



**A NEET SS (SURGERY) PREPARATION COURSE
BY MARROW, WITH A TEAM OF SELECTED
SUPER-SPECIALITY FACULTY**

SURGERY NEET SS

HIGH YIELD

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TOPICS

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TRAUMA 1

Basics of trauma management

00:00:31

Pre hospital care :

Information from driver/responder :

M : mechanism.

I : Injuries.

S : Signs & symptoms.

T : treatment given.

Information from Patient :

A : Allergies.

M : medications.

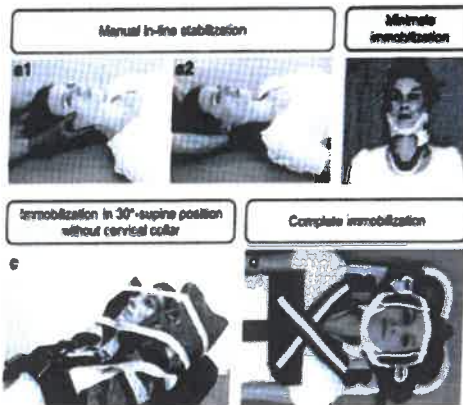
P : Past history.

L : Last meal.

E : Events leading to trauma.

Helmet removal :

- 2 people required.
- One person stabilizes the cervical spine.



Cervical spine immobilization.

Transportation of patient :

- Supine position.
- Prone position.
- Never transported in lateral position (cannot maintain cervical spine).

Trimodal distribution of mortality in trauma :

1st spike (At impact) : Severe head injury.

and peak (within 1 hour) d/t :

1. Airway obstruction.
2. Tracheobronchial injury.
3. Open pneumothorax.
4. Tension pneumothorax.
5. Acute circulatory arrest.
6. Haemothorax.
7. Cardiac tamponade.

First hour following trauma : Golden hour.

Delayed causes (days/weeks) : Delayed head injury and sepsis.

Triage :

means "to sort out".

Internationally accepted 4 color coded system :

- Red : Highest priority.
- Yellow : medium priority (fractures).
- Green : Walking wounded.
- Black : Dead/moribund.

Priority group			
Number	Name	Color	Description
P1	Emergency/ Immediate	Red	Patients who have life-threatening injuries that are treatable with a minimum amount of time, personnel, and supplies. These patients also have a good chance of recovery.
P2	Urgent	Yellow	Indicates that treatment may be delayed for a limited period of time without significant mortality or in the ICU setting patients for whom life support may or may not change their outcome given the severity of their illness.
P3	Delayed	Black	Patients with minor injuries whose treatment may be delayed until the patients in the other categories have been dealt with or patients who do not require ICU admission for the provision of life support.
P4	Expectant	Blue	Patients who have injuries requiring extensive treatment that exceeds the medical resources available in the situation or for whom life support is considered futile.
-	Dead	Black	Patients who are in cardiac arrest and for which resuscitation efforts are not going to be provided.

Advanced trauma life support

00:04:25

Primary survey : ABCD + life threatening injuries.

Secondary survey : Detailed survey to look for all the other injuries.

Note : In basic life support, CAB sequence is followed.

Primary survey :

Airway :

- Cervical spine f/b airway.
- Assessment of cervical spine : Nexus criteria.
- Any 1 criteria present → imaging and cervical spine stabilisation using philadelphia collar.
- Life threatening injuries ruled out.

Airway

- Airway Obstruction
- Tracheobronchial Tree Injury

Breathing

- Tension Pneumothorax
- Open Pneumothorax

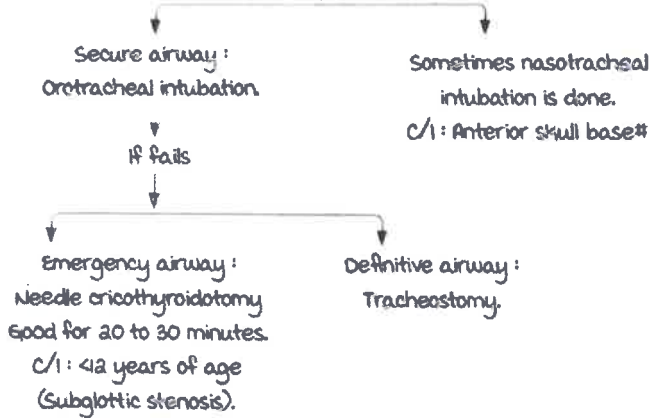
Circulation

- Massive Hemothorax
- Cardiac Tamponade
- Traumatic Circulatory Arrest

Life threatening injuries.

