REVIEW ARTICLE

Management Quality of Surgical Instrument and Influence of Cleaning and Sterilization on the Surgical Outcomes of the Patient: A Review

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ABSTRACT

When a medical device or surgical instrument comes into contact with the patient's sterile tissue or mucous membrane during the various processes, the risk of introducing infections into the patient's body increases. Furthermore, an infection may be transmitted from one patient to another, from a patient to a member of the medical staff and vice versa or from the environment to the patient via improperly sterilized or disinfected equipment. A number of outbreaks and diseases have been documented in the hospital setting as a result of poorly sanitized devices. As a result, adequate disinfection procedures for medical and surgical items are required in all healthcare facilities. It is equally the responsibility of healthcare providers to reduce and eliminate such infections. Each hospital should have its own standards for sterilization and disinfection of equipment based on the intended use of medical devices and associated infections. In order to reduce the risk of both endogenous and exogenous infections, infection control procedures must be implemented in general practice. Using a formulation containing alcohol alone or in combination with other agents to properly wash hands after each patient's checkup and before any procedure reduces the likelihood of transmitting infections to and from patients. Sterilization and disinfection are the most important aspects of infection control. The most common sterilization methods are steam sterilizers and ethylene dioxide sterilizers. Trash generated during practice should be handled according to protocol and rules, as it may be a source of nosocomial infections. Trained personnel are required to carry out these procedures. (*Altern Ther Health Med.* 2023;29(8):863-869).

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INTRODUCTION

In most hospitals, the operating room is involved in a number of different departments that provide crucial treatment and rescue services for patients.[1,2] The patients who are brought into the operating room typically suffer from severe illnesses or are dealing with difficult circumstances, both of which call for the assistance of skilled nurses.[3] The efficiency with which nurses perform their duties in the operating room has a direct bearing on the level of care that can be provided to patients, both in terms of their physical well-being and their emotional well-being.[4] The majority of traditional operating room management systems rely on manual recording, which not only adds to the amount of labor that must be done but also makes errors more likely. In addition, the difficulty of the nursing task in the operating room increased the likelihood of unfavorable outcomes occurring frequently.[5] The frequency of adverse events can be reduced and the patient satisfaction rate can be improved by strengthening the nursing quality in the administration of the operating room and standardizing the behavior and operation of nursing staff.[6]

With the advancement of medical technology and the improvement of surgical quality requirements, the hospital management staff is turning its attention to the master of operating room nursing technology in order to focus on the exploration of scientific management modes.[7,8] This is because the hospital management staff now attaches a greater importance to the surgical quality requirements. Recently, the construction of intelligent information systems in medical and health institutions across the country has provided a great deal of ease for the staff working in those institutions. In addition, the internet of intelligence and security presents an opportunity to significantly enhance the efficacy of the work performed by

medical personnel.[9] An intelligent management system is being used in operating rooms as a new form of management,[10] which was previously unheard of.

The term "intelligent operating room" refers to the adoption of contemporary information technology in the operating room; more specifically, it refers to the exploitation of high-tech software and hardware capabilities to perform contemporary management of the operation process.[11] It is possible to visibly restrict the access and leave of operating room medical staff if an information management system is put into place, and this restriction may be enforced. This leads to a large decrease in the amount of wear and tear that operating garments experience, as well as a significant decrease in the amount of money that the hospital spends on its operational costs.[12] Also, the integration of all data in the operating room can significantly regulate the arrival time of medical professionals in the operating room, which, in turn, increases the percentage of procedures that begin on time.[13] Because of the organization of medical practices and the distribution of medical supplies, it is possible to conduct prompt monitoring of the patient's status both during and after the operation. Because of this, it is much simpler for the medical staff to adapt the treatment plan to correspond with the varied conditions that patients may be in.[14,15] It is possible to achieve information integration in the operating room by collecting complete data from a number of different systems, effectively managing the flow of personnel and logistics, and significantly improving both the operation's efficiency and its management of perioperative quality control.[16]

This article was a review that focuses on the investigation of the effect that an intelligent process management system has on the enhancement of work quality in the digital process of the operating room. This effect, together with the changes in relevant work quality of medical staff and patients' job satisfaction both before and after adoption, was researched and assessed.

