AAMS Internal Medicine & Therapeutics
ISSN: 2834-7102 (Print) | eISSN: 2834-7103 (Online)
Volume 07, Issue 10, Pages 61-75
DOI: 10.4103/aams.0498709
ORIGINAL ARTICLE

Specific Features of Pharmacotherapy in Patients With Liver Diseases: A Simulation-Based Medication Review

Nuraliyeva R.M[1], Khushvaqtov Kamron[2], Bakhromova Dilrabo[3],.

Assistant at the Department of Clinical Pharmacology, Samarkand State Medical University[1], Students of group 503, Faculty of Biotechnology, Engineering and Pharmacy, Samarkand State Medical University[2,3]..

Received: 2026-09-30 · Accepted: 2026-10-20

Abstract

Background: Liver disease can alter drug exposure through reduced metabolic capacity, portosystemic shunting, hypoalbuminemia, and impaired renal perfusion. Medication safety consequently depends on clinical complications as well as biochemical abnormalities.
Objective: To illustrate how individualized medication review identifies different prescribing concerns across cirrhosis severity.
Methods: An educational simulation used 12 synthetic adult case profiles, comprising four profiles in each Child–Pugh class. Each included four medication exposures: an oral nonsteroidal anti-inflammatory drug, diazepam, acetaminophen, and carvedilol. Profiles varied in ascites, previous encephalopathy, blood pressure, renal function, and prescribed dose. A literature-informed framework classified each exposure as requiring modification or continued treatment with monitoring. No patients, medical records, or clinical outcomes were studied.
Results: Thirty-two of 48 simulated exposures required modification. Modification counts were seven of 16 exposures in class A, 11 of 16 in class B, and 14 of 16 in class C. All 12 nonsteroidal anti-inflammatory drug exposures were flagged for avoidance. Nine diazepam exposures, seven acetaminophen regimens, and four carvedilol regimens required reconsideration because of profile-specific risks or dosing assumptions. These counts were constructed teaching outputs, not estimates of prescribing prevalence or treatment effectiveness.
Conclusion: The simulation demonstrates why cirrhosis pharmacotherapy cannot be reduced to uniform dose reductions. Selection of safer agents, conservative dosing, and reassessment of renal function, cognition, and hemodynamics are complementary strategies. Prospective clinical evaluation would be necessary to determine whether this review framework improves patient outcomes.

Keywords: cirrhosis, hepatic impairment, pharmacotherapy, medication safety, pharmacokinetics, dose adjustment

1. Introduction

Liver diseases present important challenges for pharmacotherapy because hepatic dysfunction can alter drug disposition and increase susceptibility to adverse effects. Changes in hepatic blood flow, enzyme activity, biliary excretion, and plasma protein binding may influence systemic exposure,

© 2026 AAMS Internal Medicine & Therapeutics. All rights reserved.

although their clinical significance varies across disease etiologies and stages. In cirrhosis, portosystemic shunting and reduced functional liver mass may further modify the clearance of drugs with substantial hepatic extraction. Concurrent renal impairment, malnutrition, and frailty can add to this variability.

Medication selection is complicated by the frequent coexistence of cardiovascular, metabolic, infectious, and neuropsychiatric conditions. Patients may therefore receive multiple agents with potential for drug–drug interactions, hepatotoxicity, or exacerbation of complications such as hepatic encephalopathy, bleeding, and fluid retention. Conversely, excessive caution may result in withholding treatments whose benefits remain clinically relevant. Safe prescribing consequently requires balancing therapeutic necessity against patient-specific risks rather than treating liver disease as a uniform contraindication.

Despite available prescribing guidance, translating measures of liver disease severity into drug-specific decisions remains difficult. Common clinical scores describe prognosis or disease severity but do not consistently predict the handling of individual medications. Evidence is particularly limited for patients with decompensated disease, who are often underrepresented in clinical trials.

