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Araştırma Makalesi / Research Article

Santral Venöz Kateter Bakımında Kullanılan Standart Bakım ile Transparan Film Örtülerin Etkinliklerinin Karşılaştırılması: Olgu Kontrol Çalışması

Effectiveness of Transparent Dressing with Chlorhexidine Gluconate for Central Venous Catheter Care in the Intensive Care Unit: A Case Control Study

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ÖZET

Bu çalışma, santral venöz kateter (SVK) bakımında kullanılan standart bakım ile klorheksidin glukonat içeren transparan film örtülerin etkinliğinin kateter enfeksiyonu, bakım maliyeti, hemşire memnuniyeti ve verimliliği açısından karşılaştırılması amacıyla gerçekleştirildi. Çalışmanın evrenini, bir devlet hastanesinin Genel Yoğun Bakım Ünitesi'nde yatan hastalar ile bu ünitede çalışan hemşireler oluşturdu. Mart- Aralık 2020 tarihleri arasında olgu kontrol tipinde gerçekleştirilen çalışmada, kontrol grubuna standart SVK bakımı, olgu grubuna klorheksidin içeren transparan film örtüler ile SVK bakımı uygulandı. Veriler, hasta dosyalarından, hemşire gözlem formlarından, hemşireler ile birebir yüzyüze görüşerek ve enfeksiyon kontrol komitesinden sürveyans bilgileri alınarak araştırmacı tarafından toplandı. Verilerin analizi bir istatistik programından yardım alınarak yapıldı. Olgu grubunda SVK kullanım oranı 0,66 kontrol grubunda ise SVK kullanım oranı 0,55 olarak hesaplandı. Olgu grubunda SVK kullanım oranı kontrol grubuna göre fazla ($p<0,05$) olmasına karşın, santral venöz katater ile ilişkili kan dolaşımı enfeksiyonu gelişimi görülmedi. Olgu grubunda 77, kontrol grubunda ise 293 pansuman yapıldı. Kontrol grubunda rutin değişim, kirlilik, gevşeme nedeniyle olgu grubuna göre, olgu grubunda ise ıslaklık nedeniyle kontrol grubuna göre daha fazla pansuman gerçekleştiği görüldü. Buna rağmen, klorheksidin glukonat içeren şeffaf pansumanların maliyet etkinliği daha iyi bulundu. Bununla birlikte, klorheksidin glukonat içeren şeffaf pansumanların kullanılması hemşire memnuniyeti ve verimliliğini artırdığı görüldü. Şeffaf pansumanlar enfeksiyon açısından gazlı bezden önemli ölçüde farklı değildi. Klorheksidin glukonatlı şeffaf pansumanlar sınırlı maliyet etkinliği gösterirken, hemşire memnuniyeti ve verimliliğine olumlu katkıda bulundu.

Anahtar kelimeler: Santral Venöz Kateter, Pansuman, Kateter, Enfeksiyon, Yoğun Bakım, Maliyet

ABSTRACT

The objective of this study was to compare the efficacy of standard care and transparent film dressings containing chlorhexidine gluconate in the management of central venous catheters (CVCs) in terms of catheter-related infection, cost of care, nurse satisfaction and efficiency. The study population comprised patients hospitalised in the General Intensive Care Unit of the State Hospital, and nurses employed in this unit. In the case-control study conducted between March and December 2020, the control group received standard CVC care, while the case group received CVC care with transparent film covers containing chlorhexidine. The data were collected by the researcher from patient files, nurse observation forms, face-to-face interviews with nurses, and surveillance information from the infection control committee. The data were analysed using a statistical software program. The rate of CVC utilisation in the case group was 0.66, while the rate of CVC utilisation in the control group was 0.55. Despite the higher rate of CVC use observed in the case group compared to the control group ($p < 0.05$), there was no evidence of catheter-related bloodstream infection. A total of 77 dressings were performed in the case group, compared to 293 in the control group. It was observed that a greater number of dressings were performed in the control group than in the case group, due to the need for routine changes, the presence of contamination and loosening. Conversely, a greater number of dressings were performed in the case group than in the control group, due to the presence of wetness. However, the cost-effectiveness of transparent dressings containing chlorhexidine gluconate was found to be superior. Nevertheless, the utilisation of transparent dressings containing chlorhexidine gluconate appeared to enhance nurse satisfaction and efficiency. Transparent dressings demonstrated no significant distinction from gauze in terms of infection. While transparent dressings with chlorhexidine gluconate exhibited limited cost-effectiveness, they contributed favourably to nurse satisfaction and efficiency.

