Eliminating central line infections

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Abstract

Central lines are implanted devices that help facilitate medication administration, administration of blood products, and blood collection without having to stick someone multiple times. The central lines lie in large veins and may be placed in the neck or chest. These veins tolerate extended usage better than peripheral veins would. There are risks involved in having these lines placed including the risk of a central line associated infected. Many central line infections happen and if these infections become systemic, they can become detrimental to the patient’s health. The incidences of these infections are far too high and we must used evidence based practice to help combat these infections and learn how to better prevent them from occurring.

Nurses that work in acute-care or long-term care are usually familiar with central lines. Central lines are large-gage catheters that are implanted into a patient’s neck or chest and sit in a large vein just above the heart in order to administer medications, collect blood, or administer blood products. Central lines are a great resource because they are more stable then peripheral IVs in that they can tolerate usage over an extended period of time. They also protect the patients from the need for multiple needle sticks for blood collection. In emergency situation these lines can be placed so that medications can be administered quicker than with peripheral lines. These veins are not as fragile as small veins that are utilized in peripheral IVs. There are risks associated with the implantation of these devices including

bleeding during insertion, irritation at the insertion site, and catheters placed in the wrong location. Long term risks include central lines infections and embolisms. The incident of infections has led to the need for more research on preventing and treating these infections. As a nurse it is our job to utilize research and apply it to practice, protecting our patients from these infections, monitoring our patients for the presence of these infections, and treating them if they acquire an infection. These infections, like any infection, can lead systemic issues including organ failure and ultimately death if they are not treated correctly or left untreated for extended periods. Central lines are the most frequent cause of healthcare associated infections (CLABSI Toolkit, 2019). According to the Joint Commission there are approximately 100, 000 healthcare associated infection deaths annually (CLABSI Toolkit, 2019). Central line infections are responsible for one third of all healthcare associated infection deaths each year (CLABSI Toolkit, 2019). " The CDC estimated that the annual cost of CLABSI is more than $1 billion, the cost per patient is more than $16, 000" (CLABSI Toolkit, 2019). These infections have been known to cost as much as $30, 000-$50, 000 (Evanovich, Malast, Festus, & Riskie, 2015). This cost includes cost of pharmaceuticals, cather changes, lab testing, and more time spent in the hospital (Evanovich et al., 2015). 250, 000 central line infections occur in the United States each year and many of these infections are in intensive care units (CLABSI Toolkit, 2019). There is a greater incident of central lines infections in developing countries (CLABSI Toolkit, 2019). Policies and procedures have been constructed from evidence-based research on central lines and infections associated with them. We will look at some of the

research that has been done in the last few years on ways to prevent central line associated infections and treat these infections as they occur.

The first step in lowering the incidence of these infections is preventing them from occurring. Prevention of illness and infection is a major part of healthcare. We must understand how these infections occur to adequately evaluate how to prevent them. We must use evidence-based standards to gain the most precise knowledge on how to decrease the frequency of these infections (Conley, 2016). “ Central line-associated bloodstream infection can cause significant avoidable morbidity and mortality” (Conley, 2016). Some of the high-risk factors for developing a central line infection include heavy microorganism growth at the the insertions site , microorganism growth at the hub of the line, neutropenia (especially in immunocompromised patients such as those with cancer), and inadequate care of the central line after insertion (Conley, 2016). Some of the major focuses of prevention are adequate hand hygiene, cleaning of the hub prior to each use with appropriate antiseptic, accessing central lines with only sterile devices, replacing dressings as they become soiled, and performing dressing changes using sterile technique (Conley, 2016). Adequate hand hygiene should be performed by each staff member before they come in contact with a central line (Conley, 2016). Chlorhexidine solution has been found to significantly decrease the number of microorganisms on the skin around the catheter and the insertion site should be scrubbed with 2% solution for 30 seconds and it should be allowed to dry for 30 seconds (Conley, 2016). Strict aseptic technique should always be used when coming in contact with these devices (Conley, 2017). The hub should be cleansed with the appropriate antiseptic

prior to access such as alcohol wipes (Conley, 2016). When using a huber needle to access a lifeport, all of the following should be utilized as well as applying a stabilization device to reduce the risk of the needle becoming dislodged and increasing the risk of infection (Conely, 2016). Educating staff on these practices is a vital component of reducing the incidence of infections (Conely, 2016). In a study done in 2012-2013, 100% nursing compliance with the critical components known to prevent central lines infections (those listed above) were shown to drastically decreased the incident of these infections (Conely, 2016). “ Standardizing port access and dressing practice by implementing evidence-based policies are associated with measurable improvement in patient outcomes” (Conley, 2016). We must implement our research into our everyday practice to better protect our patients from avoidable infections.