Background of the Study

Hand hygiene practices, preoperative patient preparation, and antibiotic prophylaxis for procedures are the essential components of infection control protocols that are adhered to in general medical practice. Other components include cleaning, disinfection, and sterilization of equipment and the surrounding environment.[17] It is imperative that medical and surgical equipment undergo thorough cleaning, disinfection, and sterilization processes in order to eliminate the risk of infectious germs being passed on to patients. It is not required to sterilize all of the things used in patient care, and practitioners need to determine in the first place if cleaning, disinfection, or sterilization is indicated for a particular item that is currently in use.[18]

Cleaning is the process of physically removing organic material or filth from the items, which is a prerequisite for disinfection or sterilization. Cleaning can also be thought of as hygienic maintenance. In most cases, water, with or without detergents, is used to accomplish the task.[19] In most cases, the goal of cleaning is to eliminate bacteria rather than to eradicate them. Ultrasonic cleaners are a helpful addition to the assortment of other equipment that is now accessible. By striking the instrument or piece of equipment with sound waves that have a high frequency and a high energy level, one can make certain that the proteinaceous material that is adhering to the instruments is dislodged prior to cleaning the instruments.[20] They are especially effective in cannulated devices that are looped or have a natural curve, making it difficult to clean them with regular brushes. These cannulated equipments can benefit greatly from the usage of these brushes. The use of automated washers will reduce the amount of time spent manually washing instruments.[21-23]

Sterilization. The term "sterilization" refers to a technique that, by definition, destroys or eradicates all forms of microbial life, including spores. This process, which can be carried out in healthcare facilities using either physical or chemical methods, is known as "sterilization." The word "sterilization" is used to convey the idea of a definitive process.[24] The most frequent ways are dry heat, steam under pressure, and ethylene oxide (ETO) gas. More recent approaches include hydrogen peroxide gas plasma, low-temperature sterilizing technology, and liquid chemicals.[25]

There are multiple steps involved in the process of sterilization, including pre-sterilization, drying, packaging, heat sterilization, and storage of the sterile material.[26] The dental instruments are cleaned, disinfected, and decontaminated before going through the process of pre-sterilization. During this stage, the instruments are either washed in washer-disinfectors or submerged in liquids that decontaminate and disinfect them. Although decontamination lessens the microbial load on endodontic instruments, washing gets rid of organic and inorganic residues (the use of ultrasonic trays is advised to avoid the removal of debris by hand brushing).[27] Rinsing, drying, and packaging the instruments is the next step in the process, which is followed by heat sterilization in an autoclave at 134 degrees Fahrenheit and 2 atmospheres to remove any spores that may have been present. The storing of the instruments is the final step in the process.[28] Glass bead sterilization and treatment with 2% glutaraldehyde are two further methods of sterilization that can be performed after the initial step of pre-sterilization. Formerly, glutaraldehyde was employed for high-level disinfection rather than sterilization.[29]

Disinfection is a method that kills most or all pathogenic microorganisms but does not remove bacterial spores from the area being treated. Disinfection, on the other hand, does not kill spores in the same way that sterilizing does. In actuality, liquid chemicals are most frequently utilized in the process of disinfecting devices.[30]

Chemical sterilants are the name given to certain disinfectants that, when exposed to spores for an extended period of time, are able to kill them. Antibiotic and antiviral medication are given to the patient before to surgery as part of preoperative prophylaxis.[31] Antibiotics are given to patients before any surgical procedure as a matter of course, but antivirals, such as acyclovir, are given to patients before

surgery or aesthetic treatments on the face if they have a history of herpes simplex outbreaks in the past. These issues have been addressed in depth within particular recommendations pertaining to each process, and it is strongly recommended that the reader study these guidelines.[32,33]