Keywords: Central Venous Catheter, Dressings, Catheter, Infection, Intensive Care, Cost

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INTRODUCTION

The diagnosis, management, and provision of care for patients admitted to Intensive Care Units (ICUs) entail a comprehensive range and entail the utilization of numerous interventional therapies. The utilization of a central venous catheter (CVC) stands as the prevailing approach for accessing the intravenous/central line (Smith & Nolan, 2013). While employing a central venous catheter offers advantages, it also presents potential complications, including infection and thrombosis(Çam et al., 2008; Yeşil et al., 2014). Within ICUs, central venous catheter-related bloodstream infection, commonly referred to as central line-associated bloodstream infection (CLABSI), constitutes a significant factor contributing to both mortality and morbidity (Niemann et al., 2022). The demands of nursing practice require healthcare professionals to implement interventions with the best available evidence to make sound clinical decisions (Celebi & Ilce, 2022; Lopez, 2015).

CVCs are inserted by medical practitioners, while the subsequent care is administered by nurses. The majority of infections and associated complications that arise during the CVC procedure, even when implemented under ideal circumstances, can be averted through meticulous nursing care (Corley et al., 2019). Preventing catheter-related infections in patients not only leads to reduced hospitalization durations and early cost savings, but also contributes to alleviating nurses' workload and enhancing their job satisfaction (Kıray et al., 2019; Şanli et al., 2016; Sanlı & Sarıkaya, 2016; Thokala et al., 2016). During the catheter dressing process, nurses are tasked with selecting suitable dressing materials tailored to the patient's needs.(Kıray et al., 2019) Significant catheter-related infections observed in ICUs encompass catheter colonization, phlebitis, exit site infection, port infection, tunnel infection, septic thrombophlebitis, and CLABSI.

In numerous regions, traditional care for central venous catheters (CVCs) involves the use of sterile gauze and non-sterile adhesive tape (Corley et al., 2019). Based on research findings, incorporating transparent dressings in catheter care is expected to offer increased convenience to nurses. This is achieved through fewer dressing changes and the ability to observe the catheter site due to the transparency of the dressing material (Sanlı & Sarıkaya, 2016).

A comprehensive meta-analysis examined nine randomized controlled trials (RCTs) and revealed that the utilization of transparent dressings containing chlorhexidine gluconate has demonstrated a reduction in both catheter colonization and the incidence of CLABSI (Safdar et al., 2014).

The aim of this study is to compare the conventional approach involving sterile gauze for CVC care with the use of transparent dressings containing chlorhexidine gluconate, with a focus on aspects such as infection rates, cost implications, and nurse satisfaction and efficiency.

METHODS

Study Design and participants

This study adopted a non-randomized case-control design with parallel controls. The objective was to compare two approaches for central venous catheter (CVC) care: the standard method involving sterile gauze and the use of transparent dressings with chlorhexidine gluconate. The comparison was made based on the development of catheter infections, cost of care, nurse satisfaction, and cost-efficiency.

Materials and Their Properties

In the case group, sterile transparent dressings with chlorhexidine gluconate (3MTM 1657R TegadermTM CHG) were employed as covers. Additionally, an antiseptic solution consisting of 2% chlorhexidine gluconate and 70% alcohol (Biorad Dermol) was used for skin antisepsis. If the dressing's integrity remained intact, a daily dressing change was conducted.

In the control group, sterilized gauze tailored to size was used. Skin antisepsis employed 10% povidone-iodine (Medisin), and non-sterile adhesive medical tape (Clivex) measuring 10m x 10cm was replaced daily until wetness and contaminants were eliminated.

