

Queensland
Trauma Education

ABDOMINAL TRAUMA

Blunt hepatic trauma

Case discussion

Facilitator resource kit

CSDS



Clinical Skills Development Service

Metro North
Health



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Developed by

Dr Frances Williamson
Emergency Staff Specialist - Metro North Hospital and Health Service

Kimberly Ballinger
Simulation Educator - Clinical Skills Development Service

Reviewed by

Education Working Group, Statewide Trauma Clinical Network - Clinical Excellence Queensland

Designed by

Rebecca Launder
Product Designer - Clinical Skills Development Service

Queensland Trauma Education**Abdominal Trauma - Blunt hepatic trauma: Case discussion - Facilitator resource kit
Version 1.0**

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Herston, Queensland, Australia
csds.qld.edu.au/qte
Phone +61 7 3646 6500
Email CSDS-Courses@health.qld.gov.au

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Queensland Trauma Education

The resources developed for Queensland Trauma Education are designed for use in any Queensland Health facility that cares for patients who have been injured as a result of trauma. Each resource can be modified by the facilitator and scaled to the learners needs as well as the environment in which the education is being delivered, from tertiary to rural and remote facilities.

National Safety and Quality Health Service (NSQHS) Standards



About this training resource kit

This resource kit provides healthcare workers with an understanding of the diagnostic and therapeutic methods utilised for the optimal management of blunt hepatic trauma.

Target audience

- Medical and nursing clinicians.
- Allied health clinicians.

Duration

30 minutes.

Group size

Small group participation (4-6 participants).

Learning objectives

By the end of this session the participant will be able to:

- Understand the diagnostic methods and therapeutic interventions implemented in blunt hepatic trauma.
- Demonstrate knowledge of evidenced-based guidelines used to determine the severity of hepatic injury to support management decisions in liver trauma, including both operative and non-operative management.

Facilitator guide

1. Facilitator to provide participant resource kit to learner.
2. Facilitator to present case study overview to group and utilise question and answer guide to facilitate group discussion.
3. Utilise supporting documents to reinforce learning throughout case discussion.

Participant resource kit

- Learning objectives.
- Overview of blunt hepatic trauma.
- Further reading.
- Supporting resources:
 - WSES liver trauma classification.
 - AAST liver trauma classification.
 - Statements summary.

Supporting resources

- WSES liver trauma classification.
- AAST liver trauma classification.
- Statements summary.

Overview of blunt hepatic trauma

The liver when injured in blunt abdominal trauma represents one of the most life-threatening injuries in trauma patients due to the highly vascular nature of the liver itself.

The optimal management of blunt hepatic trauma requires consideration of the patients' haemodynamic status, associated injuries and the anatomical liver injury grade to determine whether patients require operative or non-operative management.

The World Society of Emergency Surgery (WSES) provides guidelines for management of traumatic injuries and can aid in the successful diagnosis and therapeutic interventions in the trauma patient. The WSES classification (Table 1) divides liver injuries into four classes considering the American Association for Surgery of Trauma – Organ Injury Scale (AAST-OIS classification (Table 2) and hemodynamic status (Table 3):

Minor hepatic injuries:

- WSES grade I includes AAST-OIS grade I–II hemodynamically stable lesions.

Moderate hepatic injuries:

- WSES grade II includes AAST-OIS grade III hemodynamically stable lesions.

Severe hepatic injuries:

- WSES grade III includes AAST-OIS grade IV–V hemodynamically stable lesions.
- WSES grade IV includes AAST-OIS grade I–VI hemodynamically unstable lesions.

