

Bundle Care and Multidisciplinary Team Approach to Reduce the Risk of Surgical Site Infections: A Scoping Review

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INDEXING

Keywords:

Surgical Site
Infection;
Patient-Centered
Care;
Bundle Care;
Multidisciplinary
Team

Kata kunci:

Infeksi Luka Operasi;
Perawatan Berpusat
pada Pasien;
Bundel Perawatan;
Tim Multidisiplin

ABSTRACT

This scoping review aims to analyze a combination of bundle care and a multidisciplinary team approach to reduce Surgical Site Infection (SSI) in high-risk patients. The search will identify literature published between 2012 and 2021. The databases that will be used to search for related journals are PubMed, Scopus, and EBSCO. PRISMA protocol will be used in this study. The review will include published papers discussing bundle care use and the multidisciplinary team approach which impacts SSI, especially in high-risk patients. Several studies showed a decrease in SSI rate in the intervention group that applied bundle care and a multidisciplinary team approach. Reducing SSI in patients with higher ASA (The American Society of Anesthesiologists) levels is even more significant.

Scoping review ini bertujuan untuk menganalisis kombinasi bundle care dan pendekatan tim multidisiplin untuk mengurangi Infeksi Luka Operasi pada pasien yang berisiko tinggi. Pencarian akan mengidentifikasi literatur yang diterbitkan antara tahun 2012 sampai 2021. Database yang akan digunakan untuk mencari jurnal terkait adalah PubMed, Scopus, dan EBSCO. Protokol PRISMA akan digunakan dalam penelitian ini. Review ini mengambil makalah yang membahas penggunaan bundle care dan pendekatan tim multidisiplin yang berdampak terhadap kejadian Infeksi Luka Operasi, terutama pada pasien yang berisiko tinggi. Beberapa penelitian menunjukkan penurunan Infeksi Luka Operasi pada kelompok intervensi yang menerapkan bundle care dan tim multidisiplin. Pengurangan Infeksi Luka Operasi pada pasien dengan skor ASA (American Society of Anesthesiologists) yang lebih tinggi bahkan lebih signifikan.

Article history: Received 2023-02-22; Revised 2023-03-13; Accepted 2023-03-14

INTRODUCTION

The World Health Organization (WHO) reported that SSI had been found in many developing countries at 11.8 incidents per 100 surgeries. However, no less than 66% of developing countries do not have clear data on SSI (Berríos-Torres et al., 2017). SSI in Indonesia is quite high. Based on data from the Indonesian Ministry of Health in 2011, SSI in government hospitals was 55.1% (Sulviana et al., 2018). Surveillance results at a government hospital in Indonesia showed that 87% of patients had SSI in a superficial incision, while 13% had SSI in a deep incision (van Seben et al., 2019).

SSIs occur when pathogens multiply in wounds, causing local signs and symptoms and ultimately triggering a systemic inflammatory response (Johnson et al., 2013). SSI is a common and serious surgical complication that increases morbidity, mortality, and healthcare costs. To address this challenge, bundle care, and multidisciplinary team approaches have been proposed to reduce SSI risk (Curcio, 2019).

Since many factors can increase a patient's risk of SSI during rehabilitation, involving multiple disciplines in different hospital departments is important. The role of a multidisciplinary team should not only follow best practice risk guidelines and adopt a patient-defined approach to minimize SSI in each patient (Gillespie et al., 2015). Bundle care is designed to foster multidisciplinary teamwork. A jointly discussed treatment plan allows



team members to be more focused and not include unnecessary items during patient care (Riemen & Hutchison, 2016).

A retrospective study used data from operations performed at a tertiary referral hospital. Analysis was performed on 1,042 patients. Seven hundred forty-one (741) operations occurred before implementing bundle care (control group), and 301 operations after implementation occurred (intervention group). The result of this study was that the SSI rate decreased significantly from 3.8% to 0.7% ($p < 0.01$) after the intervention, with an overall relative risk reduction of 82% (Yamada et al., 2018).

This scoping review aims to analyze a combination of bundle care and a multidisciplinary team approach to reduce Surgical Site Infection (SSI) in high-risk patients. Based on this information, hospitals can develop strategies to implement bundle care and a multidisciplinary team approach in their service systems. If this strategy can be implemented in hospitals, the community, especially patients, will benefit greatly.

RESEARCH METHOD

A search strategy begins with keyword development through investigator- and expert-led discussions to ensure that key points of the literature review were adequately covered: surgical site infections, patient-centered care, multidisciplinary team approaches, and bundle care. Boolean operators (AND, OR, and NOT) combine or exclude search keywords, resulting in more targeted and relevant results.