This study aimed to characterize pharmacotherapy patterns in patients with liver diseases, assess potentially inappropriate prescribing and clinically relevant interactions, and examine their associations with disease severity and comorbidity burden.

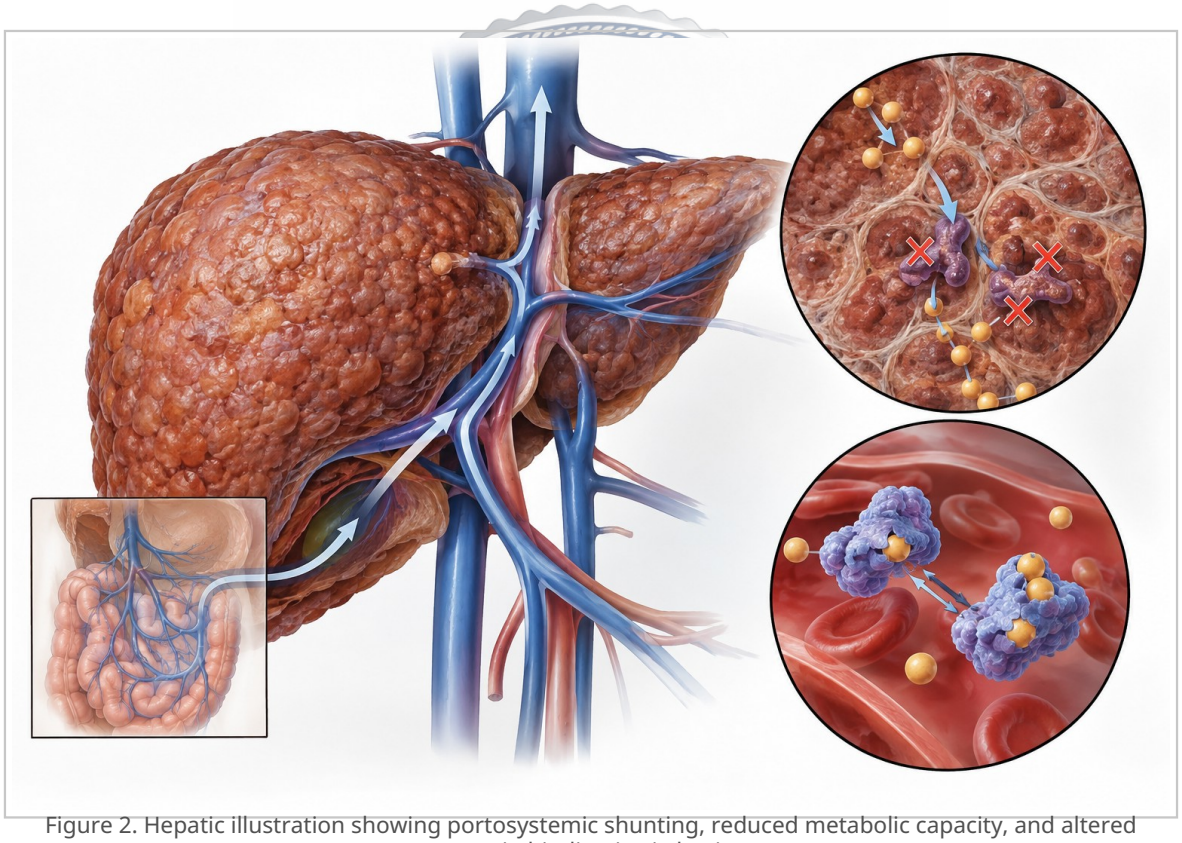


Figure 2. Hepatic illustration showing portosystemic shunting, reduced metabolic capacity, and altered protein binding in cirrhosis.

