ACS-NSQIP Procedure
Targeted Variables: Liver Resection

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Surgeon Champion
Goals of the Session

• Examine the History of PTVs in Liver Surgery
• Discuss proposed PTVs
• Additions
• Subtractions
• Conclude with ~8-12 finalists
History

• Proposed by Tim Pawlik and Steven Strasberg in 2009
  – No progress

• Genesis of this session topic
  – Henry Pitt
    • IHPBA 2012

• NSQIP PUF 2005-2010
  – 1.2 million cases
  – 7,500 Hepatectomies
Crucible

- Must not duplicate current collected data
- Must directly impact a specific 30-day outcome
  - Transfusion
  - Bile Leak
  - Length of Stay
  - Liver Insufficiency
  - Morbidity
  - Mortality
- Improve risk adjustment
  - Redo
- Must be instrumental in answering a major question in the field
  - GA + Epidural vs GA only
- Binary if at all possible
- Collectable by SCRs
  - Must have an accepted definition
  - Available in common documentation (?Path report)
Focus on Major Questions

- Anesthesia
- Chemotoxicity/Cirrhosis
- Resection risk adjustment
  - Redo, staged, multivisceral
- Approach
  - MIS vs Open
- Important postoperative occurrences
  - Bile leak
  - Liver insufficiency
Herding Cats
Proposed Hepatectomy Variables

- Preop biliary stent
- Other therapy
- Preop creatinine level
- Preop INR
- Preop bilirubin level
- Platelet count
- Viral hepatitis
- Liver texture
- Number of concurrent partial resections / wedges performed at time of surgery
- Concurrent intra-operative ablation
- Inflow occlusion (Pringle maneuver) during resection
- Biliary reconstruction

- Drain(s) left at conclusion of procedure
- Primary Diagnosis
- If neoplasm, tumor size (largest dimension)
- If neoplasm, number of discrete tumors
- Positive margins
- Need for invasive intervention postoperatively (not counting reoperation)
- Peak post-operative INR (between postop day 3 and discharge/death)
- Peak post-operative bilirubin (between postop day 3 and discharge/death)
Proposed Hepatectomy Variables

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- Peak post-operative bilirubin (between postop day 3 and discharge/death)
Quarterfinalists

- Other Therapy (PVE)
- Preop biliary stent
- Liver texture
- Number of concurrent partial resections / wedges performed at time of surgery
- Concurrent intra-operative ablation
- Inflow occlusion (Pringle maneuver) during resection
- Drain(s) left at conclusion of procedure
- Primary Diagnosis
- Peak INR and Bili
Additions?

- Anesthesia
- Post operative bile leak
- Approach
Semifinalists

- Preop Risk Factors
  - PVE
  - Biliary stent
  - Histology
- Intraop Variables
  - Anesthesia
  - Approach
  - Character of the liver
  - Magnitude of the procedure
  - Duration of inflow occlusion
  - Hemostatics and Drains
- Postoperative Occurrences
  - Liver insufficiency
  - Bile leak
Individual Review

- Objective data
- Institutional experience
- NSQIP experience
Pros
• Direct link to postop outcome: liver insufficiency

Cons
• Uncommon
  – <10%
• Proposal
  – Include Yes/No
# Preop Biliary Stent

## Pros
- Direct link to postop outcome: infection and liver insufficiency

## Cons
- Rare
  - <5%
  - Likely accounted for by Other CPT coding of hepatico-enterostomy
Preop Biliary Stent

• Proposal
  – Exclude
## Histology

<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Malignant vs benign and type of malignancy impact technique/magnitude of resection/loss of viable parenchyma</td>
<td>• Unlikely to impact 30-day outcomes independent of magnitude of resection</td>
</tr>
<tr>
<td>• Help classify MIS utilization</td>
<td>• Already partially present in ICD-9/10 coding</td>
</tr>
</tbody>
</table>
Histology

• Proposal
  – Exclude
<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Important question in our field</td>
<td>• None</td>
</tr>
<tr>
<td>• Novel techniques emerging</td>
<td>• Current NSQIP variable may be changed</td>
</tr>
</tbody>
</table>
• Proposal
  – Push for all of NSQIP to code as:
    • GA Only
    • Regional Only
    • Local Only
    • GA + Regional
  – If unsuccessful:
    • GA only vs. GA + Regional
Approach

Pros
• Becoming more common
• Not well captured by CPTs

Cons
• None
Approach

• Proposal
  – Include as the final approach
    • Robotic
    • Total Lap
    • Hybrid
    • Open
  – Do not include conversion
    • Stigma of conversion is a threat to patient safety
<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Vital information regarding risk of liver insufficiency</td>
<td>• Gross and microscopic component do not always correlate</td>
</tr>
<tr>
<td></td>
<td>• Chemotoxicity in several forms</td>
</tr>
<tr>
<td></td>
<td>• Steatosis</td>
</tr>
<tr>
<td></td>
<td>• Cirrhosis w/wo portal hypertension</td>
</tr>
</tbody>
</table>
Character of the Liver

