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Surgery in Cirrhosis: Strategies for Risk Stratification and Optimization

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This summary reviews Mahmud N, Fricker ZP, LM McElroy, et al. ACG Clinical Guideline: Perioperative risk assessment and management in patients with cirrhosis. Am J Gastroenterol 2025;120:1968-1984.

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STRUCTURED ABSTRACT

Question: What is the optimal approach to manage perioperative risk in cirrhotic patients undergoing non-hepatic surgical procedures?

Design: A clinical practice guideline developed under the auspices of the ACG Practice Parameters Committee.1 An expert panel of hepatologists, gastroenterologists, and surgeons conducted a systematic literature review and applied the GRADE framework to assess evidence quality and formulate recommendations, following a PICO-based approach.

Setting: Multidisciplinary guideline development sponsored by the ACG, intended for use across all clinical settings (community hospitals, tertiary, and transplant centers) where adults with chronic liver disease undergo surgery.

Patients: Adults with compensated and decompensated cirrhosis undergoing non-hepatic operations (abdominal, cardiothoracic, orthopedic, and others). Patients with

clinically significant portal hypertension (CSPH) were the primary focus. Pediatric patients and liver transplant recipients were excluded

Interventions: Key recommendations include risk:

- Use of cirrhosis-specific calculators (preferably VOCAL-Penn) plus clinical judgement and non-invasive rule-in of CSPH
- Preoperative transplant evaluation should be considered if the projected 90-day mortality is ≥ 15%
- Consideration of transjugular intrahepatic portosystemic shunt (TIPS) when CSPH risk is high and there is another indication for TIPS. Optimize with strict alcohol and tobacco cessation while meeting target nutritional goals (30–35 kcal/kg/day; 1.25–1.5 g/kg/day protein for ≥ 2 weeks).
- Refer to a high-volume liver or transplant-capable center for major procedures when feasible.

Outcomes: The outcomes emphasized in this guideline were: perioperative mortality (particularly 90-day), postoperative hepatic decompensation (new/worsening ascites, hepatic encephalopathy, variceal bleeding), and major complications (infection, wound complications, ICU admission).

Data Analysis: The guideline panel systematically analyzed the available evidence for each clinical question. Using the GRADE methodology, the quality of evidence was rated as high, moderate, low, or very low. Many recommendations in this perioperative domain are based on lower-quality evidence (retrospective studies, cohort data, and expert opinion), since randomized trials in patients with cirrhosis undergoing surgical operations are rare. Strong consensus recommendations were made when the balance of benefit and harm was clear.

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Results: The guideline provides several recommendations summarized in **Table 1**. In this section, we highlight the most important findings. Initially, the guideline that, to achieve accurate surgical risk stratification, it is recommended to consider three categories of factors: liver-related factors, nonhepatic comorbidities, and surgery-specific factors.

Risk stratification: General scores of liver disease severity are considered insufficient

because they do not capture the complexity of individual procedures; these scores include the CTP and MELD. Among models, the VOCAL-Penn Score is the most reliable predictor of postoperative mortality, with the added benefit of estimating postoperative decompensation within 90 days and being applicable to both hepatic and nonhepatic surgeries.[2] MELD and CTP alone are inadequate, although patients with low MELD scores (6–9) and CTP scores (5–6) seem to have minimal additional risk for low-risk surgeries.[3]

Portal hypertension: CSPH is one of the strongest predictors of postoperative mortality. CSPH is defined as hepatic venous pressure gradient ≥10 mm Hg, liver stiffness measurement (LSM) ≥25 kPa Regardless of platelet count, LSM 20–24.9 kPa with platelet count less than 150K/mm³, or LSM 15–19.9 kPa. with platelet count <110 K/mm³, as well as clear evidence of gastroesophageal varices, portosystemic collaterals, or hepatofugal flow (**Figure 1**).[4]

Etiology: The surgical risk is not directly affected by the cause of cirrhosis, except for MASLD, since it is strongly associated with cardiometabolic comorbidities.[5] The VOCAL-Penn Score incorporates MASLD as a variable,[6] likely serving as a surrogate for cardiometabolic risk. Future studies could investigate the potential interplay between hepatocellular carcinoma,[7] alcohol,[8] viral, or autoimmune liver diseases[9] with surgical risk.