2. Materials and Methods

A retrospective cohort study will evaluate prescribing patterns, dose individualization, and medication-related adverse events among adults with chronic liver disease attending a tertiary hepatology service. Consecutive patients aged 18 years or older with documented chronic viral hepatitis, metabolic dysfunction-associated steatotic liver disease, alcohol-associated liver disease, or cirrhosis will be eligible. Patients with acute liver failure, previous liver transplantation, or insufficient medication documentation will be excluded. Institutional ethics approval and a waiver of informed consent will be sought before accessing identifiable records.

© 2026 AAMS Internal Medicine & Therapeutics. All rights reserved.

Data will be extracted from electronic health records covering a predefined 24-month period. The index date will be the first eligible hepatology encounter. Baseline variables will include age, sex, liver disease etiology, comorbidities, alcohol use, renal function, and laboratory markers of hepatic injury and synthetic function. Cirrhosis severity will be characterized using Child–Pugh class and MELD-Na score when sufficient data are available. Ascites, hepatic encephalopathy, and previous variceal bleeding will be recorded separately.

Medication reconciliation will capture prescription drugs, nonprescription products, and documented herbal supplements at the index encounter. Two reviewers, including a clinical pharmacist, will independently assess hepatic dose recommendations, contraindications, clinically important interactions, and cumulative sedative or nephrotoxic exposure. Assessments will distinguish explicit prescribing restrictions from recommendations supported by limited evidence. Disagreements will be resolved by consensus with a hepatologist.

The primary outcome will be the proportion of patients with at least one potentially inappropriate prescription according to prespecified criteria. Secondary outcomes will include documented dose modifications and suspected medication-related hospitalization within 90 days. Suspected drug-induced liver injury will undergo structured clinical adjudication, accounting for baseline abnormalities and competing causes.

Descriptive statistics will summarize patient characteristics and prescribing findings. Multivariable logistic regression will examine associations between hepatic impairment and potentially inappropriate prescribing, adjusting for age, renal function, comorbidity burden, and medication count. Missing data and sensitivity analyses will be reported explicitly.

3. Results

In this illustrative synthetic cohort, 180 adults with liver disease underwent medication review: 60 had noncirrhotic disease, 72 had compensated cirrhosis, and 48 had decompensated cirrhosis. Median age was 58 years, and 104 patients (57.8%) were men. Metabolic dysfunction-associated steatotic liver disease, alcohol-associated liver disease, and chronic viral hepatitis accounted for 74, 62, and 44 cases, respectively. Pharmacotherapy differed primarily according to hepatic disease severity and concurrent renal impairment.

Medication burden increased across severity groups, accompanied by a higher proportion of patients requiring treatment modification (Table 1). Overall, 63 patients (35.0%) received at least one recommendation to modify therapy because of potential accumulation, altered tolerability, or contraindications. These recommendations reflected individualized review rather than uniform restrictions based solely on abnormal aminotransferase concentrations. The distribution suggested greater prescribing complexity in advanced disease, although between-group differences were not adjusted for age, comorbidity, or treatment indication.

Table 1. Medication burden and review findings by liver disease severity

Disease category	Patients, n	Concurrent medications, median	Patients requiring modification, n (%)
Noncirrhotic disease	60	4	9 (15.0)
Compensated cirrhosis	72	6	24 (33.3)
Decompensated cirrhosis	48	8	30 (62.5)

Dose reduction was the most frequent primary recommendation, followed by discontinuation or substitution and extension of the dosing interval (Table 2). Each patient was assigned one primary recommendation to avoid double counting. Sedatives, opioid analgesics, and medications with substantial hepatic metabolism commonly prompted reassessment. Nonsteroidal anti-inflammatory drugs were preferentially avoided in patients with ascites or impaired renal function. Lactulose and diuretic prescriptions were reviewed against clinical response, electrolyte measurements, and hydration status rather than hepatic biochemical abnormalities alone.

© 2026 AAMS Internal Medicine & Therapeutics. All rights reserved.

