Anticoagulation in Solid Organ Injury (SOI)

- Venous thromboembolism (VTE) prophylaxis should be initiated per routine protocol. Recommend AGAINST holding VTE chemoprophylaxis for any grade SOI
- Therapeutic Anticoagulation: For SOI patients taking pre-injury therapeutic anticoagulation,
  -o Grade 1 and 2 SOI – No reversal of therapeutic anticoagulation
  -o Grade 3-5 SOI – recommend reversal of therapeutic anticoagulation
- Antiplatelet agents: Recommend holding antiplatelet agents in SOI but recommend against active treatment with DDAVP or platelet transfusion.

Liver Injury
Grading – AAST, updated 2018

<table>
<thead>
<tr>
<th>Classification</th>
<th>Description</th>
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</thead>
</table>
| Grade 1       | • Subcapsular hematoma <10% surface area  
                • Parenchymal laceration <1 cm depth |
| Grade 2       | • Subcapsular hematoma 10–50% surface area; intraparenchymal hematoma <10 cm in diameter  
                • Parenchymal laceration 1–3 cm in depth and <10 cm length |
| Grade 3       | • Subcapsular hematoma >50% surface area; ruptured subcapsular or parenchymal hematoma  
                • Intraparenchymal laceration >10 cm  
                • Laceration >3 cm depth  
                • Any injury in the presence of a liver vascular injury or active bleeding contained within liver parenchyma |
| Grade 4       | • Parenchymal disruption involving 25–75% of a hepatic lobe  
                • Active bleeding extending beyond the liver parenchyma into the peritoneum |
| Grade 5       | • Parenchymal disruption >75% of hepatic lobe  
                • Juxtahepatic venous injury to include retrohepatic vena cava and central major hepatic veins |

**Advance one grade for multiple hepatic injuries up to grade 3.

ERCP: Major bile leak after hepatic trauma has been reported 1-20%. Higher rates of major bile leak in higher grade liver injury (>IV) and those injuries managed operatively or with angiembolization

- Routine ERCP is not indicated for grades 1-3 of non-operative management (NOM) liver injury
- ERCP potentially indicated for Grades IV – V NOM liver trauma if centrally located liver injury or angiembolization
- Recommend total serum bilirubin level sent on post—injury day 4 for patients with Grade IV — V liver injury and those that have been embolized
- If bilirubin greater than 2.5 mg/dL, consult GI for ERCP consideration. Further imaging with CT or MRCP not necessary unless requested by GI
Repeat or surveillance imaging*

- No repeat imaging indicated for Grade 1 and 2 injuries
- **Consider** repeat CT on Grade 3 liver injuries with vascular component (contrast blush or pseudoaneurysm seen on initial CT scan) per Trauma Surgeon discretion
- **Recommend** repeat CT on post-injury day 4 for all Grade 4 & 5 liver injuries that do not undergo angioembolization.

*Imaging modality of preference is CTA abdomen with arterial and venous phase
### Splenic Injury

*Grading, AAST updated 2018*

<table>
<thead>
<tr>
<th>Classification</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Grade 1</td>
<td>- Subcapsular hematoma &lt;10% surface area</td>
</tr>
<tr>
<td></td>
<td>- Parenchymal laceration &lt;1 cm depth</td>
</tr>
<tr>
<td></td>
<td>- Capsular tear</td>
</tr>
<tr>
<td>Grade 2</td>
<td>- Hematoma: Subcapsular, 10-50% surface area</td>
</tr>
<tr>
<td></td>
<td>- Subcapsular hematoma 10–50% surface area; intraparenchymal hematoma &lt;5 cm</td>
</tr>
<tr>
<td></td>
<td>- Parenchymal laceration 1–3 cm</td>
</tr>
<tr>
<td>Grade 3</td>
<td>- Subcapsular hematoma &gt;50% surface area; ruptured subcapsular or intraparenchymal hematoma ≥5 cm</td>
</tr>
<tr>
<td></td>
<td>- Parenchymal laceration &gt;3 cm depth</td>
</tr>
<tr>
<td>Grade 4</td>
<td>- Any injury in the presence of a splenic vascular injury or active bleeding confined within splenic capsule</td>
</tr>
<tr>
<td></td>
<td>- Parenchymal laceration involving segmental or hilar vessels producing &gt;25% devascularization</td>
</tr>
<tr>
<td>Grade 5</td>
<td>- Any injury in the presence of splenic vascular injury with active bleeding extending beyond the spleen into the peritoneum</td>
</tr>
</tbody>
</table>

