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A Review On Integrated Awareness Programme On The Knowledge, Attitudes, And Practices Regarding Nosocomial Infection Control Measures Among Healthcare Personnel At Tertiary Care Hospitals

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Abstract:

As early as their first year, health science students are often exposed to hospitals and other places where they are more likely to get sick. One of the main goals of infection control methods is to stop the spread of sickness. The point of this study is to find out how knowledgeable field healthcare workers are about how to stop and control infections. Nosocomial infections are illnesses that people get while they are getting medical care in a hospital. For these illnesses to show up, at least 48 hours or 30 days must have passed since the hospital stay. Since nosocomial viruses affect more than 700,000 people, more money should be put into tracking and prevention. Reports say that in some hospitals, nosocomial cases have dropped by as much as 70%. Still, hospitals, clinics, medical staff, and nurses need to work together to make this happen. Some possible solutions are preventing infections, keeping an eye on things more closely, and giving staff more training and duty. So far, neither a group nor a country has been able to solve this problem. I watched five doctors clean their hands, wear PPE, and take other safety precautions while I learned more about how they protect themselves from nosocomial infections. My study has shown that people need to pay more attention to washing their hands, especially after taking off their safety gear and leaving patient rooms. The latest CDC progress report showed an increase in nosocomial infections. The results of this study may help explain this trend. However, the results are not clear because the sample size was small and the statistical methods used were not correct.

Keywords: Impact, Integrated Awareness Programme, Knowledge, Attitude, Practice, Nosocomial Infection, Health Care Personnel and Tertiary Care Hospitals.

Introduction:

Numerous aspects pertaining to the substandard sanitary practices inside the hospital have been brought to public attention, including the concerns expressed by patients over their personal safety. The topic of virus control has become a prominent subject of discussion among professionals, the media, and individuals in their daily lives. The primary objective of infection control is to mitigate the incidence and transmission of communicable diseases. Prior to using medical devices for patient care, health

studies students are required to undergo specialized training. Health studies students are exposed to healthcare settings and activities at an early stage, which perhaps increases their susceptibility to illness and the transmission of illnesses. Medical personnel may get these diseases from patients, and conversely, patients can also acquire these illnesses from medical professionals. Furthermore, these pathogens have the potential to be transmitted by airborne particles or droplets, as well as via the use of communal vehicles for transporting food and beverages. Additionally, transmission may occur through direct contact with infected surfaces. The etiology of these disorders is mostly attributed to bacterial or viral pathogens (1, 2).

Infection acquisition is well acknowledged as a prevalent challenge encountered by healthcare professionals in their occupational settings. Consequently, it is essential and within the confines of the law to promptly instruct medical students on strategies to prevent the acquisition of blood-borne illnesses. In the context of Namibian medical schools, there exists a notable probability for students to encounter a significant sickness while doing their professional duties. In contrast to affluent nations, infectious illnesses such as HIV/AIDS and TB have lower prevalence rates. The study revealed that a proportion of 18.8% of individuals seeking assistance at a pregnancy center in Namibia tested positive for HIV, but a higher proportion of 56.0% of those diagnosed with tuberculosis were found to be HIV-positive. Namibia exhibited a notable incidence of tuberculosis (TB) in the year 2010, with a recorded count of 12,625 individuals affected. This figure positioned Namibia among the nations with the most elevated rates of TB reporting globally, amounting to 589 cases per 100,000 people (3, 4).

For instance, a substantiated elevated prevalence of TB indicates a significantly heightened probability of transmission. This suggests that tuberculosis (TB) has a high likelihood of transmission inside hospital settings. Studies have shown that the prevalence of the hepatitis B virus (HBV) is highest in Southeast Asia and sub-Saharan Africa. According to reports issued by the Namibian National Blood Transfusion Service, there exists a dearth of knowledge on the prevalence of Hepatitis B Virus (HBV) in Namibia, despite the prevailing belief that a substantial portion of the Namibian population is afflicted with chronic HBV infections. A total of 14.8% of individuals had indications of an ongoing hepatitis B virus (HBV) infection, while 53% displayed evidence of prior exposure to HBV. It is important for health science students to begin their education at an early stage, including a diverse array of subjects, including strategies for the prevention and management of infectious illnesses. Maintaining proper hand hygiene is a straightforward and cost-effective approach to mitigating the transmission of antibiotic-resistant illnesses and reducing the incidence of healthcare-associated infections. This assertion holds true across many healthcare contexts, ranging from primary care facilities to advanced,

technologically-driven healthcare systems. Hand hygiene is a crucial practice that significantly contributes to the overall well-being of individuals (5).

During the 1890s, the first healthcare facilities were established in Windhoek and Swakopmund, Namibia, with the primary objective of providing medical assistance to German military personnel. Subsequently, Finnish missionaries established many hospitals in the northern region. Prior to 1985, the provision of professional nursing education was mostly facilitated by the nursing schools affiliated with Oshakati and Windhoek hospitals. The establishment of the Academy for Tertiary Education was prompted by the recognition of a perceived need for reform within the realm of higher education. The establishment of the Faculty of Medical and Health Science in January 1986 by the Academy aimed to address the need for Namibia to develop its own nursing workforce, reducing its reliance on South Africa for such training. The establishment of this educational institution marked the pioneering introduction of a health professional education school inside a university setting in the region formerly known as South West Africa, now recognized as Namibia. Prior to 1996, the majority of the research conducted by the Faculty mostly focused on the field of nursing sciences. The National Diploma in Radiography was established with the assistance of the World Health Organization (6).

