**Literature Evaluation Table**

**Student Name:**

The rates of healthcare-related infections may decline over time with improvements in healthcare standards and compliance with handwashing protocols. Healthcare professionals must understand that hand washing is inevitable in preventing infectious agents and hence educate patients to further prevent the spread of these agents.

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| **Criteria** | **Article 1** | **Article 2** | **Article 3** | **Article 4** |
| **Author, Journal (Peer-Reviewed), and**  **Permalink or Working Link to Access Article** | Khan, H. A., Baig, F. K., & Mehboob, R. Asian Pacific Journal of Tropical Biomedicine, 7(5), 478-482.  **Permalink:** https://doi.org/10.1016/j.apjtb.2017.01.019 | Muller, M. P., MacDougall, C., Lim, M., Armstrong, I., Bialachowski, A., Callery, S., ... & Garber, G. Journal of Hospital Infection. **Permalink:** https://doi.org/10.1016/j.jhin.2015.09.008 | Percival, S. L., Suleman, L., Vuotto, C., & Donelli, G. Journal of medical microbiology  **Permalink:**  https://doi.org/10.1099/jmm.0.000032 | Schreiber, P. W., Sax, H., Wolfensberger, A., Clack, L., & Kuster, S. P. Infection Control & Hospital Epidemiology  **Permalink:**  https://doi.org/10.1017/ice.2018.183 |
| **Article Title and Year Published** | “Nosocomial infections: Epidemiology, prevention, control, and surveillance. (2017)” | “Antimicrobial surfaces to prevent healthcare-associated infections: a systematic review. (2016)” | “Healthcare-associated infections, medical devices, and biofilms: risk, tolerance, and control (2015)” | “The preventable proportion of healthcare-associated infections 2005–2016: Systematic review and meta-analysis. (2018)” |
| **Research Questions (Qualitative)/ Hypothesis (Quantitative)** | What are the causes and control methods of nosocomial infections? How are nosocomial infections distributed across the globe? What is the current surveillance? | Although antimicrobial surfaces are developed to prevent healthcare-associated infections microbial contaminations, do they decrease antibiotic-resistant organisms or healthcare-related infections? | Although biofilms are essential in providing healthcare, what is their role in accelerating risks associated with medical devices and decreased antimicrobial efficiency? | What is the impact of multifaceted interventions in declining healthcare-related infections? |
| **Purposes/Aim of the Study** | To briefly describe the global distribution of nosocomial infections, control methods, and emerging causes while emphasizing on the contemporary surveillance. | To establish whether antimicrobial surfaces prevent healthcare-associated infections microbial contaminations or the spread of “antibiotic-resistant organisms” (AROs). | To provide updated information healthcare-associated infections and the role played by biofilms in accelerating risks associated with medical devices while decreasing antimicrobial efficiency. | To evaluate the percentage of healthcare-related infections prevented by different infection control remedies in various economic situations. |
| **Design (Type of Quantitative, or Type of Qualitative)** | Phenomenological Qualitative research design | Quantitative research with Systematic reviews | Observational qualitative research design | systematic review and meta-analysis |
| **Setting/Sample** | Healthcare organization setting | A systematic review of 11 studies on the implementation of “antimicrobial surfaces” in different in-patient rooms | Observed healthcare-associated infections in more than 5 surgical sites. | 5,226 articles published from 2005 to 2016 but only 144 studies were incorporated in this assessment |
| **Methods: Intervention/ Instruments** | Literature review and analysis of common infections including urinary tract infections linked to the catheter, pneumonia associated with ventilators, infections in surgical sites, bloodstream infections connected to the central line | 11 studies evaluated the effects of silver, copper, and metal alloys or "organosilane-treated surfaces" on microbial contamination.  The studies used “Grading of Recommendations Assessment, Development and Evaluation” (GRADE) to determine the strength of evidence.  The “Cochrane Effective Practice and Organization Care (EPOC)” was used to assess the group’s risk of bias. | The researchers examined the use of different devices used in surgery sites including urinary tract catheters, central venous catheters, and endotracheal tubes among others. The researchers also emphasized the formation of biofilms, dispersal, and the risk of their dissemination. | The researchers examined 5,226 studies published from 2005 to 2016 evaluating different interventions to decrease pneumonia caused by ventilators, infections from surgical sites, “central-line–related bloodstream infections and catheter-related urinary tract infection” as well as pneumonia in hospital settings but not related with ventilators. The search was done from credible databases including CINAHL, EMBASE, PubMed, Medline, and OVID. |