**Treatment Algorithm**

**Grade V splenic injuries:**

- Recommend operative management for these injuries over NOM or angioembolization due to increased risk of failure with angioembolization. Ultimate management per trauma surgeon discretion.

**Vaccination:**

- Routine post-splenectomy vaccination is NOT recommended for splenic injuries managed with angioembolization

**Repeat or surveillance imaging:**

- No repeat imaging indicated for Grade 1 and 2 injuries
- **Consider** repeat CT on Grade 3 splenic injuries per Trauma Surgeon discretion
- **Recommend** repeat CT on post-injury day 3 for all Grade 4 & 5 splenic injuries that do not undergo angioembolization.

*Repeat Imaging modality of preference is CT Angio with arterial and venous phase*
Blunt Splenic Injury - NOM

**Grade I, II**
Observation only

**Grade III**
Consider repeat CT scan on day 3 or prior to d/c

**Grade IV and V**
No repeat imaging recommended if angioembolization performed
Repeat CT on day 3 or prior to d/c if no embolization done
## Kidney Injury

<table>
<thead>
<tr>
<th>Classification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grade 1</strong></td>
<td>- Subcapsular hematoma and/or parenchymal contusion without laceration</td>
</tr>
</tbody>
</table>
| **Grade 2**    | - Perirenal hematoma confined to Gerota’s fascia  
                 - Renal parenchymal laceration ≤1 cm depth without urinary extravasation |
| **Grade 3**    | - Renal parenchymal laceration >1 cm depth without collecting system rupture or urinary extravasation  
                 - Any injury in the presence of a kidney vascular injury or active bleeding contained within Gerota’s fascia |
| **Grade 4**    | - Parenchymal laceration extending into urinary collecting system with urinary extravasation  
                 - Renal pelvis laceration and/or complete ureteropelvic disruption  
                 - Segmental renal vein or artery injury  
                 - Active bleeding beyond Gerota’s fascia into the retroperitoneum or peritoneum  
                 - Segmental or complete kidney infarction(s) due to vessel thrombosis without active bleeding |
| **Grade 5**    | - Main renal artery or vein laceration or avulsion of hilum  
                 - Devascularized kidney with active bleeding  
                 - Shattered kidney with loss of identifiable parenchymal renal anatomy |

### Treatment Algorithm

**Repeat or surveillance imaging:**

- No repeat imaging indicated for Grade 1 and 2 injuries
- **Recommend delayed phase CT** at admission for all Grade 3-5 renal injuries to evaluate for urinary extravasation
- **Recommend** repeat CTA on post-injury day 3 for all Grade 3-5 renal injuries that do not undergo angioembolization.

*Imaging modality of preference is CTA Abdomen with arterial and venous phase*
Blunt kidney injury

Grade I, II
- Observation only
- Collecting system injury
  - Urology consult for ureteral stent consideration

Grade III, IV, V
- Delayed phase CT scan
  - Contrast extravasation
    - IR consult for angioembolization
  - No contrast extravasation
    - Repeat CT in 3 days or prior to d/c
References:


**Oversight:**
Multidisciplinary Trauma Conference
Dept. of Surgery, Division of Trauma, Trauma Program Operational Process Performance

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**Last revision:** 2/2/2023, 1/27/2021