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Late postoperative complications in surgical patients: an integrative review

Complicações no pós-operatório tardio em pacientes cirúrgicos: revisão integrativa

Complicaciones postoperatorias tardías en pacientes quirúrgicos: revisión integradora

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ABSTRACT

Objective: to identify the main complications in the late postoperative period of surgical patients. **Method**: an integrative review from the CINAHL, LILACS, Science direct, Web of Science, SCOPUS, Europe PMC, and MEDLINE databases. Descriptors and keywords were combined without language or time restriction. **Results**: ten primary studies were included. Infectious complications were the most common, especially surgical site infection, pneumonia and urinary tract infection. The presence of complications was linked to increased mortality, need for reoperations and worse survival. Few studies report on monitoring frequency, follow-up time and/or when complications started to be observed. **Conclusion**: infectious complications were the most prevalent postoperatively. The scarcity of guidelines that guide the monitoring of complications regarding monitoring frequency, follow-up time and classification makes it difficult to establish an overview of them and consequently propose intervention strategies.
Descriptors: Operative Surgical Procedures; Complications; Postoperative Complications; Epidemiological Monitoring; Infections.

RESUMO

Objetivo: identificar as principais complicações ocorridas no pós-operatório tardio de pacientes cirúrgicos. **Método**: revisão integrativa a partir das bases CINAHL, LILACS, *Science Direct*, *Web of Science*, SCOPUS, *Europe PMC* e MEDLINE. Combinaram-se descritores e palavras-chave, sem restrição de idioma ou tempo. **Resultados**: dez estudos primários foram incluídos. As complicações infecciosas foram as mais comuns, com destaque para infecção do sitio cirúrgico, pneumonia e infecção urinária. A presença de complicações esteve ligada ao aumento na mortalidade, necessidade de reoperações e pior sobrevida. Poucos estudos relatam a frequência de monitoramento, tempo de seguimento e/ou quando as complicações começaram a serem observadas. **Conclusão**: as complicações infecciosas foram as mais prevalentes no pós-operatório. A escassez de diretrizes que guiem a vigilância das complicações no que concerne a frequência de monitoramento, tempo de seguimento e classificação dificulta estabelecer um panorama das mesmas e consequentemente propor estratégias de intervenção.
Descritores: Procedimentos Cirúrgicos Operatórios; Complicações; Complicações Pós-Operatórias; Vigilância Epidemiológica; Infecções.

RESUMEN

Objetivo: identificar las principales complicaciones que ocurren en el postoperatorio tardío de los pacientes quirúrgicos. **Método:** revisión integradora de CINAHL, LILACS, Science Direct, Web of Science, SCOPUS, Europe PMC y MEDLINE. Descriptores y palabras clave fueron combinadas sin restricción de idioma o tiempo. **Resultados**: se incluyeron diez estudios primarios. Las complicaciones infecciosas fueron las *más* comunes, especialmente la infección del sitio quirúrgico, la neumonía y la infección del tracto urinario. La presencia de complicaciones se relacionó con un aumento de la mortalidad, la necesidad de reoperaciones y una peor supervivencia. Pocos estudios informan sobre la frecuencia de monitoreo, el tiempo de seguimiento y/o cuándo comenzaron a observarse complicaciones. **Conclusión**: las complicaciones infecciosas fueron las más frecuentes después de la operación. La escasez de pautas que guían la vigilancia de las complicaciones con respecto a la frecuencia de monitoreo, el tiempo de seguimiento y la clasificación hace que sea difícil establecer una visión general de las mismas y, en consecuencia, proponer estrategias de intervención,
Descriptores: Procedimientos Quirúrgicos Quirúrgicos; Complicaciones; Complicaciones Postoperatorias; Monitoreo Epidemiológica; Infecciones.

INTRODUCTION

Clinical complications after hospital discharge indicates a significant change in the surgical patient's recovery, increasing the risk of reoperation, length of stay, decreased bed arrangement and increased mortality[1].