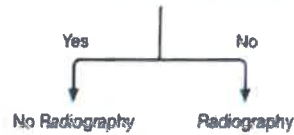
Danger signs present :

- GCS \leq 8.
- Coma.
- Unable to speak.
- Non purposeful movements.



National Emergency X-Radiography Utilization Study (NEXUS) Criteria

- Meets ALL low-risk criteria?
1. No posterior midline cervical-spine tenderness and
 2. No evidence of intoxication and
 3. A normal level of alertness and
 4. No focal neurologic deficit and
 5. No painful distracting injuries



NEXUS Mnemonic

- N - Neuro deficit
- E - EtOH (alcohol)/intoxication
- X - eXtreme distracting injury(ies)
- U - Unable to provide history (altered level of consciousness)
- S - Spinal tenderness (midline)

Fracture	Description	Typical management
C1 Jefferson #	Disruption of C1 ring. (blow out #)	Stable : Hard collar. Unstable : Surgery/ traction.
Odontoid #	Type I : Tip of odontoid. Type II : Through base. Type III : Involves C2 body.	Hard collar. Halo vest/surgery. Halo vest.
C2 hangman #	B/I C2 pedicles with spondylolisthesis.	Halo vest/surgery.
Cervical v.body #	Compression/burst of vertebral body (v.body) with/without retropulsion into canal.	Hard collar/surgical stabilisation.
Thoracic v.body #		Anterior column only : TLSO.
Lumbar v.body #		Anterior and posterior columns : Surgical stabilisation.
Chance #	Avulsion of posterior elements of lumbar vertebrae (high seat belt use)	Surgical stabilisation.

: Fracture.

REBOA :

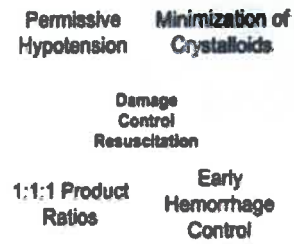
- Resuscitative endovascular balloon occlusion of aorta (REBOA).
- Temporary hemorrhage control in decompensated trauma patients
- Introduced through common femoral artery, advanced proximal to level of injury and then inflated.
- Helps in reducing bleeding and shunting the blood to heart and brain.



Pelvic binder in case of suspected pelvic #.

Damage control resuscitation :

- Permissive hypotension : SBP at lower limit of normal.
- minimisation of crysalloids : to prevent dilutional coagulopathy.
- Blood products PRBCs/platelets/plasma ratio : 1 : 1 : 1.
- Early hemorrhage control.



Glasgow coma scale :

BEHAVIOR	RESPONSE	SCORE
Eye opening response	Spontaneously	4
	To speech	3
	To pain	2
	No response	1
Best verbal response	Oriented to time, place, and person	5
	Confused	4
	Inappropriate words	3
	Incomprehensible sounds	2
	No response	1
Best motor response	Obeys commands	6
	Moves to localized pain	5
	Flexion withdrawal from pain	4
	Abnormal flexion (decorticate)	3
	Abnormal extension (decerebrate)	2
	No response	1

Single best score : motor score.

Always consider the highest response in GCS.

NT : Non testable.

