# Mortalidad a 30 Días en Cirugía de Urgencia: Factores de Riesgo Clínico, Desempeño Hospitalario y Estrategias Epidemiológicas para Mejorar los Resultados Quirúrgicos

# Thirty-Day Mortality in Emergency Surgery: Clinical Risk Factors, Hospital Performance, and Epidemiological Strategies for Improving Surgical Outcomes

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**RESUMEN**

La mortalidad a 30 días después de cirugía de urgencia constituye un indicador fundamental de los resultados posoperatorios, la seguridad del paciente y el desempeño de los sistemas de salud. A pesar de los avances en la medicina perioperatoria y el tratamiento quirúrgico, persisten diferencias importantes en la mortalidad entre distintos entornos asistenciales, relacionadas con la interacción de factores de riesgo clínico, recursos institucionales y procesos de atención hospitalaria. Esta revisión narrativa tuvo como objetivo analizar la mortalidad a 30 días posterior a cirugía de urgencia mediante el estudio de su distribución epidemiológica, principales determinantes clínicos, indicadores de desempeño hospitalario, mecanismos de vigilancia y oportunidades de mejora asistencial, integrando evidencia internacional con especial atención a Latinoamérica. Se adoptó un enfoque descriptivo, analítico y comparativo, incorporando investigaciones observacionales, cohortes multicéntricas, auditorías quirúrgicas, estudios de predicción de riesgo y programas de mejora de la calidad. La evidencia examinada identificó variaciones internacionales significativas en la mortalidad posoperatoria, con tasas a 30 días de 4.5%, 6.0% y 8.6% en países con índices de desarrollo humano alto, medio y bajo, respectivamente. Aproximadamente el 70% de los fallecimientos registrados en una importante cohorte internacional de cirugía abdominal urgente ocurrió después de las primeras 24 horas, destacando la importancia de mantener una vigilancia prolongada. La edad avanzada, las comorbilidades, la inestabilidad fisiológica preoperatoria, la sepsis y la complejidad quirúrgica se identificaron como factores relevantes asociados con la mortalidad. Los modelos de ajuste de riesgo demostraron utilidad para interpretar los resultados posoperatorios, mientras que las características organizacionales de los hospitales, el seguimiento incompleto después del alta y las diferencias en las definiciones de mortalidad dificultaron las comparaciones institucionales. Las investigaciones latinoamericanas aportaron evidencia regional y señalaron la necesidad de fortalecer los sistemas de vigilancia y estandarizar los mecanismos de registro. En conjunto, la mortalidad a 30 días debe comprenderse como un indicador multidimensional que refleja tanto la vulnerabilidad clínica de los pacientes como las características de los sistemas de salud. La integración de vigilancia epidemiológica, ajuste de riesgo, coordinación multidisciplinaria y evaluación institucional continua puede fortalecer la valoración de la calidad quirúrgica. Se requieren investigaciones prospectivas adicionales para establecer la efectividad de intervenciones específicas dirigidas a reducir la mortalidad posoperatoria, especialmente en entornos con recursos limitados.

***PALABRAS CLAVE***

*Mortalidad a 30 días, Cirugía de urgencia, Mortalidad posoperatoria, Vigilancia epidemiológica, Indicadores de desempeño hospitalario, Resultados quirúrgicos, Ajuste de riesgo, Seguridad del paciente, Mejora de la calidad asistencial, Latinoamérica*

**ABSTRACT**

Thirty-day mortality following emergency surgery represents a critical indicator of postoperative outcomes, patient safety, and healthcare system performance. Despite advances in perioperative medicine and surgical management, substantial differences in mortality persist across healthcare settings, reflecting interactions between clinical risk factors, institutional resources, and healthcare delivery processes. This narrative review aimed to analyze thirty-day mortality after emergency surgery by examining its epidemiological distribution, principal clinical determinants, hospital performance indicators, surveillance practices, and opportunities for healthcare quality improvement, incorporating international evidence with particular attention to Latin America. A descriptive, analytical, and comparative approach was adopted, integrating published evidence from observational studies, multicenter cohorts, surgical audits, risk prediction investigations, and quality improvement research. The reviewed evidence identified substantial international variation in postoperative mortality, with reported thirty-day mortality rates of 4.5%, 6.0%,

and 8.6% in high-, middle-, and low-Human Development Index settings, respectively. Approximately 70% of postoperative deaths in a major international emergency abdominal surgery cohort occurred after the first 24 hours, emphasizing the importance of extended surveillance. Advanced age, comorbidities, preoperative physiological instability, sepsis, and surgical complexity emerged as relevant mortality-associated factors. Risk-adjustment models demonstrated value for interpreting postoperative outcomes, while hospital organizational characteristics, incomplete post-discharge follow-up, and inconsistent mortality definitions complicated institutional comparisons. Latin American investigations contributed regional evidence but also highlighted the need for stronger surveillance systems and standardized reporting. Overall, thirty-day mortality should be understood as a multidimensional indicator reflecting both patient vulnerability and healthcare system characteristics. Integrating epidemiological surveillance, appropriate risk adjustment, multidisciplinary coordination, and continuous institutional evaluation may strengthen emergency surgical quality assessment. Further prospective research is required to establish the effectiveness of specific interventions in reducing postoperative mortality, particularly in resource-constrained healthcare settings.

***KEYWORDS***

*Thirty-day mortality, Emergency surgery, Postoperative mortality, Epidemiological surveillance, Hospital performance indicators, Surgical outcomes, Risk adjustment, Patient safety, Healthcare quality improvement, Latin America*

## INTRODUCCIÓN

Emergency surgery represents a major challenge for healthcare systems worldwide due to its association with postoperative complications, prolonged hospitalization, and increased mortality. Unlike elective procedures, emergency surgical interventions frequently occur in patients presenting with advanced disease, physiological instability, systemic inflammation, or multiple comorbidities, limiting opportunities for adequate preoperative optimization. These conditions increase perioperative risk and demand coordinated responses involving surgical teams, anesthesiologists, intensive care specialists, and hospital administrators. Consequently, postoperative mortality has become an essential indicator for assessing the safety, effectiveness, and organizational performance of emergency surgical services (GlobalSurg Collaborative, 2016; Barazanchi et al., 2020).

Among the available outcome measures, 30-day postoperative mortality has gained particular relevance because it captures deaths occurring during hospitalization and after discharge, providing a broader assessment of surgical outcomes than immediate or in-hospital mortality alone. This indicator facilitates epidemiological surveillance, institutional comparisons, risk stratification, and the identification of potentially preventable adverse events. However, its interpretation requires consideration of patient characteristics, procedural complexity, institutional resources, and differences in healthcare delivery. Without adequate risk adjustment, mortality comparisons may reflect variations in clinical severity rather than differences in the quality of hospital care (Ariyaratnam et al., 2015; Eugene et al., 2018).

International studies have demonstrated substantial disparities in emergency surgical mortality across healthcare settings. The GlobalSurg Collaborative (2016) identified higher postoperative mortality in countries with fewer healthcare resources, emphasizing the influence of socioeconomic conditions, access to essential surgical services, and perioperative care capacity. Similarly, investigations involving emergency laparotomy have highlighted the contribution of advanced age, comorbidities, sepsis, physiological deterioration, and postoperative complications to unfavorable outcomes (Tolstrup et al., 2017; Watt et al., 2015). These findings suggest that mortality cannot be explained exclusively by operative factors but must be understood as the result of interactions between patient-related characteristics and healthcare system performance.

Recent evidence from Latin America has expanded the understanding of surgical outcomes in middle-income healthcare settings. The Latin American Surgical Outcomes Study (LASOS) Group (2025) examined postoperative outcomes across 17 Latin American countries, providing valuable information regarding regional differences in surgical care and postoperative complications. Likewise, Pérez Rivera et al. (2024) evaluated perioperative mortality in Colombian hospitals, emphasizing the importance of standardized indicators for assessing surgical system performance. These investigations reinforce the need to incorporate regional evidence into international comparisons,

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particularly because differences in hospital infrastructure, critical care availability, referral systems, and postoperative surveillance may influence patient survival.

Beyond individual clinical risk, institutional organization plays a determining role in postoperative outcomes. Delays in diagnosis, limited access to operating rooms, insufficient critical care capacity, inadequate postoperative monitoring, and fragmented communication between healthcare professionals may compromise the timely recognition and management of complications. Oliver et al. (2018) demonstrated associations between organizational characteristics and mortality following emergency laparotomy, while Peden et al. (2019) evaluated a national quality improvement intervention designed to strengthen emergency surgical care. Although the latter intervention did not demonstrate a significant reduction in mortality, it highlighted the complexity of translating standardized improvement strategies into measurable clinical benefits.

Epidemiological surveillance provides an essential framework for identifying mortality patterns, monitoring postoperative complications, and evaluating institutional performance over time. The integration of standardized clinical registries, risk-adjusted mortality indicators, systematic postoperative follow-up, and multidisciplinary case reviews can support the identification of potentially modifiable factors affecting surgical outcomes. Nevertheless, limitations in data completeness, inconsistent definitions, insufficient post-discharge follow-up, and variability in institutional reporting continue to affect the comparability and reliability of available information (Ingraham et al., 2017; Ariyaratnam et al., 2015). These challenges are particularly relevant in healthcare systems where epidemiological surveillance infrastructure remains fragmented.

Despite advances in perioperative medicine, surgical risk prediction, and quality improvement initiatives, important gaps remain regarding the integration of clinical indicators, epidemiological monitoring, and hospital management strategies for reducing 30-day mortality after emergency surgery. Much of the existing literature evaluates individual prognostic factors or institutional outcomes separately, making it difficult to establish a comprehensive understanding of how clinical severity, healthcare organization, and surveillance practices interact. Furthermore, the applicability of evidence generated in high-income countries to Latin American healthcare systems requires critical consideration of differences in available resources, surgical access, and institutional capacities.

