C361 - MLM1 – Performance Assessment 1

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C361: Evidence-Based Practice and Applied Nursing Research

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Hospital-acquired infections

Hospital-acquired infections (HAI), also known as nosocomial infections, are diseases that patients contract while receiving healthcare. Initially, the term HAI was used to refer to those infections that are associated with admission to an acute hospital. However, the term now implies infections developed in various settings where patients receive care such as ambulatory care, home care, family medicine clinics, and long-term care. Typically, HAIs manifest 48 hours or more after hospital admission (Haque *et al*., 2018). HAIs can also occur within 30 days after receiving healthcare. Several studies indicate that the most common types of adverse effects that are likely to occur in hospitalized patients are surgical complications, HAIs, and adverse drug events.

The Center for Disease Control and Prevention reports that nearly 1.7 million hospitalized patients in the United States contract HAIs while undergoing treatment for other conditions. Out of these statistics, about 98,000 patients succumb to HAIs. HAIs are one of the top 10 leading causes of mortality in the United States and common complications of hospital care (Haque *et al*., 2018). In every 100 hospitalized patients, ten patients in developing and 7 in advanced countries acquire HAIs. The World Health Organization (WHO) reports that HAIs usually receive public attention only when there are pandemics (Haque *et al*., 2018). HAIs have a severe impact on critically ill patients, with about 0.5 cases of HAIs in intensive care units (ICUs) reported every year in the United States. ICU patients are critically ill and immunocompromised, which increases their susceptibility to HAIs (Haque *et al*., 2018). There are various HAIs such as ventilator-associated pneumonia, surgical site infections, catheter-associated urinary tract infections, and central line infections. HAIs are an essential health

problem that results in prolonged hospitalization, high mortality, and increased care costs (Leoncio *et al.,* 2019).

HAIs occur during healthcare delivery in healthcare settings and are usually transmitted due to non-compliance with hand hygiene by healthcare providers. HAIs are barriers to proper medical care and cause an increase in morbidity and mortality along with growth in length of patient stay in the hospital and cost of providing care (Graveto *et al.,* 2018). In relation to the rampant multi-resistant microorganism, the hands of healthcare practitioners could act as a common way of transmission of infectious pathogens causing HAIs. However, the mode of transmission of HAIs is not only complex but also multimodal. Therefore, proper compliance with hospital hygiene, including hand washing both before and aftercare of patients, is critical in nursing care (Graveto *et al.,* 2018).

Impact of HAIs on Patient

Increased hospital length of stay

HAIs affect millions of patients globally and are linked to increased hospital length of stay (LOS). According to Zaha *et al.* (2019), on the effect of HAIs on length of hospital stay, increased HAIs and LOS was twice more than those of the non-infected patients with a mean of 10.4 days prolongation. The investigators also found that the average extra LOS was 13.1 days for MRMO infections. In the treatment process, healthcare practitioners are forced to pay more attention to the impact of MRMO. HAIs will lead to the prolongation of the average hospital stay, which will reduce the facility's medical income and the number of patients admitted to a hospital.

Lost wages

HAIs can prolong recovery time and prevent an individual from going back to work. This state translates to lost wages.

Death

In some cases, HAIs can be severe and ultimately fatal. The Alliance for Aging Research reports that approximately 99,000 people in the U.S succumb to HAIs every year (Gatto *et al.,* 2019).

Impact of the HAIs on Hospitals

Increased Healthcare Cost

Patients who contract HAIs incur a higher cost of treatment than those without infection. The extra costs are associated with the additional hospitalization days and treatment complexity. Each year, the top five leading HAIs result in about $10.8 billion, with surgical site infections leading the pack. HAIs increase hospitalization costs among hospitalized individuals in the ICUs three-fold (Leoncio *et al.,* 2019). Another aggravating factor that rises hospital-acquired infections is multi-resistant microorganisms (MRMO). According to a report by the CDC, MRMO account for about 2 million illnesses and 23,000 deaths in the United States (Leoncio *et al.,* 2019). The total cost of antimicrobial resistance can reach as high as 20 billion dollars per year. This cost is justified by the long hospitalization period of patients with stubbornness to treat infections and the use of state-of-the-art antimicrobials that are very expensive (Leoncio *et al.,* 2019). Healthcare costs have been shown to occur in every surgical and medical department, including the intensive care unit. However, best practices have been put in place in many hospitals for wound care and central lines to prevent HAIs (Lobdell, Stamou & Sanchez, 2012). HAIs not only increase healthcare costs which burden the healthcare system but also advances patients' sufferings.

