

Evaluation of Postoperative Infections in Patients Undergoing Abdominal Surgery: A Systematic Review

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ARTICLE INFO	ABSTRACT
<p>Article type: Review Article</p> <hr/> <p>Article history: Received: 21-July-2015 Accepted: 11-Aug-2015</p> <hr/> <p>Keywords: Abdominal surgery Elective surgery Post-surgical infections</p>	<p>Introduction: Postoperative infectious complications impose substantial costs on patients, increase the length of hospitalization and adversely affect patient outcomes. Several predisposing factors have been suggested for the development of infections after elective surgeries. This study aimed to evaluate the rate of infectious complications following elective abdominal surgery.</p> <p>Materials and Methods: This systematic review was performed via searching in databases such as Cochrane Library and MEDLINE until December 2014, and articles with available abstracts were included in the study. In addition, manual search was conducted within the reference lists of selected articles. Inclusion criteria and quality of related articles were evaluated by two reviewers independently, and required data were extracted.</p> <p>Results: Among related studies, the earliest article was published in 1988, and the most recent one was published in 2013. All studies were performed on adult patients. Surgical Site Infections (SSIs) were reported to be the third most frequent hospital-acquired infections, with the prevalence rate of 4.7-25% in patients undergoing elective colorectal surgery.</p> <p>Conclusions: According to the results of this study, postoperative infections are a global issue, leading to several health consequences and increased morbidity and mortality among different patients. Patient factors are considered as the main predisposing factors associated with these infections.</p>

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Introduction

Postoperative complications play a pivotal role in determining the rate of patient survival after surgery (1). According to population-based studies, although the prevalence of sepsis has risen dramatically within recent decades, the mortality rate associated with sepsis has declined less significantly (2).

Postoperative infectious complications impose substantial costs on surgery patients, increase the length of hospitalization and have adverse effects on patient outcomes (3). Surgical Site Infections (SSIs) are one of the most frequent types of hospital-acquired infections accounting for 14-16% of inpatient Infectious Complications (IC). ICs have been reported to prolong hospital stay for about seven days. According to the literature, potential causes of these infections are patient factors (e.g., contamination via gastrointestinal tract), hospital environment and use of infected surgical instruments (4).

Several predisposing factors have been suggested for the development of ICs after elective surgeries; such

examples are blood glucose levels, comorbidities, use of medications (e.g., preoperative antibiotic use), intraoperative variables (e.g., use of blood products) and postoperative medical procedures (e.g., admission at intensive care units) (5). Furthermore, postoperative blood glucose levels have been considered as an independent risk factor for ICs after abdominal vascular operations. Length of hospitalization is also likely to increase the risk of nosocomial infections (6).

Surgical Infection Prevention Project was created in 2003, resulting in the foundation of Surgical Care Improvement Project (SCIP) in 2006, which became an integral part of surgical care programs (7). SCIP was developed as one of the joint commission core measures, designated to enhance the safety and quality of patient care in hospitals. This project is the result of the collaboration between the Agency for Healthcare Research and Quality (AHRQ), Medicare and Medicaid Services (CMS) and Centers for Disease Control and Prevention (CDC). Fundamentally, SCIP aims to

“reduce postoperative mortality and morbidity among patients undergoing surgical procedures by 25% within 5 years”. Moreover, SCIP offers helpful recommendations regarding prophylactic antibiotic therapy to reduce the risk of SSIs (7).

This study aimed to review the rate of ICs after elective abdominal surgery through evaluating recently published scientific literature. As the health care system focuses on the efficient performance of medical professionals, analyses of ICs following elective surgical procedures may offer the insight to improve the quality of care and patient outcomes.

Materials and Methods

In this systematic review, articles were selected via searching in databases such as Cochrane Library and MEDLINE until December 2014. Keywords and Medical Subject Headings (MESH) were broad terms, including “elective abdominal surgery” and “post-surgical infections”. Reference lists of retrieved articles were evaluated to identify additional related studies, and articles with available abstracts were reviewed in this study. Moreover, manual search was conducted within the reference lists of selected articles.

Critical Appraisal

Initially, all the abstracts were reviewed by two researchers independently. Eventually, 28 abstracts were screened twice for relevance, and 12 articles were excluded due to lack of relevance. The remaining 16 abstracts were fully assessed by the reviewers. With respect to the type of articles, two case reports and two reviews were excluded from further evaluation.

In this review, we used the Consolidated Standards of Reporting Trials (CONSORT) to assess the quality of selected studies. The reviewers independently scored the quality criteria of each study, and a third reviewer resolved the discrepancies. In addition, structural data

extraction tool was used for the selected articles; however, due to the heterogeneity of the main outcome measures, no meta-analysis was performed.

The flow diagram of literature search is shown in Figure.