Classification of Medical Devices and/or Equipment

The primary objective of cleaning, disinfection, and sterilization is to lower the total number of microorganisms present on the equipment to such a low count that there is no longer any risk of infection being passed on as a result of contact with it.[34,35] The different kinds of medical equipment each provide their own unique dangers when it comes to the spread of infection. For instance, in the case of a blood pressure–measuring cuff, the component of the device that is in direct touch with the patient's skin has the lowest risk of disease transmission. On the other hand, there is an elevated chance of infection being passed on by medical equipment that has been in contact with the neural tissue of a patient suffering from Creutzfeldt–Jakob disease (CJD). Earle H. Spaulding, in 1968, developed a categorization to specify the desired amount of antimicrobial killing for various devices. This was done with the intention of reducing the potential dangers of infection transmission through various devices. He classified the instruments as critical, semicritical, or noncritical based on the likelihood that infectious agents would be transmitted by using those instruments. This straightforward classification of Spaulding's needs to be updated because it does not take into account the instruments that come into contact with the mucous membrane (for example, an endoscope), biopsy forceps that come into contact with tissue that has been breached sterilely, prions, and heat-sensitive items. In 1991, the Centers for Disease Control and Prevention (CDC) suggested adding a new category to Spaulding's classification known as "environmental surfaces".[36] This category would have been used to represent surfaces that do not typically come into contact with patients. The term "environmental surfaces" can be further broken down into two categories: clinical contact surfaces (also known as high-touch surfaces or medical equipment), and housekeeping surfaces. Clinical touch surfaces are defined by the Centers for Disease Control and Prevention (CDC) as the regions that behave like reservoirs of germs, such as the hands of health care workers. The contacting equipment that ultimately comes into contact with the patient includes high-touch surfaces like the telephone, the light switch board, the bedrails, the computer, and the door handle, as well as medical devices like the ventilator, X-ray machines, and hemodialysis machines.[37] The Centers for Disease Control and Prevention (CDC) had developed guidelines for proper hand washing and hospital environmental control. The Environmental Protection Agency has given its approval to a variety of LLDs and ILDs that can be utilized for the purpose of disinfecting the clinical contact surfaces (EPA). The surfaces that are typically cleaned during cleaning, such as the walls, floor, and sinks, pose a very low risk of spreading infection. In light of this, the frequency with which disinfection of such surfaces is performed is lower compared to that of the earlier one.[38]

Cleaning and Disinfection of Medical Instruments

The process of cleaning and disinfecting medical equipment is determined by a number of factors, including the equipment's physical characteristics, the nature of the material it is composed of, the lumen size, and so on. Because cleaning eliminates the vast majority of microorganisms successfully, it is best to clean the equipment completely before applying disinfectant to it.[39]

The staff members ought to be given the appropriate education and training concerning the technique for cleaning, the physical and chemical nature of the instruments, the nature of disinfectants, and other related topics. During the process, it is imperative that all personnel wear protective equipment (PPE).

It is difficult to clean the instrument if it has been contaminated with dry organic contaminants. As a result, the drying process is to be avoided at all costs by submerging the apparatus in the detergent or disinfectant solution before cleaning it. The saturated material can be scrubbed and rubbed by hand or with an automatic scrubber, and then it can be fully washed with water that is being forced through a nozzle at high pressure. Steer clear of submerging the gadgets for an extended period of time or overnight.[36] It is imperative that the duration of exposure, as well as the concentration of the detergent or disinfectant, are adequately managed in accordance with the recommendations made in the relevant research. When the concentration is too low, it is possible that the organic materials or bacteria will not be removed efficiently.[40] The instructions provided by the manufacturer should be followed in order to accurately determine the pH of the disinfectant. Processing of fragile items should take place in an environment with a pH that is neutral.[39]

To hasten the cleaning process, it is possible to incorporate enzymes into the solution, such as proteases. To protect the items from being harmed, it is best to use enzymatic cleaners that have a pH that is neutral. For instance, a neutral pH detergent that also has an enzymatic action is recommended for cleaning flexible endoscopes. It has been discovered that a new nonenzyme product that is based on hydrogen peroxide and has been cleared by the US Food and Drug Administration (FDA) is an extremely excellent cleaning agent.[41]

