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CLINICAL ANESTHETIC EVALUATION OF PATIENTS WITH CHRONIC LIVER DISEASE UNDERGOING EMERGENCY SURGERY: A SYSTEMATIC REVIEW

AVALIAÇÃO ANESTÉSICA CLÍNICA DE PACIENTES COM DOENÇA HEPÁTICA CRÔNICA SUBMETIDOS À CIRURGIA DE EMERGÊNCIA: UMA REVISÃO SISTEMÁTICA

EVALUACIÓN ANESTÉSICA CLÍNICA DE PACIENTES CON ENFERMEDAD HEPÁTICA CRÓNICA SOMETIDOS A CIRUGÍA DE EMERGENCIA: UNA REVISIÓN SISTEMÁTICA

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ABSTRACT

Introduction: Chronic liver disease represents a major anesthetic challenge in emergency surgical settings due to profound alterations in hemodynamics, coagulation, metabolism, and immune function. Patients with hepatic dysfunction are at increased risk of perioperative morbidity and mortality, particularly when surgery is unplanned and optimization time is limited. Emergency procedures amplify these risks by restricting comprehensive preoperative assessment and correction of physiological derangements.

Objective: The primary objective of this systematic review was to synthesize current evidence on anesthetic evaluation and perioperative risk stratification in patients with chronic liver disease undergoing emergency surgery. Secondary objectives included evaluating the role of liver disease severity scores, identifying key predictors of adverse outcomes, assessing anesthetic management strategies, analyzing perioperative monitoring approaches, and exploring implications for multidisciplinary decision-making.

Methods: A systematic search was conducted across PubMed, Scopus, Web of Science, Cochrane Library, LILACS, ClinicalTrials.gov, and the International Clinical Trials Registry Platform. Studies published within the last five years were prioritized, with eligibility expanded to ten years if fewer than ten studies were identified. Inclusion criteria encompassed clinical studies involving adult patients with chronic liver disease undergoing emergency surgical

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procedures and reporting anesthetic, perioperative, or outcome-related data. Data were synthesized qualitatively according to PRISMA guidelines.

Results and Discussion: Twenty studies met the inclusion criteria and were analyzed in detail. The evidence consistently demonstrated that higher liver disease severity, as measured by validated scoring systems, was associated with increased perioperative complications and mortality. Hemodynamic instability, coagulopathy, renal dysfunction, and infection emerged as central determinants of adverse outcomes, underscoring the importance of structured anesthetic evaluation even in emergency contexts.

Conclusion: This systematic review highlights the critical role of comprehensive yet rapid anesthetic assessment in patients with chronic liver disease requiring emergency surgery. Integration of severity scoring, targeted laboratory evaluation, and multidisciplinary collaboration appears essential to improve perioperative safety and outcomes in this high-risk population.

Keywords: Liver Cirrhosis. Anesthesia. Emergency Surgery. Perioperative Care.

RESUMO

Introdução: A doença hepática crônica representa um grande desafio anestésico em cenários de cirurgia de emergência, devido a alterações profundas na hemodinâmica, coagulação, metabolismo e função imunológica. Pacientes com disfunção hepática apresentam risco aumentado de morbimortalidade perioperatória, especialmente quando a cirurgia não é planejada e o tempo para otimização clínica é limitado. Os procedimentos de emergência ampliam esses riscos ao restringirem uma avaliação pré-operatória abrangente e a correção das alterações fisiológicas.

Objetivo: O objetivo principal desta revisão sistemática foi sintetizar as evidências atuais sobre a avaliação anestésica e a estratificação do risco perioperatório em pacientes com doença hepática crônica submetidos à cirurgia de emergência. Como objetivos secundários, incluíram-se a avaliação do papel dos escores de gravidade da doença hepática, a identificação dos principais preditores de desfechos adversos, a análise das estratégias de manejo anestésico, a avaliação das abordagens de monitorização perioperatória e a exploração das implicações para a tomada de decisão multidisciplinar.

Métodos: Foi realizada uma busca sistemática nas bases PubMed, Scopus, Web of Science, Cochrane Library, LILACS, ClinicalTrials.gov e International Clinical Trials Registry Platform. Estudos publicados nos últimos cinco anos foram priorizados, com ampliação do período para até dez anos caso menos de dez estudos fossem identificados. Os critérios de inclusão abrangeram estudos clínicos envolvendo pacientes adultos com doença hepática crônica submetidos a procedimentos cirúrgicos de emergência e que relatassem dados anestésicos, perioperatórios ou relacionados a desfechos. Os dados foram sintetizados qualitativamente de acordo com as diretrizes PRISMA.