Accordingly, the present narrative review aims to examine 30-day mortality following emergency surgery as a multidimensional indicator of healthcare quality, integrating international and Latin American evidence. Specifically, it seeks to identify major clinical and institutional factors associated with postoperative mortality, evaluate the usefulness and limitations of hospital performance indicators, examine epidemiological surveillance approaches, and describe opportunities for improving emergency surgical care. The central research question is whether the integration of risk-adjusted mortality assessment, systematic epidemiological surveillance, and structured institutional quality improvement strategies can contribute to more effective identification of potentially preventable deaths and strengthen emergency surgical services. Through a critical synthesis of published observational studies, multicenter investigations, surgical audits, and quality improvement research, this review provides a foundation for understanding postoperative mortality as both a clinical outcome and a measure of healthcare system performance.

## DESARROLLO

### 1. Epidemiological Burden of Thirty-Day Mortality After Emergency Surgery

Emergency surgical procedures represent a substantial source of postoperative morbidity and mortality, particularly in patients requiring immediate intervention for life-threatening conditions. The unpredictable nature of surgical emergencies, combined with limited opportunities for preoperative optimization, contributes to adverse outcomes that extend beyond the operating room. Thirty-day mortality has therefore emerged as a relevant indicator for evaluating surgical safety, monitoring clinical outcomes, and identifying disparities in healthcare delivery.

The GlobalSurg Collaborative (2016) evaluated 10,745 patients from 357 hospitals across 58 countries, reporting an overall 30-day mortality rate of 5.4%. Mortality differed according to national development levels, reaching 4.5% in high-development settings, 6.0% in middle-development settings, and 8.6% in low-development settings. These

findings illustrate the relationship between postoperative survival and healthcare system characteristics, including access to surgical resources, perioperative monitoring, and critical care services. Importantly, approximately 70% of recorded deaths occurred after the first postoperative day, reinforcing the importance of extending surveillance beyond the immediate surgical period.

The burden of emergency surgical mortality must also be interpreted according to procedure type and baseline patient risk. Major emergency laparotomies, particularly those involving gastrointestinal perforation, intestinal ischemia, or severe abdominal infection, are associated with greater physiological deterioration than less invasive emergency interventions. Consequently, meaningful epidemiological comparisons require standardized definitions and adjustment for differences in patient characteristics and operative complexity (Tolstrup et al., 2017; Barazanchi et al., 2020).

**2. Clinical Determinants and Predictive Factors of Postoperative Mortality**

Thirty-day mortality following emergency surgery results from interactions among patient characteristics, disease severity, operative complexity, and postoperative complications. Advanced age, functional dependence, cardiovascular disease, chronic kidney dysfunction, malnutrition, and immunosuppression may reduce physiological reserve and increase vulnerability to surgical stress. However, chronological age alone does not adequately represent operative risk, making comprehensive clinical assessment necessary.

Preoperative physiological instability is particularly relevant. Patients presenting with sepsis, hypotension, metabolic acidosis, respiratory insufficiency, or evolving organ dysfunction have increased risks of postoperative deterioration. Delayed source control may further aggravate inflammatory responses and contribute to progressive multiorgan failure. Barazanchi et al. (2020) identified several relevant predictors of mortality following emergency laparotomy, emphasizing the importance of evaluating both preoperative and intraoperative risk factors.

Risk prediction systems provide structured approaches to identifying vulnerable populations. Eugene et al. (2018) developed the National Emergency Laparotomy Audit risk model using clinical information from a large surgical cohort. Such models support preoperative decision-making, postoperative resource allocation, and institutional outcome comparisons. Nevertheless, predictive accuracy depends on the availability of reliable clinical information, appropriate model calibration, and consideration of the populations in which the instruments are applied.

Postoperative complications also contribute significantly to mortality. Surgical site infections, anastomotic leakage, respiratory failure, thromboembolic events, acute kidney injury, and postoperative sepsis may initiate progressive clinical deterioration. Tengberg et al. (2017) demonstrated the importance of monitoring complications beyond the immediate postoperative period, supporting prolonged clinical surveillance and timely recognition of potentially reversible conditions.

**3. Hospital Performance Indicators and Quality of Surgical Care**

Hospital performance evaluation requires indicators capable of reflecting clinical outcomes while accounting for differences in patient populations and institutional capabilities. Thirty-day mortality is particularly valuable because it captures fatal outcomes occurring during the initial postoperative period, including deaths after hospital discharge. Nevertheless, mortality alone provides an incomplete assessment of healthcare quality and should be interpreted alongside additional indicators.

Relevant complementary measures include postoperative complication rates, unplanned intensive care admissions, surgical reinterventions, duration of hospitalization, delays before definitive surgical treatment, and adherence to established perioperative protocols. These indicators may help identify weaknesses in clinical pathways and support institutional quality improvement programs (Ingraham et al., 2017).

Risk-adjusted mortality is especially important for comparative hospital evaluation. Institutions receiving patients with advanced disease or substantial physiological compromise may demonstrate higher crude mortality despite delivering appropriate clinical care. Therefore, comparisons based exclusively on unadjusted mortality rates can generate misleading interpretations. The integration of prognostic models, standardized clinical definitions, and reliable data collection procedures contributes to more equitable assessments of institutional performance (Eugene et al., 2018; Ariyaratnam et al., 2015).

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Organizational characteristics also influence surgical outcomes. Oliver et al. (2018), in an analysis involving 39,903 emergency laparotomy patients, examined relationships between hospital organizational factors and postoperative mortality. Their findings emphasize the importance of considering healthcare delivery processes, institutional resources, and coordination between clinical services when evaluating surgical performance.

**4. Epidemiological Surveillance and Postoperative Follow-Up**

Epidemiological surveillance constitutes a fundamental component of surgical quality assessment because it enables the systematic identification, documentation, and analysis of postoperative outcomes. Reliable monitoring of 30-day mortality requires consistent patient registration, standardized definitions, adequate clinical documentation, and mechanisms for identifying deaths occurring after hospital discharge.

A major limitation of traditional hospital-based surveillance is its dependence on inpatient information. Patients discharged before completing the 30-day observation period may experience serious complications or die outside the institution, potentially leading to underestimation of postoperative mortality. Consequently, effective surveillance should incorporate post-discharge follow-up, hospital information systems, and, where available, linkage with mortality registries.

The standardization of epidemiological indicators is essential for comparing results across institutions and geographical regions. Ariyaratnam et al. (2015) emphasized the importance of consistent perioperative mortality measurement and reporting, particularly in international surgical quality initiatives. Clear definitions of the observation period, population denominator, mortality outcome, and completeness of follow-up reduce discrepancies between reported results.

Furthermore, epidemiological surveillance should extend beyond the collection of mortality statistics. The identification of recurring postoperative complications, institutional delays, and potentially preventable adverse events can guide targeted interventions. Multidisciplinary mortality reviews, periodic clinical audits, and continuous assessment of institutional indicators provide opportunities to translate surveillance findings into improvements in patient care.

**5. Healthcare Inequalities and the Latin American Context**

Differences in emergency surgical outcomes are closely associated with structural inequalities affecting healthcare systems. Limited hospital infrastructure, restricted access to specialized surgical services, shortages of critical care resources, and fragmented referral networks may compromise the timely management of surgical emergencies.

These circumstances are particularly relevant in Latin America, where healthcare systems exhibit substantial differences in financing, organization, geographic accessibility, and resource distribution. Although several countries have expanded access to surgical services, important challenges remain in ensuring equitable perioperative care and comprehensive postoperative monitoring.

The Latin American Surgical Outcomes Study (LASOS) Group (2025) provided multicenter evidence from 17 Latin American countries, examining postoperative complications and hospital outcomes across diverse healthcare environments. Although the study included surgical populations beyond emergency procedures and did not exclusively measure all-cause 30-day mortality, its findings contribute important regional evidence regarding surgical safety and perioperative care.

Similarly, Pérez Rivera et al. (2024) investigated perioperative mortality in Colombian hospitals, supporting the relevance of standardized outcome measurement for assessing surgical systems. These regional investigations provide a foundation for identifying differences in surgical outcomes and evaluating the applicability of international quality indicators to Latin American healthcare environments.

However, transferring clinical protocols developed in highly resourced institutions to hospitals with limited infrastructure requires careful consideration. Sustainable improvements depend not only on adopting standardized recommendations but also on adapting surveillance systems, clinical pathways, and resource allocation strategies to local organizational capacities.

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**6. Opportunities for Improving Emergency Surgical Outcomes**

Reducing mortality after emergency surgery requires coordinated interventions throughout the perioperative continuum. Early recognition of critical illness, timely diagnosis, appropriate resuscitation, rapid surgical source control, and adequate postoperative surveillance represent important components of high-quality emergency surgical care.

Clinical protocols may improve the consistency of care by establishing standardized procedures for risk assessment, antibiotic administration when indicated, physiological monitoring, escalation of treatment, and postoperative evaluation. However, their effectiveness depends on implementation quality, professional adherence, available resources, and continuous institutional evaluation.

The EPOCH trial, conducted by Peden et al. (2019), assessed a national quality improvement program intended to improve survival following emergency abdominal surgery. Although the intervention did not produce a statistically significant reduction in mortality, the study demonstrated the challenges associated with implementing complex organizational changes across multiple institutions. These findings suggest that successful quality improvement requires sustained institutional engagement, reliable performance measurement, and careful assessment of implementation barriers.