Eye opening

Criterion	Observed	Rating	Score
Open before stimulus	<input checked="" type="checkbox"/>	Spontaneous	4
After spoken or shouted request	<input checked="" type="checkbox"/>	To sound	3
After finger tip stimulus	<input checked="" type="checkbox"/>	To pressure	2
No opening at any time, no interfering factor	<input checked="" type="checkbox"/>	None	1
Closed by local factor	<input checked="" type="checkbox"/>	Non testable	NT

Verbal response

Criterion	Observed	Rating	Score
Correctly gives name, place and date	<input checked="" type="checkbox"/>	Orientated	5
Not orientated but communication coherently	<input checked="" type="checkbox"/>	Confused	4
Intelligible single words	<input checked="" type="checkbox"/>	Words	3
Only moans / groans	<input checked="" type="checkbox"/>	Sounds	2
No audible response, no interfering factor	<input checked="" type="checkbox"/>	None	1
Factor interfering with communication	<input checked="" type="checkbox"/>	Non testable	NT

Best motor response

Criterion	Observed	Rating	Score
Oblly 2-part request	<input checked="" type="checkbox"/>	Obeys commands	6
Brings hand above clavicle to stimulus on head neck	<input checked="" type="checkbox"/>	Localising	5
Bends arm at elbow rapidly but features not predominantly abnormal	<input checked="" type="checkbox"/>	Normal flexion	4
Bends arm at elbow, features clearly predominantly abnormal	<input checked="" type="checkbox"/>	Abnormal flexion	3
Extends arm at elbow	<input checked="" type="checkbox"/>	Extension	2
No movement in arms / legs, no interfering factor	<input checked="" type="checkbox"/>	None	1
Paralysed or other limiting factor	<input checked="" type="checkbox"/>	Non testable	NT

Pupils Unreactive to Light

Pupil Reactivity Score

Both Pupils	2
One Pupil	1
Neither Pupil	0

The GCS-P is calculated by subtracting the Pupil Reactivity Score (PRS) from the Glasgow Coma Scale (GCS) total score:

$$\text{GCS-P} = \text{GCS} - \text{PRS}$$

- GCS score :
 - mild head injury : 13 to 15.
- moderate head injury : 9 to 12.
- Severe head injury : 8 or less, needs intubation.

Log roll :

Technique to examine back of a trauma patient.

Minimum 4 people are required.



Revised trauma score

Glasgow coma scale	Systolic blood pressure (mmHg)	Respiratory rate	Coded value
13 - 15	> 89	10 - 29	4
9 - 12	76 - 89	> 29	3
6 - 8	50 - 75	6 - 9	2
4 - 5	1 - 49	1 - 5	1
3	0	0	0

Mangled Extremity Severity Score (MESS)

Type	Characteristics	Injuries	Points
1	Low energy	Stab wound, simple closed fx, small-caliber GSW	1
2	Medium energy	Open/multilevel fx, dislocation, moderate crush	2
3	High energy	shotgun, high-velocity GSW	3
4	Massive crush	Logging, railroad, oil rig accidents	4
Shock group			
1	Normotensive	BP stable	0
2	Transiently hypotensive	BP unstable in field but responsive to fluid	1
3	Prolonged hypotension	SBP <90mmHg in field and responsive to IV fluids in OR	2
Ischemia Group			
1	None	Pulsatile, no signs of ischemia	1
2	Mild	Diminished pulses without signs of ischemia	2
3	Moderate	No dopplerable pulse, sluggish cap refill, paresthesia, diminished motor activity	3
4	Advanced	Pulseless, cool, paralyzed, numb without cap refill	4
Age Group			
1	<30y/o		0
2	> 30 <50		1

MESS score: six or less consistent with a salvageable limb. Seven or greater amputation generally the eventual result.

Abdominal trauma

00:18:36

m/c organ injured overall : Spleen.

