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BIBLIOMETRIC ANALYSIS OF STUDIES ON SURGICAL SITE INFECTIONS IN NURSING (2000-2022)

HEMŞİRELİKTE CERRAHİ ALAN ENFEKSİYONLARI KONUSUNDAKİ ÇALIŞMALARIN BİBLİYOMETRİK ANALİZİ (2000-2022)

Hale TURHAN DAMAR [1], Filiz ÖGCE AKTAS [2],

[1] Izmir Democracy University, Health Services Vocational School, Elderly Health Program, Izmir, Turkey
[2] Izmir University of Economics, Faculty of Health Science, Department of Nursing, Izmir, Turkey

ABSTRACT
Surgical site infections are one of the most important health-related problems that cause mortality, morbidity, length of hospital stay, and increased health expenditures. This study aims to reveal the general texture of the literature by examining the research and review articles published in the journals scanned in the Scopus database between 2000-2022 on surgical site infections in the field of nursing research. A total of 677 publications were reached, including 565 research articles and 112 reviews, published in the field of nursing research between 2000 and 2022. It was determined that the studies were mostly published in the AORN Journal (n=112), Journal of Wound Care (n=41), and Journal of Infection Prevention (n=36). In the studies on surgical site infections in the nursing field, it was determined that the most repeated words were surgical infection, female, procedures, risk factors, aged, infection control, perioperative nursing, guideline, wound healing, postoperative complications, and preoperative care. It was determined that the keywords used in the studies were orthopedics, antibiotics, wound care, gastric surgery, evidence-based clinical applications, colorectal surgery, and telehealth. It is considered that the study will provide significant information in terms of revealing the general pattern, trend, and discussions in the studies on surgical site infection in the nursing research field on a global scale.
Keywords: Bibliometric, Nursing, Surgical, Surgical Site Infections.

ÖZET
Cerrahi alan enfeksiyonları, mortalite, morbidite, hastanede yatış süresi ve sağlık harcamalarının artmasına neden olan en önemli sağlık ilişkili problemlerden biridir. Bu çalışmanın amacı hemşirelik araştırma alanında cerrahi alan enfeksiyonları konusunda gerçekleştirilmiş olan, 2000-2022 yılları arasında Scopus veri tabanında taranan dergilerde yayınlanan araştırma ve derleme makalelerini inceleyerek literatürün genel dokusunu ortaya koymaktır. İlgili konuda 2000-2022 tarih aralığında yayınlanmış, hemşirelik araştırmaları içinde yer alan 565 araştırma makalesi ve 112 derleme olmak üzere toplamda 677 yayına ulaşılmıştır. Yapılan incelemede, çalışmaların en yoğun olarak AORN Journal (n=112), Journal of Wound Care (n=41) ve Journal of Infection Prevention (n=36) dergilerinde yer aldığı görülmektedir. İlgili alanda en yoğun çalışmalara sahip ülkeler arasında Amerika Birleşik Devletleri, İngiltere ve Brezilya başta gelmektedir. Hemşirelik alanındaki cerrahi alan enfeksiyonları konusunda yapılan çalışmalar incelendiğinde, bu alanda en yoğun tekrarlanan kelimeler; kadın, ameliyatlar, risk faktörleri, yaş, enfeksiyon kontrolü, perioperatif hemşirelik, uygulama rehberleri, yara bakımı, postoperatif komplikasyonlar, ve preoperatif bakım olarak belirlendi. Çalışmalarda kullanılan anahtar kelimelerin de ortopedi, antibiyotik, yara bakım örtüleri, gastrik cerrahi, kanıta dayalı klinik uygulamalar, kolorektal cerrahi ve tele sağlık üzerinde yoğun çalışıldığı belirlendi. Çalışmanın, küresel ölçekte hemşirelik araştırma alanındaki cerrahi alan enfeksiyonu konulu çalışmalardaki genel dokuyu, eğilimi ve tartışmaları ortaya koyması adına önemli bilgiler sunacağı düşünülmektedir.
Anahtar Kelimeler: Bibliyometri, Cerrahi, Cerrahi Alan Enfeksiyonları, Hemşirelik.

Sorumlu Yazar / Corresponding Author: Hale TURHAN DAMAR, Assistant Professor, PhD, Izmir Democracy University, Health Services Vocational School, Elderly Health Program, Izmir, Turkey. **E-mail:** hale.turhan1986@gmail.com

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INTRODUCTION

Surgical site infections (SSI) are an important health problem that is common all over the world, increasing the length of hospital stay, mortality rate, and treatment costs (Broex et al., 2009). SSIs are defined by the Centers for Disease Control and Prevention (CDC) as infections that occur in tissue spaces and organs within 30 days following the surgical intervention, or infections that occur within 90 days after a foreign material such as a prosthesis or implant is implanted into the body (Borchardt and Tzizik, 2018).

SSI rates differ according to countries and the type of surgical intervention. SSI occurs in about 2% of the estimated 80 million surgeries performed each year in the United States (Magill et al., 2012; Mu et al., 2011), while in Europe SSI rates range from 0.60% to 9.50% (Meijs et al., 2019). In a study conducted in Brazil, the infection rate after general surgery was found to be 3.40% (de Carvalho et al., 2017). In a study conducted in 16 cities in Turkey, the rate was found to be 4.5% (Leblebicioglu et al., 2015). It is known that SSI rates vary according to the surgical intervention and develop between 2% and 15% (Labi et al., 2019). Surgical site infections (SSI) are one of the most important and serious problems of surgery in terms of mortality, morbidity, length of hospital stay, and increase in hospital costs. Examining the content and trends of studies on surgical site infections will contribute to future studies.