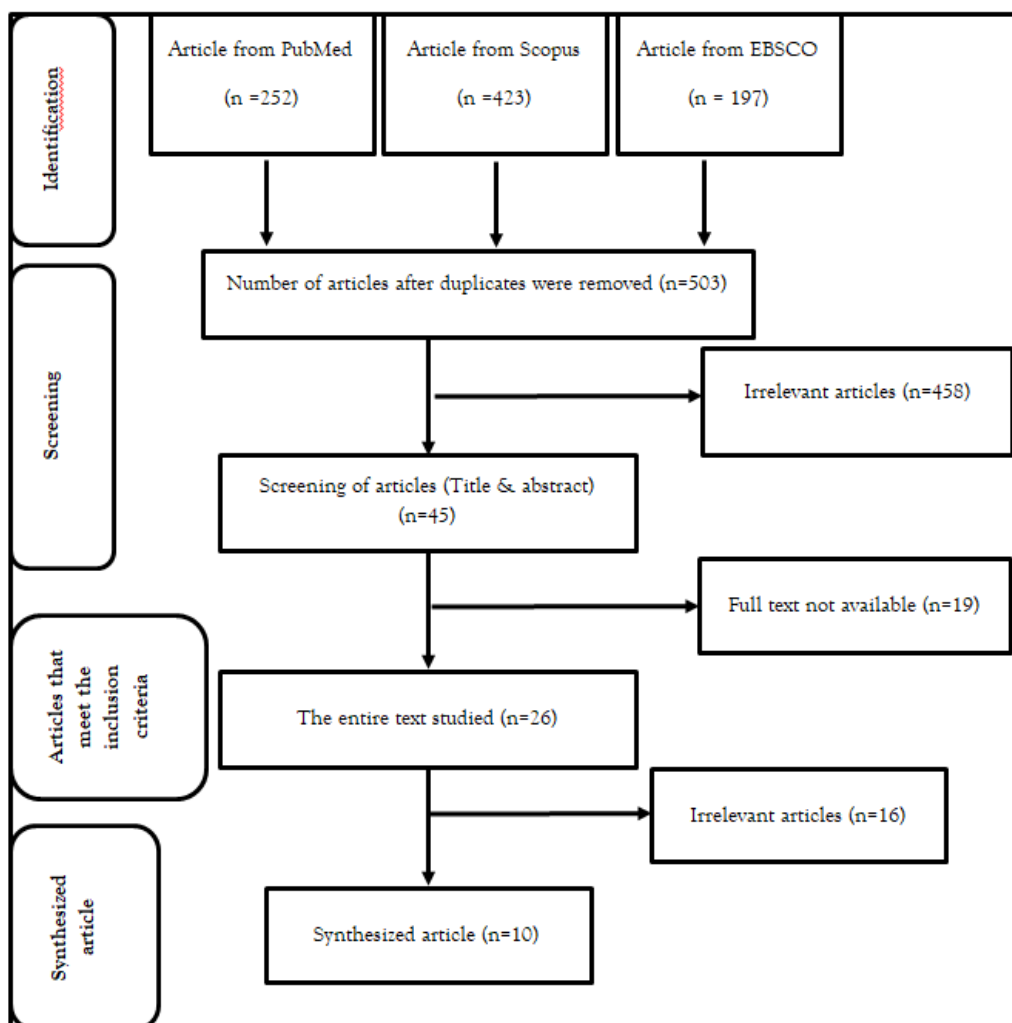
This review included studies published between 2016 and 2021. Studies written in languages other than English were excluded. The databases used for searching related journals are PubMed, Scopus, and EBSCO. This review included studies that discuss changes in postoperative wound infections in patients undergoing surgical procedures. Studies were selected if the work employed a multidisciplinary team approach and bundled treatments. This review includes studies on areas of study in the hospital setting only, such as public, private, teaching, or tertiary care hospitals.

