

CLABSI A STUDY WITH 3,707 NURSES

A 29% drop in CLABSI in 23 Hospitals over 2 years

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Central venous catheters (CVCs) are used for the administration of intravenous fluids, blood products, medications, and parenteral nutrition. They also provide access for hemodialysis and other forms of long-term treatment, such as chemotherapy.

Widespread and essential, CVCs are also a frequent cause of healthcare-associated bloodstream infections. It is estimated that 250,000 cases of central line-associated bloodstream infections (CLABSIs) occur in the U.S.

Every year, 33,000 Americans die from a Central Line Infection.

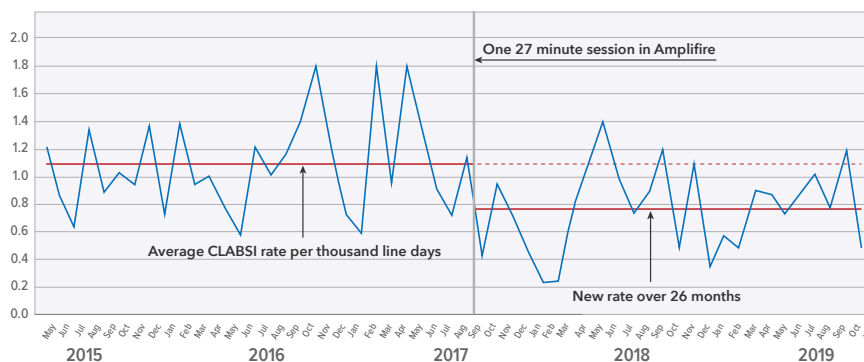
every year. According to the CDC, CLABSIs are associated with a mortality rate of 12-25%. Each CLABSI episode costs approximately \$22,000, which includes the burdens of additional diagnosis and

treatment, and prolonged hospital stays.

CLABSI rates can be reduced by adherence to evidence-based protocols. National CLABSI rates dropped between 2008 and 2016. So why does CLABSI still happen? A major US health system employed the Amplifire training tool across 23 hospitals to acquire data on what its nurses know and don't know about these protocols for managing CVCs, and to find and fix any misinformation the nurses might have held.

As seen below, the results show a 29% drop in CLABSI rates over 26 months when compared with the prior three years.

29% Reduction in Central Line Infections (3,707 nurses trained)



CLABSI Findings and Takeaways

CLABSI Crisis

- 250,000 CLABSIs every year
- CLABSIs are associated with a mortality rate of 12-25%
- Each CLABSI episode costs approximately \$22,000

The Puzzle

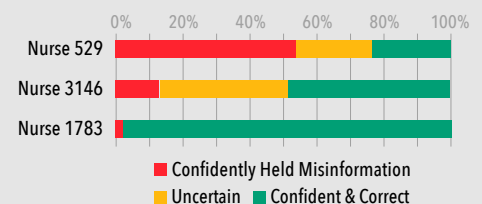
- CLABSIs can be reduced, if not eliminated, by understanding of and adherence to evidence-based guidelines.
- So why aren't national CLABSI rates at 0%?

The Study

- Major US health system, 23 hospitals
- 3,707 participating nurses
- Based on Amplifire, an advanced learning tool that finds and fixes the misinformation that impacts performance

The Results

- 25,129 instances of confidently held misinformation—believed correct, but actually inaccurate
- 29,838 instances of doubt or uncertainty
- Analytic reports identified productive interventions for nurse supervisors and managers
- High starting variance among nurses as seen below



