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Effectiveness of Continuing Post-Surgery Antibiotic Prophylaxis in Reducing Nosocomial Infections – A Literature Review

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Rezumat

Eficacitatea continuării profilaxiei antibiotice postoperatorii în reducerea infecțiilor nosocomiale - o revizuire a literaturii de specialitate

Context: Pentru a preveni infecția chirurgicală, profilaxia cu antibiotice este frecvent prelungită pentru o zi sau mai multe după intervențiile operatorii. Profilaxia antibiotică postoperatorie poate să nu fie avantajoasă în comparație cu oprirea imediată a acesteia, deoarece expune pacienții la riscurile asociate cu tratamentul antibiotic. Deşi este recomandată în mod obişnuit, profilaxia post-procedurală, uneori, nu este necesară. Pentru a optimiza eficacitatea profilaxiei cu antibiotice în prevenirea infecțiilor nosocomiale post-operatorii, furnizorii de asistență medicală ar trebui să adere la liniile directoare bazate pe dovezi, cum ar fi cele furnizate de Organizația Mondială a Sănătății (OMS) sau de Societatea Americană a Farmaciştilor din Sistemul Sanitar (ASHP). Aceste ghiduri oferă recomandări cu privire la selecția adecvată, momentul şi durata profilaxiei cu antibiotice pentru diferite proceduri chirurgicale. În această revizuire a literaturii de specialitate am căutat dacă datele disponibile în literatură care susțin aceste recomandări.
Metode: Am căutat în baza de date PubMed articole scrise între 1 ianuarie 2012 şi 31 decembrie 2022. Am analizat studiile control randomizate ale pacienților internați în secții de chirurgie, cărora

li s-a administrat profilaxie antibiotică postoperatorie, comparându-i cu cei care nu au primit-o.
Rezultate: Dintr-un total de 566 de studii de control randomizate, 15 au fost incluse în această revizuire a literaturii, însumând 11.728 de pacienți. Am găsit indicii că, în multe cazuri, există o diferență semnificativă a evoluției post-operatorii la pacienții carora s-a continuat profilaxia cu antibiotice. Cu toate acestea, în unele cazuri, acest lucru va duce la o incidență similară a infecțiilor nosocomiale postoperatorii între grupul de intervenție şi cel de control.
Concluzie: În timp ce profilaxia cu antibiotice este o strategie importantă pentru prevenirea infecțiilor chirurgicale, decizia de a extinde profilaxia cu antibiotice dincolo de perioada intraoperatorie ar trebui luată de la caz la caz şi în concordanță cu ghidurile existente.

Cuvinte cheie: profilaxie cu antibiotice, infecții nosocomiale, chirurgie, agenți patogeni, infecții

Abstract
Background: To prevent surgical site infection (SSI), antibiotic prophylaxis is frequently extended for one day or more following surgery. Post-operative, continuing antibiotic prophylaxis may not be advantageous compared to stopping it right away, as it exposes patients to the hazards of taking antibiotics. Although it is routinely recommended, post-procedural prophylaxis is sometimes not necessary. To optimize the effectiveness of antibiotic prophylaxis (AP) in preventing SSIs, healthcare providers should adhere to evidence-based guidelines, such as those provided by the World Health Organization (WHO) or the American Society of Health-System Pharmacists (ASHP). These guidelines provide recommendations on the appropriate selection, timing, and duration of antibiotic prophylaxis for various surgical procedures. In this literature review we looked if the data available support these recommendations.
Methods: We searched PubMed database for articles written between 1st of January 2012 up to 31st of December 2022. We looked at randomized control trials (RCTs) of patients hospitalized in surgical departments, who were given postoperative antibiotic prophylaxis comparing them with those that did not receive it.
Results: Out of a total of 566 randomized control trials, 15 were included in this literature review, totalling 11,728 patients. We found indications that in many cases it makes a significant difference in continuing antibiotic prophylaxis postoperatively. However, in some cases, this will result in a similar incidence of post-surgery nosocomial infections between the intervention and control groups.
Conclusion: While antibiotic prophylaxis is an important strategy to prevent surgical site infections, the decision to extend antibiotic prophylaxis beyond the intraoperative period should be made on a case-by-case basis and led by guidelines.

