

**Impact of Educational' Interventions that Lead to the
Compliance with Hand Hygiene Guidelines for Healthcare
Professionals within a Hospital Care Setting in Abu Dhabi.
thus, Reducing the Nosocomial' Infections**

تأثير التدخلات التربوية التي تتوافق مع إرشادات الصحة العامة لمهنيي الرعاية
الصحية في إطار مستشفى للرعاية الصحية في أبو ظبي ، والحد من الالتهابات
"الإلتهابات المكتسبة من المستشفى"

by

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**A dissertation submitted in fulfilment
of the requirements for the degree of
MASTER OF EDUCATION**

at

The British University in Dubai

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Abstract

Healthcare-associated infections (HCAI) can be prevented by applying better policies, and interventions. Complete adherence to these infection control procedures is essential for the successful implementation of educational interventions (McCay, 2015). The purpose of the current study was to determine the features of structured educational interventions that impact the compliance of hand hygiene by healthcare professionals within a hospital setting. Current research work also focused hand washing practice to make it a regular practice for the healthcare. The current study has been designed in the context of HCAIs practices at the global level and HCAIs compliance levels have been reviewed. An electronic search of 16 relevant health and educational databases was performed and then augmentation of this search was done. The search gave multiple strategies and ideas (McGoldrick, 2017). Authors have applied multi-featured interventions in different studies and multiple component interventions have been found better as compared to single component interventions for better HH compliance (Saint et al., 2009). Quasi-experimental design approach has been used for the current work. This involves pre and post-intervention analyses. Current research work has been organized to develop the structured educational intervention to modify medical staff attitude towards better compliance of hand sanitation rules (Russo, 2009). The study gave interventional approach for HH compliance measurement in the hospital. The current work has devised the ways to make hand washing practices a peculiar part of medical personnel health care activities. Intervention programs, training, education, giving HH facilities, and HH reminders improved HH practices. Currently, these interventions designed according to WHO rules have brought awareness regarding the HH compliance in developing and developed regions. Hand hygiene habits must be an intrinsic part of clinical and treatment practices (Benton, 2007).

Keywords: Hand hygiene, Hygiene compliance, ADA rules, WHO guidelines, HH interventions, Hand sanitation practices.

نبذة مختصرة

من خلال تطبيق سياسات وتدخلات أفضل. يعد الالتزام الكامل (HCAI) يمكن الوقاية من العدوى المرتبطة بالرعاية الصحية كان الغرض من الدراسة .(ماك كاي, 2015) بإجراءات مكافحة العدوى هذه أمراً أساسياً للتنفيذ الناجح للتدخلات التعليمية الحالية هو تحديد ملامح التدخلات التعليمية المنظمة التي تؤثر على التزام نظافة الرعاية الصحية من قبل المتخصصين في الرعاية الصحية داخل المستشفى. كما ركزت الأبحاث الحالية على ممارسة غسل اليدين لجعلها ممارسة منتظمة للرعاية على المستوى العالمي وقد تم استعراض مستويات HCAIs الصحية. وقد تم تصميم الدراسة الحالية في سياق ممارسات تم إجراء بحث إلكتروني على 16 قاعدة بيانات صحية وثقافية ذات صلة ، ومن ثم تم إجراء عملية البحث. HCAIs الامتثال قام الباحثون بتطبيق تدخلات متعددة المزايا في دراسات .(جولدرينك 2017) (قدم البحث العديد من الاستراتيجيات والأفكار مختلفة وتم العثور على تدخلات متعددة المكونات بشكل أفضل بالمقارنة مع التدخلات المكونة منفردة من أجل تحسين امتثال تم استخدام نهج التصميم شبه التجريبي للعمل الحالي. هذا ينطوي على التحليلات السابقة وبعد .(سينت أت 2009) HH التدخل. وقد تم تنظيم العمل البحثي الحالي لتطوير التدخل التعليمي المنظم لتعديل سلوك الموظفين الطبيين نحو الامتثال بشكل في المستشفى. ابتكر العمل HH أعطت الدراسة نهج تدخل لقياس الامتثال .(روسو 2009) أفضل لقواعد الإصحاح اليدوي الحالي طرق لجعل ممارسات غسل اليدين جزءاً مميزاً من أنشطة الرعاية الصحية للعاملين في المجال الطبي. أدت برامج التدخل والتدريب والتعليم وإعطاء مرافق سمو وذكريات سموه إلى تحسين ممارسات الصحة والسلامة. وفي الوقت الحالي ، فإن هذه التدخلات المصممة وفقاً لقواعد منظمة الصحة العالمية جلبت الوعي بشأن امتثال الصحة الإيجابية في المناطق النامية والمتقدمة. يجب أن تكون عادات النظافة اليدوية جزءاً لا يتجزأ من الممارسات السريرية والعلاجية (بنتون ، 2007)

HH ، إرشادات منظمة الصحة العالمية ، تدخلات ADA الكلمات المفتاحية: نظافة اليدين ، الالتزام بالنظافة ، قواعد ممارسات

الصرف الصحي .

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List of Acronyms

HH	Hand Hygiene
HCAIs	Health care associated infections
ICU	Intense care unit
CAUTI	Catheter-associated urinary Line infection
HCW	Health care worker
WHO	World health organization
MRSA	Methicillin resistant Staphylococcus, Aureus
MDRO	Multi-drug resistant organisms
MSSA	Methicillin-sensitive Staphylococcus Aureus
HHC	Hand hygiene compliance
RCT	Random control trails
ITS	Interrupted time series
CBAs	Control before and after trails
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
NICU	Neonatal Intensive Care Unit
ADN	Associate degree in nursing
LPN	Licensed practical nurse
SPSS	Statistical Package for the Social Sciences
TDF	Theoretical domain framework

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IMPACT OF EDUCATIONAL' INTERVENTIONS THAT LEAD TO THE COMPLIANCE WITH HAND HYGIENE GUIDELINES FOR HEALTHCARE PROFESSIONALS WITHIN A HOSPITAL CARE SETTING IN ABU DHABI. THUS, REDUCING THE NOSOCOMIAL' INFECTIONS

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

The significance of hand sanitation or Hand Hygiene (HH) in medical history to limit nosocomial infections in the hospital settings was first time recognized by Semmelweis late in the nineteenth century. Since then, there is a continual advancement in hand hygiene practice and numerous sanitizing methods have been introduced to reduce microbial infections (Benton, 2007). Currently, almost all the hospitals worldwide are equipped with basic HH facilities and healthcare professionals are aware of its importance in their daily routines (Hinkin, 2002). Hand sanitation is mandatory for the removal of microorganisms that negatively affect human health. Infectious' hands have numerous microbes which are invisible to the human eye. During patient contacts, skin is occupied with harmful bacteria and viruses forms (Allegranzi et al., 2013). Infected medical tools, patients, and medical staff are the source of microbes. Hand washing practice with antiseptic soaps removes these microbes.

Research has determined that particular resistant microbial strains cannot be removed through simple HH practices (Macbeth and Murphy, 2012). Health care professionals come into contact with different surfaces and objects which may have fluids, mucous substances, rotten food particles and patients' body and skin cells etc. During the patient's check-ups and treatments, pathogens colonize their hands like Clostridium difcile strains, Enterococcus, Candida and many other microbial species strains. HH practice usually involves hands cleaning in a proper way before and after patient handling, and thus, inhibits HCAIs transmission from infectious hands (McCay, 2015). HCAI infections cause serious diseases that have economic pressure on the patient and the medical sector. This trend has been observed at the universal level. HCAI infections are usually caused by pathogens such as Saureus, Enterobacter, Klebsiella, Streptococcus pneumonia and Klebsiella pneumonia spp. Etc. HH practices are the most important consideration for reducing emerging infections. It has been found that unavailability of gloves, gowns, aseptic soaps, alcohol rubs, sinks, soaps, paper towels and other HH facilities are

the hurdles in performing hand sanitation practices to achieving high compliance levels (Russo, 2009).

HCAIs have been found of urinary, pneumonia, and surgical origins infections. American Guidelines 2002 reported 300,000 HCAIs types and their imposed costs have been estimated to about £1.5 billion a year in U.K (Randle, Firth and Vaughan, 2012). Disease Control Centers mentioned in 2002 that compliance to HCAI guidelines was only 45% and lack of knowledge, time, and departmental or personal priority influence compliance rate. Different healthcare units have varying compliance rate and settings. The requirements must be assessed to develop educational interventions by considering current trends, compliance rates, and resistance factors to perform HH practices. Studies suggest that high compliance rate has reduced HCAIs infections rate in U.K (Lukacsko et al., 2013).

Before developing educational interventions program, all the basic components must be recognized and organized to develop transferable, knowledgeable and successful interventions for better compliance rate with hand hygiene guidelines in the hospitals (Rameswarapu, K and Valsangkar, 2015). Countries have developed health system policies and now the research has opened the ways to focus on HCAIs for better patient care. Due to HCAIs infections, mortality rates have been increased because patients already suffering from other health diseases when exposed to such infections, their immune system lose the power to combat with existing and emerging diseases and it further makes them vulnerable to other diseases. It hampers medicinal intake. In this way already running treatment process is hindered (McKenzie, 2012).

HCAIs are preventable, but negligence in its management has pressurized the healthcare sector at the global level and particularly in the ICUs the situation is worse. HCAIs are classified as a central line or blood infection, catheter-related urinary Line infection or CAUTI, ventilator-related pneumonia that patients are exposed to during Medical care and in surgical units. HCAIs are hazardous for patient health safety. HCAIs are the major reason of death in US and data shows that above 91,000 fatalities occur every year due to it. The economic pressure of HCAIs was found above than \$42 billion a year. They have affected mortality, mental health, and the economy at the global level. Few European regions have reported 16.6 million additional patient hospitalization stays on annual bases due to HCAIs. There is a need for HH basic strategy to limit HCAIs infections (Schwappach, 2018).

The study found that medical personnel has basic knowledge of HH compliance to limit germs spread. HCW or medical personnel team is comprised of therapists, ancillary staff, physicians, technicians, and nurses. They transfer germs to patients in critical illness in ICU. HCAs cause a high rate of patient's readmissions and high rate of hospital expenses (Russo, 2011).

1.2 PROBLEM STATEMENT

Healthcare-associated infections (HCAI) can be prevented by applying better policies, applications, and interventions of knowledge. Proper following and adherence to these infection control procedures are mandatory for the successful implementation of educational interventions and training. WHO has given guidelines for HH compliance and development of the educational intervention. Studies have suggested that Implementation of these hand hygiene rules through educational interventions would be helpful in the significant enhancement and continual improvements for hand sanitation compliance in the healthcare sector. Studies have given the evidence of reductions in the spread of HCAI that has controlled morbidity and mortality levels (Allegranzi et al., 2013).

Currently, limited research was found on educational interventions to determine its effects on compliance rate with hand sanitation guidelines and reduction in patient infections as a result. Similarly, few studies were found to focus on the parameters to improve the hand sanitation compliance. However, enough literature was found on how to reduce HCAI infections. The current study has addressed this limitation to developing the base for strategic educational intervention that opens up the ways for further research (RN et al., 2017).

1.3 THE AIM OF THE STUDY

The aim and purpose of the current study was to determine the features of structured educational interventions that impact the compliance of hand hygiene by healthcare professionals within a hospital setting.

Educational interventions will improve the compliance with hand hygiene practices and it will result in the reduction of nosocomial infections. The current work has devised the ways to make hand washing practices a peculiar part of medical personnel health care activities (Bellaard-Smith and Gillespie, 2012). Current research work is also focused to make hand washing practice

a regular practice for the healthcare professionals to make them competent at hand cleansing and to find hurdles that hinder this practice to become the activity of everyday compliance (McGoldrick, 2017).

Quasi-experimental design approach has been used for the current work. This involves pre and post-intervention analyses. It considered the sample of 20 registered nurses.

An electronic search of 16 relevant health and educational databases was performed and then augmentation of this search using hand searching of high-yield journals and screening of reference lists of papers and relevant systematic reviews was done. The search incorporated a number of strategies, combining index terms and free text words. Mufraq hospital and Lifecare Hospital provides quality services of healthcare in Abu Dhabi. These hospitals have been considered for the current study intervention (Schwappach, 2018).

Theoretical consolidation of current research suggests how it would be helpful to generate the current research. It has been considered as the base for developing the methodological framework of current research. Research studies gave different practical implications and patterns to improve HH compliance level in the hospital setting. These approached can be integrated to develop the framework of intervention for the current study (Russo, Pittet and Grayson, 2012).

1.4 RESEARCH QUESTIONS

The research study is based on evidence to support the given research questions:

Will educational interventions improve the compliance of hand hygiene resulting in reduction of nosocomial infections?

Research Question 1: How to ensure hand washing practices become intrinsic within professional personnel within healthcare practice?

Research Question 2: Why would healthcare professional could be competent at washing their hands but not translate this practice into an everyday compliance?

For the current study, 16 reviews of the studies have been performed. Studies have been conducted in different countries and research approach for intervention to promote HH practices among medical personnel has been considered to develop precise intervention programs for current research work.

For data analysis, six months based intervention program was designed. Doctors and nurses were asked to voluntarily participate in it. It was non-randomized research approach, anyone could participate. Ten doctors & ten nurses were selected for the quasi-experimental study design approach. The two hospitals Mafraq & Life care in Abu Dhabi were selected as study area.

Current research work has been organized to develop structured educational intervention to modify medical staff attitude towards better compliance of hand sanitation rules. Results must give the measures for aseptic treatment, staff attitudes and better compliance with sanitary regulations. Studies gave an interventional approach for HH compliance measurement in the hospital. Compliance facilities that were non-randomized or randomized trial based studies, only authentic, updated and published papers were considered for the current work.