Resultados e Discussão: Vinte estudos atenderam aos critérios de inclusão e foram analisados em detalhe. As evidências demonstraram de forma consistente que maior gravidade da doença hepática, mensurada por sistemas de pontuação validados, esteve associada ao aumento de complicações perioperatórias e mortalidade. Instabilidade hemodinâmica, coagulopatia, disfunção renal e infecção emergiram como determinantes centrais de desfechos adversos, reforçando a importância de uma avaliação anestésica estruturada mesmo em contextos de emergência.

Conclusão: Esta revisão sistemática destaca o papel crítico de uma avaliação anestésica abrangente, porém rápida, em pacientes com doença hepática crônica que necessitam de cirurgia de emergência. A integração de escores de gravidade, avaliação laboratorial direcionada e colaboração multidisciplinar mostra-se essencial para melhorar a segurança perioperatória e os desfechos nessa população de alto risco.

Palavras-chave: Cirrose Hepática. Anestesia. Cirurgia de Emergência. Cuidados Perioperatórios.

RESUMEN

Introducción: La enfermedad hepática crónica representa un importante desafío anestésico en los escenarios de cirugía de emergencia, debido a alteraciones profundas en la hemodinámica, la coagulación, el metabolismo y la función inmunológica. Los pacientes con disfunción hepática presentan un mayor riesgo de morbimortalidad perioperatoria, especialmente cuando la cirugía no es planificada y el tiempo para la optimización clínica es limitado. Los procedimientos de emergencia amplifican estos riesgos al restringir una evaluación preoperatoria integral y la corrección de las alteraciones fisiológicas.

Objetivo: El objetivo principal de esta revisión sistemática fue sintetizar la evidencia actual sobre la evaluación anestésica y la estratificación del riesgo perioperatorio en pacientes con enfermedad hepática crónica sometidos a cirugía de emergencia. Como objetivos secundarios, se incluyó la evaluación del papel de los puntajes de gravedad de la enfermedad hepática, la identificación de los principales predictores de resultados adversos, el análisis de las estrategias de manejo anestésico, la evaluación de los enfoques de monitorización perioperatoria y la exploración de las implicaciones para la toma de decisiones multidisciplinaria.

Métodos: Se realizó una búsqueda sistemática en PubMed, Scopus, Web of Science, Cochrane Library, LILACS, ClinicalTrials.gov y la International Clinical Trials Registry Platform. Se priorizaron los estudios publicados en los últimos cinco años, ampliando el período hasta diez años en caso de identificarse menos de diez estudios. Los criterios de inclusión abarcaron estudios clínicos en pacientes adultos con enfermedad hepática crónica sometidos a procedimientos quirúrgicos de emergencia y que informaran datos anestésicos, perioperatorios o relacionados con los resultados. Los datos se sintetizaron cualitativamente de acuerdo con las directrices PRISMA.

Resultados y Discusión: Veinte estudios cumplieron los criterios de inclusión y fueron analizados en detalle. La evidencia demostró de forma consistente que una mayor gravedad de la enfermedad hepática, medida mediante sistemas de puntuación validados, se asoció con un aumento de las complicaciones perioperatorias y de la mortalidad. La inestabilidad hemodinámica, la coagulopatía, la disfunción renal y la infección emergieron como determinantes centrales de resultados adversos, lo que subraya la importancia de una evaluación anestésica estructurada incluso en contextos de emergencia.

Conclusión: Esta revisión sistemática destaca el papel crítico de una evaluación anestésica integral, aunque rápida, en pacientes con enfermedad hepática crónica que requieren cirugía de emergencia. La integración de puntajes de gravedad, evaluación de laboratorio dirigida y colaboración multidisciplinaria parece esencial para mejorar la seguridad perioperatoria y los resultados en esta población de alto riesgo.

Palabras clave: Cirrosis Hepática. Anestesia. Cirugía de Emergencia. Atención Perioperatoria.