Bibliometrics is a research method that includes techniques based on the measurement of processes and features related to documents (Thelwall, 2008). The bibliometric analysis includes statistical methods to identify qualitative and quantitative changes in a particular scientific research topic, create a profile of publications on the topic, and identify trends within a discipline (Rey-Martí et al., 2016). These methods have the potential to improve the quality of the relevant science field through a systematic, transparent, and reproducible review process (Zupic & Čater, 2014). Bibliometric analysis, which is a quantitative research technique based on bibliographic data, provides information about the general perspective of a research field on the basis of articles, authors, and journals (Merigó and Yang, 2017). In the bibliometric analysis method, a wide range of analysis techniques are used, including citation-based and performance-based analyzes by classifying publications according to countries, universities, research groups or authors (Gaviria-Marin et al., 2019). Many different techniques such as citation analysis, co-citation analysis, bibliometric mapping analysis, and bibliometric mapping can be used together in bibliometric analysis methods (Chai and Xiao, 2012).

Many studies have been analyzed with the bibliometric analysis method in nursing. There are bibliometric studies on various subjects such as pain management, self-management of chronic diseases, nursing career, and caregivers (Bilik et al., 2019, Damar et al., 2018, Dong et al., 2020; Kokol and Vosger, 2019). This study aims to examine the articles on SSI in nursing using bibliometric approaches and techniques. This study will provide to examine the distribution of articles on SSIs in the field of nursing by years, the course of the topics, the trends in the cited journals and authors, the status of countries and institutions, the distribution of keywords by years, the concentration of keywords and the citations.

MATERIALS AND METHODS

In our study, a bibliometric, descriptive research design was used. Data were collected on 01 June 2022. The universe of the study consists of research articles and reviews focused on SSIs published in the field of nursing research between 2000 and 2022 in the journals scanned by the Scopus database. The data were obtained by scanning the Scopus database with the keyword "surgical site infection". A total of 677 publications were reached, including 565 (83.5%) research articles and 112 (16.5%) compilations, which were published between 2000 and 2022, with the phrase "surgical site infection" as the subject. Studies whose title, abstract, and keywords were associated with SSIs were included in the dataset. In the preprocessing stage, a PHP program, integrated with the database designed on the Oracle platform, has been developed to convert the data from the Scopus database to a relational database and to obtain different summary tables and statistics with the help of SQL and MS-Excel. In the analysis process, the VOSviewer package software, which can directly process Scopus data for visual outputs and graphics, was used.

Bibliometric mapping is a quantitative approach that aims to visualize various bibliometric aspects of scientific publications. This visualization is carried out in the form of various bibliometric

maps. The software used is VOSviewer, which can be accessed at www.vosviewer.com. The VosViewer package is specially designed to analyze and view large bibliographic data sets. VOSviewer launches and visualizes a wide range of bibliometric networks. These networks may consist of journals, authors, countries, institutions or individual publications. Networks can be established based on co-authorship, co-citation, or bibliographic matching. Different analyzes were used according to the needs of this study.

RESULTS

A total of 677 studies were reached, including n= 565 (83.5%) research articles and n= 112 (16.5%) reviews published between 2000-2022 on surgical site infection. There is a steady increase in the number of studies on surgical site infections in the field of nursing and the number of citations given to articles by years (Figure 1). The year with the most publications of all time is 2021 with 80 studies (11.99%). Considering the distribution of the 667 articles produced according to the languages in which they were produced; English (n=647), Portuguese (n=30), Spanish (n=16), French (n=7), German (n=3), Italian (2), Chinese (1), Korean (n=1) Slovak (n=1). In addition, surgical site infections are studies that are followed with interest and arouse interest in the literature. The number of citations to all articles is 5241, and the number of citations per article is 7.85.

Year	N
2022	32
2021	80
2020	59
2019	51
2018	61
2017	53
2016	44
2015	44
2014	34
2013	42
2012	21
2011	34
2010	30
2009	17
2008	17
2007	15
2006	14
2005	7
2004	9
2003	3
2002	4
2001	1
2000	5