Key words: antibiotic prophylaxis, nosocomial infections, surgery, pathogens, infections

Background

Surgical site infections are infections that occur at the site of a surgical incision and can lead to significant morbidity, prolonged hospital stays, increased healthcare costs, and even mortality. Antibiotic prophylaxis is an essential component of SSI prevention, as it involves administering antibiotics to patients before surgery to reduce the risk of infection. The primary goal of antibiotic prophylaxis is to reduce the bacterial load, thereby minimizing the risk of contamination (1). During surgery, the patient's skin, mucous membranes, or other tissues may be colonized by bacteria, thus antibiotic treatment may be helpful in preventing this by targeting the most common pathogens associated with SSIs for the specific type of surgery being performed (2).

The timing of antibiotic administration is crucial for the effectiveness of prophylaxis. According to the WHO guidelines of 2016, antibiotics should be administered within 60 minutes before the surgical incision is made, ensuring adequate tissue and serum concentrations during the procedure (3). The guidelines recommend that AP should be given at the appropriate time before surgery to ensure adequate tissue concentrations during the operation. The 60-minute time frame is based on studies showing that administering antibiotics too early or too late can be less effective in preventing SSIs. Administering such treatment too early may result in sub-therapeutic levels of antibiotics at the time of surgery, while administering antibiotics too late may result in inadequate tissue levels (4).

The same guidelines also recommend that the appropriate antibiotic should be chosen based on the type of surgery, expected pathogens, and local resistance patterns. The duration of this treatment prevention should be limited to the time needed for the procedure and should not be continued beyond 24 hours after surgery unless there are specific indications for prolonged prophylaxis (3). Following the prevention guidelines issued by Centers for Disease Control and Prevention (CDC), it is important to ensure the effectiveness of the intervention and to reduce the risk of adverse effects, such as the development of antibiotic resistance (5).

In the case of certain antibiotics with a shorter half-life, such as Cefazolin, administration within 30 minutes before the incision is recommended. For prolonged surgeries or significant blood loss, additional doses may be required to maintain adequate antibiotic levels (6).

The choice of antibiotic for prophylaxis depends on the type of surgery, the most common pathogens associated with SSIs for that surgery, and local antimicrobial resistance patterns. In general, narrow-spectrum antibiotics are preferred to minimize the risk of promoting antibiotic resistance. As mentioned above, Cefazolin is commonly used for prophylaxis in clean-contaminated surgeries, while broader-spectrum antibiotics, such as Cefoxitin or Cefotetan, may be used for gastrointestinal or gynaecological surgeries (7).

Prolonged use of antibiotics for prophylaxis is generally not recommended, as it can increase the risk of antibiotic resistance and adverse effects. In most cases, a single dose of antibiotics is sufficient for prophylaxis. However, for certain high-risk surgeries or patients with specific risk factors, a short course of postoperative antibiotics may be considered.

In some cases, extending AP may be beneficial, particularly for high-risk patients or those undergoing complex surgical procedures. However, in other cases, extending it may not provide additional benefit and may increase the risk of adverse effects, such as antibiotic resistance and infection with Clostridium difficile (8). The decision to extend antibiotic prophylaxis should be based on various factors, including the type of surgery being performed, the patient's overall health status, and the risk of infection.

Methods

For this review, we used as a tool the Patient, Intervention, Comparison, Outcome (PICO) framework, as presented by Schard et al (9). The best available research data and clinical experience must be included in the decision process to apply evidence-based medicine. Asking targeted questions, looking for the best available evidence, evaluating that evidence for validity, and applying the findings to the patient's treatment are all phases in the EBM process, which is patient centred (10).

PICO is a structure that is commonly used in practice to formulate a clinical research question. The framework helped us in breaking down the research question of this analysis into its component parts, making it easier to identify and search for relevant studies (11).

