



Evaluation & Management of a Patient with Hepatic Dysfunction and Liver Failure

Description of the Activity	<p>Patients with acute or exacerbation of chronic liver dysfunction and hepatic failure are often among the most complex patients to manage. Surgical intensivists must work with a multidisciplinary team of hepatologists, gastroenterologists, interventional radiologists, and transplant surgeons to coordinate the best care for these complex patients.</p>
Functions	<ul style="list-style-type: none">❖ Resuscitation<ul style="list-style-type: none">➤ Promptly recognize and evaluate patients with hepatic dysfunction, including acute, ischemic, and decompensated liver failure.➤ Use a grading scale to characterize the severity of liver dysfunction, such as the Model for End-Stage Liver Disease (MELD) score, Child-Pugh score, or King's College criteria.➤ Evaluate patients with cirrhosis for pre-, intra-, and posthepatic etiology.➤ Recognize, evaluate, and perform initial management of hepatic encephalopathy.<ul style="list-style-type: none">▪ Use West Haven criteria.➤ Perform initial management of patients with variceal bleeding, including recognition, medical management, blood product resuscitation, consultation with gastroenterologists for endoscopy, and interventional radiology evaluation for transjugular intrahepatic portosystemic shunt (TIPS).➤ Recognize and manage patients with hepatorenal syndrome.➤ Initiate prophylactic care for surgical patients with a history of portal hypertension, cirrhosis, ascites, varices, or spontaneous bacterial peritonitis (SBP).➤ Recognize associated coagulopathy, and initiate goal-directed resuscitation.➤ Identify the indications for and use of point-of-care ultrasound (POCUS) and paracentesis.<ul style="list-style-type: none">▪ Use ultrasound to identify volume status and ascites.▪ Perform and interpret diagnostic and therapeutic paracentesis.❖ Ongoing Management<ul style="list-style-type: none">➤ Manage patients with hepatic dysfunction in the pre-, peri-, and postoperative critical care setting to minimize sequelae of decompensation.➤ Manage patients with acute fulminant liver failure.<ul style="list-style-type: none">▪ Recognize and manage the sequelae of acute liver failure, including hepatic encephalopathy and acute cerebral edema, coagulopathy, vasoplegia, renal failure, acidosis, and hypoglycemia.▪ Recognize the potential for loss of airway protection and the need for early intubation.▪ Demonstrate understanding of the pharmacokinetics of toxin overdose, and initiate appropriate treatment.▪ Use evidence-based criteria (such as King's College) to determine the need for referral for liver transplant.▪ Initiate discussion with the local transplant team.➤ Manage patients with hepatic encephalopathy.<ul style="list-style-type: none">▪ Recognize and manage patients with acute cerebral edema, including sodium and serum osmolality.



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	<ul style="list-style-type: none">▪ Recognize and manage patients with portosystemic hepatic encephalopathy, including associated medications.➤ Manage patients with portal hypertension.<ul style="list-style-type: none">▪ Identify the indications for TIPS, and initiate a consultation with interventional radiology.▪ Recognize the immediate complications after TIPS, including worsened encephalopathy, bleeding, and shunt failure.▪ Initiate pharmacologic therapy for surgical patients with portal hypertension and cirrhosis.➤ Manage patients with variceal bleeding.<ul style="list-style-type: none">▪ Coordinate with gastroenterology, interventional radiology, or both for additional hemorrhage control procedures as needed.▪ Initiate pharmacologic therapy for surgical patients with variceal bleeding.➤ Manage patients with hepatorenal syndrome.➤ Initiate appropriate nutritional support.➤ Recognize and manage the pharmacokinetics of hepatic clearance of medications in patients with liver dysfunction. <p>❖ Transition Of Care</p> <ul style="list-style-type: none">➤ Coordinate with multidisciplinary care teams, including appropriate consultation with gastroenterology, interventional radiology, and transplant teams.➤ Communicate an updated plan of care to a patient/caregiver(s) to ensure understanding of the illness severity, prognosis, additional treatment options, and feasibility of carrying out the plan within the patient's psychosocial and socioeconomic context.➤ Throughout the care continuum, and particularly when there are unanticipated changes in the course of a patient's treatment, provide and lead the team in primary palliative care regarding communication, symptom management, and goal concordance, adjusting as needed and communicating any changes to all involved teams.➤ In complex patient care scenarios, lead the team in weighing the risks, benefits, and goal concordance of possible therapies, using the assistance of subspecialty palliative care and ethics teams as needed.➤ In the event that disease has become acutely life-limiting and there are no additional disease-directed treatments, identify the end-of-life stage of care, and lead the team in helping patients/caregivers into this stage, prioritizing comfort and symptom-directed therapy as indicated.➤ Lead the team in reflection on the experience of having been involved in a patient's care, and help others—and self—facilitate healthy ways to process the experience, both inside and outside of the hospital, to support the care team's physical, mental, emotional, and spiritual well-being.
Scope	<p>❖ In scope</p> <ul style="list-style-type: none">➤ Acute liver injury/ischemic hepatitis➤ Cirrhosis<ul style="list-style-type: none">▪ Portal hypertension➤ Cirrhotic bleeding<ul style="list-style-type: none">▪ Coagulopathy▪ TIPS indications



