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IMPACT OF IMPLEMENTING A SURGICAL SAFETY CHECKLIST IN HOSPITAL: LITERATURE REVIEW

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ABSTRACT

Background: The Surgical Safety Checklist is part of WHO's efforts to reduce the number of deaths worldwide. **Purpose:** To analyze the impact of implementing the WHO Surgical Safety Checklist in hospitals. **Methods:** Article search was carried out through PubMed and ScienceDirect databases using keywords ("impact") OR ("effect") AND ("implementation") AND ("surgical safety checklist") AND ("hospital") . The total number of articles found was 195, but only six articles met the inclusion criteria. **Results:** A comprehensive study in 7 hospitals located in 4 countries found the impact of implementing the Surgical Safety Checklist in hospitals could improve the quality of care, reduce the length of hospitalization, reduce mortality and complications that cause morbidity, reduce treatment costs, improve surgical team communication, increase trust in the safety culture in the operating room, improve teamwork climate, safety climate, surgical outcomes, and improve patient safety. **Conclusion:** Surgical Safety Checklist can reduce mortality and morbidity, improve quality of care, reduce treatment costs, and affect the attitudes & perceptions of team members and patient safety.

Keywords : impact, effect, implementation, surgical safety checklist, hospital

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INTRODUCTION

Patient safety is a basic principle of health care. Research by the World Health Organization (WHO) in the United Kingdom estimates that the average incidence of injury to a patient is reported every 35 seconds. Likewise, in low- and middle-income countries. Health care safety is currently a major global concern. Unsafe and low-quality services will result in diminished or even harmful health outcomes (WHO, 2017).

There is evidence that nearly half of complications stem from surgical procedures. It is estimated that surgical site errors and surgical errors occur in approximately 50,000-100,000 procedures in the United States, equivalent to 1500-2500 incidents annually. The Joint Commission for Accreditation of Health Organizations found that more than 13% of reported side effects were due to incorrect surgical site. Analysis of 126 cases related to surgical site errors and errors during surgery in 2005 revealed 76% surgical site errors, 13% surgical errors, and 11% procedural errors (WHO, 2009). The most common incidence of patient complications was related to surgical procedures (27%), medication errors (18.3%), and health care-related infections (12.2%) (WHO, 2017).

In 2008, WHO has a patient safety program (safe surgery saves lives) which is part of WHO's efforts to reduce the number of surgical deaths worldwide, WHO published a document recommending the use of a surgical safety checklist with the aim of reducing the risk of accidents that could otherwise be prevented. during the surgical procedure (WHO, 2009).

WHO shows the impact of implementing a surgical safety checklist can reduce complications from 11% to 7% and reduce mortality by 53%. Since then it has been applied to more than 4100 hospitals, 1790 of which are actively used (Lacassie *et al*., 2016). Surgical safety checklists have been implemented at both institutional and national levels, currently used by most surgical service providers worldwide (WHO, 2017). Surgical safety checklist is a tool that has been promoted with the aim of improving patient safety, morbidity, and mortality (Anderson *et al*, 2017).

The rationale for the surgical safety checklist was to assist the operating team in reducing the number of surgical deaths worldwide, patient safety WHO consulted surgeons, anesthesiologists, nurses, patient and patient safety experts around the world to identify ten important goals for a safe operation, then compiled into a surgical safety checklist. Surgical safety checklists strengthen patient safety practices by encouraging better communication and teamwork. Thus, WHO formulated a surgical safety checklist which is divided into 3 parts, which are before induction of anesthesia (sign-in), before skin incision (time out), and before the patient leaves the operating room (sign-out).

Sign-in is carried out by nurses, anesthesiologists, and patients which consists of verifying the patient's identity, location, surgical procedure and other things that must be done related to anesthesia. The time-out is carried out by the entire team by confirming the names and roles of team members. In the sign-out phase, the surgical team will review the operations that have been carried out by checking the completeness of the equipment or other problems that need to be addressed (WHO Patient Safety & WHO, 2009).