Following Namibia's attainment of independence on September 1, 1992, the establishment of the University of Namibia (UNAM) was facilitated via an Act of Parliament. A comprehensive examination of the challenges faced by Namibia's higher education system was undertaken by a committee in 1991. One of the recommendations put out was the establishment of a consulting committee tasked with devising health research initiatives. Therefore, a recommendation was made to conduct a feasibility study in order to assess the potential for establishing a medical school. The individuals or entities who were solicited to support this project, despite the engagement of an expert and the production of a report, did not proceed with its implementation. In contrast, the Universidad Nacional Autónoma de México (UNAM) started a pre-medical curriculum in the year 2000, aimed at equipping students with the necessary foundation in pharmacy and medicine within their first two years of academic study. Upon completion of their pre-medical coursework, students were assigned to medical schools within the Southern Africa Development Community (SADC). In 2010, the School of Medicine admitted a cohort of 55 students at the commencement of its admission process. In 2013, the Faculty of Health Sciences established the School of Public Health (7).

The Senate and the Health Professionals' Council of Namibia have approved all health-related programs offered by the Faculty, which adhere to the Namibian Framework of Qualifications. All training programs designed for

healthcare personnel include instruction on infection prevention techniques. The acquisition of skills and knowledge is crucial for both macro- and micro-level initiatives in health promotion and illness prevention. The topic of infection control is introduced at an early stage in health sciences education; nevertheless, comprehensive discussions of strategies and measures for preventing and managing infections are not extensively covered. The objective of this research was to ascertain the level of knowledge and attitudes among students about the prevention and control of diseases (8).

Nosocomial Infection:

The colonization of a host by germs is what we call an infection. Microorganisms that infect humans do so because they want to replicate, and they do so by draining the body of its vital resources. Infection is the process by which disease-causing organisms gain access to, multiply inside, and cause reactions within the tissues of a host organism. Infectious agents are the microorganisms or viruses that cause illness in humans and other animals. Naturally occurring microorganisms inside the body should not be considered infections. Microorganisms found in the pharynx and stomach are not the causative agents of infections. Healthcare facilities are ideal breeding grounds for infectious diseases. There are three essential elements necessary for an infection to take hold: an infectious agent, a transmission mechanism, and a vulnerable host. Healthcare institutions, including hospitals, nursing homes, and ambulatory care clinics, all have a role in the transmission of nosocomial diseases. Unrelated to the underlying medical condition, nosocomial infections often appear within 48 hours of hospital admission or within 30 days after release. These infections are the most common kind of healthcare-related adverse event and the main cause of morbidity and death globally. Nosocomial infections, also known as healthcare-associated infections or hospital-acquired infections, are a subset of infectious diseases that may be contracted while receiving medical treatment. Nosocomial infections are those that appear in a hospital within two days of the patient's admission. During the application procedure, it is impossible. Invasive procedures, inappropriate or excessive antibiotic use, and a lack of adherence to infection control and prevention protocols are common causes of nosocomial infections, which can result in life-threatening complications like sepsis and even death. In reality, many nosocomial infections may be avoided by following the protocols recommended by the CDC and other national public health agencies (9).

Type of Nosocomial Infection:

Nosocomial infections may be caused by a wide variety of organisms, but Staphylococcus aureus is by far the most prevalent. In addition to the aforementioned illnesses, the skin and mucous membranes often host Escherichia coli, Enterococci, and Candida. Bugs that are immune to methicillin The methicillin-resistant Staphylococcus aureus (MRSA) strain of the common cold may be deadly and difficult to cure.

Urinary Catheters:

To collect and preserve pee in a sterile environment, a urinary catheter is placed in the bladder. Patients who have trouble emptying their bladders may benefit from urinary catheters. The inability of patients under anesthesia to regulate their bowel movements necessitates the implantation of urinary catheters to keep the bladder empty. The majority of nosocomial infections affect the urinary system and are spread via infected catheters or through the perineum. Urinary tract infections cause uncomfortable and painful urination in addition to high body temperature and discomfort in the flank (10).

Surgical Procedures:

Infections at the incision site are the second most prevalent kind of nosocomial infection. Nosocomial infections at surgical sites may be impacted by a number of variables, such as the kind of surgery performed, the length of the procedure, and the cleanliness of the operating room. Surgical site infections may damage the skin, internal organs, or implanted materials and are caused by either preexisting pathogens or germs discharged by operating room workers. Postoperative symptoms may include skin redness, discomfort, and drainage (9, 10).