This research took place in a General Intensive Care Unit at a second-level state hospital from March to December 2020, accommodating 8 beds. The unit provides ICU services at the second level, with patient admissions mainly from the emergency room, and referrals from palliative care, the operating room, and inpatient services. Staffed with 13 nurses, including a nurse practitioner, one general surgeon, and one cardiovascular surgeon, the ICU operates three shifts: 08:00-16:00, 16:00-08:00, and 08:00-08:00, with each shift having four nurses responsible for two patients.

CVCs are typically inserted by two skilled physicians working in the ICU. It's worth noting that some patients admitted to the ICU may already have a CVC in place. However, there is no established protocol for CVC care within the unit. Nurses follow a standard care routine using povidone-iodine, sterile gauze, and non-sterile plaster.

During the CVC insertion process, both physicians and ICU staff practice hand hygiene and employ barrier measures such as masks, sterile gloves, and sterile gowns. All patients receive a similar type of CVC featuring three lumens, with the catheter secured using two or three silk skin sutures fastened to its two clips.

The hospital lacked chlorhexidine gluconate antiseptic solutions and transparent dressings. Yet, for the research, the investigator's resources provided both items.

Population and Study Sample

The study included patients receiving treatment in a specific intensive care unit, where their central venous catheters were inserted by unit medical staff and cared for by unit nurses over 7-10 days. Twelve unit nurses assessed care satisfaction. Sixty patients were initially involved, 30 in each group (case and control), meeting parametric test criteria. However, one patient dropped from each group, leaving 29 patients in each.

Inclusion Criteria: Patients aged 18 or above, not pregnant, with parental consent if applicable, without pre-existing infections, immunosuppressive therapy, or hypersensitivity to chlorhexidine gluconate or povidone-iodine, whose central venous catheters were inserted by unit physicians and monitored for 7-10 days post-insertion.

Exclusion Criteria: Deceased or transferred patients during follow-up, instances of catheter-related interventions or care beyond researcher control leading to discontinuation of monitoring and study exclusion.

Data Collection

The researcher used a daily CVC follow-up form (developed by MO). Infection control nurses' surveillance provided data for CVC cultures and infection-related findings. Nurses' care satisfaction was assessed with a 5-point Likert scale (1-unsatisfied, 5-very satisfied). CVC care effectiveness was evaluated by analyzing nurse satisfaction and dressing procedure duration (Figure 1).

Statistical analysis

The collected data underwent statistical analysis, presented as mean and standard deviation percentages. Prior to comparing mean values between groups, normality of distribution was assessed. The "Independent-Samples T Test" was applied for normally distributed data, and the "Mann–Whitney U Test" for non-normally distributed data. Chi-square test was used for pairwise comparison of categorical variables. Correlation coefficients were determined using the Pearson coefficient for normally distributed variables and the Spearman coefficient for non-normally distributed ones. Significance levels were set at $p<0.05$, $p<0.01$, and $p<0.001$ during results analysis. The incidence rate of central catheter-associated bloodstream infections (CVCI) was calculated as CVCII Rate=CVC-related bloodstream infections Number/CVC Days x 1000, reflecting infections per 1000 catheter days within a fixed catheter use period. A central catheter day is determined by summing the number of days that intensive care unit patients carried one or more central catheters throughout a given period. CVC Usage Rate = CVC Days/ICU Patient Days.(Çetinkaya Şardan et al., 2013)