The WHO surgical safety checklist has been proven to reduce morbidity and mortality as well as improve teamwork, communication and consistency of care in the operating room. Implementation of a surgical safety checklist can significantly reduce morbidity and mortality (an average of about 36%) (WHO, 2017).

In some country, the implementation of a surgical safety checklist can also improve team performance and good communication (Haugen *et al*., 2020). It can then be used to ensure that the surgical team consistently follows several patient safety measures, thereby minimizing the most common and avoidable risks that could compromise well-being (Gillespie *et al*., 2018). The aim of this study is then to assess the latest evidence of the impact of the implementation of the surgical safety checklist that has been implemented in hospitals.

METHOD

The method used in writing this article was a literature review. Data collection was undertaken through two data base sources: PubMed and ScienceDirect. The keywords used in writing the article were ((("impact") OR ("effect")) AND ("implementation")) AND ("surgical safety checklist")) AND ("hospital").

The search for articles was limited to the last five years (2016-2021). The articles used were in the form of original articles, full text, in English and limited by quantitative research. The writing of the article was in accordance with the purpose of knowing the impact of implementing a surgical safety checklist in hospitals. The study discussed the impact of implementing a surgical safety checklist in hospitals, without regional restrictions.

Extraction and identification of data is described in Figure 1:

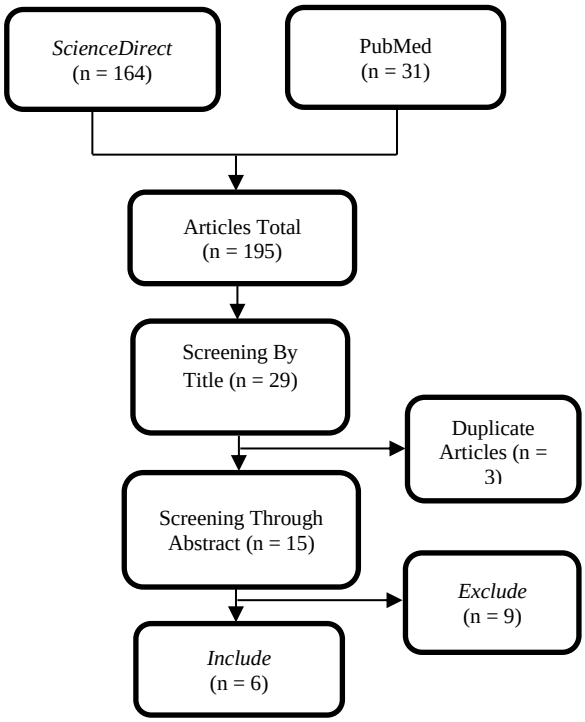

Figure 1. PRISMA Diagram

RESULT

Based on Figure 1 on the prism diagram, the researcher obtained as many as 195 articles that match the research keywords. Researchers screened articles using predetermined inclusion and exclusion criteria to obtain the final findings of 6 articles with a total study conducted in 7 hospitals located in 9 countries. The following is a table of study characteristics in the literature review.

Table 1. Study Characteristic

No.	Criteria	Number of articles
1.	Research Method	
	a. Quantitative Research	6
	b. Qualitative Research	0
	c. *Mixed Method*	0
2.	Sample	
	a. Surgical execution data	3
	b. Surgical team members	3
3.	Year of Publication	
	a. 2016	2
	b. 2017	1
	c. 2018	1
	d. 2019	1
	e. 2020	1
4.	Country	
	a. Latin America	1
	b. United States	2
	c. Australia	1
	d. Norwegia	2

Sources: The screening result of articles in the research

Based on Table 1, the research method used quantitative research with total 6 articles. The article sample uses 3 articles of surgical execution data and 3 articles of surgical team members. The year of publication of articles from 2016-2020, as many as 2 articles from 2016 and 1 article each from 2017-2020. The selected articles came from Latin America and Australia as many as 1 article. Then the United States and Norway with 2 articles each.