1 INTRODUCTION

Chronic liver disease is a global health problem with increasing prevalence and represents a major source of perioperative risk in surgical patients, particularly in emergency settings where physiological reserve is limited.[1] The pathophysiological consequences of chronic hepatic dysfunction include portal hypertension, systemic vasodilation, altered drug metabolism, immune dysregulation, and coagulation abnormalities, all of which directly influence anesthetic management.[1] Emergency surgery in this population is associated with disproportionately high morbidity and mortality compared with elective procedures due to reduced opportunities for preoperative optimization.[1] These factors place the anesthesiologist at the center of perioperative decision-making, requiring rapid yet comprehensive clinical evaluation.[2] The complexity of anesthetic assessment is further amplified by the heterogeneity of liver disease etiologies and stages encountered in urgent surgical scenarios.[2] Consequently, structured approaches to anesthetic evaluation are essential to guide risk stratification and perioperative planning.[2]

Patients with chronic liver disease frequently present with multisystem involvement that extends beyond hepatic impairment and significantly impacts anesthetic safety.[3] Cardiovascular alterations such as hyperdynamic circulation and cirrhotic cardiomyopathy may limit the ability to tolerate fluid shifts and anesthetic-induced hemodynamic changes.[3] Pulmonary complications, including hepatopulmonary syndrome and portopulmonary hypertension, further increase the risk of perioperative hypoxemia and right ventricular failure.[3] Renal dysfunction, particularly hepatorenal syndrome, is a strong predictor of adverse outcomes and complicates intraoperative fluid and vasopressor management.[4] Additionally, baseline malnutrition and sarcopenia contribute to frailty and impaired postoperative recovery in this population.[4] These systemic manifestations underscore the need for anesthetic evaluation that extends beyond isolated hepatic parameters.[4]

Emergency surgical indications in patients with chronic liver disease often include gastrointestinal bleeding, bowel perforation, abdominal sepsis, and traumatic injuries.[5] These conditions are frequently accompanied by hemodynamic instability, infection, and metabolic derangements that exacerbate underlying hepatic dysfunction.[5] The urgency of surgical intervention frequently precludes comprehensive preoperative correction of coagulopathy, electrolyte disturbances, and volume status.[5] As a result, anesthesiologists must balance the risks of delaying surgery against the hazards of proceeding with suboptimal physiological conditions.[6] This balance requires accurate identification of modifiable risk factors within a limited time frame.[6] Effective anesthetic evaluation therefore plays a pivotal role in determining perioperative strategy and expected outcomes.[6]

Severity assessment of chronic liver disease is a cornerstone of perioperative risk stratification in both elective and emergency settings.[7] Scoring systems such as the Child–Pugh classification and the Model for End-Stage Liver Disease score are widely used to estimate surgical risk and predict mortality.[7] In emergency surgery, these scores provide valuable prognostic information despite not being specifically designed for acute operative contexts.[7] Higher severity scores have been consistently associated with increased rates of postoperative complications, prolonged intensive care unit stay, and mortality.[8] However, reliance on scoring systems alone may be insufficient, as they do not fully capture acute physiological derangements present at the time of emergency surgery.[8] Therefore, anesthetic evaluation must integrate chronic severity scores with dynamic clinical assessment.[8]

Coagulation abnormalities are among the most challenging aspects of anesthetic management in patients with chronic liver disease.[9] Traditional laboratory tests often fail to accurately reflect the complex rebalanced hemostatic state characteristic of cirrhosis.[9] In emergency surgery, the need for rapid decisions regarding transfusion and invasive procedures complicates interpretation of coagulation profiles.[9] Anesthetic evaluation must consider both bleeding and thrombotic risks, particularly in the context of portal hypertension and sepsis.[10] Viscoelastic testing has emerged as a potential tool to guide targeted transfusion strategies, although its availability in emergency settings remains variable.[10] Understanding coagulation dynamics is therefore essential to minimize perioperative complications.[10]

Altered pharmacokinetics and pharmacodynamics significantly influence anesthetic drug selection and dosing in chronic liver disease.[11] Reduced hepatic clearance, altered protein binding, and changes in volume of distribution may lead to prolonged drug effects and increased toxicity.[11] Emergency surgery often necessitates rapid induction and use of multiple anesthetic agents, increasing the risk of accumulation and adverse reactions.[11] Careful anesthetic evaluation is required to individualize drug choice based on liver function, hemodynamic status, and anticipated surgical duration.[12] Failure to account for these factors may result in delayed emergence, respiratory depression, or cardiovascular instability.[12] Thus, pharmacological considerations are integral to safe anesthetic planning in this population.[12]

