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Exploring the Perception and Attitude of Cardiovascular Nurses for the Prevention of Central Line Associated Blood Stream Infections: A Qualitative Study

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ABSTRACT

Background: Many healthcare facilities have implemented evidence-based guidelines and best practices for preventing Central line-associated bloodstream infections (CLABSI), and nurses often actively adhere to these protocols. They may collaborate with infection control teams, implement proper hand hygiene practices, use sterile techniques during catheter insertion and maintenance, and monitor patients closely for signs of infection. While most cardiovascular nurses are diligent in preventing CLABSIs, challenges may arise due to factors such as heavy workload, time constraints, staff shortages, and variations in adherence to infection control protocols among healthcare workers.

Purpose: Therefore, our research study aims to explore the underlying factors contributing to the increase of CLABSI despite the availability of prevention guidelines and bundles of care in a government tertiary-military specialized cardiac center in Saudi Arabia. Accordingly, the study explored the perception and attitude of cardiovascular nurses toward preventing Central line-associated bloodstream infections (CLABSI).

Methods: This is an exploratory qualitative research study in which Prince Sultan Cardiac Center nurses participated. An invitation link was distributed to the target participants for a focus group interview. Then, the data collected was transcribed verbatim for content analysis for repeated patterns of themes.

Results: The study revealed three main themes, namely, handling (i.e., the importance of handling a central line properly for cardiac patients), competency (i.e., the need for reconsidering the evaluation frequency of management of central line competency), and actual practice (i.e., aspects related to the actual practice).

Conclusion: Accordingly, several sub-themes emerged as a result. Implications of the study and recommendations were made.

Keywords: attitude, cardiovascular nursing, CLABSI, perception, prevention

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BACKGROUND

The adherence to the Central Line-Associated Bloodstream Infection bundle is complex and not specific to a single non-compliance factor. General factors can influence healthcare professionals' commitment to clinical protocols and bundles, including the CLABSI bundle. It is worth exploring common factors that challenge nurses in adhering to the CLABSI bundle. Similarly, Cardiovascular nurses, known for their dedication and awareness of the risks associated with CLABSIs, understand the importance of preventing them. They recognize that central venous catheters (CVCs) are essential for many critically ill patients but also acknowledge that they can be a potential source of infection. CLABSIs can lead to serious complications and prolong hospital stays, which can adversely affect patient outcomes and increase healthcare costs. Therefore, nurses usually perceive CLABSI prevention as a critical aspect of their practice.

The incidence of central line-associated bloodstream infections in critical care areas has experienced a concerning increase in recent years. However, it is important to note that CLABSIs are largely preventable when evidence-based guidelines for inserting and maintaining central venous catheters are followed. The risk of infection is increased in ICUs with line-associated bloodstream infections due to the prevalence of invasive procedures, devices, immunosuppression, comorbidity, frailty, and elderly patients (Lutufyo et al., 2022). According to surveillance data from Belgium in 2012, the CLABSI rate in intensive care units was reported at 2.5 per 1,000 central-line days. This suggests a notable prevalence of CLABSIs in critical care settings, which can have significant implications for patient morbidity and mortality.

Moreover, the serious consequences of CLABSIs cannot be underestimated. The cost to healthcare systems and individuals is significant, with increased morbidity and mortality rates. There is also a significant impact on healthcare costs, as CLABSIs often require extended hospital stays and unnecessary antibiotic usage. The increased incidence of CLABSIs in critical care areas is a concerning issue that requires immediate attention. CLABSIs have been associated with unnecessary antibiotic usage, increased hospital stay length, and healthcare costs. To address this issue, healthcare settings in critical care areas must take the lead in implementing comprehensive CLABSI prevention efforts. This can include educating and training healthcare staff on proper insertion and maintenance techniques for central venous catheters and using checklists and protocols to ensure adherence to evidence-based guidelines. By working together and prioritizing CLABSI prevention, we can significantly reduce the incidence of these infections.

Moreover, Parlon and Carroll (2021) conducted a descriptive phenomenological study in an adult hospital context with one-on-one interviews. Nurses and nurse supervisors with expertise in caring for adolescents and young adults with a history of heart transplantation presented difficulties concerning the daily menus, the ward's décor, and visiting hours, causing nurses to convey stress to the patients and their families. Even though CLABSI often occurs in critical and non-critical care settings, this healthcare-associated infection can be avoided. Chlorhexidine (CHG) bathing was adopted by Engel et al. (2023) utilizing a variety of educational tactics, including an e-learning module, printed educational materials, educational outreach, the involvement of unit-based CLABSI advocates, and an electronic reminder in the electronic health record. There was a clinically significant 22.8 percent drop in CLABSI rates following the intervention. At the same time, it was not statistically significant ($b = 0.35$, $P = 0.15$). Also, the system-wide compliance rate for CHG bathing paperwork rose from 77% in January 2020 to 94% in February 2021. Nurse leaders were generally happy with the way CHG bathing was implemented.