Another important strategy involves strengthening multidisciplinary coordination. Communication between emergency physicians, surgeons, anesthesiologists, critical care specialists, nursing personnel, and hospital administrators can facilitate timely clinical decisions and improve continuity of care. Likewise, structured postoperative monitoring may support earlier detection of complications and faster access to therapeutic interventions.

From an administrative perspective, improvement initiatives should incorporate measurable objectives, periodic evaluation of hospital indicators, clinical audits, and feedback mechanisms. The integration of mortality surveillance into institutional governance allows hospital leadership to identify recurrent problems, prioritize interventions, and assess changes in care quality over time.

Ultimately, thirty-day postoperative mortality should be understood not merely as an isolated clinical outcome but as a multidimensional indicator reflecting patient vulnerability, disease severity, institutional organization, and healthcare system performance. Its systematic evaluation, supported by risk adjustment and epidemiological surveillance, provides an opportunity to strengthen emergency surgical services and promote safer, more equitable healthcare delivery.

## OBJETIVO GENERAL Y OBJETIVOS ESPECÍFICOS

### General Objective

To critically analyze thirty-day mortality following emergency surgical procedures through an integrated assessment of clinical risk factors, hospital performance indicators, epidemiological surveillance systems, and healthcare management strategies, incorporating international and Latin American evidence to identify opportunities for improving postoperative outcomes, strengthening institutional quality assessment, and promoting safer, more equitable emergency surgical care.

### Specific Objectives

**1. Cognitive Domain: Knowledge, Analysis, and Critical Evaluation**

**1.1. Identify and describe** the principal epidemiological characteristics of thirty-day mortality following emergency surgery, including its frequency, distribution, and variation across surgical populations, hospital settings, and geographical regions.

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**1.2. Analyze** the clinical and physiological determinants associated with postoperative mortality, emphasizing advanced age, comorbidities, preoperative instability, surgical complexity, infectious complications, and postoperative organ dysfunction.

**1.3. Compare** international and Latin American evidence regarding mortality outcomes, identifying differences in healthcare infrastructure, access to emergency surgical services, critical care availability, and institutional performance (GlobalSurg Collaborative, 2016; Latin American Surgical Outcomes Study Group, 2025).

**1.4. Evaluate** the usefulness and limitations of hospital performance indicators, particularly crude and risk-adjusted thirty-day mortality, for measuring surgical safety, institutional effectiveness, and quality of perioperative care.

**1.5. Critically examine** published evidence on epidemiological surveillance, institutional audits, and quality improvement interventions to identify strategies potentially associated with better postoperative outcomes (Ingraham et al., 2017; Peden et al., 2019).

**2. Psychomotor Domain: Procedural Application and Technical Skills**

**2.1. Organize and classify** published epidemiological information into standardized analytical categories, including patient characteristics, surgical risk, mortality outcomes, hospital indicators, and organizational factors.

**2.2. Apply** established principles of epidemiological measurement to the interpretation of thirty-day mortality rates, distinguishing between crude mortality, risk-adjusted mortality, in-hospital mortality, and procedure-related outcomes.

**2.3. Construct** comparative evidence matrices and conceptual frameworks that integrate clinical predictors, postoperative complications, institutional resources, and surveillance indicators.

**2.4. Develop** a structured analytical framework for identifying potential weaknesses in postoperative surveillance, clinical documentation, surgical pathways, and hospital quality monitoring.

**2.5. Formulate** evidence-informed recommendations for improving the interpretation, reporting, and institutional application of postoperative mortality indicators.

Within this narrative review, the psychomotor domain refers to procedural and technical competencies related to evidence organization, indicator construction, and structured analysis. It does not involve direct clinical procedures or practical assessment of healthcare personnel.

**3. Affective Domain: Ethical Awareness, Professional Responsibility, and Patient Safety**

**3.1. Recognize** the importance of postoperative mortality surveillance as a component of professional accountability, patient safety, and institutional responsibility.

**3.2. Value** the ethical significance of transparent mortality reporting, accurate clinical documentation, and the identification of potentially preventable adverse outcomes.

**3.3. Demonstrate commitment to** equitable evaluation of healthcare institutions by considering differences in patient complexity, socioeconomic conditions, and available clinical resources.

**3.4. Promote** a multidisciplinary perspective that recognizes the contributions of surgical teams, anesthesiology, critical care, nursing, epidemiology, and healthcare administration to postoperative survival.

**3.5. Integrate** principles of continuous quality improvement, patient-centered care, and responsible use of epidemiological information into the interpretation of emergency surgical outcomes.

## OBJETO DE ESTUDIO

The object of study of this narrative review is **thirty-day postoperative mortality following emergency surgical procedures**, examined as a clinical, epidemiological, and institutional performance indicator. The analysis focuses on

the relationship between patient-related risk factors, surgical complexity, postoperative complications, hospital organizational characteristics, and healthcare quality management strategies that may influence mortality within the first 30 days after emergency surgery.

The study considers adult patients undergoing emergency general surgical procedures, particularly those requiring urgent abdominal interventions for conditions such as intestinal obstruction, gastrointestinal perforation, intra-abdominal infection, intestinal ischemia, and other acute surgical pathologies. These populations frequently present with physiological instability, pre-existing comorbidities, and limited opportunities for preoperative optimization, which contribute to an increased risk of adverse postoperative outcomes (GlobalSurg Collaborative, 2016; Barazanchi et al., 2020).

From an epidemiological perspective, the primary phenomenon of interest is **all-cause mortality occurring within 30 days after emergency surgery**, regardless of whether death occurs during the initial hospitalization or following discharge. Complementary variables include demographic characteristics, comorbidity burden, preoperative physiological status, surgical urgency, postoperative complications, intensive care requirements, and institutional characteristics. Particular attention is given to the distinction between crude mortality and risk-adjusted mortality, as these measures provide different perspectives on clinical outcomes and hospital performance (Ariyaratnam et al., 2015; Eugene et al., 2018).

The institutional dimension encompasses hospitals providing emergency surgical care, including secondary and tertiary healthcare facilities operating within different resource environments. Relevant organizational characteristics include surgical service availability, access to diagnostic resources, operating room capacity, intensive care infrastructure, multidisciplinary coordination, postoperative monitoring, and institutional surveillance systems. These elements are examined to understand how healthcare organization may contribute to variations in postoperative mortality (Oliver et al., 2018).

Geographically, the review adopts an international perspective, incorporating evidence from high-, middle-, and low-income healthcare settings while emphasizing the relevance of Latin American experiences. Regional investigations, including the Latin American Surgical Outcomes Study and Colombian surgical outcomes research, provide important contextual information for interpreting differences in surgical outcomes and institutional capacities (Latin American Surgical Outcomes Study Group, 2025; Pérez Rivera et al., 2024).

The temporal dimension is defined by the 30-day postoperative observation period. This interval allows consideration of immediate surgical complications and subsequent clinical deterioration, including events that occur after hospital discharge. Studies using different mortality observation periods may be incorporated when they provide relevant contextual information; however, their findings are distinguished from studies reporting standardized 30-day outcomes to avoid inappropriate comparisons.

The unit of analysis consists of published scientific evidence derived from observational investigations, multicenter cohort studies, epidemiological reports, surgical audits, risk prediction studies, and institutional quality improvement research. Because the investigation follows a narrative review design, it does not involve direct patient recruitment, primary clinical data collection, or experimental interventions.

Ultimately, the object of study extends beyond the numerical measurement of postoperative deaths. It includes the evaluation of how mortality indicators are defined, recorded, interpreted, and incorporated into hospital decision-making processes. This approach facilitates an integrated understanding of thirty-day mortality as both a clinical outcome and an instrument for epidemiological surveillance, institutional accountability, and continuous improvement in emergency surgical care.

## METODOLOGÍA

### Study Design and Methodological Approach

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This study was structured as a **narrative literature review with a descriptive, analytical, and comparative approach**, aimed at examining thirty-day mortality after emergency surgery from clinical, epidemiological, and hospital management perspectives. The methodological framework was based on the scientific method, incorporating systematic identification of relevant evidence, critical evaluation of published findings, comparative analysis, and interpretative synthesis.

The review was designed to integrate international scientific evidence while emphasizing research conducted in Latin America. Its analytical orientation sought to identify relationships between postoperative mortality, clinical risk factors, institutional performance indicators, epidemiological surveillance practices, and opportunities for improving emergency surgical care.

Unlike a systematic review or meta-analysis, this approach did not seek to generate pooled mortality estimates or quantify a single intervention effect. Instead, it prioritized the contextual interpretation of heterogeneous evidence, allowing clinical outcomes to be examined alongside institutional and healthcare system characteristics.

**1. Research Framework: Scientific Method**

The scientific method was selected as the principal methodological framework because it provides a logical sequence for defining a research problem, formulating questions, examining available evidence, and developing evidence-based conclusions.

The investigation was organized around the following guiding question:

*How do clinical risk factors, hospital performance indicators, and epidemiological surveillance practices contribute to the understanding of thirty-day mortality after emergency surgery, and what opportunities for healthcare quality improvement can be identified from international and Latin American evidence?*

The analytical proposition was that combining risk-adjusted mortality indicators with structured postoperative surveillance and institutional quality assessment could improve the identification of potentially modifiable factors associated with postoperative deaths. This proposition served as a framework for interpreting the literature rather than as a causal hypothesis subjected to experimental testing.

**2. Information Sources and Literature Search Strategy**

The literature search strategy was defined around scientific publications indexed in **PubMed/MEDLINE and Scopus**, prioritizing peer-reviewed studies addressing emergency surgical mortality, postoperative complications, hospital performance, and healthcare quality improvement.