PICO components

P-patients at risk infection

I-will education on proper hand hygiene

C-no education on good hand hygiene

O-improve hand hygiene compliance or reduce infection.

Evidence-Based Practice Question

Will education on proper hand hygiene improve hand hygiene compliance in patients at risk for infection compared to no education on good hand hygiene?

Research Article

Romero, D. M. P., Reboredo, M. M., Gomes, E. P., Coelho, C. M., Paula, M. A. S. D., Souza, L. C. D., ... & Pinheiro, B. V. (2019). Effects of the implementation of a hand hygiene education program among ICU professionals: an interrupted time-series analysis. *Jornal Brasileiro de Pneumologia, 45*(5).

Background information

In the article, "Effects of the implementation of a hand hygiene education program among ICU professionals: an interrupted time-series analysis," Romero and her colleagues argue that HAIs are recognized as a critical healthcare problem among inpatients with a prevalence rate of 6.4-8.7 in Europe and North America (Romero *et al.,* 2019). Ventilator-associated pneumonia (VAP) is one of the most common HAIs among intensive care units. VAP increases the length of hospital stay and mechanical ventilation, resulting in increased cost of care. It is estimated that VAP accounts for a 20-50% mortality rate (Romero *et al.,* 2019).

Measures to prevent VAP include providing oral care with chlorhexidine and silver-coated tubes or catheters with high sealing volume to permit subglottic drainage. Other VAP prevention strategies include the use of protocols to evaluate the possibility of ventilator weaning and the possibility of daily sedation interruption and use of noninvasive ventilation to avoid endotracheal intubation.

The care bundle to prevent VAP entails proper hand hygiene by healthcare providers. The hands of healthcare workers play a significant role in transmitting pathogens from one patient to another. Although appropriate hand hygiene has been established in many healthcare facilities, compliance rates remain low. Studies indicate that education measures effectively promote compliance rates and reduce the rates of infection (Romero *et al.,* 2019).

Methodology

The study was a quasi-experiment with an interrupted time-series design. It was conducted between January and December 2016 in the Federal University of Juiz de Fora University Hospital in Brazil. The Federal University of Juiz de Fora University Hospital is a 150-bed teaching hospital with 9 ICU beds for adult patients. HAIs control measures already in the hospital included contact isolation, especially gowns, caps, and masks worn by patients with a history of multidrug-resistant Staphylococcus gram-negative bacilli or methicillin-resistant *Staphylococcus aureus* (MRSA). Implemented VAP prevention strategies included prophylaxis of acute gastroduodenal mucosal and providing oral care with chlorhexidine.

Between June and July 2016, all healthcare providers and medical students participated in a hand hygiene education program. The programs entailed weekly sessions that groups of eight people attended. The sessions discussed the significance and prevalence of HAIs, the role of proper hand hygiene, and preventive measures of HAIs. Data on compliance of hand hygiene and

prevalence of HAIs were presented and discussed with the participants. Adherence to hand hygiene was monitored by the researchers unbeknownst by the intensive care unit team. The observer recorded all the hand hygiene opportunities and whether or not it was performed. Hand hygiene opportunities were achieved through alcohol-based hand rub or washing hands with water and soap. Compliance was determined by determining the number of times an ICU healthcare worker cleaned his or her hands and dividing by the number of hand hygiene opportunities. Hand hygiene compliance was monitored for 12 months.

Level of Evidence

The research article has level II quality of evidence according to JHNEBP model. It presents high quality of evidence with consistent results, definitive conclusion, and sufficient sample size. The summative review of the essay of the study are well-defined and consistent with results. Besides, the article presents a well-defined methodology that uses a rigorous approach and valid measures.

Data Analysis

Kaplan-Meir analysis was conducted to compare VAP incidence and mortality at 60 days between the post-intervention and baseline periods. Distribution differences were evaluated using a long-rank test. Generalized equation models for corrected data were employed to estimate the incidence ratios. All statistical tests and estimates were performed with the SPSS.