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Furthermore, after implementing the CLABSI prevention package in a pediatric congenital Cardiac Surgery facility, Vachirapuranon et al. (2022) reported that the incidence of Blood bloodstream infection dramatically decreased. The CLABSI prevention package includes hand washing before all procedures, the use of a maximal sterile barrier when inserting a central line, the use of 2 percent chlorhexidine gluconate in 70% alcohol before inserting a central line, avoiding inserting a central in the femoral vein, daily evaluation of the condition of the central line, and 15-second hub scrubs with 70% alcohol.

Additionally, a significant and consistent improvement in lowering the CLABSI rate in adult Coronary Intensive Care Units (CICU) was achieved by implementing an evidence-based CLABSI prevention bundle and process monitoring through direct observation. In the unit, Gupta et al. (2021) achieved 757 days without an incidence of CLABSI up till December 2018. After that, they accrued 602 days of freedom till July 2020. Also, In the ICUs of fifteen hospitals spread across five cities in Jordan, Aloush and Alsaraireh (2018) assessed nurses' compliance with prevention guidelines for central line-associated bloodstream infections related to maintaining the central line and the predictors of compliance. Seventy percent of the participants, or 120, demonstrated adequate compliance. The average compliance ratings were 14.2 ± 4.7 (with a range of 8 to 20). The nurse-patient ratio was the sole significant predictor at the same time. The nurses with a 1:1 nurse-to-patient ratio outperformed those with a 1:2 ratio in compliance.

Subsequently, this research study explored the underlying factors contributing to the increase of CLABSI despite the availability of prevention guidelines and bundles of care in a government tertiary-military specialized cardiac center in Saudi Arabia. Furthermore, the Cardiac Center has a robust surveillance system in place to monitor and track CLABSI rates, allowing for the identification of trends and potential areas for improvement by the Infection Control Department.

OBJECTIVE

This study aims to determine what underlying factors contribute to the increase in CLABSI despite the availability of prevention guidelines and bundles of care in a government tertiary-military specialized cardiac center in Saudi Arabia.

The project objectives are:

- To determine participants' perception of the bundle's importance in patient outcomes and safety.
- To determine whether support from nurse managers and hospital leadership can positively impact adherence.
- To assess if the CLABSI bundle is easy to implement and integrate into existing workflows, nurses are more likely to incorporate it into their daily practice.

METHODS

This qualitative exploratory research study occurred in nine in-patient care units in Prince Sultan Cardiac Center, with a target population of 373 participants**.** A purposive sampling technique for this focus group discussion was used to recruit 12-15 nurses. The subject recruitment procedures for Focus Group Discussion (FGD) were done by sending Google invites to experienced clinical nurses handling Central Vascular Access Devices in an in-patient setting by the research team. The inclusion criteria were in-patient nurses in both Pediatric and adult staff nurses (SN) in critical and non-care settings who had spent at least one year in a current clinical setting. These criteria were designed to ensure that participants have completed the required unit competencies, are familiar with unit policies and key indicators, and independently work with patients with Central venous Access Devices

(CVAD). Ambulatory setting nurses and those who are < 1 year in the study setting clinical area nurses were excluded.

Additionally, a consent form was sent to the participants before the Zoom meeting, and demographic information was sought during the initiation of the FGD. Then, during the FGD, there was an interviewer, recorder, and observer. The FGD took 45 minutes and 15 minutes to address participants' additional concerns, which was an hour-long session.

The recorded audio-video was transcribed for content analysis when the interview was completed. Audio-recorded interviews are generally transcribed verbatim with different punctuation marks to indicate laughter, changes in voice tone, or other nuances. The coding began simultaneously to identify core categories and themes. Researchers shared the preliminary findings to meet the requirements of confirmability of developing conceptualization. When no new categories emerge, saturation is reached after a couple of reviews. The team decided to use Microsoft Word during coding and content analysis. The researchers looked for repeated ideas or patterns of thought. The research team developed a semi-structured interview guide to ensure the interview will obtain rich information quickly. The research team kept the demographic and data information from FGD in the Nursing Research data file. Moreover, securing an IRB review and approval from the PSCC IRB committee was granted No.1683, 2nd October 2023.