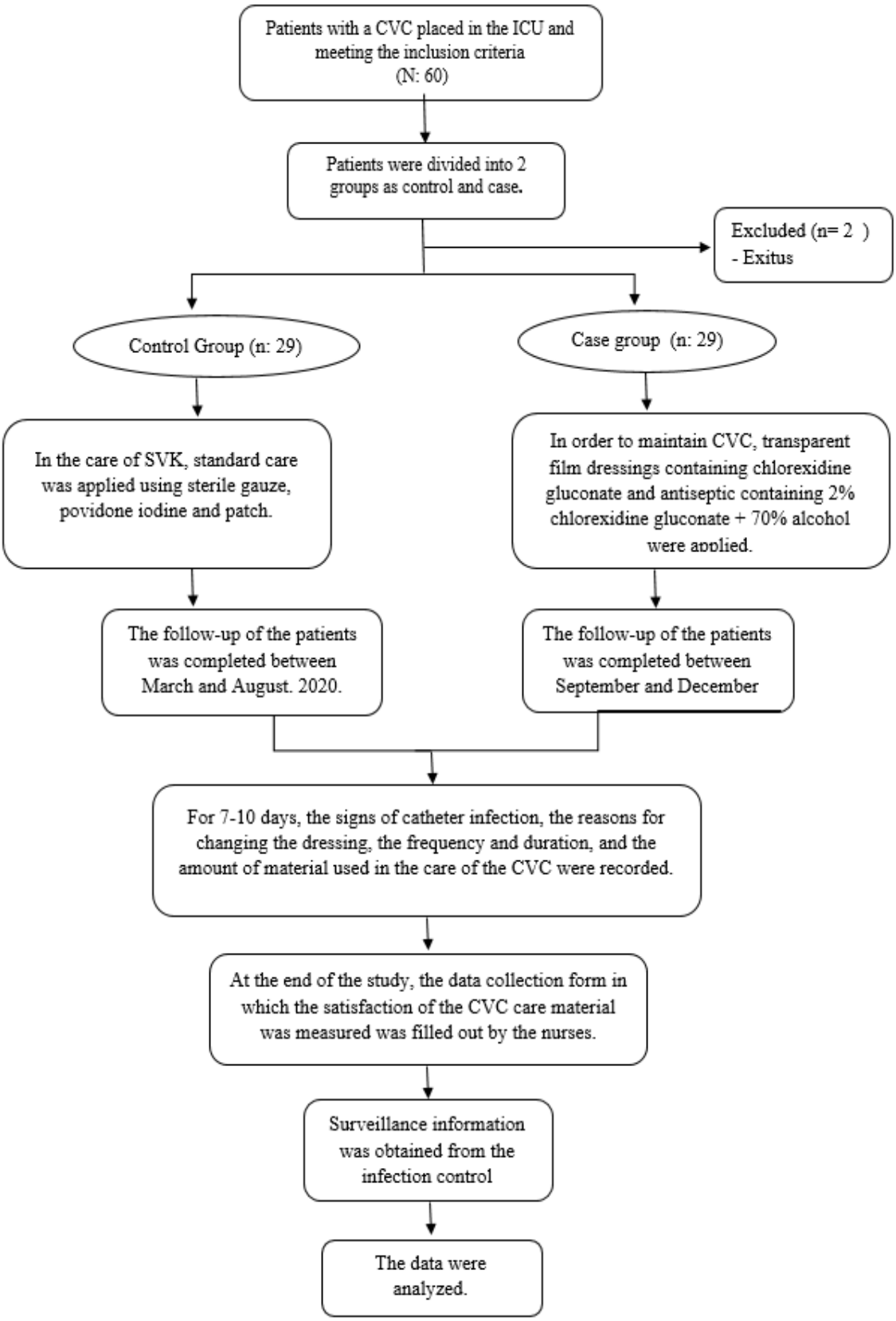

Figure 1. Study Flow diagram

RESULTS

The case group consisted of patients with a mean age of 72.17±14.83, among whom 36.7% (n:11) were female and 63.3% (n:19) were male. In the control group, the average age was 75.03±14.83, with 12.50% being female (n:12) and 60% being male (n:18). The statistical analysis indicated that the two groups exhibited similar age and gender distributions (p>0.05). The most common diagnoses among patients in both groups were cerebrovascular and pulmonary disorders, as well as cancer and trauma.

Regarding the duration of mechanical ventilation and the days of follow-up with Nasogastric Tube (NG) or Percutaneous Endoscopic Gastrostomy (PEG), there was no statistically significant difference between the case and control groups (p>0.05). In terms of central venous catheter (CVC) insertion sites, 73.3% (n:22) of patients in the case group had femoral CVCs, and 26.7% (n:8) had subclavian CVCs. In the control group, 70.0% (n:21) had femoral CVCs, and 30.0% (n:7) had subclavian CVCs. The comparison of insertion sites between the two groups did not yield a statistically significant difference (p>0.05).