Further reading

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<https://doi.org/10.1097/TA.0b013e3181ba361f>

Table 1. WSES liver trauma classification ¹

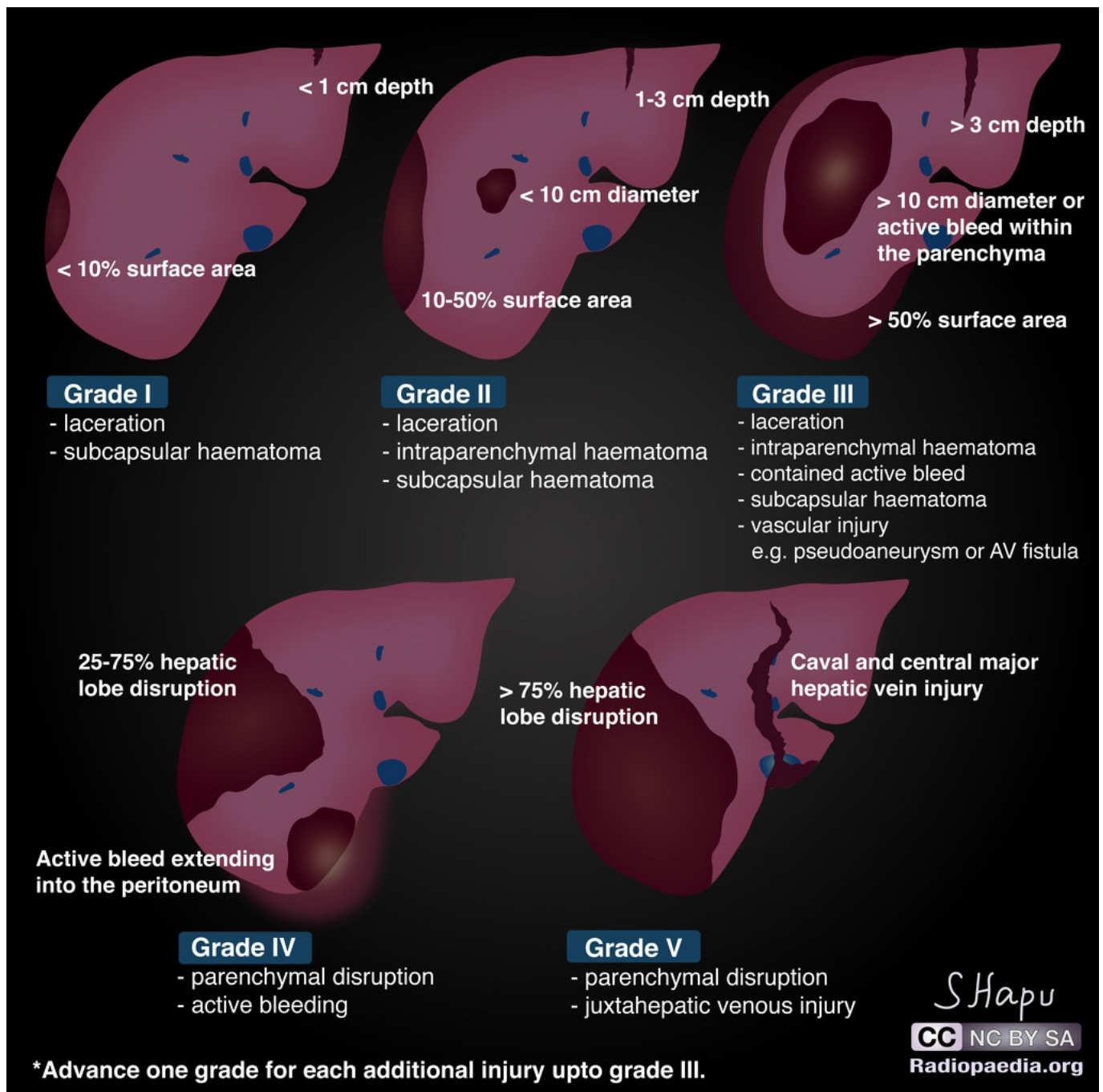
	WSES grade	AAST	Hemodynamic
Minor	WSES grade I	I–II	Stable
Moderate	WSES grade II	III	Stable
Severe	WSES grade III	IV–V	Stable
	WSES grade IV	I–VI	Unstable