Ethical considerations

The study received exempt status from the institutional review board of the hospital. Since the project met the criteria for a quality improvement project, informed consent was waived. No ethical issues were noted in this project.

Quality Rating

The article presents a high quality of evidence. There is a clear association between the data and findings. The authors show how they made their findings by observing hand hygiene compliance among the ICU team. The research has transferability in the manner in which it was performed and how it shaped the findings. Besides, the project is credible, and there is alignment between data collection, research question, analysis, and results.

Results and conclusion

A total of 959 hand hygiene opportunities were observed during the 12 months study period. Out of these hand hygiene opportunities, 114 (11.9%) were observed during the program, 419 (43.7%) were observed before implementation of the programs, and 426 (44.4%) were observed after implementing the program. Of all opportunities recorded, nursing technicians accounted for 41.2 %; physiotherapists, students, nurses, physicians, and other healthcare providers accounted for 6.3%, 6.5%, 14.3%, 24.5%, and 7.3%, respectively. There was a significant and progressive increase in hand hygiene adherence-from a baseline of 31.5% to 65.8% during the intervention phase and 83.8% during the post-intervention phase. Even though the sample size was not determined, the significance level of the study was 5%, while the statistical power of the study was 100%. The study also reported an 84% increase in hand hygiene compliance.

In conclusion, the study's findings indicate that hand hygiene education can improve compliance in the ICU. However, it appears to have no significant effect on length of ICU stay, mortality, and VAP incidence.

Non-research Article

Haverstick, S., Goodrich, C., Freeman, R., James, S., Kullar, R., & Ahrens, M. (2017). Patients' hand washing and reducing hospital-acquired infection. *Critical care nurse, 37*(3), e1-e8.

Background Introduction

In the article "Patients' hand washing and reducing hospital-acquired infection," the authors argue that 1 in every 25 patients in the acute care setting will contract HAIs during their hospital stay. Haverstick and his colleagues report that in 2011, about 722000 patients in the United States had HAIs with surgical site infections and pneumonia leading to the highest rate. Out of these statistics, 75,000 succumbed to hospital-acquired infections (Haverstick *et al.*, 2017). Since the common mode of transmission of HAIs is through contaminated hands, maintaining hand hygiene is a critical approach to preventing hospital-acquired infections. Patient and staff hand hygiene is always important in preventing the spread of HAIs. However, providing education to patients on how to protect themselves from HAIs is fundamentally essential. Reports on cross-contamination indicate a link between the staff, patient, and the environment.

In many cases, most hospitals' efforts to prevent the spread of HAIs are focused on the practices and attitudes of staff members. In the hospital, patients' capacity to maintain hand hygiene is hindered by accessibility to hand sanitizer or soap and water. For instance, there is a bottle of hand sanitizer and a sink placed on the wall opposite a patient's bed in many patients' rooms. However, many patients are inept at accessing these hand cleaning points because of drains, postsurgical intravenous catheters, and mobility issues. These hurdles result in declined hand hygiene adherence among patients. The study aimed to provide for the patient to safeguard themselves against HAIs.

Level of Evidence

HAIs are among the most severe healthcare issues affecting the healthcare system globally. They cause severe burdens on patients, families, and the healthcare system. HAIs increase the length of hospital stays, hospital costs, mortality, and morbidity. Infections acquired in the hospital by patients, their families, or even healthcare workers are considered the 5th leading cause of mortality in acute facilities. However, the first line of defense in preventing the spread of hospital-acquired infections is proper hygiene.

Level of Evidence

The article presents level I type of evidence according to JHNEBP model. It has well-defined methodology that employs a rigorous research approach. The findings of the research are consistent with sufficient sample size. Expertise is clearly evident throughout the entire study by presenting hand washing as an essential principle of quality healthcare. Although direct causal benefits are hard to prove and interventions are often multimodal, substantive epidemiological evidence supports the impact of hand hygiene in reducing HAIs.

