Acute Pancreatitis

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ACG Treatment Guideline
Case: Acute Pancreatitis

57 y/o female with a history of cholelithiasis presents with 8 hours of severe epigastric abdominal pain and vomiting. No other past medical history. BMI is 32.6.

HR 121       BP  94/76       RR 34       Temp 102.3      O2 Sat 92%
Mild distress, mentating appropriately
Decreased breath sounds at left base
Tachycardic without murmurs
Hypoactive bowel sounds. Voluntary guarding with palpation
1/2 edema bilaterally

- WBC count  = 21.2                   HCT = 49
- Lipase = 1,243                           TB = 3.2     AP = 321
- BUN/CR = 42/1.6                         AST/ALT = 139/223

Case: Acute Pancreatitis

• CT scan performed in the emergency room
Pancreatic Physiology

Duodenal Lumen

Enterokinase

Trypsinogen → Trypsin
Proelastase → Elastase
Prolipase → Lipase
Propeptidase → Peptidase

Acute Pancreatitis Pathophysiology

Duodenal Lumen

Enterokinase

Trypsinogen → Trypsin
Proelastase → Elastase
Prolipase → Lipase
Propeptidase → Peptidase
Acute Pancreatitis Pathophysiology

Duodenal Lumen

Enterokinase

Trypsininogen → Trypsin
Enzymes Prematurely Activated
Proelastase
Prolipase
Propeptidase
Peptidase

Inflammatory Mediators
57 y/o female with a history of cholelithiasis presents with 8 hours of severe epigastric abdominal pain and vomiting. No other past medical history. BMI is 32.6.

- WBC count = 21,235  
- Lipase = 1,243  
- BUN/CR = 42/1.6

HCT = 49  
TB = 3.2  
AP = 321  
AST/ALT = 139/223

Does this patient have acute pancreatitis?

**Pancreatitis Pearls**

**Make the Appropriate Diagnosis**

- Clinical evidence – pain, nausea, vomiting, hypoxia, etc

- Laboratory evidence – amylase or lipase >3x normal

- Imaging evidence – CT scan

**2 Features for Diagnosis**

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What are the best predictors of severity for acute pancreatitis?
**PANCREATITIS PEARLS**

- **Hemoconcentration:**
  - BUN >25
  - Hct > 44

- **BISAP score:**
  - Elevated BUN >25
  - Impaired Mental Status
  - SIRS
  - Age >60
  - Pleural Effusion

- **APACHE II score**

Use Hemoconcentration as a Simple Predictor


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**Pancreatitis Pearls**

Use Hemoconcentration as a Simple Predictor


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**Table 1: AUC of different scoring systems in predicting clinical severity**

<table>
<thead>
<tr>
<th>Scoring system</th>
<th>CECT (n=131)</th>
<th>CECT and UECT (n=29)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinically severe AP N=23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCTI</td>
<td>0.86 (0.77-0.90)</td>
<td></td>
</tr>
<tr>
<td>CTSI</td>
<td>0.84 (0.70-0.90)</td>
<td></td>
</tr>
<tr>
<td>Balthazar score</td>
<td>0.85 (0.71-0.90)</td>
<td>0.70 (0.57-0.83)</td>
</tr>
<tr>
<td>RPI score</td>
<td>0.81 (0.70-0.83)</td>
<td>0.70 (0.57-0.83)</td>
</tr>
<tr>
<td>MP score</td>
<td>0.79 (0.71-0.83)</td>
<td>0.70 (0.57-0.83)</td>
</tr>
<tr>
<td>APACHE II</td>
<td>0.77 (0.63-0.90)</td>
<td>0.70 (0.57-0.83)</td>
</tr>
<tr>
<td>BISAP</td>
<td>0.71 (0.50-0.90)</td>
<td>0.70 (0.57-0.83)</td>
</tr>
</tbody>
</table>

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Why does she have acute pancreatitis?

Pancreatitis Pearls

**Common:**
- Alcohol (40%)
- Biliary disease (40%)
- Obstruction (10%)

**Frequent:**
- Medications
- Post-ERCP
- Triglycerides

**Uncommon:**
- Hereditary
- Hypercalcemia
Pancreatitis Pearls

Search for a Reversible Etiology

- Alcohol query
- Right upper quadrant ultrasound
- Calcium and triglyceride levels
- Imaging evidence – CT scan

Goal is to prevent another attack

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What fluid orders should I write?