- 29% drop in the CLABSI rate over two years

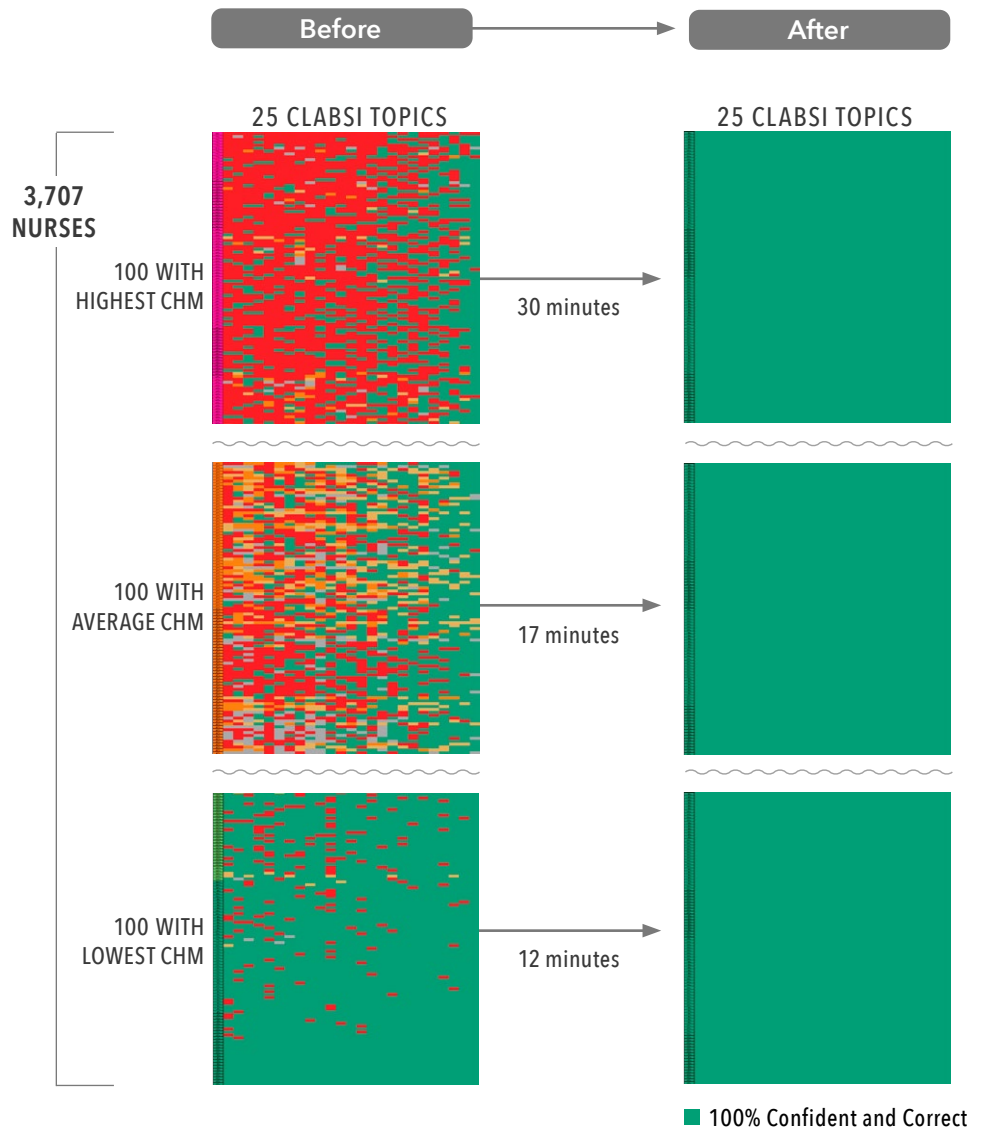
Finding and Fixing the CHM that Affects Performance

Knowledge before Amplifire

- 27% CHM
- 32% Uncertainty
- 41% Confident and Correct

Observations

- 25,129 instances of CHM were found and fixed.
- 29,838 instances of uncertainty were found and fixed.
- The variation of knowledge was high, with some nurses quite misinformed and others showing confident mastery of the topic. The most knowledgeable were 100% confident and correct about CLABSI. The least show that misinformation occupied up to 60% of their knowledge.
- Nurses who were most misinformed or uncertain spent half an hour in the module, while nurses who were most knowledgeable about CLABSI spent only 12 minutes.
- By the end of the course, 100% of the nurses who completed were confident and correct on all the information.



Confidently held misinformation lives in the minds of all clinicians and is one of the largest contributors to costly medical error.

CHM exists when a clinician is sure they are right, but they are wrong. It creates misjudgments and mistakes. Misplaced confidence can be perilous—especially in patient care.

Amplifire has the unique power to detect and correct CHM. The platform requires learners to state their certainty when they answer questions.

The system then classifies which questions were answered confidently but incorrectly—representing confidently held misinformation—and customizes a module in real time that will lead the learner to rapid mastery of the topic.