Central Venous Catheters:

Often referred to simply as a "central line," a central venous catheter is a medical device that is surgically placed into a major vein in the pelvis, an arm, the chest, or the neck. Total parenteral nutrition (TPN) is an intravenous therapy that gives patients meals and fluids using a central venous catheter. Bloodstream infections may be induced by microorganisms that break the skin's surface during central line hub insertion. Among nosocomial infections, this one has the third-highest fatality rate. Infections may cause redness, pain, and drainage at the insertion sites (11).

Mechanical Ventilation:

Ventilator-associated pneumonia may occur from inhalation of contaminated oropharyngeal flora during mechanical ventilation (also called machine-assisted respiration). After UTIs and infections acquired via central lines, this is the third most prevalent kind of nosocomial infection. Nosocomial pneumonia, also known as early-onset pneumonia, often appears during the first four days of hospitalization. Oftentimes, it is brought on by a community-acquired infection like Haemophilus influenza, Streptococcus pneumoniae, or Staphylococcus aureus. Multidrug-resistant bacteria including MRSA, Pseudomonas aeruginosa, Klebsiella, and Acinetobacter are common causes of pneumonia with a late onset. Among the signs and symptoms include a high body temperature, an increase in mucus production, a rise in white blood cell count, and unusual findings on a chest X-ray (12).

Epidemiology:

Nosocomial infections impact a sizable population worldwide, significantly increasing mortality risk and placing a heavy financial burden on healthcare systems everywhere. Lacking sufficient data and reliable monitoring

tools, we continue to underestimate the true prevalence of healthcare-associated infections (HAI) worldwide. This is so even if research in American and European epidemiology demonstrates that similar findings are made by different monitoring systems. This is why the United States and Europe are the primary locations for demographic research. Primary care hospitals had a 4.4% rate of at least one HAI, tertiary care hospitals had a 7.1% incidence, intensive care units had a 19.2% rate, and long-term care institutions had a 3.7% rate. In the European Union, around 8.9 million HAIs occur annually in hospitals and nursing homes. Twenty-six percent of intensive care unit (ICU) patients were sick in 1995, according to the European Prevalence of Infection in Intensive Care (EPIC) research. The percentage of hospitalized patients that contract a HAI decreased from 4% in 2011 to 3.2% in 2015 in the United States. They made a big loss. Similar research indicated that 36.4% of HAIs in US hospitals occurred in CICUs, 57.5% in regular wards and nurseries, 6.1% in step-down or specialized care units, and 6.1% in mixed-acuity wards. The greatest incidence of HAI was reported in intensive care units, with the exception of high-risk newborn nurseries, well-baby nurseries, adults, and children. About 687,200 cases of HAI occurred in US hospitals in 2015, affecting 633,300 patients. This is encouraging since it was estimated that 1.7 million HAIs occurred annually in U.S. hospitals in 2002. It seems that HAI is more prevalent in less-developed nations. Ventilator-associated pneumonia (VAP) and infections in infants are the most common types of HAIs seen in intensive care units. A significant percentage of persons (9.1%) in Southeast Asian nations were found to have a HAI (13).

Microorganisms Casing Nosocomial Infection:

Healthcare-related diseases may be caused by a wide variety of microorganisms, such as bacteria, viruses, fungus, protozoa, and many more. Acinetobacter is the most common microbe responsible for nosocomial infections, followed by "Staphylococcus aureus," "Vancomycin-Resistant Enterococci (VRE)," Gram-Negative Bacteria," Influenza," "Clostridium Difficile," and "Methicillin-Resistant Staphylococcus aureus (MARSA)." Nosocomial infections are very costly to treat, and the costs increase as the prevalence of infections caused by "multiple drug-resistant organisms (MDROs)" increases. When antibiotics are used to treat "Healthcare Associated Infections," more than 70 percent of the bacteria responsible for the illness are resistant to at least one antibiotic (14).

Influencing Factors of Nosocomial Infections:

There was a web of interconnected and convoluted elements that determined how well the hygiene measures were carried out. The aspects that were observed are going to be broken down into three categories: organization, knowledge, and resources (15-17).

Organization:

The hospital's success in implementing safety standards may be attributed to many factors, including effective direction, efficient task organization, collaborative cooperation, and the establishment of a welcoming, inclusive, and reflective atmosphere. In response to the objective of enhancing workplace cleanliness, workers have expressed their desire for management to implement modifications to the company's values and organizational structure. The prioritization of sickness prevention in the healthcare setting was not a key focus on the ward. Restrictions were imposed on the objectives that would have indicated the desired level of cleanliness and the manner in which it should be maintained. Consequently, the employees were lacking clarity on their responsibilities and the means to achieve them. Based on the conducted interviews and observations, it has been ascertained that the absence of effective leadership has impeded endeavors aimed at enhancing cleanliness.

