

HIMSS “Stories of Success!” Application

Cover Page:

1. RFID Hand Hygiene Monitoring Improves Compliance
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4.

<i>2010 Hospital National Patient Safety Goals</i>	<i>Yes</i>	<i>No</i>
Improve accuracy of patient identification		
Improve the effectiveness of communication among caregivers		
Improve the safety of using medications		
Reduce the risk of healthcare associated infections	X	
Identify safety risks inherent in the patient population		

5.

<i>Health Information Technology</i>	<i>“X”</i>
Computerized Provider Order Entry (CPOE)	
Clinical Decision Support System (CDSS)	
Electronic Health Record (EHR)	
E-Prescribing	
RFID	X
Other [e.g., e-signout tool, etc]. Please list.	

6. Not Applicable

**Title:** Efficacy of an Electronic Hand Hygiene Surveillance and Feedback Monitoring Device Against Healthcare Associated Infections

**Background knowledge:** Healthcare associated infections (HAIs) account for thousands of lives and millions of dollars lost every year. A study noted that while care for patients with HAIs only accounts for 4.03% of all care delivered, the costs associated with their treatment make up 79% of net losses. Overall, for each HAI that occurs, length of stay increases by 8.12 days, hospital costs increase by \$9,347 and a hospital net loss for the care is \$5,206 per patient.<sup>i</sup> The Centers for Disease Control, The World Health Organization (WHO) and The Joint Commission indicate effective hand hygiene as the single most important way to reduce infection risk. However, hand hygiene compliance monitoring methods, such as periodic surveillance, self-reporting, and aggregate volume measurements, are often inaccurate and hard to implement.<sup>ii</sup> High levels of sustained hand hygiene compliance are elusive in healthcare facilities around the world.<sup>iii</sup> Because of the weaknesses of these previously utilized methods, healthcare and government agencies are calling for research and new sciences to be developed in order to measure hand hygiene compliance quickly, accurately, and without the use of extra personnel.<sup>iv</sup>

Setting of Intervention: Princeton Baptist Medical Center, Birmingham, AL; a 42-bed Post Surgical unit (6 West) of a 323-bed acute care hospital.

**Local Problem:** Clinical managers and directors over the Post Surgical unit, 6 West, noted that in 2009, over a seven month period, the single unit experienced 100 HAIs. Healthcare regulatory agencies note that effective hand hygiene is the single most important method to reducing infection risk. While high levels of noncompliance and high levels of HAIs are unfortunately very common in healthcare organizations, Princeton Baptist Medical Center wanted to challenge the status quo to attempt to reduce the risk for infection by monitoring hand hygiene.

**Intended improvement:** The intended improvement was to increase hand hygiene compliance through actively monitoring personnel. Through increased hand hygiene, a decrease in the incidence of HAIs was intended and anticipated. In addition to improved compliance, improved awareness by patients and visitors as well as staff was hoped for. The nGage system was chosen, among other reasons, because of its messaging capabilities. The ability to use the messaging to disseminate infection prevention-related information was recognized as an important tool in inspiring behavioral change in regards to hand hygiene compliance. Therefore, behavior change was intended as well as improvements in compliance and infection rates.

**Planning the intervention:** A seven-month-long, prospective case-study of an automated, point-of-care compliance monitoring and communication system was implemented in 6 West and went live in February 2010. Employees (51), including nursing and housekeeping personnel, were issued badges for the pilot program after an initial two-month period of a baseline dispensings only were recorded. Dispensing counts from both hand cleanser and soap dispensers were automatically tracked by hour, day, and month with the same system.

The system consists of an active communication display unit, radio frequency identification (RFID) tags and a touchless dispenser that has the ability to measure hand hygiene events for healthcare workers, visitors and patients continuously without disrupting workflow. Personal RFID tags are worn by healthcare workers, and the tags measure whether or not he or she in fact engaged in a hand hygiene

activity, whether with soap or alcohol. The display (control) unit next to the dispenser recognizes the healthcare worker, the time spent in the room is monitored and the system registers whether soap or hand sanitizer is used. The information gathered by the control unit from the tag is relayed to the bridge unit and is then sent to the central server where the data is organized and stored for review by management. The tags “awaken” every second for a few milliseconds, and therefore have a long battery life. When a tag wakes up, if it is near a control unit, the control unit is triggered by the tag and sends the tag data to the central server so that personalized messaging can be displayed on the screen of the control unit while the individual is washing.