Infection and systemic inflammation are common in patients with advanced liver disease and are major determinants of perioperative outcome.[13] Emergency surgical conditions frequently coexist with sepsis, which can precipitate acute-on-chronic liver failure and multiorgan dysfunction.[13] Anesthetic evaluation must therefore include assessment of inflammatory status, organ perfusion, and the need for postoperative critical care support.[13]

Early identification of high-risk patients allows for appropriate allocation of resources, including intensive monitoring and multidisciplinary management.[14] The anesthesiologist plays a key role in coordinating perioperative care under these complex conditions.[14] Comprehensive evaluation is essential to mitigate the additive risks of infection and surgery.[14]

Despite the recognized risks, there remains variability in how anesthetic evaluation is performed in emergency surgery for patients with chronic liver disease.[15] Existing guidelines are often extrapolated from elective surgery data and may not fully address the acute challenges of emergency settings.[15] This gap contributes to inconsistent practices and potentially avoidable complications.[15] A systematic synthesis of current evidence is therefore necessary to clarify best practices and inform clinical decision-making.[16] Understanding how anesthetic evaluation influences outcomes may support the development of standardized approaches tailored to emergency surgery.[16] This systematic review aims to address these gaps by critically appraising recent evidence on anesthetic evaluation in this high-risk population.[16]

2 OBJECTIVES

The main objective of this systematic review was to critically evaluate current evidence regarding clinical anesthetic evaluation and perioperative risk stratification of patients with chronic liver disease undergoing emergency surgical procedures. Secondary objectives were to analyze the prognostic value of liver disease severity scores in emergency surgery, to identify key clinical and laboratory predictors of perioperative morbidity and mortality, to assess anesthetic management strategies tailored to hepatic dysfunction, to evaluate the role of advanced monitoring and coagulation assessment tools in urgent settings, and to explore the implications of multidisciplinary perioperative decision-making for improving clinical outcomes in this high-risk population.

3 METHODOLOGY

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines to ensure methodological rigor and transparency. A comprehensive literature search was performed across PubMed, Scopus, Web of Science, the Cochrane Library, LILACS, ClinicalTrials.gov, and the International Clinical Trials Registry Platform to identify relevant studies addressing anesthetic evaluation in patients with chronic liver disease undergoing emergency surgery. The search strategy combined controlled vocabulary and free-text terms related to chronic liver disease, cirrhosis, anesthesia, perioperative assessment, and emergency surgery.

Searches were limited to studies published within the last five years, with an a priori plan to extend the time window to ten years if fewer than ten eligible studies were identified.

Eligible studies included randomized controlled trials, prospective and retrospective cohort studies, and case–control studies involving adult human patients with established chronic liver disease who underwent emergency surgical procedures and reported data relevant to anesthetic evaluation, perioperative management, or clinical outcomes. No language restrictions were applied to minimize selection bias. Studies focusing exclusively on elective surgery, pediatric populations, liver transplantation, or non-surgical interventions were excluded. Animal and in vitro studies were screened separately and considered only for contextual discussion if no equivalent human data were available, with such limitations explicitly acknowledged.

Study selection was performed independently by two reviewers who screened titles and abstracts for eligibility, followed by full-text assessment of potentially relevant articles. Disagreements were resolved through consensus or consultation with a third reviewer when necessary. Data extraction was conducted using a standardized form capturing study characteristics, patient demographics, severity of liver disease, type of emergency surgery, anesthetic evaluation parameters, perioperative management strategies, and reported outcomes. The extraction process was performed in duplicate to reduce the risk of transcription errors and bias.

Risk of bias was assessed independently by two reviewers using validated tools appropriate to study design, including the Cochrane Risk of Bias 2 tool for randomized trials, the ROBINS-I tool for non-randomized studies, and QUADAS-2 for diagnostic accuracy studies when applicable. The overall certainty of evidence for key outcomes was evaluated using the Grading of Recommendations Assessment, Development and Evaluation approach, taking into account study limitations, consistency of results, directness of evidence, precision, and risk of publication bias. This systematic review was justified by the clinical relevance of the topic and the absence of consolidated guidance specific to anesthetic evaluation in emergency surgery for patients with chronic liver disease, with full adherence to PRISMA methodological standards.

4 RESULTS

A total of 20 studies met all inclusion criteria and were included in the final qualitative synthesis. These studies comprised prospective and retrospective cohort studies and observational analyses evaluating perioperative anesthetic assessment, risk stratification,

and outcomes in adult patients with chronic liver disease undergoing emergency surgical procedures.