There is no consensus on the actual incidence of postoperative complications, although rates are estimated at 5.8% to 43.5% in the first 30 days[2-7], with overall mortality ranging from 0.79% to 5.7%[2,4-5,8] related to the type of surgery and severity of the complication. In addition, multiple complications is associated with a considerable increase in the chances of mortality, approximately 7.2 times[9].

Currently, the number of complications increases at a rate proportional to the surgical procedures. Approximately 234.2 million surgical procedures are performed worldwide each year, of which seven million suffer preventable complications, making this a major public health problem[10].

In the United States alone, approximately 20 million people undergo surgical procedures annually[11]. Future forecasts show an exponential growth trend in the surgical sector as the world market for surgical procedures is expected to reach 2.2 billion procedures by 2022. North America is the fastest growing market, but Asia Pacific leads due to the increasing incidence of cardiovascular and neurological diseases, traumatic injuries and the introduction of advanced surgical technologies in the region. The market in North America is growing rapidly due to the increased number of cesarean surgeries and high demand for minimally invasive surgical procedures. Regarding the volume of procedures, gynecological, orthopedic and plastic surgeries stand out[12].

In Brazil, it is complicated to estimate the overall prevalence of surgical interventions due to the lack of systematized data addressing such procedures. However, a recent study[13], based on a database of the Brazilian national health system, points out that the surgical volume in the country was 4,433 procedures/100,000 people in 2014. In this sense, it is very important to develop strategies for analysis, management and monitoring of patients undergoing these surgeries, especially to identify complications.

In this sense, the most important limitation in reporting postoperative complications is the lack of a standardized system to classify and characterize complications. Studies that explored this object were limited to arbitrarily describing complications as "severe", "major" or "minor", which makes it difficult to compare results in the literature as a whole[2,9,14] and to propose intervention strategies. In addition, there is little specificity about which complications are commonly associated with different surgeries, and it is necessary to generalize the findings by extrapolating them and disregarding intrinsic characteristics of different surgical specialties. Thus, it is necessary to better characterize these complications that include the specificities and aspects of monitoring, such as manifestation time, intensity, monitoring frequency, among others.

OBJECTIVE

To identify the main complications occurring in the late postoperative period of surgical patients.

METHODS

This is an integrative literature review, one of the key features of evidence-based practice, a technique that allows us to summarize the past of empirical literature and to provide a comprehensive understanding of a phenomenon to be studied[15].

For study development, the following steps were taken: establishment of the hypothesis/guiding question; selection of databases to be searched; definition of inclusion and exclusion criteria; database search, analysis of retrieved studies; interpretation of results and presentation of the review or synthesis of knowledge[15].

The research question was guided by the question: "What are the most frequent late postoperative complications of surgical patients?" Following the specifications of the PICOT strategy (acronym for Patient, Intervention, Comparison, Outcomes, and Time). Thus we define for P: patient; I: surgery; O: complication; and T: late postoperative. Comparison was not the object of this study.

We adopted as late postoperative the period after discharge from the hospital care patient[9,16]. It is a period of "difficult determination" in which decreased attention to the patient may increase the likelihood of complications[9,16-17].

In the search for the articles, we chose to use international and wide-spread biomedical databases[18], such as: Cumulative Index to Nursing and Allied Health Literature (CINAHL), Latin American and Caribbean Health Sciences Literature (LILACS - *Literatura Latino-Americana e do Caribe em Ciências da Saúde*), Science direct, Web of Science, SCOPUS, Europe PMC and MEDLINE through the National Library of Medicine PubMed portal.