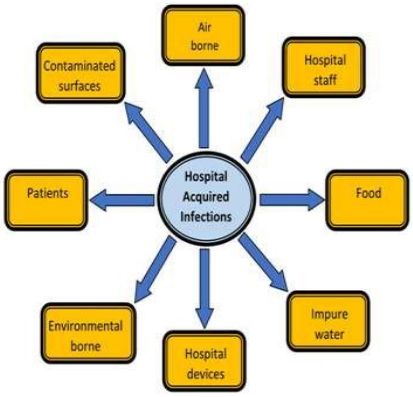

Figure 1 Influencing factors of Nosocomial Infections

The advantages of maintaining a well-structured work environment were clearly apparent in certain domains where established protocols were in place, such as the efficient disposal of waste and the regular cleaning of floors. The organizational structure of the hospital seemed to have a pronounced hierarchical nature, which, in my view, had a role in the suboptimal collaboration among the staff members. The personnel and administration of the ward exhibited a significant deficiency in intercommunication and a pervasive lack of mutual trust. Based on the observations made, it can be inferred that there was an impact on the comprehensiveness of hygiene protocols, resulting in a decline in hygiene standards (16). The inflexible organizational structure directly contributed to the manifestation of inadequate collaboration. There was a lack of collaboration and mutual assistance among staff members, since they did not see it as within their job responsibilities. The absence of accountability, transparency, confidence, and regard all contributed to the situation. The ward lacked a sense of communal healing spirit, whereby patients provided assistance to one another. The frequency of discussions among team members on the appropriate procedures and rationale for maintaining cleanliness was limited.

Knowledge:

The findings derived from the staff's observations and interviews indicated their awareness of alternative methods for sustaining a higher level of cleanliness. The right technique to maintain hygiene and how infections are propagated was discussed. It was suggested that the performances and

knowledge were not sufficiently environment-aware. The relevance of cleaning measures and their rationale were brought to light by my observations and interviews, which led me to the conclusion that there was a lack of knowledge of the ramifications of not adhering to sufficient hygiene standards. There was a lack of foresight about possible repercussions and of continuing education and training on health and safety practices in the workplace. Nurses traditionally worked in hospitals five days a week, and the present nursing program reflects this reality. Some nursing tasks are taught in classrooms, while others are carried out by hospital workers dressed as nurses. Staff members remarked that the hospital mirrored the cultural values for cleanliness and skill. My observations and interviews led me to conclude that, although being aware of the flaws in the execution of hygiene measures, the persons I saw lacked the knowledge and consequence-oriented thinking required to properly comprehend the urgency of correcting the situation. This may shed insight on why particular hygiene practices aren't being executed as efficiently as they may be, why conventional hygiene objectives aren't being addressed, and why people aren't thinking about the best approach to get there (17).

Resources:

Money, people, materials, and equipment have all been shown to make a difference in sanitation methods. Staff members said that a lack of funding was the main factor in the ineffectiveness of hygiene practices. From what I've seen and heard, it seems like the hospital is struggling to bring in enough money to cover basic operating costs like food, medicine, and staff salaries. Workers have complained about the difficulty and expense of acquiring the hygiene tools and supplies they need to do their jobs properly. Another difficulty brought on by poverty was that patients had to foot the bill for all of their medical care. Based on my observations and interviews, I think this helped keep workers from wasting money by purchasing an excessive amount of supplies. Justifying cannula reuse may have been the fact that patients had to pay for them and that the cost to them grew with each usage. Despite the fact that certain things were missing and material waste should be addressed, my observations led me to conclude that the hospital had an adequate number of buildings, equipment, supplies, and people. Despite this, the result gave the sense that more could have been done if the resources had been used more effectively. There were places like the patient waiting room and the nurse's office where people could wash their hands, but they weren't. Hygiene standards dropped, however, because of a shortage of money, and in times of scarcity, people's focus may shift away from preventing medical problems (15, 16).

Routes of Transmission:

Healthcare-associated infections (HAIs) may be caused by many pathogens that may be transmitted via different methods. The primary mode of transmission often seen is via touch, when the organisms are conveyed via direct or

indirect contact. Various microorganisms that may be transferred by touch include multidrug-resistant bacteria, such as methicillin-resistant Staphylococcus aureus (MRSA), extended-spectrum beta-lactamase (ESBL)-producing Gram-negative organisms, and vancomycin-resistant enterococci (VRE). Additionally, Clostridium difficile and rotavirus are also among the microorganisms that can be spread through contact. Droplet transmission may take place when bacteria are transferred from the respiratory system by the dispersion of relatively large droplets, measuring larger than 5 microns in size, which have a limited range of motion, often less than 3 feet. Influenza, Bordetella pertussis, and Neisseria meningitidis are among the infectious diseases that are spread by the droplet route. Airborne transmission refers to the process by which microorganisms are transmitted from the respiratory system by the dispersion of minute droplets, measuring less than 5 microns in size, which have the ability to travel considerable distances. The transmission of certain infectious diseases, such as the chickenpox virus, TB, measles, and the new SARS-COV-2 virus, may occur by the airborne route (17).