The search terminology combined controlled vocabulary, where applicable, with free-text terms in English, including:

*Emergency surgery, emergency laparotomy, thirty-day mortality, postoperative mortality, perioperative mortality, hospital performance indicators, epidemiological surveillance, surgical outcomes, risk adjustment, patient safety, quality improvement, and Latin America.*

A reproducible search expression proposed for PubMed was:

("Emergency Surgical Procedures"MeSH Terms OR "emergency surgery"Title/Abstract OR "emergency laparotomy"Title/Abstract) AND ("Mortality"MeSH Terms OR "30-day mortality"Title/Abstract OR "postoperative mortality"Title/Abstract OR "perioperative mortality"Title/Abstract) AND ("risk factors"Title/Abstract OR "quality improvement"Title/Abstract OR "hospital performance"Title/Abstract OR "surveillance"Title/Abstract OR "surgical outcomes"Title/Abstract)

Additional searches focused on Latin American surgical outcomes, emergency general surgery registries, perioperative mortality reporting, and healthcare system inequalities.

The principal reference base comprised 20 scientific publications selected for their relevance to the research objectives. Foundational investigations were considered alongside more recent publications to provide historical context and

contemporary perspectives. References identified through bibliographic cross-checking could also be considered when directly relevant to the review.

For methodological reproducibility, the final search record should preserve database-specific queries, execution dates, filters, retrieved references, and reasons for exclusion. These operational details should be documented from the actual search records rather than estimated retrospectively.

**3. Eligibility Criteria and Evidence Selection**

The selection framework prioritized scientific publications meeting the following criteria:

- **Inclusion criteria:** peer-reviewed observational studies, multicenter investigations, cohort studies, relevant systematic or narrative reviews, surgical audits, risk prediction studies, and hospital quality improvement research addressing emergency surgical outcomes.
- **Population:** primarily adult patients undergoing emergency general surgery, with particular emphasis on emergency abdominal procedures.
- **Outcomes:** thirty-day postoperative mortality, mortality-related risk factors, postoperative complications, surgical performance indicators, or institutional quality measures.
- **Geographical scope:** international evidence, including studies conducted in Latin American healthcare systems.
- **Exclusion criteria:** publications without a meaningful relationship to emergency surgical outcomes, studies focused exclusively on elective surgery without transferable findings, duplicate reports, and sources lacking sufficient methodological information for critical interpretation.

Priority was assigned to studies reporting standardized mortality outcomes, clearly defined populations, and appropriate statistical methods. Publications using alternative postoperative observation periods were considered for contextual interpretation but were not treated as directly equivalent to thirty-day mortality studies.

**4. Data Extraction and Analytical Variables**

Information from eligible publications was organized using a structured evidence-extraction framework encompassing five analytical dimensions.

**Clinical characteristics:** age, comorbidities, preoperative physiological status, severity of illness, and predictors of postoperative mortality.

**Surgical characteristics:** indication for emergency intervention, procedural complexity, urgency, and relevant perioperative conditions.

**Epidemiological outcomes:** crude mortality, risk-adjusted mortality, observation periods, postoperative complications, and completeness of follow-up.

**Institutional characteristics:** hospital resources, critical care availability, organizational processes, delays in treatment, and multidisciplinary coordination.

**Quality improvement:** surveillance mechanisms, mortality audits, standardized protocols, risk prediction models, and hospital performance assessment strategies.

Data extraction emphasized the original definitions and reported findings of each study. Numerical findings were interpreted within their corresponding clinical populations and methodological contexts, avoiding direct comparisons when substantial differences existed in patient selection, risk adjustment, or outcome measurement.

**5. Critical Appraisal and Evidence Synthesis**

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The analytical process was guided by principles of methodological transparency, clinical relevance, and critical interpretation.

The evidence appraisal framework considered study design, sample characteristics, selection bias, outcome definitions, completeness of follow-up, adjustment for confounding variables, and applicability to different healthcare settings. For observational research, relevant criteria from the Newcastle–Ottawa Scale and the STROBE reporting framework were considered as methodological references, without treating reporting quality as equivalent to risk of bias.

A **thematic narrative synthesis** was selected because of the anticipated heterogeneity in surgical populations, institutional environments, outcome definitions, and study designs. Evidence was grouped into the following themes: epidemiological burden, clinical predictors, hospital performance, postoperative surveillance, healthcare inequalities, and improvement strategies.

Comparative interpretation emphasized consistency and disagreement among published findings, the limitations of individual investigations, and the distinction between statistical associations and causal relationships.

No new patient-level database was constructed, and no original mortality rates, effect estimates, or inferential statistics were generated. Published numerical results were retained within their original evidentiary context.

**6. Methodological Reliability and Reproducibility**

Reproducibility was supported through the definition of research questions, bibliographic search expressions, eligibility criteria, analytical variables, and thematic synthesis procedures.

The proposed methodological structure allows subsequent researchers to reproduce the literature search, evaluate the same categories of evidence, and compare the resulting interpretations. Nevertheless, narrative synthesis necessarily involves interpretative judgment, and complete reproducibility also requires preservation of the actual search history and a documented record of study selection.

Particular attention was given to avoiding misleading comparisons between crude and adjusted mortality, between emergency and elective surgical populations, and between in-hospital and thirty-day outcomes.

**7. Ethical Considerations**

The investigation was based exclusively on publicly available scientific literature and did not involve direct contact with patients, identifiable clinical records, biological samples, or experimental interventions.

Accordingly, the review did not require individual informed consent or introduce additional clinical risks to patients. Ethical considerations centered on accurate representation of scientific evidence, appropriate attribution of published findings, responsible interpretation of mortality indicators, and avoidance of unsupported causal conclusions.

## FASES DEL DESARROLLO

### Phase 1. Identification and Delimitation of the Research Problem

The first phase consisted of defining thirty-day mortality after emergency surgery as a relevant indicator of postoperative outcomes and healthcare quality. The research problem was established around the persistence of preventable and nonpreventable postoperative deaths, differences in hospital performance, and limitations in the standardization of mortality surveillance.

International evidence demonstrates that postoperative mortality varies according to patient characteristics, surgical complexity, and healthcare resource availability. The GlobalSurg Collaborative (2016) identified important differences in mortality across countries with different levels of development, suggesting that surgical outcomes are influenced by both clinical and structural determinants.

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The problem was delimited to adult emergency general surgery, particularly urgent abdominal operations, while recognizing that findings from broader surgical cohorts may provide additional contextual evidence. The principal outcome was defined as death from any cause within 30 days following the surgical procedure.

Three dimensions were established to guide the analysis: clinical determinants of mortality, hospital performance and organizational characteristics, and epidemiological surveillance systems.

**Phase 2. Formulation of the Research Question and Analytical Proposition**

The second phase involved structuring the research question according to the relationship between postoperative mortality, institutional performance, and surveillance practices.

The central research question was formulated as follows:

*How can the integrated evaluation of clinical risk factors, hospital performance indicators, and epidemiological surveillance contribute to identifying opportunities for reducing thirty-day mortality after emergency surgery?*

Three complementary questions supported the analysis:

- Which clinical and perioperative factors are most consistently associated with thirty-day mortality?
- How do institutional resources, organizational processes, and healthcare inequalities influence emergency surgical outcomes?
- Which surveillance practices and quality improvement strategies may strengthen postoperative mortality assessment and hospital decision-making?

The guiding analytical proposition was that risk-adjusted mortality assessment, comprehensive postoperative surveillance, and structured institutional quality improvement could contribute to more reliable identification of potentially modifiable factors affecting surgical outcomes.

This proposition was treated as an interpretative framework rather than an experimentally tested hypothesis, consistent with the narrative review design.

**Phase 3. Identification and Selection of Scientific Evidence**

The third phase focused on establishing a structured framework for identifying relevant scientific publications. PubMed/MEDLINE and Scopus were designated as the principal bibliographic sources because of their coverage of clinical, surgical, epidemiological, and health services research.

Search terms were organized around emergency surgery, thirty-day mortality, postoperative complications, hospital performance, surveillance, risk adjustment, and quality improvement. Additional terminology addressed Latin American surgical outcomes and healthcare disparities.

The reference base prioritized multicenter cohort studies, observational investigations, surgical audits, risk prediction models, and quality improvement research. Studies were considered relevant when they contributed evidence concerning postoperative mortality, determinants of adverse outcomes, institutional performance, or mortality surveillance.

The GlobalSurg Collaborative (2016), Eugene et al. (2018), Oliver et al. (2018), and Peden et al. (2019) provided important evidence regarding international mortality differences, prognostic assessment, organizational characteristics, and quality improvement strategies. Regional studies, including Pérez Rivera et al. (2024) and the Latin American Surgical Outcomes Study Group (2025), contributed information regarding surgical outcomes in Latin American healthcare systems.

The selection framework emphasized methodological relevance, clarity of outcome definitions, and applicability to the research objectives. The total number of retrieved and excluded records was not estimated in the absence of a documented database search log.

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**Phase 4. Classification and Organization of the Evidence**

The fourth phase consisted of organizing the selected literature into predefined analytical categories to facilitate comparison and thematic synthesis.

The information was structured according to five principal dimensions: clinical characteristics, surgical factors, epidemiological outcomes, institutional conditions, and quality improvement strategies.

Within the clinical dimension, emphasis was placed on age, comorbidities, physiological instability, sepsis, and organ dysfunction. Surgical variables included operative urgency, procedural complexity, and underlying disease severity. Epidemiological variables included mortality definitions, follow-up intervals, postoperative complications, and risk-adjusted outcomes.

The institutional dimension addressed operating room availability, critical care resources, organizational processes, and multidisciplinary coordination. Finally, the quality improvement dimension incorporated clinical audits, surveillance programs, standardized care pathways, and performance feedback mechanisms.

This classification was intended to facilitate the identification of recurrent findings across studies while preserving differences in methodology, population characteristics, and healthcare settings.