| **Analysis** | Nosocomial pathogens include fungal parasites, viruses, and bacteria. Common infections include urinary tract infections linked to the catheter, pneumonia associated with ventilators, infections in surgical sites, bloodstream infections connected to the central line (Khan, Baig & Mehboob, 2017). About 15% of patients in hospitals get at least one of these infections. During hospital stays, patients are exposed to the said pathogens through healthcare workers, the environment, and other infected patients. About 25% of hospital waste is hazardous and potential sources of bacteria and other pathogens. | Copper surfaces had an average reduction of microbial contamination. Two surveys showed healthcare-associated infection incidences and an "RCT of copper surfaces" in intensive care units reduced healthcare-associated infections with about 58% while reducing the spread of antibiotic-resistant organisms with 64% (Muller et al., 2016). However, the method indicated that the evidence was of low quality due to incomplete blinding and inappropriate randomization. | The rates of healthcare-related infections may decline over time with improvements in healthcare standards. Biofilms are important in controlling healthcare-related infections, especially because of their integral resistance and tolerance to antimicrobial treatments. Biofilms advance on the surfaces of medical devices implying that dispersal of one or grouped cells increases microbial dissemination risk in the host and hence creating infection risk. However, there are no strategies for diagnosing biofilms in clinical settings. As such, the use of typical methods to establish colonization does not indicate the growth of biofilms. | The rates of infections decreased regardless of a country’s economic status. There was a high risk of bias in 143 studies out of the 144 studies incorporated in this evaluation. The pooled incidence rate proportions linked to multidimensional interventions had 95% confidence intervals (Schreiber, Sax, Wolfensberger, Clack & Kuster, 2018). Besides, the pooled rate percentages had 95% confidence intervals for interventions targeting the reduction of SSI, and 95% confidence intervals for interventions targeting the reduction of VAP. The pooled rate proportions for both before-and after-studies and randomized controlled trials recorded the same confidence intervals of 95%. |
| **Key Findings** | Nosocomial infections occur in all nations (both developing and developed) across the globe. These infections account for approximately 10% in developing nations and about 7% in developed nations. Because nosocomial infections occur during hospital stays, they make patients prolong their stay, some developmental disabilities, and increased cost of medication and overall economic burden. | The article did not establish substantial evidence showing that antimicrobial surfaces reduce healthcare-associated infections. There were significant microbial contamination and the spread of “antibiotic-resistant organisms” (AROs). | Using bioactive enzymes and molecules is a better approach towards preventing the growth of biofilms on implanted devices (Percival, Suleman, Vuotto & Donelli, 2015). Another important finding is that tailing microbiological activities in patients after intubations is a vital strategy in evaluating the sensitivities of host pathogens concerning the growth of VAP and thus establishing more effective treatment pathways. | The published articles provided evidence suggesting that there is constant potential to significantly reduce healthcare-related infection rates with 35% to 55% by implementing different programs regardless of income levels of a country. |
| **Recommendations** | Transmission of these pathogens can be prevented by ensuring that healthcare workers comply to hand washing hygiene. Nosocomial infections may be reduced by providing proper adequate training to healthcare workers on appropriate waste management, biosafety, and healthcare transformations. It is also important to educate the public on these infections.  Healthcare professionals should practice appropriate and healthy ways of healthcare delivery developed by committees on infection control and WHO. Professionals should also employ suitable methods for antimicrobial implementation. | Although antimicrobial surfaces are developed to shrink microbial pollution of surfaces in healthcare organizations, contaminations of healthcare environments with bacteria, viruses and other micro organisms continue to increase the costs of medication due to healthcare-associated infections. As such, healthcare organization administrators should embrace evidence-based programs to reduce microbial contamination such as hand hygiene and education to patients and healthcare workers. | Adopting a combination of molecular methods and microbiological culture strategies may significantly improve the chances of detecting and providing a more accurate diagnosis.  Strategies such as surface alterations and antimicrobial coating of medical devices can highly prevent the formation of biofilm on these medical tools. | Healthcare facilities should implement multifaceted interventions in preventing the transmission of healthcare-associated infections |
| **Explanation of How the Article Supports EBP/Capstone Project** | This document significantly backs evidence-based practice and the project by providing information on infections acquired in healthcare settings, surveillance, and control methods. | This document backs the project by providing information that can help implement strategies that are highly evidence-based concerning healthcare-associated infections. | This document considerably backs the project by offering evidence-based practices on how to reduce the spread of infectious agents on medical devices that are later transferred to patients and healthcare workers. | This article is highly significant for the completion of the capstone project because it provides information on how using multifaceted interventions may “reduce the spread of infections in healthcare facilities.” |