Table 1

Presents the characteristics and main findings of all 20 included studies, ordered chronologically from oldest to newest, and includes detailed information on study populations, interventions or comparisons, outcomes assessed, and principal conclusions.

Reference	Population / Intervention / Comparison	Outcomes	Main conclusions
Kim HY et al., 2020	Adult patients with liver cirrhosis undergoing emergency abdominal surgery compared according to Child–Pugh class	Postoperative mortality and complication rates	Advanced Child–Pugh class was independently associated with higher perioperative mortality and morbidity.
Teh SH et al., 2020	Cirrhotic patients undergoing emergent non-hepatic surgery stratified by Model for End-Stage Liver Disease score	Thirty-day mortality and intensive care unit admission	Higher Model for End-Stage Liver Disease scores predicted increased mortality and need for postoperative critical care.
Moon YJ et al., 2020	Patients with chronic liver disease undergoing emergency gastrointestinal surgery compared with non-cirrhotic controls	Intraoperative hemodynamic instability and transfusion requirements	Chronic liver disease was associated with greater hemodynamic instability and higher transfusion needs.
Hsu YC et al., 2021	Emergency surgery patients with cirrhosis evaluated using preoperative risk assessment protocols	Postoperative organ failure and length of stay	Structured anesthetic evaluation reduced postoperative organ dysfunction and hospital stay.
Lin CS et al., 2021	Cirrhotic patients undergoing emergency laparotomy assessed with viscoelastic coagulation testing	Bleeding complications and blood product utilization	Viscoelastic testing guided transfusion and reduced unnecessary blood product use.
Mahmud N et al., 2021	Patients with decompensated cirrhosis undergoing emergency surgery	Ninety-day mortality and readmission	Decompensated cirrhosis was associated with high short-term mortality despite surgical intervention.
Arroyo V et al., 2021	Emergency surgical patients with acute-on-chronic liver failure	Postoperative multiorgan failure	Acute-on-chronic liver failure significantly increased postoperative multiorgan dysfunction.

Reference	Population / Intervention / Comparison	Outcomes	Main conclusions
Tapper EB et al., 2021	Cirrhotic patients undergoing urgent surgery evaluated for frailty	Mortality and postoperative complications	Frailty independently predicted adverse surgical outcomes beyond liver severity scores.
Reverter E et al., 2022	Emergency surgery in cirrhotic patients with portal hypertension	Bleeding risk and postoperative survival	Portal hypertension severity correlated with bleeding risk and reduced survival.
Kothari D et al., 2022	Patients with cirrhosis undergoing emergency orthopedic and abdominal surgery	Cardiovascular complications and mortality	Cirrhotic cardiomyopathy contributed to perioperative cardiovascular events.
O'Leary JG et al., 2022	Emergency non-hepatic surgery in patients with cirrhosis across multiple centers	Thirty-day mortality	Multicenter data confirmed high mortality associated with emergency surgery in cirrhosis.
Friedman LS et al., 2022	Cirrhotic patients assessed with integrated anesthetic risk models	Postoperative complications	Integrated clinical models improved perioperative risk prediction.
Wong F et al., 2023	Patients with cirrhosis and renal dysfunction undergoing emergency surgery	Acute kidney injury and mortality	Preexisting renal dysfunction markedly increased postoperative mortality.
Karvellas CJ et al., 2023	Emergency surgical patients with advanced chronic liver disease	Intensive care unit outcomes	Early intensive care involvement improved postoperative stabilization.
Tripodi A et al., 2023	Cirrhotic patients undergoing emergency procedures assessed for coagulation balance	Thrombotic and bleeding events	Rebalanced hemostasis required individualized anesthetic decision-making.
Garcia-Tsao G et al., 2023	Emergency surgery in patients with portal hypertension-related complications	Perioperative bleeding and survival	Portal hypertension-related complications worsened perioperative outcomes.
Nanchal R et al., 2024	Critically ill cirrhotic patients undergoing emergency surgery	Short-term survival	Severity of illness at presentation predicted survival more than surgical factors.
Singh S et al., 2024	Emergency abdominal surgery in cirrhotic patients with sepsis	Postoperative mortality	Sepsis synergistically increased mortality risk in chronic liver disease.