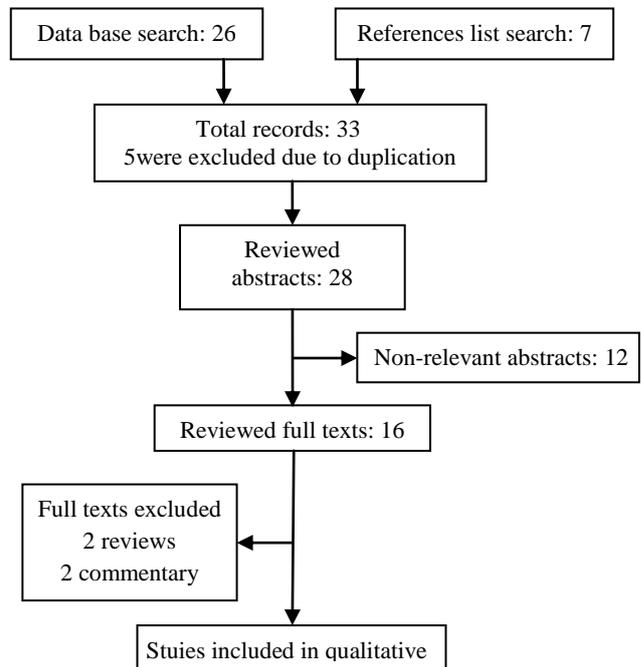


Figure: Flow diagram of the literature search and study selection

Results

In the current review, the earliest article was published in 1988, and the most recent one was published in 2013. All the reviewed studies were conducted on adult patients. General features of the selected articles are shown in Table 1.

Table1: Summary of the 15 studies included in the review

Reference number	year	target population	Sample size	Abdominal Surgery type	Study design	Final result
8	2013	Adults	29549	vascular	Cohort	Post-surgical infections increase hospital mortality
9	2012	Adults	100	colorectal	Cohort	Blood glucose and surgery duration are the main risk factors for post-surgical infections
10	2011	Adults	605	colorectal	Cohort	Antibiotic prophylaxis reduce the SSI
11	2011	Adults	100	colorectal	RCT	Probiotics decrease post-surgical infections
12	2009	Adults	26961	vascular	Cohort	Smoking is the most important predisposing factor for ssis
13	2007	Adults	30	colorectal	Cohort	Antibiotic prophylaxis reduce the SSI
14	2005	Adults	300	colorectal	RCT	Antibiotic prophylaxis reduce the SSI
15	2005	Adults	802	colorectal	Cohort	Antibiotic prophylaxis reduce the SSI
16	2000	Adults	9	colorectal	Case series	Antibiotic prophylaxis reduce the SSI
17	1990	Adults	50	cholecystectomy	RCT	Antibiotic prophylaxis is not indicated in elective cholecystectomy
18	1988	Adults	24	colorectal	RCT	Antibiotic prophylaxis reduce the SSI
19	1988	Adults	1537	colorectal	Cohort	Blood transfusion and surgery duration influence the rate of ssis.

In total, we summarized the results of 12 studies conducted on 60067 patients undergoing elective abdominal surgery. Given the increasing prevalence of obesity in modern and developing countries, it is considered as a major predisposing factor for post-surgical complications in different patients (8).

On the other hand, SSIs are reported to be the third most frequent types of hospital-acquired infections. In elective colorectal surgeries, prevalence rate of SSIs is estimated at 4.7-25% (9). According to several studies, surgical factors more commonly lead to the development of SSIs compared to patient factors.

Therefore, use of efficient surgical techniques could reduce leakage and need for blood transfusions, resulting in decreased length of hospitalization and risk of different ICs (10).

For instance, laparoscopic surgery is associated with lower risk of SSIs and could reduce the rate of these infections by more than 50% compared to open surgeries (20). Post-surgical SSIs are multi-factorial events affected by different parameters, such as the type and duration of surgery, underlying diseases and lifestyle of patients (13).

In a study performed in Ethiopia, prevalence rate of post-surgical wound infections was reported to be 75% and 82% of these infections were multi-drug resistant (5).

In another study in Canada, 9% of the patients undergoing Cesarean Section (CS) experienced post-surgical infections, and the main cause of ICs was reported to be underuse of antibiotics (20).

In various studies, factors such as obesity, diabetes and hypertension, premature rupture of membranes, emergency cesarean delivery and twin pregnancy were

proposed as the risk factors associated with ICs after CS and other abdominal operations (21-23).

SSIs are common causes of postoperative mortality and morbidity, and gram-positive cocci, especially staphylococcus, are considered as the main etiology of many of these infections. Antimicrobial Prophylaxis (AP) plays a pivotal role in the reduction of SSIs, particularly in high-risk patients (24).

Factors such as timing, efficacy, cost and coverage need to be taken into account before AP administration. Furthermore, evidence confirms the efficacy of probiotics in the reduction of SSIs (11), whereas orally administered drugs might not have significant effects on the prevention of postoperative infections (12-14).

Discussion & Conclusion

According to the results of this study, postoperative ICs are a global issue leading to severe health consequences, as well as increased morbidity and mortality. For the most part, post-surgical infections are nosocomial and may vary in different hospitals. Therefore, standard criteria need to be defined for the accurate diagnosis of these infections, as well as the development of comprehensive guidelines for the effective management of ICs.

It is mainly because in developing countries, irrational prescription of antibiotics has resulted in high rate of antimicrobial resistance.

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