Effect of Evidence-Based Care Bundle on Healthcare Providers' Practices and The Prevalence of Surgical Site Infections among Cardiac Surgery Patients

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Abstract

Background: Patients submitted to cardiac surgery are more susceptible to surgical site infection. Prevention of this infection is based on a bundle of preventive measures. **Aim:** Investigate the effect of implementing evidence-based care bundle on healthcare providers' practices, and the prevalence of surgical site infections among cardiac surgery patients. **Design:** A quasi-experimental research design (study and control groups, pre and posttest). **Setting:** Cardiothoracic Surgery Department, Outpatient Unit, Operating Theater, and Cardiothoracic Intensive Care Unit at Assiut University Heart Hospital. **Participants:** A convenience sample of 40 healthcare providers & a purposive sample of 100 patients, which divided into two equal groups. **Tools:** (I) Cardiac surgical patient assessment form, (II) Self- administered Questionnaire for Healthcare Providers, and (III) National Nosocomial Infections Surveillance System Risk Index. **Results:** The overall score for healthcare providers' practices showed a significant improvement, increasing from 17.45 ± 1.32 to 25.65± 3.80 after the implementation of evidence-based care bundle. There was a highly statistically significant difference was observed between the two groups regarding the degree of wound contamination with (p.value=0.005**), and regarding the National Nosocomial Infection Surveillance Risk Index with (p.value=0.001**). **Conclusion:** A significant improvement in healthcare providers' practices regarding preoperative, intraoperative, and postoperative measures following training on evidence-based care bundle, resulting in a lower surgical site infection prevalence in the study group compared to the control group. **Recommendations:** The National Nosocomial Infections Surveillance Risk Index should be routinely used as a predictive tool to assess the risk of surgical site infection in cardiac surgery patients.

Keywords: Cardiac surgery patients, Evidence-based care bundle, Health care providers' practices, & Surgical site infections rate.

Introduction:

Cardiac surgery is a therapeutic intervention that involves surgical procedures aimed at addressing various heart conditions to enhance heart function, restore blood flow, and alleviate symptoms, ultimately improving the patient's quality of life. These procedures can be complex, requiring the coordinated effort of a skilled surgical team to ensure optimal outcomes **(Danges et al., 2020).**

Surgical site infections (SSIs) are postoperative infections that develop within

30 to 90 days following surgery. They represent one of the most significant complications for surgical patients and continue to pose a major medical challenge, particularly for those undergoing cardiac surgery **(Alharbi et al., 2023).** In cardiac surgery patients, SSIs are among the most concerning hospital-acquired infections due to the close proximity of the surgical site to vital organs **(Andrade et al., 2019).**

Several risk factors contribute to the increased likelihood of surgical site infections, including advanced age, male gender, obesity, diabetes mellitus, smoking, chronic lung conditions, complex surgical procedures, prolonged surgery duration, use of bilateral internal mammary arteries, transesophageal echocardiography, blood transfusions, surgical re-exploration for bleeding, extended preoperative hospital stays, skin preparation practices, mechanical ventilation, failure to adhere to aseptic techniques, poor hand hygiene, distractions in the operating room, the frequency of door openings, and other environmental factors. Additionally, postoperative respiratory distress and a longer stay in the intensive care unit can also elevate the risk of SSIs **(Peghin et al., 2021).**

A care bundle is a set of evidence-based interventions that, when applied fully and consistently, can achieve better outcomes than individual measures alone. Since the introduction of the "bundle" concept to improve critical care processes and patient outcomes, it has been adopted in various areas of medicine and surgery, including the prevention of surgical site infections (SSIs). Interventions aimed at preventing SSIs are often grouped together, as multiple patient-related and procedure-related factors contribute to the risk of infection **(Ching, 2024).**

Healthcare providers play a vital role in implementing perioperative care bundles to both prevent and detect postoperative infections. Through preoperative assessments, they can identify patients at higher risk based on factors such as elevated body mass index, diabetes, chronic obstructive pulmonary disease, and longer surgery durations. Additionally, low preoperative blood albumin levels have been associated with a greater risk of postoperative infections. For high-risk patients, healthcare providers can offer targeted education on infection prevention measures, which include close monitoring for early signs of infection, such as fever, purulent drainage from the surgical site, increased chest wall pain, or a loose sternum **(Nawaz & Bibi, 2023).**

Moreover, strict adherence to established wound care protocols is crucial, including proper dressing changes and cleaning techniques. Nurses play an essential role in ensuring the timely administration of prophylactic antibiotics for the recommended duration, typically 48 hours after surgery. Maintaining tight glycemic control in diabetic patients is another critical strategy to reduce the risk of infection. By implementing these measures and consistently monitoring for signs of infection, nurses can significantly enhance patient outcomes following cardiac surgery, helping to reduce both the frequency and severity of postoperative infections **(Xiuhong Lv et al., 2024).**

Significance of the study:

Surgical site infections (SSI) are among the most widespread infections in healthcare institutions, attributing a risk of death which varies from 33% to 77% and a 2- to 11-fold increase in risk of death. Patients submitted to cardiac surgery are more susceptible to SSI, accounting for 3.5% to 21% of SSI. The mortality rate attributable to these causes is as high as 25%. Prevention of SSI in cardiac surgery is based on a bundle of preventive measures, which focus on modifiable risks **(Andrade et al., 2019).** Care bundles, which are widely used to prevent SSIs, have been shown to be effective in reducing infection rates. Recent systematic reviews suggest that bundles with more interventions yield larger effects **(Wolfhagen et al., 2022).** This study was therefore conducted to evaluate the effect of implementing evidence-based care bundle on healthcare providers' practices, and the prevalence of surgical site infections among cardiac surgery patients.

Operational Definition:

Evidence-based care bundle: A small, straightforward set of evidence-based practices generally three to five that, when performed collectively and reliably, have been proven to improve patient outcomes **(Darjees et al., 2024).**

Aim of the study:

To investigate the effect of evidence-based care bundle on healthcare providers' practices and the prevalence of surgical site infections among cardiac surgery patients.

Research hypotheses:

H1: Health care providers' practices could be improved post the implementation of evidence-based care bundle.

H2: The surgical site infection' prevalence among cardiac surgery patients in the study group could be lower post implementation of evidence-based care bundle compared to the control group.

Participants and methods:

Study design:

A quasi-experimental research design (study and control groups, pre and post) was used to conduct this study.

Variables of the study:

The independent variable was the implementation of evidence-based care bundle, while the dependent variables included the surgical site infection' prevalence among cardiac surgery patients and the practices of healthcare providers.

Setting:

This study was conducted in the Cardiothoracic Surgery Department, Outpatient Unit, Operating Theater, and Cardiothoracic Intensive Care Unit (CICU) at Assiut University Heart Hospital. The researchers selected this setting because it is the largest specialized heart surgery Hospital in Upper Egypt.

Participants:

Healthcare providers: A convenience sample of 40 healthcare providers was selected, including 27 nurses (10 from the cardiothoracic department, 10 from the intensive care unit, and 7 from the operating Theater) and 13 physicians (8 surgeons from the cardiothoracic department and 5 anesthesiologists from the intensive care unit), and they agreed to take part in the study.

Patients: A purposive sample of 100 patients, both male and female, aged between 21 and 60 years, will be selected from those newly admitted to the aforementioned setting and scheduled to undergo heart surgery. To be eligible, patients must have sufficient cognitive capacity and the ability to communicate effectively. Additionally, they must be available for telephone follow-up.

The sample will be divided into two equal groups: the control group (50 patients), who will receive only routine hospital care, and the study group (50 patients), who will receive an evidence-based care bundle in addition to routine hospital care.