Central Line-Associated Blood Stream Infection (CLABSI):

Central Line-Associated Bloodstream Infection (CLABSI) is the most preventable form of Healthcare-Associated Infection (HAI) that manifests in the presence of a central venous line (CVC). In the United States, central venous catheter (CVC) use impacts around 24% of non-intensive care unit (ICU) patients and 55% of ICU patients. Commonly, catheter-associated bloodstream infections (CLABSI) occur as a result of the migration of skin bacteria from the external surface of the catheter to the intravascular region. Additional mechanisms by which central line-associated bloodstream infections (CLABSI) may occur include the introduction of contaminants into the central venous catheter (CVC) during the insertion or manipulation operation, as well as by the dissemination of pathogens throughout the bloodstream (haematogenous seeding). The bacterial and fungal pathogens responsible for central line-associated bloodstream infections (CLABSI) and catheter-associated urinary tract infections (CAUTI) often exhibit virulence features that contribute to the formation of biofilms. These biofilms enhance the pathogens' ability to adhere to and proliferate on external medical devices (18).

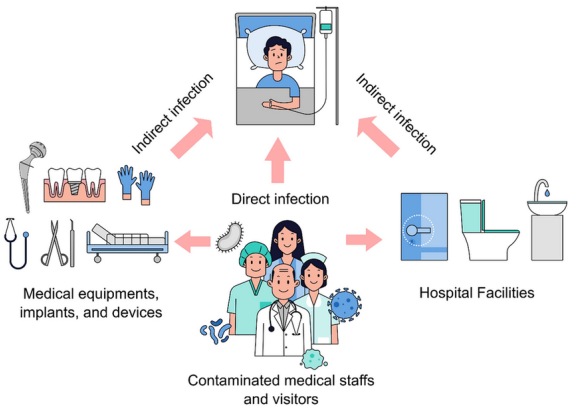

Figure 2 Transmission routes of Nosocomial Infection

Based on a recent study done inside the United States, it has been shown that the primary microorganisms

associated with central line-associated bloodstream infections (CLABSI) include S. aureus, Candida, Enterococcus, Streptococcus, and Bactericide species. Coagulase-negative refers to a group of bacteria that lack the enzyme coagul Staphylococci remain consistently recognized as the predominant organism according to several studies. Antimicrobial resistance is a significant concern in relation to these illnesses. There are two distinct groups of risk factors associated with central line-associated bloodstream infections (CLABSI), namely catheter-related variables and host-related ones. Host variables include a range of immunocompromised circumstances, including but not limited to long-term illness, neutropenia, malnutrition, reliance on parenteral nutrition, advanced age, and bone marrow transplantation. Catheter-related factors include a range of variables, including prolonged hospital stays preceding catheterization, increased duration of catheterization, use of multi-lumen central venous catheters (CVCs), various catheter materials, repeated CVC insertions, urgent catheter placement, and the presence of sterile barriers or potential gaps in aseptic technique. The issue of whether femoral central venous catheter (CVC) placement has a higher risk of central line-associated bloodstream infection (CLABSI) compared to subclavian or jugular locations is a topic of ongoing debate (17, 18).

Catheter-Associated Urinary Tract Infection (CAUTI):

CAUTIs, or catheter-associated urinary tract infections, can occur when an indwelling urine catheter is in position for a variety of medical reasons. In the United States, 15–25% of hospitalized patients use urinary catheters. Two forms of CAUTI exist: extra luminal and intraluminal. Extra luminal infections may be caused by bacteria that traverse the catheter's extra luminal surface and infiltrate the bladder via the urethral meatus. Urinary stasis, frequently brought on by obstructed drainage or ascending infection from the intraluminal side of a contaminated catheter, results in an intraluminal infection. Biofilm formation is a common tactic employed by bacterial and fungal infections to promote growth and spread within an implanted device. Problem-causing microorganisms are typically fecal and cutaneous microflora. Numerous studies indicate that E. coli is the most common pathogen associated with CAUTI, followed by *Candida species, Pseudomonas aeruginosa, Enterococcus species, and Klebsiella pneumonia. Sepsis, bacteremia,* and involvement of the upper urinary tract are among the complications of CAUTI. The duration of catheterization is the most prominent CAUTI risk factor. Conformity to aseptic procedures or operational or insertion protocols is a further modifiable risk factor. Female sex, paraplegia, cerebrovascular disease, advanced age, diabetes mellitus, history of UTI within the past year, and recent antibiotic use within the past 90 days are patient characteristics associated with an increased risk (18).

Skin and Soft Tissue Infection (SSI):

About 2 to 5 percent of laparoscopic patients have SSI, and they

usually start to feel bad 30 days after surgery or 90 days after putting in a device. The type of SSI depends on where and how deep the infection is: Superficial SSI only affects the skin and subcutaneous tissues. Deep SSI affects the muscles or facia. Organ or space-specific SSI are found close to the surgery site. A patient's skin, gastric system, or female urinary tract may hold good bacteria that could affect the surgical spot, depending on where the surgery is being done. Procedures have risks that depend on the length of the surgery, the type of wound, cold and hypovolemia during surgery, hypoxemia, the need for surgery right away, the need for multiple treatments or surgeries, the need for blood transfusions, and the type of device that is inserted. The length of the process is the biggest risk because it gives the tissue more time to be exposed to the air, which makes it more likely to get contaminated. Another important thing to think about is the type of wound. Wounds that are dirty, contaminated, or clean and sick have the biggest risk compared to clean wounds. Some post-operative risk factors are wound tubes, not getting enough wound care, and staying in the hospital for a long time after surgery. Immunosuppression, smoking, being overweight, having high blood sugar, not getting enough food, having joint disease, and getting older are all risk factors that are unique to each patient. Coagulase-negative *Enterobacter species, Streptococcus species, E. coli, S. aureus, Klebsiella species, Enterobacter species*, and *Streptococcus Species* A lot of SSI bacteria are *Staphylococcus*. In some cases, groups of illnesses are caused by bacteria that come from outside sources, like medical tools, the surroundings, or the operator (18, 19).