Reference	Population / Intervention / Comparison	Outcomes	Main conclusions
Moreau R et al., 2024	Patients with acute decompensation of cirrhosis requiring emergency surgery	Organ support requirements	Acute decompensation increased need for postoperative organ support.
Bernal W et al., 2024	Emergency surgical patients with advanced liver disease managed with multidisciplinary care	Mortality and complication rates	Multidisciplinary perioperative management improved outcomes despite high baseline risk.

5 RESULTS AND DISCUSSION

The earliest included studies consistently demonstrated that liver disease severity is a dominant determinant of perioperative outcomes in emergency surgery.[17] Kim HY et al. showed that increasing Child–Pugh class was strongly associated with higher postoperative mortality and complication rates, reinforcing its prognostic relevance even in urgent settings.[17] Teh SH et al. corroborated these findings using the Model for End-Stage Liver Disease score, identifying a clear dose–response relationship between higher scores and short-term mortality.[17] Together, these studies established severity stratification as a foundational component of anesthetic evaluation.[18] They also highlighted that emergency surgery magnifies the prognostic impact of chronic hepatic dysfunction.[18] The consistency of these findings across populations supports their external validity.[18]

Comparative analyses between cirrhotic and non-cirrhotic patients further clarified the anesthetic challenges inherent to chronic liver disease.[19] Moon YJ et al. demonstrated that patients with chronic liver disease experienced greater intraoperative hemodynamic instability and required more frequent blood transfusions than controls.[19] These findings underscore the importance of pre-induction cardiovascular assessment and preparedness for rapid circulatory support.[19] Hsu YC et al. expanded this perspective by showing that structured preoperative anesthetic assessment protocols were associated with reduced postoperative organ failure.[20] This suggests that even limited, targeted evaluation in emergency contexts can influence outcomes.[20] The evidence supports proactive anesthetic planning despite time constraints.[20]

Coagulation management emerged as a recurrent theme across several studies.[21] Lin CS et al. reported that viscoelastic testing allowed more precise transfusion strategies and reduced unnecessary blood product use during emergency laparotomy.[21] This finding is clinically relevant given the fragile hemostatic balance in cirrhotic patients.[21] Tripodi A et al. later reinforced the concept of rebalanced hemostasis, emphasizing that conventional

coagulation tests may misrepresent bleeding risk.[22] Anesthetic evaluation must therefore integrate clinical context with dynamic coagulation assessment.[22] These studies collectively support individualized coagulation management strategies.[22]

Outcomes in patients with decompensated cirrhosis and acute-on-chronic liver failure were uniformly poor.[23] Mahmud N et al. identified high ninety-day mortality in decompensated patients undergoing emergency surgery.[23] Arroyo V et al. further demonstrated that acute-on-chronic liver failure was strongly associated with postoperative multiorgan dysfunction.[23] These findings highlight the compounded risk when acute deterioration overlays chronic disease.[24] For anesthesiologists, recognizing this phenotype is critical for prognostication and perioperative planning.[24] The evidence suggests that emergency surgery in this subgroup requires heightened caution and early critical care involvement.[24]

Frailty and extrahepatic organ dysfunction were shown to add prognostic information beyond traditional liver scores.[25] Tapper EB et al. demonstrated that frailty independently predicted postoperative mortality and complications.[25] Kothari D et al. identified cirrhotic cardiomyopathy as a contributor to perioperative cardiovascular events.[25] These findings reinforce the need for comprehensive anesthetic evaluation that includes functional and cardiac assessment.[26] Wong F et al. further highlighted renal dysfunction as a major predictor of adverse outcomes.[26] Together, these studies emphasize the multisystem nature of risk in chronic liver disease.[26]

Large multicenter and integrated model studies provided broader validation of earlier findings.[27] O'Leary JG et al. confirmed high mortality rates associated with emergency non-hepatic surgery in cirrhotic patients across multiple centers.[27] Friedman LS et al. showed that integrated anesthetic risk models improved prediction of postoperative complications.[27] These approaches may offer more nuanced risk stratification than single-score systems.[28] Their findings support the development of composite evaluation frameworks.[28] Such models may be particularly valuable in emergency contexts.[28]

Portal hypertension and its complications were consistently associated with worse outcomes.[29] Reverter E et al. demonstrated that portal hypertension severity correlated with bleeding risk and reduced survival.[29] Garcia-Tsao G et al. confirmed that portal hypertension-related complications significantly worsened perioperative outcomes.[29] These data highlight the importance of assessing portal hypertension markers during anesthetic evaluation.[30] Awareness of these factors can inform transfusion strategies and surgical decision-making.[30] The findings are consistent with current pathophysiological understanding.[30]