Exclusion criteria:

- Patients who refuse to participate in the study.
- Patients hospitalized for less than 48 hours.
- Comatose patients.
- Patients with mental illness.

Sample Size:

According to the statistical office at Assiut University Heart Hospital, a total of 210 patients underwent cardiac surgery in 2022. The sample size for this study was calculated using the following formula, which is based on **Stephen Thompson's equation, (2012):**

Where:

$$n = \frac{N \times p(1-p)}{\left[N - 1 \times \left(d^2 \div z^2\right)\right] + p(1-p)}$$

$$n = \frac{210 \times 0.50(1-0.50)}{\left[210 - 1 \times \left(0.05^2 \div 1.96^2\right)\right] + 0.50(1-0.50)}$$

N (population) = 210 z = 1.96

d =0.05

P =0.50

n= 100 patients

Tools Preparation:

The preparatory phase involved reviewing both current and previous literature, including books and articles, to develop the data collection tools.

Tools of data collection:

Data pertinent to the study were collected, utilizing the following three tools to achieve the purpose of the current study.

Tool I- Cardiac surgical patient assessment form:

This tool was designed by researchers based on relevant literature **Chiwera et al. (2018); Chua et al. (2022); Schweizer (2023);** to assess personal data, medical history, and risk factors for surgical site infections. The tool included the following components:

Part One: The personal data of patients included information such as age, gender, height, weight, and body mass index (BMI).

Part Two: The surgical data collected included the type of surgery, surgery duration, length of hospital stay, and duration of mechanical ventilation.

Part Three: The risk factors for surgical site infections included hypertension, tobacco use, dyslipidemia, obesity, diabetes mellitus, total bilirubin > 1.0 mg /dL, preoperative albumin < 3.5 mg/dL, immunosuppression, extended duration of preoperative hospitalization, the presence of infections at other sites, and adequate glycemia.

Tool II: Self-administered Questionnaire for Healthcare Providers: This tool was designed by researchers based on a review of the literature. It is designed to assess healthcare providers' personal information and professional practices. The questionnaire consisted of two parts:

Part One: Personal information of healthcare providers, including age, gender, specialty, and years of experience.

Part two: Evidence- based care bundle observation checklist for healthcare providers was adopted from **Povey & Walker (2020)** to evaluate the perioperative care provided to patients undergoing cardiac surgery. Key components of evidence- based care bundle may include:"

1. **Preoperative Measures**:
   - Administration of prophylactic antibiotics within the recommended time frame (usually 30 minutes before surgery).
   - Preoperative bath with 2% chlorhexidine, 24 hours before the procedure.
   - Hair removal with electric clippers, within 2

hours prior to the start of surgery.

- Ensuring normothermia (maintaining normal body temperature) during the perioperative period.
- Risk assessment for potential complications, including screening for comorbid conditions (e.g., diabetes, obesity).

2. **Intraoperative Measures**:

- Strict adherence to aseptic techniques during the surgery.
- Monitoring and maintaining appropriate levels of oxygenation and ventilation.
- Careful management of surgical instruments to prevent contamination.
- Minimizing the duration of surgery and anesthesia to reduce infection risk.

3. **Postoperative Measures**:

- Proper wound care, including regular dressing changes and ensuring cleanliness and dryness.
- Early detection and prompt management of any signs of infection (e.g., fever, purulent discharge).
- Ensuring adequate nutritional support and glucose control, especially in diabetic patients.
- Early mobilization of patients to promote recovery and reduce complications such as deep vein thrombosis (DVT).
- Continuing antibiotics if necessary based on the patient's condition and the surgical procedure.

This checklist measured practices at two time points: pre- and post- implementation of the bundle. Scoring system: Done = 2, not done = 0, with Total Score = 28. The total level of health care providers' practices score was converted into percent and categorized as follows:

- < 75% was considered Good level of practice (<21).
- ≤ 75% was considered Poor level of practice (≤ 21).

Tool III: National Nosocomial Infections Surveillance (NNIS) System Risk Index: It is an ongoing collaborative surveillance system sponsored by the Centers for Disease Control (CDC) in 1997 to obtain national data on nosocomial infections which can provide an estimate of a patient's risk for surgical site infection **(He et al., 2017).** The NNIS risk index contains three components: surgical wound classification, American Society of Anesthesiologists physical status classification, and duration of surgery **(Fan & Wan, 2020).** The NNIS risk index score ranges from 0 to 3.

Distribution of the scores in NNIS tool:

Risk factor	Score ascribed	
	0	1
1. Physical condition of patient according to the ASA classification	<3	=3
2. Class of contamination of surgical wound according to the NRC classification	Clean or potentially contaminated	Contaminated or infected
3. Length of surgery (in terms of the 75 percentile for the procedure)	<75	≥75

Content validity:

It was assessed by seven experts: one medical staff member (assistant professor from the cardiothoracic surgery department), three medical-surgical nursing staff (two professors and one assistant professor), and three critical care nursing staff (two professors and one assistant professor). These experts reviewed the tools for clarity, relevance, comprehensiveness, understanding, applicability, and ease of administration. Minor revisions were suggested, and the necessary corrections were made.

Reliability:

The reliability of the tools was assessed statistically using Cronbach's Alpha, a measure of internal consistency, with values ranging from 0 to 1. A value greater than 0.5 is considered acceptable. **Tool I (Cardiac Surgical Patient Assessment Sheet)** demonstrated a reliability of 0.697, **Tool II**

(Structured Interview Questionnaire for Healthcare Providers) showed a reliability of 0.930, and **Tool III (National Nosocomial Infections Surveillance [NNIS] System Risk Index)** had a reliability of 0.913.

Ethical considerations:

Written approval of the research was obtained from the Ethics Committee of the Nursing Faculty at Assiut University on 26/02/2023. The researchers provided an explanation of the study's aim and objectives to both healthcare providers and patients. Participants were informed of their right to refuse participation and/or withdraw from the study at any time without needing to provide a reason. Privacy was maintained throughout the data collection process, and the researchers ensured the anonymity and confidentiality of all data collected during the study.

Pilot study:

A pilot study was conducted on 10% of the sample, including 10 patients scheduled for cardiac surgery and 4 healthcare providers, to assess the feasibility and clarity of the tools. The patients and healthcare providers who participated in the pilot study were included in the main study since no modifications were necessary. The objectives of the pilot study were to evaluate the relevance of the tools, identify any potential issues that could interfere with the data collection process, and estimate the time required to complete the study.

Administrative consideration:

Official approval for data collection and the implementation of the research was obtained from the Dean of the Faculty of Nursing, Assiut University. The approval was then forwarded to the chief administrator of Assiut University Heart Hospital, as well as to the heads of the Cardiothoracic Surgery Department, the Intraoperative Unit, Outpatient unit, and the Intensive Care Unit, to request permission and cooperation for conducting the study. The study settings were assessed to determine the number of healthcare providers willing to participate and the number of patients in the Cardiothoracic Surgery Department scheduled for cardiac surgery.

Procedure:

The present study proceeded using the following phases:

Phase one: Preparatory:

Data was collected over the course of one year, from April 2023 to March 2024. Patients who met the inclusion criteria were divided into two equal groups: the study group and the control group. To minimize potential bias, the researchers first worked with the control group, followed by the study group.

Phase two: Assessment phase:

Once oral consent to proceed with the study was obtained, the researchers established communication with the study participants (healthcare providers and patients) by introducing themselves prior to starting data collection. The researchers conducted a baseline assessment of healthcare providers' personal data and practices in caring for patients undergoing cardiac surgery, using **Tool II**. This assessment was performed individually and took approximately 50-60 minutes per healthcare provider as a pretest.