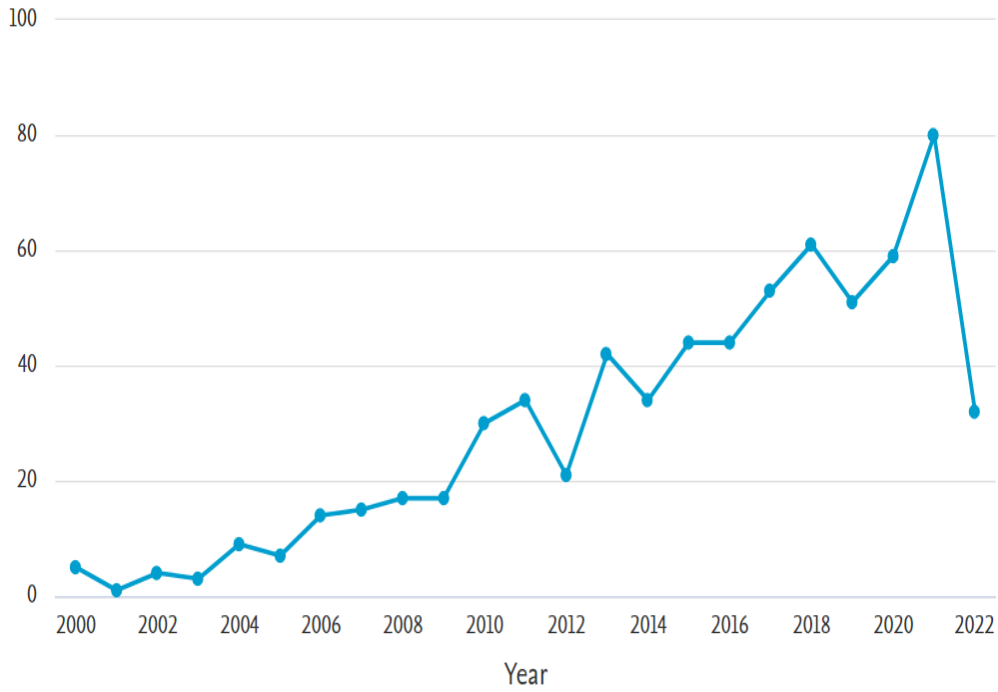

Figure 1. Year-Based Visualization of Authors According to Article Count

The top 10 researchers who contributed the most in the order of their articles on surgical site infection; Spruce L.(n=10), Tanner, J. (n=10), Edmiston C.E. (n=9) Gillespie B.M. (n=9), Chaboyer W. (n=8), Link T. (n=6), Galvão C.M. (n=6), Allen G. (n=5), Duff J. (n=5), Edward K.L. (n=5). When the literature is examined in terms of countries, 677 studies have been prepared with the contribution of 2369 different authors from 89 different countries. The countries that contribute the most to the literature in this field are respectively; Americ (n=265, cited=2286), England (n=90, cited=699), Brezilian (n=60, cited=319), Australia (n=42, cited=347), China (n=19, cited=75), Canada(n=16, cited=85), Japan (n=13, cited=202), Italy(n=11, cited=116), Sweden(n=11, cited=69), France(n=10,

cited=16), Iran (n=8, cited=70), Turkey (n=8, cited=83), India (n=7, cited=15), Ireland (n=7, cited=16), Spain (n=7, cited=75), Greece (n=6, cited=20), Israel (n=6, cited) =97), Germany (n=5, cited=21), Jordan (n=5, cited=15), Netherlands (n=5, cited=13) and Pakistan(n=5, cited=16).

Studies on surgical site infections in the field of nursing were created with the contribution of 1476 different institutions. The top 10 universities in the world ranking that contribute the most in this field Universidade de Sao Paulo – USP(n=26), Griffith University (n=14), Association of periOperative Registered Nurses(n=14), Universidade Federal de Minas Gerais (n= 12), Menzies Health Institute Queensland (n=11), Medical College of Wisconsin (n=10), University of Huddersfield (n=10), De Montfort University (n=9), Gold Coast University Hospital (n=9), Griffith Health (n=8), (Figure 2).

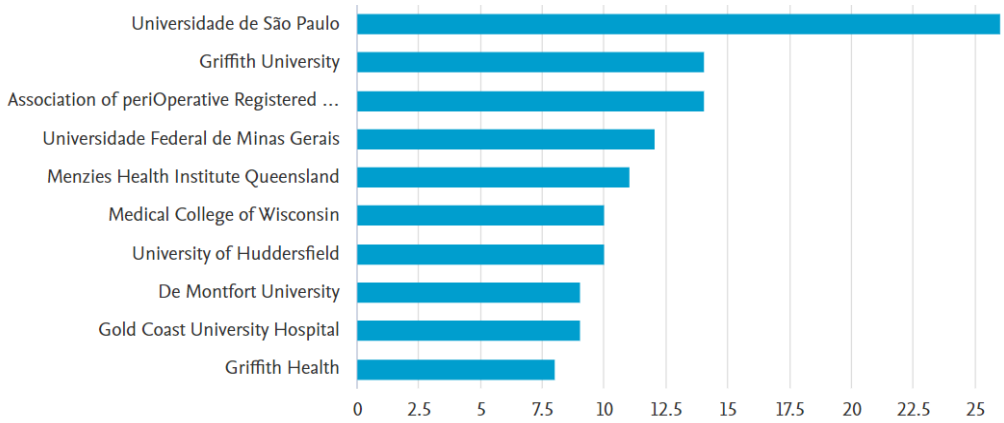

Figure 2. Top 10 institutions contributing to the literature

The most intensive publications in the field of surgical site infections are respectively; AORN Journal (n=112), Journal of Wound Care (n=41), Journal of Infection Prevention(n=36), Journal of Perioperative Practice (n=28), Obesity Surgery (n=24), Journal of Clinical Nursing (n=14), Revista Da Escola De Enfermagem (n=14), British Journal of Nursing (n=13), Perioperative Nursing Clinics (n=13), Journal of Patient Safety (n=11), Orthopedic Nursing (n=13) =11), Advances in Skin and Wound Care (n=10), Joint Commission Journal on Quality and Patient Safety (n=10), Revista Latino Americana de Enfermagem (n=10), Wounds (n=10). The distribution of publications by years of the top ten journals producing the most intensive publications in the field is shown on the figure (Figure 3).