Nutritional status: Malnutrition, sarcopenia, and frailty significantly worsen postoperative outcomes.[10] These factors have been shown to significantly impact post–liver transplant outcomes, though post-transplant mortality itself varies based on transplant type, disease etiology, and other factors.

Other models: In the context of extrahepatic surgery, the Hospital Frailty Risk Score enhances the prediction of postoperative mortality compared to MELD alone,[11] although it does not outperform VOCAL-Penn.The accuracy of the Mayo Surgical Risk Score has decreased over time as it tends to overestimate risk.[2,12]

Procedure-specific guidance and transplant consideration: There are no standardized criteria for initiating liver transplant evaluation before surgery in cirrhosis, but expert guidance suggests consideration when the projected 90-day mortality exceeds 15%.[13] For high-risk patients who may decompensate postoperatively yet do not otherwise meet transplant criteria, completing a transplant evaluation preoperatively can avoid unforeseen challenges during the postoperative period.[13] Abdominal hernias are frequent in decompensated cirrhosis, and while elective repair is often deferred due

Risk factors influencing postoperative outcomes	
Surgical risk estimation in cirrhosis	Determined by liver disease severity, comorbidities, and surgery type
	Best assessed with cirrhosis-specific risk calculators plus clinical judgment
Key risk factors affecting surgical risk	Low MELD (6–9), low CTP (5–6), and no portal hypertension/ decompensation → minimal added risk
	Portal hypertension and decompensation (ascites, encephalopathy, varices) are major predictors of poor outcomes
	Standard labs (PT/INR, aPTT, PLT) do not reliably reflect bleeding/clotting risk in cirrhosis
	Very low PLT (<50–75k/μL) linked to bleeding and poor outcomes, but reflects severity of disease more than thrombocytopenia itself
	INR not independently predictive
	Nonhepatic comorbidities significantly affect outcomes
Preoperative evaluation	
Noninvasive fibrosis assessment	Use FIB-4/elastography in patients with unknown fibrosis stage. It might affect surgical planning
Prognostic risk models	VOCAL-Penn plus clinical judgment for preoperative risk is the preferred tool
Preoperative assessment for LT needs	For elective surgery, consider pre-op transplant evaluation if 90-day mortality risk > 15% (e.g., VOCAL-Penn)
Frailty	Assessing preoperative frailty helps refine risk prediction
Risk mitigation strategies and perioperative management	
Treatment of underlying liver disease	Manage reversible causes (HBV, HCV, autoimmune hepatitis) before elective surgery
Alcohol and tobacco cessation	Strict cessation lowers risk of liver events, infection, wound issues, and ICU need
Nutrition	Optimize with 30–35 kcal/kg/day and 1.25–1.5 g/kg/day protein ≥2 weeks pre-op; consider enteral feeding, or prehabilitation for frailty/sarcopenia if elective surgery
Peri-operative coagulopathy management	TEG is preferred over PT/INR to guide management
	Vitamin K/blood products have not been demonstrated to lower operative bleeding risk
Experienced centers	Refer to high-volume liver/transplant centers when possible
Surgery-specific considerations	
Abdominal hernia repair	Elective repair after ascites control reduces risk of emergent complications
Cholecystectomy	Laparoscopic favored in CTP A–B
	CTP C usually prohibitive. May benefit from supportive care and alternative drainage procedures
	VOCAL-Penn can guide decision-making in cases of uncertainty
Bariatric surgery	Safe in selected compensated cirrhosis; laparoscopic sleeve gastrectomy preferred
	In transplant candidates, may be done pre- or peri-transplant; limited data to support bariatric surgery post-transplant.

Table 1. Guideline recommendations and key concepts.

to bleeding risk, ascites, or poor nutrition, delaying repair increases the likelihood of emergent operations with markedly higher mortality.[14] For symptomatic cholelithiasis, laparoscopic cholecystectomy is favored in CTP A and B cirrhosis, but considered prohibitive in most CTP C cases.[15,16] In cardiac surgery, mortality ranges from 0%–11% in CTP A, and up to as high as 100% in CTP C.[17] Finally, bariatric surgery can be safe and effective in select compensated cirrhosis cases. In particular, sleeve gastrectomy is a safe procedure and can be considered prior to or after transplantation.[18]

COMMENTARY

Why Is This Important?