An interesting study was done recently in an oncology unit in which the focus on reducing their central line infections rates were placed on an interdisciplinary team approach, educating staff on best practices, and the implementation of an alcohol-based cap (Evanovich et al., 2015). At the beginning of the study, the infection rate on this specific oncology unit was 6. 01 per 1, 000 patient days and the rate of central lines infections hospital wide was 2 infections per 1, 000 patient days (Evanovich et al., 2015). Their goal was to decrease the incidence of these infections on this specific unit by 5% within 12 months (Evanovich et al., 2015). Nursing directors, Clinical nurse specialists, and assistant vice president for nursing created teams that included staff nurses from different units along with their performance improvement analyst, director, and clinical nurse educator (Evanovich et al.,

2015). These teams were constructed to participate in weekly meetings to discuss literature on best practices and develop ideas on how to implement this research into practice on their unit (Evanovich et al., 2015). Each infection that occurred was analyzed in depth with concentration on the nursing practice and the affect patient (Evanovich et al., 2015). They made changes to policies and procedures to reflect best practice from their research and established ongoing peer-to-peer accountability (Evanovich et al., 2015). The staff was educated on the importance on following policies and procedures to help protect their patients from these infections and forms were created as educational tools (Evanovich et al., 2015). The teams evaluated an alcohol-based cap and implement the use of them into practice on their unit (Evanovich et al., 2015). The trial of these caps lasted 30 days and the results included a decreased in infections rates (Evanovich et al., 2015). Employees were educated on these devices and policies and procedures were put into places regarding these devices (Evanovich et al., 2015). The teams also educated their staff on proper insertion of these catheters, dressing changes, and way to appropriately maintain these lines to reduce the risk of infection (Evanovich et al., 2015). Policies and procedures that were already in place were updated to reflect new and upcoming research (Evanovich et al., 2015). A checklist was created as an accountability tool and daily huddles between staff nurses and leaders were held to identify areas of concern from day-to-day, including concerns related to central line infections (Evanovich et al., 2015). Using these approaches the numbers of these infections decreased from 6. 01% to 0. 32% in just two years (Evanovich et al., 2015).

Central lines infections occur when the lines become colonized with microorganisms extraluminally or intraluminally (CLABSI Toolkit, 2019). This can happen during insertion if organisms on the patient's skin are introduced into the body during the process of insertion. This could occur due to inadequate skin preparation (CLABSI Toolkit, 2019). Infections may also occur when microorganisms are introduced postinsertion into the catheter lumen while the catheter connection or hub is manipulated or from contaminated fluids during administration of IV medications or fluids (CLABSI Toolkit, 2019). One of the tools that is being investigated as treatment for these infections post insertion is antimicrobial lock therapy (Vassallo, Dunais, & Roger, 2015). Antimicrobial lock therapy is when high doses of antibiotics are instilled into central venous catheters to combat catheter association infections for an extended period of time. These infections and the microorganisms responsible for these infections are associated with biofilm formation (Vassallo et al., 2015). Microorganisms attach to the surface of the catheters and are able to produce rapidly because of the production of extracellular polymers (Vassallo et al., 2015). This facilitates adhesion of these microorganisms and provides a structural matrix that inhibits the efficacy of the antibiotics (Vassallo et al., 2015). According to a recent study of those patients with central line infections only 10% of the lines had to be removed after undergoing antimicrobial lock therapy compared to those with infections where antimicrobial lock therapy was not used in which 33% had to be removed. The goal of antimicrobial lock therapy is to preserve central lines and treat the infection without having to remove the lines (Vassallo et al., 2015). If the infections are related to staphylococcus aureas or fungi infection, catheter removal is found to be the best option (Vassallo et al.,

2015). Although, if the infections are due to other bacteria such as gram-negative bacilli or coagulase-negative staphylococci, then conservative treatments such as antimicrobial therapy may be an option (Vassallo et al., 2015). Vancomycin has shown promise in treating gram-positive infections especially for coagulase negative staphylococcus (Vassallo et al., 2015). Daptomycin has the ability to inhibit the replication of gram-positive bacteria that can form biofilms and may help in coagulase negative staphyolococcus and staphylococcus aureus infections (Vassallo et al., 2015). Daptomycin is thought to be superior to Vancomycin in inhibiting growth for coagulase negative staphyoloccous infections and staphylococcus aureus strains (Vassallo et al., 2015). There are several other medications such as Tetracycline, Ethanol, and Taurolidine that have potential to combat these ‘ infections (Vassallo et al., 2015). More research will need to be done and more clinical trial performed with these medications to gather additional data (Vassallo et al., 2015). Antimicrobial lock therapy shows promise in being a major treatment strategy in conservative management of central line infections (Vassallo et al., 2015).

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