The cognitive science behind the platform has proven itself in over one billion learner interactions.

The Study: Confidently Held Misinformation and Implications

The Amplifire e-learning platform probes the accuracy of a learner's knowledge and the confidence with which it is held. Confidence leads to action, and action to outcomes. When people know that they don't know a correct action for a given situation, they do nothing. When they are uncertain, they hesitate. When they are confident, they act. High-quality outcomes result when clinicians are both confident and correct in their knowledge.

This study specifically identified confidently held misinformation about central line catheters (CVCs). The study ran from early September through mid-October 2017 and included 3,707 nurses across 25 locations in a single health system. The nurses were a mix of RNs, Charge RNs, LPNs, NPs, and RN Educators.

AREAS OF LOW CHM

Central Line Bundle Practices

The Institute for Healthcare Improvement (IHI) has developed a central line bundle aimed at preventing CLABSI that includes 5 components: hand hygiene, maximal barrier precautions, chlorhexidine skin antisepsis, optimal catheter site selection, and daily review of line necessity. Only 8% of nurses had CHM about the practices in this bundle (63% had accurate prior knowledge).

Contamination Introduced by the Hands of Healthcare Workers

Whenever a central line is accessed or manipulated, there is risk of introducing contamination from the healthcare worker's hands. Nurses showed accurate prior knowledge at a rate of 66% on questions related to this topic (11% had CHM).

AREAS OF HIGH CHM REMEDIATED

Blood Draws from Central Lines

Studies have long shown that blood cultures drawn from central lines are at high risk of contamination, which can result in false-positive test results. Less than half of nurses (48%) indicated that blood should NOT be drawn from central lines.

Clinical Implication: After implementing policy that discourages drawing blood samples from central lines, along with other interventions, hospitals have seen reductions in blood culture contamination rates and substantial cost savings.

CLABSI Incidence and Catheter Type

Nontunneled CVCs are associated with the highest incidence of CLABSI. Only 24% of nurses were aware of this association.

Clinical Implication: Surveillance attention can be misplaced if nurses don't know which catheter types are associated with higher rates of CLABSI.

CLABSI Prevention and Antimicrobial Stewardship

The CDC recommends using prophylactic antimicrobial lock solutions for patients with long-term catheters who have a history of multiple CLABSIs despite adherence to maximal aseptic technique. In other words, they should not be used routinely. Only 26% of nurses indicated prior knowledge of this recommendation.

Clinical Implication: Inappropriate use of antimicrobial lock solutions in central lines can result in antibiotic toxicity and promote the emergence of antimicrobial-resistant strains of bacteria.

Routes of Infection

Different catheters are associated with different infection routes. CVCs with prolonged dwell times are most often infected via the intraluminal route, whereas extraluminal contamination is the most common kind of infection for short-term nontunneled catheters. Only 22% of nurses knew which routes of infection are associated with which types of catheters.

Clinical Implication: Nurses should be familiar with CLABSI pathophysiology in order to effectively manage patients with central lines.

Catheter Site Selection

Although it is part of the IHI's central line bundle, only 22% of nurses had correct prior knowledge of optimal site selection.

Clinical Implication: It is important to know which sites are associated with higher incidence of infection in order to effectively surveil patients.

Catheter and/or Administration Set Replacement

Nurses who care for patients with CVCs and peripheral venous catheters need to "own the line." Such management includes appropriately replacing the administration set and needleless connector, and ensuring that the catheter itself is replaced when necessary (and only when necessary!). Only 37% of nurses initially answered questions related to this topic correctly and confidently.

Clinical Implication: Failing to replace lines, administration sets, and needleless connectors when indicated—or replacing them too often—increases the risk for CLABSI.