Table 2. AAST liver trauma classification ¹

Grade	Type of injury	Description of injury
I	Haematoma	Subcapsular < 10% surface
	Laceration	Capsular tear < 1cm parenchymal depth
II	Haematoma	Subcapsular 10-50% surface area; intraparenchymal, < 10cm diameter
	Laceration	1-3cm parenchymal depth, < 10 cm in length
III	Haematoma	Subcapsular > 50% surface area or expanding, ruptured subcapsular or parenchymal haematoma. Intraparenchymal haematoma > 10cm
	Laceration	> 3cm parenchymal depth
IV	Laceration	Parenchymal disruption 25-75% of hepatic lobe
V	Laceration	Parenchymal disruption involving > 75% of hepatic lobe
	Vascular	Juxtavenous hepatic injuries i.e retrohepatic vena cava/central major hepatic veins
VI	Vascular	Hepatic avulsion

Advance one grade for bilateral injuries up to grade III.

Liver trauma grading diagram



Source: https://radiopaedia.org/cases/51390/studies/73834?lang=gb&referrer=%2Farticles%2FLiver-trauma%3Flang%3Dgb%23image_list_item_44955209

Table 3. Statements summary ¹

	Statements
Diagnostic procedures	<ul style="list-style-type: none"> • The diagnostic methods on admission are determined by the hemodynamic status (GoR 1A). • E-FAST is rapid in detecting intra-abdominal free fluid (GoR 1A). • CT scan with intravenous contrast is the gold standard in hemodynamically stable trauma patients (GoR 1A).
Non-operative management (NOM)	<ul style="list-style-type: none"> • NOM should be the treatment of choice for all hemodynamically stable minor (WSES I) (AAST I–II), moderate (WSES II) (AAST III), and severe (WSES III) (AAST IV–V) injuries in the absence of other internal injuries requiring surgery (GoR 2A). • In patients considered transient responders with moderate (WSES II) (AAST III) and severe (WSES III) (AAST IV–V) injuries, NOM should be considered only in selected settings provided the immediate availability of trained surgeons, operating room, continuous monitoring ideally in an ICU or ER setting, access to angiography, angioembolization, blood and blood products, and in locations where a system exists to quickly transfer such patients to higher level of care facilities (GoR 2B). • A CT scan with intravenous contrast should always be performed in patients being considered for NOM (GoR 2A). • AG/AE may be considered as a first-line intervention in hemodynamically stable patients with arterial blush on CT scan (GoR 2B). • In hemodynamically stable children, the presence of contrast blush on CT scan is not an absolute indication for AG/AE (GoR 2B). • Serial clinical evaluations (physical exams and laboratory testing) must be performed to detect a change in clinical status during NOM (GoR 2A). • NOM should be attempted in the setting of concomitant head trauma and/or spinal cord injuries with reliable clinical exam, unless the patient could not achieve specific hemodynamic goals for the neurotrauma and the instability might be due to intra-abdominal bleeding (GoR 2B). • Intensive care unit admission in isolated liver injury may be required only for moderate (WSES II) (AAST III) and severe (WSES III) (AAST IV–V) lesions (GoR 2B). • In selected cases where an intra-abdominal injury is suspected in the days after the initial trauma, interval laparoscopic exploration may be considered as an extension of NOM and a means to plan patient management in a step-up treatment strategy (GoR 2C). • In low-resource settings, NOM could be considered in patients with hemodynamic stability without evidence of associated injuries, with negative serial physical examinations and negative imaging and blood tests (GoR 2C).