Pneumonia:

If you get pneumonia 48 hours after being admitted to the hospital, you have contracted pneumonia while you were there. 48 hours after oral intubation, pneumonia linked to using a respirator shows up. VAP happens to 5 to 15% of people who are on artificial breathing. HAP in patients is caused by aspiration, breathing in toxic droplets, the spread of germs, and the spreading of blood. Pathogens like *S. aureus, P. aeruginosa, Candida species, Klebsiella oxytoca and pneumoniae, Streptococcus species*, and *Enterobacter species* are often connected to HAP and VAP. In VAP, organisms that are resistant to more than one drug are common. Some local factors, like having a lung disease, and some general factors, like having low white blood cells, being over 70 years old, having trouble swallowing, or having recently had stomach or chest surgery, can all make a person more or less vulnerable. Deconditioning, sleep, lying on your back, not taking care of your teeth, artificial breathing, and reintubation are all things that can put you at risk for VAP. People who have had IV antibiotics within the last 90 days, needed a ventilator, were in septic shock during VAP, had acute respiratory distress syndrome before VAP, spent more than five days in the hospital before VAP started, or needed acute renal replacement therapy are more likely to get HAP or

VAP with organisms that are resistant to multiple drugs (19).

***Clostridioides difficile* Infection (CDI):**

Clostridium difficile is the predominant microorganism often seen in healthcare-associated infections (HAI). Clostridium difficile infection (CDI) is known to be a causative factor in the development of antibiotic-associated diarrhea and colitis. The colonization of the intestinal tract takes place by the transfer of fecal-oral route, as well as the Aerosolization of spores. Clostridium difficile creates toxins that exert their effects on the cells lining the intestines, causing damage to the tissue and ultimately resulting in the manifestation of diarrhea. Antibiotic use and environmental contamination are the two primary modifiable risk factors that significantly contribute to the beginning of healthcare-facility associated Clostridium difficile infection (HO-CDI), which is considered the most crucial risk factor in this context. Additional often seen risk variables include advancing age, hospitalization, the presence of various comorbidities, use of stomach acid-suppressing drugs, and immunosuppression (19, 20).

Strategies to Prevent Nosocomial Infections:

Based on empirical evidence, it has been shown that healthcare-associated infections (HAIs) have the potential for a reduction of around 70%, and moreover, these infections are often preventable. However, it is essential that all healthcare personnel possess the necessary discipline and undergo comprehensive training in order to effectively fulfill their roles. Several studies have examined strategies aimed at preventing Healthcare-Associated Infections (HAIs), including the development of comprehensive guidelines for healthcare providers to adhere to. The study examined many organizations, including the Centers for Disease Control and Prevention, the National Centers for Biotechnology Information, and the Healthcare Infection Control Practices Advisory Committee. According to the National Center for Biotechnology Information (NCBI), there are six recommended measures that may be used to achieve a 30% reduction in healthcare-associated infections (HAIs). To ensure the production of dependable and inclusive data for research purposes, it is essential to enhance the nationwide surveillance of Healthcare-Associated Infections (HAIs). In order to accomplish this objective, it is essential for researchers to develop methodologies for monitoring healthcare-associated infections (HAIs) occurring outside the confines of hospital settings, while simultaneously assessing the sensitivity and specificity of the surveillance techniques. Furthermore, the implementation of outpatient monitoring should be preceded by the establishment of valid and justified use cases for surveillance. Thirdly, it is important to enhance invasive designs since they possess a greater susceptibility to modification compared to human behavior, such as the act of properly washing one's hands. Furthermore, the implementation of robust antibiotic control programs is crucial in mitigating and containing the emergence and proliferation of antibiotic

resistance. Furthermore, it is essential to underscore the importance of emerging microbiologic approaches, as they will play a pivotal role in enhancing our comprehension of the underlying processes driving the development of resistant strains. Managing tuberculosis (TB) in hospitals is of utmost importance as it exemplifies the successful collaboration of the Centers for Disease Control and Prevention (CDC), the infection control community, and regulatory entities (20).

Figure 3 Strategies to Prevent Nosocomial Infections

The bulk of currently available antimicrobials are resistant, and very few new antimicrobials are being developed for widespread use. Klebsiella pneumoniae is the most common resistant infection and a major threat, especially in critical care units. Complexity of HCAI prevention and management calls for a comprehensive plan to solve this pressing public health problem. In the sections that follow, we'll go over the most important approaches to reducing the risk of healthcare-associated infections (HCAIs), as described in the articles published in scholarly journals that were consulted throughout our search. These are the most often discussed topics in these publications, however it's important to keep in mind that the focus of individual articles might vary widely depending on the scope of the research conducted and the conclusions drawn (21).