Literature suggests that individual components were not evaluated for interventions to determine the effect of hand sanitation in hospitals. However, authors have reported multi-featured interventions and multiple conclusions (Polat, Parlak Gürol and Çevik, 2011). Interventions with practicing techniques were found to have a high influence on compliance rate. Multiple component intervention was found better as compared to single component interventions in bringing change in attitudes (Randle, Firth and Vaughan, 2012). Continuous and regular intervention programs brought more improvement as compared to single component interventions in bringing Change in attitudes. Data has given the measures on time management and booster training sessions to refresh the knowledge and to get the feedback to make a hand sanitation compliance a regular practice (Jolliff and Reed, 2017).

1.5 HYPOTHESIS

Following the hypothesis can be proposed for the current study to support the research questions and to fulfill the research objectives.

- Educational interventions will improve the compliance with hand hygiene practices and it will result in the reduction of nosocomial infections.
- Current research work will find the ways to make hand washing practice a regular practice for the healthcare professional to make them competent at hand cleansing.
- Determination of hurdles that hinder this practice to become the activity of everyday compliance can improve the educational intervention strategic approach (Bellaard-Smith and Gillespie, 2012).

1.6 THE SIGNIFICANCE OF THE STUDY

The current study will determine the features of structured educational interventions that will boost the compliance of hand hygiene activities for healthcare professionals within a hospital setting. Educational interventions will improve the compliance with hand hygiene practices and it will result in the reduction of nosocomial infections. The current work has devised the ways to make hand washing practices a peculiar part of medical personnel health care activities (Allegranzi et al., 2013). Hand washing practice as a regular practice for healthcare professional will make them competent in hand cleaning activity. The study will highlight the hurdles that create complications for this practice to become the activity of everyday compliance. In this way, it would be helpful to consistently and sustainably maintaining this practice. It will enhance the compliance with sanitation guidelines.

Moreover, combining intervention with surveillance, reminders, incentives, checklists, feedback, and audits will bring more improvement. Regular sessions would be helpful in maintaining the high compliance rate. These interventions must focus on areas having poor compliance practices (Macbeth and Murphy, 2012). The researcher must consider feedback for performance evaluation during intervention training. UV technology introduction in intervention will improve the compliance and sanitation practices. Hand hygiene habits must be an intrinsic part of clinical and treatment practices and internal staff can better design and implement that intervention. It is also important to evaluate and assess the reasons for non-compliance so that hygiene interventions can be designed accordingly. By educating and training the staff, HCW attitude can be improved and they can be motivated for better compliance. It will reduce HCAIs infection rates.

Numerous steps have been taken to deal with HCAIs at the global level. Healthcare Institute has initiated a 100,000 and 5 million Campaign to save the lives in 2016. More than 41 countries are supporting WHO for HH campaigns. Other campaigns were based on multimodal framework to control HCAIs. Studies show an overall reduction in HCAI s in ICUs, but there is a need for further improvement. Statistical data records of HCAIs from 2009 to 2014 have shown no modification in infection rates (Polat, Parlak Gürol and Çevik, 2011). The WHO campaign on hand cleanliness was focused to bring educational awareness for HH practices. It will also reduce the economic health sector financial burden and would save more than \$2.81 million rupees annually (LOBO et al., 2005). The current study will contribute to reducing HCAIs and it

will control death and disease rate which would be helpful in limiting associated financial treatment costs for patients and the healthcare sector. The study also highlighted the importance of global gloving basic requirements, needs, and settings with the focus on hand sanitation after gloves or gown removal (Randle, Firth and Vaughan, 2012).

1.7 RESEARCH STRUCTURE

Current research work has been divided into five chapters: introduction, literature review, methodology, result analyses and discussion, conclusion and finally references.

1.8 Theoretical foundation

HAIs impose serious threat for patients' health and also results in financial loss & even deaths. Improper patient treatment diagnosed with nosocomial infection causes longer hospitalization and further spread of disease to other patients. Therefore, it was found important to guide medical personnel to carefully handle such patients with extra care. WHO guidelines have been considered to develop hand hygiene intervention to improve nursing practices of handwashing and cleaning for better compliance (McGoldrick, 2017).

Theoretical framework of study is comprised of a review of different studies related to HH practices and different educational training programs. Previous studies were a lack of individual features description for successful educational intervention for sanitation practices. In this study, educational interventions to promote hand sanitation habits among medical staff have been developed. Qualitative and quantitative data analysis suggested that HH practices improved after intervention sessions (Lukacsko et al, 2013).

CHAPTER 1: INTRODUCTION

Introduction part has following sections: Background, research problem, study purpose, research question, hypothesis, research significance. Background part has described the concept of HCAs in terms of its nature, types, causes, and preventive measures. Current trends have been described to determine its level of spread at the international level. WHO's guideline framework has been described for better strategic educational intervention development. Research problem has demonstrated the reasons to conduct this study. Current HCAs disease status, previous research

limitations, and future considerations have been deliberately described under this section. The study purpose was to devise ways for better HH compliance among healthcare professionals and to find hurdles in its compliance. Hypothesis part has described that desired outcomes can be achieved by taking particular pathways. The final section, research significance has described the study need to reduce HCAs and its' economic and research implications have been covered in this section.

CHAPTER 2: THE LITERATURE REVIEW

Conceptual analyses section cover study concepts background, and current HCAs practices at the global level. The theoretical framework has covered the theme of the research study. This section has described HCAs compliance levels in the context of WHO guidelines. Review of studies has the summary of selected works of literature based on previous HH practices and future aspects for more evaluation. Further elaboration section has described the studies limitation and mechanism to conduct further research. Moreover, WHO and other governmental efforts have also been discussed. Theoretical consolidation suggests how it would be helpful to generate the current research. It has been considered as the base for developing the methodological framework of current research.

CHAPTER 3: METHODOLOGY

Quasi-experimental design approach has been used for the current work. This involves pre and post-intervention analyses. It considered the sample of 20 registered nurses.

An electronic search of 16 relevant health and educational databases was performed and then augmentation of this search using hand searching of high-yield journals and screening of reference lists of papers and relevant systematic reviews was done. The search incorporated a number of strategies, combining index terms and free text words.

CHAPTER 4: RESULTS ANALYSES AND DISCUSSION

This section has previous studies analytical and comparative table to devise the best strategical approach. SPSS tool has been used to find the significance of pre and post intervention results. It was the quantitative data analyses

Qualitative data analyses were performed to get in-depth views of participants to find the hurdles in HH compliance levels.

CHAPTER 5: CONCLUSION

Increase hand hygiene compliance will decrease the risk for nosocomial infections, yet proving the efficacy of structured educational interventions in changing a particular practice.

CHAPTER 6: REFERENCES

CHAPTER 2: LITERATURE REVIEW

Hand sanitation or Hand Hygiene is necessary to remove microbes which affect human health or have the tendency to harm them. They are not visible to human eye. Dirty hands have plenty of such microbes. Hand washing with antiseptic soaps removes these harmful microbes without impacting the hand skin. During patient contacts in the hospital setting, skin is accumulated with various forms of harmful bacteria and viruses (Randle, Firth and Vaughan, 2012). Contaminated appliances, infected patients, and medical staff such as doctors or nurses become the source of microbes. HH sanitation practices can remove and kill such microorganisms. The study found that special foras' strains reside deep in the skin and through simple HH practices, they cannot be removed (Luangasanatip et al., 2015).

Health care professional's hands are the major source of germs transmission. They had to touch different surfaces and objects which have body waste, fluids, mucous substances, rotten food particles and patients' body and hand skin cells, and various articles. Medical staff particularly doctors and nurses, have to perform health care related tasks. During the check-ups, treatments, and operations, various strains of pathogens colonize their hands, these may be drug defiant like Clostridiumdificile strains, gram-negative bacteria germs, Enterococcus, S.aureus, and Candida microbial species (McGoldrick, 2017). Good HH practice mostly involves hands cleaning in a proper way and exact after treatment or check-up has the tendency of inhibiting HCAIs transmission due to infectious hands that are colonized by the pathogens and other microbial strains. HCAI infections cause serious diseases which significantly have economic consequences for patient and healthcare department at the universal level.

HCAI infections are majorly caused by pathogens like S.aureus, Enterobacter, Klebsiella, Streptococcus pneumonia, Pseudomonasaeruginosa, E.coli, Acinetobacter, Proteus spp., Citrobacter, Serratia and Klebsiella pneumonia spp. HH practices have been observed as low but these are the most important consideration for managing emerging infectious disease burdens. Drug defiant microbes pose a challenge for healthcare sectors because it causes many issues and

patients problems (McCay, 2015). In the current study, there were the efforts to develop and apply educational intervention model to enhance HH practices among nurses. The systematic review of other research studies helped to devise the appropriate intervention framework. The study found that about 35% health department professionals reported infections of dermatitis, and 86% complained about skin related problems after patients contacts. Studies reported deficiency of gloves, gowns, aseptic soaps, alcohol rubs, and sinks, soaps, paper towels and aseptic hand washers inhibited the hand sanitation practices (McGoldrick, 2017).

2.1 BACKGROUND

Nosocomial infections or HCAI spread due to poor treatment practices and negatively affect hospitalized or discharged patients within 50 hours of exposure. Infections are usually transmitted from health care providers like doctors and nurses to the patient during patient care due to physical touch or through gloves, needles, and other operating equipment. Nurses' hands become contaminated with *Klebsiella.spp* germs during the patient lifting, checking pulse rate, oral temperature, and blood pressure, or physical check-up of a patient (Luangasanatip et al., 2015). *Clostridiumdifficile* and *Staphylococcus, Aureus* are the organisms that were reported in patients that had been transmitted through physical contact. HCAI were found urinary, pneumonia, and surgical parts infections. Germs were also found to be transmitted through a ventilator and other hospital equipment (Randle, Firth and Vaughan, 2012).

American Guidelines 2002 reported 300,000 HCAs and their associated costs of £1.5 billion a year in U.K. Disease Control Centers mentioned in 2002 that compliance to HCAI guidelines was only 45% and lack of knowledge, time, and departmental or personal priority influenced compliance rate. Different healthcare units have varying compliance rate and settings. ICU units were observed with the poorest rate of compliance with HCAI guidelines (McGoldrick, 2017). WHO has recommended a framework for educational intervention based on contemporary statistical data and expert views. Different studies have been carried to apply different intervention models to determine the possible better outcomes. Studies suggest that high compliance rate with hygiene guidelines has reduced infections spread in the U.S and U.K. The requirements must be a modification in the current hand hygiene practices, interventions and must consider current trends, compliance rates with guidelines and resistance factors to comply with them. Before developing educational interventions program, all the basic components must

be recognized and organized to develop transferable, knowledgeable and successful interventions for better compliance rate with hand hygiene guidelines in the hospitals. Therefore, intervention model must consider these variables like resources to invest in HH essentials; gloves, aseptic detergent, etc., monitoring tools and time etc. All the countries have health system policies. HH practice has been found fundamental, but its implementation and regular advancement have usually seemed difficult because proper compliance needs health workers training and education in this regard. The training sessions and regular monitoring mechanisms as the component of the intervention model and greatly increase compliance level. Hand sanitation practices can prevent HCAIs infections along with drug defiant viral and bacterial strains (Luangasanatip et al., 2015). Above 16% of hospital admitted patients who developed diseases due to HCAI infections. Due to these infections mortality rates have also been accelerated.

Patients already suffering from other health diseases when exposed to such infections, they face the reduction in their immune strength and become vulnerable to other diseases. It also hinders the use of requisite medicines and obligatory tests. In this way, their treatment success is hindered which puts them at the risk of death.

2.2 THEORETICAL FRAMEWORK

HAI infections have found as the high threat for patients and above 1.6 million annual costs are imposed by HAIs in U.S. Significant rate of deaths has also been recorded due to HCAI infections. Patients that were given Staphylococcus aureus methicillin defiant Or MRSA medicine doses caused an increase in hospitalization stay and death rates as opposed to those Patients who were not given such medicines. Disease Prevention centers gave guidelines and a 2-tier mechanism to control the infection and precautions for prevention (Randle, Firth and Vaughan, 2012). These precautionary measures are failed due to multiple factors like patients only receive medicine or precautions after they are recognized with disease resistant or infectious organisms/MDRO disease. Then, control cultures are considered to use for MDROs, but it is a costly method of control. WHO in 2009 gave hand sanitation guidelines and proper following of these guidelines in hospital settings can significantly reduce HCAIs and research studies will support this statement. Feedback and audits can inhibit the spread of HCAIs. Feedback, audits for assessment, education and training were the basic elements of WHO hand sanitation strategy. Hand sanitation guidelines are very complicated to implement in the global gloving framework for better compliance (McGoldrick, 2017).

Safdar in his research paper said that educational interventions can reduce HCAI infections. Mathai et al in 2010 discussed educational interventions for hand sanitation but did not describe the compliance level. He said that Healthcare-associated staff education positively influences hand sanitation practices. Aboelela, et.al in 2007 discussed the effectiveness of HCAI prevention through proper hand hygiene guidelines and intervention strategies. He described different educational training programs with a focus on quality enhancement, feedback and, compliance and monitoring to develop a hygiene agreement. Current studies lack in individual features description for successful educational intervention for sanitation practices. The current study was carried out to find the effective individual components for educational interventions to enhance hand sanitation habits among medical staff in clinical and hospitals. Group sizes must be comprehensive to get more accurate, generalized and specified results.

Professionals' behavior and motivation level also needed to consider in this regard. Intervention pre and post comparisons and compliance measurement are needed with proper follow-ups. Different delivery modes also give a base for research in the future (Lukacsko et al., 2013).