For instance, between 2002-2013, the prevalence of *S. aureus* bacteremia (SAB) decreased by about 63%, and similar declines have been seen in other places, including the United States (Haverstick *et al.*, 2017). These reductions in HAIs link with the national initiatives resulting in an extensive embracing of hand hygiene programs. For example, in Australia, hand hygiene compliance had improved from 67% in 2010 to 84% in 2016. Proper hand washing or rubbing alcohol-based sanitizer is a core tenet in preventing HAIs and remains a crucial metric of hospitals' quality and safety systems.

Data Analysis

All patients hospitalized in the cardiothoracic surgical unit were included in the project. The hospital-acquired infection rate was compared during nineteen months before and nineteen

months after the intervention. Obtained data were analyzed using SPSS version 21. The rates of HAIs were compared before and after the intervention. Due to the underpowered study and the small sample, a non-parametric Wilcoxon test will aid in the data analysis. The significance was set at the 0.05 level.

Quality Rating

The article presents a high quality of evidence. There is a clear association between the data and findings. The authors show how they made their findings through the observations of hand hygiene compliance among healthcare practitioners. The research has transferability in the manner in which it was performed and how it shaped the results.

Analysis of the Results / Conclusions

Cardiothoracic surgical unit data showed that VRE infections decreased by 70% within nineteen months after the intervention. MRSA infections were reduced by 63% within 19 months post-intervention. A Wilcoxon rank test showed no significant difference of *C. difficile* infection before and post-implementation of handwashing protocol. The researchers concluded that hand hygiene should be done at the most critical times, including before leaving the room, before touching wounds or incisions, before meals, after patients use the restroom, and upon return to the ward.

Author's Recommendations

The authors recommend that healthcare facilities implement effective hospital-acquired infection prevention strategies, and health care workers should embrace hand hygiene. However, such an approach's success will call for a cultural shift emphasizing individual and institutional accountability and embracing guidelines that promote the judicious use of antimicrobials and optimal infection control.

Recommended Practice Change

The recommended practice change is providing education on proper hand hygiene to improve hand hygiene compliance in patients at risk for infection. Hand hygiene is the least expensive, simplest, and most important in reducing hospital-acquired infections (Haverstick *et al.*, 2017). By cleaning hands, healthcare providers and patients can prevent the spread of microorganisms, including those resistant to antibiotics.

Key Stakeholders

The project will be implemented across the entire institution, and the key stakeholders will include all staff members of the organization. They registered nurse, physicians, advance practice providers, medical assistants, nursing assistants, respiratory therapists, environmental service technicians, and administrative staff.

Barrier to Implementation

The perceived barriers to the implementation and adherence of hand hygiene practices include lack of knowledge, forgetfulness, patient need perceived as a priority over hand hygiene, interference with nurse-patient relationship, inaccessible hand hygiene supplies, and irritation made caused by hand hygiene agents.

Strategy to Overcome the Implementation Barrier

Achieving sustainable hand-hygiene compliance throughout the entire organization remains an elusive goal for many organizations. Establishing a culture of safety and individual accountability for all staff members who contact patients by recommending proper hand washing is essential. This approach can help to overcome the barriers encountered in compliance with hand hygiene in a healthcare setting.

Indicator to Measure the Outcome

Monitoring hand hygiene compliance serves several functions, including outbreak investigation, the incentive for performance improvement, and infrastructure design. However, it should be noted that hand hygiene performance is one aspect of in causal tree leading to the two critical infectious outcomes: HAIs and colonization with multi-resistant microorganisms. The ideal indicator of hand hygiene performance would produce an exact and unbiased numerical measure of how appropriately healthcare workers practice hand hygiene. Education on hand hygiene is essential in promoting compliance among healthcare workers and patients (Haverstick *et al.*, 2017).

The performance of hand hygiene in a healthcare setting can be monitored directly or indirectly. The direct methods include patient assessment, healthcare workers self-reporting, and direct observation. Indirect approaches include monitoring consumption products, including alcohol-based hand sanitizer or soap, and automated monitoring of hand rub dispensers and sinks. By direct observation (by a validated observer), detection of hand hygiene adherence is presently considered the gold standard in hand hygiene performance outcomes. However, the observations are usually conducted by validated and trained observers who determine the percentage being met by hand hygiene practices and count hand hygiene opportunities.

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