Suite which delivers actionable insights for hospitals to optimize workflow. These insights are available on demand or in easy to understand reports.

More information at

www.biovigil.com



Appendix A:

How BIOVIGIL Works

There are four core system functions (the four R's) that every HHC system should have: the ability to **Record** data, **Report** it, **Remind** health-care workers to sanitize hands, and **Reassure** patients and their family members that proper hand hygiene has been observed. For more on the four R's, download a free white paper at www.biovigilsystems.com/white-papers.

The BioVigil system incorporates each of these four core functions, and the **Reminder** and **Reassurance** functions, in particular, have the potential to transform the culture and behaviors associated with HHC. In turn, these functions will reduce risk, lower infection rates, increase patient satisfaction, and raise compliance rates to over 97%.

The BioVigil **Reminder** function analyzes the workflow pattern of health-care workers as they move to and from patient care areas. BioVigil evaluates this pattern against the user's recent hygiene event history and the unit manager's policy settings to determine if a new hygiene event is warranted. If the user has not already performed hand hygiene, the BioVigil badge will provide an audible reminder to the worker to prompt a hygiene event. In this manner, BioVigil can intervene at the point of care to promote good hand hygiene practices when they matter most. This point-of-care reminder function is necessary to maintain high compliance rates in a busy environment.

The BioVigil **Reassurance** function provides patient awareness regarding the state of a user's attention to hand hygiene protocol. A green badge reassures the patient that a care provider has recently performed hand hygiene.

Additionally, BioVigil provides a mobile validation platform to register hand hygiene events without the need to visit an instrumented dispenser. An on-board chemical sensor detects the presence of alcohol to establish that a care provider has recently sanitized his or her hands.

How it Works

The BioVigil system addresses the **four R's** with the following system functions:

- **Care providers wear** a BIOVIGIL badge, each with personal user identification.
- **The badge detects** when a user moves to and from a patient care area by interacting with BIOVIGIL room sensors. These battery-operated devices are easily installed on the ceiling without the need for special installation wiring or networking.
- **After entering or exiting** a room, if necessary, the badge, via an audible tone, will prompt the user to perform hand hygiene. Additionally, the badge will display a yellow or red light to indicate that attention to hand hygiene is warranted.
- **Validating a hand hygiene** event with the badge will turn the hand symbol on the badge green. After applying hand sanitizer, a care provider presents his or her hands to the badge to register the presence of alcohol, which generally takes about one second. Alternatively, the proximity and time relative to a sink can also be used to register sink and soap hand washing hygiene events. **Data is stored** on the badge. At the end of a shift when the badge is returned to the BioVigil base station, data is sent to the cloud-based BioVigil data applications where it is then available for reporting and analytics.

In this manner, a rich data set is automatically collected regarding workflow patterns and hand hygiene activity. The BioVigil system does not require any IT system or server integration; an Internet connection for each BioVigil base station is all that is necessary.