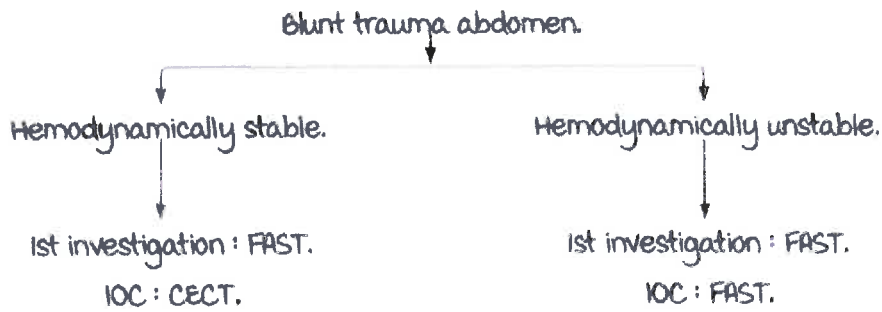
m/c organ injured in blunt trauma : Spleen.

m/c organ injured in penetrating trauma : Liver > small intestine.

m/c organ injured in gun shot wound : Small intestine.

m/c organ injured in seat belt syndrome : mesentery.

Deceleration injury : Duodenojejunal flexure.

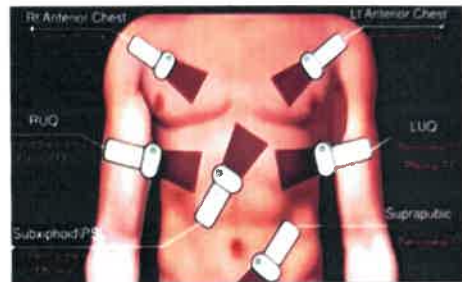


FAST (Focussed Assessment Sonogram in Trauma) :

ultrasound done in emergency.

4 probes :

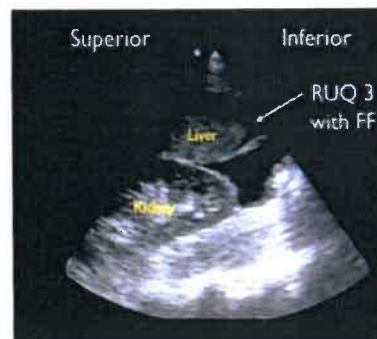
1. Epigastrium : To look for cardiac tamponade.
2. Right hypochondrium.
3. Left hypochondrium.
4. Suprapubic region : To look into pelvis.



eFAST : FAST + Thoracic cavity.

Utilisation of eFAST :

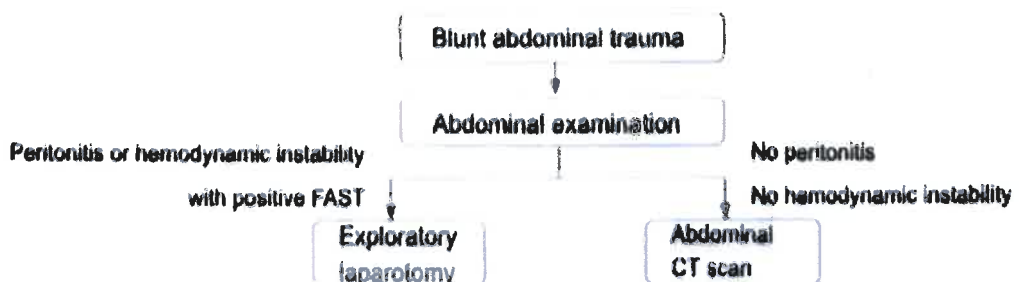
- Detects free fluid in the abdomen or pericardium.
- Not reliable to detect < 100 cc of free blood.
- Does not directly identify injury to hollow viscus.
- Cannot reliably exclude injury in penetrating trauma.
- May need repeating or supplementing with other investigations.
- Unreliable for assessment of retroperitoneum (Obscured by bowel gases).