Statements	
Operative management (OM)	<ul style="list-style-type: none"> • Hemodynamically unstable and non-responder patients (WSES IV) should undergo OM (GoR 2A). • Primary surgical intention should be to control the hemorrhage and bile leak and initiation of damage control resuscitation as soon as possible (GoR 2A). • Major hepatic resections should be avoided at first and only considered in subsequent operations, in a resectional debridement fashion in cases of large areas of devitalized liver tissue done by experienced surgeons (GoR 2B). • Angioembolization is a useful tool in case of persistent arterial bleeding after non-hemostatic or damage control procedures (GoR 2A). • Resuscitative endovascular balloon occlusion of the aorta (i.e., REBOA) may be used in hemodynamically unstable patients as a bridge to other more definitive procedures for hemorrhage control (GoR 2B).
Short and long-term follow-up	<ul style="list-style-type: none"> • Intrahepatic abscesses may be successfully treated with percutaneous drainage (GoR 2A). • Delayed hemorrhage without severe hemodynamic compromise may be managed at first with AG/AE (GoR 2A). • Hepatic artery pseudoaneurysm should be managed with AG/AE to prevent rupture (GoR 2A). • Symptomatic or infected bilomas should be managed with percutaneous drainage (GoR 2A). • Combination of percutaneous drainage and endoscopic techniques may be considered in managing post-traumatic biliary complications not suitable for percutaneous management alone (GoR 2B). • Lavage/drainage and endoscopic stenting may be considered as the first approach in delayed post-traumatic biliary fistula without any other indication for laparotomy (GoR 2B). • Laparoscopy as initial approach should be considered in cases of delayed surgery, so as to minimize the invasiveness of surgical intervention and to tailor the procedure to the lesion (GoR 2B).
Thrombo-prophylaxis, feeding, and mobilization	<ul style="list-style-type: none"> • Mechanical prophylaxis is safe and should be considered in all patients with no absolute contraindication (GoR 2A). • LMWH-based prophylaxis should be started as soon as possible following trauma and may be safe in selected patients with liver injury treated with NOM (GoR 2B). • In those patients taking anticoagulants, individualization of the risk-benefit balance of anticoagulant reversal is suggested (GoR 1C). • Early mobilization should be achieved in stable patients (GoR 2A). • In the absence of contraindications, enteral feeding should be started as soon as possible (GoR 2A).