Equipment for Patient Care that Has to Be Cleaned and Reprocessed

The intended use of patient care equipment and the potential for infection transmission determines which of three categories the equipment falls into: critical, semicritical, and noncritical.[26]

The Reprocessing of the Most Important Articles

The category of "critical things" includes all implements that have the potential to contaminate otherwise sterile areas

of the body. They pose the greatest danger to others in terms of the spread of infection.[28] As a result, sterilization is the approach that should be utilized when reusing these objects (heat stable). In the case of heat-sensitive objects, the FDA has given its blessing to the use of ethylene oxide (EtO), plasma sterilization, and liquid sterilization with glutaraldehyde or PAA. In order to prevent contamination from the surrounding environment, it is imperative that all packaged sterile materials be stored appropriately.[21]

Reprocessing of Materials Classified as Semicritical

This category contains things that come into touch with the mucous membrane of the skin, such as lotions and creams. After they have been cleaned, these things need to be processed using either HLD or heat sterilization. It is recommended that sterile water or alcohol be used to thoroughly rinse each of the semicritical objects.[23] Following the rinse step with forced air drying, the rate of contamination is cut down by a significant amount. It has been shown that cleaning equipment that have been infected with the human immunodeficiency virus (HIV) helps to lower the risk of infection transmission. After going through the cleaning process,[27] it is determined that the items are clear of germs if they are soaked in 2% glutaraldehyde for 20 minutes. In the reprocessing of endoscopes, the three most popular disinfectants are OPA, glutaraldehyde, and an automated method that uses PAA.[22]

Reprocessing of Things That Are Not Critical

Noncritical things are considered to be anything that does not come into direct touch with the intact skin. These items include clothing, flooring, high-touch surfaces, furniture, bathrooms, bed pans, weighing scales, brushes, beddings, crockery, earbuds, mobile phones, and trolleys. Other items include high-touch surfaces and high-touch floors. It has been determined that the use of these goods poses the least amount of danger in terms of the spread of infection. On the other hand, they do so in a way that indirectly contributes to the spread of infection. For instance, methicillin-resistant Staphylococcus aureus (MRSA) and vancomycin-resistant enterococci (VRE) are routinely isolated with the patient's belongings and have the potential to be easily spread to other patients by health care worker's hands, causing infections in those patients.[10,28,29] These things do not need to be sterilized; rather, they should be cleaned and disinfected with LLD on a regular basis in order to reduce the risk of infectious organisms being passed on.

Ventilators. A significant number of infections acquired in hospitals are contracted through ventilation equipment. An higher risk of aspiration of the microorganisms that cause illness is connected with the use of this artificial airway. The mechanical ventilators themselves are not directly linked to the infection; rather, the fluids and internal circuits of the ventilators (which may include the filter, tubing, humidifier, and other components) may be a possible source of infection.[16] When there is obvious soiling or a mechanical obstruction in the permanent circuits, according to the criteria provided by the CDC, sterile circuits should be substituted for them. Also, it has been observed that changing the interval of tubing every 7, 14, and 30 days significantly lowers the risk of infection transmission. In the event that it has detachable circuits, it needs to be taken apart, cleaned, and then disinfected.[39-42]

Regular Ventilator Care. It is required that the apparatus be cleaned on a regular basis, and that the ventilator be covered while it is not in use.It is recommended that you fill the humidifier with sterile water rather than tap water because tap water can introduce germs such as *Burkholderia cepacia* and *Legionella spp*.

When handling certain pieces of equipment, you are required to wear protective gear and a mask. Throw away any and all disposals and practice proper hand hygiene after every single handling.The patient's secretions have spread through the ventilator's tubing and caused an infection. When the ventilator circuit is being handled, changed, or otherwise manipulated, there is a risk that the condensate from the patient's inspiratory lines will leak into the nebulizer or into the tracheobronchial tree of the patient.[43] The effluent from the ventilator could potentially contaminate the environment, and it could also reenter the patient's airway through the ventilator, which would increase the patient's risk of infection.[44] Choose HEPA filters for the ventilator circuits' inspiratory and expiratory limbs so that air quality is maintained.Do not let the condensate leak back into the airway of the patient or back into the humidifiers.After each use, the disposable components of the ventilator should be replaced, and the reusable components should be decontaminated after using them for a period of 48 hours.Remove any obvious stains and then sanitize the components using an autoclave or a process that utilizes a low temperature. EtO should be used for the sterilization of infant ventilators.Flushing with air and oxygen should be done after each cycle of sterilization in order to remove any toxic residues that may have been left behind.[44,45]