All of this is done without any action performed by the individual to start the process; this allows for no disruption of workflow so that the individual can carry out normal functions throughout the day while being constantly and actively monitored. The system utilizes the Transtheoretical Model by James Prochaska, Ph.D., John Norcross, Ph.D. and Carlo DiClemente, PhD. to compel healthcare workers to make behavior changes regarding hand hygiene compliance.

Princeton Baptist Medical Center understood the need for improved hand hygiene compliance to improve patient safety and quality. Research was conducted on solutions and an electronic hand hygiene surveillance system, Proventix’s nGage, was chosen to be implemented. Princeton partnered with Proventix Systems, Inc. to devise a pilot program for their 6 West post-surgical unit to utilize the nGage system. The pilot program was the first phase of the plan. Should the pilot prove successful, the system was to be systematically implemented throughout other units and departments within Princeton Baptist and then would ultimately be installed in other hospitals within the Baptist Health System.

Initial planning was completed in conjunction with Proventix. The organization came prepared with installation guidelines and an adoption plan that included methods for incorporating hardware, software, and distribution of tags to employees. Furthermore, a great deal of thought was given to the impact the installation of such a system would have on staff morale. 6 West and Proventix worked together to determine the best methods of incorporating the system so as to not to change the staff’s workflow. Data and notes were collected along the way to use in possible further installations within the system in an effort to streamline the incorporation of nGage into the culture of Baptist Health System.

For seven months, employees including nursing and housekeeping personnel on the 6W unit wore tags that measured when they had the opportunity to engage in a hand hygiene activity and whether they did in fact engage in the hand hygiene activity. While engaging in a hand hygiene activity, employees received individualized feedback based on their personal compliance or through other messages that engaged them either personally or professionally. The soap and alcohol dispenser usage was tracked as well. To measure improvement, the project used electronic nosocomial infection markers™ (NIMs) as a consistently applied objective measure for the comparison infection rates of 2009 versus 2010 as indicators for the presence healthcare associated infections. The project was conducted as a case study.

### **HIT Dimensions Utilized**

Health IT was used in various ways throughout the project. Primarily, the nGage central server records the quantitative data and presents the information in ways that are useful for improvement. The server has four areas of capability: first, it is used to configure tags, devices, and the locations of the components; second, it communicates with the devices through IP connectivity and process monitoring; third, it

computes each hand hygiene episode into interpretable data; finally, it organizes those episodes by location and worker and presents the data in a number of ways to allow for various levels of analysis by management. Throughout the project, the data was exported into usable charts, such as bar charts, to measure compliance and progress. The increases in compliance were charted and used as an overlay to the comparison of HAIs during the project and how they compared with last year's occurrences. Numbers that had been collected via nGage were used along with existing infection marker data from MedMined™, a third-party company that specializes in hospital surveillance and data mining. This comparison was made to measure and establish correlations. Documentation displaying the decrease of HAIs as a result of increased compliance was especially instrumental in boosting morale and keeping workers engaged in the project. Furthermore, nGage's active messaging capabilities allowed for each wearer of a tag to know his or her compliance for each day.