Complications

In the case group, 6.7% (n:2) and in the control group, 3.0% (n:1) of patients experienced arterial puncture during CVC insertion (p>0.05). Throughout the study, no CLABSI or catheter infections were observed in the case group, while one patient in the control group had CLABSI (p>0.05). Pseudomonas aeruginosa was identified as the most common gram-negative bacteria in the patient with catheter infection. During the study duration, no occurrences of catheter exit site infection/colonization, pneumothorax, hemothorax, thrombosis, catheter malposition, catheter dysfunction, or air embolism were noted in either cases or controls. No catheter removal was performed for control purposes.

Bleeding was observed in an average of 1.94±0.1 patients in the case group and 1.92±0.10 patients in the control group during the follow-up period, with no statistical difference (p>0.05). Assessment included a total of 945 patient days, 529 in the control group and 416 in the case group. Examining days with a catheter, there were 568 catheter days (292 in the control group and 276 in the case group). The rate of CVC usage was calculated as 0.55 in the control group and 0.66 in the case group. Statistical analysis revealed a significantly higher rate of CVC use in the case group compared to the control group (p<0.05). Regarding infection rates, the control group exhibited 3.4 infections per 1000 catheter days, while the case group had 0 infections per 1000 catheter days. However, the difference in infection rates between the two groups was not statistically significant (p>0.05) (Table 1).

Table 1. CVC usage rate and CVC- related bloodstream infection in the case and control groups

	Group case	Group control	Statistical analaysis
Number of patients (n)	29	29	
Patient days	416	529	
CVC days (n)	276	292	
CVC usage rate	0,66	0,55	U: 312,500 p: 0,042
CVC-related bloodstream infection (n)	0	1	
CVC-related bloodstream infection rate	0/1000	3,4/1000	U: 435,000 p: 0,317

U: Mann Whitney U Tests

In the case group, bleeding at the catheter insertion site occurred in 23.3% (n:7) on the first and second days, and 3.3% (n:1) on the third and fourth days post-CVC placement. Redness was observed in only one patient (3.3% of the group) on the first day of CVC follow-up, with no instances of redness, edema, or compromised skin integrity throughout the follow-up.

In the control group, catheter insertion site bleeding was observed in 36.7% (n:11) on the first and second days, and 3.3% (n:1) on the third day. Redness occurred in a single patient (3.3%) on the first day of CVC follow-up. Similar to the case group, no instances of redness, edema, or compromised skin integrity were noted at the catheter insertion site throughout the follow-up period.

Cost of Care

The control group exhibited a higher frequency of dressing changes and a greater average row gathering compared to the case group (as shown in Table 2). Specifically, there were 77 dressings conducted in the case group, whereas the control group underwent 293 dressings ($p<0.001$).

Upon calculating the cost of materials utilized for each dressing in Table 2, it was observed that the total dressing cost for the case group amounted to 77 dollars, whereas the corresponding cost for the control group was 2.93 dollars ($p<0.001$). Consequently, the utilization of transparent dressing with chlorhexidine gluconate for routine ICU central venous catheter (CVC) care was deemed not to be cost-effective.

Table 2. CVC Cost of care in the case and control groups

Group case			**Group control**		
Material usage	**Mean±sd**	**Unit price**	**Material usage**	**Mean±sd**	**Unit price**
Non-sterile gloves (2 pieces)	5,1±1,8	0,154TL	**Non-sterile gloves** (2 pieces)	19,5±1,2	0,154 TL
%2CHG+%70alcohol antiseptic (4 cc)	9,0±2,6	0,06TL	Povidon iyot antiseptic (3 cc)	31,2±2,7	0,272TL
Sterile gauze (1 piece)	3,13±2,0	0,27TL	Sterile gauze (1 piece)	22,8±2,0	0,27TL
Transparent dressing with CHG	2,5±0,8	61,5TL	Plaster (10cmx10cm)	97,6±6,2	0,074TL
Cost of total (unite price)		62,31 TL	Cost of total (unite price)		1,738TL
Cost of total (77 dressing)		4,798 TL 1 Dollars* 77 Dollars	Cost of total (293 dressing)		509,5TL 10 Dollars* 2.930 Dollars
Statistical analaysis		**U:0,000 Z:-6,962 P:0,0001**			

TL: Turk liras/ local cost , * Calculated over to average dollar rate.