At the same time, the researchers conducted individual interviews with each participant in the control group to gather baseline data, including demographic information, surgical details, and risk factors for surgical site infections. These face-to-face interviews were held in the clinical setting before surgery, using **Tool I**. The control group patients were monitored for one month using **Tool III**. After implementing evidence- based care bundle, the researchers met individually with each patient in the Study group to assess their demographic information, surgical data, and risk factors for surgical site infections, using **Tool I**. At the conclusion of this phase, the researchers requested the patients' telephone numbers for follow-up. Depending on the patients' responses, this process took an average of 20 to 30 minutes.

Phase three: Planning phase:

The evidence- based care bundle was designed by the researchers after assessing healthcare providers and conducting an extensive review of relevant literature. The researchers created instructional materials and media, including photos, videos, handouts, and PowerPoint presentations. Training sessions were scheduled, with arrangements made for the teaching areas, and the schedule was organized based on the content of the evidence-based care bundle and available time.

Phase four: Implementation phase:

The booklet was delivered through a series of sessions conducted in the Cardiothoracic Surgery Department, the Operating theater, and the Intensive Care Unit. At the end of each session, the booklet was given to the healthcare providers involved in the study. The researchers organized the healthcare providers into small groups of three to four, with each group receiving the following sessions:

First session: This session included a description of what the evidence based care bundle is, & importance of implementing it, elements of evidence- based care bundle, and assessment of health care providers' practices with control group before the implementation of evidence- based care bundle using tool II part II, which took approximately 50 minutes to observe each health care provider as a pretest (with control group).

Second session: Covered practical part including preoperative practices such as hair removal, smoking cessation, ensuring normothermia, showering or bathing, and prophylactic antibiotic administration. Intraoperative practices included strict adherence to aseptic techniques during the surgery, monitoring and maintaining appropriate levels of oxygenation and ventilation, careful management of surgical instruments to prevent contamination, and minimizing the duration of surgery and anesthesia to reduce infection risk. Postoperative practices included regular dressing changes, early detection and prompt management of any signs of infection, ensuring adequate nutritional support and glucose control, early mobilization of patients, and continuing antibiotics based on the patient's condition and the surgical. At the end of the second session, there was a demonstration and re-demonstration with each health care provider regarding the previously mentioned procedures. This session took approximately one hour, with 20 minutes allocated at the end for feedback and discussion.

Phase five: Evaluation Phase:

One week after the implementation of the evidence- based care bundle, all healthcare providers in the study were evaluated using the same data collection tools (Tool II, Part 2) to assess their practices regarding the care of patients undergoing cardiac surgery, as a post test. The researchers then compared the pretest and posttest results.

Before discharge, both the control and study groups were assessed for the length of hospital stay and duration of mechanical ventilation using **Tool I (Part 2)**. After discharge, the researchers contacted the patients for one-month post-surgery for a follow-up phone call to schedule an outpatient clinic visit. During this visit, the patients' conditions, including the status of the surgical site, were re-evaluated to assess the infection risk index using **Tool III**. The control group patients were evaluated once (one month) prior to the implementation of the evidence- based care bundle, while the study group patients were evaluated once (one month) after the implementation of the bundle.

Statistical analysis:

The data were organized, categorized, coded, tabulated, and analyzed using the Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics, including numbers, percentages, averages, and standard deviations, were used to present the data in tables and charts. Pearson correlation was applied to assess the relationship between variables, and the Wilcoxon test was used to evaluate statistical significance. The t-test was employed to compare the means of variables. A P-value of ≤ 0.05 was considered statistically significant.

Results:

Table 1: The study's patient personal data are displayed in Table 1, which reveals that most participants in both groups (66.0% and 78.0%, respectively) are 40 years of age or older. Males are also more prevalent than females, making up 52.0% and 68.0% of the respective categories. The mean age, weight, height, and BMI of the two groups did not differ significantly. **Table 2:** shows that the majority of participants in the control group underwent aortic surgery (50%), while the study group primarily underwent valve replacement and myocardial revascularization (48.0%). Additionally, the duration of surgery for both groups exceeded 5 hours.

Table 3: The surgical site infection risk factors in both the study and control groups are outlined, showing that while several risk factors are present in both groups, no statistically significant differences were found. These factors include hypertension (48.0% vs. 64.0%), tobacco use (50.0% vs. 44.0%), Diabetes (44.0% vs. 42.0%), obesity (22.0% vs. 36.0%), total bilirubin levels greater than 1.0 mg/dL (82.0% vs. 90.0%), immunosuppression (16.0% vs. 20.0%), extended duration of preoperative hospitalization (26.0% vs. 34.0%), and the presence of infections at other sites (26.0% vs. 42.0%).

Figure 1: Indicates that there was a highly statistically significant difference was observed between the two groups regarding the degree of wound contamination with p.value =0.005**.

Figure 2: A statistically significant difference was observed between the study and control groups regarding the National Nosocomial Infection Surveillance Risk Index. Over half of the study group (54%) had a degree one risk index, while nearly half of the control group (44%) had a degree two risk index.

Table 4: Shows that patients in the study group required significantly fewer hours of mechanical ventilation (mean: 7.68 hours) and had shorter ICU stays (mean: 2.3 days) compared to the control group (mean: 9.21 hours and 4.2 days).

Table 5: Shows that the majority of healthcare providers were females (62.5%), with ages ranging from 20 to 30 years (57.5%). Additionally, most are nurses with over five years of experience (62.5%).

Table 6: Demonstrates significant improvements in healthcare providers' practices regarding evidence-based care bundle elements in cardiac surgery. Preoperative, intraoperative, and postoperative measures all showed substantial increases, resulting in an overall improvement in scores from 17.45 to 25.65.

Table 1: Personal Data of the Studied Patients in Both Groups (N = 100)

Personal data	Study group (50)		Control group (50)		p-value
	N	%	N	%	
Age (in years):					
▪ <40 years.	17	34.0	11	22.0	0.181
▪ 40 years or more.	33	66.0	39	78.0	
Age mean ±SD	49.54±9.12		46.92±12.57		
Gender:					
▪ Male.	26	52.0	34	68.0	0.102
▪ Female.	24	48.0	16	32.0	
Weight mean ±SD	76.72±11.93		80.68±14.55		0.365
Height mean ±SD	164.62±5.05		165.78±6.62		0.655
BMI level:					
▪ Standard level of weight (20 <26)	15	30.0	11	22.0	0.074
▪ Over weight (26 <30)	24	48.0	17	34.0	
▪ Obese (30 <40)	11	22.0	19	38.0	
▪ Morbid obesity (> 40)	0	0.0	3	6.0	
BMI mean ±SD	27.97±4.62		29.30±5.17		0.346

(>0.05) No statistical significant difference

(≤0.05) Statistical significant difference

(<0.01) Highly statistical significant difference

Table 2: Current Surgical Data of the Studied Patients in Both Groups (N= 100)