## **Outcomes**

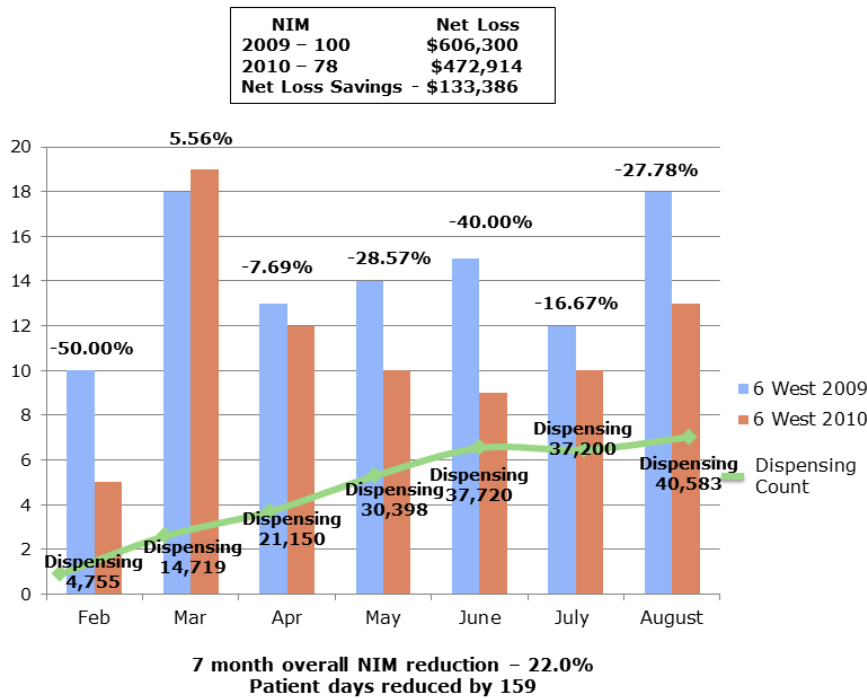
The plan began to evolve when the CEO of Proventix approached us about doing an installation of nGage. We were very interested in the product and knew the need for such a product in not only our organization, but in other organizations nationally. Once the pilot installation had been completed, we observed its success and began furthering plans for installation in other units of the hospital and across the Health System.

The 6 West Post Surgical unit was chosen to be the setting of the pilot as the first phase of the overall plan for a few reasons. First, infection rates are high in post surgical units because of the number surgical site infections that occur. Also, surgical step-down units are less chaotic and the patients are more stable than in an ICU. The goal was to test nGage in a setting that would not be negatively impacted should the system lead to inefficiencies, rather than the intended efficiencies. The nGage infrastructure allows for installation in any healthcare setting. Furthermore, unlike with many hand hygiene compliance monitoring methods, the type or brand of alcohol disinfectant or soap is irrelevant. This technology is soap dispenser neutral and doesn't require a specific soap, alcohol or gel for monitoring. nGage works with any type of alcohol or soap dispenser and is adaptable into any setting within the organization. Before we tested nGage in one of our units, we made sure that the system would be easily implemented.

51 employees wore tags that tracked their compliance. The implementation began with testing of all badges to make sure the system recognized each badge as each individual. The testing was conducted primarily by Proventix, but with some assistance from management. Once tags were issued and live, the system was merely monitored. Proventix's clinical project supervisor handled any troubleshooting required and served as the liaison between the hospital unit and the company.

At the seven-month mark of the pilot, NIMs had decreased by 22.0% overall on the pilot unit as compared to the same months during the previous year. The number of patient admissions was accounted for during this study and there was very little difference in total admits to the pilot unit (2602 versus 2652) over the seven months with only slight month-to-month variation. The month of May started with a celebration on the fifth which was to coincide with the WHO Hand Hygiene Day. During this month the pilot unit achieved a greater than 28% decrease in NIMs even though patient admissions had increased over 7% for the month of May. We attribute these results to a combination of the personalized tags being distributed, the education provided by and about the RFID technology, and the active messaging at the control unit.

During the pilot period the overall hospital NIMS decreased 4% with total hospital admissions slightly increasing for the same time period. Also noted and reflected in the chart was an increase in dispenser usage after the tags were issued as well as a subsequent decrease of NIM incidence. This confirms numerous studies that indicate that while hand hygiene education is important, compliance improves when personnel are monitored. <sup>v</sup> Since the introduction of the hand hygiene compliance monitoring system and the 22.0% reduction of NIMs, the cost studies for our hospital over this seven-month period on just 2652 patient admissions reflected a decrease of 159 patient days and reduced hospital net losses of over \$133,386. See Figure 1 below.