Case discussion

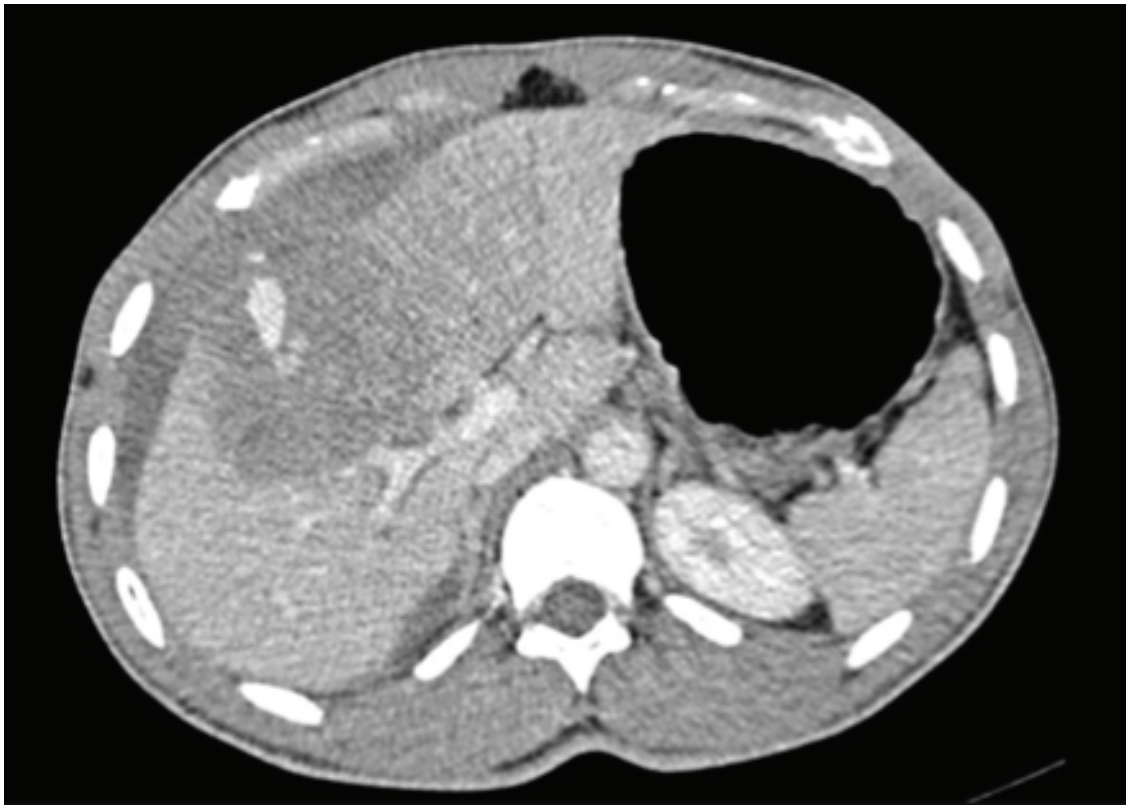
Case study

A 34yo male is brought to the emergency department after a fall from a ladder, landing on his right side and striking his abdomen and chest. On assessment in ED he complains of significant abdominal pain.

His vital signs are HR 90 and BP 130/80mmHg. A primary survey does not identify any other areas of concern. The patient is noted to have a large bruise across his RUQ in addition to tenderness on secondary examination.

He undergoes a CT chest and abdomen (PV phase) which reveals a grade 3 liver injury with moderate haemoperitoneum without active extravasation of contrast. He has no other injuries on his trauma CT scan.

Grade 4 Liver



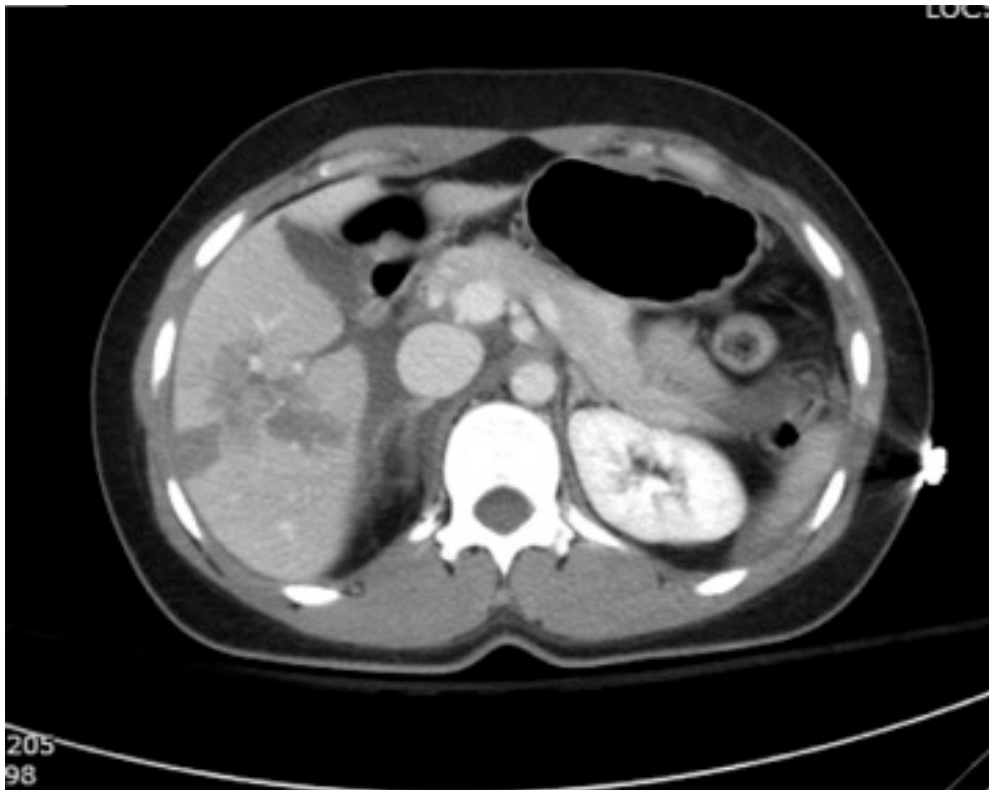


Image courtesy of: <https://doi.org/10.1016/j.circen.2016.04.006>

Question and answer guide

1. Where should this patient be managed?

Blunt abdominal trauma represents a high risk of hepatic injury and further bleeding, therefore requires:

- Early definitive management in a centre where emergent operative management is available or;
- Early notification and referral to tertiary centre where emergent operative management is available.
- Ideally will be managed in a tertiary referral centre for trauma.