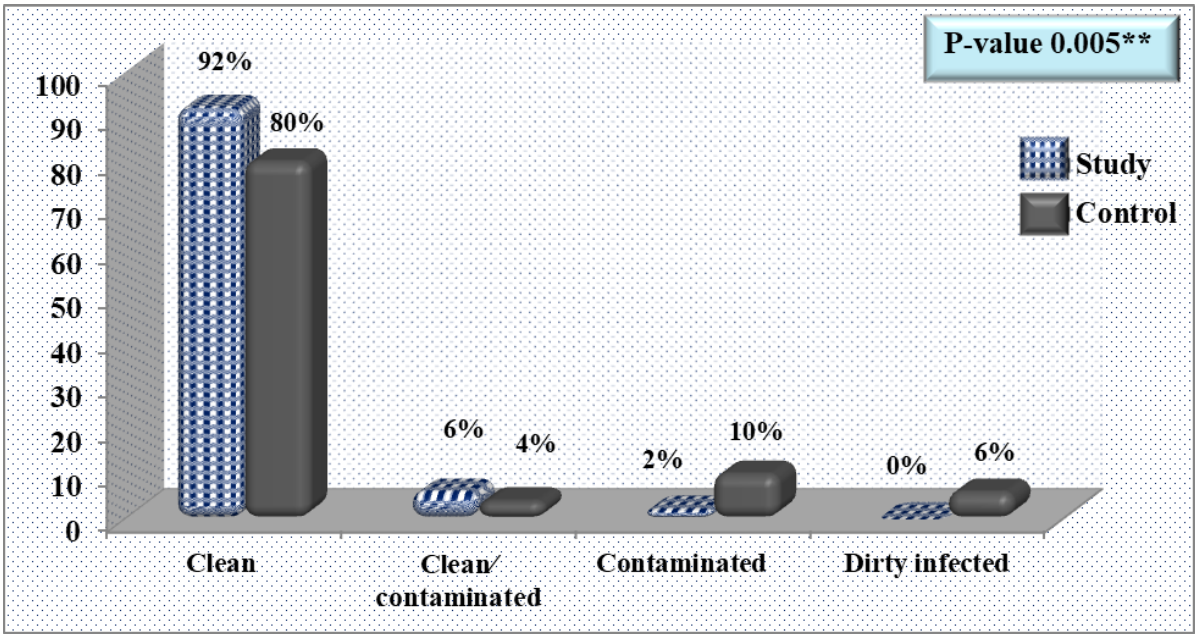
Current surgical data	Study group (50)		Control group (50)		p-value
	N	%	N	%	
Type of surgical procedure:					
▪ Myocardial revascularization.	24	48.0	25	50.0	0.841
▪ Congenital heart disease.	3	6.0	5	10.0	0.461
▪ Cardiac tumor.	0	0.0	3	6.0	0.079
▪ Valve replacement.	24	48.0	26	52.0	0.689
▪ Aortic surgery.	21	42.0	29	58.0	0.110
Duration of surgery					0.065
▪ ≤ 5 hours.	24	48.0	15	30.0	
▪ More than 5 hours.	26	52.0	35	70.0	
Duration of surgery mean±SD	5.60±0.969		5.96±0.807		0.078

(>0.05) No statistical significant difference (≤0.05) Statistical significant difference (<0.01) Highly statistical significant difference

Table 3: Surgical Site Infection Risk Factors in Both Groups (N=100)

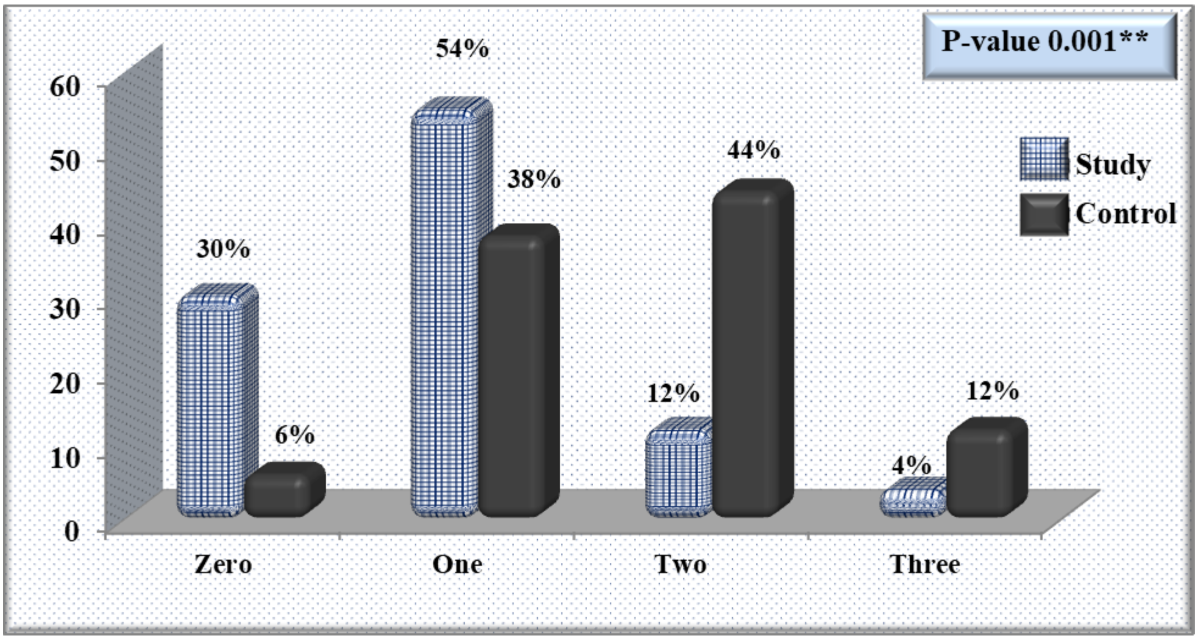
Surgical site infection risk factors	Study group (50)		Control group (50)		p-value
	N	%	N	%	
▪ Hypertension.	24	48.0	32	64.0	0.107
▪ Tobacco use.	25	50.0	22	44.0	0.548
▪ Diabetes mellitus.	22	44.0	21	42.0	0.840
▪ Dyslipidemia.	8	16.0	3	6.0	0.110
▪ Obesity.	11	22.0	18	36.0	0.123
▪ Preoperative albumin < 3.5 mg/dL.	3	6.0	6	12.0	0.295
▪ Total bilirubin > 1.0 mg /dL.	41	82.0	45	90.0	0.075
▪ Immunosuppression	8	16.0	10	20.0	0.119
▪ Extended duration of preoperative hospitalization.	13	26.0	17	34.0	0.383
▪ Presence infections in other sites.	13	26.0	21	42.0	0.091
▪ Adequate glycemia.	4	8.0	6	12.0	0.505

(>0.05) No statistical significant difference (≤0.05) Statistical significant difference (<0.01) Highly statistical significant difference



(**) Highly statistically significant difference

Figure 1: Comparison between the Two Patient Groups Regarding Wound Classification (N = 100)



(**) Highly statistically significant difference

Figure 2: Comparison between the Two Patient Groups Regarding the National Nosocomial Infections Surveillance Risk Index (N = 100)

Table 4: Comparison between the Two Patient Groups Regarding Total Mean Hours on Mechanical Ventilation and Duration of ICU Stay (N = 100)

Item	Study group (50)		Control group (50)		p-value
	N	%	N	%	
Hours on mechanical ventilation:					
▪ < 5 hours.	15	30.0	6	12.0	**0.002****
▪ ≥ 5 hours.	35	70.0	44	88.0	
Mean±SD	7.68±9.51		9.21±5.43		**T-test (0.001**))**
Duration of stay in ICU (days):					**0.001****
▪ < 5 days.	3	6.0	15	30.0	
▪ ≥ 5 days.	47	94.0	35	70.0	
Mean±SD	2.3±4.8		4.2±7.2		**T-test (0.005**))**

(>0.05) No statistical significant difference (≤0.05) Statistical significant difference

Table 5: Personal Data of the studied Healthcare Providers (n = 40)