Hand Hygiene:

Labarraque, Semmelweis, and Wendell Holmes were among the European and American researchers working to eradicate nosocomial HCAIs in hospitals during the middle of the nineteenth century. They independently conducted studies, but their results supported the same hypothesis: that HCWs carried harmful bacteria on their hands, which they then transferred to vulnerable patients. A growing body of studies in the 21st century has shown that healthcare workers routinely harbor harmful microorganisms. As a pioneering doctor, Semmelweis was the first to realize the significance of hand hygiene (HH) in the fight against communicable illnesses. After the introduction of handwashing and other hygiene measures in hospitals during the Crimean War, Florence Nightingale, the woman often regarded as the creator of modern nursing, noted, "every nurse should be careful to wash her hands frequently throughout the day with soap and soft water."

Environmental Hygiene:

Maintaining sterility is crucial for the purposes of infection control and prevention, particularly in the context of healthcare-related illnesses. Potentially fatal infections including vancomycin-resistant enterococci (VRE), methicillin-resistant Staphylococcus aureus (MRSA), and Clostridium difficile are often transmitted via contaminated and diseased

hospital surfaces. Microbiological contamination with infectious microorganisms is common on hospital surfaces. Bed rails, door knobs, doorbells, and light switches are all examples of porous and nonporous surfaces. Therefore, HCAI prevention relies heavily on good hospital cleanliness practices. Reducing the quantity of pathogens on surfaces is an important goal of environmental hygiene because it lessens the chance that germs may spread from one thing to a person. Infectious and contagious items such sputum, urine, blood, secretions, excretions, germs, and dust that might support the development of microorganisms must be physically cleaned from all hospital surfaces using detergents, chemical disinfectants, and water (18, 19).

Screening and Cohorting Patients:

High rates of morbidity and death from AMR infections acquired during hospital stays are an increasing political and social issue, in part because various methods to control the spread of HCAIs have proved unsuccessful or hard. Active surveillance cultures (ASCs), contact isolation of patients colonized with epidemiologically relevant pathogens, and preventative isolation of high-risk patients are all methods used to lower the prevalence of and care for HCAIs. Multidrug-resistant organisms (MDROs) that may cause healthcare-associated infections (HCAIs) may be reduced or eliminated if contact precautions are implemented and ASCs are obtained from all or some high-risk patients. Implementing ASCs, however, is challenging. Concerns about bed management and logistics that could lead to unnecessary segregation of patients, reallocation of funds to deal with potentially infected patients, and a decrease in healthcare output all arise, along with ethical questions about conflict of interest and confidentiality. The number of patients seen by hospitals and ambulance services may change significantly if ASCs become widely used. Given these concerns, a number of studies have concluded that accurate assessments of the impact on public health and the advantages and downsides of compared to present preventative and control measures are necessary before ASCs can be widely used. Despite widespread support from hospitals, a comprehensive assessment of 20 papers found no evidence that ASCs are an efficient or cost-effective way to deal with the increased prevalence of infections caused by multidrug-resistant pathogens. ASCs conducted on patients admitted to the intensive care unit (ICU) could not discover the bacteria causing the bacteriological diseases with the most severe results, suggesting that ASCs are not linked to bloodstream infections (19, 21).

Surveillance:

In order to inform public health programs targeted at lowering morbidity and mortality rates and improving overall health, public health surveillance is the ongoing process of collecting, analyzing, interpreting, and distributing information about a health-related incidence. Healthcare-associated infection (HAI) surveillance data may be used to evaluate

the breadth, depth, and current status of infections; analyze, scan, and track trends in infection rates; direct early warning systems; and boost performance, strategy, and competence development. Researchers in Scotland found that, compared to the gold standard, it took much longer to discover healthcare-associated infections (HCAIs) because of the country's disorganized monitoring system. The research also indicated that "increasing the number of hospitals participating in surveillance or by optimally selecting which hospitals to include in a surveillance system" may speed up the process of identifying HCAIs. Multiple cases of Staphylococcus aureus bacteremia (SAB) may have been prevented if better monitoring systems had been in place, as shown by two separate investigations conducted in Scotland. Recent prospective observational research in India has shown that neurosurgical institutions there have a low frequency of healthcare-associated infections, suggesting that they strictly enforce active monitoring. Health care-associated infections (HCAIs) in Germany have been reduced more efficiently than with any other method thanks to the Krankenhaus Infections Surveillance System (KISS). Similarities between this system and the one used by the Centers for Disease Control and Prevention (CDC) may be seen in their organizational structures (20, 21).

Antibiotic Stewardship:

The term "Antimicrobial Stewardship" (AS) was first used in 1996 by McGowan and Girding. They stressed the importance of doctors and other healthcare providers seeing antimicrobials as a unique healthcare asset. Antibiotic stewardship is defined by the American Society for Healthcare Epidemiology as "a set of practices intended to improve the safe and effective use of antimicrobial drugs to achieve three overarching goals: better patient outcomes; less antibiotic resistance; and lower healthcare system costs." Antimicrobial stewardship (AS) may also mean choosing an antibiotic that will have the highest possible therapeutic effect on a patient without negatively impacting the patient or encouraging the development of resistance in the future. Encourages prudent antibiotic usage and discourages their inappropriate or excessive use (21, 22).