Below, it can be seen what each component of the PICO framework refers to:

- Population: children and adults at risk of post-surgical hospital acquired infection;
- Intervention: antibiotic prophylaxis prescribed;
- Comparison: intervention group receiving AP with control group with no AP;
- Outcomes: to see if AP reduced surgical site infection.

By breaking down a research question or clinical scenario into its component parts using the PICO framework, clinicians and researchers can easily identify relevant studies and synthesize the evidence to make informed decisions about patient care or treatment (12).

Search and Selection Criteria

For this literature review we searched the PubMed database for articles published between 1st of January 2012 and 31st of December 2022.

To report the results, we used the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) model, as seen in *Fig. 1.* It is a set of guidelines and checklist

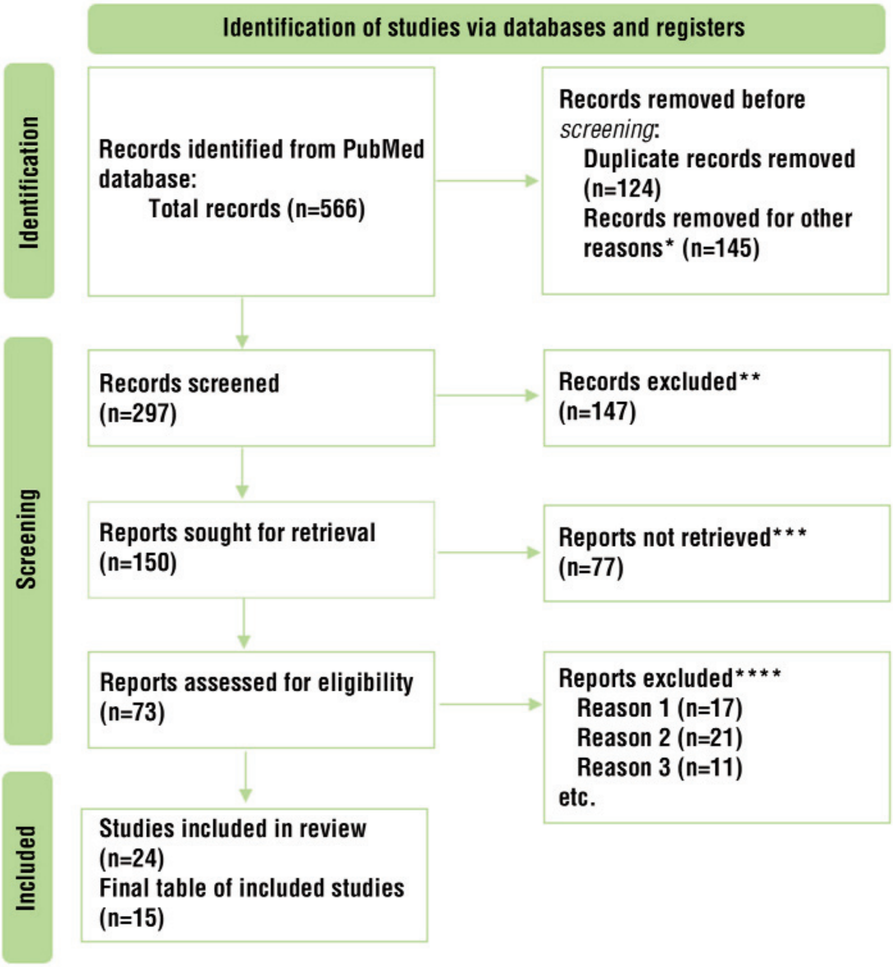

Figure 1. PRISMA framework
*studies are not relevant for the present review; **studies do not help us to provide an answer to the research question; ***unable to find the full text of the study; **** Reason 1 - wrong setting
Reason 2 - wrong patient population
Reason 3 - research question not relevant

designed to improve the quality and transparency of reporting systematic reviews and meta-analyses in healthcare research (13). We included a flow diagram that outlines the process of selecting studies for inclusion in this review and the reasons for excluding studies.