**Phase 5. Critical Analysis and Comparative Interpretation**

The fifth phase focused on examining relationships between mortality outcomes, clinical determinants, and institutional characteristics. Evidence was interpreted according to methodological quality, clinical relevance, and consistency across different healthcare environments.

Particular attention was given to distinguishing associations from causal relationships. For example, higher mortality in hospitals with limited resources may reflect differences in disease severity, delayed access to treatment, referral patterns, or organizational capacity rather than any single determinant.

Risk adjustment was considered essential for evaluating hospital performance. The predictive approach developed by Eugene et al. (2018) demonstrates how clinical variables can support more meaningful interpretation of postoperative mortality.

International comparisons were examined alongside Latin American findings to identify differences in surgical access, resource availability, and postoperative monitoring. However, results obtained from heterogeneous populations were not combined into a single pooled mortality estimate.

The analysis also considered contradictory or inconclusive findings. In particular, the EPOCH trial found no significant survival benefit from implementing a national quality improvement program, illustrating that standardized interventions do not necessarily produce improved outcomes without sufficient organizational support and implementation fidelity (Peden et al., 2019).

**Phase 6. Integration and Synthesis of Findings**

The sixth phase involved constructing an integrated interpretation of postoperative mortality through the interaction of clinical, epidemiological, and institutional factors.

The synthesis was organized around three interconnected analytical levels.

**Individual level:** Patient characteristics, underlying disease, physiological deterioration, comorbidities, and postoperative complications influencing the probability of death.

**Institutional level:** Availability of specialized personnel, operating room accessibility, intensive care capacity, communication processes, postoperative surveillance, and timely management of complications.

**Health system level:** Geographic accessibility, referral networks, resource distribution, epidemiological reporting, and national surgical quality policies.

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These analytical levels were used to develop a conceptual framework explaining how patient vulnerability and healthcare delivery conditions may interact to influence postoperative outcomes.

The synthesis also distinguished potentially modifiable institutional processes from baseline clinical characteristics that cannot be directly altered. This distinction was fundamental for identifying realistic quality improvement opportunities without attributing all postoperative deaths to failures in healthcare delivery.

**Phase 7. Formulation of Evidence-Informed Improvement Strategies**

The final phase focused on translating the synthesized evidence into potential strategies for strengthening emergency surgical care and postoperative mortality surveillance.

The proposed improvement framework incorporated standardized risk assessment, early recognition of postoperative deterioration, adequate clinical documentation, consistent mortality definitions, and structured follow-up during the first 30 postoperative days.

At the institutional level, relevant strategies included multidisciplinary mortality reviews, regular analysis of risk-adjusted indicators, evaluation of delays in surgical treatment, and continuous monitoring of postoperative complications.

At the health system level, priority areas included strengthening surgical registries, improving referral coordination, expanding access to essential perioperative resources, and promoting standardized reporting practices.

These strategies were considered in relation to their feasibility across different healthcare environments, particularly in Latin American hospitals where infrastructure, staffing, and financial resources may vary substantially.

## RESULTADOS Y DISCUSIÓN

**Figure 1.**

*Thirty-Day Postoperative Mortality Across Human Development Settings*

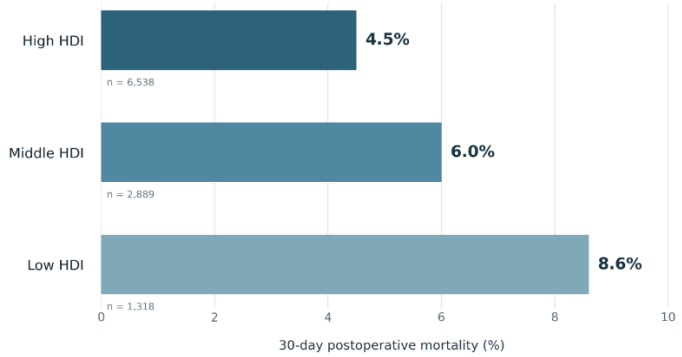



Figure 1 presents the distribution of thirty-day postoperative mortality following emergency abdominal surgery across countries classified according to their Human Development Index (HDI). The analysis incorporates findings from the GlobalSurg Collaborative (2016), a prospective multicenter cohort study involving 10,745 patients treated at 357 hospitals across 58 countries. The population was distributed into three categories: high-HDI settings (n = 6,538), middle-HDI settings (n = 2,889), and low-HDI settings (n = 1,318). This classification permits the comparison of postoperative mortality across healthcare environments characterized by different levels of socioeconomic development and healthcare resources.

The results demonstrate a progressive increase in thirty-day mortality as the level of human development decreases. Patients treated in high-HDI settings presented the lowest mortality rate, at **4.5%**, whereas those in middle-HDI settings experienced a mortality rate of **6.0%**. The highest proportion of postoperative deaths was observed in low-HDI

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settings, reaching **8.6%**. The overall thirty-day mortality rate across the complete study population was 5.4% (GlobalSurg Collaborative, 2016).

The absolute difference between high- and middle-HDI settings was 1.5 percentage points, while the difference between middle- and low-HDI settings reached 2.6 percentage points. The comparison between the highest and lowest development categories demonstrated an absolute difference of 4.1 percentage points. In relative terms, the crude mortality rate observed in low-HDI settings was approximately 1.91 times that reported in high-HDI settings. These descriptive comparisons illustrate the magnitude of the differences identified across the three categories without implying direct causal relationships.

The original investigation also identified a statistically significant association between HDI classification and thirty-day postoperative mortality ($p < .001$). Importantly, the differences were not restricted to unadjusted mortality estimates. Following multivariable adjustment, patients in middle-HDI settings demonstrated higher odds of postoperative death than those in high-HDI settings (OR = 2.78; 95% CI: 1.84–4.20). Similarly, the adjusted odds ratio for low-HDI settings was 2.97 (95% CI: 1.84–4.81). These findings indicate that differences between development categories remained evident after adjustment for variables included in the statistical model (GlobalSurg Collaborative, 2016).

The distribution of the study population also revealed differences in the number of patients represented within each development category. High-HDI countries contributed approximately 60.8% of the cohort, compared with 26.9% from middle-HDI countries and 12.3% from low-HDI countries. Therefore, the mortality estimates were derived from groups of unequal sizes. This distinction is relevant when interpreting the precision and representativeness of the estimates, particularly for the low-HDI category.

The findings presented in Figure 1 correspond specifically to emergency abdominal surgical procedures and should not be generalized without qualification to every category of emergency surgery. Furthermore, the HDI classification represents a national development indicator rather than a direct measurement of individual hospital infrastructure or institutional performance. Accordingly, the observed differences describe associations between development settings and postoperative outcomes rather than the independent effects of specific hospital characteristics.

**Figure 2.**

*Temporal Distribution of Mortality After Emergency Abdominal Surgery*

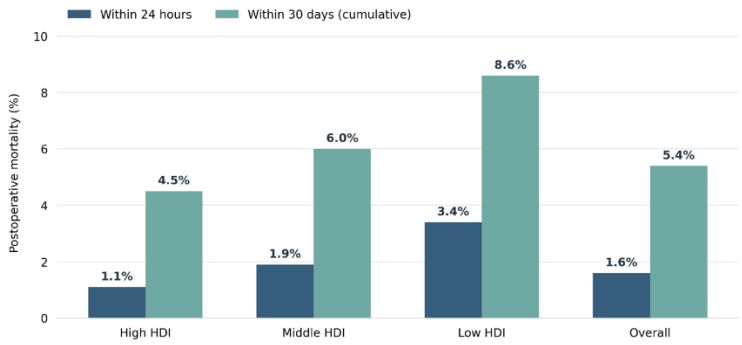



Figure 2 illustrates the temporal distribution of postoperative mortality following emergency abdominal surgery, comparing deaths recorded within the first 24 hours with cumulative mortality observed during the 30-day postoperative period. The findings were obtained from the prospective multicenter investigation conducted by the GlobalSurg Collaborative (2016), which included 10,745 patients from 357 hospitals across 58 countries. Mortality outcomes were stratified according to three categories of the Human Development Index (HDI), allowing comparison of early postoperative mortality and longer-term survival across different healthcare environments.

The overall mortality rate within the first 24 postoperative hours was **1.6%**, corresponding to 174 deaths. By postoperative day 30, cumulative mortality had increased to **5.4%**, representing 578 deaths. Consequently, 404 deaths occurred after the initial 24-hour period but within the first 30 postoperative days. These events accounted for 69.9% of all deaths documented during the observation period (GlobalSurg Collaborative, 2016). Thus, approximately seven out of every ten recorded postoperative deaths occurred after the first postoperative day.

In high-HDI settings, mortality increased from 1.1% within the first 24 hours to 4.5% at 30 days, representing an absolute increase of 3.4 percentage points. Among the 291 patients who died within the observation period, 75 deaths occurred during the first 24 hours, whereas 216 were recorded subsequently. Therefore, **74.2% of deaths in high-HDI settings occurred between the second postoperative day and day 30**, representing the highest proportion of later deaths among the three development categories.

Middle-HDI settings demonstrated mortality rates of 1.9% within 24 hours and 6.0% at 30 days. The absolute difference between these observation periods was 4.1 percentage points. Of the 173 deaths recorded, 54 occurred during the first postoperative day and 119 occurred afterward, accounting for 31.2% and 68.8% of deaths, respectively. This distribution demonstrates that mortality accumulated substantially beyond the immediate postoperative period, with more than two-thirds of deaths occurring after the initial 24 hours (GlobalSurg Collaborative, 2016).