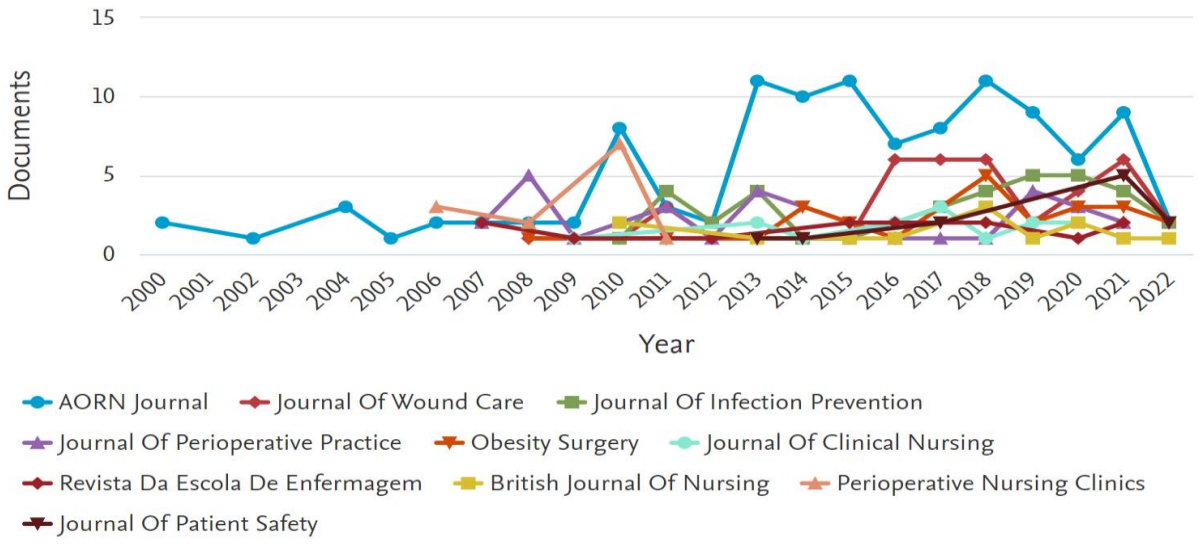

Figure 3. Distribution of Top 10 Journals Published Most By Years

When the studies on surgical site infections in the field of nursing are examined, the most frequently repeated words in this field are; surgical infection (n=315), female (n=185), adult (n=122), procedures (n=110), risk factors (n= 92), aged (n=91), infection control (n=79), retrospective study (n=72), postoperative complication (n=60), surgery (n=58), perioperative nursing (n=57), practice guideline (n=56), wound healing (n=56), care (n=55), major clinical study (n=53), treatment outcome (n=51), anti-infective agent (n=49), length of stay (n=49), incidence (n=46), prospective study (n=43), anti-bacterial agents (n=41), antibiotic prophylaxis (n=41), adverse event (n=40), perioperative event period (n=38), patient safety (n=37), prospective studies (n=37), topical anti-infective agent (n=35), quality improvement (n=34), aged, 80 and over (n= 33), operating room (n=33), total quality management (n=33), chlorhexidine (n=32), chlorhexidine gluconate (n=25), organization and management (n=31), health care quality (n=30), postoperative care (n=30), infection prevention (n=29), practice guidelines as topic (n=29), standards (n=29), bandage (n=28), body mass (n=27), postoperative period (n=27), adolescent (n=26), risk assessment (n=25). When the distribution of keywords according to years is examined, it is seen that orthopedics, antibiotic, wound care, gastric surgery, evidence-based guidelines, colorectal surgery and telehealth have been studied more intensively in the last 5 years (Figure 4). In Figure 5, the clustering of keywords is examined and the clusters are; obesity surgery, operating room, perioperative precautions, sterilization and disinfection, preoperative precautions, clinical practices and evidence-based practices (Figure 5).