We searched for combinations of the key words: “surgical site infections”, “antibiotic prophylaxis” and “nosocomial infections post surgery”. Only studies that were available to download and published in English language were selected. In cases where the title and abstract suggested a probable eligibility, we reviewed the content and extracted the information needed.

Additionally, we conducted a manual search of all relevant articles, reviews, and other materials. Since this study is a review of the literature, no ethical approval is required.

Inclusion and Exclusion Criteria

Only articles who met the following inclusion criteria were chosen: randomized clinical trials (RCT), free complete texts in the English language, the population group to include children and adults of all ages, and finally, the search criteria included as timeframe only studies published between 1st of January 2012 up to 31st of December 2022.

Articles for which we could not easily find the whole text were not considered.

The exclusion criteria involved looking for peer-reviewed articles with a sample size of at least 20 patients.

The search of the PubMed database generated a total of 566 citations. One hundred and twenty-four articles remained on the list after duplicates were eliminated. Out of these, 145 papers were ignored since it was clear from their abstracts that they did not meet the criteria. Another 147 publications were further eliminated from consideration because they failed to address the main topic of the research or were disqualified because we were unable to obtain the full text of the study. We now had 150 search results that were relevant to our investigation. After thorough review, 126 papers either had an incorrect patient group, or a study topic that was unrelated to our research. The final literature review contained 24 papers that satisfied the inclusion requirements. By looking up the references, sample size and the research included in these papers, we were able to select 15 studies and analyse them in *Table 1* which is displayed in the Results section.

Results

The results are displayed below:

“*surgical site infections*” – 366 citations

Filters applied: Free full text, Randomized Controlled Trial, English, Child: birth-18 years, Adult: 19+ years, 1st January 2012 - 31st December 2022:

“*antibiotic prophylaxis*” – 188 results

Filters applied: Free full text, Randomized Controlled Trial, English, Child: birth-18 years, Adult: 19+ years, 1st January 2012 - 31st December 2022:

“*nosocomial infections post surgery*” – 12 results

Filters applied: Free full text, Randomized Controlled Trial, English, Child: birth-18 years, Adult: 19+ years, 1st January 2012 - 31st December 2022.

To select the final 15 studies, the criteria for exclusion/inclusion were used by reviewing titles and then reviewing the abstracts. Moreover, we removed publications related to general medicine, diseases, medical diagnosis, medical devices, related to maternal or child health, mental health, dental health, and oncology. We also came across studies that were not published in peer-reviewed journals, instead they were part of various congresses or symposia papers. We decided that these papers would not bring value to our work, thus we decided not to include them in our final analysis.

Whether the incidence, severity, and mortality rate of patients developing SSIs infections is related to nosocomial post-surgery infections, is a question we tried to answer using the *Table 1.* We collected data