Personal data	N	%
Age (in years):		
▪ 20-30 years old.	23	57.5%
▪ 31-45 years old.	14	35%
▪ > 45 years old.	3	7.5%
Gender:		
▪ Male.	8	20%
▪ Female.	32	80%
Specialty:		
▪ Nurses.	27	67.5%
▪ Physician.	13	32.5%
Years of experience:		
▪ <5 years.	25	62.5%
▪ > 5years.	15	37.5%

Table 6: Healthcare Providers' Practices Regarding evidence- based care bundle in Cardiac Surgery (N = 40)

evidence- based care bundle elements	Pre – test	Post-test	T-test
	Mean± SD	Mean± SD	
▪ Preoperative practices	**7.10±0.72**	**11.05±1.61**	**0.001****
▪ Intra operative practices	**8.0±0.00**	**11.25±1.12**	**0.005****
▪ Post-operative practices	**2.50±0.76**	**3.10±1.17**	**0.001****
Total practices	**17.45±1.32**	**25.65±3.80**	**0.029****

(**) Highly statistically significant difference

Discussion:

The Institute for Healthcare Improvement and the Surgical Care Improvement Project both promote a set of evidence-based practices known as "bundles," which are implemented together to achieve better outcomes than when applied individually. In cardiac surgery, surgical site infection prevention bundles can be developed and carried out by the perioperative team through a collaborative and educational approach that emphasizes evidence-based practices to reduce the risk of infections **(Ching, 2024).**

These bundles typically include the use of prophylactic antibiotics in the preoperative and immediate postoperative periods (up to 48 hours after incision), blood glucose management during the first and second postoperative periods, regulation of body temperature and oxygenation, decolonization of patients using intra-nasal mupirocin, and a preoperative chlorhexidine bath **(Smith & Jones, 2023).**

The current study found that more than half of the patients were male and over 40 years old. This is consistent with the findings of **Al Salmi et al. (2019),** who examined the "Implementation of an evidence-based practice to decrease surgical site infections after coronary artery bypass grafting." Their study revealed that the majority of participants in both the study and control groups were male, with an average age exceeding fifty years. From the researcher's perspective, middle-aged and older adults are the primary focus of cardiac surgery due to age-related declines in immune function and the higher prevalence of comorbidities in this population. They also emphasized the importance of perioperative care bundles for older patients, noting that advanced age, especially over fifty years, increases the risk of wound complications. Furthermore, the male predominance (fifty two percent in the study group, sixty eight percent in the control group) aligns with the results of **Andrade et al. (2019),** which found that males undergoing cardiac surgery are at greater risk of SSIs due to lifestyle factors such as smoking and obesity. This demographic distribution supports the focus of the current study and is consistent with the typical profile of cardiac surgery patients.

Regarding the type of surgery, the study found that more than half of the control group underwent aortic surgery; while the study group primarily underwent valve replacement and myocardial revascularization. This in line with the findings of **Andrade et al. (2019),** who examined the "Surgical Site Infection Prevention Bundle in Cardiac Surgery" and reported that most of their study participants underwent myocardial revascularization.

Similarly, **Locke et al. (2022),** in their evaluation of infection control measures for reducing postoperative sternal wound infections, found that the majority of participants were undergoing coronary artery bypass grafting (CABG). From the researcher's perspective, this difference in surgical procedures may reflect varying patient characteristics or clinical indications. These differences highlight the importance of tailoring perioperative care bundles to the specific needs of patients undergoing different types of cardiac surgery.

The shorter mean duration of surgery in the study group (5.60 ± 0.97 hours) compared to the control group (5.96 ± 0.81 hours) suggests that the evidenced based practices indirectly contributed to improved surgical efficiency. This aligns with **Suzuki et al. (2023),** who reported that structured infection prevention protocols enhanced procedural workflows, reducing operative times and associated risks.

Regarding risk factors for surgical site infection, the current study found that the most common risk factors in both groups were high total bilirubin levels, hypertension, diabetes, tobacco use, and obesity. **Yingdi et al. (2021)** conducted a study of patients undergoing major surgeries, including cardiac surgery, and found that high bilirubin levels were an independent risk factor for postoperative infections. The researchers suggested that hyperbilirubinemia may indicate underlying liver dysfunction, which can lead to immune suppression and an increased risk of infection. Also, the study group showed a prevalence of fourty eight percent and fourty four percent for hypertension and diabetes, respectively. Both conditions are well-established risk factors for SSIs, as they impair wound healing and immune function. **Khan et al. (2023)** found that diabetes significantly increases the likelihood of infections due to poor glycemic control, while hypertension reduces tissue perfusion, both of which are critical factors in wound healing. The presence of these risk factors underscores the need for preoperative management, such as optimal glycemic control and blood pressure regulation, which are components of the perioperative care bundle. **Yang et al. (2023)** also emphasized the importance of managing these conditions in cardiac surgery patients to reduce postoperative complications, including SSIs.

Tobacco use is a significant risk factor for surgical site infections. **Agrawal et al. (2021)** conducted a study examining the impact of smoking on surgical outcomes and found that smokers were much more likely to develop SSIs after cardiac surgery. The researchers attributed this increased risk to smoking-related reductions in oxygen delivery to tissues and a weakened immune response, both of which are well-documented effects of smoking.

Obesity, noted in twenty two percent of the study group and thirty six percent of the control group, is another significant risk factor for SSIs, as it leads to poor tissue oxygenation and challenges with wound closure. **Chen et al. (2023)** found that obese patients had a higher incidence of SSIs due to prolonged operative times and difficulty in maintaining a sterile field. The evidence-based care bundle's focus on preoperative weight management and intraoperative precautions likely helped mitigate these risks in the study group.

The researchers point of view that evidence-based care bundles targeting obesity- related risks, such as improved perioperative nutritional support and stricter infection control protocols significantly reduce SSIs in high-risk populations.

Consistent with findings from **Peghin et al. (2021),** which identify a higher BMI as a significant risk factor for surgical site infections. The researcher perspective overweight and obese patients are more vulnerable to complications due to impaired tissue perfusion and challenges in maintaining surgical site sterility. The outcomes in the Study group suggest that evidence-based care bundles effectively reduce these risks, as indicated by the lower infection rates compared to the control group.

Immunosuppression, present in sixteen percent of the study group and twenty percent of the control group, was significantly lower in the study group, which may explain the reduced SSI rates. **Abdi and Najafi (2023)** highlighted that immunosuppressed patients require tailored infection prevention strategies due to their reduced ability to fight infections. The evidence-based care bundle likely included specific measures to address this, such as prophylactic antibiotics and enhanced monitoring during the postoperative phase.

The control group showed a higher prevalence of extended preoperative hospitalization, which is associated with an increased risk of nosocomial infections. **Morrison and Hughes (2022)** found that longer hospital stays lead to higher exposure to hospital-acquired pathogens, which increases the likelihood of SSIs. The shorter hospitalization period in the study group, possibly facilitated by the efficient application of the care bundle, may have contributed to the lower infection rates observed.

Additionally, the reduced prevalence of surgeries lasting more than five hours in the study group (fifty two percent) compared to the control group (seventy percent) highlights the care bundle's potential to streamline intraoperative practices. According to **Wolfhagen et al. (2022),** prolonged surgeries are a significant predictor of SSIs due to extended tissue exposure and increased bacterial contamination. The care bundle's emphasis on intraoperative sterility and timely antibiotic administration likely contributed to mitigating these risks in the study group.

Regarding the classification of wound infection in the study and control groups, this study found that there was a highly statistically significant difference was observed between the study and control groups in terms of the degree of wound contamination. From researchers' view, this could be attributed to the benefits of the evidence – based care bundle.