WHO model of Hand Hygiene:

WHO gave HH guidelines in 2009 to promote HH compliance levels in the hospital and clinical settings for nurses, doctors and management authorities. The purpose was to inhibit the spread of infections through contaminated hands. Experts in Geneva met to decide the best framework, evidence-based reforms and recommendations. They incorporated CDC guidelines 2002 of HH practices. WHO document mentioned all hand cleaning products. They talked about behavioral reforms, educational tools, hand antisepsis guidelines, gloving, hand washing, patient awareness, cultural aspects, monitoring, policies and accreditation, campaigning etc. Trough IT graphics, they presented the germs transmission criteria, possible preventive measures, and their effectiveness. Experts suggested the use of particular antiseptic chemicals like Chlorhexidine, Chloroxyleneol, Hexachlorophene, Iodine, iodophors, and Triclosan with their strong antimicrobial activities. The document contained detailed guidelines for hand preparation before surgical operations that was alcohol-based hand washing and rubbing with graphical presentation. Implementation involves training, monitoring, and reporting. WHO gave key moments of hand washing with proper hand washing steps. These moments are before patient touch, before cleaning procedures, after exposure to fluid, after patient touch and patient surroundings. The model components have been applied in the current study to aware,

implement and monitor staff behavior after and before education intervention. Intervention is also based on WHO principles of HH.

2.3 Review of works of literature

The literature review of different HH research papers shows different cleaning methods, intervention approaches, monitoring mechanisms and overall improvement in behaviors of medical personnel to determine the compliance level. It will help in devising the best possible educational intervention for the current study with the general trends. Gloves use to check all in terms of universal or global gloving has been proposed in several research studies to inhibit infection spread. It was said that gloves might have infectious organisms and they must be disinfected, sterilized and re-changed before any patient contact.

A study was conducted in the hospital care units and follow-up time limit was adjusted for about 7 months. The study did not mention group participants' numbers or size, moreover, the quality point was also found missing in healthcare settings. Research considered pre and post-intervention feed-back and effects on hand sanitation practices. The study found high Compliance and glove usage after universal or global gloving in ICUs in hospitals of Japan. Results suggested that compliance rate increased from 16 % to 55 % within 5 weeks of intervention. With time, few staphylococci incidences were reported and universal gloving trend also deceased. It was found difficult to adjust universal gloving system. Feedback was found important for better compliance (Randle, Firth and Vaughan, 2012).

Universal or global gowning or gloving trend can spread such as MDROs. Reports and studies have determined lower adherence rates with glove and gown usage and hand sanitation practices. MRSA incidences forced universal gloving application in hospitals. Gloves were also found protective for healthcare staff or HCWs from MDROs contamination. Harris et al reported a reduction in MRSA to about 45% in more than 21 surgical m ICUs in USA hospitals. Yinetal said that blood-related infections and transplant units were reported with lower rates of bacterial and viral infections in ICUs after gloving trends. Girou, et al., said that improper removal of infected gloves and gowns has a great chance of transmittal of infectious organisms to patients and even co-workers. Thus the appropriate mechanism for gloves removal and re-changing with precautionary hand sanitation guidelines was found mandatory for successful gloving. The study

was carried out to determine hand sanitation practices and gloving mechanism. Observational and feedback approach was considered to analyze after intervention effects. They considered sanitation compliance, glove wearing and rate of MRSA occurrences. . [It brought reforms and suggests to integrating it in developing an intervention model to promote the awareness of compliance with this precautionary practice.](#)

The study was carried out in Geneva ICU hospital units. Hospitals rooms were found to had Gel dispenser with alcohol, sink having soap with antibiotic properties, alcoholic hand rub and paper swabs were also found there. Separate Computers, desks, graph machine, gowns and disposable gloves, and racks were found for all the rooms. MRSA screening facility was also available. Nursing behavior was under observation for patient contact, before body fluid exchanges, and gloving compliance. The study held WHO guideline training sessions for half hour duration. Hand sanitation techniques and participants feedback were considered. Results found that registered nurse with infection control Masters' level qualification were more aware of WHO's principles and guidelines of hand sanitation. Glove number and used gloves estimation gave the compliance rate for universal gloving. MRSA incidents were recorded by considering and comparing MRSA-diagnosed patients with patients' numbers admitted in ICU.

Their investigation found that hygiene could be improved by more than 6,051 ways. Hand rubbing was found as the most effective way of hand sanitation practice. It brought an improvement level from 6.6% to 6.7% as compared to hand washing that only contributed from 9.5% to 15.1% germs sterilizing (Schwappach, 2018). Unchanged gloves practice especially during body fluid handling and missed washing or rubbing of hands after glove change were found the basic reason of noncompliance ([Akanji, Walker and Christian, 2017](#)). During these findings, educational' intervention training was designed to address the consequences of unchanges gloves. The study observed that with the passage of time compliance rate increased but gloving compliance reduced. Moreover, the study showed MRSA occurrence also reduced during training sessions. Studies purpose of the intervention was to limit HCAI infections, MRSA, or MDROs infectious diseases (Awoke et al., 2018).

The study revealed that MRSA decrease was associated with HH compliance. As the hand sanitation increased, global gloving decreased. Studies show glove usage reduced hand hygiene because the staff was found to keeping the gloves after treatment, or their glove unchanging

behavior was the reason of noncompliance. It shows the perception of HCWs' that hand sanitation is more helpful and effective as compared to universal or global gloving. Study intervention program was based on stepwise training, education, and feedback. The study highlighted the association between reduced rate of gloving and MRSA for properly designing of the training session (McGoldrick, 2017). This study gave the intervention model, its implementation and evaluation. It proved effective disease and infection control. It suggests that how an effective intervention model can bring reforms in better HH practices.

Study was carried out to compare the surface cleanser effects and reduction in HAI infections. Table surface antimicrobial compliance was found tough to obtain and monitor because of this process was not centralized. However, CPD reprocessing was found attainable to maintain better outcomes. Electronic-based appliances or tools have been employed by IPC for proper monitoring of compliance. IHP cleansers have been found to inhibit contamination of table, desks, and shelf surfaces in the hospitals but limited data was found to determine the effects of such inhibitors on controlling the HAIs (Lukacsko et al., 2013). The four wards of patients were considered. The wards were disinfected with IHP or Quat on regular bases. Rooms were also had touch surfaces with fluorescent' markings and disinfected with Dey-Engley sterilizers. Hospitals data was analyzed for pathogen's attacks. Statistical analyses determined that disinfected surface with IHP had 14.0 microbial level as compared to Quat disinfectant 22.1 microbial level. IHP controlled the microbial growth to the higher level than Quat. Composite occurrences of nosocomial organisms were less with HP than Quat wards (Longuenesse et al., 2017). This intervention model used IHP cleanser, and four patients' wards were considered. This disinfectant can be used as an applicant agent for disinfecting surfaces in the medical and non- medical health facilities

Hospital Department of Infection Prevention or IP measured hand hygiene HH practice differences and compliance levels in different departments (McGoldrick, 2017). IP unit trained their staff to voluntarily audit HH practices when treating patients based on the WHO rules. Volunteers were given Ovel technological HH monitoring and narrating appliances. IP personnel along with volunteers recorded all the variables under observation in different departments (Kaur, Razez and Seale, 2016). HH compliance considered rubbing, washing, or noncompliance trends. This study was conducted in 2015. Auditors determined 28% HH compliance rate in

some departments while some departments showed about 57 % HH compliance levels. SPSS t-test was applied to compare data, which gave the $p < .01$. It suggests significant variations among HH compliance levels.

Irregular HH practices were the great reason for hospital-based infections. The study was carried out during which a wireless Sensor was employed to increase HH constancy before entering or leaving the room that specifically needed infection control guidelines (M Assiri, 2013). Electrical audio signal reminded for better HH adherence and in this way, it reduced the occurrence of hospital-associated infections. This proposed study had pre and post-intervention programs. Baseline HH practices for patient contact were considered.

The author used the wireless sensor for HH enhancement in patient rooms that specifically required safety measures (Monnet and Sprenger, 2012). On entering and leaving the room, the sensor delivered an audio signal for hand washing, and hand sanitation compliance was recorded. Measures were taken before and after the intervention program and approximately 125 measurements were considered. The study found that during baseline observation, and without sensor signals, only 8.4% staff rubbed hands, while 92 % ignored it. Device increased the compliance level to 50 % while 50 % did not follow it and did not wash hands before the entrance and leaving the room. SPSS analyses were performed to determine pre and post-intervention effects significance. The significance level was ($P < .001$), which determined that ten-fold increment level for HH compliance (Awoke et al., 2018). This intervention model is also based on WHO HH guidelines. It brought reforms in HH compliance.

The researcher conducted a qualitative study to analyze patients for C.difficile. Patients who were given laxatives and softeners to ease constipation were checked for the strain Clostridium difficile infection or CDI. Awareness level for C. difficile was also considered. Responses were coded in thematic forms. Results showed that 200+ patients were tested for C.difficile during the observational period. Among them, 17% got laxatives for softening the stool before the test. Nurses gave various testing reasons. The study suggested that education intervention must consider focusing on reducing the Testing levels for patients who were getting such medications (Kaur, Razee and Seale, 2016).

The study was conducted to determine the nurses HH practice and aspects that impede HH sanitation in Hospitals of Ethiopia. Observational based study was designed for the set time

period. About 115 nurses were observed working in the critical patient's section, Pediatrics, Medical, maternity ICU and Surgical wards. The checklist was designed to assess all the observatory components and questionnaires tool was considered to gather the data. WHO' guidelines were considered in devising tools which were comprised of socio-demographic and HH-related questions. After performing nursing duty, nurses had the opportunity to clean their hand and their HH action was recorded. If performed or missed, both actions were noted and at the end, compliance level was determined by considering HHA (action) and HHO (opportunity). Training was given for observation and data collection during work hours. To eliminate the Hawthorne effect, the observers kept the study procedures secret. In the end, the questionnaire was given to them to find the issues that influence HH compliance for nurses. Epi software and SPSS was used for Data analyses.

Frequency and standard deviation gave the better understanding of results (Kuruno, Kasahara and Mikasa, 2017). Above 111 Participants were found that had the compliance level of 18.6%. Compliance level was high during night shifts and in the ICU ward. HH was carried out with washing soap and alcoholic hand rub usage. Questionnaire responses were evaluated, and a major cause of HH hindrance was found that was the absence of training and inaccessibility of sink and other HH facilities. Some reported time shortage to perform the action (Monnet and Sprenger, 2012).). This was quantitative data analyses of data. This model of intervention allowed in-depth data analyses to determine future aspects. The study was conducted to assess the degree of HH practice to develop an intervention for infection control strategies (Park and Kim, 2012). Different countries were considered to acquire their HH behaviors to get the appropriate practicing criteria as a general approach. Results from different study areas were compared and the study areas were Istanbul, India, Nigeria, South Florida, Saudi Arabia and Kuwait. It was to determine the practices of HH and to develop the best strategy for better compliance with HH guidelines given by WHO (Polat, Parlak Gürol and Çevik, 2011).

Different nursing behaviors were found that were due to different demographic characteristics such as age factor, knowledge and experience level, work pressure, and departmental facilities such as HH resources (McKenzie, 2012). Different studies indicated that hand hygiene practice and compliance rate were low in Taiwan, Northern India, and South Florida. Gonder had higher compliance rate than other comparable areas. Cleaning methods and access to facilities were found important to meet the set compliance framework. Similarly, lack of training,

awareness, and knowledge regarding the WHO rules was also the hurdle in HH compliance. Socioeconomic variations among countries contributed to variations in the results. A major part of the study was conducted in the ICU parts (RN et al., 2017). The compliance rate was also high in the ICU wards like 23 %, while the lowest was in emergency section 15%. Surgical, maternity and pediatric units also had some sort of awareness about it. The HH Five components WHO also had been used during the training part (Longuenesse et al., 2017). Variation in compliance was observed on monthly bases. NICU unit showed the least increase in compliance levels. There was a non-uniform trend was observed but it sustained over a long period of time. More than 2639 studies were screened by the author, while among them only 140 was according to the criteria. Thus, he selected above 50 for the current research paper. Compliance data were taken from studies for comparative purpose and analyses (Gill et al., 2009).

Meta-analysis was used for the comparison of the effectiveness and reliability of multiple strategies and resultant outcomes for direct analyses of HH compliance level with set hygiene guidelines. More studies encountered the whole hospital, and few were limited to specific wards such as ICUs, surgical wards etc. Some studies have been from developed countries and some are based on developing world healthcare systems. Study time has one to six years of the intervention period. Interrupted designs of programs were for evaluation trials to devise the intervention strategy accordingly. Studies considered WHO-5 components (Schwappach, 2018). HH practices, events, HH products usage, and checklist Biasness issues and improper sequences, remained the issues. Interrupted pattern studies were affected by the mid-program interventions like one study involved chlorhexidine hand cleaning program initiation, which suddenly gave higher outcomes. A study was performed in about the 57 wards of Netherland' hospitals. Results suggest that Compliance increased after the programs from 13% to 45% and practical sustenance and maintenance rate was more than seven months (Kaur, Razei and Seale, 2016).

Similarly, the randomized trial based study was carried out for individual education program vs baseline practices in China. Results determined HH compliance level with 35 % improvement rate. The study compared the effectiveness of different strategies such as no intervention, WHO-5, WHO-5+ and single intervention. Comparison of WHO-5+ and WHO-5 interventions showed effective outcomes and additional benefits as compared to single and no intervention based strategies (Smiddy, 2016). On research study developed an intervention that considered patients

shifting and ward washing and sterilization. Grayson, Australia and Victoria regions reported such interventions. MRSA levels were found lowered during the inspection process. Similarly, WHO-5 +, this addition intervention practice was performed in Wales and England and it was said that MRSA cases reduced per day from 1.91 to 0.91 /10 000 beds and in the same way C.difcile levels declined from 16.3 to 9.3 incidents/10 000 beds a day, however, methicillin-sensitive, Aureus, S or MSSA remained unmodified(LOBO et al., 2005). Study determined that MRSA levels reduced by 1% on the addition of each 1mL alcoholic rub, while the addition of 1 mL soap reduced C .difcile microbial infection to about 0.7%. The study also considered European ICUs HH practices and compliance.