Seeking to retrieve as many primary studies as possible, we combine controlled descriptors (terms obtained from Medical Subject Headings (MeSH) and titles extracted from CINAHL or Health Sciences Descriptors or DeCS), with keywords as follows:

- PubMed and Web of Science: Postoperative Complications AND surgical OR general surgical AND surgical procedures, operative OR surgical AND procedures AND operative OR operative surgical procedures OR surgical AND complications.
- CINAHL and Embase: Postoperative Complications OR post-discharge complications AND surgical complications AND surgical OR general surgical AND surgical procedures, operative OR surgical AND procedures AND operative OR operative surgical procedures OR surgical AND complications AND post-hospital.
- LILACS (in Portuguese, English and Spanish): "Postoperative Complications" [Words] AND Surgery [Words] AND Post-Discharge [Words].
- Scopus and Science direct: Postoperative Complications AND surgical OR general surgical AND surgical procedures AND operative OR surgical AND procedures AND operative OR operative surgical procedures OR surgical AND complications.
- Europe PMC: Postoperative Complications AND surgical AND surgical procedures AND surgical operative AND surgical Patient AND surgical complications.

As inclusion criteria we defined: primary or original articles[15,18] published on the theme in any language, with available abstract and no time limit. The bibliographic search occurred concurrently in the seven databases by two researchers with expertise in the method and thematic studied at the same time, in different places, aiming to avoid bias in the screening of articles to be analyzed. Meetings were held for discussion and consensus among researchers about the inclusion or exclusion of studies in the research. For any disagreements that could not be resolved by consensus, a third reviewer was called.

We excluded review surveys, expert opinion, protocols, response letters, and editorials in the first search. The analysis to select the research was performed in three phases, namely:

I. The manuscripts identified in the databases were pre-selected according to the inclusion criteria, analyzed by reading their titles and abstracts. Thus, the number of retrieved studies per database was 332 at PubMed, 355 at Web of Science, 96 at CINAHL, 30 at Embase, 09 at LILACS, 412 at Scopus, 331 at Science Direct and 315 at Europe PMC, resulting in a total of 1,880 primary studies.
II. In the second phase, 372 duplicate studies were withdrawn and the pre-selected researches were analyzed regarding the participation potential, assessing the attendance to the research question, the type of research developed, objectives, materials and method, main results and conclusion. At this stage, we excluded studies conducted with non-surgical patients, which were developed with individuals under 18 years old or exclusively over 85 years old and who addressed only individuals in the immediate postoperative, intraoperative or preoperative period. Based on this, this step generated 33 primary studies, excluding 1847 studies according to the criteria set out in Chart 1.

Chart 1 - Distribution of justifications for the exclusion of articles and corresponding quantity of disregarded publications

Reason for exclusion	Quantitative excluded (n= 1847)
Duplicate studies	372
Does not address surgical patient	379
Performed exclusively with a patient aged 18 or younger.	15
Performed exclusively with a patient over 80 years old	08
Addresses pre and/or intraoperative patient complications	423
Addresses patient complications only in the immediate postoperative period	371
Does not address complications	175
Review studies	47
Opinion studies	53
Protocols	04

III. The third phase consisted of the full reading of the 33 primary studies, aiming at collecting data specific to the objectives of the review. Studies that did not make clear which complications assessed were excluded, resulting in the 10 primary studies (PS) selected. From these manuscripts were assessed: bibliometric questions (year, base and language of publication), methodological design, contemplated surgical topographies, monitoring frequency, follow-up time and severity assessment system.

The flowchart that led to the selection of the 10 primary studies is shown in Figure 01.