Table 1. Results summary of the included studies

Year	Authors	Study type	Surgical procedure	No. of patients	Results	Is post-surgery antibiotic prophylaxis recommended?
2019	Knight et al. (14)	RCT	Operative vaginal birth	3420	180 patients in the group receiving treatment with Amoxicillin and Clavulanic acid were considerably less likely to have an infection than 306 of those who received a placebo.	YES
2022	Nagata et al. (15)	RCT	Clean orthopaedic surgery	1211	The hazard ratio for SSI within 30 days after surgery in group that received AP was 0.73% compared with 1.37% from the patients in the placebo group	YES
2013	Gil-Ascencio et al. (16)	RCT	Tonsillectomy	102	In lowering morbidity in paediatric patients having tonsillectomy, the use of a one dose of Cephalothin is equally effective as the use of oral Amoxicillin and Clavulanate for 7 days. Therefore, it is best to refrain from using oral antibiotics on a regular basis.	NO
2022	Ghert et al. (17)	RCT	Endo-prosthetic reconstruction for lower extremity bone tumors	604	SSIs were developed in 15% of the patients receiving AP for 5 days and in 16.7% of those that received the treatment for one day only. Thus, a higher incidence is seen in the short prophylaxis group.	YES
2017	Valent et al. (18)	RCT	Caesarean birth delivery	403	Thirteen women, which account for around 6.5% in the Cephalexin and Metronidazole group, and more than double (15.4%) in the control group had post-caesarean contaminations, respectively.	YES
2013	Ishibashi et al. (19)	RCT	Rectal cancer surgery	279	There was no appreciable difference in the SSIs incidence between patients having elective rectal surgery who received a single dose of postoperative antibiotics and those who received several doses of antibiotics. The prevalence of SSIs was 13.7% in group 1 (single dose) and 13.6% in group 2 (multiple doses).	NO
2021	Ehdaie et al. (20)	RCT	Radical prostatectomy	824	Ciprofloxacin was given to the first group (1 day treatment) vs the second group (3 days treatment). Among the first group of patients there were no urinary tract infections, while in the second group, there were 3 urinary tract infections, accounting for 0.7%.	NO
2014	Gelijns et al. (21)	RCT	Cardiac surgery	2596	In the perioperative prophylaxis group utilizing 2nd generation cephalosporins, a wide range of Gram+ and Gram- bacterial infections were associated with a lower risk without substantially changing the risk of C. difficile colitis. Longer-term antibiotic prophylaxis (24 to 48 hours) was equivalent, but prophylaxis lasting more than 48 hours doubled the risk of serious illness. The incidence of C. difficile colitis was shown to be six times greater when long-term prevention was used.	YES
2022	Tara et al. (22)	RCT	Caesarean birth delivery	420	The use of Cephalexin and Metronidazole for the first 48 hours following the C-section birth delivery in overweight and obese patients reduced the overall risk of SSIs and the signs of any infection in the 14 days follow-up, along with the usual prophylaxis given before the surgery.	YES
2014	Matsui et al. (23)	RCT	Laparoscopic cholecystectomy	1006	SSIs were all considerably lower in the antibiotic prophylaxis group than they were in the control group (0.8% vs. 3.7%, 0.4% vs. 3.1, and 1.2% vs. 6.7%, respectively). The placebo group was significantly longer (mean 4.07 days vs. 3.69 days in the antibiotic prophylaxis group).	YES
2020	Mohammed et al. (24)	RCT	Caesarean birth delivery	160	When two consecutive doses of Amoxicillin and Clavulanic acid were compared with a seven-day course of treatment after C-section birth, there were insignificant differences in infectious morbidity or length of hospital stay.	NO
2018	Sittitrai et al. (25)	RCT	Open tracheostomy	30	6.7% patients from the intervention group and 23.3% from the control group developed SSIs. The mean hospital stay following tracheostomy was 4 says vs 17 days for those not receiving treatment, respectively. This shows a longer length of hospital stay and a higher change for SSIs in the control group.	YES
2020	Garcia et al. (26)	RCT	Mammaplasty	124	Patients scheduled for mammaplasty received at the beginning of the anaesthetic a dose, and then another 4 doses of IV Cephalothin over 24 hours post-surgery. Total SSIs were less than 1% (0.81%). Thus, the duration of antibiotics during the reduction mammaplasty postoperative period had no effect on the prevalence of surgical-site infections.	NO
2015	Zhang et al. (27)	RCT	Resection of colorectal lesions	428	Patients in the intervention group received 1.5 g of Cefuroxime 30 minutes before and 6h after surgery, respectively. Compared to the control group with a rate of almost 15% SSIs, the intervention group had only a 2.8% rate of infections.	YES
2017	Dhooria et al. (28)	RCT	Thoracoscopy	121	Patients included in the treatment group received a dose of 2f of Cefazolin and subsequently 2% of the developed SSIs. Patients from the control group, had a higher rate of infections, reaching 6%.	YES

from the final 15 studies included in this review, and we present in *Table 1*.

The results of this literature review are in line with numerous previous meta-analyses that found that antibiotic prophylaxis has a positive impact on SSI prevention in selected surgeries when compared to a placebo (10 of the 15 studies showed a positive association between the AP and the outcome of the medical procedure). Five of these studies were unable to link antibiotic usage to change outcomes in both the intervention and control groups.