Figure 4. Keyword topic distribution by years

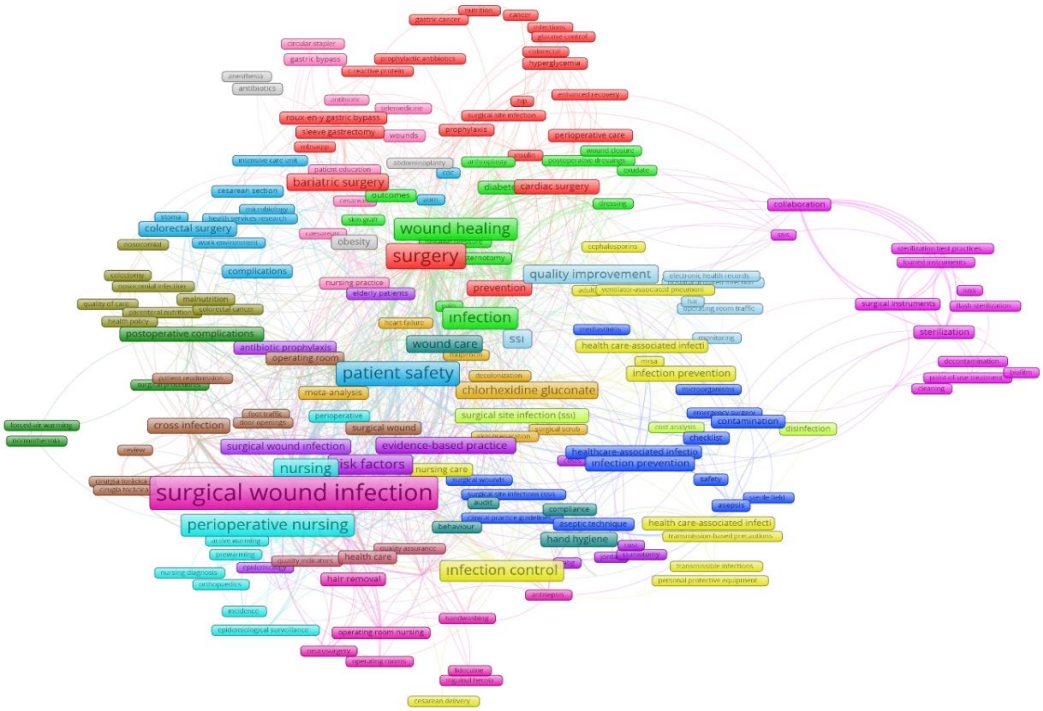

Figure 5. Keyword distribution and clustering

The journals that include the top 20 most frequently used references in the bibliography of studies on surgical site infection can be listed as follows; Infect Control Hosp Epidemiol (n=418), Am J Infect Control (n=374), J Hosp Infect (n=239), Journal of Hospital Infection (n=189), Infection Control and Hospital Epidemiology (n=169), Aorn J (n=163), N Engl J Med (n=154), Cochrane Database Syst Rev (n=147), Ann Surg (n=144), American Journal of Infection Control (n=135), Jama (n=129), Obes Surg (n=122), Lancet (n=120), Clin Infect Dis (n=118), Anesthesiology (n=102), J Am Coll Surg (n=104), Bmj (n=99), Surgery (n=94), Guidelines for Perioperative Practice (n=94), and Ann Thorac Surg (n=90). The top 20 most cited studies in studies on surgical site infections in nursing are given in Table 1.

DISCUSSION

Surgical site infections are a health problem that needs to be addressed even after years (Borchardt and Tzizik, 2018). Since it adversely affects the quality of life, mortality, and morbidity of the patients, it is important to prevent it first and to plan the treatment when it develops. In our study, the distribution of studies on SSI in the nursing field by years, authors, journals, the countries and institutions of the authors, keywords, associations between words, and the density of cited studies were examined. It was determined that there has been an increase in the number of publications and therefore the number of citations over the years. The number of surgical procedures has increased over the years, and it is stated that the incidence of SSI varies according to the cases (Abbas et al., 2019; Krieger et al., 2017).

It was determined that more nursing studies on SSI were carried out by researchers in the USA, England, Brazil, and Australia, and in terms of institutions, universities in Brazil and Australia came to the fore in studies on SSI. CDC, Agency for Healthcare Research and Quality, and The National Institute for Health and Care Excellence (NICE), which are institutions and organizations for the prevention of surgical site infection, are located in these countries. In addition, it was determined that studies on SSI in nursing were mostly published in the AORN Journal. AORN is the journal of the America Operating Room Nurses Association and is at the forefront of publishing evidence-based guidelines and studies for the operating room and perioperative nursing.

In the studies examined, it was determined that the words female (n=185), male (n=159), procedures (n=110), risk factor (n=94), aged (n=91), infection control (n=79), retrospective study (n=72), postoperative complication (n=60), surgery (n=58), perioperative nursing (n=57), practice guideline (n=56), wound healing (n=56), and preoperative care (n=55) were used most frequently. It was determined that many studies are aimed at risk factors, prevention, and care of SSI. Some studies

compared SSIs according to gender (Aghdassi et al., 2019; Peng et al., 2019) and there are studies stating that there is no difference (Zwicky et al., 2022). In addition, it has been stated in the literature that factors such as age, gender, and the presence of chronic diseases such as diabetes are among the risk factors for SSI (Borchardt and Tzizik, 2018). It was determined that among the 20 most cited publications, "Diabetes Care" magazine ranks first with 4 publications. In our study, it was determined that the words procedure and practice guideline were studied intensively. Many clinical practice studies on SSI prevention have been prepared for evidence-based guidelines (Borchardt and Tzizik, 2018, Leaper et al., 2019). In addition, it was determined that the word postoperative care is studied as well as the words preoperative and perioperative in the prevention of SSI. Many studies have been designed to cover the entire perioperative process in SSI prevention (Bashaw et al., 2019; Martin et al., 2018; Borchardt and Tzizik, 2018).