RESULTS

A thematic analysis was done, and accordingly, three main themes and subsequent sub-themes were identified as indicated below:

Table 1. Thematic analysis:

Theme	Theme description	Sub-themes	Sub-theme description
1. Handling	The cruciality of adequately handling the central line, especially for cardiac patients.	Infection process	Despite CLABSI bundle education given to staff, CLABSI symptoms develop within a matter of three days on average when patients are transferred from critical to non-critical units.
		Contributing factors	Patient-related factors, irritated skin around the central line site, location of the central line, poor adherence to infection control measures, lack of supervision, need to change the culture, availability of and poor-quality supplies and its impact on the practice, leadership support regarding the availability of supply, need for multidisciplinary cooperation when transfer patients for procedures outside the Cardiac Centre were all considered as contributing factors.
		Consequences	Prolonged hospitalizations and occupying critical care beds and the consequent impact on delaying other aspects of treatment as a

			result.
2.Competency	Need for re-evaluating the frequency of central line management competency.	Frequency	The current management of central line competency is being done annually.
		Practical compliance	Proper adherence to the policy, guideline, or protocol in daily practice in the unit, attitude, and the need for a role model.
		Bundle checklist	Access to, content of, and training on the bundle checklist.
	Aspects of the current policy and practices.	Practice change	Non-compliance to aseptic technique and aseptic non-touch technique
3.Actual practice		Education	The importance of more frequent education of the bundle and frequent reminders regarding preventing CLABSI.
		Acknowledgment	Share information, appreciation, and acknowledgment.
		Policy	Need to revise the current policy to adjust to certain conditions.
		Information resources	Availability of information resources.

DISCUSSION

The following themes were identified:

Main theme 1. Importance of handling a central line properly for cardiac patients:

The cruciality of adequately handling the central line, especially for cardiac patients, was stated numerous times. Accordingly, the following subthemes emerged as a result of this discussion:

Emerging themes:

1.Course of CLABSI infection development:

Despite the CLABSI bundle education given to staff, patients transferred from the Pediatric Surgical Intensive Care Unit (PSICU) to the Pediatric post-surgical unit stay for about three days, develop symptoms, and then return positive CLABSI.

2. Contributing factors of CLABSI infection development:

- Irritated skin around the central line site: Irritated babies' skin can contribute. Also, injured surrounding skin can be a source of infection.
- Adherence to infection control measures: Another contributing factor was the need for all nurses in all locations to follow the CLABSI bundle infection control measure strictly.
- Lack of supervision: After day duty hours, no one is there to correct staff in the same way during the day due to the presence of the nurse manager, charge nurse, and nurse clinician during day duty hours.
- Need to change the culture: It was stated that a culture where peer corrections are acceptable professionally is needed.
- Patient-related factors: The status of the patient's condition can also contribute, such as long-stay immuno-compromised patients.

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- Availability of sub-standard quality supplies and their impact on the practice: occasional limited quantality of Pediatric chlorhexidine dressing in the hospital was reported. Adult chlorhexidine dressing is used instead, but it is oversized for a baby, making it very difficult to secure properly. Therefore, the dressing will be loosened, and the infection will go inside the dressing because the baby's saliva is touching the dressing. Sometimes, sub-standard quality transparent dressings are provided instead, which cannot be adequately secured on the baby's skin, allowing the infection to go in. Also, the transparent dressing used when the skin is wet and moist does not stick to the skin, which is a problem as well.
- Leadership support regarding supply availability: Local support is available from the nurse manager, who usually issues several incident reports and reports through the CLABSI committee. Occasional shortage of chlorhexidine, yellow gowns, and different-sized gloves was reported. It was noted that the current practice (protocol) cannot be adhered to due to the quality of the transparent supply. Informants said, "The lines, we are changing it like every 96 hours, and the dressing, we are changing it every 5-7 days or "PRN" if there is any bloodstain around the central line dressing site and this dressing. There is an evident blood strain, so we do the dressing and have this protocol if we do not. Eh, but if we use gauze dressing, we must also change the dressing 48 hours and PRN. However, if it is transparent, we dress like 5 days or 7 days. Nevertheless, it is better to have this chlorhexidine pediatric dressing because it stays there for 7 days".
- Location of the central line: Patients with Femoral central lines usually require more dressing because the fluid goes to the site when the baby pees or defecates.
- Need for multidisciplinary cooperation when transferring patients for procedures outside the department/organization: when patients are being sent to undergo any Computed tomography (CT) abdomens or CT brain with contrast or similar procedures. The healthcare worker (the radiologist or technician) will hand over the nurse contrast tubing with exposure, without any swabs, and then give it to the nurse. Usually, an alcohol swab should be used to swab the port first, even the one exposed. The informants stated that "time is crucial for the nurse to whether she will right away connect the tubing directly to the Central Line (CL) or swab first. And then you hand it to the nurse to connect, which is unacceptable. When you request an alcohol swab, they do not have one, I feel that this is not the first time this practice has happened."

3. Consequences of developing a CLABSI infection: The negative impact of CLABSI infection includes prolonged hospitalizations, longer stays in critical care beds, and delays in other aspects of treatment.