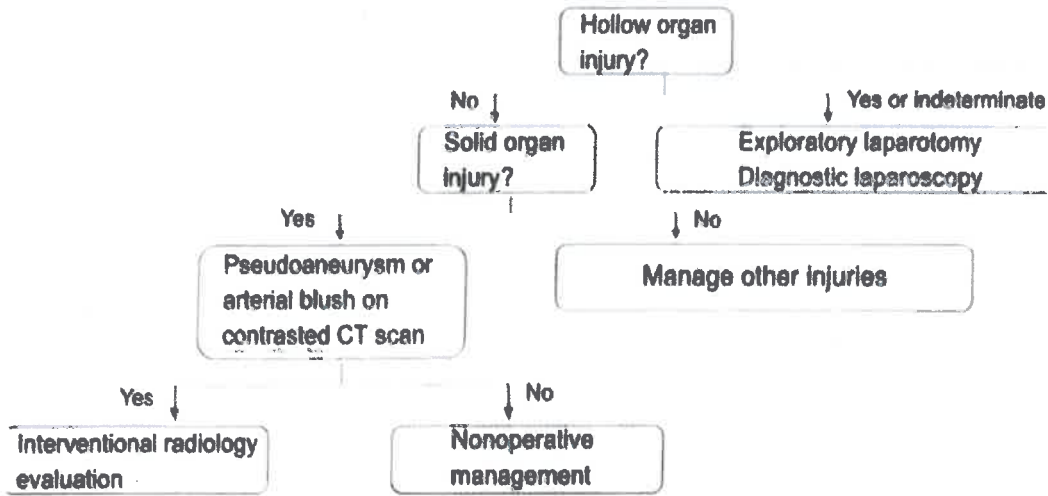


FAST positive : Hypoechoic collection present.

Note : If FAST is positive, do midline laparotomy.

Algorithm for work up of blunt trauma abdomen :





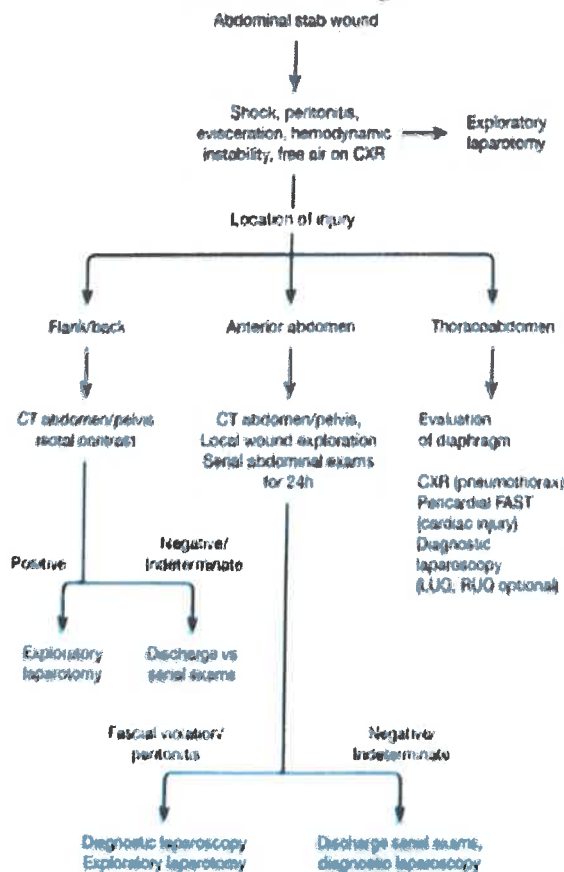
Penetrating abdominal trauma :

If injury is superior to peritoneum → local exploration and suturing → CECT.

If there is peritoneal breach :

- Peritonitis
 - Omentum hanging out.
 - Bile staining of dressing.
- } Laparotomy even if patient is hemodynamically stable.

Note : If there is a sharp object impaled in the body, **remove** the object in the **OT only** (Provides tamponade, prevents bleeding).



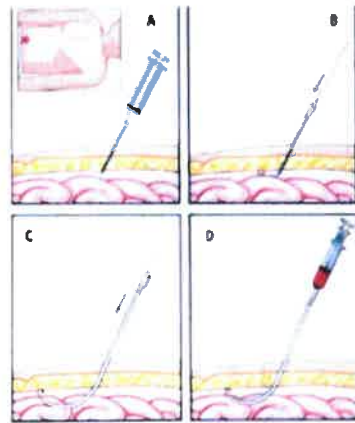
Diagnostic peritoneal lavage (DPL) :

Rarely done now.