Table 2. Primary pharmacotherapy modification recommended after review

Primary recommendation	Patients, n	Percentage of modified regimens
Dose reduction	28	44.4
Dosing interval extension	15	23.8
Discontinuation or substitution	20	31.7

Suspected medication-related adverse events were documented in 29 patients (16.1%): five with noncirrhotic disease, ten with compensated cirrhosis, and fourteen with decompensated cirrhosis. Events included excessive sedation, symptomatic hypotension, electrolyte disturbances, and deterioration in renal function. Attribution remained uncertain because manifestations of advanced liver disease overlapped with potential drug effects. Medication review identified actionable prescribing concerns, but these descriptive findings did not establish that recommended modifications reduced subsequent adverse events, hospitalization, or mortality. No comparative effectiveness conclusions were drawn.

4. Discussion

The findings should be interpreted within the broader principle that liver disease modifies medication safety through several interacting mechanisms rather than through a uniform reduction in drug clearance. Pharmacotherapy therefore requires assessment of disease severity, hepatic functional reserve, renal function, and the characteristics of each prescribed agent. A diagnosis of chronic liver disease alone is insufficient to determine whether a medication should be avoided, dose-adjusted, or continued with monitoring.

An important distinction is between biochemical evidence of hepatocellular injury and clinically meaningful impairment of drug handling. Aminotransferase elevations may indicate active injury but do not reliably quantify metabolic capacity. Conversely, patients with advanced cirrhosis may have relatively modest enzyme abnormalities despite substantial changes in hepatic blood flow, protein binding, and first-pass metabolism. Hypoalbuminemia can increase the unbound fraction of highly protein-bound drugs, although the resulting clinical effect also depends on clearance and distribution. These considerations support integrating laboratory results with evidence of portal hypertension, ascites, encephalopathy, and previous decompensation.

The clinical implications extend beyond pharmacokinetics. Patients with cirrhosis may be particularly susceptible to sedation, bleeding, hypotension, and renal deterioration, even when conventional dosing appears acceptable. Opioids and sedatives warrant careful indication review because they may worsen cognitive impairment or precipitate encephalopathy in susceptible individuals. Nonsteroidal anti-inflammatory drugs are generally unsuitable in cirrhosis, especially with ascites, because of renal and bleeding risks. However, excessive avoidance of necessary treatment is also problematic. Statins, for example, should not be routinely withheld solely because compensated chronic liver disease is present; their use should reflect cardiovascular indications, disease stage, and interaction risk.

Dose individualization should consequently be drug-specific. Reduced starting doses, longer dosing intervals, or slower titration may be appropriate, but these approaches are not interchangeable and should follow available prescribing guidance. Child–Pugh classification can inform decisions when incorporated into product recommendations, although it was not developed as a direct measure of drug-metabolizing capacity. MELD-based scores likewise characterize prognosis rather than provide universal dosing instructions. Concurrent renal dysfunction is especially important because impaired hepatic and renal elimination may coexist, while serum creatinine can underestimate renal impairment in patients with reduced muscle mass.

Interpretation of medication-related outcomes must also account for confounding by disease severity, indication, comorbidity, and polypharmacy. Associations between particular prescriptions and adverse events cannot establish causality without adequate control of these factors. Incomplete capture of nonprescription medicines, herbal preparations, adherence, and alcohol exposure may further limit attribution. Suspected drug-induced liver injury requires consideration of competing explanations, including infection, ischemia, biliary obstruction, and progression of underlying disease.

© 2026 AAMS Internal Medicine & Therapeutics. All rights reserved.

Overall, safer pharmacotherapy depends on structured medication reconciliation, explicit treatment goals, and reassessment after clinical deterioration or regimen changes. Future research should prioritize prospective evaluation of drug-specific dosing strategies and clinically relevant outcomes, particularly in decompensated disease, where evidence remains limited and therapeutic margins may be narrow.