Respecting the Standards for Patient Safety:

Essential rules, guidelines, and procedures must be used to improve patient safety. However, owing to cultural and geographical factors, these resources are often misinterpreted and misused by people, departments, and organizations. Low physician engagement and compliance with rules and procedures was shown to be a major contributor to the failure of an HCAI approach, according to the research. It was revealed that after a year, doctors and other health professionals' practices started to degrade even in healthcare facilities where regulations, standards, and procedures were efficiently applied. Some of the reasons given for not following the rules and recommendations were that they were conflicting, that there wasn't enough data to back them up, that there was too much

information, and that they were too difficult to apply. When it comes to patient safety, healthcare organizations should prioritize the elimination of HCAIs via stringent infection control measures. As was previously stated, collaboration between healthcare facilities, public health agencies, health insurance companies, quality management and patient safety organizations, educational institutions, the general public, and the veterinary industry is the most effective method for controlling and preventing healthcare-associated infections (HCAIs). The following methods were identified in a follow-up study on patient safety enhancement as having the greatest potential for optimizing program impact: properly introducing and certifying the educational program; publicly reporting program outcomes; designing healthcare environments with patient safety in mind; encouraging an informed and transparent managerial approach; providing clear guidance and serving as an example for others; and facilitating communication between the healthcare program and governing body (22).

Integrated Awareness Programme on Nosocomial Infection Control Measure:

The primary objective of the Integrated Awareness Program was to enhance the nurses' comprehension of infection control measures related to nosocomial infections and provide them with the skills necessary to effectively use these measures within real-world healthcare environments. This is the exact reason for the establishment of three intervention groups. Intervention Group 1 had a face-to-face training program spanning a duration of six weeks, including three instructional units with a cumulative duration of 20 hours. In addition, the participants were provided with teaching materials, including a compact disc containing concise films elucidating non-invasive control methods, as well as a hard copy of the training program spanning 60 pages. Intervention group 2 received just the teaching module in paper format and the accompanying CD. Conversely, from an ethical standpoint, the waiting group was furnished with instructional materials subsequent to the conclusion of the study, whereas no training or materials were supplied to them during the data collection phase (21).

The multimodal learning approaches were administered to intervention group 1 throughout a series of 10 consecutive training sessions. Prior to the implementation of the sessions, a comprehensive communication plan was devised to ensure their effective implementation. The designated individual responsible for facilitating all communications and activities between the hospital and researchers is the infection control practitioner (ICP) at each of the selected hospitals. A flexible schedule was provided after collaboration with the designated contact person(s), hospital authorities, and participants. Subsequently, the participants were divided into twelve smaller groups, each including fifteen individuals. Following that, the participants were provided with the chance to participate in the in-person training session, which was scheduled to

accommodate their morning or evening shifts. This facilitated the resolution of problems highlighted by the participants' expected nonattendance at the training sessions and the hospital administration's reluctance to provide the training. The training session was conducted by three nurses who had a master's degree in nursing and had previous expertise in infection control. One of the training sessions pertaining to sterilization procedures included the presence and aid of a visitor affiliated with the Central Sterile Supply Department (CSSD). Table 1 provides a comprehensive summary of the educational program (22).

Table 1 Implementation of an educational module on nosocomial infection control measures

Theme	Content	Teaching strategies
Unit one: Introduction	Overview on Nosocomial Infection. Point of care risk assessment.	Interactive lecture (slides), brainstorming and small group discussion
Unit Two: Prevention of person-to-person transmission	Hand hygiene (HH). Personal protective equipment (PPE). Safe injection practices.	Interactive lecture with slides, small group discussion, group work assessment, short video demonstration followed by discussion, hands-on practice.
Unit Three: Prevention of transmission from the hospital environment	Reprocessing of patient care equipment. Routine hospital cleaning. Safe linen handling. Safe hospital waste handling and disposal. Source control.	Interactive lecture with slides, small group discussion, video demonstration, role play, performance-based assessment
Summary and evaluation	Module reflection	Module evaluation and open discussion.

Conclusion:

Hospital-acquired infections pose a significant challenge for nurses engaged in daily patient care. Despite receiving training to prevent infections, not all schools had adequate nurse care provisions. The study was conducted by the researcher to assess the level of knowledge among nurses on hospital-acquired diseases. Numerous inferences have been derived from the provided responses. In summary, the implementation of regular cleanliness assessments, adherence to hand hygiene protocols, use of disinfectants, maintenance of a clean environment, and effective patient management all contribute to the transmission of nosocomial infections. Nurses may maintain their well-being via the implementation of vaccination protocols and diligent monitoring for nosocomial diseases. The administration of Lifeline Multispecialty Hospital has been instructed to eliminate any nosocomial infections acquired inside the facility (23).

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