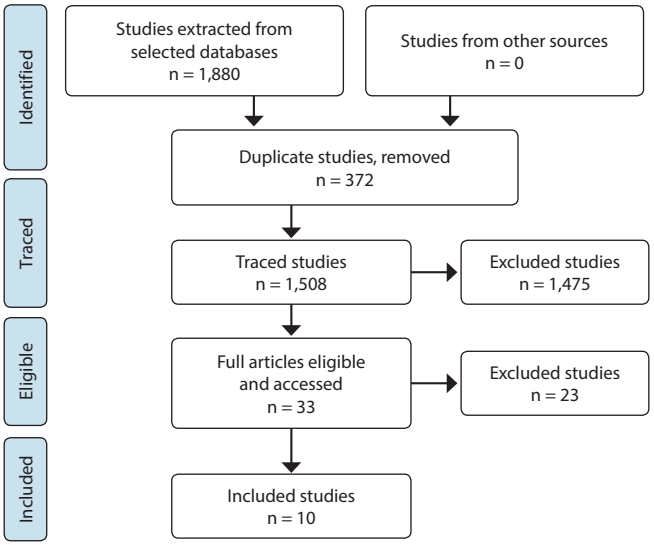

Figure 1- Publication Selection Flowchart

RESULTS

The included PS were all in English (100%)[19-28]. There was no concentration in any given year, although 40%[20,22-23,26] of the studies were recently published (2013-2018). Concerning the database, PubMed hosted 70% of the studies[19-23,25,28].

Regarding the methodological design, retrospective studies predominated (50%)[20,21,23,26,28] based on secondary data retrieved from patient records. A series of surgical topographies were contemplated, with emphasis on general, orthopedic, thoracic, gastrointestinal and urinary surgeries. In general, the selected studies sought to identify the main post-discharge complications of patients undergoing surgery, relating this finding to risk factors, readmissions and mortality.

Infectious complications were the most common in all (100%)[19-28] studies, especially surgical wound infection/surgical site infection (80%)[19,21-27], pneumonia and other complications of the respiratory tract (60%)[19,21-22,24,26,29] and urinary tract infection (20%)[23,27]. Bleeding (60%)[19-20,22,24-25,28], dehiscence (40%)[19,21,23-24] and other complications related to the operated organ/site were also reported. The presence of complications was linked to increased mortality, need for reoperations and poor survival (Chart 2).

We highlight that few studies (20.0%)[23-24] reported the frequency of monitoring, follow-up time and/or when complications began to be observed (20%)[22,24]. Regarding the system of assessment of the severity of the complications, eight (80%)[21-28] of the primary studies used the Clavien-Dindo system, and no other classification attempt was registered.