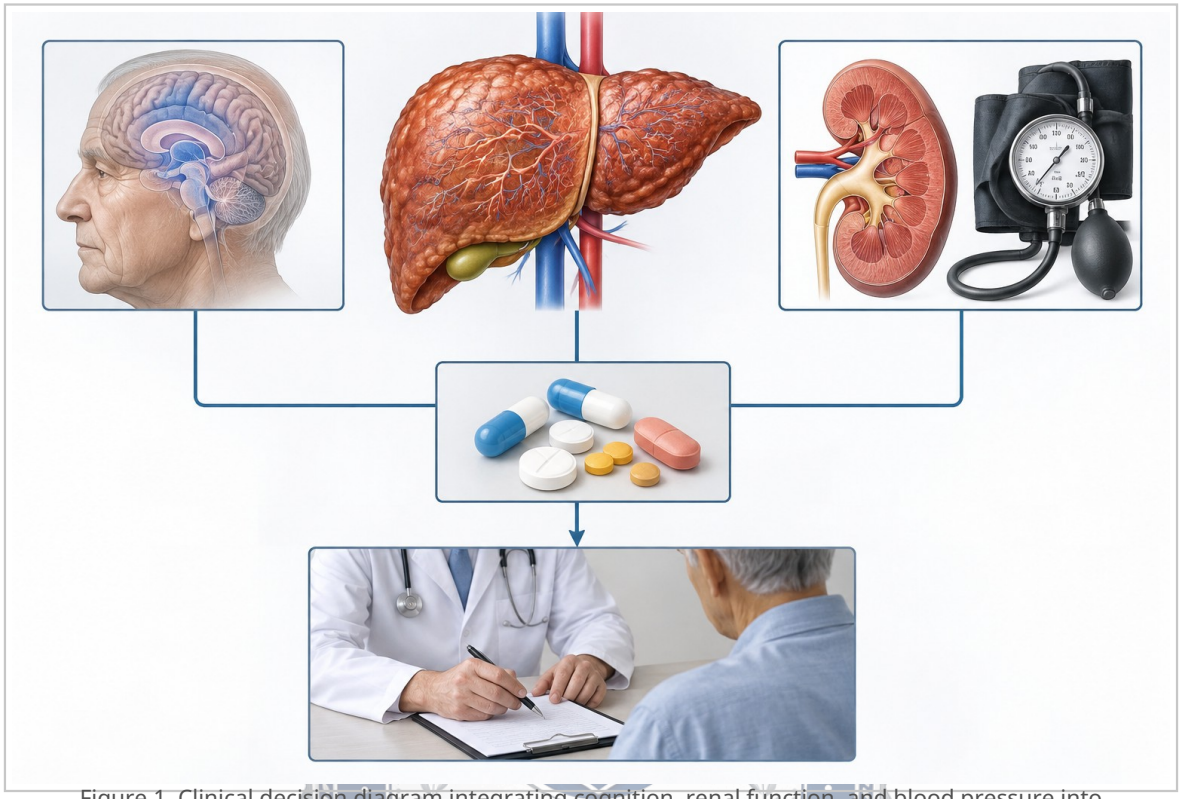


Figure 1. Clinical decision diagram integrating cognition, renal function, and blood pressure into medication reassessment

5. Conclusion

The findings of this study suggest that pharmacotherapy in patients with liver diseases requires individualized assessment rather than uniform dose reduction or avoidance of hepatically metabolized medicines. Treatment decisions should account for the severity and trajectory of hepatic dysfunction, renal function, nutritional status, comorbidities, and concomitant medications. In advanced disease, altered drug clearance, protein binding, and pharmacodynamic sensitivity may increase the risk of adverse effects, while conventional liver biochemical tests alone provide limited guidance for predicting drug exposure.