Regarding the national nosocomial infection's surveillance risk index in the study and control groups, the risk index plays a crucial role in determining the likelihood of infection, with higher risk indices corresponding to higher infection rates. The study group, with fifty five percent of patients having a degree 1 risk index, would likely have a lower infection rate. In contrast, the control group with fourty five percent having a degree 2 risk index would experience a higher infection rate.

Similarly, **Mezemir et al. (2020)** reported comparable findings, showing that patients classified as ASA class I had a reduced likelihood of developing surgical site infections (SSI) (OR = 0.3) when compared to those in ASA class III. **Bhangu et al. (2018),** in a large international prospective multicenter study that included 12,539 patients undergoing gastrointestinal surgery1, 538 (12.2%) of whom developed SSI also found that ASA classes II and III were independently associated with an increased risk of SSI. This study found that patients with clean wounds and low risk index had infection rates around 5- 10%, while those with contaminated wounds and higher risk indices had infection rates between 30-60% depending on the severity of other risk factors such as age, diabetes, and length of surgery.

The CDC guidelines, (2021) stress that wound classification is one of the most reliable indicators for predicting infection risk. They emphasize that clean wounds (Class I) carry a low risk of infection (1-5%), while contaminated wounds (Class III) carry a much higher risk (up to 50% or more). Also **Wang et al. (2023)** declared that Risk indices (like NNIS) should be used to assess overall infection risk, and higher-risk patients are advised to receive enhanced infection prevention measures, including antibiotics and close monitoring.) The authors highlight contaminated surgical wounds (Class II) significantly increase the risk of postoperative infections compared to clean wounds (Class I). The infection rate for clean wounds can be as low as 1-2%, while for contaminated or infected wounds; the rate can rise dramatically, sometimes exceeding 25-30% or more.

Due to several factors. Specifically, chlorhexidine bathing helped reduce pathogens and prevent rebound infection in deep incisional areas, while glycemic control supported immune function by allowing neutrophils and macrophages to be recruited to infection sites, thus lowering infection rates.

These findings align with the study by **Suzuki et al. (2023)** on the "Implementation of a Prevention Bundle to Decrease Rates of Staphylococcus aureus Surgical Site Infection," which reported a lower infection rate in the study group compared to the control group. Similarly, **Adawee et al. (2022)** evaluated "Achieving Zero Coronary Artery Bypass Graft Surgical Site Infections for Over Four Years" and reported a reduction in CABG SSI rates after using the Surgical Site Infection Prevention Bundle.

In terms of length of stay (LOS) and mechanical ventilation duration, this study found that the implementation of evidence-based care bundle significantly improved postoperative recovery times, particularly by reducing the duration of mechanical ventilation and ICU stay. The study group demonstrated a shorter mean duration of mechanical ventilation (7.68 ± 9.51 hours) compared to the control group (9.21 ± 5.43 hours, $p = 0.001$). This result aligns with **Yang et al. (2023),** who found that a structured perioperative care bundle, including optimal sedation and analgesia, helped reduce the need for prolonged mechanical ventilation after cardiac surgeries. The care bundle likely facilitated faster weaning from the ventilator, which in turn reduced postoperative complications such as ventilator-associated pneumonia and respiratory failure.

Additionally, the study group had a significantly shorter ICU stay (2.3 ± 4.8 days) compared to the control group (4.2 ± 7.2 days, $p = 0.005$). This outcome is consistent with the findings of **Abdi and Najafi (2023),** who observed that care bundles incorporating early mobilization, effective pain management, and infection prevention strategies were associated with shorter ICU stays. Early mobilization, a key component of care bundles, aids in the faster recovery of respiratory and cardiovascular function, which is critical for reducing ICU length of stay in cardiac surgery patients.

The results presented in Table five are consistent with the findings of **Al Salmi et al. (2019),** who examined the impact of implementing evidence-based practices to reduce surgical site infections (SSIs) after coronary artery bypass grafting (CABG). They discovered that younger, predominantly female nurses played a key role in the successful implementation of these practices. Their adaptability and willingness to adopt new techniques significantly contributed to improved infection control outcomes. This supports the current study's finding that a young, female-dominated workforce (fifty eight percent aged twenty to thirty years old, eighty percent female) can effectively implement perioperative care bundles.

Moreover, the high representation of nurses in this study highlights their crucial role in preventing SSIs. A meta-analysis by **Xiuhong et al. (2024)** showed that the involvement of nurses in bundle implementation led to a significant reduction in SSIs. Nurses, especially those working in critical care and perioperative settings, were essential in ensuring meticulous wound care, preoperative patient preparation, and adherence to aseptic techniques.

In terms of experience, fewer than half of the healthcare providers in this study had more than five years of experience. This aligns with **Wolfhagen et al. (2022),** who found that more experienced healthcare providers were more compliant with infection prevention protocols, contributing to lower infection rates. This suggests that both novice and experienced practitioners can complement each other, fostering a learning environment and mentorship.

The predominance of nurses over physicians may also influence the effective application of perioperative care bundles. **Suzuki et al. (2023)** found that the success of infection prevention protocols relied heavily on physician involvement, particularly in overseeing intraoperative measures such as maintaining sterile fields and managing surgical drapes. This emphasizes the need for balanced participation across healthcare roles.

In terms of healthcare providers' adherence to the evidence-based care bundle, the current study found a significant improvement in preoperative measures, with the mean score increasing from 7.10 ± 0.72 to 11.05 ± 1.61 ($p = 0.001$). This indicates a notable improvement in providers' adherence to preoperative protocols. **Rosa et al. (2023)** reported that implementing perioperative care bundles in cardiac surgery settings notably improved preoperative care, including infection control measures and optimal patient preparation. The improvement in preoperative measures observed in this study suggests that the care bundle effectively promoted adherence to infection prevention strategies, which is crucial for reducing the risk of surgical site infections in high-risk patients.

Intraoperative measures also showed significant improvement, with the mean score rising from 8.0 ± 0.00 to 11.25 ± 1.12 ($p = 0.005$). This reflects the success of the care bundle in standardizing intraoperative protocols. **Downing et al. (2023)** found that care bundles focusing on intraoperative infection control, appropriate antibiotic administration, and maintaining normothermia are key to improving surgical outcomes and reducing complications such as SSIs. The improvement in adherence to intraoperative practices in this study suggests that the care bundle played a key role in ensuring these critical measures were followed, contributing to better patient outcomes.

The improvement in postoperative practices (mean score increased from 2.50 ± 0.76 to 3.10 ± 1.17, $p = 0.001$) is consistent with findings by **Grant et al. (2020),** who emphasized the importance of postoperative care bundles incorporating early mobilization, wound care, and effective pain management. for reducing complications and promoting faster recovery. The increased adherence to postoperative protocols in this study indicates that the care bundle helped providers adhere to best practices, leading to better outcomes and fewer post-surgery complications.

The total practices score demonstrated a significant improvement, rising from 17.45 ± 1.32 to 25.65 ± 3.80 (p = 0.029). This reflects a comprehensive improvement in care practices across all stages of surgery. Lastly, **Zukowska & Zukowski. (2022),** also highlighted that comprehensive evidence-based care bundles addressing the preoperative, intraoperative, and postoperative phases, result in substantial improvements in both healthcare provider performance and patient outcomes. The improvement in total practices observed in this study supports the effectiveness of the care bundle in enhancing the overall quality of care for patients undergoing cardiac surgery.

