CATS Clinical Guideline

Acute Liver Failure

1. Definitions
   - **Acute Liver Failure:**
     Rare multisystem disorder involving massive hepatic necrosis associated with severe impairment of liver function with or without encephalopathy in a patient with no recognised underlying chronic liver disease. In the absence of encephalopathy the severity of liver impairment is best assessed by the degree of coagulopathy.
   - **Fulminant Liver Failure:**
     Onset of hepatic encephalopathy and coagulopathy within 8 weeks of onset of liver disease, in the absence of pre-existing liver disease in any form.

2. Assessment
   - **Aetiology of liver failure**
     Neonatal:
     - viral hepatitis: HSV
     - HLH
     - neonatal haemochromatosis
     - metabolic disorders
     Children:
     - infective: non A-E hepatitis, parvovirus, adenovirus
     - septicaemia
     - toxic: paracetamol, sodium valproate, carbemazepine, isoniazid, rifampicin, halothane
     - infiltrative: leukaemia, HLH
     - autoimmune
     - ischaemic: Budd Chiari syndrome, shock
     - metabolic
     - cryptogenic
   - **Clinical features**
     - Jaundice
     - Altered conscious level (encephalopathy)
     - Ascites, effusions
     - GI haemorrhage (variceal haemorrhage in portal hypertension)
     - Hepatomegaly (may shrink with deterioration)
     - Systemic collapse (poor prognosis)
• **Biochemical findings**
  o Hepatic injury:
    ▪ raised transaminases (ALT, AST, GGT)
  o Hepatic dysfunction:
    ▪ Coagulopathy (PT > 20sec) not correctable with vit K
    ▪ Hypoglycaemia
    ▪ Hypoalbuminaemia
    ▪ Increasing bilirubin
    ▪ Hyperammonia and encephalopathy
    ▪ High lactate

**Investigations requested should therefore include:**
Bili (total, conj), AST, ALT, GGT, Alb, NH3, Lactate, Glucose
FBC, clotting (including PT/INR, APTT, Fib)

• **Common complications**
  o Cerebral oedema, raised intracranial pressure
  o Sepsis
  o Coagulopathy
  o Respiratory failure, aspiration
  o Renal failure
  o MODS
  o Adrenal insufficiency
  o Electrolyte disturbances (low Na, K, Ca, Mg, phosphate)

3. **Indications for transfer to King’s College Hospital (KCH)**
• Altered level of consciousness
• Elevated INR >1.6 in absence of DIC and unresponsive to Vitamin K and FFP, with elevated or decreasing transaminases
• Hypoglycaemia
• Jaundice
• Metabolic acidosis
• Patient requires liver transplantation
• Hyperlactataemia
• Variceal haemorrhage

**Not all of these indications require intensive care retrieval by CATS.**
Liver failure requires specialised management and advice should not be given to referral hospitals without prior discussion with the KCH consultant and the CATS team.

When preparing for transfer:

- Consider taking Sengstaken tubes and octreotide if known portal hypertension and bleeding varices. **Discuss with KCH and CATS consultant.**

4. Initial management

4.1 High flow oxygen
4.2 Secure and maintain airway.
4.3 Obtain venous access. The preferred route for central access is femoral.
4.4 Treat coagulopathy with IV vit K 2-10mg. Avoid the use of blood products unless actively bleeding, requiring invasive procedures or severe coagulopathy (PT>60 sec). In these circumstances treat with FFP and cryoprecipitate and aim for a platelet count of \( >50 \times 10^9/L \).
4.5 Monitor blood glucose and maintain between 4-6mmol/l. This may require 10-20% dextrose IVIs. (NB: 20% dextrose should be given centrally)
4.6 0.9% NaCl should be used for maintenance. Fluid restrict all patients to 2/3 calculated maintenance.
4.7 Site nasogastric tube or orogastric tube (occasionally avoided in coagulopathy)
4.8 Institute regular neuro observations (every 15 mins)
4.9 Consider commencing acyclovir, antibiotics and antifungals.
4.10 Commence N-acetylcysteine (Parvolex) in paracetamol poisoning or if instructed by the KCH team.

5. Indications for intubation

5.1 ≥Grade 2 encephalopathy
5.2 Raised intracranial pressure
5.3 Rapidly deteriorating course
5.4 Respiratory failure
5.5 Cardiovascular collapse
5.6 Portal hypertension with variceal haemorrhage

Oral intubation is preferred, with a cuffed ETT, due to risk of bleeding and aspiration.
Table: Hepatic Encephalopathy Grading

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>0</td>
<td>Clinically normal mental status but minimal changes in memory, concentration, intellectual function, and coordination</td>
</tr>
<tr>
<td>1</td>
<td>Mild confusion/anxiety, disturbed or reversal of sleep rhythm, shortened attention span, slowing of ability to perform mental tasks (simple addition or subtraction). In young children, irritability, altered sleep pattern, unexplained bursts of excessive crying.</td>
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<tr>
<td>2</td>
<td>Drowsiness, confusion, mood swings with personality changes, inappropriate behaviour, intermittent disorientation of time and place, gross deficit in ability to perform mental tasks. In young children, excessive sleepiness, inability to interact with or recognise parents, lack of interest in favourite toys and activities.</td>
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<tr>
<td>3</td>
<td>Pronounced confusion, delirious but arousable, persistent disorientation of time and place, hyperreflexia with a positive Babinski's sign.</td>
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<tr>
<td>4</td>
<td>Comatose with or without decerebrate or decorticate posturing, response to pain present (IVa) or no response to pain (IVb).</td>
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6. Management following intubation

6.1 Aim to oxygenate (PaO$_2$ >10 kPa) and maintain normocarbia (PaCO$_2$ 4.5- 5.3)
6.2 If raised ICP suspected, treat as such (see guideline on traumatic head injury). Consider the use of mannitol or 3% saline (aim for Na 145mmol/l)
6.3 Femoral central access if vasoactive agents or high concentration dextrose infusions are required.
6.4 Noradrenaline is the vasoactive agent of choice.
6.5 Consider IV hydrocortisone 1-2 mg/kg 6 hourly if adrenal insufficiency suspected. Draw blood for baseline cortisol first but do not wait for assay.

For uncontrolled variceal haemorrhage

6.7 Correct coagulopathy
6.8 Give Vitamin K
6.9 Ensure packed cells given and more available for transfer, as well as other blood products
6.10 Commence octreotide infusion (mix 500mcg in 40mls 0.9% NaCl, run at 2-4 ml/hr)
6.11 Consider placing Sengstaken tube (if appropriately trained)
Discuss with CATS consultant and KCH consultant on call

7. Transport considerations

7.1 Paralyse and sedate with morphine/midazolam/vecuronium. Monitor pupils.
7.2 Monitor arterial gases, glucose and lactate levels closely.
7.3 For non-intubated patients: no sedation (risk of loss of airway), avoid any unnecessary pain and stimulation.