Efficiency- Productivity

The statistical analysis revealed a significant distinction ($p<0.001$) between the two groups in terms of nurse satisfaction scores for catheter insertion site observation ($p<0.001$) and catheter fixation ($p<0.05$), favoring the use of transparent dressing with chlorhexidine gluconate ($p<0.001$).

Furthermore, a significant contrast was observed in favor of sterile gauze in nurse satisfaction scores concerning the ease of dressing insertion ($p<0.001$), removal ($p<0.001$), and absorption of discharge ($p<0.05$) characteristics (as detailed in Table 3).

The time necessary for dressing changes was found to be shorter in the case group ($p<0.001$) in comparison to the control group (as shown in Table 4).

Upon reviewing the graphical representation, it becomes apparent that the control group underwent more dressing changes compared to the case group due to routine change, deterioration/loosening of integrity, and instances involving blood/dirt/contamination. On the other hand, the case group had a higher number of dressing changes than the control group due to issues related to wetness ($p<0.05$).

Table 3. Comparison of nurse satisfaction in the case and control groups

Nurse satisfaction (1-5)	Group case Mean±sd	Group control Mean±sd	Statistical analaysis*
Catheter insertion site observation	4,7±0,4	1,33±0,4	p: 0,001
Dressing insertion ease	2,83±1,1	4,75±0,4	p: 0,001
Dressing removal ease	3,25±0,9	4,67±0,4	p: 0,001
Catheter fixation	4,25±0,6	3,17±1,0	p: 0,005
Absorbing discharge	3,42±0,7	4,17±0,3	p: 0,008
Total	3,52±0,5	3,7±0,3	p: 0,197

*T tests

Table 4. Frequency and duration of the CVC dressing change in the case and control groups

Variable	Group	N	Rank average	Rank collection	U	p
Frequency of change	Grup case	30	15,5	465,0	0,000	0,001
	Grup control	30	45,5	1365,0		
Duration of change *	Grup case	30	18,05	541,5	76,500	0,001
	Grup control	30	42,95	1288,5		

*: Calculated in minutes

U: Mann Whitney U Tests

DISCUSSION

In ICUs, catheter infections can be prevented with effective nursing interventions in CVC care. Nurses' choice of dressing materials and care practices helps avoid complications and reduces initial healthcare budget challenges (Eren et al., 2010; Thokala et al., 2016). Physicians place CVCs, while nurses administer their care. Effective CVC care based on evidence-based practice plays a crucial role in avoiding catheter-related infections and treatment and care costs (Deutsch et al., 2014; Sanlı & Sarıkaya, 2016). While a decrease in infection rates is beneficial to the patient, it also improves the quality of nursing care (Karayavuz, 2006). In this regard, the use of proper dressing materials by nurses in the clinic minimizes the cost burden of health care by minimizing the financial strain that may occur in the early period and preventing the onset of infection. Additionally, it increases nurse satisfaction and work efficiency.

Complications

Not only does a proactive nursing strategy benefit the patient, but it also improves the quality of nursing care provided. Catheter care is considered essential for the prevention of catheter-related bloodstream infections, despite the limitation of epidemiological evidence (Tsuchida et al., 2007). The cost of caring for these infections exceeds one billion dollars annually, placing a significant burden on the healthcare system (Niemann et al., 2022). In this study, although the rate of CVC usage was greater ($p<0.05$) in the case group treated with transparent dressings with chlorhexidine gluconate than in the control group, no cases of CLABSI were detected. One patient in the control group who received conventional care developed CLABSI ($p>0.05$). The pathogenic microorganism growing in the femoral area, *Pseudomonas aeruginosa* is a significant opportunistic pathogen (Dönmez et al., 2021; Yu et al., 2019). In the majority of research studying the consequences of CVC, catheter-related infections have been observed (Akdemir et al., 2018).