Hospital leadership at the executive and the unit level helped to create employee engagement and support of the system. During the pilot program, the 6 West unit also observed an increase in hand hygiene events by both patients and visitors. Patients reported that they enjoyed the active messaging the technology offers and they also wanted to follow the staff’s example. Active messaging at the soap and alcohol dispensers varied after each dispensing to provide patient satisfaction suggestions, HAI reduction tips by individual source, motivational quotes and award recognitions. When asked for feedback, the staff reported that they were encouraged by the across-the-board improved compliance results and improved patient outcomes. They valued the real-time feedback of messages that provided education, encouragement, goal setting and reward recognition.

**Barriers Encountered:** The major barrier to implementation of the system was the elimination of the “big brother” concerns by healthcare workers. A buy-in by the nurses on the unit was essential to the adoption of the system, but improved hand hygiene compliance was also required from patients and visitors in order to reduce HAIs. During the pilot, it was observed that both patients and visitors increased hand hygiene events. They reported an enjoyment in the active messaging the technology offered and also enjoyed following the staff’s example.

**Challenges Faced:** While staff initially voiced concern about being tracked with the RFID system, they recognized that the ultimate goal was to protect patients. It appeared that the systematic adoption process carried out over a period of months integrated the automatic observational capabilities into normal hospital operations. They reported that they were encouraged by the across-the-board improved compliance results and the improved patient outcomes.

**Summary:** The most important success achieved during the pilot program was the reduction in electronic infection markers from the seven-month period as compared to the same period during the previous year. A 22% decrease in electronic infection markers indicates the potential to not only reduce HAIs in a hospital but to decrease the costs associated with these infections.

**Interpretation** Improved hand hygiene improves the quality of patient care. The implementation of an electronic hand hygiene surveillance and feedback-monitoring device resulted in a significant reduction in nosocomial infection markers<sup>TM</sup>. With hospital leadership at the executive and unit level as well as the engagement of the employees on the pilot unit throughout the implementation, this unit observed significant reductions in NIMs, patient days, and net losses. These numbers indicate opportunities for hospital-wide and national reductions in healthcare costs and patient lives lost if applied across the country. Using national statistics of 1.7 million HAIs<sup>vi</sup> with an average per patient cost of \$20,549 per HAI (based on adjusted 2007 dollars), results in a national cost of more than \$35 Billion as depicted in Table 8 below.<sup>vii</sup> Applying a 22% reduction nationwide would correlate to a national savings of over \$7.8 Billion.

**Conclusions:** The pilot program outcomes indicate the potential to prevent HAIs by actively monitoring hand hygiene compliance and providing motivational tools necessary to sustain the hand hygiene efforts by healthcare workers. This increase in compliance translates to a decrease of HAIs and an improvement in patient safety and quality. An active monitoring system that continuously monitors without disruption to workflow provides the possibility for future studies to assist with improvement for patient safety goals, increased patient satisfaction, employee efficiencies and risk reductions. RFID technology presents the opportunity for other facilities to improve upon workflow through the automated monitoring of data.

## **Financial Considerations**

Funding for this project was approved by Princeton Baptist Medical Center Administration. As previously stated, for just the 7-month pilot of 6 West, we observed net loss savings of \$133,386. Hospital Administration is currently taking steps to install the system throughout other areas of the hospital as well as other hospitals within Baptist Health System.

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## **REFERENCES:**

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<sup>vi</sup> Klevens RM, Edwards JR, Richards CL, Horan T, Gaynes R, Pollock D, Cardo D. Estimating healthcare-associated infections in U.S. hospitals, 2002. *Public Health Rep.* 2007;122:160-166.

<sup>vii</sup> Scott RD II. *The direct medical costs of healthcare-associated infections in U.S. hospitals and the benefits of prevention.* Atlanta, GA: Division of Healthcare Quality Promotion National Center for Preparedness, Detection, and Control of Infectious Diseases Coordinating Center for Infectious Diseases Centers for Disease Control and Prevention, 2009. [http://www.cdc.gov/ncidod/dhqp/pdf/Scott\\_CostPaper.pdf](http://www.cdc.gov/ncidod/dhqp/pdf/Scott_CostPaper.pdf)