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HEALTH-NET: INTELLIGENT HAND HYGIENE RECORDING AND REMINDING SYSTEM TO PREVENT HOSPITAL ACQUIRED INFECTIONS

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ABSTRACT

Hospital Acquired Infection refers to the infection the patient did not have when they enter the hospital but acquired it during their stay. This is one of the major challenges in healthcare industry as it causes millions to die worldwide. Hand washing is the single most important procedure for preventing such infections. But Health Care Workers like doctors and nurses often forget to wash their hands before interacting with a patient. Contaminated healthcare workers hands continue to play a major role in transmitting infections, contributing to prolonged hospital stays, long-term disability and increased bacterial resistance to antibiotics, high costs for hospitals and patients, and ultimately to death. The project proposed here has the potential to remove this problem 100 percent.

Keywords: Handwashing, Hospital acquired infection, Hygiene recording

INTRODUCTION

Millions of Patients die worldwide because of Hospital Acquired Infection. Intelligent Hand Hygiene Recording and Reminding System, is an innovative solution that actively reminds busy healthcare workers to wash their hands, and records all hand-washing events and patient-staff interactions in the hospital environment. The U.S. CDC (Center for Disease Control and Prevention) estimates that one of every 20 patients gets a hospital-acquired infection each year resulting in the loss of numerous lives and an estimated $28 billion dollars annually for the American health-care system. Originally developed out of research at the University of Florida health net is designed to help stem the spread of these infections by recording all "hand hygiene events" in a hospital and gentle reminding healthcare workers to wash up before they interact with a patient. The system works using a combination of wireless sensors and device feedback notifications. After washing up with soap or gel healthcare workers place their hands under a wall mounted health net sensor. When this device detects there is alcohol on the workers hands it sends out a wireless "clean" message to a badge worn on the care providers shirt where it uses an LED to glow green to notify the patient of the process. Near a patients bed an additional wireless sensor also looks for the message and if not detected will use the badges buzzing notification system to remind the worker to wash their hands before interacting with the patient. All of these interactions are recorded in real time showing exactly who on the staff is washing properly. A health care workers ID, and the time and location of the interaction are all passed onto "HyMarks" the real -time reporting database where administrators can review the data and issue noncompliance warnings to individuals or specific units of a facility.

Importance of Hand Hygiene: Hand hygiene affects the quality of healthcare every moment of every day across the globe. In the United States alone, more than 270 people die each day from an infection contracted while at the hospital. Healthcare associated infections (HAIs) exact a tremendous toll, resulting in increased morbidity, mortality, and adding from $28 billion to $40 billion each year. Studies indicate that many HAIs are directly related to pathogens transmitted from patient to patient via the hands of healthcare workers, which occurs when workers fail to follow the Centers for Disease Control and Prevention (CDC) guidelines for hand hygiene. In October 2008, the U.S. Center for Medicare and Medicaid Services (CMS) issued a final ruling denying hospital payments for hospital stay costs related to certain HAI. Moreover, most states now require mandatory public reporting of infection rates by hospital and publish this information. In these states, a consumer can review this information and opt for a hospital reporting the lowest rate of HAIs. Similar concerns exist in other industries, such as those relating to the processing and preparation of food. Retail outlets such as restaurants and grocery stores, and other institutions such as nursing homes, are subject to the U.S. Food and Drug Administration's Food Code. In addition to requiring employees to wash their hands, the Food Code requires employers to monitor their employees' hand washing. Despite such extensive efforts to ensure that proper hand hygiene is performed, more than a quarter of all food-borne illnesses are thought to be due to improper hand washing, and it is estimated that food-borne diseases cause approximately 76 million illnesses, 325,000 hospitalizations, and 5,000 deaths in the United States each year.

Working principle: After applying cleaning gel in his/her hands, a healthcare worker must place them under a HyGeneNet Sensor Mote which has the ability to sense the chemical and sends a wireless "all clean" message to his or her HyGeneNet Badge Mote, which then blinks green. When the healthcare worker approaches a patient bed, the HyGeneNet Monitor Mote above the bed checks if the badge is transmitting an "all clean" signal. If the badge is not green, the badge vibrates, reminding the healthcare worker to wash. A Report of hand-washing pattern of all the healthcare workers will be generated and available at the hospital management in real time using HyGeneNet PC Mote for later analysis in desktop/laptop computers. Additionally the system also records the database in a Micro-SD card flash memory for mobile access. HyGeneNet nodes uses the ARM Cortex-M3 microcontroller and

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the IEEE 802.15.4 wireless network protocol stack optimized for low-power, low-data rate and cost-sensitive applications. IEEE 802.15.4 network helps HyGeneNet to track all hand-washing events, as well as which patient bed each healthcare worker has visited, allowing hospitals to effectively monitor adherence to hand hygiene protocols. It is an electronic hand hygiene recording and reminding system. It records all hand hygiene events in the hospital and reminds healthcare workers to wash before interacting with a patient.

CONCLUSION

Hand hygiene has long been regarded as the most effective method to prevent healthcare associated infections. It provides the first line of defense in the control of healthcare associated infections. This electronic hand hygiene monitoring system not only records all hand hygiene events in the hospital, but it also reminds busy healthcare workers to wash their hands between patients. The Hand Hygiene Recording and Reminding System is the first and most comprehensive tool to definitively monitor adherence to hand hygiene protocols. The systems promise more accurate hygiene measurement -- and remind doctors and nurses who forget to wash up. The system demonstrates how smart wireless technologies can help to tackle a major challenge in the healthcare industry – improving patient care, saving lives and saving costs. The system can be used not only in hospitals and clinics, but also in other environments such as schools and restaurants.

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