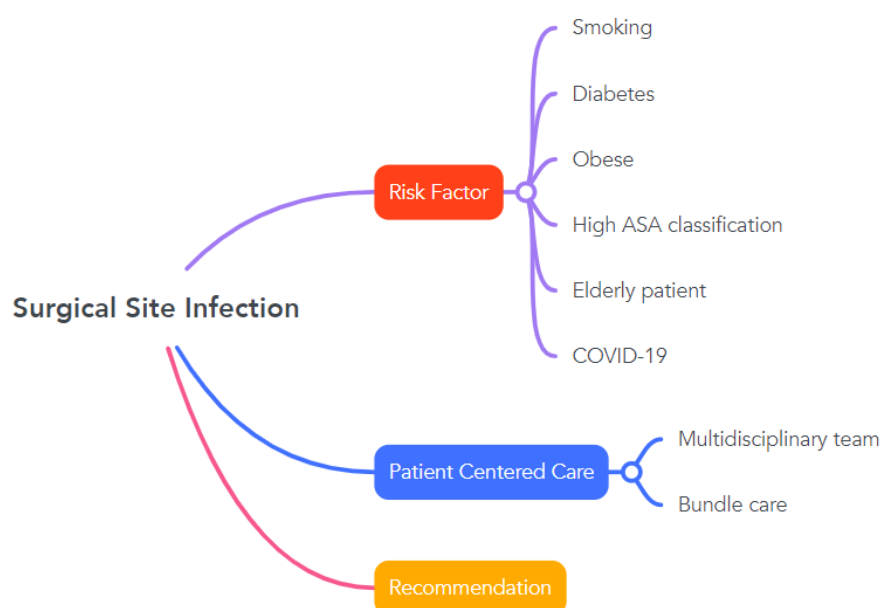
Data were extracted from articles included in the scoping review by two independent reviewers using reviewer-developed data extraction tools. The extracted data included details about participants, concepts, context, research methods, and key findings relevant to the review questions. The literature selected according to the selection criteria underwent critical evaluation and analysis.

RESULT AND DISCUSSION

The initial search yielded 872 articles from 3 databases: PubMed, Scopus, and EBSCO, 369 articles were duplicates, and 458 articles were irrelevant based on the results of article screening, namely titles, and abstracts. Screening results of the remaining 45 articles, 19 of which were not available in full text. Only 26 full-text articles were available; 16 were unfit for analysis after reviewing the journals.

Table.1 PRISMA Diagram





Picture.1 Mind Map

The risk factors for SSI can be divided into the patient's own and perioperative factors, which can further be divided into preoperative, intraoperative, and postoperative factors. Some of these factors can be controlled, and others cannot. Identifying preoperative risk factors and patient risk stratification is critical to effectively assessing individual risk, postoperative outcome and considering the likelihood of SSI (Cvijanovic et al., 2019).

ASA Physical Condition (American Society of Anesthesiologists Classification). Physical status assessment performed by an anesthesiologist on preoperative patients using the ASA classification. Most studies reported that an ASA score of 3 or higher puts patients at increased risk for SSI (Cvijanovic et al., 2019).

Diabetes mellitus. Wound infections are more common in diabetic and non-diabetic patients experiencing postoperative transient hyperglycemia. Hyperglycemia is associated with increased susceptibility of monocytes to apoptosis and impaired neutrophil function (impaired chemotaxis, phagocytosis, and bactericidal capacity) (Forrester, 2020).

Obesity. The impact of obesity on SSI, defined as body mass index (BMI) > 30 kg/m², has been widely reported. Increased surgical time and complexity and decreased subcutaneous neovascularization contribute to increased SSI. Bariatric surgery may be indicated in extremely obese patients (BMI ≥ 50 kg/m²), although referral to a nutritionist may be required. Additionally, communication with an anesthesiologist is recommended to assess risk and discuss increasing perioperative doses of antibiotics (Johnson et al., 2013).

Smoke. Smoking is associated with impaired wound healing and infections. Numerous studies have shown that smoking cessation significantly reduces SSI (Forrester, 2020).

Elderly patients. Good wound healing after surgery is critical for patients, especially elderly patients. The role of malnutrition in wound healing and the development of complications is widely debated in research. Nutritional surgeons should optimize perioperative strategies by assessing the nutritional status of older patients and providing additional nutritional support to reduce the risk of postoperative wound infection.

Undernutrition is an independent predictor of postoperative morbidity, including the development of infections. Several previous studies have associated low albumin levels (preoperative albumin levels < 35 g/L) with delayed wound healing and the development of SSI after surgery in the elderly (Ren et al., 2019).

COVID 19. Status Positive/Suspected COVID-19 is one of the risk assessments. A high risk of perioperative morbidity and mortality should be considered in these patients. Patients with symptoms of COVID-19 should postpone surgery until symptoms improve or resolve and other risk factors are reassessed (Heffernan et al., 2020). Based on other studies, increased use of personal protective equipment and the implementation of specific protocols related to preoperative, intraoperative, and infectious diseases have led to decreased incidence of SSIs during the COVID-19 pandemic. Strict enforcement measures in public health systems critical to the fight against COVID-19 inadvertently affect health systems (Jabarpour et al., 2021).