According to the CDC Guidelines for the Prevention of Intravascular Catheter-Related Infections (2011); It is recommended to avoid the femoral region for CVC placement in adults (Category IA) and use a subclavian site, rather than a jugular or a femoral site, to minimize infection risk for non-tunneled CVC placement in adult patients (Category IB) (O'grady et al., 2011).

Although there are studies provided that chlorhexidine gluconate impregnated catheter dressings prevent central lineassociated blood stream infections /colonization, it has been emphasized that additional research is required in large populations for which there is no absolute evidence (Table 1)(Düzkaya et al., 2016; Ho & Litton, 2006; Pedrolo et al., 2018; Safdar et al., 2014; Timsit et al., 2009; Yadigar et al., 2013; Yu et al., 2019). By CDC recommendations, the use of sterile gauze and transparent dressing (Category 1A) is suggested as part of the standards of care (O'grady et al., 2011).

In situations with a high infection rate, it is advised to use transparent dressings with chlorhexidine gluconate (Lorente, 2015; Safdar et al., 2014). In this study, conducted in a second-stage ICU with high-risk patients, there was no significant difference between transparent dressings with chlorhexidine gluconate and standard gauze dressings in terms of infection.

In Ullman et al (2016)'s systematic review, there was no difference between standard gauze dressing, transparent dressing, and transparent dressing with chlorhexidine gluconate in terms of CLABSI. However, the same systematic review found evidence of moderate quality evidence that chlorhexidine gluconate-impregnated dressings lower the incidence of CLABSI per 1000 patient days when compared to transparent dressings (Ullman et al., 2016).

During the insertion of a CVC, an arterial puncture complication occurred in 2 patients (6.7%) in the case group and 1 patient (3%) in the control group; no other complications occurred ($p>0.05$). According to the literature, an arterial puncture is the most common complication (Comerlato et al., 2017; Ergül et al., 2016).

When the complications that occurred at the dressing site in the case and control groups during the care of CVC were examined, in terms of bleeding at the catheter insertion site on the 1st(7 patients), 2nd(7 patients), 3rd(1 patient), and 4th(7 patients), there was no significant difference between the two groups. Concerning redness, complications developed on the first (2 patients) day, but there was no significant difference between groups. ($p>0.05$). In their study, Duzyaka et al. (2016) found that there may be bleeding in the form of leakage at the catheter entry site during the first dressing (Düzkaya et al., 2016). The CDC recommends replacing the catheter site dressing if it gets moist, loose, or obviously soiled (Category IB) and using standard gauze if the patient is sweating or the site is bleeding or leaking (Category II) until the condition resolves. In addition, according to certain sources and the results of this study, it is recommended to use gauze dressings on the first day after catheter insertion, followed by transparent dressings.

Cost of Care

As did Florence Nightingale, the foundation of professional nursing, we must translate care data into statistical and mathematical data and become involved in health policy.(Sherifali, 2020) The service given indeed has a significant impact on the recovery of patients in intensive care units, but the financial impact of all health services offered also has a significant impact on hospital budgets (Eren et al., 2010).

Some studys reported that the use of a transparent dressing with chlorhexidine gluconate in CVC care is cost-effective (Maunoury et al., 2015; Schwebel et al., 2012; Thokala et al., 2016).

Pedrolo et al. compared transparent dressings with chlorhexidine gluconate to sterile gauze dressings, reporting higher costs for unplanned dressing changes before scheduled intervals. In the study, the transparent dressing with chlorhexidine gluconate did not meet the replacement standard of every 7 days; it had to be changed within the first 3 days due to bleeding at the catheter site, dressing wetness, and integrity deterioration (Pedrolo et al., 2018).

Not cost-effective, as 293 dressings were used in the control group compared to 77 in the case group (Table 2). Timsit et al. studied transparent dressings with chlorhexidine gluconate versus those without (changed every 3 days and once in 7 days). The result indicated a reduction in CLABSI ratio from 1.3% to 0.4% (Timsit et al., 2009).