Indication : When FAST is not available.

Positive DPL :

- If 10 cc of gross blood is aspirated.
- $> 1,00,000$ RBCs/mm³.
- > 500 WBCs/mm³.
- Amylase > 175 IU/L.
- Presence of rectal content.



DPL.

Splenic trauma :

Should be suspected if :

- Bruising in lower chest wall.
- # Left 9th to 11th ribs.

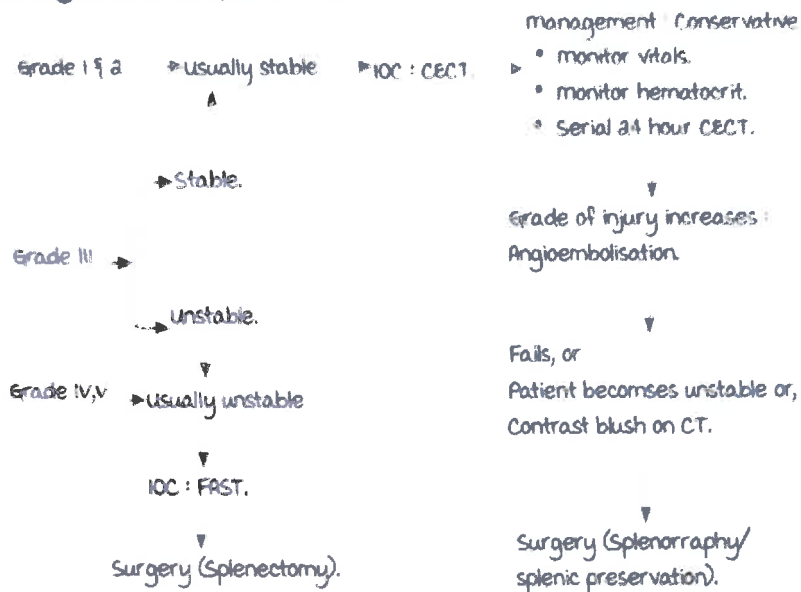
Grading of splenic trauma :

Grade 1	<ul style="list-style-type: none">• Subcapsular haematoma $< 10\%$ of surface area• Parenchymal laceration < 1 cm depth• Capsular tear
Grade 2	<ul style="list-style-type: none">• Subcapsular haematoma 10-50% of surface area; intraparenchymal haematoma < 5 cm• Parenchymal laceration 1-3 cm
Grade 3	<ul style="list-style-type: none">• Subcapsular haematoma $> 50\%$ surface area; ruptured subcapsular or intraparenchymal haematoma ≥ 25 cm• Parenchymal laceration > 3 cm depth
Grade 4	<ul style="list-style-type: none">• Any injury in the presence of a splenic vascular injury or active bleeding confined within the splenic capsule• Parenchymal laceration involving segmental or hilar vessels producing $> 25\%$ devascularisation
Grade 5	<ul style="list-style-type: none">• Any injury in the presence of splenic vascular injury with active bleeding extending beyond the spleen into the peritoneum - shattered spleen

Vascular Injury is defined as a pseudoaneurysm or arteriovenous fistula and appears as a focal collection of vascular contrast that decreases in attenuation with delayed imaging. Active bleeding from a vascular injury presents as vascular contrast, focal or diffuse, that increases in size or attenuation in the delayed phase.

Grading of splenic trauma.

management of splenic trauma :



Complications of splenic trauma :

- a. Hemorrhage.
- b. Injury to pancreas (Tail of pancreas is close to hilum of spleen).
- c. Hematological changes :
 - Transient increase in WBCs, RBCs, platelets (uptil 2 weeks).
 - Permanent changes : Basophilic stippling, howell jolly bodies, reticulocytosis, hypersegmented WBCs.
- d. Left lung atelectasis (m/c complication).
- e. Opportunistic post splenectomy infections (OPSI) :
 - Caused by encapsulated bacteria : Pneumococcus (m/c), meningococcus, H. influenzae.
 - Children > adults.
 - Within 1st two years of splenectomy.
 - High mortality.
 - Splenectomy done for hematological conditions > trauma conditions.