Humidifiers. While filling the humidifiers, it is recommended that you use sterile water rather than tap water for optimal results. It is imperative that the liquid be delivered in a sterile manner, without being introduced into or handled by hand. On the other hand, a heat–moisture exchanger, often known as an HME, is an option. It does this by taking in the heat and moisture that are present in the patient's exhaled breath and storing them.[46] These heat and moisture are absorbed by the cold, dry gas that is entering the ventilator during the inhalation process, which results in a reduction in the amount of condensate that is formed. In the event of gross contamination, mechanical malfunction, or transitioning between patients, HME should be swapped out. Alcohol containing between 70 and 90 percent can be used to clean humidifiers. The water that is used in the humidifier should not have any antiseptic added to it.[47]

Nebulizer. Nebulization requires the use of sterile water. Any fluid or medication that is left over should be handled in a sterile manner. Before you refill the nebulizer with water,

the cap of the nebulizer should be made dry or cleansed with alcohol that is 70–90% strength after each usage. Before each and every use, the mouthpiece and mask should both be cleansed with warm water and then dried thoroughly.[48]

Anesthetic Equipment. Equipment used during anesthesia, including the face mask, ambu bag, tubings, and endotracheal tubes, should be cleaned on a regular basis. While working with individuals who may have tuberculosis, it is important to wear a disposable face mask and tubing. Ambu bag needs to be kept covered at all times to protect it from being exposed to dust particles.[45] In the event that there is obvious soiling or secretion on the bags, they should be replaced. Pulmonary Function Test Machines' Internal Machinery Should not Be Routinely Sterilized or Disinfected Sterilizing or disinfecting the pulmonary function test machines' internal machinery is not routinely necessary. In the intervals between patients, they should be washed down and disinfected with HLD. After a single use, each of the screening devices, including the inspiratory force manometer, the tidal volume/vital capacity devices, and the peak flow meters, should be thrown away.[43,48]

Transmission of Diseases in Surgical and Critical Care Units

Source. The majority of infections that take place in operating rooms (ORs) are classified as surgical site infections (SSIs). It is possible for pathogens to enter the body via airborne transmission or through direct contact with contaminated instruments or the hands of a healthcare provider.[49,50] The majority of surgical site infections are caused by the transfer of bacteria from the air to the wound, while SSIs caused by direct contact occur much less frequently.[49,50] The germs from the patient are released into the air, where they can subsequently be found adhering to the surface of the floor, instruments, or the palm of a healthcare professional, among other places. The frequency of postoperative infections is drastically reduced thanks to ventilation in the operating theaters. It has also been found that the number of members and movements taking place within the OT setup contribute to an increase in the spread of airborne infections. The patients in the intensive care unit have severe illnesses, impaired defense mechanisms, and are on invasive devices (such as ventilators, IV catheters, and urinary catheters). Extreme age, multiple trauma, burns, and abdominal surgery are the most common risk factors for the patients to acquire NI while they are in the hospital.[36] Patients can also acquire NI if they have undergone abdominal surgery. Immobilization, overcrowding, a low patient–nurse ratio, and poor infection control procedures all contribute to an increased risk of infection in intensive care units (ICUs).[14] Some of the most common types of infections that can be contracted in ICUs include VAP, CR-BSI, CR-UTI, SSI, and C. difficile–associated diarrhea, etc. Infections that are caused by devices are the most common of all.[50]

Interventions to Decrease Infections Related with Medical Care

In the operating theater, poor preventive practices are the primary cause of surgical site infections (SSIs), which are the most common type of HAI. These infections are extremely difficult to treat and pose a significant risk to one's life. Because of this, the recommendation of guidelines and the implementation of the procedures are necessary in order to prevent SSIs in the operating rooms.[51]