When the distribution of keywords by years was examined, it was found that orthopedics, antibiotics, gastric surgery, and telehealth were studied more intensively in recent years. Surgical site infection is a significant complication in studies after implant/prosthesis placement in orthopedic surgeries. In recent years, hip fractures, osteoarthritis, and related surgeries have been reported to increase (Worlicek et al., 2021). The importance of prophylactic antibiotic use in the prevention of SSIs has been proven. Rational application of prophylaxis is very is important. The selection of the appropriate antibiotic is important to prevent the development of resistant microorganisms (Abbas et al., 2019). SSI is the most common complication after surgery in colorectal surgery. SSI results in decreased quality of life, prolonged hospital stay, probability of mortality, and significantly increased cost. Therefore, identifying and implementing evidence-based strategies designed to minimize SSI is an essential step (Borchardt and Tzizik, 2018; Anthony et al., 2011). The incidence of SSI, especially after colorectal surgery due to being a dirty area, is reported to be between 5-27% in various studies and often causes morbidity (Tanner et al., 2015; Wick et al., 2012; Young et al., 2012). In our study, it was determined that the word telehealth has been used intensively in recent years. Telehealth is the ability to provide surgical preparation and care to patients before and after surgery by telecommunication tools. Telehealth aims to monitor patients in the post-operative period with remote monitoring, to follow up on existing chronic diseases, and ultimately reduce patients' emergency service admissions (Langer, 2015). Telehealth is also used to monitor home infection control of patients who have undergone surgery in terms of SSI (Monnet et al., 2019). SSI can be detected with the mobile phone application, thus providing great benefits in surgical care (Sandberg et al., 2019). Pathak et al. (2015) observed the incision area with a mobile phone after the patients were discharged, and it was concluded that observation with a mobile phone was effective in diagnosing SSIs. Such situations may be the reason for the intensification of telehealth applications in recent years.

CONCLUSION

Surgical site infection especially increases the mortality and morbidity rate of patients. In addition to the increase in morbidity and mortality, SSIs bring increased workload and cost, as they may require prolonged hospitalization, hospital readmissions, and reoperations. SSI also contributes to the increase in antibiotic resistance. As a result of the keyword analysis, it was determined that the most frequently studied subjects were SSI risk factors and prevention. In addition, it was determined that evidence-based practice and guide keywords were also studied intensively. As a result of examining the distribution of keywords by years, it has been determined that orthopedics, antibiotics, gastric surgery, evidence-based clinical applications, colorectal surgery, and telehealth have been studied more in recent years. In the future, with the increase of studies on the effects of evidence-based practices and telehealth practices on SSI, these studies can also be evaluated.

Table 1. Information of the Most Cited Studies on Surgical Site Infections

	Article Title	**Journal**	**Authors**	**Year**	**Cited**
1	Obesity and the risk and outcome of infection	International Journal of Obesity	Huttunen, R., & Syrjänen, J.	2013	339
2	Surgical site infections after foot and ankle surgery: A comparison of patients with and without diabetes	Diabetes Care	Wukich, D. K., McMillen, R. L., Lowery, N. J., & Frykberg, R. G.	2011	82
3	Bacterial diversity in surgical site infections: not just aerobic cocci any more	Journal of Wound Care	Wolcott, R. D., Gontcharova, V., Sun, Y., Zischakau, A., & Dowd, S. E.	2009	77
4	Financial impact of failing to prevent surgical site infections	Quality Management in Healthcare	Sparling, K. W., Ryckman, F. C., Schoettker, P. J., Byczkowski, T. L., Helpling, A., Mandel, K., ... & Kotagal, U. R.	2007	76
5	Developing and validating a risk score for lower-extremity amputation in patients hospitalized for a diabetic foot infection	Diabetes Care	Lipsky, B. A., Weigelt, J. A., Sun, X., Johannes, R. S., Derby, K. G., & Tabak, Y. P.	2011	75
6	Presurgical skin preparation with a novel 2% chlorhexidine gluconate cloth reduces rates of surgical site infection in orthopaedic surgical patients	Orthopaedic Nursing	Eiselt, D.	2009	72
7	Effect of surgical safety checklists on postoperative morbidity and mortality rates, Shiraz, Faghihy hospital, a 1-year study	Quality Management in Healthcare	Askarian, M., Kouchak, F., & Palenik, C. J.	2011	67
8	Evidence for Using Chlorhexidine Gluconate Preoperative Cleansing to Reduce the Risk of Surgical Site Infection	AORN Journal	Edmiston Jr, C. E., Okoli, O., Graham, M. B., Sinski, S., & Seabrook, G. R.	2010	67
9	The impact of a normoglycemic management protocol on clinical outcomes in the trauma intensive care unit	Journal of Parenteral and Enteral Nutrition	Collier, B., Diaz Jr, J., Forbes, R., Morris Jr, J., May, A., Guy, J., ... & Jensen, G.	2005	66
10	Systematic review of the impact of HbA1c on outcomes following surgery in patients with diabetes mellitus	Clinical Nutrition	Rollins, K. E., Varadhan, K. K., Dhatariya, K., & Lobo, D. N.	2016	64
11	Intensive versus intermediate glucose control in surgical intensive care unit patients	Diabetes Care	Okabayashi, T., Shima, Y., Sumiyoshi, T., Kozuki, A., Tokumaru, T., Iiyama, T., ... & Hanazaki, K.	2014	63
12	Postcesarean wound infection: Prevalence, impact, prevention, and management challenges	International Journal of Women's Health	Zuarez-Easton, S., Zafran, N., Garmi, G., & Salim, R.	2017	56
13	Effect of intensive insulin therapy using a closed-loop glycemic control system in hepatic resection patients: A prospective randomized clinical trial	Diabetes Care	Okabayashi, T., Nishimori, I., Maeda, H., Yamashita, K., Yatabe, T., & Hanazaki, K.	2009	55
14	A systematic review on the effectiveness of prewarming to prevent perioperative hypothermia	Journal of Clinical Nursing	de Brito Poveda, V., Clark, A. M., & Galvão, C. M.	2013	49
15	Hospital-Acquired Infections: Current Trends and Prevention	Critical Care Nursing Clinics	Boev, C., & Kiss, E.	2017	48
16	The burden of healthcare-associated infection in Australian hospitals: A systematic review of the literature	Infection, Disease & Health	Mitchell, B. G., Shaban, R. Z., MacBeth, D., Wood, C. J., & Russo, P. L.	2017	46
17	An unblinded randomised controlled trial of preoperative oral supplements in colorectal cancer patients	Journal of Human Nutrition and Dietetics	Burden, S. T., Hill, J., Shaffer, J. L., Campbell, M., & Todd, C.	2011	45
18	Thirty-day readmission rates as a measure of quality: Causes of readmission after orthopedic surgeries and accuracy of administrative data	Journal of Healthcare Management	McCormack, R., Michels, R., Ramos, N., Hutzler, L., Slover, J. D., & Bosco, J. A.	2013	44
19	Reducing surgical site infections at a pediatric academic medical center	The Joint Commission Journal on Quality and Patient Safety	Ryckman, F. C., Schoettker, P. J., Hays, K. R., Connelly, B. L., Blacklidge, R. L., Bedinghaus, C. A., ... & Kotagal, U. R.	2009	44
20	Preoperative hair removal: a systematic review	Journal of Perioperative Practice	Tanner, J., Moncaster, K., & Woodings, D.	2007	39