Chart 2 - Summary of articles included in the integrative review

Article title	Year/ Country	Outlining/Participants	Outcomes/Conclusions
The AFC Score: Validation of a 4-Item Predicting Score of Postoperative Mortality After Colorectal Resection for Cancer or Diverticulitis: Results of a Prospective Multicenter Study in 1049 Patient[s(19)]	2007 France	A multicenter study to assess mortality and morbidity after colorectal surgery. N= 1,049 patients	The main complications were: dehiscence and wound infection (8%), postoperative hemorrhage (3%), and complications related to the cardiorespiratory tract (7%). Postoperative morbidity was observed in a significant portion (23%) of patients. Post-discharge reoperation due to complications was required in 42 patients (4%).
Complications after pancreaticoduodenectomy are associated with higher amounts of intra- and postoperative fluid therapy: A single center retrospective cohort stud[y(20)]	2017 Germany	A descriptive, documentary and retrospective study with patients submitted to duodenopancreatectomy. N: 553 patients	Infection, fistula, delayed gastric emptying and bleeding were the main complications. The incidence of complications was high (44.7%), with morbidity of 59.5%. Long-term mortality (30 days post-discharge) was 1.1%. Postoperative intervention was required to treat complications in 28.3% of patients, of which 12.1% reoperations.
Systematic Classification of Morbidity and Mortality After Thoracic Surgery[(21)]	2010 Canada	A retrospective study assessing postoperative complications in thoracic surgery. N: 953 patients	Complication rates were 29.3%. The main ones were Surgical Wound Infection (30.8%), prolonged air escape (18.8%), atrial fibrillation (18.2%), and pneumonia (9.7%).
Morbidity after Total Gastrectomy: Analysis of 238 Patients[(22)]	2015 United States	A 90-day prospective follow-up cohort N: 238 students	The incidence of complications was 30%. The main ones were surgical wound infection (18.5%), esophageal anastomotic leak (14.7%), respiratory system complications (14.3%), cardiac arrhythmia (9.7%), organ-cavity infection (4.2%), and hemorrhage (3.4%). The readmission rate was high (20%). The presence of one or more complications increased the hospitalization time of the subjects.
Post-Discharge Complications are an Important Predictor of Post-operative Readmissions[(23)]	2014 United States	A retrospective study with patient undergoing general surgery. N: 3,556 patients	The incidence of complications was 31%, the most common being gastrointestinal complications (29.5%), surgical site infection (organ-cavity, superficial, deep and dehiscence) (26.3%), sepsis (3.8%), and urinary tract infection (2.9%). The average time between discharge and post-discharge complication was 10 days.
Value of General Surgical Risk Models for Predicting Postoperative Liver Failure and Mortality Following Liver Surgery[(24)]	2012 Japan	A prospective follow-up study of postoperative course of hepatectomy. N: 960 patients	The incidence of post-discharge complications was 16.6%, the most common being: wound infection (2.5%), pleural effusion (2.9%), abscess (2.5%), pneumonia (1.2%), and hemorrhage (0.7%).
The Percutaneous Nephrolithotomy Global Study: Classification of Complications[(25)]	2011 PubMed	A multicenter study with patients undergoing percutaneous nephrolithotomy. N: 5,724 patients	The incidence of complications was 20.5%. The main ones were fever (13.7%), hemorrhage (12.5%), urinary leakage (3.4%), and infections (4.6%).
The Impact of Postoperative Complications on Survivals After Esophagectomy for Esophageal Cancer[(26)]	2015 Japan	A retrospective cohort with surgical esophagectomy graduates N: 402 patients	There was a high incidence of surgical complications (40.1%), the main ones being pneumonia (22.5%), surgical wound infection (11.3%), anastomosis (15.8%), and laryngeal nerve paralysis (19.4%).
Effect of comorbidities and postoperative complications on mortality after hip fracture in elderly people: prospective observational cohort study[(27)]	2005 England	A prospective observational cohort of older adults undergoing hip fracture surgery. N: 2,448 patients	498 patients had at least one postoperative complication (20%). The most common were chest infection (9%), heart failure (5%) and other infections (organ-cavity, UTI) (5%). Mortality was 9.6% at 30 days after hospitalization. In patients who developed postoperative chest infection, mortality at 30 days was 43%.
Association of Postoperative Complications with Hospital Costs and Length of Stay in a Tertiary Care Center[(28)]	2005 Canada	A retrospective descriptive study in patients undergoing noncardiac surgery. N: 7,457 patients	About 6.9% of patients had at least one post-discharge complication. Pneumonia (3%), hemorrhage (1.8%), sepsis (1.3%), and cardiac complications (1.3%) were prevalent.

DISCUSSION

Assessment and monitoring of post-discharge complications in surgical patients has been performed retrospectively, based on secondary data (medical records search) or through outpatient return (patient interviews and/or reassessment). There are few studies that detail the main complications, and differences in the approaches used make it difficult to make comparisons that would provide an adequate situational picture.

Even so, infectious complications stood out after the hospital in all selected studies[(19-28)], especially surgical site-related infection (SSI)/operative wound (OW). It has a prevalence ranging from 2.5[(24)] to 30.8[(21)] and pneumonia ranging from 3[(28)] to 22.5[(26)] in prevalence. Postoperative hemorrhage was around 3%[(19,22,24,28)], and in a study with patients undergoing percutaneous nephrolithotomy, this value reached 12.5% of patients. The occurrence of these complications has been associated with the need for readmissions and/or high mortality[(19-23,25-28)].

Complications tend to vary in frequency, incidence, and severity, and this difference is related to a number of variables intrinsic to the patient (age, malnutrition, past disease, immunosuppression), as well as related to the procedure, such as the presence of associated clinical condition, type of anesthesia, degree of injury and postoperative care[(16-17,29)]. However, we realize from this

review that although there are a range of possible complications, those of infectious nature stand out and are common to almost all surgeries studied[19-28].