Derde reported increased levels of compliance after intervention implementation and MRSA levels were also reduced. Intervention introduced chlorhexidine cleansing mechanism. The study suggested high associated costs for managing the antiseptic materials for all the patients (Phan et al., 2018). The study was performed in Vietnam to view HH compliance as pre and post educational intervention with a quasi-experimental design approach. The medical staff of neonatal ICU and delivery and surgical units was monitored to determine HH practices. A study performed baseline assessment, middle intervention assessment and finally the monitoring of HH compliance levels. More than 206 healthcare staff was considered for HH practices and training. They were involved in routine patient's check-ups, anesthetic compounds, and intravenous therapeutic management. Hospitals such as in Vietnam had shown 15% compliance rate that was far below the WHO standard. A study conducted in Vietnam reported a reduction in HCAs from 14.1% to 2% after HH interventions. One intervention employed chlorhexidine antiseptic hand cleaners to inhibit HCAI occurrences in neurological departments. It also reduced wound infections in neurosurgical units to about 55 % rate. Control ward with no such intervention showed an increase in wound infections (RN et al., 2017). By considering this review based research paper, current work also summarized HH related research papers. Different intervention schemes, monitoring, and HH practices were applied. It also determined how reforms can be brought in current behaviors and trends.

HHOs or HH opportunities are the times in patient care management when HH becomes mandatory to inhibit microbes for better compliance. Simple HH educational program was

devised for HCW (Smiddy, 2016). HH related instruction and guidance were mentioned in the session. Video, group discussion, play game, ultraviolet light use for germs detection, practical implementation of HH procedures, HH technique discussion, and comparative analyses of simple soap vs alcohol rubbed hands cleaning were employed mechanisms to train the participants (Pavani and Murty, 2016). It was experience-based technical learning procedure that also demonstrated past HH exercises. Questionnaire tool was used for pre and post-intervention analyses. Results showed improved compliance rates specifically in surgical and delivery wards. Study data determined improved compliance level after intervention like other research studies (Longuenesse et al., 2017). The study was conducted to find the interventions that could promote HHC among medical personnel. The review determined high levels of HHC for nurses and doctors. Studies were based on randomized control test, or RCTs, pre/post studies control tests or CBAs and interrupted pattern sequence, or ITS. RCT strategy gave positive results and 6 M period of practical sustenance. Education was found essential to support the intervention for a longer period.

Electronic alarms and feedback mechanism also improved compliance level. HH is seen as the effective way to combat HCAs (Russo, 2009). Studies found that cultural aspects also lead to compliance with HH rules. The review considered long/ short term interventional effects to enhance HHC in a clinical and hospital setting. For interrupted approach, the time limit must be well defined. Data points and baseline monitoring were also found important features of it. They checked the hand cleansing level and observed the quantity of soap or sanitizer that was used during the intervention process (Kuruno, Kasahara and Mikasa, 2017). Researcher integrated education audits, and feedback to formulate the appropriate strategy (Gould and Drey, 2013). The electronic alarming approach was also considered. Accountability, product accessibility, incentives, goal orientation and unit leaders were also incorporated for the successful strategic approach. In this method, ICU nurses were taken into consideration for the intervention. Observational practice gave baseline data of almost duration of 6 weeks. Interventions were launched after every week. The study showed an improvement in compliance rate to about 94% and the compliance rate reduced after 4 weeks (Bellaard-Smith and Gillespie, 2012). Staff was told about the observation of their hygiene activities and therefore baseline data showed high compliance rates that further improved after the intervention. In one intervention, the HH system was taken for the staff to inform them of HH opportunity. Hand cleanser unit was equipped with

a movable sensor (Phan et al., 2018). HCW was also given a radio frequency determination board and that was able to throw flash light to activate the sanitizing and cleansing system. It worked when HCW came to check the patient and did not stop until the worker performed hand sanitization. It resulted in higher usage of hand antiseptic cleanser than the control group (Rameswarapu, K and Valsangkar, 2015).). For the current research work, the two approaches of data analyses have been used. Complete intervention program was developed and compliance data was gathered.

2.4 FURTHER ELABORATION

Usually, studies were based on an observational mechanism for data collection which may be had Hawthorne effect. However, it gave the general assessment of medical staff behavior (Memish, El-Saed and Tannous, 2009). It also determined awareness level, current practical situation, and thus data reliability can be assessed by considering several studies and statistical analyses. Studies have described the effectiveness and need of HH compliance to limit HCAI in the framework of institutional sanitation guidelines. There are no standards to measure the compliance at the departmental level on regular bases. The observational technique has been set as the standard method for HH measurement of Compliance rate.

However, it was found sometimes costly, defective, and labor demand. Other monitoring techniques were electronic and self-reporting which also had associated risks (Pavani and Murty, 2016). Thus, there was no regular and standard hand hygiene compliance procedure. Numerous steps have been taken to deal with HCAIs at the global level. Healthcare Institute has initiated the 100,000 and 5million Campaign to save the lives. WHO also initiated the campaign in 2016? More than 41 countries are supporting WHO for HH campaigns. Other campaigns were a multimodal framework to control HCAIs. Studies show an overall reduction in HCAI s in ICUs, but there is a need for further improvement. Above 35 % patients in ICU were found with HCAIs infections. Statistical data records on HCAIs from 2009 to 2014 have shown no modification in infection rates. The WHO campaign on Hand cleanliness was focused to bring educational awareness for HH practices. It will also reduce the economic health sector financial burden and would save more than \$2.81 million rupees annually (Russo, 2011). Above 1.5 million hospitalized patients worldwide have struggled with HCAIs associated infectious' diseases. Contact of HC workers who have nosocomial germs is the major cause of microbe's

transmission to the patients and makes them infected or colonized with microbial strains. HH inhibits nosocomial germs infections. According to WHO, the HH compliance level for medical staff was only 41 %.

WHO In 2005 initiated a movement for Patient Safety “Clean Care” to improve and advance HH practices in the medical sector (Kuruno, Kasahara and Mikasa, 2017). This movement is also marked as WHO-5, that promoted five elements of structural change, education and training, feedback or examination, reminders, and safety climate in the hospital setting for HCW inhospitals (Gould and Drey, 2013). Studies also gave the concept of the behavioral amendment for better HH practices in the context of the behavioral theory. WHO-5 and relevant strategies can boost HH practices. The review has considered studies involving quasi-experimental or experimental approach of research design. Randomized and non-randomized trials for control groups, Pre and post-test studies, etc were found to perform the research. Moreover, observation-based analytical data were also found achievable. Published literature has been considered for the current study (Guidelines for Hand Hygiene in Healthcare Settings, 2004). Research studies based on non-randomized approach can better evaluate training intervention.

Pre/ post-analytical studies were found the part of almost all the studies. Interrupted interval study sessions with pre and post-intervention approach placed a solid quasi-experimental study design pathway (Longuenesse et al., 2017). Meta-analysis of different papers allowed to gather and review various strategical approaches to select and devise the most appropriate one. Major issues in this way were detail, quality, delivery and compliance differences. More studies were found to have Hawthorne effect which limits results reliability and gives overestimated compliance analyses. Randomized and interrupted method approaches also need consideration for proper analyses. Finally, it was found that WHO-5 based study intervention as compared to a single approach produced strong compliance behaviors among HCW in the hospitals. Similarly, goal oriented interventions based on reward, accountability, and incentives can bring improvement in WHO-5 intervention accomplishment. Future work must be focused on cost-effective and sustainable approaches for HH compliance (Jeong et al., 2015).

2.5 THEORETICAL CONSOLIDATION

Theoretical consolidation suggests how it would be helpful to generate the current research. It has been considered as the base for developing the methodological framework of current research. Research studies gave different practical implications and patterns to improve HH compliance level in the hospital setting. These approached can be integrated to develop the framework of intervention for the current study (Russo, Pittet and Grayson, 2012).

CHAPTER 3: METHODOLOGY

3.1 DATA COLLECTION METHOD

Quasi-experimental design approach has been used for the current work. This involves non-random sample organization. This does not include control groups and leads to general conclusions instead for the particular population group. The study has two parts; the paper review and other part are quantitative and qualitative data analyses. It involves pre and post-intervention analyses. It considered the sample of 20 registered nurses. Questionnaire tool was used to collect the qualitative and quantitative data from nurses (Hinkin, 2002).

For previous studies, the analytical and comparative table was developed to devise the best strategical approach. For this purpose, an electronic search of 16 relevant health and educational databases was performed and then augmentation of this search using hand searching of high-yield journals and screening of reference lists of papers and relevant systematic reviews was

done. The search incorporated a number of strategies, combining index terms and free text words (Guidelines for Hand Hygiene in Healthcare Settings, 2004).

3.2 EDUCATIONAL TECHNIQUE

Mafraq hospital and Lifecare Hospital in Abu Dhabi were the study areas. Part 2 of methodology below has demonstrated study sample and intervention model. The intervention assessment tool,

The questionnaire was designed with open and close-ended questions. Close-ended questions gave the improvement level in knowledge enhancement after the educational intervention. Open-ended questions were asked related to the effectiveness of educational intervention, its need and hurdles in the compliance with HH sound practices to get qualitative data analyses for in-depth behavioral improvement assessment for continual enhancement.

In quantitative data analyses approach, SPSS tool has been used to find the significance of pre and post-intervention results. For another part, comparative study table was developed to summarize more than 15 research studies to get the sampling techniques and strategical approach to promote HH compliance in the best way. After comparing it, the data was organized to generate the outcomes (Bosek and Shaner-McRae, 2010).

3.3 SAMPLING METHOD

The current research study was devised in accordance with experts HH opinions and WHO guidelines. It would be helpful in minimizing HCAs associated complications. Different studies were evaluated. Current research framework has two parts.

3.3.1 PART 1

During an electronic mode of search, more than 15 to 16 research papers related to health educational training interventions were studied. Then, highly relevant papers' reference lists were seen and paper reviews were further considered to get the research viewpoint. Intervention strategies were evaluated. E- Databases gave educational and clinical data records. Studies published since 2000 have been considered for the current work (Gould and Drey, 2013).

The review has considered studies involving quasi-experimental or experimental approach of research design. Randomized and non-randomized trials for control groups, Pre and post-test studies, etc were found. Moreover, observation-based analytical data records have also been encountered (Phan et al., 2018). Published literature has been considered for the current work.

Elements of interventions for HH promotion can be evaluated in every hospital setting. Structural change refers to the basic infrastructure that has basic facilities such as soap, towels water, and alcohol rub for HH promotion. Training/ Education refers to programs that are based on proper procedures and techniques for HH. Feedback on HH practices is necessary to determine the compliance level (Jolliff and Reed, 2017).

Reminders in the form of posters, charts, verbal clocks, and electronic alarms help to remind hand hygiene indications. Organizational climate in the context of safety measures ensures HH practices. Reward-based Interventions offer rewards for completion of a task to reach HH compliance. That may be financial or non-financial rewards (Randle, Firth and Vaughan, 2012).

Review study was carried out to consider relevant studies evaluation. List of Reference of the included studies for the current study has been critically screened to assess other studies for further evaluation of research methods and intervention plans (Rameswarapu, K and Valsangkar, 2015).

Information and Data source include PUBMED, Springer link, Elsevier, SCOPUS Embase and PsycINFO. The keywords for the search were education, hand hygiene, hospital-associated infections, ICU related infection, compliance, feedback, and training to control nosocomial infection rates (McKenzie, 2012).

The study gave the data on previously performed interventions, sample types of populations, methodologies to perform the studies, and results determination in the framework of study objectives. We also considered interrupted time studies and pre/ post analyses research papers.

3.3.2 PART 2

The study was conducted in two hospital care units. Mafraq hospital and Lifecare Hospital in Abu Dhabi were the study areas. It considered the sample of 20 registered nurses. Follow-up time limit was adjusted for one months. Mafraq hospital and Life care Hospital provides quality services of healthcare in Abu Dhabi. These hospitals have been considered for the current study intervention (Memish, El-Saed and Tannous, 2009). Six months based intervention program was designed. Doctors and nurses were asked to voluntarily participate in it. Before the intervention, the observation was done to find the compliance level and along with it, a pre-test was held. Two-six months intervention was held and after it, the observation was and post-test was held again. Hand sanitation practices, compliance rate before and after the intervention, strategies for

better practices, and management of nature and time have been considered for booster intervention discussion sessions to improve the effectiveness of educational training.

The study revealed that intervention programs involving training, giving HH facilities, and HH reminders improved HH practices. Currently, these interventions designed according to WHO rules have brought awareness regarding the HH in developing and developed regions. Literature has addressed multimodal HH policies which brought effective behavioral amendments.

Quasi-experimental designed research study involves feedback. HH education can be delivered through training, by using videos, discussion, plays etc. Feedback is taken in form of regular and consistent reports.

3.4 LIMITATIONS

Currently, limited research was found on educational interventions to determine its effects on compliance rate with hand sanitation guidelines and reduction in patient infections as a result.

Similarly few studies have been found to focus on the parameter to improve the hand sanitation compliance. However, literature was found on how to reduce HCAI infections. Data was not found in time management, and booster training sessions to refresh the knowledge and to get the feedback to make a hand sanitation compliance a regular practice (Bosek and Shaner-McRae, 2010). Studies were based on non-randomized methods of research, similarly low research quality, Variation among several studies for HH, and proper comparison of interventions were also missing.

The current study has focused on those research paper that is based on quality based randomized and non-randomized research studies. We maintained a comparison control group for proper results evaluations. Most studies were based on direct observation during which compliance analyses may have some variations and errors (Benton, 2007).