Based on the results of the present investigation, we advise the prudent use of AP during surgical operations. Particularly at surgical sites with a reduced incidence of SSI, the advantages of SSI prevention must be weighed against the possible AEs brought on by antibiotic allergic responses, drug interactions, the development of antibiotic resistance, and cost.

Discussions

Risk Factors Associated with Post-Surgery Nosocomial Infections

At least 5% of patients who have surgery will acquire a surgical site infection (SSI), which accounts for roughly 20% of all healthcare-associated infections (HAIs) (29). Individuals having inpatient surgeries have a 2-5% chance of developing SSIs, however this percentage is probably overestimated since 50% of SSIs develop only after the patient has been discharged from the hospital (30).

There are a series of hazards that are associated with nosocomial post-surgery infections. Some of them include length of hospital stay (31). The longer a patient stays in the hospital, the higher their risk of complications. Patients who have medical devices such as catheters, ventilators, and feeding tubes are at a higher risk of developing nosocomial infections, together with patients who have weakened immune systems due to pre-existing conditions or medications (32).

When it comes to surgical site contamination, if the surgical site is infected during the procedure, there is a higher risk of illness. Healthcare workers who do not properly wash their hands before and after interacting with patients can spread infection. Overcrowding in hospitals can also lead to the spread of infection among patients (33).

It is important to follow recommendations for antibiotic prophylaxis and to monitor patients closely for signs of infection or adverse effects. Prescriptions for AP account for a sixth of the total prescriptions written during hospitalisation (34). A growing body of research indicates that a single preoperative dose of antibiotic, with repeated administration intraoperatively when indicated, might be as effective as a lengthy postoperative medication therapy, even though the effectiveness of appropriate surgical antibiotic prophylaxis to prevent surgical site infections in indicated procedures is well established (35-40). Acute kidney damage, Clostridium difficile infection, and antimicrobial resistance have all been linked to prolonged antibiotic use (41). Numerous randomized controlled trials and few systematic reviews have examined the advantages of extending antibiotic prophylaxis after surgery across surgical subspecialties (42-44). The effect of continuing antibiotic prophylaxis on the risk of surgical site infection was the subject of a systematic review and meta-analysis conducted by WHO in 2015. Based on the findings, WHO advised against continuing antibiotic prophylaxis after surgery (3).

The antiseptic skin preparation is a vital component of SSI risk-reduction techniques. A chlorhexidine alcohol-based solution is the primary option, unless it is contraindicated, or the surgical site is close to a mucous membrane (45). Chlorhexidine aqueous solution is an option in the latter scenario. Povidone-iodine solution based on alcohol should be used instead of chlorhexidine if it is contraindicated (46). If neither an alcohol-based solution nor chlorhexidine can be utilized, the option is to use an aqueous solution of povidone-iodine. An alcohol-based solution of chlorhexidine was linked to a decreased incidence of surgical site infections than the aqueous solution of povidone-iodine (47).

Antibiotic prophylaxis is a key component in the treatment of SSIs, whereas prevention is a basic approach. For patients undergoing clean surgery for the implantation of a prosthesis or implant, clean-contaminated surgery, or contaminated surgery, antibiotic prophylaxis is advised. It is not advised to routinely provide antibiotics as a preventative measure after clean, non-complicated surgery (48).

Microorganisms Responsible for Surgical Site Infections

Surgical site infections can be caused by a variety of microorganisms, including bacteria, fungi, and viruses. The most common microorganisms responsible for SSIs are bacteria (49). The following are some of the most common bacteria associated with SSIs:

- o Staphylococcus aureus - found on the skin and mucous membranes, being particularly associated with infections after orthopaedic surgery (50).
- o Coagulase-negative staphylococci - they are part of the normal skin flora but can cause SSIs when introduced into deeper tissues during surgery (51).
- o Escherichia coli - is commonly found in the gastrointestinal tract and can cause SSIs after abdominal surgery (52).
- o Pseudomonas aeruginosa - is usually found in soil and water and can cause SSIs after contaminated surgical procedures (53).
- o Enterococcus faecalis - is found in the gastrointestinal tract and can cause SSIs after colorectal surgery (54).
- o Klebsiella pneumoniae - in the respiratory and gastrointestinal tracts causing SSIs after contaminated surgical procedures (55).