Conflict of Interest
Authors declare that there is no conflict of interest.

Author Contributions
Plan, design: HTD, FÖA; **Material, methods and data collection:** HTD; **Data analysis and comments:** HTD; **Writing and corrections:** HTD, FÖA

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REFERENCES

Abbas, M., de Kraker, M. E., Aghayev, E., Astagneau, P., Aupee, M., Behnke, M., Harbarth, S. (2019). Impact of participation in a surgical site infection surveillance network: results from a large international cohort study. Journal of hospital infection 102(3), 267-276.

Aghdassi, S. J. S., Schröder, C., Gastmeier, P. (2019). Gender-related risk factors for surgical site infections. Results from 10 years of surveillance in Germany. Antimicrobial Resistance & Infection Control 8(1), 1-8.

Anthony, T., Murray, B. W., Sum-Ping, J. T., Lenkovsky, F., Vornik, V. D., Parker, B. J., McFarlin, J. E., Hartless, K., Huerta, S. (2011). Evaluating an evidence-based bundle for preventing surgical site infection: a randomized trial. Archives of Surgery 146(3), 263-269.

Bashaw, M. A., Keister, K. J. (2019). Perioperative strategies for surgical site infection prevention. Aorn journal 109(1), 68-78.

Bilik, O., Damar, H. T., Ozdagoglu, G., Ozdagoglu, A., Damar, M. (2020). Identifying trends, patterns, and collaborations in nursing career research: A bibliometric snapshot (1980–2017). Collegian 27(1), 40-48.

Borchardt, R. A., Tzizik, D. (2018). Update on surgical site infections: the new CDC guidelines. Journal of the American Academy of Pas 31(4), 52-54.

Broex, E. C. J., Van Asselt, A. D. I., Bruggeman, C. A., Van Tiel, F. H. (2009). Surgical site infections: how high are the costs?. Journal of Hospital Infection, 72(3), 193-201.

Carvalho, R. L. R. D., Campos, C. C., Franco, L. M. D. C., Rocha, A. D. M., Ercole, F. F. (2017). Incidence and risk factors for surgical site infection in general surgeries. Revista latino-americana de enfermagem 25, 1-8.

Chai, K. H., Xiao, X. (2012). Understanding design research: A bibliometric analysis of Design Studies (1996–2010). Design Studies 33(1), 24-43.

Damar, H. T., Bilik, O., Ozdagoglu, G., Ozdagoglu, A., Damar, M. (2018). Scientometric overview of nursing research on pain management. Revista latino-americana de enfermagem 26, 1-8.

Dong, J., Wei, W., Wang, C., Fu, Y., Li, Y., Li, J., Peng, X. (2020). Research trends and hotspots in caregiver studies: A bibliometric and scientometric analysis of nursing journals. Journal of advanced nursing 76(11), 2955-2970.

Gaviria-Marin, M., Merigó, J. M., Baier-Fuentes, H. (2019). Knowledge management: A global examination based on bibliometric analysis. Technological Forecasting and Social Change 140, 194-220.

Kokol, P., Vošner, H. B. (2019). Historical, descriptive and exploratory analysis of application of bibliometrics in nursing research. Nursing Outlook 67(6), 680-695.

Krieger, Y., Walfisch, A., Sheiner, E. (2017). Surgical site infection following cesarean deliveries: trends and risk factors. The Journal of Maternal-Fetal & Neonatal Medicine 30(1), 8-12.

Labi, A. K., Obeng-Nkrumah, N., Owusu, E., Bjerrum, S., Bediako-Bowan, A., Sunkwa-Mills, G., Newman, M. J. (2019). Multi-centre point-prevalence survey of hospital-acquired infections in Ghana. Journal of Hospital Infection 101(1), 60-68.