The study considered compliance in various wards and accurate monitoring while some limitations were also seen as HCAI were not measured methodically, lack of confidentiality in claiming that HH-associated infections reduced. There is a need for the inclusion of diverse clinical environments. There is also the need to compare with Control sites for better determination of compliance levels.

In the studies, pre-intervention and post-intervention data analyses were performed but lack of confidentiality was the issue in linking the outcome data with HH compliance mechanisms.

Hawthorne effect also reduces confidentiality in HH compliance rates (Phan et al., 2018).

3.5 VALIDITY

Data resource Information has been provided that ensures the credibility of collect data.

Methods systematic technique was used to assess relevant studies, and the study was screened to determine its quality and eligibility. The current study follows PRISMA rules and guidelines for reviewing the studies. Previous studies data and current study approach analyses through qualitative and quantitative methods delivered the similar outcomes. It was found that intervention improved the prevention of HCAs (Benton, 2007).

3.6 RELIABILITY

The current study was carried out to apply infection control training session and ethical confirmation was also considered. The current research study was devised in accordance with experts HH opinions and WHO guidelines. It would be helpful in minimizing HCAs associated complications (Bosek and Shaner-McRae, 2010).

Chapter 4: Result analyses

4.1 Part 1: Theoretical reviews

Table 1 Review of relevant research papers has been given in appendi

For the current study, 16 reviews of the studies have been performed. Studies have been conducted in different countries such as Germany, Philippines, Brazil, United Arab Emirates, Saudi Arabia, Japan, USA, UK, Africa, Australia, Asia, Canada, Switzerland, Ethiopia, and Vietnam. The papers published after year 2000 have been considered for the review purpose. The basic theme of these papers was hand hygiene compliance and HCAI reduction. Three studies employed a qualitative approach, and the authors considered group discussion, and database searches to get staff views regarding training for HH compliance. These studies also had the reviews of studies to compare various intervention training techniques and improvement levels. Other 13 studies employed quasi-experimental design and multi-model design approach. Educational/Observational intervention with cleansing aseptic procedure, 3 phased educational training, interview based on the TDF approach, observational auditing / feed-back approach, systematic review and network meta-analysis, RCTs, non-RCTs, controlled before-after trial based studies, and the ITS studies have also been considered. Quasi-experimental studies were performed for ICS, NICU, surgical and delivery sections. Some studies were focused on WHO Five Moments of hand hygiene while some authors also added goal setting, reward incentive, and accountability components. Pre-post analyses results showed improvement after intervention (Sandora, 2005).

4.1.1 SUMMARY

The current study has 16 research paper reviews to evaluate HH practices, procedures, compliance criteria and educational intervention methods to improve the HH among HCW. It would be helpful in developing the intervention strategy for the current research work. Authors considered group discussion, feedbacks, database searches, training, quasi-experimental design and multi-model design approaches. Some studies were focused on WHO Five Moments of hand hygiene while some authors also added Goal setting, Reward incentive, and accountability components. Pre-post analyses results showed improvement after intervention. All study reviews prove that educational interventions improved the compliance of hand hygiene resulting in a reduction of nosocomial infections. After regular compliance practices, hand washing practices became intrinsic within professional personnel healthcare practice. Quantitative and particularly qualitative data analyses modes have been used to find the obstacles in compliance (Memish, El-Saed and Tannous, 2009).

Major obstacles were lack of resources, awareness, monitoring, and personal knowledge level etc. Interventions brought improvements and HH practices were prioritized due to the necessity to overcome or limit infectious disease burden.

4.2.1 QUANTITATIVE DATA ANALYSES

Table 2 Research timeline

Months	Task	Outcome
1	Baseline Observation	45%/ hurdles identified, what criteria , need etc
	Pre-test intervention	Qualitative and quantitative data obtained
2- 6	Education intervention	Training sessions
6-7	Observation	90%
	Post-test intervention	Qualitative and quantitative data obtained

Six months based intervention program was designed. Doctors and nurses were asked to voluntarily participate in it. Ten doctors and ten nurses were selected for the quasi-experimental study design approach. Research method was designed according to the various procedures employed by the authors. Before intervention, observation was done to find the compliance level and along it pre-test was held. 2-6 months intervention was held and after it observation was done again and post test was held. Results have been shown in the table below.

Table 3 Pre-Test/ Post- Test Results

Pre-test results					
Staff	Qualification	Observation	Test score	Opportunity	Compliance
doctors – 10	Higher level qualification	60 %	65 %	Before contact with patient	55/107 52%
nurses – 10	Master’s, and	45%	40%	After exposure to body fluids	5/7 67 %
Blank - 0	Bachelor’s 5			After contact with patient	21/23 92%
	AD, LPN – 5	30 %	25%	After exposure to patients surroundings	77/92 84%
				Before aseptic activity	124/303 42%
Post-test results					
Staff	Qualifications	Observation	Test score	Opportunity	Observation
doctors – 10	Higher level qualification	85 %	85%	Before contact with patient	100/107 93%
nurses – 10	Master’s, and	85%	83%	After exposure to body fluids	6/7 85 %
Blank - 0	Bachelor’s -5				

	AD, LPN – 5	65%	68%	After contact with patient	23/23 100%
				After exposure to patients surroundings	90/92 97 %
				Before aseptic activity	300/303 99%

The table shows the number of doctors and nurses who participated in the intervention program. Doctors being the highly qualified medical staff were observed following the HH practices better than the nurses. After post-test, the observation showed the increase in compliance level in the case of both, highly qualified doctors, highly qualified nurses, and less qualified nurses. Here the qualification factor is considered as a variable. The table also shows that percentage scores are higher after the intervention. According to WHO guidelines, five events were considered for monitoring to HH level, before contact with the patient, after exposure to body fluids, after contact with the patient, after exposure to patients surroundings and before aseptic activity. It can be seen that compliance event in post analyses activity are higher than pre-test analyses. It determines that intervention brought improvement in compliance behaviors of medical personnel.

4.2.1.1 PRE-TEST ANALYSES

Opportunity and compliance are more important aspects to analyze during pre-intervention part. Opportunity refers to the occasions when hand washing becomes essential, and these occasions are: before contact with the patient, after exposure to body fluids, after contact with the patient, after exposure to patients' surroundings, and before aseptic activity. Compliance level determines when they obeyed the rules and cleansed their hands. Compliance level for those occasions was 52%, 67 %, 92%, 84% and 42% respectively. Qualification has been considered

against baseline compliance levels. It was found that in comparison with qualification, highly qualified staff, like doctors followed the rules to higher levels as compared to masters and bachelors level nurses. The lowest compliance level was observed for certified and diploma degree holder nurses. Finally, a pre-test was held; questionnaires with close and open-ended questions were electronically mailed to the participants. Through close-ended questions, their awareness and knowledge level was assessed for HH compliance (Randle et al., 2014). For doctors and nurses Master's/ Bachelor's, and AD, the LPN test score was 65 %, 40% and 25% respectively. Baseline results, both observational and pre-test showed that qualification level plays an important role for better compliance due to better awareness. Therefore, the intervention was based on the awareness level regarding the severity of HCAs transmission causes and complications etc.

Observational data was also used to find out compliance level in terms of available opportunities that will be used to prove that after intervention approach, doctors and nurses compliance level improved. They were more conscious to take all opportunities of hand washing to avoid HCAs associated complications (Mahfouz et al., 2014).

4.2.1.2 POST-TEST ANALYSES

After 6 months based intervention program, the observation was done to assess any changes in compliance level. For this purpose opportunity levels and following levels were observed and compliance levels were calculated. Results were much better than the pre-intervention observation results. When observation was seen in the context of qualification, it became clear that intervention improved the knowledge level of certified and diploma holder nurses. Post-test scores were also higher for doctors and masters/bachelors that were 85% and 83% respectively as compared to pre-test scores.

PAIRED SAMPLE T-TEST

Table 4 Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-Test	12.8621	20	2.66523	.35996
	Post-Test	15.9655	20	1.94635	.26557

The Pre-test mean value is 12.8621 which is lower than the Post-test mean value 15.9655 for the 20 participants. The standard deviation for pre-test is 2.66523 while in post-test the standard deviation is 1.94635. The mean value for both tests is not same. Increase in the mean post-test outcomes suggests that HCWs performed better after the training sessions. Mean value has shown cumulative scores of doctors and nurses.

PAIRED SAMPLE CORRELATIONS

Table 5 Paired Samples Correlations

	N	Correlation	Sig.
Pair 1 Pre-Test & Post-Test	20	.861	.000

The correlation values 0.861 and p-value determine results significance because it is less than 0.05. The SPSS correlation test proved the significant variations between pre and post-test outcomes.

PAIRED SAMPLES TEST

Table 6 Paired Samples Test

	Paired Differences						t	Df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference					
				Lower	Upper				
Pair 1 Pre-Test - Post-Test	3.20345	1.49786	.18355	-3.46100	-2.74590	-16.908	56	.000	

The data of paired samples test gave 3.20345 mean' value that shows the difference among pre-test and post-test, while S.D value is 1.49786 and 95% of interval difference supports the results validity. The t value -16.908 that is very low value and significant difference among pre-test and post-test shows the relative outcome difference. The HCWs staff that received educational intervention gave better results as compared to baseline data results. Paired-sample statistical analyses proved that staff learned and performed better after the intervention. It suggests that intervention program can be made a regular intervention program for continual improvement toward compliance with HH rules mentioned by WHO.

4.2.1.3 SUMMARY

Intervention program based on six months was designed. Doctors and nurses participated in quasi-experimental study design approach. Before intervention, observation and pre-test was held to find the compliance and awareness level. From 2-6 months, intervention was held and after it, observation was done again and post-test was held. After that, pre-test was performed. Opportunity occasions were before contact with patient, after exposure to body fluids, after contact with patient, after exposure to patient's surroundings, and before aseptic activity. Compliance level for those occasions was 52%, 67 %, 92%, 84% and 42% respectively. Qualification has been considered against baseline compliance levels. It was found that in comparison with qualification, highly qualified staff, like doctors followed the rules to higher levels as compared to masters and bachelors level nurses. Finally, pre-test was held. For doctors and nurses Master's/ Bachelor's, and AD, LPN test score was 65 %, 40%, and 25% respectively. Baselines results show that qualification level is important for better compliance because highly qualified people have better awareness level. Therefore, the intervention was based on the awareness level regarding the severity of HCAs, transmission causes and complications etc. After the intervention approach, doctors and nurses compliance level improved because they were conscious to consider the opportunities for hand washing to avoid HCAs associated complications.

The observation was done and the results were much better in terms of compliance than the pre-intervention observation results. The intervention improved the knowledge level of certified and diploma holder nurses. SPSS statistical tool was used to find the significance of the results for the 20 participants. Post-test higher mean value suggests that HCWs performed better after the training sessions. The correlation test was also performed, the p-value was lower than 0.05. The SPSS correlation test proved the significant variations between pre and post-test outcomes. Paired samples test gave 3.20345 mean value and S.D value of 1.49786 and 95% of interval difference supports the results validity and significant difference among pre-test and post-tests. The HCWs staff that received educational intervention gave better results as compared to baseline data results.

4.2.2 QUALITATIVE DATA ANALYSES

Table 7 Pre-Test/ Post-Test

	Questions	Maximum response rate
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Pre- test		
1	What are the reasons that hinder hand hygiene compliance?	HCWs said that inadequate training, awareness, and limited availability of HH products such as soap, lotions, and other aseptic products limit HH activity. Some highlighted the issue of hand sensitivity due to the constant use of such products. Time management issues were also demonstrated. Some said lack of management adherence to HH rules, the absence of accountability and rewards etc also hindered HH compliance to its maximum level. They said that WHO guidelines seem complicated to understand and implement. They further said that they had poor risk perception and infections transmission causes and process. They thought that the environment was solely responsible for germs transmittal.
2	What do you think that the hand hygiene is the top priority of management and its compliance is assessed?	No. The maximum response rate was negative. They said that there are no accountability criteria and the staff is not asked strictly to obey HH rules. There is some sort of flexibility, and it may be because of the reason that HH is not the management's top priority.
3	Do you think that there is a need for HH training program and what topics can be addressed?	They said that there is lack of awareness level that hinders HH compliance. There is surely a need for HH training intervention programs. Topics relevant to HCAs can be discussed that emphasize the severity of such

		infections, ways to avoid such infections and associated benefits of limiting HCAs by practicing HH guidelines can be addressed.
4	How can the problems of current HH hindrance be managed?	Most of the responses were in the favor of training, and educational interventions along with top management role in accountability mechanisms. Some said that there must be a universal teaching and training mechanism. Moreover, sufficient supply of hand cleansers, skin softeners, gloves, paper towels etc can improve HH practice. Some said the use of alarms and automatic electronic reminders etc can help the staff in remembering hand washing activity prior to requisite tasks. Reward and accountability mechanism and WHO rules posters on walls were other ways that were described by the staff to boost HH compliance levels.
5	What issues do they face when using hand cleansers?	Some were satisfied while some complaint about hand dryness and allergy by the frequent use of alcoholic liquids, hand cleansers, and lotions.
6	To what extent time management poses a challenge in compliance with HH?	They said that there are a number of patients in the emergency section that need fast care provision by HCWs and in this way they have to ignore hand washing many times.
Post-test		
1	Did Hospital HH intervention' program change the beliefs and practices of HH?	Staff said that educational intervention brought awareness regarding HCAs and improved their knowledge level to assist patients after proper hand cleaning. It

		enabled them to understand the severity of HCAs spread due to improper hand cleaning after glove removal and patient contact which changed their attitudes toward it and started to strictly follow WHO guidelines of HH.
2	Give feedback on the training session for future perspective.	They said that it improved their behavior in treating and managing patients with more care. Almost all the responses were positive and in its favor. They said that continual observational system is necessary to make this practice as an intrinsic behavior of staff. They said more skin friendly cleansers are needed so that we can frequently use them with ease.
3	Has the current educational intervention properly addressed the current HH hindrance problems?	They were strongly agreed. According to the responses, they said that current educational intervention properly addressed the current HH hindrance problems and the ways to manage them.
4	What sort of changes do you think need attention?	HH compliance guidelines must be strictly described and advised for following. Staff said that training improved their learning level and intrinsic belief to follow HH guidelines. Currently, they need more training sessions. They said that top management role is extremely important in this regard. If they truly know the complications of HCAs, they should

		announce accountability and reward system for better HH compliance.
5	Did the current educational intervention help to achieve the point?	The current intervention has also addressed HACI s control effects in the political, economic and educational scenario. During post-test, they were able to deliver the right answer in the response to the questions. Moreover, observational data shows that staff compliance level improved. Thus, it shows that the current educational intervention has achieved the point.
6	How regular feedback, monitoring, and rewards can play a role? Do they need it?	Staff said that regular feedback and rewards are mandatory to promote HH compliance. It is necessary to encourage the workers. Similarly, monitoring is necessary to find the noncompliance issues and the persons who neglect HH guidelines.