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- Variceal bleeding
- Decompensated liver failure
- Fulminant acute liver failure
 - Ingestion/toxins
- Hepatic encephalopathy
- Hepatorenal syndrome
- Paracentesis



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Level	Resuscitation	Ongoing Management	Transition of Care
<p>1</p> <p>Limited Participation Demonstrates limited critical care knowledge and skills</p> <p>Framework: What a learner directly out of residency should know</p> <p>Performs ICU procedures on straightforward patients but requires supervision/direction for more complex patients/procedures</p> <p>Requires continuous direct supervision by the attending for patient management</p>	<ul style="list-style-type: none">• With assistance, diagnoses acute and chronic liver failure in a patient who is critically ill• Generates a limited differential for the etiology of acute liver failure• Describes prognostic models such as Child-Pugh and MELD for a patient with liver failure in the ICU but needs prompting to use them correctly• Identifies differing resuscitation needs of a patient with liver failure but does not describe specific strategies• Identifies a patient with coagulopathy due to liver failure but does not implement strategies to mitigate bleeding risk or address hemorrhage• Recognizes and describes the physiologic consequences and complications of portal hypertension but needs assistance to manage them• Identifies the need for consultants such as hepatology but requires prompting to do so	<ul style="list-style-type: none">• Monitors patient response to therapies for hepatic dysfunction, reporting relevant data to the team• Assesses and initiates treatment of a critically ill patient with hepatic encephalopathy with active direction• Evaluates a patient with renal dysfunction and hepatic failure; describes potential etiologies, including hepatorenal syndrome; needs direction to initiate treatment• Describes basic principles of management of nutritional support in a critically ill patient with liver failure with ongoing direction; needs assistance to implement these principles	<ul style="list-style-type: none">• Demonstrates limited knowledge of the typical disease course and prognosis of acute and chronic liver failure• Communicates objective data and events in transition of care to the interprofessional team; requires assistance to anticipate future patient needs
<p>2</p> <p>Direct Supervision Initiates straightforward management for many</p>	<ul style="list-style-type: none">• Diagnoses and initiates treatment of acute and chronic liver failure in a straightforward patient but does not recognize more subtle signs of progression	<ul style="list-style-type: none">• Monitors patient response to therapies for hepatic dysfunction and adjusts accordingly, reporting relevant data to the team (PC8, MK1 L2)	<ul style="list-style-type: none">• Identifies prognostic uncertainty in the clinical course for a patient with acute and chronic liver failure (PC8, MK2 L2)



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<p>critical illnesses but requires active direction for further management and complex critical illnesses</p> <p>Framework:</p> <p>Demonstrates a sufficient fund of knowledge for basic critical care and some knowledge of complex critical illness</p> <p>Performs ICU procedures on straightforward patients but may require supervision/direction for more complex patients/procedures</p> <p>The attending gives active help throughout to direct the clinical course.</p>	<ul style="list-style-type: none">Identifies likely etiologies of acute liver failure in a straightforward patient; initiates directed treatment with assistanceDescribes and uses prognostic models such as Child-Pugh and MELD to guide care of a straightforward patient with liver failure in the ICUDescribes and implements resuscitation strategies for a straightforward patient with liver failureIdentifies a patient with coagulopathy, recognizing variations in the coagulation cascade due to liver failure; implements some strategies to mitigate bleeding risk and address hemorrhage, requiring assistance in a more complex patientRecognizes and describes the physiologic consequences and complications of portal hypertension and initiates treatment with supervisionIdentifies the need for and communicates with consultants such as hepatology	<ul style="list-style-type: none">Assesses and initiates treatment of hepatic encephalopathy with active directionEvaluates a patient with renal dysfunction and hepatic failure and diagnoses etiologies, including hepatorenal syndrome; begins initial treatmentApplies evidence-based principles in the management of nutritional support in a straightforward patient with liver failure	<ul style="list-style-type: none">Communicates with all team members to coordinate ongoing multidisciplinary care; demonstrates basic understanding of criteria for transfer to a transplant center
<p>3</p> <p>Indirect Supervision</p>	<ul style="list-style-type: none">Assesses and initiates treatment of a complex patient with acute and chronic liver failure with limited guidance	<ul style="list-style-type: none">Monitors patient response to therapies for hepatic dysfunction and adjusts accordingly in a highly complex patient, enlisting the team in management	<ul style="list-style-type: none">Demonstrates understanding of the important role of estimating prognosis; with assistance, integrates objective data into the clinical course and