Table 2. Summary of the Research Results

Author (Year)	Study Design	Sample	Place	Results
Haugen *et al* (2019)	Randomized controlled trial Study (RCT)	Data on the application of Surgical Safety Checklist as many as 3702 (1398 controls compared to 2304 interventions Procedure)	Two Hospitals in Norway (Community Hospital and Tertiary Educational Programs)	1. Surgical Safety Checklist Implementation can improve the treatment process. a) An increase in the use of forced air warming blankets from 35.3% to 42.4% (p <0.001). b) Increased antibiotic before incision from 54.5% to 63.1%. c) Decrease in the administration of post -incision antibiotics from 12.5% to 9.8%, without antibiotic administration from 33.0% to 27.1% d) Surgical infection decreased from 7.4% (104/1398) to 3.6% (p <0.001). 2. Complications including breathing, heart, surgical infection, wound rupture, bleeding, and blood transfusion are all reduced significantly. 3. The average blood transfusion cost in the control procedure is USD 46.42 vs USD 36.39 in the intervention procedure (p ¼ 0.092). The cost is USD 28.03 in an intervention procedure that uses surgical safety checklist with high accuracy (all 3 parts, p ¼ 0.007), represent 40% reduction in blood transfusion costs.
Lacassie *et al* (2016)	Observation study, retrospective analysis.	Data on surgery (n = 70,639) during the period from January 2005 to December 2012.	Hospital at the Latin American Tertiary Health Treatment Center.	1. Decreased mortality rate before and after the application of Surgical Safety Checklist in hospitals from 0.79% [95% Confidence Interval (CI), 0.69-0.89] to 0.61% (95% CI, 0, 46-0.71) after the application [odds ratio (OR) 0.73; 95% CI, 0.61-0.89]. 2. The average inpatient length (LOS) is 3 days and 2 days for the period before and after the application of Surgical Safety Checklist, respectively (p <0.01).
Anderson *et al* (2017)	Prospective observational studies	8 Specialization of the main pediatric surgery that performs elective pediatric operations on weekdays.	Children's Memorial Hospital, Hermann, Texas	1. Based on 591 observed cases, 19% has at least one documented intraoperative delay. Cases without delays have an average level of compliance 7.6% compared to cases with a delay of 5.8%. 2. 2. The degree of loyalty to the implementation of the surgical safety checklist with cases without delay has an average compliance rate of 14.3% compared to cases of delay of 14.6%.
Cabral et al (2016)	Study design of *single-group* (*pretest* and *posttest*)	Voluntary sample of surgical team members. Participants included surgeons, nurses, and surgical technologists.	Broward Health Imperial Point Hospital, Ft Lauderdale, Florida	1. Showed an increase in the perception of surgical team communication by 6% as measured by SAQ from pretest to posttest, from an average score of 60.81 to 64.68 2. Nurses' perceptions of communication increased by a maximum of 12% from pretest to posttest. 3. Improved perception of communication for surgeons 4.0% and surgical technologists lower at 2.3%
Haugen *et al* (2020)	C*ross-sectional longitudinal study*	1754 operating room personnel to participate in the study, 920 of whom responded to the survey at three times in 2009, 2010 and 2017	Norway's largest tertiary teaching hospital.	Eight of the 12 dimensions of safety culture improved significantly over time with the largest increase being 'Hospital manager support for patient safety' from a mean score of 2.82 in early 2009 to 3.15 in 2017 (change in mean : 0.33, 95% CI 0.21 to 0.44).
Jager *et al* (2018)	Retrospective review study	Data from 21,306 surgical procedures, performed over a 5 year time period	Tertiary care centers in Australia	1. Postoperative mortality rate decreased from 1.2% to 0.92% 2. Length of stay decreased from 5.2 to 4.7 days (p = 0.014). 3. The reduction in mortality reached significance in the 2-3 year post-implementation period.

Treatment Quality

Implementation of a surgical safety checklist can improve the treatment process. The implementation carried out in the treatment process at the Norwegian University Hospital was able to improve the quality of nursing services including the use of forced air warming blankets and the administration of antibiotics before incision. There was a decrease in post-incision antibiotics, without antibiotics, and surgical infections decreased (Haugen *et al*., 2019). In addition, when compared in terms of the average length of stay (LOS) before the application of the surgical safety checklist, which is 3 days and after the implementation of the SSC, it is 2 days (Lacassie *et al*., 2016).