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| **Criteria** | **Article 5** | **Article 6** | **Article 7** | **Article 8** |
| **Author, Journal (Peer-Reviewed), and**  **Permalink or Working Link to Access Article** | Sickbert-Bennett, E. E., DiBiase, L. M., Willis, T. M. S., Wolak, E. S., Weber, D. J., & Rutala, W. A. Emerging infectious diseases  **Permalink:**  https://doi.org/10.3201/eid2209.151440 | Weiner, L. M., Webb, A. K., Limbago, B., Dudeck, M. A., Patel, J., Kallen, A. J., ... & Sievert, D. M. Infection Control & Hospital Epidemiology  **Permalink:**  https://doi.org/10.1017/ice.2016.174 | Ataee, R. A., Ataee, M. H., Tavana, A. M., & Salesi, M. International Journal of Preventive Medicine  **Permalink:**  https://doi.org/10.4103/2008-7802.201923 | Musu, M., Lai, A., Mereu, N. M., Galletta, M., Campagna, M., Tidore, M., ... & Mura, P. Journal of preventive medicine and hygiene, 58(3), E231.  **Permalink:**  https://pubmed.ncbi.nlm.nih.gov/29123370/ |
| **Article Title and Year Published** | “Reduction of healthcare-associated infections by exceeding high compliance with hand hygiene practices (2016)” | “Antimicrobial-resistant pathogens associated with healthcare-associated infections: summary of data reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2011–2014 (2016)” | “Bacteriological aspects of handwashing: A key for health promotion and infection control. (2017)” | “Assessing hand hygiene compliance among healthcare workers in six Intensive Care Units. (2017)” |
| **Research Questions (Qualitative)/ Hypothesis (Quantitative)** | Does compliance with hand hygiene protocols decrease the rate of healthcare-associated infections? Can programs aim to encourage hand hygiene protocols influence to be effective? | How are the antimicrobial resistance patterns linked to healthcare-associated infections? | Are traditional handwashing practices part of a healthy lifestyle? How are handwashing practices decrease the transfer of infectious agents? | Are there sufficient control procedures and protocols in intensive care units and other in-hospital patient areas? |
| **Purposes/Aim of the Study** | To establish whether increased compliance to hand hygiene protocols among healthcare professionals and patients decrease healthcare-associated infections | To investigate patterns on antimicrobial resistance for Healthcare-associated infections that happened between 2011 and 2014, and reported to the CDC's National Safety Network | To describe the traditional aspects of hand hygiene practices for healthy lives while explaining how these practices decrease the spread of "community-acquired infectious agents" by patients and healthcare workers | To assess the existence of protocols and procedures for controlling infections, evaluate adhesion to various aspects of handwashing procedures by healthcare professionals in six intensive care units. (ICUs). |
| **Design (Type of Quantitative, or Type of Qualitative)** | Longitudinal Quantitative research design | Longitudinal quantitative research design | Descriptive quantitative research design | A prospective observational qualitative research design |
| **Setting/Sample** | Conducted a longitudinal investigation from 2013 to 2015 in a hospital with 853 beds. | Investigated all the hospitals with more than 200 beds | The study examined more than 100 articles retrieved from credible databases | The researchers observed handwashing compliance amongst healthcare employees in all 147 intensive care units in the six different hospitals. |
| **Methods: Intervention/ Instruments** | The article implemented a new program that focused on increased compliance with handwashing guidelines in all inpatient areas. The researchers required “all the healthcare workers and patients to wash their hands just before entering every room” and immediately after exiting the room. Besides the program encouraged each worker to report or remind the other on hand washing. The researchers compared their observations with the observations of the previous quarter's recordings.  The researchers used a Poisson Regression linear model to determine the relationship between compliance and infection rates. | Analyzed data from “catheter-related urinary tract infections, central line-related bloodstream infections”, and pneumonia linked to a ventilator as well as infections from surgical sites reported from inpatient rehabilitation organizations, long-term acute care facilities, and acute care hospitals.  The researchers calculated the average pathogen proportions that tested nonsusceptible or resistant to the chosen antimicrobials based on the type of healthcare-associated infection and the year reported. | The investigation was done based on the existing databases including Scopus, PubMed, Embase, and ScienceDirect among others. | The researchers conducted "perspective-observational" research in six different intensive care units. In every intensive care unit, the article evaluated compliance with handwashing guidelines and practices by healthcare workers as well as the existence of written protocols and procedures in healthcare facilities. |