Prophylactic antibiotics in children :

- For 2 years post splenectomy.
- Ideally given 2 weeks prior to surgery.
- Emergency surgery : Post op day 2.

CDC vaccine recommendations for asplenic patients :

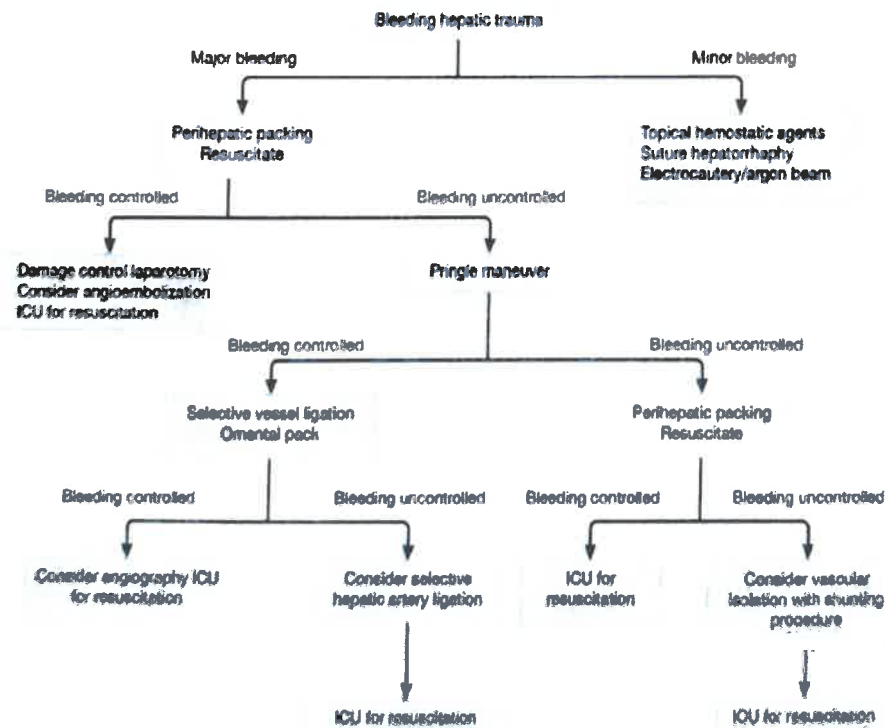
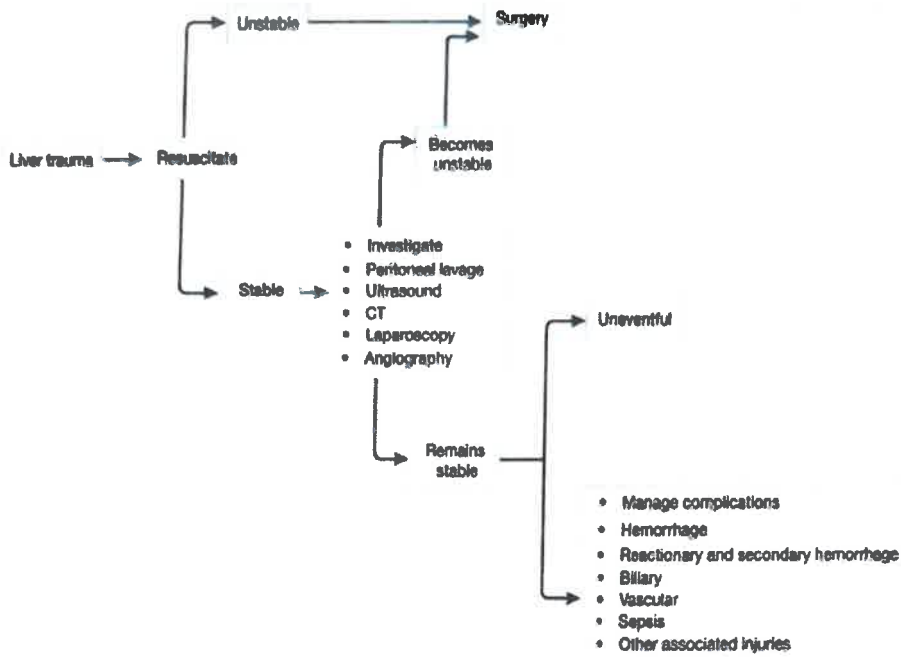
	Pneumococcal vaccination	Meningococcal vaccination	Haemophilus influenzae Type B vaccination
Children	<ul style="list-style-type: none"> Immunologically naive < 6 years: PCV13 followed by PNV13 8 weeks later; PPSV23 8 weeks later; repeat PPSV23 at 5 years Immunologically naive 6-18 years: PCV13 followed by PPSV23 8 weeks later; repeat PPSV23 at 5 years 	<ul style="list-style-type: none"> MenACWY series AND MenB series 	No once if 15 months or older and previously not vaccinated
Adults (age 18 and older)	<ul style="list-style-type: none"> Immunologically naive: PCV13 followed by PPSV23 8 weeks later; repeat PPSV23 every 5 years 	<ul style="list-style-type: none"> MenACWY or MPSV4 2 months apart; repeat MenACWY every 5 years AND MenB series once 	No once