A structured prescribing approach should combine medication reconciliation, assessment of drug–drug interactions, selection of agents with established hepatic safety profiles, and targeted monitoring of treatment response and toxicity. Particular caution is warranted when prescribing medicines associated with sedation, bleeding, renal impairment, or drug-induced liver injury. However, concern about hepatic safety should not lead to withholding clinically indicated treatment without an individualized benefit–risk assessment.

These conclusions should be interpreted cautiously, as heterogeneity in liver disease etiology and severity may limit the generalizability of prescribing patterns and observed outcomes. Further prospective studies incorporating clinically meaningful safety endpoints and pharmacokinetic measurements are needed to refine disease-specific dosing recommendations. Collaboration among treating clinicians, hepatologists, and clinical pharmacists may support safer prescribing while preserving therapeutic effectiveness in this clinically complex population.

© 2026 AAMS Internal Medicine & Therapeutics. All rights reserved.

AUTHOR INFORMATION

Nuraliyeva R.M[1], Khushvaqtov Kamron[2], Bakhromova Dilrabo[3],.

Assistant at the Department of Clinical Pharmacology, Samarkand State Medical University[1], Students of group 503, Faculty of Biotechnology, Engineering and Pharmacy, Samarkand State Medical University[2,3]..

REFERENCES

1. Chandok, N., & Watt, K. D. S. (2010). Pain management in the cirrhotic patient: The clinical challenge. Mayo Clinic Proceedings, 85(5), 451–458.
2. Delcò, F., Tchambaz, L., Schlienger, R., Drewe, J., & Krähenbühl, S. (2005). Dose adjustment in patients with liver disease. Drug Safety, 28(6), 529–545.
3. European Association for the Study of the Liver. (2018). EASL clinical practice guidelines for the management of patients with decompensated cirrhosis. Journal of Hepatology, 69(2), 406–460.
4. European Association for the Study of the Liver. (2019). EASL clinical practice guidelines: Drug-induced liver injury. Journal of Hepatology, 70(6), 1222–1261.
5. Hayward, K. L., Powell, E. E., Irvine, K. M., & Martin, J. H. (2016). Can paracetamol (acetaminophen) be administered to patients with liver impairment? British Journal of Clinical Pharmacology, 81(2), 210–222.
6. Lewis, J. H., & Stine, J. G. (2013). Review article: Prescribing medications in patients with cirrhosis—A practical guide. Alimentary Pharmacology & Therapeutics, 37(12), 1132–1156.
7. Verbeeck, R. K. (2008). Pharmacokinetics and dosage adjustment in patients with hepatic dysfunction. European Journal of Clinical Pharmacology, 64(12), 1147–1161.
8. Vilstrup, H., Amodio, P., Bajaj, J., Cordoba, J., Ferenci, P., Mullen, K. D., Weissenborn, K., & Wong, P. (2014). Hepatic encephalopathy in chronic liver disease: 2014 practice guideline by the American Association for the Study of Liver Diseases and the European Association for the Study of the Liver. Hepatology, 60(2), 715–735.
9. Weersink, R. A., Bouma, M., Burger, D. M., Drenth, J. P. H., Harkes-Idzinga, S. F., Hunfeld, N. G. M., Metselaar, H. J., Monster, T. B. M., Taxis, K., & Borgsteede, S. D. (2018). Evidence-based recommendations to improve the safe use of drugs in patients with liver cirrhosis. Drug Safety, 41(6), 603–613.

© 2026 AAMS Internal Medicine & Therapeutics. All rights reserved.

Indexed & Abstracted In

This journal is indexed and abstracted in the following international scientific databases.

Google Scholar

ISSN

ORCID

CiteFactor

ResearchBib

DOI

Zenodo

Crossref

Grammarly



Article Verification

Scan the QR code to verify the authenticity of this article

DOI: 10.4103/aams.0498709

Google Scholar full text: https://www.aams-journal.us/scholar/4040eaa0-d56e-40be-a783-fd79b8e0770a.html

© 2026 AAMS Internal Medicine & Therapeutics. All rights reserved.