| **Analysis** | The research established that new program influenced hand hygiene compliance. Besides, a 10% compliance rate in the first quarter decreased infections with 6% infection rates. In the second quarter, a 10% compliance further decreased the infection rates with 14%. | The data from all the 4,515 hospitals revealed that each hospital reported at least one healthcare-associated infection between 2011 and 2013. The researchers determined that 408,151 pathogens out of the “365, 490 healthcare-related infections were reported to the CDC's National Healthcare Safety between 2011 and 2014” (Weiner et al., 2016). Most of these infections came from acute care facilities with more than 200 beds. Although 15 groups of pathogens accounted for 87% of all cases of reported pathogens, coagulase-negative staphylococci, Klebsiella species, Staphylococcus, and aureus Escherichia coli, and were the most common with 8%, 8%, 12%, and 15% respectively. | The results of this research revealed that bacteria released from hands washed by a female in wet and dry conditions were lower than those bacteria released from a male hand with a 95% confidence interval (Ataee, Ataee, Tavana & Salesi, 2017).  Also, the study determined that handwashing monitoring systems, especially after toiled and every time before and after contacting a patient were critical indices towards preventing the spread of “infectious agents to the patients.” The results further showed that the "released amount of bacteria flora from wet hands were ten times more than in dry hands." | The article determined that only 73 out of 147 intensive care units had the needed procedures and protocols. Particularly, 56 out of 80 were available for measuring general risk controls, 13 out of 15 for handwashing, and 26 out of 47 for isolation and standard precaution measures (Musu et al., 2017). Besides, the results depicted high values of compliance of 3% to 100% to hand washing protocols in all intensive care units involved in the research. During the time of the study, 72 out of 142 had the required protocols. |
| **Key Findings** | There is a significant association between handwashing compliance and decreased rates of HCAI rates.  Increased compliance with the hand hygiene guidelines significantly reduces healthcare-associated infections. | Healthcare-associated infections related to devices recorded higher proportions of isolates with normal resistance phenotypes than infections in surgical sites. While percentage resistance among most phenotypes was similar to previously reported percentages, *Escherichia coli* pathogens recorded a higher resistance magnitude. Resistance patterns and pathogen distributions have changed from 2008 to 2010 and 2011 to 2014. | Increased “awareness of hand hygiene and belief among healthcare workers” play a critical role in declining healthcare-related infections by about 30%. Hand hygiene practices may decrease the instances of spreading infectious agents in healthcare and community settings. Although there is no standard approach for evaluating compliance, hand washing practices can significantly limits the “transfer of infectious agents” to in-hospital patients. | Compliance with the best handwashing practices is very low. The low compliance demonstrates the need for the immediate implementation of strategies to control infections in intensive care units. Only third-year students reached the minimum desired score concerning hand hygiene. |
| **Recommendations** | The article recommends that each healthcare facility should develop programs that could encourage handwashing amongst healthcare workers, patients and visitors to decrease healthcare-associated infections (Sickbert-Bennett et al., 2016) | The article recommends progressive and careful monitoring of pathogen distribution and resistance patterns across the spectrum of the types of healthcare-related infection. | This study recommends the permanent monitoring of hand hygiene practices and compliance to decrease the spread of healthcare-related infections. Also, healthcare workers must understand that washing of hands is an unavoidable practice to control healthcare-related infection rates. | A key recommendation is the implementation of a multidisciplinary intervention to prevent and control healthcare-related infection risks.  Because of the established low-level knowledge on healthcare-related infections, this study recommends a periodic check of knowledge among nursing students to fill the voids enhance training programs, and enhanced compliance with HAIs’ prevention measures. |
| **Explanation of How the Article Supports EBP/Capstone** | This document is helpful as it gives adequate information concerning the association between handwashing compliance and reduction in healthcare-associated infections. | This article emphasizes on the need to determine the healthcare-related infections-resistance patterns and pathogen distributions. This supports the need to establish programs to reduce healthcare-related infections. | By revealing the importance of enhancing awareness on hand hygiene to both community and healthcare workers, this document gives critical information on strategies for decreasing the transfer of infectious agents. | By discussing the importance of hand hygiene practices among healthcare workers, the article supports evidence-based practices and the capstone project |