The patient should be managed in a critical care (ICU/HDU/trauma ward) setting with access to operating theatres as they require close observation with regular clinical consultation and review.

2. What ongoing clinical assessments/trends can be used to monitor this patient?

- Haemodynamic monitoring: closely observe increasing HR and lowering of systolic BP; indicative of ongoing blood loss and perfusion deficits.
- Serial abdominal exams: peritonism suggests an increase in haemoperitoneum.
- Serial haemoglobin trends (either laboratory or point-of-care): decreasing trend indicative of ongoing blood loss.

3. If this patient became haemodynamically unstable or is a non-responder, what is the next course of action? ¹

- In the unstable or non-responder patient, operative management to control bleeding should be used in the first instance.
- Transient responders may benefit from interventional radiology (IR) depending on transfusion requirements.
- Interventional Radiology (IR) can be considered in the persistent arterial bleed after damage control surgery.
- Damage control surgery intention is to control immediate haemorrhage and exclude other intraperitoneal injuries.
- Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) can be used as a bridge to more definitive surgical control (commonly in USA and Europe).

4. The patient remains stable and is managed in an appropriate monitored setting. What other supportive cares should be implemented?

- Mechanical prophylaxis for DVT prevention should be commenced early.
- Chemical DVT prophylaxis can be commenced early, if the patient remains haemodynamically stable.
- Early mobilisation, even with higher grade injury, in the stable patient should occur.
- Enteral feeding is aimed to commence as soon as possible.

5. What is the likely overall success rate in non-operative management (NOM) of blunt hepatic trauma?

› 80% of cases are managed non-operatively.

- Of these, 90% are successfully managed without the need for an operation. ²

6. When is hepatic embolisation useful?

- After damage control surgery when arterial bleeding still ongoing.
- Used to prevent bleeding- highest success when used pre-emptively in patients who have extravasation of contrast on the initial CT scan and are haemodynamically stable.
- Success rate 68-87%. ³

7. What complications may arise from non-operative management or hepatic embolisation?

- Increased rate of missed hollow viscous injury.
- Complications from embolisation include: arterial puncture site bleeding/infection; liver necrosis; liver abscess; inadvertent embolisation of other organs; lower extremity ischaemia from arterial intimal dissection; contrast induced allergic reactions and renal toxicity from contrast.
- Failure of non-operative management is generally related to bleeding in which case surgical management is the preferred treatment.
- Biliary tree disruption may present after a period of NOM- with a biloma or persistent biliary leak. ²
- Additional factors that can increase complications include increasing age of the patient, delayed bleeding, sudden hypotension and active extravasation of contrast not controlled by embolization. ^{4,5}

8. When can discharge planning be considered in this group?

- Higher-grade injuries should be observed in an ICU/HDU setting for 48-72 hours to confirm clinical stability.
- Following this, if the patient has normal clinical abdominal exams, and a stable haemoglobin for 24 hours they can be considered for discharge. ⁶

9. What factors are associated with a higher mortality rate?

- Overall mortality rate 10-42%.
- Factors associated with increased mortality include: higher grade of injury, co-existing significant traumatic injuries, high levels of AST/ ALT, raised lactate, increased APTT, low fibrinogen, low platelet count.
- Improved mortality is associated with tertiary care with hepatobiliary surgical team involvement. ⁷

Acronyms and abbreviations

AST	aspartate transaminase (liver function test)
ALT	alanine transaminase (liver function test)
APTT	activated partial thromboplastin time
DVT	deep vein thrombosis
PV	portal venous

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