Liver trauma :

Should be suspected if : # Right 9th:11th ribs.

- | | |
|----------------|--|
| Grade 1 | <ul style="list-style-type: none"> • Haematoma: subcapsular, <10% surface area • Laceration: capsular tear, <1 cm parenchymal depth |
| Grade 2 | <ul style="list-style-type: none"> • Haematoma: subcapsular, 10-50% surface area • Haematoma: intraparenchymal, <10 cm diameter • Laceration: capsular tear 1-3 cm parenchymal depth, <10 cm length |
| Grade 3 | <ul style="list-style-type: none"> • Haematoma: subcapsular, >50% surface area of ruptured subcapsular or parenchymal haematoma • Haematoma: intraparenchymal, >10 cm • Laceration: capsular tear, >3 cm parenchymal depth • Vascular injury with active bleeding contained within liver parenchyma |
| Grade 4 | <ul style="list-style-type: none"> • Laceration: parenchymal disruption involving 25-75% hepatic lobe or involves 1-3 Couinaud segments • Vascular injury with active bleeding breaching the liver parenchyma into the peritoneum |
| Grade 5 | <ul style="list-style-type: none"> • Laceration: parenchymal disruption involving >75% of hepatic lobe • Vascular: juxtahepatic venous injuries (retrohepatic vena cava/central major hepatic veins) |
-
- Advance one grade for multiple injuries up to grade III.
 - 'Vascular injury' (i.e. pseudoaneurysm or arteriovenous fistula): appears as a focal collection of vascular contrast that decreases in attenuation on delayed images.
 - 'Active bleeding': focal or diffuse collection of vascular contrast that increases in size or attenuation on a delayed phase.

Algorithm for operative management of hepatic injuries



Pringle's maneuver :

- Compression of hepatic pedicle at the foramen of Winslow.
- Can be done for 15 minutes.
- Can indicate source of bleeding (if bleeding stops, it is d/t hepatic artery/portal vein).
- Can temporarily stop bleeding.

Packing : Covering of upper and lower surface of liver with mops to provide tamponade effect.

Note : Liver defects should not be packed with omentum (Can lead to adhesions).

Mesenteric injury :

Occurs in seatbelt syndrome.

Longitudinal tear :

- No loss of bowel vascularity.
- mx : Repair of tear.

Transverse tear :

- Loss of bowel vascularity.
- mx : Resection & anastomosis.

Duodenal and pancreatic injury :

Can be d/t penetrating and blunt trauma.

management :

Duodenal hematoma : NPO and ryle's tube.

Perforation : Omental patch repair.

Pancreatic injury :

- most important prognostic factor is the integrity of main pancreatic duct (MPD).
- MPD spared : management is conservative.
- MPD injured : Surgical repair.