Mortality & Morbidity

Surgical safety checklist from WHO has been proven to reduce morbidity and mortality. The effectiveness of the surgical safety checklist can reduce mortality after implementing to patients. Research conducted in Latin American tertiary hospitals showed a comparison of mortality before and after implementation (Lacassie *et al*., 2016). Haugen *et al*. (2020) stated that the initial evaluation of the surgical safety checklist showed a reduction in complications and mortality.

The study of Haynes *et al*. (2017) revealed the implementation of an effective surgical safety checklist supported by a statewide surgical safety program, demonstrated a significant reduction in 30-day mortality in US South Carolina hospitals. If the application is not equipped and associated with the risk of complications after surgery, it has a higher tendency to die. By completing the three components of the surgical safety checklist, the risk of complications is lower (Mayer *et al*., 2016). If the surgical safety checklist is implemented properly, it can reduce postoperative bleeding and the need for blood transfusions (Haugen *et al*., 2019). Haugen et al (2020) in their research showed a reduction in complications by implementing a surgical safety checklist (Haugen *et al*., 2020)

Lower Maintenance Cost

Implementing a surgical safety checklist in US hospitals is estimated to result in cost savings after preventing at least 5 major complications. The observation results are estimated to be a reduction in costs related to blood transfusion after the implementation of the surgical safety checklist (Haugen *et al*., 2019). Likewise, based on the research of Anderson *et al*. (2017) the application of a surgical safety checklist that is conducted correctly can reduce intraoperative delays which have an effect on reducing costs.

Attitudes and Perceptions of Team Members

Research conducted at Children's Memorial Hermann hospital had at least one documented intraoperative delay. When compared to cases with delays, they did not have a level of compliance with the use of a surgical safety checklist (Anderson *et al*., 2017). Operation delays are a frequent occurrence, a major cause of equipment-related delay issues. Some delays cannot be predicted or prevented, but the poor relationship between the surgical team's loyalty in implementing the surgical safety checklist will affect the delay. Operational delays can be reduced if you apply the surgical safety checklist correctly and appropriately. The degree of loyalty of the surgical team to the application of the surgical safety checklist differs between cases with delay and without delay (Anderson *et al*., 2017). According to Cabral *et al* (2016), if the surgical safety checklist is used over a long period of application, the effect on the perception of communication will be greater. In its application, it can increase the perception of surgical team communication, increase nurses' perceptions of communication, increase communication perceptions for surgeons and surgical technologists. Cabral *et al* (2016) re-added that the application of the surgical safety checklist not only increased the perception of communication among surgical team members, but as several team members stated that the implementation of the surgical safety checklist would increase trust in the safety culture in the operating room.

Molina *et al* (2016) in their research revealed that if used correctly, it can improve teamwork, including clinical leadership, communication, coordination, assertiveness, and respect. Implementation of the WHO surgical safety checklist has been shown to improve surgical team communication, teamwork climate, safety climate, and surgical outcomes (Cabral *et al*., 2016). The results of Ayabe *et al*'s research (2017) examined that the

implementation of the surgical safety checklist had a visible impact on improving communication and on the use of the surgical safety checklist, which seemed to contribute to the staff in the operating room to build good communication, teamwork, and collaboration in the operating room.

Patient Safety

Patient safety is a basic principle of health care. Unsafe and low-quality services will provide poor results and can even harm patients (WHO, 2017). Eight of the 12 dimensions of safety culture improved significantly over time with the largest increase being 'Hospital managers' support of patient safety (Haugen *et al*., 2020). This is supported by Sokhanvar *et al.* (2018) that the application of a surgical safety checklist can improve patient safety. The research of Schmitt et al (2018) proves that there is a significant reduction in the frequency of reported incidents when a surgical safety checklist is applied compared to no application. In the research of Gitelis *et al.* (2017) conducted on the operating team that the surgical safety checklist has a positive impact on patient safety. In line with the research of Jager *et al*. (2018), after the implementation of the surgical safety checklist the postoperative mortality rate decreased from 1.2% to 0.92%. Then the reduction in mortality reached a significant level in 2-3 years after implementation.