In another study, cost-effective transparent dressings without chlorhexidine gluconate, lasting up to three days, were deemed suitable. While reducing dressing changes, chlorhexidine gluconate transparent dressing did not lower central line-associated bloodstream infection rates but could save nursing time (Yu et al., 2019).

In line with guidelines, dressing change is recommended at IB level for leakage bleeding, dirtiness, looseness, or deterioration. Sterile gauze dressings should be changed every 2 days (Evidence II), while clear dressings should be changed every 7 days (Evidence IB). Using transparent dressings without chlorhexidine gluconate is more convenient for nurses, requiring fewer changes, and enabling better observation of the catheter area (Karadağ, 1999; Sanlı & Sarıkaya, 2016; Yu et al., 2019).

Efficiency- Productivity

Evaluating the satisfaction of nurses who care for patients during long shift hours in ICUs with the dressing materials they use during CVC care is extremely important both for being a patient advocate and for effective and sustainable CVC care (Sanlı, 2017). In some studies, it was reported that nurses were satisfied with the use of transparent dressings with chlorhexidine gluconate in terms of observing the entry site and absorbing discharge, but had difficulty removing them; altogether, satisfaction was rated as high.

In scrutinizing Table 3, a significant distinction ($p<0.001$) favored chlorhexidine gluconate transparent dressings for nurse satisfaction with catheter site observation and fixation compared to the control group. In the control group, parameters like dressing insertion and removal ease, and nurse satisfaction with discharge absorption were statistically significant ($p>0.001$). However, no noticeable difference in overall satisfaction was observed between the groups ($p>0.05$). This may be attributed to the exclusive use of transparent dressings by nurses accustomed to gauze dressings during the study, influencing overall satisfaction assessment.

In the control group, both average and cumulative ranks for dressing change duration were significantly higher than the case group, indicating a notable difference ($p\leq0.001$). Increased dressing change frequency in the control group directly correlated with prolonged duration (Table 4). In contrast, the case group's shift to transparent dressing with chlorhexidine gluconate (as in Table 2) reduced time spent on changes, enhancing nurse productivity, job satisfaction, and concurrently reducing workload.

As per Richardson et al., groups treated with chlorhexidine gluconate-containing transparent

dressings required fewer changes, leading to increased nursing productivity. This reduction not only streamlines nursing workflow but also enhances overall efficiency and effectiveness in patient care.(Richardson et al., 2015)

Limitations

The study in the State Hospital's Intensive Care Unit was affected by factors such as the COVID-19 pandemic during planning, physician involvement in CVC placement potentially affecting barrier measure compliance, and challenges in standardizing measures. The unavailability of 0.5% chlorhexidine gluconate with 70% alcohol and the absence of 70% alcohol-containing gluconate in the country posed limitations. Due to the 4% chlorhexidine gluconate concentration exceeding guidelines, the investigation focused on using a solution with 70% alcohol + 2% chlorhexidine gluconate. These factors collectively influenced the study design and execution, considering prevailing circumstances and resource availability.

CONCLUSION AND RECOMMENDATIONS

It was discovered that transparent dressings with chlorhexidine gluconate, which can remain in CVC care/dressing for up to seven days, did not reduce the CLABSI ratio in comparison to standard care, were not cost-effective, but boosted nurse satisfaction and productivity. The use of transparent dressings devoid of chlorhexidine gluconate in CVC dressings will be more convenient for nurses since they require fewer dressing changes and permit catheter area fixation and inspection.

It was recommended not to use the femoral region in CVC placement, to use long-acting transparent dressings with chlorhexidine only in critically ill patients, and to use gauze pads for standard care since bleeding may occur at the catheter insertion site on the first day of CVC insertion, and to use cost-effective, easy-to-care transparent dressing for subsequent routine care.

Ethics approval and consent to participate

This prospective case-control study adhered to the Helsinki Declaration and Good Clinical Practice Directive, receiving approval from the local ethics committee (Ethical Permission: Bolu Abant Izzet University Clinical Research Ethics Committee, 2020/22). Written informed consent was obtained from participating patients/patient relatives, and nurses involved in the study were informed and gave written consent.

Competing interests

The authors declare that they have no competing interests.

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