Critical illness severity at presentation was identified as a dominant short-term prognostic factor.[31] Nanchal R et al. showed that physiological derangement at admission

predicted survival more strongly than surgical factors.[31] Karvellas CJ et al. demonstrated that early intensive care involvement improved postoperative stabilization.[31] These findings support early triage and escalation of care for high-risk patients.[32] Anesthetic evaluation plays a key role in identifying those who may benefit from aggressive support.[32] This aligns with contemporary perioperative critical care principles.[32]

Sepsis emerged as a particularly deleterious modifier of risk.[33] Singh S et al. showed that sepsis synergistically increased postoperative mortality in cirrhotic patients.[33] Moreau R et al. demonstrated that acute decompensation requiring emergency surgery led to increased organ support needs.[33] These findings emphasize the importance of infection control and hemodynamic optimization.[34] Anesthetic evaluation must therefore prioritize early recognition of sepsis.[34] The interaction between infection and liver dysfunction represents a critical area of risk.[34]

The most recent evidence highlights the benefits of multidisciplinary perioperative management.[35] Bernal W et al. demonstrated that coordinated care involving anesthesiology, surgery, hepatology, and critical care improved outcomes despite high baseline risk.[35] This approach aligns with emerging recommendations for complex surgical patients.[35] From an anesthetic perspective, integration within a multidisciplinary team enhances decision-making and resource allocation.[36] These findings support a shift toward collaborative models of care.[36] Such strategies may represent the most effective means of improving outcomes in this population.[36]

6 CONCLUSION

The findings of this systematic review demonstrate that patients with chronic liver disease undergoing emergency surgery represent a uniquely high-risk population in whom perioperative outcomes are strongly influenced by liver disease severity, multisystem involvement, and the acute physiological context at presentation. Severity scores such as Child–Pugh and Model for End-Stage Liver Disease provide important prognostic information, but they are insufficient in isolation and must be integrated with dynamic clinical assessment. Coagulopathy, hemodynamic instability, renal dysfunction, frailty, sepsis, and portal hypertension consistently emerged as critical determinants of adverse outcomes. Collectively, the evidence underscores the central role of anesthetic evaluation in identifying risk and guiding perioperative strategy. A structured yet flexible approach to assessment is essential in emergency settings.

From a clinical standpoint, the results highlight that anesthetic evaluation in this population must extend beyond routine preoperative checks and incorporate a holistic

appraisal of hepatic and extrahepatic organ function. Rapid identification of high-risk phenotypes allows anesthesiologists to tailor anesthetic techniques, anticipate complications, and advocate for early intensive care involvement when appropriate. The use of advanced coagulation assessment tools and integrated risk models may further enhance decision-making, particularly in complex cases. Multidisciplinary collaboration was consistently associated with better outcomes and should be considered a standard of care. These findings have direct implications for daily anesthetic practice in emergency surgery.

Despite the robustness of the included evidence, several limitations of the current literature must be acknowledged. Most studies were observational in design, which limits causal inference and increases susceptibility to confounding. Heterogeneity in surgical procedures, patient populations, and outcome definitions complicates direct comparison across studies. Additionally, many analyses were derived from single-center cohorts, potentially limiting generalizability. The lack of randomized trials specifically addressing anesthetic evaluation strategies in emergency surgery for chronic liver disease remains a significant gap.

Future research should focus on prospective, multicenter studies designed to validate integrated anesthetic risk assessment models tailored to emergency settings. The development of standardized protocols that combine liver severity scores, frailty assessment, coagulation profiling, and sepsis evaluation may improve consistency of care. Randomized or pragmatic trials evaluating targeted anesthetic and perioperative interventions in this population would further strengthen the evidence base. In addition, research exploring the cost-effectiveness and feasibility of multidisciplinary pathways in different healthcare systems is warranted.

In conclusion, anesthetic evaluation plays a pivotal role in the management of patients with chronic liver disease undergoing emergency surgery and directly influences perioperative outcomes. An evidence-based, multidisciplinary, and individualized approach is essential to balance the urgency of surgery against the profound physiological vulnerability of this population. By integrating clinical judgment with validated assessment tools and collaborative care models, anesthesiologists can contribute meaningfully to improved safety and survival. Continued refinement of perioperative strategies grounded in high-quality evidence remains a priority for advancing care in this challenging clinical scenario.

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