Since many factors can increase a patient's risk of SSI during rehabilitation, involving multiple disciplines in different hospital departments is important. The role of the multidisciplinary team should not only follow best practice risk guidelines and adopt a patient-defined approach to minimize SSI in each patient (Gillespie et al., 2015).

Every patient and patient companion approved for surgery attends a brief training better to understand the preparations for surgery and postoperative care. Patients and their companions must understand what bundle care must be applied before surgical procedures and postoperative wound care (Sethi et al., 2017).

The Group Health Research Institute and Virginia Mason Medical Center are examples of systematic multidisciplinary approaches. Before surgery, potential surgical cases should be reviewed at an interdisciplinary meeting involving the surgeon (there may be multiple types), anesthesiologists, internists, psychiatrists, and the nursing team involved in the operation. At this meeting, possible surgical interventions and suitability for the patient's condition were discussed for each case. Surgery is postponed if the patient has issues that must be addressed first (such as quitting smoking, losing weight, or requiring further medical advice) (Sethi et al., 2017).

Bundle care is designed to foster multidisciplinary teamwork. A jointly discussed treatment plan allows team members to be more focused and not include unnecessary items during patient care. Bundle care also can increase team engagement by allowing team members to identify each individual's contribution to patient care. Maintenance of bundles reinforces the idea of shared responsibilities within a team, as specific items are not considered specific responsibilities of a designated person (Riemen & Hutchison, 2016).

Table.2 Bundles Care

Modification risk factors	
Diabetes Mellitus	Glycemic control
Obese	<ul style="list-style-type: none"> - Dieticians advise encouraging weight loss - Adjust perioperative antibiotic doses appropriately - In very severe obesity, consider bariatric surgery beforehand
Smoking	Consider a smoking cessation program
Preoperative	
Patient preparation	<ul style="list-style-type: none"> - Take a shower with soap on the day of the operation - If you need to shave, use scissors, not a razor - Cleaning the skin with chlorhexidine the night before surgery and the morning of surgery
Prophylactic antibiotics	Prophylactic antibiotics should be administered in the anesthesia room (15-60 minutes before surgery) and continued for 24 hours postoperatively (type of antibiotics depending on local guidelines)
Intraoperative	
Operating room	<ul style="list-style-type: none"> - Use laminar flow whenever possible - Maintain operating room door opening to a minimum (<10x/hour)
Operations personnel	<ul style="list-style-type: none"> - Wash hands with an antiseptic solution using a disposable brush - Before the next operation, hands should be washed with alcohol or an antiseptic surgical solution - Double gloves and change gloves regularly - Non-woven polypropylene gown with adequate mask and head covering
Preparation of the skin for the operation area	Use alcohol followed by a 2% chlorhexidine-alcohol scrub solution
Anesthesia	<ul style="list-style-type: none"> - Maintain normothermia (temperature between 36°C and 38°C at the end of the procedure) - Maintain normovolemia (water content in the body), prevent hypovolemia - Higher concentrations of inspired oxygen perioperatively and for 6 hours postoperatively may be beneficial
Blood transfusion	Optimize preoperative hemoglobin. If possible, intra-operative transfusion should be avoided and, if anticipated, given more than 48 hours before surgery. Antifibrinolytics may indirectly reduce SSI by reducing the need for transfusions.
Postoperative	
Antibiotic	Stopping antibiotics after 24 hours
Injury cure	The patient takes a shower after the 2nd day of surgery

Source: *Summary of Bundle Care to reduce SSI* (Crolla et al., 2012; Forrester, 2020; Johnson et al., 2013; Tufts et al., 2019)

Nearly all the literature shows that surgical site infections are significantly reduced with a multidisciplinary team approach and bundle care. In the literature, patients with higher ASA who completed at least three bundle elements had a 50% lower prevalence of complications (Kelley et al., 2018). In other literature, patients with modifiable risk factors such as diabetes mellitus, BMI 30kg/m², and a smoking history showed decreased surgical site infection after

implementing bundles care (Weiser et al., 2018). Also, patients of higher age showed a significant decrease in surgical site infection after implementing a multidisciplinary team approach and bundles care from the preoperative period to the patient's discharge home (Sono et al., 2018).

CONCLUSION

Surgical Site Infection (SSI) is a common and serious surgical complication leading to increased morbidity, mortality, and healthcare costs. Since many factors can increase a patient's risk of SSI, it is important to involve bundle care and multidisciplinary team approaches. The role of the multidisciplinary team should not only follow best practice risk guidelines but also adopt a patient-defined approach to minimize SSI in each patient. Bundle care is designed to foster multidisciplinary teamwork.

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