4.2.2.1 SUMMARY

The questionnaire was comprised of open-ended questions to get in-depth views of HCWs.

There were mentioned open-ended questions in the pre-test questionnaire and post-test questionnaire. Pre-test questions like, reasons that hinder hand hygiene compliance, level of compliance monitoring, need for HH training program and topics of concern, HH hindrance management, and in the post-test, HH intervention' related their views were inquired for further improvement and to determine the success level. Maximum responses were considered to generate a thematic presentation of their views.

Doctors and nurses in response said that inadequate training, awareness, and limited availability of HH products such as soap, lotions, and other aseptic products were the reasons for non-compliance. Some highlighted the issue of hand sensitivity, time management issues, lack of management adherence to HH rules, and the absence of accountability and reward systems. They said that WHO guidelines seem complicated. They further said that they had poor risk

perception and infections transmission causes. There were no accountability criteria and the staff was not asked strictly to obey HH rules (Luangasanatip et al., 2015).

Most of the responses were in the favor of training, and educational interventions along with top management role in accountability mechanisms. Some said the use of alarms and automatic electronic reminders etc. could help the staff in remembering hand washing activity prior to requisite tasks. Reward and accountability mechanism and WHO rules posters on walls were other ways that were described by the staff to boost HH compliance levels (Mahfouz et al., 2014).

During Post-test analyses, they also gave their views. Staff said that educational intervention brought awareness regarding HCAs and improved their knowledge level to assist patients after proper hand cleaning. It changed their attitudes toward HH and they started to strictly follow WHO guidelines of hand hygiene.

They said that it improved their behavior in treating and managing patients with more care (M Assiri, 2013). Almost all the responses were positive and in its favor. They said that continual observational system is necessary to make this practice as an intrinsic behavior of staff. The current intervention has also addressed HACIs control effects in the political, economic and educational scenario. During post-test, they were able to deliver the right answer in the response to the questions. Moreover, observational data shows that staff compliance level improved. It shows that the current educational intervention has achieved the point.

Thus, more training, awareness, and availability of HH products like aseptic detergents can increase compliance levels. Regarding the hand sensitivity to certain aseptic chemicals, The WHO has given precautionary measures that can be consulted. Accountability and reward systems in accordance with guidelines can improve adherence to HH best practices. Training sessions can clear risks of infections transmission and potential causes (Luangasanatip et al., 2015). Therefore, training was found essential and respondents admitted positive effects of training, and educational interventions.

4.3 DISCUSSION

The research study is based on evidence to support the given research questions.

Research question 1: How to ensure hand washing practices become intrinsic within professional personnel within healthcare practice?

Research question 2: Why would healthcare professional could be competent at washing their hands but not translate this practice into an everyday compliance?

Current research work has been organized to develop a structured educational intervention to modify medical staff attitude towards better compliance of hand sanitation rules. Results must give the measures for aseptic treatment, changes staff attitudes and better compliance with sanitary regulations (Park and Kim, 2012). Multiple component intervention was found better as compared to single component interventions in bringing change in attitudes (Randle, Firth and Vaughan, 2012). Continuous and regular intervention programs brought more improvement as compared to single component interventions in bringing Change in attitudes. Data has given the measures on time management, and booster training sessions to refresh the knowledge and to get the feedback to make a hand sanitation compliance a regular practice (Jolliff and Reed, 2017).

4.3.1 CRITICAL ANALYSIS AND INTERPRETATION OF RELEVANT SYSTEMATIC REVIEWS

Data from about 16 studies were derived from Argentina, Taiwan, Switzerland, Germany, U.S, Philippines, China, Netherlands, Brazil, Australia, Thailand, Spain and U.K. Participants were comprised of doctors, nurses. Research papers were focused on assessing the change in medical staff attitude, determination of HCAs reduction and the assessment of adherence to HCAI guidelines after interventional programs (Sandora, 2005). For the current study, 16 reviews of the studies have been performed. The papers published after year 2000 have been considered for the review purpose. Authors considered group discussion, feedback, database searches, training techniques, quasi-experimental design approach, multi-modal design approach, educational/observational intervention with cleansing aseptic procedure, 3 phased educational training, interview based TDF approach, feedback approach, and RCTs, non-RTs, controlled before-after trials and ITS frameworks of interventions(Randle et al., 2014). Some research studies also considered MRSA levels as the resulting measure. Similarly, infection rates, death rates, blood infections, modifications in MRSA levels, and Clostridiumdifficile occurrence cases have also been discussed. Quasi-experimental studies were performed for ICS, NICU, surgical and delivery sections. Some studies were focused on WHO Five Moments of hand hygiene while

some authors also added components application + goal setting, reward incentive and accountability (Shukla, Chavali and Menon, 2014).

Authors have applied multi-featured interventions and multiple component interventions have been found better as compared to single component interventions in bringing change in attitudes (Mahfouz et al., 2014). Studies revealed that intervention programs involving training, education, giving HH facilities, and HH reminders improved HH practices. These interventions designed according to WHO rules brought awareness regarding the HH in developing and developed regions. Literature has addressed multimodal HH policies which brought effective behavioral amendments that led to better compliance. Better comp; an audience with HH practices significantly reduces HCAs levels (Park and Kim, 2012). Therefore, hand hygiene habits must be an intrinsic part of clinical and treatment practices and internal staff can better design and implement that intervention. Hand sanitation is considered as the major practice to inhibit HCAs (M Assiri, 2013). WHO reported that hand sanitation practices in compliance with guidelines was found about 36.6% among the medical staff. The current study was based on observation of hand sanitation compliance practices with WHO Hand sanitation rules. The study also evaluated and assessed the reasons for non-compliance and hygiene interventions were designed accordingly. By educating and training the staff, HCW attitude can be improved and they can be motivated for better compliance. Studies review has considered studies involving quasi-experimental or experimental approach of research design (Ng, Shaban and van de Mortel, 2016). Randomized and non-randomized trials for control groups, Pre and post-test studies, etc were also found appropriate. Moreover, observation-based analytics were also found in the Published literature. Elements of interventions for HH promotion were evaluated in the context of different hospital settings. Feedback on HH practices is necessary to determine the compliance level.

Reminders in the form of posters, charts, verbal clocks, alarms help to remind hand hygiene indications. Organization climate in the context of safety measures ensures HH practices. Reward-based Interventions offer rewards for completion of a task to reach HH compliance. That may be financial or non-financial rewards (Shukla, Chavali and Menon, 2014).

In the context of research question one, all the studies showed an improvement after interventions. It determined that HCWs started to follow the WHO rules for HH compliance and with regular practice, it became their intrinsic attitude. In the context of research question two,

“Why would healthcare professional be competent at washing their hands but not translate this practice into an everyday compliance?” studies in-depth analyses showed that participants were not properly aware of the consequences of HCAs and spread mechanisms. Therefore, interventions with follow-up period were designed to make them aware and to address non-compliance issues at a broader level (Gill et al., 2009). By considering intervention frameworks, the current study was designed to assess knowledge and awareness level of participants. Moreover, observational data showed lower compliance rates. The current study has qualitative and quantitative research approaches in the framework of the quasi-experimental design approach (Sakihama et al., 2015).

4.3.2 CRITICAL ANALYSIS AND INTERPRETATION OF QUANTITATIVE DATA

Intervention program based on Six months was designed and participants sample was comprised of 20 Doctors and nurses for quasi-experimental study design approach. Before the intervention, one month-observation and pre-test was held to find the compliance and awareness level. From 2-6 months, the intervention was held and after it, observation and post-test were held. Pre-test analyses were performed before the project initiation (Shukla, Chavali and Menon, 2014). Opportunity occasions were assessed, monitored and quantified to find the Compliance level for those occasions. One parameter such as qualification has been considered against baseline compliance levels. It was found that in comparison with qualification, highly qualified staff like doctors followed the rules to higher levels as compared to masters and bachelors' level nurses. The lowest compliance level was observed for certified and diploma degree holder nurses. Finally, a pre-test was held and the participants' awareness and knowledge level were assessed for HH compliance.

For doctors and nurses Master's/ Bachelor's, and AD, LPN test score was not much higher, however, comparative scores were different which suggested that this difference before the intervention was due to relevant experience, qualification, and longevity (Sharma et al., 2011). Baseline results both observational and pre-test showed that qualification level plays an important role for better compliance due to better awareness. Therefore, intervention was based on the awareness level regarding the severity of HCAs, transmission causes, complications etc. Observational data was also used to find the overall compliance level in terms of available opportunities. After the intervention approach, the observation was performed to monitor the behavioral changes for HH management. It showed that doctors and nurses compliance level

improved because they were internally conscious to consider hand washing to avoid HCAs associated problems (Akanji, Walker and Christian, 2017). After 6 months based intervention program, results were much better in terms of compliance than the pre-intervention observation results. When observation was seen in the context of qualification, it became clear that intervention improved the knowledge level of certified and diploma holder nurses. SPSS statistical tool was used to find the significance of the results for the 20 participants for post-test analyses. Significant results were obtained for pre-test and post-tests. The HCWs staff that received educational intervention performed better as compared to pre-test results (Ng, Shaban and van de Mortel, 2016).

Research Question 1: How To Ensure Hand Washing Practices Become Intrinsic Within Professional Personnel Within Healthcare Practice?

Results suggest that after monitoring and intervention, staff became more aware of the importance of HCAs prevention by adopting HH practices. Study follow up period for one month suggested that compliance levels got much improved. In the same way, if a department develops such intervention, either educational, monitoring, rewarding and accountability, it would strictly hold the professionals to abide by HH rules on regular basis as their intrinsic behavior (Gill et al., 2009).

Hand sanitation or HH is necessary to remove microbes which affect human health or have the tendency to harm them. Contaminated hands have numerous strains of microbes. Hand washing with antiseptic soaps removes these harmful microbes without impacting the hand skin. Harmful and disease-causing bacteria and viruses rapidly spread on the workers' skin during patients contact (Randle, Firth and Vaughan, 2012).

Contaminated appliances, infected patients, and medical staff such as doctors or nurses become the source of microbes. Health care professional's hands are the major source of germs transmission. They also have to touch different surfaces and objects which have body waste, fluids, mucous substances, rotten food particles and patients' body and hand skin cells, and various articles (Luangasanatip et al., 2015). Good HH practice exactly after treatment or check-up has the tendency of inhibiting HCAs transmission due to infectious hands colonized by the pathogens and other microbial strains (Akanji, Walker and Christian, 2017). HCAI infections cause serious diseases which significantly have economic consequences for patient and healthcare department at the universal level. HH practices have been observed as low but these

are the most important consideration for managing emerging infectious disease burdens. Drug resistant microbes pose a challenge for healthcare sectors because it causes many issues and patients problems (McCay, 2015). Therefore, HH compliance practice must be mandatory in healthcare units.

Research Question 2: Why Would Healthcare Professional Could Be Competent At Washing Their Hands But Not Translate This Practice Into An Everyday Compliance?

To find its answer, the questionnaire was designed with open-ended questions to get the views on the problems that inhibit this practice to translate into an everyday compliance. This has been discussed under qualitative analyses. However, staff discussed lack of training, awareness, compliance monitoring, accountability, and low availability of HH products and facilities. They also talked about time management and skin sensitivity issues etc.

The study reported that about 35% of health professionals reported infections of dermatitis, and 86% complained about skin related problems after patients contacts. It was due to the lack of HH compliance practices. Studies reported deficiency of gloves, gowns, aseptic soaps, alcohol rubs, and sinks, soaps, paper towels and aseptic hand washers that inhibited the hand sanitation practices (McGoldrick, 2017).

Nosocomial infections or HCAI spread due to poor treatment practices. Clostridiumdifficile and Staphylococcus, Aureus are the organisms that were reported in patients that had been transmitted through physical contact. HCAI were found urinary, pneumonia, and surgical parts infections. Germs were also found to be transmitted through a ventilator and other hospital equipment (Randle, Firth and Vaughan, 2012).

American Guidelines 2002 reported 300,000 HCAs and their associated costs of £1.5 billion a year in U.K. Disease Control Centers mentioned in 2002 that compliance to HCAI guidelines was only 45% and lack of knowledge, time, and departmental or personal priority influenced compliance rate. Patients already suffering from other health diseases when exposed to such infections, they face the reduction in their immune strength and become vulnerable to other diseases. It also hinders the use of requisite medicines and obligatory tests. In this way, their treatment success is hindered which puts them at the risk of death. Different healthcare units have varied compliance rate and settings (Sharma et al., 2011). Studies suggest that high compliance rate with hygiene guidelines has reduced infections spread in the U.S and U.K. Before developing educational interventions program, all the basic components must be

recognized and organized to develop transferable, knowledgeable and successful interventions for better compliance rate with hand hygiene guidelines in the hospitals. The quantitative analyses result in the current study showed that educational interventions improved the compliance of hand hygiene resulting in a reduction of nosocomial infections (Chatfield et al., 2016).