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Level	Resuscitation	Ongoing Management	Transition of Care
<p>Manages most critical illnesses but may require guidance for more complex patients or atypical presentations</p> <p>Framework: Demonstrates a sufficient fund of knowledge for basic and most complex critical care</p> <p>Independently performs most ICU procedures and supervises procedures on straightforward patients</p> <p>The learner can manage a critically ill patient in straightforward circumstances.</p> <p>May require input in managing the most complicated ICU patients</p>	<ul style="list-style-type: none">Identifies likely etiologies of acute liver failure in a complex patient and implements a treatment planDescribes and uses prognostic models such as Child-Pugh and MELD to guide the care of a complex patient with liver failure in the ICUDescribes and implements resuscitation strategies for a complex patient with liver failureIdentifies a patient with coagulopathy, recognizing variations in the coagulation cascade due to liver failure; implements strategies to mitigate bleeding risk and address hemorrhage with intermittent assistanceRecognizes and describes the physiologic consequences of portal hypertension and develops and implements a treatment plan for a straightforward patientCoordinates recommendations from consultants to optimize patient care in resuscitation	<ul style="list-style-type: none">Assesses and initiates treatment of hepatic encephalopathy with limited guidancePerforms a comprehensive evaluation of a patient with renal dysfunction and hepatic failure and diagnoses etiology, including hepatorenal syndrome; develops a treatment plan but needs assistance in a highly complex patientApplies evidence-based principles in the management of nutritional support for a complex patient with liver failure	<p>prognostication for a patient with acute and chronic liver failure</p> <ul style="list-style-type: none">Coordinates the multidisciplinary team to optimize care, including considering transfer of care to a transplant center when indicated
<p>4</p> <p>Practice Ready</p>	<ul style="list-style-type: none">Independently assesses and initiates comprehensive treatment for hepatic failure	<ul style="list-style-type: none">Leads the team in monitoring patient response to therapies for hepatic dysfunction and adjusts accordingly in a highly complex patient	<ul style="list-style-type: none">Uses evidence-based methods and objective data to determine a prognosis



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<p>Independently manages complex critical illnesses and leads a critical care team</p> <p>Framework:</p> <p>Demonstrates an attending-level fund of knowledge</p> <p>Independently performs and supervises procedures</p> <p>The attending is available at the request of the learner but is not routinely needed for common or complex critical illness.</p>	<ul style="list-style-type: none">Identifies likely etiologies of acute liver failure in a complex patient and implements a comprehensive treatment plan, incorporating patient history and comorbiditiesUses prognostic models such as Child-Pugh and MELD to guide care for a patient with liver failure in the ICU; leads the team in discussing prognosis, risk-stratifying for procedures, and recommending referral for transplantationLeads the team in implementing resuscitation strategies for a patient with liver failure, including assessment of volume responsiveness and the use of colloid and vasopressorsGuides the team in correction of coagulopathy and mitigation of bleeding risk, including the use of advanced assessment of coagulation abnormalities such as TEG/ROTEMLeads the team in comprehensive management of a complex patient with portal hypertension and complications thereofLeads the team in implementing recommendations from consultants to optimize patient care in resuscitation	<ul style="list-style-type: none">Develops a thorough differential and independently assesses and initiates comprehensive treatment for a patient with hepatic encephalopathyAccurately diagnoses and develops a comprehensive treatment plan for a patient with renal dysfunction and liver failureLeads the team in providing nutritional support to a patient with liver failure, incorporating chronicity of illness and comorbid factors	<ul style="list-style-type: none">Leads the multidisciplinary team in transition of care, including coordinating transfer of care to a transplant center when indicated