Langer, D. (2015). Rehabilitation in patients before and after lung transplantation. Thematic Review Series 89(5), 353-62.

Leaper, D., Rochon, M., Pinkney, T., Edmiston, C. E. (2019). Guidelines for the prevention of surgical site infection: an update from NICE. Infection Prevention in Practice, 1(3-4).

Leblebicioglu, H., Erben, N., Rosenthal, V. D., Sener, A., Uzun, C., Senol, G., Willke, A., Özgültekin, A., Altin, N., Bakir, M., Oncul, O., Ersöz, G., Ozdemir, D., Yalcin, A., N., Özdemir, H., Yıldızdaş, D., Kksal, I., Aygun, C., Sirmatel, F., Sener, A., Tuna, N., Akan, Ö. A., Turgut, H., Demiröz, A. P., Kendirli, T., Alp, E., Uzun, C., Ulusoy, S., Arman, D. (2015). Surgical site infection rates in 16 cities in Turkey: findings

of the International Nosocomial Infection Control Consortium (INICC). American journal of infection control, 43(1), 48-52.

Magill, S. S., Hellinger, W., Cohen, J., Kay, R., Bailey, C., Boland, B., Carey, D., Guzman, J., Dominguez, K., Edwards, J., Goraczewski, L., Horan, T., Miller M., Phelps, M., Saltford, R., Seibert, J., Smith, B., Starling, P., Viergutz, B., Walsh, K., Rathore, M., Guzman, N., Fridkin, S. (2012). Prevalence of Healthcare-Associated Infections in Acute Care Hospitals in Jacksonville, Florida. Infection Control & Hospital Epidemiology 33(3), 283–291.

Martin, E. K., Beckmann, M. M., Barnsbee, L. N., Halton, K. A., Merollini, K. M. D., Graves, N. (2018). Best practice perioperative strategies and surgical techniques for preventing caesarean section surgical site infections: a systematic review of reviews and meta-analyses. BJOG: An International Journal of Obstetrics & Gynaecology 125(8), 956-964.

Meijs, A. P., Koek, M. B., Vos, M. C., Geerlings, S. E., Vogely, H. C., de Greeff, S. C. (2019). The effect of body mass index on the risk of surgical site infection. Infection Control & Hospital Epidemiology 40(9), 991-996.

Merigó, J. M., Yang, J. B. (2017). A bibliometric analysis of operations research and management science. Omega, 73, 37-48.

Mousa, A. Y., Broce, M., Monnett, S., Davis, E., McKee, B., Lucas, B. D. (2019). Results of telehealth electronic monitoring for post discharge complications and surgical site infections following arterial revascularization with groin incision. Annals of Vascular Surgery 57, 160-169.

Pathak, A., Sharma, S., Mahadik, V.K. (2015). Feasibility of a mobile phone-based surveillance for surgical site infections in rural India. Telemedicine Journal and e-Health 21(11), 946-949.

Peng, X. Q., Sun, C. G., Fei, Z. G., Zhou, Q. J. (2019). Risk factors for surgical site infection after spinal surgery: a systematic review and meta-analysis based on twenty-seven studies. World Neurosurgery, 123, e318-e329.

Rey-Martí, A., Ribeiro-Soriano, D., Palacios-Marqués, D. (2016). A bibliometric analysis of social entrepreneurship. Journal of Business Research 69(5), 1651-1655.

Sandberg, C.E.J., Knight, S.R., Qureshi, A.U., Pathak, S. (2019). Using telemedicine to diagnose surgical site infections in low- and middle-income countries: Systematic review. JMIR Mhealth Uhealth 7(8), e13309.

Tanner, J., Padley, W., Assadian, O., Leaper, D., Kiernan, M., Edmiston, C. (2015). Do surgical care bundles reduce the risk of surgical site infections in patients undergoing colorectal surgery? A systematic review and cohort meta-analysis of 8,515 patients. Surgery 158(1), 66-77.

Thelwall, M. (2008). Bibliometrics to webometrics. Journal of Information Science 34(4), 605-621.

Wick, E. C., Hobson, D. B., Bennett, J. L., Demski, R., Maragakis, L., Gearhart, S. L., Makary, M. A. (2012). Implementation of a surgical comprehensive unit-based safety program to reduce surgical site infections. Journal of the American College of Surgeons 215(2), 193-200.

Worlicek, M., Koch, M., Daniel, P., Freigang, V., Angele, P., Alt, V., Kerschaum, M., Rupp, M. (2021). A retrospective analysis of trends in primary knee arthroplasty in Germany from 2008 to 2018. Scientific Reports, 11(1), 1-6.

Young, H., Knepper, B., Moore, E. E., Johnson, J. L., Mehler, P., Price, C. S. (2012). Surgical site infection after colon surgery: National Healthcare Safety Network risk factors and modeled rates compared with published risk factors and rates. Journal of the American College of Surgeons 214(5), 852-859.

Zupic, I., Čater, T. (2014). Bibliometric methods in management and organization. Organizational Research Methods 18(3), 429–472.

Zwicky, S. N., Gloor, S., Tschan, F., Candinas, D., Demartines, N., Weber, M., Beldi, G. (2022). Impact of gender on surgical site infections in abdominal surgery: A multi-center study. British Journal of Surgery, 109.