Low-HDI settings exhibited the highest mortality at both observation points, with rates of 3.4% within 24 hours and 8.6% at 30 days. The absolute increase of 5.2 percentage points was greater than that observed in the other development categories. Among the 114 deaths recorded in this group, 45 occurred within the first 24 hours and 69 occurred afterward. Accordingly, 39.5% of deaths occurred during the immediate postoperative period, while 60.5% occurred between 24 hours and 30 days.

Comparison of the three development categories identified a consistent mortality gradient. At 24 hours, mortality in low-HDI settings was approximately 3.1 times that reported in high-HDI settings, based on the rounded published rates. At 30 days, the corresponding crude rate ratio was approximately 1.9. These descriptive ratios indicate that differences between development categories were evident at both observation points, although their relative magnitude varied according to the postoperative interval examined.

The original study identified statistically significant differences in mortality across HDI categories at both 24 hours and 30 days ($p < .001$ for each comparison). Additionally, the distribution of deaths occurring within the first postoperative day versus those occurring afterward differed significantly across development groups ($p = .024$). These findings confirm that mortality varied not only in its overall frequency but also in its temporal distribution (GlobalSurg Collaborative, 2016).

A further distinction concerns the relationship between cumulative mortality and the timing of individual deaths. The 30-day mortality rates presented in Figure 2 include deaths occurring within the first 24 hours; therefore, the two series represent nested observation periods rather than independent groups. The difference between cumulative mortality rates describes the additional proportion of the original surgical population who died after 24 hours and before completion of the 30-day observation period.

The temporal distribution also varied according to the indication for emergency surgery. In the original cohort, patients undergoing emergency surgery for traumatic injuries demonstrated a different pattern from patients treated for nontraumatic abdominal conditions. Of the 82 deaths associated with trauma, 50 occurred within the first 24 hours, whereas 32 occurred afterward. In contrast, the majority of deaths associated with nontraumatic surgical indications occurred after the initial postoperative day (GlobalSurg Collaborative, 2016). This distinction demonstrates heterogeneity in the timing of mortality among different emergency surgical populations.

**Figure 3.**

*Clinical Determinants of Thirty-Day Mortality Following Emergency Surgery*

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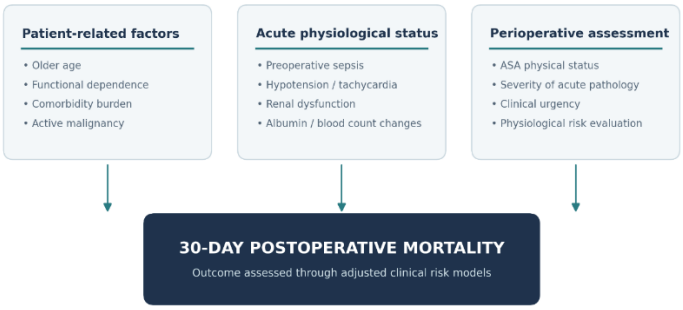



Figure 3 summarizes the principal clinical determinants associated with thirty-day postoperative mortality following emergency abdominal surgery, organized into three complementary domains: patient-related characteristics, acute physiological disturbances, and perioperative risk assessment. The classification was developed from published evidence on emergency laparotomy, particularly the systematic scoping review conducted by Barazanchi et al. (2020) and the National Emergency Laparotomy Audit (NELA) risk prediction study by Eugene et al. (2018).

The evidence synthesized by Barazanchi et al. (2020) included 22 studies involving 157,728 patients undergoing emergency laparotomy. Across the included investigations, the combined reported thirty-day postoperative mortality was approximately 13%. The review identified several preoperative characteristics consistently associated with mortality, including advanced age, higher American Society of Anesthesiologists (ASA) physical status classification, functional dependence, active malignancy, preoperative sepsis, and abnormalities in physiological and laboratory parameters. Nevertheless, substantial heterogeneity prevented a quantitative meta-analysis of the individual risk factors.

Within the first domain, **patient-related characteristics** represented a substantial component of postoperative risk. Advanced age was identified as a recurrent predictor of mortality, although its clinical significance must be considered alongside functional status and associated diseases. Patients with reduced functional independence or substantial comorbidity burdens exhibited greater vulnerability to postoperative adverse outcomes in the reviewed literature. Active malignancy was also associated with increased mortality, reflecting the importance of underlying disease characteristics in the assessment of surgical risk (Barazanchi et al., 2020).

The second domain encompasses **acute physiological disturbances**, which provide information regarding the patient's clinical condition immediately before surgical intervention. Preoperative sepsis was identified among the factors associated with increased mortality. Similarly, alterations in renal function, serum albumin concentration, and complete blood count parameters demonstrated associations with postoperative outcomes. These laboratory findings were evaluated as indicators of physiological disturbance rather than as isolated determinants capable of independently explaining mortality.

Evidence from the NELA study further supports the relevance of physiological assessment. Eugene et al. (2018) analyzed 38,830 patients undergoing emergency laparotomy, among whom 4,458 died within 30 days, corresponding to a mortality rate of 11.5%. Variables associated with mortality included age, blood pressure, heart rate, physiological measurements, malignancy, and ASA physical status classification. The analysis demonstrated substantial variation in estimated mortality risk across the surgical population, consistent with differences in patients' preoperative clinical conditions.

The third domain concerns **perioperative risk assessment**, particularly the integration of multiple clinical variables into structured prediction models. ASA physical status classification appeared in both principal sources as a relevant component of mortality assessment. However, the figure does not treat ASA classification as equivalent to a comprehensive prognostic model. Rather, it represents one clinical measure that can be incorporated into broader risk-adjustment approaches.

In the NELA investigation, the developed prediction model demonstrated a C-statistic of 0.863 (95% CI: 0.858–0.867), indicating strong discrimination between patients with different postoperative mortality outcomes. Internal validation

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produced a C-statistic of 0.861. The investigators also reported substantial variation in predicted mortality across patients, with estimated risks ranging from approximately 1% to 50% (Eugene et al., 2018).

These findings demonstrate that thirty-day mortality following emergency laparotomy is associated with a combination of baseline patient characteristics and acute clinical conditions. No single variable presented in Figure 3 adequately represents the full spectrum of postoperative risk. Instead, the included studies identified multiple factors that contribute information to mortality prediction and risk adjustment.

An additional finding from the scoping review concerns variables with less consistent associations. Barazanchi et al. (2020) did not identify an overall association between diabetes or surgical delay and mortality in their synthesis, while higher body mass index was associated with lower mortality in the included evidence. These findings should be interpreted within the limitations of the reviewed populations and study designs. In particular, the absence of a consistent association for surgical delay should not be interpreted as evidence that delaying emergency surgery is clinically harmless.

The two principal investigations also differed in their analytical approaches. Barazanchi et al. (2020) synthesized evidence from multiple studies to identify preoperative mortality predictors, whereas Eugene et al. (2018) developed and internally validated a multivariable risk-adjustment model using a defined national surgical cohort. Despite these methodological differences, both sources identified age, physiological status, comorbidity-related characteristics, and ASA classification as relevant elements of postoperative mortality assessment.

**Figure 4.**

*Risk Adjustment and Hospital Performance in Emergency Surgical Care*

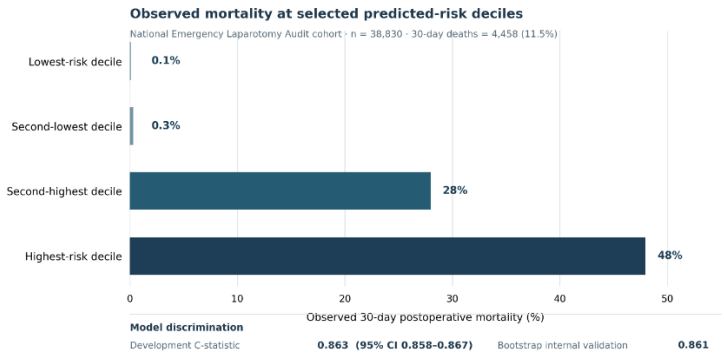



Figure 4 presents the distribution of observed thirty-day postoperative mortality across selected predicted-risk categories, together with the discriminatory performance of the National Emergency Laparotomy Audit (NELA) risk prediction model. The data were obtained from the multicenter investigation conducted by Eugene et al. (2018), which analyzed 38,830 patients undergoing emergency laparotomy between December 2013 and November 2015. The study aimed to develop a clinical prediction model capable of estimating postoperative mortality and supporting risk-adjusted comparisons between healthcare providers.

Within the study population, **4,458 deaths were recorded during the first 30 postoperative days**, corresponding to an overall mortality rate of 11.5%. However, the distribution of mortality was not uniform across the surgical population. Considerable differences were observed between patients categorized into lower and higher predicted-risk groups, demonstrating substantial heterogeneity in baseline mortality risk (Eugene et al., 2018).

In the two lowest predicted-risk deciles, observed thirty-day mortality rates were 0.1% and 0.3%, respectively. In contrast, the two highest predicted-risk deciles demonstrated observed mortality rates of 28% and 48%. These findings indicate pronounced differences in postoperative outcomes between patients classified according to their estimated probability of death.

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The absolute difference between the lowest and highest reported deciles reached 47.9 percentage points. This comparison demonstrates the extent of mortality variation within the same emergency laparotomy population. Importantly, the figure presents only the four deciles for which the source explicitly reports these values; the six intermediate deciles are not represented.

The predictive model incorporated variables associated with postoperative mortality, including patient age, systolic blood pressure, heart rate, physiological measurements, malignancy status, and American Society of Anesthesiologists (ASA) physical status classification. These characteristics were incorporated into a multivariable logistic regression model to estimate the probability of death within thirty days after surgery (Eugene et al., 2018).