Patients with cirrhosis face some of the highest surgical risks, and until now, guidance towards the approach to perioperative management has been fragmented and inconsistent. This new ACG clinical guideline consolidates the evidence into a structured roadmap comparing risk calculators, CSPH evaluation, and procedure-specific considerations (see Figure 1) [1].

Key Study Findings

The guideline emphasizes that perioperative risk in cirrhosis depends on three domains: liver disease severity, comorbidities and surgery type. VOCAL-Penn is the preferred risk tool; MELD and CTP alone are insufficient.

CSPH is a strong predictor of adverse outcomes, even in compensated patients. Malnutrition, sarcopenia, and frailty are highly prevalent and strongly linked to postoperative mortality. Thus, nutritional optimization and prehabilitation are important risk mitigation strategies.

Elective hernia repair, laparoscopic cholecystectomy, and bariatric surgery can be safe in select patients with compensated cirrhosis, whereas cardiac surgeries require careful patient selection given the very high mortality associated with advanced liver disease. Regarding hemostatic derangements, the guideline suggests utilizing TEG to assess coagulopathy. The use of TPO agonists is reasonable in severe thrombocytopenic cases (<50K/mm3), but INR correction is not beneficial.

Finally, the guideline emphasizes the importance of multidisciplinary care and consideration of referrals to high-volume transplant-capable centers, while calling for more prospective data to refine perioperative risk prediction.

Caution

Most recommendations are based on low- to very-low-quality evidence, often from retrospective and single-center studies. VOCAL-Penn is validated only in patients who underwent surgery, which