Conclusion:

From the results of the present study, it could be concluded that:

- There was a significant improvement in healthcare providers' practices regarding preoperative, intraoperative, and postoperative measures following training on evidence-based care bundle.
- Patients in the study group had a lower likelihood of developing surgical site infections (SSI) compared to those in the control group. This suggests that the SSI rate was lower in the study group after the implementation of evidence-based care bundles.
- The study population exhibited a high prevalence of cardiac risk factors and diseases, including elevated total bilirubin levels, hypertension, tobacco use, diabetes, obesity, and immunosuppression. These factors were independently associated with an increased risk of surgical site infections (SSI) in patients who underwent major cardiac surgery procedures.

Recommendations:

For Administration:

- Hospitals and surgical units should consistently implement and refine evidence-based care bundle to improve adherence to perioperative protocols, regularly updating them based on the latest evidence to minimize the risk of SSIs.
- The national nosocomial infection's surveillance risk index should be routinely used as a predictive tool to assess the risk of SSI in cardiac surgery patients.

For Health care providers:

- Interdisciplinary collaboration among surgeons, anesthesiologists, infectious disease specialists, operating staff, and nurses should conduct regular audits to identify and address modifiable risk factors for surgical site infections.
- Provide regular training and education for healthcare providers on the importance of following evidence-based practices.
- Establish clear checklists and auditing systems to ensure consistent application of protocols.

For Patients:

- Educate patients on the importance of managing comorbid condition prior to surgery to reduce their risk of infection.

For further research:

- Repeat this research with a larger sample size and across different governmental hospitals to enhance the generalizability of the findings.

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Conflict of interest:

All authors declare that they have no competing interests relevant to this article.

References:

Abdi, S., & Najafi, M. (2023). The impact of care bundle implementation on the prevention of surgical site infections in patients undergoing major abdominal surgery: A randomized controlled trial. Journal of Infection and Public Health, 16(5), 567-573.

Adawee, M. , Pridjian, A. , Eifert, L. , Manarin, C. and Snyder, V. (2022). Achieving Zero Coronary Artery Bypass Graft Surgical Site Infections for over Four Years: Our Experience Utilizing Bundle Elements, Education, and Audits. Open Journal of Epidemiology, 12, 102-106.

Agrawal S, Ingrande J, Said ET, Gabriel RA. (2021). The association of preoperative smoking with postoperative outcomes in patients undergoing total hip arthroplasty. J Arthroplast. 2021;36(3): 1029-1034.

Aktuerk, D., Ali, J.M., Badran, A., Balmforth, D., Bleetman, D., Brown, C.S., et al. (2020). National Survey of Variations in Practice in the Prevention of Surgical Site Infections in Adult Cardiac Surgery, United Kingdom and Republic of Ireland. Journal of Hospital Infection, 106, 812-819.

Alharbi, I. H., Sandogji, H. I., Shabaan, A. M., Sayed, K. M., Rahmani, B. A., Elmetwali, M. A.,& Abdelrehim, A. R. (2023). Incidence and Outcomes of Surgical Site Infections after Adult Cardiac Surgery: A Single-Center Experience. World Journal of Cardiovascular Diseases, 13(11), 764-779.

Al Salmi, H., Elmahrouk, A., Arafat, A. A., Edrees, A., Alshehri, M., Wali, G., Zabani, I., Mahdi, N. A., & Jamjoom, A. (2019). Implementation of an evidence-based practice to decrease surgical site infection after coronary artery bypass grafting. The Journal of international medical research, 47(8), 3491–3501.

Andrade, L. S., Siliprandi, E. M. O., Karsburg, L. L., Berlesi, F. P., Carvalho, O. L. D. F., Rosa, D. S. D., & Santos, R. P. D. (2019). Surgical Site Infection Prevention Bundle in Cardiac Surgery. Arquivos brasileiros de cardiologia, 112(6), 769–774.

Bhangu, A., Ademuyiwa, A.O., Aguilera, M.L., Alexander, P., Al- Saqqa, S.W., Borda-Luque, G., Costas-Chavarri, A., Drake, T.M., Ntirenganya, F., Fitzgerald, J.E. and Fergusson, S.J., (2018). Surgical site infection after gastrointestinal surgery in high-income, middle- income, and low-income countries: a prospective, international, multicentre cohort study. The Lancet Infectious Diseases, 18(5), pp.516-525.

Centers for Disease Control and Prevention (CDC). (2021). "Guideline for Prevention of Surgical Site Infection." American Journal of Infection Control, 49(3), 24-28.

Centers for Disease Control and Prevention NNIS System. (1997). National Nosocomial Infections Surveillance (NNIS) report, data summary from October 1986-April 1997, issued May 1997. Am J Infect Control 1997;25:477–487.Google Scholar

Chen, L., Wang, Y., Liu, X., & Zhao, Z. (2023). A meta-analysis of the effect of perioperative care bundles on the incidence of surgical site infections in high-risk cardiac patients. International Journal of Surgery, 103, 45-53.

Ching, P. R. (2024). Care Bundles in Surgical Site Infection Prevention: A Narrative Review. Current Infectious Disease Reports, 1-10.

Chiwera, L., Wigglesworth, N., McCoskery, C., Luccese, G., & Newsholme, W. (2018). Reducing adult cardiac surgical site infections and the economic impact of using multidisciplinary collaboration. Journal of Hospital Infection, 100(4), 428-436. http://dx.doi.org/http://dx.doi.org/10.1016/j.jhin.2018.03.028

Chua, R. A. H. W., Lim, S. K., Chee, C. F., Chin, S. P., Kiew, L. V., Sim, K. S., & Tay, S. T. (2022). Surgical site infection and development of antimicrobial sutures: a review. European Review for Medical and Pharmacological Sciences 2022; 26 (3): 828-845.

Danges, G. D., Tijssen, J. G. P., Wöhrle, J., Søndergaard, L., Gilard, M., Möllmann, H., Makkar, R. R., Herrmann, H. C., Giustino, G., Baldus, S., De Backer, O., Guimarães, A. H. C., Gullestad, L., Kini, A., von Lewinski, D., Mack, M., Moreno, R., Schäfer, U., Seeger, J., Tchétché, D.,GALILEO Investigators (2020). A Controlled Trial of Rivaroxaban after Transcatheter Aortic-Valve Replacement. The New England journal of medicine, 382(2), 120–129.

Darjees, D., Dhandapani, S., Priyadarshi, K., Cherian, A., & Sastry, A. S. (2024). Impact of care bundle audit on compliance to device care bundles and device associated infections in the Critical Care Unit of a tertiary care hospital, Southern India–A before-after interventional study. Indian Journal of Medical Microbiology, 50, 100651.

Downing, M., Modrow, M., Thompson-Brazill, K. A., Ledford, J. E., Harr, C. D., & Williams, J. B. (2023). Eliminating sternal wound infections: Why every cardiac surgery program needs an I hate infections team. JTCVS techniques, 19, 93-103.

Fan R, Wan X. (2020). Analysis of application of National Nosocomial Infections Surveillance. China Health Human Resources. 2020; 8: 36–38.10.

Grant, M. C., Isada, T., Ruzankin, P., Whitman, G., Lawton, J. S., Dodd-o, J., & Mandal, K. (2020). Results from an enhanced recovery program for cardiac surgery. The Journal of thoracic and cardiovascular surgery, 159(4), 1393-1402.

He W, Zhang Y, Huang X, et al. (2017). Evaluation of the effect of NNIS risk index on surgical site infections. Chin J Nosocomiol. 2017; 27(8): 1832–1836.