CONCLUSION

The results of the literature review show that the impacts of implementing a surgical safety checklist in hospitals are divided into several points including quality of care, mortality and morbidity, reducing treatment costs, attitudes and perceptions of team members, and patient safety. At the point of quality of care, it can improve the quality of care and reduce the length of hospitalization. The effectiveness of the surgical safety checklist can reduce mortality and morbidity. Good implementation will result in cost savings. Improve the attitudes and perceptions of team members include increasing the perception of surgical team communication, increasing trust in the safety culture in the operating room, improving teamwork, including clinical leadership, communication, coordination, assertiveness, and respect, improving teamwork climate, safety climate, surgical outcomes, and improve patient safety.

SUGGESTIONS

Hospitals are expected to implement a surgical safety checklist in carrying out surgery. Surgical safety checklist can provide safe and quality surgery for patients. Then it is hoped that further research will conduct studies on the implementation of the surgical safety checklist in Indonesia.

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CONFLICT OF INTEREST

Author have no conflict of interest.

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Faculty of Public Health, Airlangga University, Surabaya Campus.

AUTHOR CONTRIBUTION

Author Ezha Gadis Rekly Arimbi served as data collector, data analysis, study design, writing article manuscripts, literature review, and bibliography. Author Inge Dhamanti served as study design, overseeing and reviewing the writing of article manuscripts, and revising article script.

REFERENCES

Anderson, K. T., Bartz-Kurycki, M. A., Masada, K. M., Abraham, J. E., Wang, J., Kawaguchi, A. L., Austin, M. T., Kao, L. S., Lally, K. P., & Tsao, K. J. 2017. *Decreasing intraoperative delays with meaningful use of the surgical safety checklist. Surgery (United States)*, *163*(2), 259–263. https://doi.org/10.1016/j.surg.2017.08.009

Ayabe, T., Shinpuku, G., Tomita, M., Nakamura, S., Yokoyama, E., Shimizu, S., Okumura, M., Itai, K., Tsuneyoshi, I., Takeshima, H., & Nakamura, K. 2017. *Changes in Safety Attitude and Improvement of Multidisciplinary Teamwork by Implementation of the WHO*

Surgical Safety Checklist in University Hospital. Open Journal of Safety Science and Technology, *07*(01), 22–41. https://doi.org/10.4236/ojsst.2017.71003

Cabral, R. A., Eggenberger, T., Keller, K., Gallison, B. S., & Newman, D. 2016. *Use of a Surgical Safety Checklist to Improve Team Communication. AORN Journal*, *104*(3), 206–216. https://doi.org/10.1016/j.aorn.2016.06.019

de Jager, E., Gunnarsson, R., & Ho, Y. H. 2018. Implementation of the World Health Organization Surgical Safety Checklist Correlates with Reduced Surgical Mortality and Length of Hospital Admission in a High-Income Country. World Journal of Surgery, 43(1), 117–124. https://doi.org/10.1007/s00268-018-4703-x

Gillespie, B. M., Harbeck, E. L., Lavin, J., Hamilton, K., Gardiner, T., Withers, T. K., & Marshall, A. P. 2018. *Evaluation of a patient safety programme on surgical safety checklist compliance: A prospective longitudinal study*. *BMJ Open Quality*, *7*(3). https://doi.org/10.1136/bmjoq-2018-000362

Gitelis, M. E., Kaczynski, A., Shear, T., Deshur, M., Beig, M., Sefa, M., Silverstein, J., & Ujiki, M. 2017. *Increasing compliance with the World Health Organization Surgical Safety Checklist—A regional health system's experience*. *American Journal of Surgery*, *214*(1), 7–13. https://doi.org/10.1016/j.amjsurg.2016.07.024