These are a set of potentially serious complications in patients undergoing various types of surgical operations. By definition, SSI may epidemiologically occur within the first 30 postoperative days, but still expand to up to one year in prosthesis and orthosis implantation. In these infections the first 48 hours are critical due to increased metabolism and surgical trauma alone. This complication is usually associated with temperature elevation especially within the first 72 hours after surgery. From the third day on vascular catheter-related infections, incisional infections and sepsis are more prevalent. From the sixth day onwards, septic complications causing fever and incisional abscesses are associated with more severe repercussions and a greater possibility of death.

Our data also highlight the correlation between the presence of one or more complications and increased mortality[19-22,25-28], need for reoperations[19-20,22-23,26] and worse survival[26,28].

Currently, there is a need for optimization of spaces, resources and expenses resulting from hospitalization, which has a significant influence on patients' discharge decision. There is a socioeconomic pressure allied to grant institutional discharge as soon as possible, aiming at reducing hospital expenses and ensuring bed turnover[19-21,24,26]. As a result of these factors, patients who still require clinical monitoring may be discharged early due to the need for bed release. When made without the necessary rigor and based on clinical inconsistencies, such a decision may expose patients to inadequate levels of care, resulting in unexpected deaths or readmissions[21]. In the case of surgical patients, this assertion has become increasingly valid and common, especially due to the high probability of postoperative complications to which these patients are exposed[30].

Outside the hospital environment, user monitoring is abruptly diminished and in some cases nonexistent[20-21,23]. The literature shows that surgical patient monitoring in most institutions has only occurred during the period of hospitalization. In these cases, these institutions tend not to report what actually happens in terms of complications, or limit the findings to the immediate postoperative period. When monitoring is performed only during hospital stay, it does not provide reliable indicators and may lead to underreporting[26,31-32].

Even though complication rates among the selected studies were high, the lack of strategies to monitor and manage surgical graduates (in terms of analysis of signs and symptoms and time to manifestation) is a cause for concern. In this sense, although the Clavien-Dindo classification system, used in most studies[21-28], is important for identifying and categorizing complications in degrees of intensity, its applicability from the point of view of monitoring and monitoring is extremely limited.

Studies have shown that barriers to effective monitoring ranged from patients' perceptions of the difficulties encountered in developing post-discharge care to obstacles reported by the health team to establish adequate information feedback. Thus, lack of monitoring, or mismanagement, can provide information with poor credibility and accuracy, making decision-making difficult.

The use of emerging mass information and communication technologies to improve or promote health (e-Health) may represent an opportunity to improve the identification and management of post-discharge complications[33-35]. Recent studies point to the importance of investing in post-discharge patient monitoring strategies, especially through smartphones. Applications have health purposes an innovative and important technological tool with the potential to improve patient follow-up regarding disease evolution and self-care, co-participation in treatment, individualized care and cost reduction for the health system[33-37].

Follow-up should be carried out by the health team, in which nurses are inserted. Professional education enables them to identify health-disease situations, supporting the prescription and implementation of concrete health actions in the promotion, prevention, recovery and rehabilitation in the health of the individual, family and community, based on the systematization of their care. In addition, the proximity of nurses to patients, whether in a hospital, outpatient or home environment, makes them protagonists in monitoring patients with postoperative complications.

Study limitations

This research has limitations related to the adopted method. Since this is an integrative review, the results are restricted to showing only a picture of current reality based on the results of primary studies. Even if the intention was to compare interventions, there were no clinical studies published in the databases to support this approach. In addition, the different approaches used limit comparisons between studies and countries[38].

Contributions to the field

Our findings generally highlight the importance of investing in post-discharge patient monitoring strategies to identify early signs and symptoms of possible complications.

CONCLUSION

Infectious complications were the most prevalent in all selected studies, especially surgical site infection and pneumonia. The presence of complications was linked to increased mortality, need for reoperations and poor survival. The scarcity of guidelines that guide the monitoring of infections with regard to monitoring frequency, follow-up time and classification makes it difficult to establish an overview and therefore to propose intervention strategies.

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