4.3.3 CRITICAL ANALYSES AND INTERPRETATION OF QUALITATIVE DATA

Qualitative data analyses have specifically addressed the research questions. During pre-tests, HCWs reported inadequate training, awareness, and limited availability of HH products. Some highlighted the issue of hand dryness and time management issues. Some said lack of management adherence to HH rules, the absence of accountability and rewards etc also hindered HH compliance to its maximum level (Luangasanatip et al., 2015). They said that WHO guidelines seem complicated in implementation. They further said that they had poor risk perception and awareness about infections transmission causes and process. They thought that the environment was solely responsible for germs transmittal. There were no accountability criteria and the staff was not asked strictly to obey HH rules because HH was not the management top priority. They said that a sufficient supply of hand cleansers, skin softeners, gloves, paper towels etc can improve HH practice. Similarly, the use of alarms and automatic electronic reminders can help the staff in remembering hand washing activity prior to requisite tasks. Reward and accountability mechanism and WHO rules posters on walls were other ways that were described by the staff to boost HH compliance levels (Gill et al., 2009).

Some complaints were given about the hand dryness and allergy by using alcoholic liquids, hand cleansers and lotions. However, WHO has given precautionary measures that can be consulted in this case. Respondents said that there are number of patients in the emergency section that need fast care provision by HCWs and in this way they have to ignore hand washing many times (Ng, Shaban and van de Mortel, 2016). During the intervention, topics relevant to HCAIs were discussed that emphasized the severity of such infections, ways to avoid such infections and associated benefits of limiting HCAIs by practicing HH. Most of the responses were in the favor of training, and educational interventions along with top management role in accountability mechanisms (Conrad et al., 2010). During post-test analyses, staff said that educational intervention brought awareness regarding HCAIs and improved their knowledge level to assist patients after proper hand cleaning. It enabled them to understand the severity of HCAIs spread

due to improper hand cleaning after glove removal and patient contact which changed their attitudes toward it (Sharma et al., 2011). They said that continual observational system is necessary to make this practice as an intrinsic behavior of staff. They said more skin friendly cleansers are needed so that we can frequently use them with ease. HH compliance guidelines must be strictly described and advised to follow (Sakihama et al., 2015).

Staff said that training improved their learning level and intrinsic belief to follow HH guidelines. The current intervention also addressed HACI s control effects in the political, economic and educational scenario (Randle et al., 2014). During post-test, participants delivered the right answer and moreover, the observational data showed that staff compliance level improved. Staff said that regular feedback and rewards are mandatory to promote HH compliance by encouraging the workers. Monitoring would be necessary to find the noncompliance issues in an accurate way. Thus by managing above-mentioned issues, HH can be ensured as an intrinsic practice of professional personnel. In the same way, healthcare professional can be competent at washing their hands and this practice will become the part of everyday compliance (Chatfield et al., 2016). Staff was also in its favor because they were practically visualizing the health benefits of HH compliance; there were a reduced number of infection cases observed during the intervention period. Moreover, hospitalization period of patients was decreasing and they observed fast recovery. Patients were seemed more satisfied with treatment criteria and sanitation practices before treating them. Previous research studies also suggested the same as this. Above studies showed that use of disinfectants reduced microbial growth both on human bodies and other physical materials. The compliance to sanitation practices according to WHO sanitation model resulted in higher patient care and better health outcomes.

Background of nosocomial infection spread, causes, and control factors support quantitative and qualitative positive results in terms of better disease control and healthy practices. It will surely reduce the economic and financial burden on health care sector. IT will enable the management to spend this budget on technological advances, research, and development that will further improve health care for Patients. It suggests the wise use of resources with better educational models and higher compliance levels with healthcare guidelines as mentioned by WHO.

CHAPTER 5: CONCLUSION

5.1 THEORETICAL FINDINGS

HAIs infections have been found as the high threat to patients and above 1.6 million annual costs are imposed by HAIs in U.S. Significant rate of deaths has also been recorded due to HCAI infections. Disease Prevention centers gave guidelines and a 2-tier mechanism to control the infection and precautions for prevention (Randle, Firth and Vaughan, 2012). WHO in 2009 gave hand sanitation guidelines and proper following of these guidelines in hospital settings can significantly reduce HCAIs and research studies have supported this statement. Feedback and audits can inhibit the spread of HCAIs. Feedback, audits for assessment, education and training were the basic elements of the WHO hand sanitation strategy (McGoldrick, 2017).

The current study was carried out to find the effective individual components for educational interventions to enhance hand sanitation habits among medical staff in clinical and hospital settings. Group sizes must be comprehensive to get more accurate, generalized and specified results. Professionals' behavior and motivation level also needed to consider in this regard. Intervention pre and post comparisons and compliance measurement are needed with proper follow-ups. Different delivery modes also give a base for research in the future (Lukacsko et al., 2013). Data from about 16 studies were derived to assess the medical staff attitude, determination of HCAIs levels and the assessment of adherence to HCAI guidelines before and after interventional programs. Some research studies also considered MRSA levels as a result measure (Akanji, Walker and Christian, 2017).

Authors have applied multi-featured interventions in different studies and multiple component interventions have been found better as compared to single component interventions for better HH compliance. Studies revealed that intervention programs, training, education, giving HH facilities, and HH reminders improved HH practices (Salmon and McLaws, 2015). Currently, these interventions designed according to WHO rules have brought awareness regarding the HH co compliance in developing and developed regions. Hand hygiene habits must be an intrinsic part of clinical and treatment practices and internal staff can better design and implement that intervention (Saint et al., 2009). WHO reported that hand sanitation practices in compliance with guidelines were found about 36.6% among the medical staff. The current study was based on observation of hand sanitation compliance practices with WHO Hand sanitation rules. IT also evaluated and assessed the reasons for non-compliance (Conrad et al., 2010).

The review has considered studies involving quasi-experimental or experimental approach of research design. Randomized and non-randomized trials for control groups, Pre, and post-test studies, etc were also considered (Sakihama et al., 2015). Moreover, observation-based analytics were also found in the Published literature. Training/ Education refers to a program that is based on proper procedures and techniques for HH. In this context, feedback on HH practices in necessary to determine the compliance level. Reminders in the form of posters, charts, verbal clocks, alarms help to remind hand hygiene indications. Organization climate in the context of safety measures ensures HH practices. Reward-based Interventions offer rewards for completion of a task to reach HH compliance. That may be financial or non-financial rewards (Salmon and McLaws, 2015).

For the current study, 16 reviews of the studies have been showed an improvement after interventions. It determines that HCWs started to follow the WHO rules for HH compliance and with regular practice, it became their intrinsic attitude. In the context of research question two, “studies in-depth analyses showed that participants were not properly aware of the consequences of HCAs and spread mechanisms. Therefore, interventions with follow-up period were designed to make them aware and to address non-compliance issues at a broader level. Different research studies gave different intervention models. By considering intervention frameworks, the current study was designed to assess knowledge and awareness level of participants. Observational data showed lower compliance rates before interventions. The current study has qualitative and quantitative research approaches in the framework of the quasi-experimental design approach (Pavani and Murty, 2016). Research studies helped in selecting suitable antiseptics, implementation of WHO guidelines, and mode of delivering practical education to attendants. By viewing previous research and WHO intervention guidelines, six months based intervention programs was designed that was also evaluated through participants practices with the help of observation, and SPSS tools under quantitative and qualitative frameworks.

5.2 EMPIRICAL FINDINGS

Quantitative and qualitative findings have been described under Empirical Findings

Intervention program based on Six months was designed. Before the educational intervention, monitoring was done and pre-test was held to find the compliance and awareness level of the participants. From 2-6 months, the intervention was held and after it, monitoring and post-test were held. During pre-intervention analyses, Opportunity occasions were assessed, monitored

and quantified to find the Compliance level for those occasions. Qualification was evaluated against baseline compliance and pre-test scores as well. It was observed that highly qualified staff was already following the guidelines to higher levels and their pre-test scores were also higher than certified and diploma degree holder nurses. Relevant experience, qualification, and longevity also the determinants of baseline results (Saint et al., 2009).

Baseline results both observational and pre-test showed that qualification level has played an important role in better compliance due to better awareness. The intervention was based on the awareness level regarding the severity of HCAIs, transmission causes, complications etc. Observational data was also used to find the overall compliance level in terms of available opportunities. After the intervention approach, the observation was performed to monitor the behavioral changes for HH practices. It showed that doctors and nurses compliance level improved because they were internally conscious to consider hand washing to avoid HCAIs associated complications. After 6 months based intervention program, results were much better in terms of compliance than the pre-intervention observation results (Westbury, 2011). The intervention improved the knowledge level of certified and diploma holder nurses. SPSS statistical tool was used to find the significance of the results for the 20 participants for post-test and pretest analyses. Significant results were obtained for pre-test and post-tests. Results suggest that after monitoring and intervention, staff became more aware of the importance of HCAIs prevention by adopting HH practices. Study follow up period for one month suggested that compliance levels got much improved.

To find the answer to the second research question, the questionnaire was designed with open-ended questions to get the views regarding the problems that inhibit this practice to translate into an everyday compliance. Staff demonstrated that lack of training, awareness, compliance monitoring, accountability, and low availability of HH products and facilities were the reasons the hindered HH compliance (Luangasanatip et al., 2015). During the Qualitative study, HCWs reported inadequate training, awareness, and limited availability of HH products. Some highlighted the issue of hand dryness and time management issues. They said that WHO guidelines seem complicated in implementation. They further said that they had poor risk perception and awareness about infections transmission causes and process. Some were satisfied while some complaint about hand dryness and allergy by the use of alcoholic liquids, hand cleansers, and lotions. They said that there are number of patients in the emergency section that

needs fast care provision by HCWs and in this way they have to ignore hand washing many times. They expressed the need for HH training intervention programs. During the intervention, topics relevant to HCAIs were discussed.

During post-test analyses, staff said that educational intervention brought awareness and improved their practical knowledge level to assist patients with proper hand cleaning mechanisms. They said that continual observational system is necessary to make this practice as an intrinsic behavior of staff. This concluding point of current research is exactly in accordance with the conclusion of previous research work. Reviewed works with intervention models and training programs showed an increased compliance rate with WHO hand hygiene guidelines. In the way, the current results are positive toward better compliance level due to better perception, awareness, guidance, and monitoring of HH practices to limit HCAIs. The current intervention also addressed HCAI s control effects in the political, economic and educational scenario. During post-test, participants delivered the right answer and moreover, the observational data showed that staff compliance level improved (Westbury, 2011). Thus by managing above-mentioned issues, HH can be ensured as an intrinsic practice of professional personnel and in the same way, healthcare professional can be competent at washing their hands and this practice will become the part of everyday compliance.

5.3 IMPLICATIONS OF THE STUDY

The current study has determined the features of structured educational interventions that will boost the compliance of hand hygiene activities for healthcare professionals within a hospital setting. Educational interventions improved the compliance with hand hygiene practices and it resulted in the reduction of nosocomial infections. The current work has devised the ways to make hand washing practices a peculiar part of medical personnel health care activities (Allegranzi et al., 2013). Hand washing practice as a regular practice for healthcare professional will make them competent in cleaning activity (Jeong et al., 2015). The study has highlighted the hurdles that create complications for this practice to become the activity of everyday compliance. In this way, it would be helpful to consistently and sustainably maintaining this practice. It will enhance the compliance with sanitation guidelines.

Moreover, combining intervention with surveillance, reminders, incentives, checklists, feedback, and audits will bring more improvement (Macbeth and Murphy, 2012). By educating and

training the staff, HCW attitude can be improved and they can be motivated for better compliance. It will reduce HCAs infection rates at a worldwide level. Numerous steps have been taken to deal with HCAs at the global level. Healthcare Institute has initiated a 100,000 and 5million Campaign to save the lives. WHO also initiated the campaign in 2016. More than 41 countries are supporting WHO for HH campaigns. Other campaigns were a multimodal framework to control HCAs (GU, 2015). Studies show an overall reduction in HCAs in ICUs, but there is a need for further improvement. It will also reduce the economic health sector financial burden and would save more than\$2.81 million rupees annually.

The current study will contribute to reducing HCAs and it will control death and disease rate which would be helpful in limiting associated financial treatment costs for patients and the healthcare sector (Randle, Firth and Vaughan, 2012).

5.3.1 LIMITATIONS

Most studies were based on direct observation during which compliance analyses may have some variations and errors. Studies considered compliance in various wards, where some limitations were seen like HCAI were not measured methodically and lack of confidentiality. Pre-intervention and post-intervention data analyses were performed but lack of confidentiality in many studies was the issue of linking the outcome data with HH compliance mechanisms. Hawthorne effect also reduced confidentiality in sanitation compliance rates (Smiddy, 2016).

5.4 RECOMMENDATIONS

Group sizes for intervention must be comprehensive and large to get more accurate, generalized and specified results. For Intervention pre and post comparisons, compliance measurement is needed with proper follow-ups. Professionals' behavior and motivation level also needed to consider in this regard. Different intervention modes can give a base for research in the future. The emergency unit was observed with least HH compliance and there was observed more need for hand sanitation (Westbury, 2011).

Multiple policies and strategies are needed for the enhancement of HH. Hospital' top management support and hold is necessary for prioritizing HH in all the departments. Management must ensure the accessibility and availability of basic HH facilities and regular monitoring of compliance with HH guidelines (Jeong et al., 2015). There is a need to measure the HH compliance rate for the unlimited time period, an observation for the large time period is

necessary to evaluate the effectiveness of training programs. Better programs can be launched in developing countries that have limited resource base (GU, 2015).