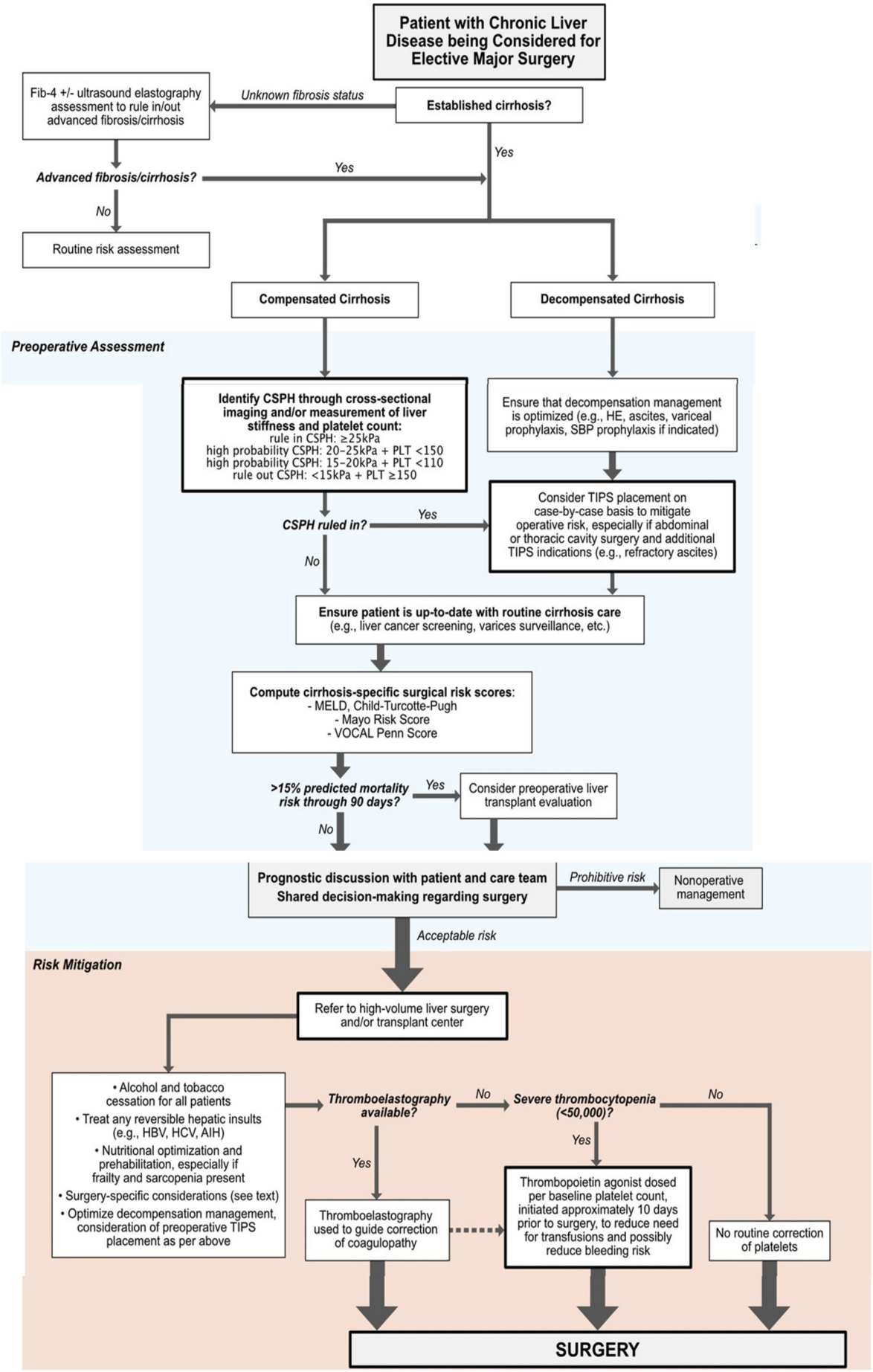

Figure 1. Proposed algorithm for cirrhosis surgical risk assessment and management.

may limit generalizability since it does not fully capture risk in those excluded from surgery. Ultimately, these scores cannot replace clinical judgment.

Lastly, procedure specific recommendations (e.g., hernia, cholecystectomy, cardiac, bariatric surgery) are often extrapolated from small or heterogeneous studies, so applicability may vary across different patient populations and practice settings.

My Practice

Depending on the type of procedure/ surgery, I gauge the urgency of the pre-operative risk stratification. Though it may seem obvious, the first step is confirming that the patient truly has compensated advanced chronic liver disease, cACLD. If so, my next priority is determining whether CSPH is present. This is achieved through a comprehensive review of non-invasive liver disease assessments (NILDA), biochemical and radiographic parameters; occasionally, a biopsy is necessary, but I strive to avoid it if possible.

A few key questions I ask myself are: Is this surgery essential, and what is the surgeon's proposed timing? Is there flexibility here? Is the patient optimized as well as possible? Should we discuss this case with other consultants? Is a pre-operative TIPS or transplant evaluation needed in case they decompensate? What is the patient's functional status, and what is the status of their other chronic medical conditions? Is a pre-surgical debrief with all key providers involved needed? Do we need to clarify the utility of platelet, INR, and TEG assessment with the care team?

This last point is interesting as it is a very common question and often a point of contention. Although the decision is usually ultimately left to the person operating, I will show the team the data and describe the clear risk of increasing portal pressures without improving outcomes if unnecessary products are administered.

In my practice, I strive to approach these cases in a multidisciplinary manner, involving other specialists, including dietitians. If the patient is not ready for surgery and it is possible to delay, then this stance should be maintained when communicating with the primary surgical team.

Finally, I certainly use dot phrases in my practice when writing notes, but I think it's essential to review each part of these dot phrases with our patients (diet, exercise, medication, surveillance, lifestyle recommendations, etc.). Whether inpatient or outpatient, I believe it is essential to openly discuss the risks with the patient and empower them to be active in asking questions before deciding if and when to move forward with surgery.

For Future Research

The guideline highlights several areas where future research is urgently needed, including the development of prospective, multicenter studies to validate perioperative risk prediction models such as the VOCAL-Penn Score across diverse surgical settings, as well as studies clarifying the role of preoperative TIPS in reducing complications without worsening hepatic function.

There is also a need to determine the true impact of frailty and CSPH management on surgical risk. Although addressed in some studies, there remains a critical need to determine the impact of cirrhosis etiology on postoperative outcomes as well. These future directions will allow for a shift from expert consensus toward higher-quality, evidence-based recommendations that can guide surgical care in patients with cirrhosis.

Conflict of Interest

The authors do not have conflicts of interest to disclose.

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