Regarding predictive performance, the NELA model demonstrated a **C-statistic of 0.863**, with a 95% confidence interval ranging from 0.858 to 0.867. This result indicates strong discrimination between patients who experienced postoperative death and those who survived the thirty-day observation period. In practical statistical terms, the C-statistic represents the probability that the model assigns a higher estimated mortality risk to a randomly selected patient who died than to a randomly selected patient who survived.

Internal validation using bootstrap resampling produced a C-statistic of **0.861**, representing a difference of only 0.002 compared with the original development estimate. The similarity between these values indicates that the model maintained its discriminatory performance during internal validation within the analyzed dataset (Eugene et al., 2018).

In addition to discrimination, the investigation assessed calibration, defined as the agreement between predicted mortality probabilities and observed outcomes. The authors reported good calibration across levels of predicted risk, with differences between observed and predicted mortality not exceeding three percentage points within any risk decile. This finding provides information about the relationship between model-generated probabilities and the mortality actually recorded in the study population.

The distinction between discrimination and calibration is particularly important when interpreting Figure 4. Discrimination describes the ability of the model to distinguish between individuals with different outcomes, whereas calibration evaluates how closely predicted probabilities correspond to observed mortality. These measures represent complementary dimensions of predictive performance and should not be considered interchangeable.

The variation in observed mortality across risk deciles also demonstrates why crude mortality rates and risk-adjusted indicators provide different forms of information. The overall mortality rate of 11.5% describes the proportion of patients who died in the complete cohort, whereas risk stratification identifies substantial differences in mortality among subgroups with distinct clinical characteristics. The figure does not present hospital-specific adjusted mortality rates; rather, it displays the patient-level risk variation underlying the model intended for hospital performance assessment.

Eugene et al. (2018) further reported that predicted individual mortality probabilities varied considerably within the emergency laparotomy population, ranging from approximately 1% to 50%. This variation is consistent with the substantial differences in observed mortality across the lowest and highest risk categories. Nevertheless, predicted probabilities and observed decile mortality are different measurements and must be distinguished when interpreting the results.

The findings presented in Figure 4 are specific to the study population and internal validation procedures. Although the model demonstrated strong statistical performance, the original investigation did not establish equivalent predictive accuracy in every healthcare environment. Accordingly, its reported discrimination and calibration characteristics should not automatically be generalized to institutions with substantially different patient populations, clinical practices, or data quality.

**Figure 5.**

*Postoperative Mortality Surveillance and Institutional Quality Indicators*

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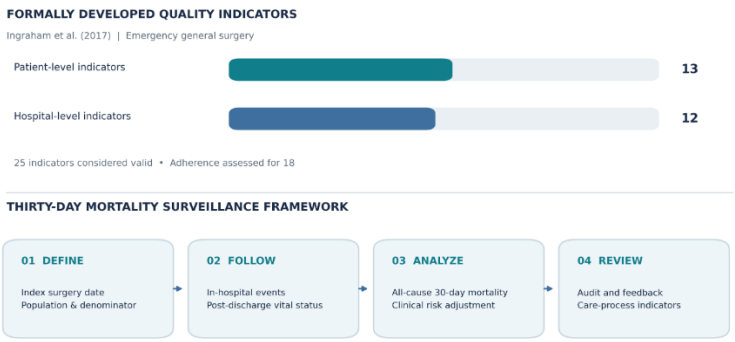



Figure 5 presents the principal components of postoperative mortality surveillance and institutional quality assessment in emergency general surgery. The figure integrates the distribution of formally developed quality indicators reported by Ingraham et al. (2017) with a structured representation of the essential processes involved in measuring and interpreting postoperative mortality. The analytical framework distinguishes indicators related to individual patient care from those associated with hospital organization and performance.

The investigation conducted by Ingraham et al. (2017) identified **25 indicators considered valid for assessing the quality of emergency general surgical care**, following a structured expert consensus process based on a modified Delphi methodology. Of these indicators, 13 corresponded to patient-level quality measures, while 12 addressed hospital-level characteristics. Therefore, patient-level measures represented 52% of the validated indicators, compared with 48% corresponding to hospital-level measures. This distribution demonstrates the relatively balanced representation of clinical care processes and organizational characteristics within the proposed quality assessment framework.

The investigators subsequently examined adherence to 18 selected indicators across four academic medical centers, focusing on patients undergoing nonelective cholecystectomy, appendectomy, colectomy, and small bowel resection. Considerable variation was identified across institutions and procedures, indicating that adherence to established quality measures was not uniform.

Among the evaluated indicators, compliance with performing cholecystectomy for acute cholecystitis within 72 hours of symptom onset ranged from **45% to 76%**. For patients with an uncontained perforated viscus, compliance with initiating surgery within three hours after the decision to operate ranged from **20% to 100%**. Similarly, adherence to timely surgical exploration for small bowel obstruction accompanied by ischemia or impending perforation varied from **0% to 88%** across the participating hospitals (Ingraham et al., 2017).

These results illustrate substantial differences in institutional adherence to selected emergency surgical care indicators. However, the reported percentages describe compliance with specific care processes rather than postoperative mortality rates. Accordingly, they should not be interpreted as direct measurements of patient survival or as evidence that variation in adherence independently caused differences in mortality.

A particularly relevant finding involved three indicators for which none of the participating institutions demonstrated compliance. These included auditing 30-day unplanned readmissions or operations among patients previously managed nonoperatively, monitoring time to source control for intra-abdominal infections, and maintaining protocols for bypass or interhospital transfer. The absence of compliance with these indicators identifies gaps in the documented organizational and monitoring processes evaluated in the study (Ingraham et al., 2017).

The second component of Figure 5 represents four interrelated stages in the measurement of postoperative mortality: defining the population and index procedure, following patients throughout the observation period, analyzing outcomes with appropriate risk adjustment, and reviewing institutional performance.

The importance of standardized measurement is supported by Ariyaratnam et al. (2015), who examined perioperative mortality across four surgical datasets representing different healthcare environments. Their investigation included

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1,362,635 hospital admissions and 1,514,242 procedures, with 8,655 deaths documented within 30 days. The authors demonstrated that mortality estimates varied according to the selected denominator and the observation period.

Differences between procedure-based and admission-based mortality calculations ranged from 7% to 70%, depending on the dataset and included procedures. These findings demonstrate that the selection of the analytical denominator materially affects the reported mortality indicator. Consequently, mortality estimates based on surgical procedures cannot automatically be considered equivalent to estimates calculated using hospital admissions (Ariyaratnam et al., 2015).

Another relevant finding concerned the completeness of postoperative mortality surveillance. In the New Zealand dataset, reliance on in-hospital deaths underestimated total 30-day mortality by approximately one-third. This discrepancy illustrates the difference between deaths occurring during hospitalization and those recorded throughout a complete postoperative observation period, including events following discharge.

The reviewed evidence also identified the importance of patient characteristics in interpreting institutional mortality rates. Ariyaratnam et al. (2015) found that age greater than 65 years and emergency admission were independently associated with perioperative mortality. Their analysis further demonstrated that differences between healthcare settings could not be fully characterized through crude mortality calculations alone.

Together, these findings establish a distinction between three categories of hospital information: **outcome indicators**, such as 30-day mortality; **process indicators**, such as time to surgery or source control; and **organizational indicators**, such as the presence of transfer protocols or formal clinical audit systems.

The studies included in this figure differed in their primary objectives. Ingraham et al. (2017) concentrated on the development and assessment of quality indicators specifically applicable to emergency general surgery, whereas Ariyaratnam et al. (2015) evaluated the measurement and reporting of perioperative mortality across different surgical healthcare settings. The combined presentation therefore represents a descriptive synthesis of complementary evidence rather than a pooled statistical analysis.

## DISCUSIÓN

The findings of this narrative review demonstrate that thirty-day mortality following emergency surgery is a multifactorial outcome influenced by patient characteristics, physiological deterioration, surgical complexity, institutional organization, and healthcare system resources. The reviewed evidence suggests that postoperative mortality cannot be adequately evaluated through isolated clinical indicators or crude mortality rates. Instead, its interpretation requires an integrated approach that incorporates risk adjustment, epidemiological surveillance, and hospital performance assessment. This perspective is particularly relevant in emergency surgical care, where clinical severity and organizational constraints frequently coexist (GlobalSurg Collaborative, 2016; Barazanchi et al., 2020).

One of the principal findings concerns the substantial international variation in thirty-day postoperative mortality. The GlobalSurg Collaborative (2016) reported mortality rates of 4.5%, 6.0%, and 8.6% across high-, middle-, and low-Human Development Index settings, respectively. These differences persisted after adjustment for relevant clinical characteristics, suggesting that variations in postoperative survival are not explained exclusively by differences in patient populations. Nevertheless, socioeconomic development represents a broad contextual measure rather than a direct indicator of hospital quality. Therefore, the relationship between national development and surgical mortality should be interpreted in conjunction with healthcare accessibility, institutional capabilities, and the availability of perioperative resources.

An important observation was the temporal distribution of postoperative deaths. Approximately 70% of deaths reported by the GlobalSurg Collaborative (2016) occurred after the first 24 postoperative hours, emphasizing that mortality extends considerably beyond the immediate surgical period. This finding supports the relevance of comprehensive postoperative surveillance rather than limiting outcome assessment to intraoperative events or early mortality. However, the timing of death alone cannot establish whether an adverse outcome was preventable. Determining

preventability requires additional information regarding clinical deterioration, complication recognition, treatment delays, and the appropriateness of therapeutic interventions.

The identification of clinical determinants represents another central component of the reviewed evidence. Advanced age, elevated ASA physical status classification, functional dependence, malignancy, sepsis, and physiological abnormalities were repeatedly associated with increased postoperative mortality (Barazanchi et al., 2020). These findings are consistent with the risk-adjustment model developed by Eugene et al. (2018), which demonstrated strong discriminatory performance in predicting thirty-day mortality following emergency laparotomy. The convergence of these investigations reinforces the importance of evaluating postoperative outcomes in relation to baseline clinical risk.