Fungal infections can also cause SSIs, particularly in patients with underlying immunosuppression or those undergoing surgery involving implanted prostheses. Candida albicans is the most common fungal species associated with SSIs (56).

The risk of SSIs can be reduced by prevention, such as proper surgical technique, appropriate use of antibiotic prophylaxis, and maintaining a sterile surgical environment (40).

Antibiotic prophylaxis is still often extended for a few days following surgery, according to studies conducted in 2018 that included many European countries (57-59). Most recommendations made prior to the WHO guidelines on preventing surgical site infections proposed extending postoperative antibiotic prophylaxis for no more than 24 to 48 hours (60). However, these recommendations were not supported by a thorough appraisal of the available research via systematic review (61). Thus, some of the data from the initial WHO evaluation may no longer be indicative of the most recent best practices for surgical antibiotic prophylaxis (10, 11,13,14,18,19,21,24).

The decision to continue AP after surgery should be based on individual patient factors, such as their risk of infection, the type of surgery performed, and the potential risks and benefits of continued antibiotic use. It is important to use and to monitor patients closely for signs of infection or adverse effects (4).

According to our research, in some surgical subspecialties, specifically maxillofacial surgery and cardiac surgery, we found some evidence that postoperative continuation of antibiotic prophylaxis may reduce the risk of surgical site infection compared with its immediate discontinuation. However, this conclusion is based on limited research on nosocomial infections related to maxillofacial surgery (62-64).

Other articles included in PubMed database evaluating the lengths of postoperative antibiotic prophylaxis did not provide clear signs that surgical site infections were avoided by prolonged postoperative antibiotic prophylaxis (see *Table 1*) (12,15,16,20,22).

Impact of SSIs on Healthcare Cost

Surgical site infections can have a significant impact on healthcare costs. In addition to the potential harm to the patient, SSIs can prolong hospital stays, increase the need for additional treatments, and increase the overall cost of care. According to some studies published after 2005 and conducted in France, Germany, the Netherlands, Italy, Spain, and the UK, a large percentage of SSIs constitute the outcome of different surgical specializations in these European nations. In patients who acquire an infection compared to individuals who are not infected, the cost burden of surgery is always greater, according to analysis of the 26 qualifying studies (65). One of these studies under consideration had an incidence of SSI as high as 36%, proving that infections are a recurring consequence of surgery (66).

Patients who develop SSIs may require additional time off work or may not be able to return to work at all. The results of these are lost productivity and income, as well as potential disability or workers' compensation claims. The impact of SSIs on healthcare costs can be significant. It is important for healthcare providers to take appropriate measures to prevent SSIs, such as proper infection control measures and appropriate use of antibiotics, to minimize the risk of harm to the patient and reduce healthcare costs (67).

International Guidelines about Antibiotic Prophylaxis

The National Institute for Health and Care Excellence (NICE) in the UK provides guidance on the use of antibiotic prophylaxis in various surgical procedures. NICE guidelines aim to optimize the use of antibiotics to prevent surgical site infections while minimizing the risk of antibiotic resistance (68).

NICE recommends that antibiotic prophylaxis should only be administered within one hour before surgery, except for Vancomycin or Fluoroquinolones (such as Ciprofloxacin), which should be given within two hours before surgery (68).

The choice of antibiotics for prophylaxis should consider the likely pathogens involved and their sensitivity patterns. Commonly used antibiotics for surgical prophylaxis include Cefazolin, Cefuroxime, or Co-amoxiclav, among others (34). The specific choice of antibiotics should be based on local antimicrobial resistance patterns and individual patient factors.

As mentioned above, in the US the Centers for Disease Control also recommends that the duration of antibiotic prophylaxis to be limited to a single dose or a short course, usually within 24 hours of the surgery (5). Moreover, according to the American Society of Health-System Pharmaceuticals, the duration of antibiotic prophylaxis is typically limited to a single dose or a short course, usually within 24 hours of the surgery (69). Prolonged prophylaxis is generally not recommended, except in specific cases where the risk of infection is particularly high.