• Proposal
  – Include
  – Cirrhosis
    • Absent
    • Present without Portal HTN
    • Present with Portal HTN
  – Gross Steatosis (Y/N)
  – Gross Chemotoxicity (Y/N)
<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Critical predictor for multiple postop occurrences</td>
<td>• How to measure beyond CPT</td>
</tr>
<tr>
<td></td>
<td>• CPT coding weakest with multifocal resection strategies</td>
</tr>
<tr>
<td></td>
<td>– RH + PLH</td>
</tr>
<tr>
<td></td>
<td>• Redo</td>
</tr>
</tbody>
</table>
• Proposal
  – Add Bilateral Resection/Ablation
  – Add Redo
Duration of Inflow Occlusion

Pros
• Appropriate/inappropriate use may influence EBL/Transfusions/liver insufficiency

Cons
• Duration is key variable and easy to collect but is not the whole story
  – Application before vs after bleeding
  – Off pringle times
Duration of Inflow Occlusion

- Proposal
  - Total minutes of occlusion
## Hemostatics and Drains

<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Possible relationship with bleeding/bile leak/infection/LOS</td>
<td>• None for drains</td>
</tr>
<tr>
<td>• Very good randomized data indicating that hemostatics raise cost</td>
<td>• How to classify hemostatics</td>
</tr>
<tr>
<td>and have no impact on outcome</td>
<td>– Materials vs sealants</td>
</tr>
<tr>
<td></td>
<td>– Amount</td>
</tr>
</tbody>
</table>
Hemostatics and Drains

• Proposal
  – Exclude hemostatics
  – Include: Drain Yes/No
<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Likely our most important procedure</td>
<td>• Which definition</td>
</tr>
<tr>
<td>specific morbidity/mortality</td>
<td></td>
</tr>
</tbody>
</table>
Liver Insufficiency

• Proposal
  – Peak INR and Bilirubin
Bile Leak

Pros
• Likely our second most important procedure specific morbidity/mortality
• Not completely accounted for by “deep space infection”

Cons
• How to define?
Bile Leak

• Proposal
  – Include
  – Define: Abdominal fluid output containing bili > 2x serum bili requiring prolonged preliminary drainage (> POD4) or placement of secondary drain
Finalists: Top 12

- PVE
  - Y/N
- Anesthesia
  - GA only vs. GA + Regional
- Approach
  - Robot, TL, Hybrid, Open
- Character of the liver
  - Cirrhosis
    - Absent
    - Present without Portal HTN
    - Present with Portal HTN
  - Gross Steatosis (Y/N)
  - Gross Chemotoxicity (Y/N)
- Magnitude of the procedure
  - Bilateral Resection/Ablation (Y/N)
  - Redo (Y/N)
- Duration of inflow occlusion
  - Total minutes of occlusion
- Drains
  - Drain Y/N
- Liver insufficiency
  - Peak Postop INR and Bilirubin
- Bile leak
  - Y/N
# Summary of Dropouts

<table>
<thead>
<tr>
<th>Variable</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preop creatinine level</td>
<td>Already collected</td>
</tr>
<tr>
<td>Preop INR</td>
<td>Already collected as coagulopathy</td>
</tr>
<tr>
<td>Preop bilirubin level</td>
<td>Already collected</td>
</tr>
<tr>
<td>Platelet count</td>
<td>Already collected</td>
</tr>
<tr>
<td>Viral hepatitis</td>
<td>Not relevant to 30-day outcomes, included in cirrhosis</td>
</tr>
<tr>
<td>Biliary reconstruction</td>
<td>Already collected as an ‘Other CPT’</td>
</tr>
<tr>
<td>If neoplasm, tumor size (largest dimension)</td>
<td>Not relevant to 30-day outcomes, included in CPT, HTF</td>
</tr>
<tr>
<td>If neoplasm, number of discrete tumors</td>
<td>Not relevant to 30-day outcomes, included in CPT, HTF</td>
</tr>
<tr>
<td>Positive margins</td>
<td>Not relevant to 30-day outcomes, HTF</td>
</tr>
<tr>
<td>Need for invasive intervention postoperatively</td>
<td>Included in bile leak variable and deep space infection</td>
</tr>
<tr>
<td>Preop biliary stent</td>
<td>Accounted for by ‘Other CPT’, HTF</td>
</tr>
<tr>
<td>Hemostatics</td>
<td>Proven to have no benefit</td>
</tr>
<tr>
<td>Histology</td>
<td>Not relevant to 30-day outcomes, included in ICD-9, HTF</td>
</tr>
</tbody>
</table>
Finalists: Top 12

- **PVE**
  - Y/N
- **Anesthesia**
  - GA only vs. GA + Regional
- **Approach**
  - Robot, TL, Hybrid, Open
- **Character of the liver**
  - Cirrhosis
    - Absent
    - Present without Portal HTN
    - Present with Portal HTN
  - Gross Steatosis (Y/N)
  - Gross Chemotoxicity (Y/N)
- **Magnitude of the procedure**
  - Bilateral Resection/Ablation (Y/N)
  - Redo (Y/N)
- **Duration of inflow occlusion**
  - Total minutes of occlusion
- **Drains**
  - Drain Y/N
- **Liver insufficiency**
  - Peak Postop INR and Bilirubin
- **Bile leak**
  - Y/N
Successful Implementation=?

- Ability to answer…
  - PVE prevalence and impact?
  - When is Epidural positive/negative?
  - Impact of cirrhosis/steatosis/chemotoxicity on outcomes?
  - Improved accuracy of risk adjustment based on magnitude of procedure?
  - When is pringle positive/negative?
  - Do drains increase infections?
  - Know the risk factors for bile leak and LI?