Nevertheless, predictive performance should not be confused with causal explanation. Risk prediction models estimate the probability of an outcome based on observed associations, but they do not necessarily identify the mechanisms responsible for mortality. Furthermore, models developed within specific healthcare systems may demonstrate different calibration when applied to populations with distinct epidemiological characteristics, surgical practices, or resource availability. Consequently, the use of prognostic instruments in Latin American hospitals requires consideration of external validation and local population characteristics before they are adopted as institutional performance measures.

The relationship between postoperative mortality and hospital organization is particularly relevant from a healthcare administration perspective. Oliver et al. (2018) examined organizational factors associated with mortality following emergency laparotomy, highlighting the need to evaluate institutional characteristics alongside patient-level variables. Operating room accessibility, availability of critical care services, multidisciplinary communication, and postoperative monitoring represent components of the healthcare delivery process that may influence surgical outcomes. However, observational associations between organizational characteristics and mortality should not automatically be interpreted as evidence of direct causation.

In this context, the distinction between crude and risk-adjusted mortality becomes essential. Hospitals treating patients with advanced disease, severe physiological instability, or complex surgical emergencies may present higher unadjusted mortality despite delivering clinically appropriate treatment. Conversely, institutions managing lower-risk populations may demonstrate favorable crude outcomes without necessarily providing superior care. The NELA model illustrates how incorporating patient-related characteristics can improve the interpretation of mortality outcomes, although risk adjustment cannot completely eliminate residual confounding or differences in data quality (Eugene et al., 2018).

The findings concerning hospital quality indicators further demonstrate that mortality assessment should not depend on a single outcome measure. Ingraham et al. (2017) identified 25 validated quality indicators for emergency general surgery, encompassing both patient-level and hospital-level characteristics. Their investigation documented substantial institutional variation in adherence to selected care processes. These differences highlight the importance of assessing how emergency surgical care is delivered rather than evaluating postoperative deaths exclusively.

Similarly, Ariyaratnam et al. (2015) demonstrated that perioperative mortality estimates vary according to the denominator, observation period, and reporting methodology employed. The underestimation associated with restricting surveillance to in-hospital deaths constitutes a particularly relevant limitation. Hospitals that do not systematically identify deaths after discharge may report mortality estimates that fail to represent the complete postoperative period. This problem may affect institutional benchmarking and reduce the reliability of comparisons between healthcare systems.

The implementation of quality improvement interventions introduces additional complexity. The EPOCH trial evaluated a national initiative designed to improve emergency abdominal surgical care but did not demonstrate a statistically significant reduction in mortality (Peden et al., 2019). This finding is important because it challenges the assumption that introducing standardized protocols necessarily produces measurable improvements in survival. Implementation fidelity, institutional engagement, resource availability, and the ability to sustain organizational changes may influence the effectiveness of quality improvement programs. Consequently, interventions should be evaluated using both implementation indicators and patient-centered outcomes.

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The Latin American context introduces additional considerations regarding the interpretation and applicability of international evidence. The Latin American Surgical Outcomes Study Group (2025) provided extensive regional information on postoperative outcomes across 17 countries, while Pérez Rivera et al. (2024) contributed evidence concerning perioperative mortality measurement in Colombian hospitals. These investigations demonstrate the growing relevance of regional research for characterizing surgical outcomes. Nevertheless, differences in surgical populations, observation periods, and study objectives limit direct numerical comparisons with investigations focused exclusively on thirty-day mortality after emergency laparotomy.

An important challenge for Latin American healthcare systems concerns the heterogeneity of institutional resources and surveillance capabilities. Differences in referral networks, availability of specialized personnel, access to intensive care, and postoperative follow-up may complicate the implementation of uniform quality assessment strategies. Accordingly, international mortality benchmarks should be interpreted in relation to local clinical and organizational conditions. Developing standardized regional registries and strengthening the completeness of postoperative outcome reporting could facilitate more meaningful comparisons while respecting differences in institutional case complexity.

From an epidemiological perspective, the reviewed evidence supports distinguishing three complementary dimensions of surgical quality: outcomes, clinical processes, and organizational structure. Thirty-day mortality represents an outcome measure; timely evaluation and appropriate postoperative monitoring correspond to care processes; and the availability of personnel, infrastructure, and surveillance systems reflects institutional structure. Evaluating these dimensions together provides a more comprehensive framework than mortality measurement alone (Ingraham et al., 2017; Oliver et al., 2018).

**Limitations of the Review**

Several limitations must be acknowledged. First, the narrative design does not provide the same level of methodological control as a systematic review with a prospectively registered protocol, exhaustive study selection, and formal quantitative synthesis. Consequently, selection bias and interpretative subjectivity cannot be completely excluded.

Second, the included investigations differed in surgical populations, sample sizes, healthcare environments, risk-adjustment methods, and outcome definitions. Some studies focused specifically on emergency laparotomy, whereas others evaluated broader emergency or general surgical populations. These differences limit direct comparisons and prevent the calculation of a valid pooled thirty-day mortality estimate from the selected evidence.

Third, international studies were not uniformly representative of Latin American healthcare settings. Although regional investigations were incorporated, differences in follow-up periods and outcome definitions constrained their comparability with global emergency surgery cohorts.

Finally, the review examined published information rather than original patient-level datasets. Therefore, it was not possible to independently assess unreported confounding variables, verify the completeness of postoperative follow-up, or determine the preventability of individual deaths.

**Implications for Clinical Practice and Future Research**

The findings indicate that future investigations should prioritize standardized definitions of thirty-day mortality, consistent post-discharge follow-up, and locally validated risk-adjustment models. Multicenter prospective studies involving Latin American hospitals would be particularly valuable for examining the relationship between surgical outcomes, institutional resources, and healthcare delivery processes.

Further research should also evaluate the effectiveness of specific interventions, including structured postoperative surveillance, multidisciplinary mortality reviews, improved referral coordination, and targeted quality improvement programs. These investigations should distinguish between improvements in process indicators and demonstrable reductions in postoperative mortality.

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## CONCLUSIÓN

Thirty-day mortality following emergency surgery represents a fundamental indicator of postoperative outcomes, patient safety, and healthcare system performance. The findings of this narrative review demonstrate that postoperative mortality is influenced by a complex interaction of clinical, surgical, epidemiological, and institutional factors. Consequently, its evaluation requires an integrated approach that extends beyond the assessment of individual patient characteristics or isolated surgical outcomes.

International evidence reveals substantial differences in postoperative mortality across healthcare environments, particularly between countries with different levels of socioeconomic development and access to essential surgical resources. The findings of the GlobalSurg Collaborative (2016) emphasize the persistence of these disparities, while the identification of a substantial proportion of deaths occurring after the first postoperative day reinforces the importance of comprehensive surveillance throughout the 30-day observation period.

The reviewed literature identifies advanced age, physiological instability, comorbidities, sepsis, and surgical complexity as relevant determinants of postoperative mortality. Furthermore, predictive models such as the National Emergency Laparotomy Audit risk model demonstrate the value of incorporating clinical characteristics into mortality assessment. Risk adjustment provides a more appropriate foundation for interpreting institutional outcomes, although it does not eliminate all sources of confounding or establish the preventability of individual deaths.

Hospital organization constitutes an additional dimension of surgical outcomes. The availability of specialized personnel, timely access to operative management, appropriate postoperative monitoring, and effective multidisciplinary coordination are important components of emergency surgical care. However, evidence from quality improvement investigations demonstrates that implementing standardized protocols does not automatically translate into reductions in mortality. Institutional strategies therefore require continuous evaluation, adequate resources, and measurable performance indicators.

Epidemiological surveillance emerges as an essential component of reliable mortality assessment. Standardized definitions, complete postoperative follow-up, appropriate selection of denominators, and systematic reporting are necessary to reduce inconsistencies between institutions. Combining thirty-day mortality with process and organizational indicators offers a more comprehensive understanding of healthcare quality than mortality rates considered independently.

In Latin America, regional investigations have expanded the available evidence on perioperative outcomes, although substantial differences in hospital infrastructure, clinical resources, and surveillance capabilities remain relevant to the interpretation of findings. Strengthening regional surgical registries, promoting standardized reporting, and developing locally validated risk-adjustment instruments constitute important priorities for future research and institutional evaluation.

This review also highlights the need to distinguish between factors associated with mortality and those that can be modified through healthcare interventions. While baseline patient vulnerability cannot always be altered, opportunities may exist to improve diagnostic timeliness, postoperative monitoring, complication recognition, continuity of care, and institutional coordination. Nevertheless, the effectiveness of these strategies must be established through appropriately designed investigations rather than assumed from observational associations.

The principal limitations of the available evidence include heterogeneity in surgical populations, inconsistent mortality definitions, differences in follow-up periods, and limited comparability between healthcare systems. The narrative nature of the present review also prevents quantitative synthesis and definitive causal conclusions, underscoring the importance of prospective multicenter research incorporating standardized clinical and institutional indicators.

**In conclusion, thirty-day mortality after emergency surgery should be understood as a multidimensional measure that reflects patient-related risk, perioperative care, and healthcare system performance.** Its systematic evaluation through epidemiological surveillance, risk-adjusted indicators, and continuous institutional assessment provides a foundation for identifying opportunities to improve emergency surgical services. Future initiatives should prioritize reliable data collection, equitable performance comparisons, multidisciplinary collaboration, and rigorous

evaluation of interventions aimed at improving postoperative survival, particularly in healthcare settings with limited resources.

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