Microbiological Sampling. In order to monitor the presence of a wide variety of airborne infections, operating rooms (ORs) should undergo routine bacteriological surveillance.[52] The rate of microbiological contamination in an OT that has been thoughtfully planned, well filtered and ventilated, and thoroughly disinfected is significantly lower. The following procedure is used to collect microbiological samples in theaters that utilize standard ventilation systems. Turn off all of the lights in the operating rooms, and leave them like way for an hour.[53] Using an air sampler, more than 250L of air should be exposed to the no-selective culture medias. The recommended amount is 1m3 air, which is equivalent to 100L. At a minimum of two samples should be collected for each OR. The colony count shouldn't be higher than 50–150 CFU/m^3, at the most. The criteria that have been established in the UK state that the standard bacterial count should not be more than 35 bacterial and/or fungal particles per cubic meter of ventilation air after an exposure time of 5 minutes. In a similar manner, the Geneva standards use a standard of 25 CFU/m^3 for an operating room that is empty and 180 CFU/m^3 for an exposure of 5 minutes. Prior to anything else, the operational state of the HEPA filters should be inspected. The level of airborne microbiological contamination is extremely minimal in environments protected by HEPA filters that are operating as intended.[54] Microbiological samples are taken in a zone with unidirectional air flow from the four corners of the perimeter zone, one from the center, and four from the inner corners of the inner zone. This area should not have more than 0.5 colony-forming units per cubic meter.[52,54]

Infections Caused by Medical Treatment Thought to Be Present in Critical Care Units and Methods to Prevent Them

In hospitals and other medical settings, the incidence of NIs and HAIs is a substantial contributor to morbidity and mortality. It has been found that the patients who are being cared for in the intensive care units are sicker.[55] These patients are also receiving several high doses of antibiotics, are being treated with multiple devices, and are being exposed to multiple antibiotic-resistant pathogens. The incidence of healthcare-associated infections (HAIs) has been reported to be five to six times greater in intensive care units (ICUs) than in regular wards. The infection rate in intensive care units (ICUs) can range anywhere from 5% to 35% overall, with roughly 25% of those cases being hospital-acquired infections.[26] The ventilator-associated infection (VAP), CR-BSI, CA-UTI, SSI, and C are the types of infections that are seen in the intensive care unit most frequently. diarrheas that related to difficile, etc. The device-related infections (VAP, CA-BSI, and CA-UTI) account for 80 percent of all of these illnesses. The many host-related and

hospital-related risk factors for the development of infections can be broken down into their respective categories.[37] The severity of the disease, the extreme age of the host, immunocompromised states (such as cancer, organ transplantation, organ failure, or HIV infection), burn injuries, traumatic injuries, and significant surgeries are all host-related issues. Device-related factors, therapy with immunosuppressant medications, numerous blood transfusions, hemodialysis, parenteral nutrition, prolonged immobilization, and other hospital- or treatment-related factors are included in this category. Pathogens such as MRSA, VRE, ESBL-producing gram-negative bacteria, Stenotrophomonas melophilia, and fluconazole-resistant Candida spp. are frequently seen in infections caused by colonizers.[56] This was due to the fact that the majority of infections are brought on by the colonizers. When the prescribed preventative measures are followed in intensive care units (ICUs), healthcare-associated infections (HAIs) can be avoided. Because infection management measures are now being used effectively, the rate of HAI has dropped to one-third of its previous level. In order to effectively plan and implement preventative measures, an individual should have sufficient knowledge regarding the risk factors, source of infection, type of infection, and cause of the infection.[57]

A Comprehensive Method for Lowering the Risk of Infection

The evidence-based group method of preventative interventions known as the "bundle approach" has been demonstrated to be more successful when carried out in conjunction with one another. According to numerous studies, the results of combination interventions are superior to those of separate ones. These bundled approaches consist of a handful (three to five), at the most, of basic practices that are carried out in groups.[58]

The majority of the time, these are used for the NIs such as CR-BSI, VAP, CA-UTI, and SSI. However, the rate of decrease of these illnesses also depends on the baseline rate of infection at that particular health care center, the adherence of the staff to the strategies, and the preventative measures chosen for the bundle. Patients who are admitted to the intensive care unit are at an increased risk of death and morbidity due to CR-BSI.[55] The number rises as more things are done to the catheter, including handling, the length of time it is inserted, the number of times it is manipulated, the number of lumens, and so on.