Haugen, A. S., Søfteland, E., Sevdalis, N., Eide, G. E., Nortvedt, M. W., Vincent, C., & Harthug, S. 2020. *Impact of the Norwegian National Patient Safety Program on implementation of the WHO Surgical Safety Checklist and on perioperative safety culture. BMJ Open Quality*, *9*(3), 1–9. https://doi.org/10.1136/bmjoq-2020-000966

Haugen, A. S., Wæhle, H. V., Almeland, S. K., Harthug, S., Sevdalis, N., Eide, G. E., Nortvedt, M. W., Smith, I., & Søfteland, E. 2019. *Causal Analysis of World Health Organization's Surgical Safety Checklist Implementation Quality and Impact on Care Processes and Patient Outcomes: Secondary Analysis From a Large Stepped Wedge Cluster Randomized Controlled Trial in Norway*. *Annals of Surgery*, *269*(2), 283–290. https://doi.org/10.1097/sla.0000000000002584

Haynes, A. B., Edmondson, L., Lipsitz, S. R., Molina, G., Neville, B. A., Singer, S. J., Moonan, A. T., Childers, A. K., Foster, R., Gibbons, L. R., Gawande, A. A., & Berry, W. R. 2017. *Mortality Trends after a Voluntary Checklist-based Surgical Safety Collaborative*. *Annals of Surgery*, *266*(6), 923–929. https://doi.org/10.1097/sla.0000000000002249

Lacassie, H. J., Ferdinand, C., Guzman, S., Camus, L., & Echevarria, G. C. 2016. *World Health Organization (WHO) surgical safety checklist implementation and its impact on perioperative morbidity and mortality in an academic medical center in Chile. Medicine (United States)*, *95*(23), 1–4. https://doi.org/10.1097/md.0000000000003844

Mayer, E. K., Sevdalis, N., Rout, S., Caris, J., Russ, S., Mansell, J., Davies, R., Skapinakis, P., Vincent, C., Athanasiou, T., Moorthy, K., & Darzi, A. 2016. *Surgical checklist implementation project: The impact of variable WHO checklist compliance on risk-adjusted clinical outcomes after national implementation: A longitudinal study. Annals of Surgery*, *263*(1), 58–63. https://doi.org/10.1097/sla.0000000000001185

Molina, G., Jiang, W., Edmondson, L., Gibbons, L., Huang, L. C., Kiang, M. V., Haynes, A. B., Gawande, A. A., Berry, W. R., & Singer, S. J. 2016. *Implementation of the Surgical Safety Checklist in South Carolina Hospitals Is Associated with Improvement in Perceived Perioperative Safety*. *Journal of the American College of Surgeons*, *222*(5), 725-736.e5. https://doi.org/10.1016/j.jamcollsurg.2015.12.052

Schmitt, C. M., Buchbender, M., Musazada, S., Bergauer, B., & Neukam, F. W. 2018. *Evaluation of Staff Satisfaction After Implementation of a Surgical Safety Checklist in the Ambulatory of an Oral and Maxillofacial Surgery Department and its Impact on Patient Safety. Journal*

of Oral and Maxillofacial Surgery, *76*(8), 1616–1639. https://doi.org/10.1016/j.joms.2018.03.032

Sokhanvar, Mobin, Edris Kakemam, N. G. 2018. Implementation of the Surgical Safety Checklist in Hospitals of Iran; Operating Room Personnel's Attitude, Awareness and Acceptance. International Journal of Health Care Quality Assurance. *International Journal of Health Care Quality Assurance*, *31*(6), 00-00 http://dx.doi.org/10.1108/IJHCQA-03-2017-0051

WHO Patient Safety & World Health Organization.2009. *Implementation manual WHO surgical safety checklist 2009 : safe surgery saves lives.* https://www.who.int/publications/i/item/9789241598590

World Health Organization. 2009. *WHO Guidelines for Safe Surgery 2009.* 7, Switzerland: World Health Organization.

World Health Organization. 2017. *Patient safety : Making health care safer*. Geneva: World Health Organization.