Results and Return on Investment

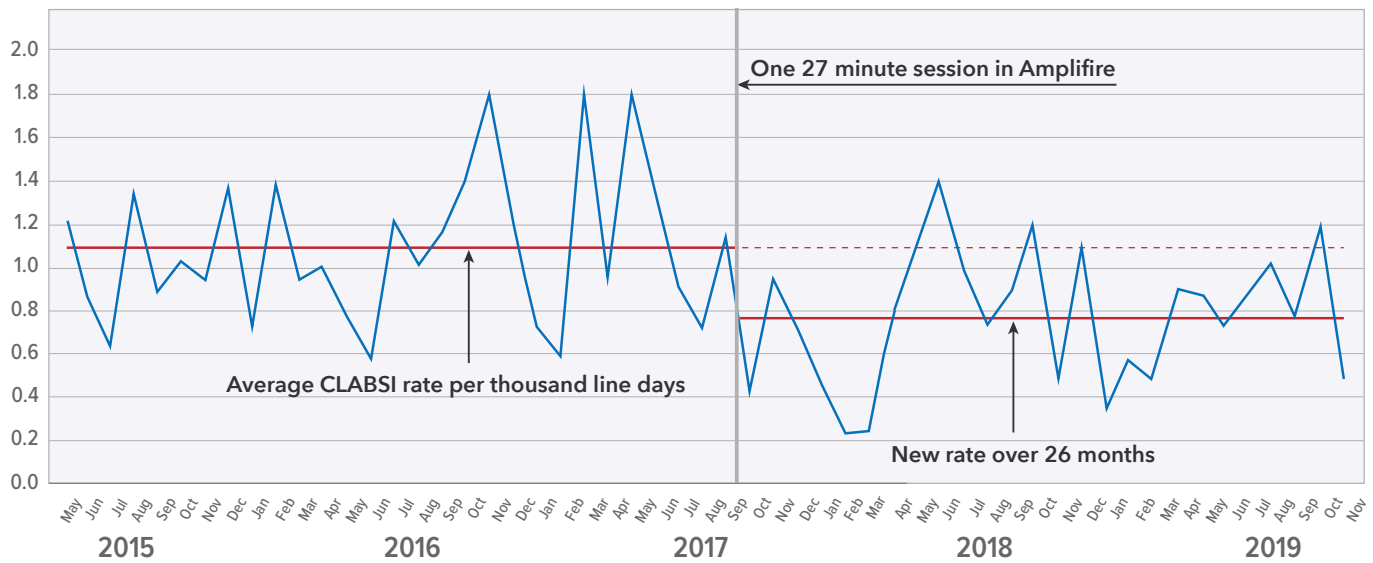
Incident Reduction

Nurses use their sense of confidence to make decisions and then act upon them. Theoretically, if Amplifire were to fix the confidently held misinformation seen on the previous pages, then the rate of mistakes made with confidence should go down. And indeed, that is precisely what has been observed for 26 months beginning in September, 2017.

- 51% reduction over the first 7 months
- 29% reduction over 26 months as new nurses are onboarded to replace for turnover

Interestingly, prior to the Amplifire deployment, this healthcare system had already obtained a low CLABSI rate, well below the national average of 5.3 incidents per 1,000 catheter hours.

29% Reduction in **Central Line Infections** (3,707 nurses trained)



Return on Investment greater than 25X

This hospital supplied their cost data for CLABSI which came in at \$48,108 per incident. Given the number of CLABSIs avoided, this works out to savings over 26 months of \$3,648,190. The ROI on training in Amplifire is therefore 2,505%. Breakeven occurred shortly after the first month.

About Amplifire

This study was conducted using Amplifire, an e-learning platform built on the latest discoveries in cognitive science. The Amplifire learning algorithm detects and corrects the knowledge gaps, doubts, and misconceptions that exist in the minds of clinicians in every healthcare organization. The platform adapts to the needs of individual learners as they take an Amplifire course until mastery of each topic is achieved.

Healthcare organizations have adopted Amplifire as a core operating asset. They have transformed training from a rote activity, where managers can only hope for results, into a strategic, measurable tool that delivers a clinical workforce aligned with the latest evidence-based medicine.

After the platform finds and fixes CHM and uncertainties held by clinicians, it delivers advanced analytics to organizations and managers that pinpoint where learners struggled, from the organization and unit level down to the individual learner.

With more than a billion learner interactions, Amplifire harnesses research, learner feedback, and artificial intelligence to provide a faster and more engaging path to mastery. This powerful combination has made Amplifire an innovative leader in the learning industry.

Amplifire has been deployed in multiple healthcare initiatives focusing on sepsis, CLABSI, CAUTI, SSIs, pressure injuries, C. difficile, patient falls, and other causes of avoidable patient harm. Additional courses are currently under development.

To learn more about the platform and its application in healthcare, contact us at:

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