Main theme 2. Re-evaluation frequency of management of central line competency:

The appropriate time to reevaluate the competency of central line management was also discussed. The following subthemes emerged as a result of this discussion:

Emerging themes:

1. Current competency frequency: Central line competency is managed annually.
2. The importance of practical compliance: It was stated that despite the theoretical understanding and knowledge of the process, there was no proper following of the policy, guideline, or protocol in the daily practice in the unit. It is not about the knowledge; it is about the staff behavior and practice in the unit, and consequently, the guideline standards (bundle checklist) are not strictly followed. Staff should be willing to accept advice, have a positive attitude, and listen to others once corrected in their practice. Need for a role model was also stated.

3. Access to the bundle checklist: Participants also stated that the bundle checklist is easily accessible in the system.
4. Content of the bundle checklist: The content of the bundle checklist was also discussed. Participants showed an understanding of the bundle contents.
5. Training on the bundle: The question of who receives training on the bundle was also addressed. Participants explained that they received training for the insertion and maintenance of the bundle. Subsequently, besides the nursing clinician providing education, resources are also available in the Organization Health Information system (HIS). Additionally, infection control practitioners reinfuse nurses' education about CLABSI. Auditing is also done. Beginners are being trained in their study days on the prevention of CLABSI.

Main theme 3. Actual practice:

The following subthemes emerged because of the current practice discussion:

Emerging themes:

1. Importance of accessing the catheter hub using an aseptic technique:

In addition to using chlorhexidine, it’s essential to maintain the non-touch technique to prevent this infection. However, the nurses' attitude sometimes contributes to that, as they did not or forgot to prepare enough equipment beforehand. Then, they had to change to a new needleless connector. This is the one that might be contributing to the infections.

2. Ways we can change our practice in dealing with the central line:

How to change the current practice in dealing with the central lines was discussed. Aseptic and non-touch techniques were suggested to be the only ways to prevent bacterial infection.

3. Importance of more frequent education about the bundle: It was suggested that more education about the bundle should be conducted more often, like every six months rather than yearly in-service, and reminders on CLABSI prevention should be reinforced every two months.
4. Share information, appreciation, and acknowledgment: As an appreciation gesture, Informants suggested that the organization should acknowledge the department with zero cases and then learn from underperforming teams.
5. Need to revise the current policy to adjust to particular conditions: the ideal time to remove the central line from a patient for both pediatric and adults, medications that require the dress to be changed after, such as antibiotics, when patients are extubated or intubated situations, patient general condition (stable or not stable) were situations that were mentioned with a need to be detailed in the policy.
6. Information resources available: The location of the available information resources was also discussed, and participants showed an understanding of how to find them.

CONCLUSION

Despite the availability of evidence-based guidelines and bundles of care to prevent CLABSIs, the rates continue to rise in critical care settings. This suggests that underlying factors may contribute to this increase, such as the use of invasive central venous access devices and potential lapses in adherence to preventive measures. Likewise, the acuity of patients in critical care areas can also contribute to the increased risk of CLABSIs. These patients often require invasive procedures and have compromised immune systems, making them more susceptible to infections.

The thematic analysis revealed that properly handling the central line is crucial, especially for cardiac patients. Competency content and frequency and the actual policy and practices were all major themes, from which sub-themes like contributing factors, practical compliance, and education emerged.

Additionally, our thematic analysis also showed that factors such as patient-related factors, irritated skin around the central line site, location of the central line, poor adherence to infection control measures, lack of supervision, need to change the culture, availability of and poor-quality supplies and its impact on the practice, leadership support regarding the availability of supply, need for multidisciplinary cooperation when transfer patients for procedures outside the Cardiac Centre were all considered as contributing factors to the increased number of CLABSI cases reported. Attention should be paid to the policy revision, competency checklist content, and competency evaluation frequency. Moreover, an encouraging gesture from the nursing leaders to acknowledge and reward units with zero cases was highlighted.

Furthermore, the results of this study have important implications for practice, especially when it comes to preventing and lowering Central-Line Associated Bloodstream Infections. Healthcare workers from our institution can utilize the identified factors leading to CLABSI to improve the quality of health outcomes and patient experience. Specifically, hospitals can implement targeted education and training programs for healthcare workers, emphasizing proper maintenance, handling techniques, and ensuring adherence to established CLABSI guidelines. In addition to this, hospitals should consider conducting regular educational sessions for both new and experienced staff to refresh their knowledge about the details of the CLABSI bundle. Another important theme that came out of this study is that nurse manager support is a big part of lowering the rate of CLABSI by making sure that the area has all the necessary and high-quality supplies for securing and maintaining the central line. By addressing the identified factors from this research study, it can lead to improved patient outcomes and decrease healthcare costs associated with these preventable factors.

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CONFLICTS OF INTEREST

The study researchers declare no conflict of interest.

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