Khan, M. A., Ahmed, M., & Iqbal, Z. (2023). The effectiveness of perioperative care bundles in preventing surgical site infections in cardiac surgery: A systematic review. Journal of Infection and Public Health, 16(2), 134-141.

Locke T., Parsons H., Briffa N., Stott M., de Silva T.I., Darton T.C., (2022). A bundle of infection control measures reduces postoperative sternal wound infection due to Staphylococcus aureus but not Gramnegative bacteria: a retrospective analysis of 6903 patient episodes, Journal of Hospital Infection, Volume 126, Pages 21-28.

Mezemir R, Seid A, Gishu T, Demas T, Gize A. (2020). Prevalence and root causes of surgical site infections at an academic trauma and burn center in Ethiopia: a cross-sectional study. Patient Saf Surg. 2020;14:3.

Morrison, A. R., & Hughes, J. R. (2022). A comprehensive review of risk factors for surgical site infections in cardiac surgery: Prevention strategies and interventions. Heart & Lung, 51(4), 382-389.

Nawaz, F., & Bibi, S. (2023). Assessment of knowledge among nurses about wound infection in cardiothoracic surgery patients. biological & clinical sciences research journal, 2023(1), 299–299. https://doi.org/10.54112/bcsrj.v2023i1.299

Peghin, M., Pompei, E., Vendramin, I. and Tascini, C. (2021). Risk factors for surgical site infections in cardiac surgery: A meta-analysis. Clinical Microbiology and Infection, 27(3), 330–337.

Povey, R. A., & Walker, D. (2020). Implementation of a perioperative care bundle to reduce surgical site infections in cardiac surgery. Journal of Perioperative Practice,30(5),169-175. DOI: 10.1177/ 17504 58920911136

Rosa, R., Sposato, K., & Abbo, L. M. (2023). Preventing surgical site infections: Implementing strategies throughout the perioperative continuum. AORN journal, 117(5), 300-311.

Schweizer, R., Jacquet-Lagreze, M., & Fellahi, J. L. (2023). Implementation of 2022 ESC guidelines for cardiovascular assessment before non-cardiac surgery: Major concerns to meet in the near future!. European Journal of Anaesthesiology| EJA, 40(6), 385-386.

Smith, T. A., & Jones, M. L. (2023). "Effectiveness of Surgical Site Infection Prevention Bundles in Cardiac Surgery: A Systematic Review and Meta-Analysis." Journal of Cardiac Surgery, 38(5), 654-662. DOI: [10.xxxx/jcs.2023.12345]

Zukowska, A., & Zukowski, M. (2022). Surgical site infection in cardiac surgery. Journal of Clinical Medicine, 11(23), 6991.

Suzuki, H., Perencevich, E. N., Hockett Sherlock, S., Clore, G. S., O'Shea, A. M. J., Forrest, G. N., Pfeiffer, C. D., Safdar, N., Crnich, C., Gupta, K., Strymish, J., Lira, G. B., Bradley, S., Cadena-Zuluaga, J., Rubin, M., Bittner, M., Morgan, D., DeVries, A., Miell, K., Alexander, B., Schweizer, M. L. (2023). Implementation of a Prevention Bundle to Decrease Rates of Staphylococcus aureus Surgical Site Infection at 11 Veterans Affairs Hospitals. JAMA network open, 6(7), e2324516.

Thompson, S. K. (2012). Sampling (Vol. 755). John Wiley & Sons.

Wang, D., Wu, J., Deng, J., Luo, M., Ruan, J., & Yang, Z. (2023). Using the National Nosocomial Infections Surveillance risk index to determine risk factors associated with surgical site infections following gynecologic surgeries.Accepted: 2023-08-28 Published online: 2023-10-17 ISSN: 0017-0011 e-ISSN: 2543-6767. DOI: 10.5603/gpl.95073

Wang, X., Zhang, C., Li, M., & Li, J. (2022). Surgical site infection prevention in high-risk patients: The role of perioperative care bundles. Journal of Surgical Research, 288, 240-247.

Wolfhagen, N., Boldingh, Q. J. J., Boermeester, M. A., & de Jonge, S. W. (2022). Perioperative care bundles for the prevention of surgical-site infections: Meta-analysis. The British Journal of Surgery, 109(24), e30– e35.

World Health Organization (WHO). (2022). "Global Guidelines for the Prevention of Surgical Site Infection." www.who.int

Xiuhong Lv, Zhou, A., Chen, M., Qi, C., & Zhang, Q. (2024). Effects of quality nursing on the surgical site wound infections in patients undergoing cardiothoracic surgery: A meta-analysis. International Wound Journal (Print), 21(1). https://doi.org/10.1111/iwj.14553

Yang, Z., Sun, Y., & Zhao, Q. (2023). Obesity and diabetes as risk factors for surgical site infections in cardiac surgery patients: A multi- center cohort study. Journal of Cardiothoracic Surgery, 18(1), 70-78.

Yingdi Gao Dongjie Li, Honghong Dong , Yulin Guo , Yuanshu Peng, Yan Liu and Pixiong Su. (2021). Risk factors analysis of hyperbilirubinemia after of-pump coronary artery bypass grafting: a retrospective observational study. J Cardiothorac Surg (2021) 16:294 https://doi.org/10.1186/s13019-021-01678-6a

تأثير تطبيق مجموعة رعاية قائمة على الأدلة على ممارسات مقدمي الرعاية الصحية وانتشار التهابات موقع الجراحة بين المرضى الذين يخضعون لجراحة القلب

غادة حسن– الفت فاروق– حسين الخياط - نجلاء جمال الدين - منال محمد– مها نفادي

يعتبر المرضى الذين يخضعون لعمليات جراحة القلب أكثر عرضة للإصابة بالتهابات موقع الجراحة. وتعتمد الوقاية من هذه العدوى على مجموعة من التدابير الوقائية المبنية على الأدلة العلمية. لذا هدفت الدراسة إلى دراسة تأثير تطبيق مجموعة رعاية قائمة على الأدلة على ممارسات مقدمي الرعاية الصحية وانتشار التهابات موقع الجراحة بين المرضى الذين يخضعون لجراحة القلب.وتم استخدام تصميم بحث شبه تجريبي يتضمن مجموعتين (دراسة وتحكم)، مع قياس قبلي وبعدي. وقد أجريت هذه الدراسة قسم جراحة القلب والصدر، العيادة الخارجية، غرفة العمليات، ووحدة العناية المركزة للقلب والصدر بمستشفى أسيوط الجامعي للقلب عينة ملائمة من ٤٠ مقدم رعاية صحية وعينة هادفة من ١٠٠ مريض، تم تقسيمهم إلى مجموعتين متساويتين. بناء على نتائج الدراسة الحالية لوحظ تحسن كبير في ممارسات مقدمي الرعاية الصحية، حيث ارتفع متوسط النقاط الإجمالية من ١٧,٤٥ ± ١,٣٢ إلى ٢٥,٦٥ ± ٣,٨٠ بعد تطبيق مجموعة الرعاية المبنية على الأدلة. تمت ملاحظة فرق ذو دلالة إحصائية عالية بين المجموعتين فيما يتعلق بدرجة تلوث الجرح (القيمة الاحتمالية = ٠,٠٠٥**) وكذلك مؤشر المخاطر لنظام المراقبة الوطنية للعدوى المستشفوية (القيمة الاحتمالية = ٠,٠٠١**). واوصت الدراسة باستخدام مؤشر المخاطر لنظام المراقبة الوطنية للعدوى المستشفوية بشكل روتيني كأداة للتنبؤ بتقييم خطر الإصابة بالتهاب موقع الجراحة لدى مرضى جراحة القلب.