The Australian guidelines for antibiotic prophylaxis in post-surgical care are generally in line with international recommendations. Australian Antibiotic Prescribing Guide provides recommendations for antibiotic prophylaxis in different surgical procedures. These guidelines aim to optimize the use of antibiotics to prevent surgical site infections while minimizing the risk of antibiotic resistance (70).

The decision to use AP depends on various factors, including the type of surgery, the risk of surgical site infection, and the patient's individual risk factors. It is typically considered for surgeries associated with a higher risk of infection, such as clean-contaminated or contaminated procedures (21).

The European Society of Clinical Microbiology and Infectious Diseases (ESCMID) also provides guidelines on the use of antibiotic prophylaxis in different surgical procedures. These guidelines aim to optimize the use of antibiotics to prevent surgical site infections while minimizing the risk of antibiotic resistance (44).

COVID-19 Pandemic and SSIs

The COVID-19 pandemic had several impacts on healthcare systems worldwide, including its effects on post-surgery nosocomial infections. In response to this, many healthcare systems postponed or cancelled elective surgeries to conserve resources, reduce the risk of virus transmission within healthcare facilities, and ensure that surgical patients received appropriate care (71).

Delaying elective surgeries may have reduced the overall incidence of SSIs during the pandemic period. With elective surgeries postponed, the surgical patient population that did undergo procedures during the pandemic often consisted of patients with more urgent medical needs. These patients might have had a higher risk of infection due to the underlying conditions that necessitated surgery (72).

Healthcare facilities implemented changes in surgical protocols and infection control measures to minimize the risk of COVID-19 transmission within surgical units. These measures included preoperative testing, enhanced personal protective equipment (PPE) usage, and stricter hand hygiene. While these changes aimed to prevent COVID-19 transmission, they may have inadvertently helped reduce the risk of SSIs as well (73).

Reduced in-person clinic visits and restrictions on patient mobility might have affected the timely detection and management of SSIs (74).

Limitations

There are several limitations of this literature review that should be considered when interpreting the results. To start with, it is possible that our search strategy did not capture all relevant studies, or the inclusion and exclusion criteria limit the generalizability of the findings.

The literature review may be affected by publication bias, where studies that report statistically significant or positive results are more likely to be published, leading to an overestimation of the true effect size. Also, the quality of the studies included in the review can vary, which can affect the reliability and validity of our results.

Another limitation of this study is the potential impact of decreased in-person clinic visits and limitations on patient mobility on the prompt identification and treatment of surgical site infections. Moreover, a literature review is a snapshot of the current state of the field, and our research may not reflect new data or changes in practice that occur after 31st of December 2022.

Conclusions

We found some proof that continuing antibiotic prophylaxis after surgery would reduce the likelihood of surgical site infections, but at the same time, other research suggests the adverse outcome is greater than the benefits of receiving antibiotics post-surgery, because of the developing of antibiotic resistance. Future studies should include better monitoring of possible complications and standardize pre-operative and intraoperative antibiotic administration to determine if there is any benefit in continuing antibiotic prophylaxis after surgery.

In conclusion, antibiotic prophylaxis after surgery is a well-established practice for preventing surgical site infections. Data available has shown that the use of prophylactic antibiotics can reduce in some cases the risk of SSIs, leading to shorter hospital stays, decreased healthcare costs, and improved patient outcomes.

It is worth stating that the overuse or misuse of antibiotics can contribute to the development of antibiotic resistance. Therefore, antibiotics should only be used when necessary and appropriate, and efforts should be made to promote responsible antibiotic use and stewardship.

In summary, antibiotic prophylaxis after surgery is a crucial component of SSI prevention and should be used appropriately, in accordance with guidelines, to ensure optimal patient outcomes and reduce the risk of adverse effects.

Conflicts of Interests

The authors declared no potential conflicts of interest.

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