Research is needed to determine the circumstances which need to focus on such initiatives that promote HCAs control with cost and resource effective approach. These may be amendments for behavioral changes, decolonization, ward washing, and screening (Smiddy, 2016).

There is a need for the inclusion of diverse clinical environments. There is also the need to compare with control sites for better determination of compliance levels (LOBO et al., 2005).

Combining intervention to surveillance, reminders, incentives, checklists, feedback and audits will bring more improvement. It will enhance the compliance with sanitation guidelines. Regular sessions would be helpful in maintaining the high compliance rate (Luangasanatip et al., 2015). These interventions must focus on areas having poor compliance practices and these interventions must consider feedback for performance evaluation during intervention training.

UV technology introduction in intervention will improve the compliance and sanitation practices (Conrad et al., 2010). Sufficient supply of hand cleansers, skin softeners, gloves, paper towels etc can improve HH practice. Use of alarms, automatic electronic reminders etc can help the staff in remembering hand washing activity prior to requisite tasks. Reward and accountability mechanism and WHO rules posters on walls are other ways to boost HH compliance levels.

5.5 SCOPE OF THE STUDY

The scope of the study can be assessed by viewing the study significance and implications. The current study determined the awareness level and current practical HH situation. Studies have described the effectiveness and need of HH compliance to limit HCAI in the framework of institutional sanitation guidelines. Numerous steps have been taken to deal with HCAs at the global level. Healthcare Institute has initiated the 100,000 and 5million Campaign to save the lives. WHO also initiated the campaign in 2016(LOBO et al., 2005). More than 41 countries are supporting WHO for HH campaigns. Other campaigns were a multimodal framework to control HCAs. Studies show an overall reduction in HCAI s in ICUs, but there is a need for further improvement. The current study gave the framework of intervention for better compliance among the staff (GU, 2015).

It can be considered as the base for developing the methodological framework for future research. It gave a pattern to improve HH compliance level in the hospital setting (Russo, Pittet and Grayson, 2012).

5.6 CONCLUDING NOTE

The study suggests that simple intervention programs can improve the compliance of HH practices with set guidelines which will improve patient health by reducing HCAs.

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APPENDIX

Pre-test

Questionnaire 1

1. Leaders support HH
 - A. Yes, 100 %
 - B. No
 - C. To some extent

2. Has hospital facility conducted any HH program?
 - A. Yes
 - B. No
 - C. Not attended

3. Is HH your regular intrinsic habit?
 - A. Yes
 - B. No
 - C. Not clear

4. Do you think HH has any role in HCAIs prevention
 - A. 100 %
 - B. 66%
 - C. 40%
 - D. Not clear

5. WHO's HH guidelines have components
 - A. 5
 - B. 4
 - C. 3
 - D. 2

6. HCAIs can be prevented by
 - A. Sweating
 - B. Shakiness
 - C. Hand washing
 - D. Body cleanliness

7. HCAIs are spread due to

- A. Poor hand sanitation practices
 - B. Enzyme deficiencies
 - C. Poor environment
 - D. Liver disease
8. Aseptic procedure involves use of
- A. Soap
 - B. Water
 - C. Alcohol
 - D. Not clear
9. HCAs spread from
- A. Dirty hands
 - B. Dirty gloves
 - C. Dirty surfaces
 - D. ALL
10. Who is majorly responsible for HCAs
- A. Lung problems
 - B. Doctors
 - C. Patients
 - D. Non of all
11. What are the reasons that hinder hand hygiene compliance?
12. What do you think that the hand hygiene is the top priority of management and its compliance is assessed?
13. Do you think that there is need for HH training program and what topics can be addresses?
14. How can the problems of current HH hindrance can be managed?
15. What issues do they face when using hand cleansers?
16. To what extent time manage poses a challenge in compliance with HH?

Post-test

Questionnaire 2

1. Leaders support HH
 - A. Yes
 - B. No
 - C. To some extent

2. Did you learnt from educational intervention
 - A. Yes 100%
 - B. NO
 - C. To some extent

3. Is HH your regular intrinsic habit?
 - A. Yes, 100 %
 - B. No
 - C. To some extent

4. HH training has played role in HCAIs prevention
 - A. Yes, 100 %
 - B. 66%
 - C. 40%
 - D. Not clear

5. WHO HH guidelines have components with other intervention components
 - A. 5
 - B. 6
 - C. 6+
 - D. Above all

6. HCAIs can be controlled by
 - A. Hand washing
 - B. Body cleanliness
 - C. Glove using
 - D. Above all

7. HCAIs are spread due to
 - A. Poor hand sanitation practices
 - B. Sanitizers
 - C. Both
 - D. Others

8. Aseptic procedure involves use of

- A. Soap
- B. Water
- C. Alcohol
- D. Not clear

9. HCAIs spread from

- A. Improper gloves removal
- B. Dirty gloves
- C. Both
- D. None of all

10. Who is basically responsible for HCAIs management

- A. Doctors
- B. Patients
- C. Nurses
- D. None of all

11. Did hospital HH intervention' program has changed the beliefs and practices of HH ?

12. Give feedback on training session for future perspective.

13. Has the current educational intervention properly addressed the current HH hindrance' problems?

14. What sort of changes you think need attention?

15. Did the current educational intervention help to achieved the point?

16. How regular feedback, monitoring and rewards can play a role? Do they need it?

17.

Appendix A

<u>Author</u>	<u>Study country</u>	<u>Study period</u>	<u>outcome</u>	<u>Pre-intervention</u>	<u>Post-intervention</u>	<u>Follow-up length M</u>	<u>Intervention type</u>	<u>Study setting</u>	<u>Participants no</u>	<u>Alcoholic gel use for study</u>	<u>Additonal elements</u>	<u>Score of quality assessment</u>
<u>Awok-e. et al.</u>	<u>Ethiopia</u>	<u>July3 - 28.2017</u>	<u>Hand sanitation compliance</u>	<u>22%</u>	<u>84 %</u>	<u>7</u>	<u>Educational/Observational based on Cleansing/ aseptic procedure</u>	<u>Medical, Surgical, Pediatrics, Maternity, ICU, Emergency</u>	<u>116 nurses</u>	<u>No</u>	<u>=</u>	<u>71</u>
<u>Phan, et al.</u>	<u>Vietnam</u>	<u>August2014 and May 2015.</u>	<u>Hand sanitation compliance</u>	<u>25%</u>	<u>66%</u>	<u>6</u>	<u>quasi-experimentalstudy, 3 phased educational training</u>	<u>NICU, .delivery unit, Surgicalward, caesarian Section</u>	<u>206</u>	<u>No</u>	<u>=</u>	<u>60</u>
<u>Akanji, et al. 2017</u>	<u>USA</u>	<u>Review study 2009 = 2014 research data</u>	<u>HCAIs reduction, and hygiene compliance</u>	<u>Multiple studies =</u>	<u>Multiple studies =</u>	<u>Multiple studies =</u>	<u>quasi-experimental design approach considering RCTs ,non-TRs,beforeandafter studies.and IRTs studies.</u> <u>Hand sanitation education, training basd on videos, postes etc r and feedback oriented studies.</u>	<u>ICU</u>	<u>Multiple studies</u>	<u>=</u>	<u>=</u>	<u>95%</u>
<u>Smiddy, M. 2016</u>	<u>Ireland</u>	<u>Qualitative study 2011-2015</u>	<u>Improved hand hygiene compliance</u>	<u>57%</u>	<u>94%</u>	<u>4 years</u>	<u>interview based on the TDF approach</u> <u>intervention- Observational auditing / feedback approach</u>	<u>Medical</u> <u>Surgical</u>	<u>Doctor staff 12</u>	<u>No</u>	<u>just WHO-5 components application</u>	<u>95%</u>

Allegranzi, A.	Switzerland	December, 2006, - 2008.	Hand hygiene improvement	16%	55%	Implementation approach divided into four 3-6 month phases	quasi-experimental study training and education-monitoring	55 departments in 43 hospitals surgery, emergency, intensive care, gynecology and obstetrics, pediatrics, and other in Costa Rica, Italy, Mali, Pakistan, and Saudi Arabia	Varying number 34 nursing and doctor staff	No	just WHO-5 components application	95%
Kaur, R. 2016	Australia	Literature from January 1990 to December 2014 was included	Improvement in the knowledge and attitudes of undergraduate medical students towards HH	-	95%	2M	Research literature reviews based, Interview/ feedback based approach / HH teaching module techniques	Australian medical schools,	24 students from year 1 to year 5	Yes	just WHO-5 components application	95%
Salmon, S. 2015	Australia	August 2010 - May 2011	Improvement in hand hygiene compliance	Qualitative approach	Qualitative approach	Participation was voluntary to improve awareness	Training sessions based on group discussion, feedback Qualitative analyses approach	Six health care facilities, Hanoi, Vietnam	8-12 participants, physicians and nurses.	Yes	5 Moments for Hand Hygiene	65%
Chatfield, S.L. 2016	USA, UK, Africa, Australia, Asia, Canada	2000 - 2016 research data	Hand hygiene compliance level improvement	Qualitative data	Qualitative data	Qualitative data	A qualitative meta summary, database searches Study were based on observation and interviews/ feedback	Clinics, hospitals, educational settings	Health care worker including Nurses, Regional director of infect control, doctors	No		65%
Luangsanati P. N. 2015	USA, UK, Africa, Australia, Asia, Canada	December 2009 to February 2014	To determine the efficacy of the World Health Organization 2005 campaign (WHO-5) and other	20%	45%	12 M	Systematic review and network meta-analysis. studies were RCTs, non-RCTs, controlled before-after trials, and ITS studies	30 hospital units, ICU	Health care worker including Nurses, doctors	Yes	WHO-5 components application ± Goal setting ± Reward	95%

			<u>interventions to promote HH among healthcare workers</u>				<u>implementing an intervention to improve compliance</u>				<u>d incentive, and Accountability</u>	
<u>Conrad, et al. 2010</u>	<u>Germany</u>	<u>January 2003– July 2008</u>	<u>MRS Arates</u>	<u>0.19/1000 patient days</u>	<u>0.12/1000 Patient days</u>	<u>37</u>	<u>Education, multimodal</u>	<u>Various departments in hospital</u>	<u>Nurses and doctors</u>	<u>Yes</u>		
<u>Gill Et al. 2009</u>	<u>The Philippines</u>	<u>May 2003– August 2004</u>	<u>Risk of death</u>	<u>Risk of death per 1000 admissions</u>	<u>Risk of death per 1000 admissions</u>	<u>10</u>	<u>Education, multimodal with video</u>	<u>Two NICUs</u>	<u>All healthcare professionals</u>	<u>Yes</u>	<u>5- WHO</u>	<u>95%</u>
<u>Lobo, et al. 2010</u>	<u>Brazil</u>	<u>January 2005– January 2007</u>	<u>Compliance with Hand hygiene And Central Venous catheter blood stream infection rates</u>	<u>6% (hand hygiene Compliance lowest estimate figure)</u>	<u>48% (hand Hygiene compliance lowest figure)</u>	<u>9</u>	<u>Education multimodal</u>	<u>Two medical ICUs</u>	<u>All healthcare professionals</u>	<u>No</u>	<u>Interventions were Designed to reduce CVC-BSI rate by education of the Whole procedure of CVC insertion Including compliance with hand hygiene</u>	<u>100%</u>
<u>W.N.G.R et al 2016</u>	<u>United Arab Emirates</u>	<u>2012</u>	<u>infection prevention and control measure to reduce healthcare-associated infection</u>	<u>20%</u>	<u>65.5%</u>	<u>26</u>	<u>mixed-methods design Electronic surveys, SPSS tool for data analyses</u>	<u>ICU</u>	<u>109 participants, nurses And doctors</u>	<u>No</u>	<u>WHO Five Moments of hand hygiene</u>	<u>100%</u>

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<u>Randle, J 2014</u>		<u>24 hour period</u>	<u>Hand hygiene adherence needs to be increased and sustained in order to prevent and reduce healthcare associated infection s.</u>	<u>53.0 %</u>	<u>70.8 %</u>	<u>9 M</u>	<u>educational intervention</u> <u>observational study before and after the introduction of an educational intervention.</u> <u>Multimedia approach</u>	<u>Teaching hospital a 28-bed respiratory medicine ward and a 28-bed diabetic unit</u>	<u>Participants were: HCWs, doctors, nurses, allied health care professionals, ancillary and patients; or visitors</u>	<u>Yes</u>	<u>WHO Five Moments of hand hygiene</u>	<u>100 %</u>
<u>Mahfouz, A. 2014</u>	<u>Saudi Arabia</u>	<u>February-April 2011) and 2120 portunitie s Collected after the intervention (February-April 2013)</u>	<u>To increase compliance with hand Hygiene practices among health-care workers</u>	<u>60.8 %</u>	<u>86.4 %</u>	<u>5 M</u>	<u>Multimodal intervention program Training and Education Direct observation</u>	<u>Intensive care facilities, ICU, IMCU, PICU, NICU</u>	<u>179 nurses and 34 physicians and 23 other health-care workers</u>	<u>No</u>	<u>WHO Five Moments of hand hygiene</u>	<u>95%</u>
<u>Kuruno, N.</u>	<u>Japan</u>	<u>Observational period June 24, 2011- November 28, 2011) Intervention Period</u>	<u>Universal gloving has been suggested as an infection prevention adjunct and alternative contact precautions</u>	<u>16.1 %</u>	<u>56.8 %</u>	<u>4 M</u>	<u>Educational intervention</u> <u>Nonrandomized observational before-after study</u> <u>Feed back</u>	<u>Japanese tertiary care university teaching hospital</u>	<u>All health care personnel</u>	<u>Yes</u>	<u>5 Moments of Hand Hygiene</u>	<u>66%</u>

		<u>dApri</u> <u>19.20</u> <u>12-</u>										
		<u>Nove</u> <u>mber</u> <u>18.</u> <u>2013.</u>										