Several studies have demonstrated that it is possible to avoid contracting a significant number of infections by using the various control methods. It is imperative that each component of the bundle be carried out at precisely the same instant.[56] Hand washing, the use of full-barrier precautions during the insertion of a central line catheter, routine cleaning of the skin with chlorhexidine solution, frequent infusion of heparin or a substance similar to heparin through total parenteral nutrition to prevent the formation of fibrin, removal of unnecessary catheters, and avoidance of femoral site catheterization are some of the measures that fall under this category.[56] The VAP is another significant factor in the development of ICU-acquired infections. It is not only the cause of death but also a significant contributor to the expenses associated with treatment. The appropriate cleaning, disinfection, and sterilization of ventilator equipment, maintenance of ventilator circuits, and routine care of patients who require ventilation are among the various recommendations for the prevention of ventilator-associated pneumonia (VAP). The use of orotracheal intubation, noninvasive ventilation, and minimizing the duration of ventilation are the preventative measures that are implemented for patients in order to lower the rate of ventilator-associated pneumonia (VAP). The patient should be kept in a semirecumbent position during the procedure (30–45 degrees elevation of head of the bed). It is important to practice good dental hygiene on a consistent basis.[57,58.] Another prevalent source of infection in intensive care units is CA-UTI. The staff needs to have adequate training to be able to distinguish between asymptomatic bacteriuria and infections caused by catheterization.

For the purpose of preventing these infections, health care workers should receive consistent education on the importance of thoroughly washing their hands both before and after performing a catheterization, keeping a closed system, ensuring that urine can flow freely, and positioning the catheter in the appropriate location.[59] SSI is a very prevalent and life-threatening infection that can occur during stays in the ICU. The CDC recommends a variety of different guidelines that are based on evidence.[60] The preoperative preparation of the patient, the management of the colonizers, the correct surgical technique, adequate antimicrobial prophylaxis, adequate sterilization and disinfection of the environmental surfaces, proper aseptic techniques, and washing surgical hands before and after the operative procedure are some examples of the various preventive measures that can be taken to reduce the incidence of surgical site infections (SSIs). The application of the proposed preventative measures has the potential to avert approximately one-third of the infections that occur in the ICUs. Further precautions, such as the contact precaution, the airborne precaution, and the droplet precaution, should also be taken to prevent certain illnesses.[57] They should be done in addition to the education of the health care professionals and the conventional precaution procedures.

Similar to tuberculosis, varicella, measles, viral hemorrhagic fever, and influenza, illnesses that are spread by droplets can be avoided by practicing proper hygiene and taking the necessary precautions. In an ICU setting, antibiotics should be used cautiously if possible.[55-57] To reduce the risk of contracting an infection from water, one should only take the barest of precautions, such as boiling the water before using it and doing routine cleaning and maintenance on one's water storage tanks.

CONCLUSION

To summarize, sterilization, disinfection, and cleaning are the three primary components that make up the core of

infection control efforts in hospitals. It is important to select and apply various procedures in a manner that is in accordance with the instructions provided by the manufacturer as well as the recommendations made by said company. Hand hygiene continues to be the most important component of all infection control activities. In addition, the overall productivity of medical staff has increased thanks to the implementation of intelligent management systems, which have replaced the manual management model that was previously used. It is possible for the intelligent management system to effectively improve the on-time operation opening rate, optimize the dressing process, improve the quality of cleaning in the operating room, and reduce the occurrence of adverse events in the operating room. All of these factors are conducive to increasing the level of satisfaction experienced by both the medical staff and the patients.

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