Pancreatitis Pearls

Aggressive Fluid Resuscitation

<table>
<thead>
<tr>
<th>Investigators</th>
<th>Journal</th>
<th>Initial resuscitation recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pandol et al.</td>
<td>Gastroenterology, 2007</td>
<td>Severe volume depletion: 500-1000 cc/h</td>
</tr>
<tr>
<td>Formark and Bäckström</td>
<td>Gastroenterology, 2007</td>
<td>Noncrisis fluid loss: 300-500 cc/h</td>
</tr>
<tr>
<td>Banks and Freeman</td>
<td>Am J Gastroenterol, 2006</td>
<td>Vigorous fluid resuscitation</td>
</tr>
<tr>
<td>Velez et al.</td>
<td>JAMA, 2004</td>
<td>Urine output ≤ 0.5 mL/kg body weight/h</td>
</tr>
<tr>
<td>Tener et al.</td>
<td>Am J Gastroenterol, 2004</td>
<td>Fluid bolus to achieve hemodynamic stability followed by 250-500 mL/h of crystalloid</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aggressive IV fluid replacement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aggressive fluid resuscitation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>At least 250-300 cc/h for 48 hours</td>
</tr>
</tbody>
</table>

Gardner TB et al. CGH 2008;6(10):1070-6
Patients with acute pancreatitis who were resuscitated with Lactated Ringer’s solution had reduced systemic inflammation compared with those who received saline.

Pancreatitis Pearls

Aggressive Fluid Resuscitation with LR

- Severe volume depletion: **500-1000 cc/hr**
- Mild fluid loss: **300-500 cc/hr**
- No sign of volume depletion: **250-300 cc/hr**

Most important initial treatment for acute pancreatitis


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Should she have an ERCP?
## Pancreatitis Pearls

### Early ERCP vs. Conservative Management in Gallstone Pancreatitis

#### Mortality

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Early routine ERCP</th>
<th>Early conservative</th>
<th>Risk Ratio</th>
<th>Risk Ratio 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n/N</td>
<td>n/N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neoptolemos 1999</td>
<td>116/303</td>
<td>696/696</td>
<td>0.17</td>
<td>(0.02, 1.47)</td>
</tr>
<tr>
<td>Tenner 1993</td>
<td>19/181</td>
<td>5/563</td>
<td>0.90</td>
<td>(0.29, 2.25)</td>
</tr>
<tr>
<td>Tsuchikawa 1997</td>
<td>20/26</td>
<td>21/12</td>
<td>1.00</td>
<td>(0.80, 1.25)</td>
</tr>
<tr>
<td>Zhao 2002</td>
<td>0/30</td>
<td>0/15</td>
<td>1.00</td>
<td>(0.20, 5.06)</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>326/318</td>
<td></td>
<td>0.74</td>
<td>(0.16, 3.03)</td>
</tr>
</tbody>
</table>


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### Pancreatitis Pearls

#### ERCP

- **Yes** – cholangitis and progressive jaundice
- **No** – stable or improving disease

**ERCP is a 4 letter word in acute pancreatitis**

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Should we put her on antibiotics?

Pancreatitis Pearls
Antibiotic Therapy for Prophylaxis Against Infection of Pancreatic Necrosis in Acute Pancreatitis

Mortality

**Pancreatitis Pearls**

**Prophylactic Antibiotics**

- **Mild disease** – no role for antibiotics

- **Severe disease** – controversial. Imipenem prevents infected necrosis but does not affect mortality

- **Necrosis** – no role for initial antibiotics

**No role for antibiotics unless confirmed infection**


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**Case: Acute Pancreatitis**

57 y/o female with a history of cholelithiasis presents with gallstone pancreatitis and is now **48 hours** into her hospitalization. She is anorexic, still using Dilaudid PCA, and has a repeat CT scan.
57 y/o female with a history of cholelithiasis presents with gallstone pancreatitis and is now 48 hours into her hospitalization. She is anorexic, still using Dilaudid PCA, and has a repeat CT scan.

How should we support her nutrition?

Pancreatitis Pearls

Enteral vs Parenteral Nutrition for Acute Pancreatitis: Mortality

Pancreatitis Pearls

Enteral vs Parenteral Nutrition for Acute Pancreatitis

Randomized to nasoenteric or oral feeding within 72 hours

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Early Enteral Feeding (N=121)</th>
<th>Delayed Enteral Feeding (N=121)</th>
<th>Risk Ratio (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary composite end point: infection of death—no. (%)</td>
<td>10 (16)</td>
<td>22 (22)</td>
<td>1.07 (0.78-1.44)</td>
<td>0.64</td>
</tr>
<tr>
<td>Secondary end points</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infusion—no. (%)</td>
<td>21 (21)</td>
<td>27 (26)</td>
<td>0.77 (0.51-1.17)</td>
<td>0.23</td>
</tr>
<tr>
<td>Infected pancreatic necrosis</td>
<td>9 (9)</td>
<td>19 (19)</td>
<td>0.90 (0.46-1.81)</td>
<td>0.88</td>
</tr>
<tr>
<td>Bacteremia</td>
<td>17 (17)</td>
<td>14 (14)</td>
<td>0.99 (0.68-1.45)</td>
<td>1.00</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>12 (12)</td>
<td>13 (13)</td>
<td>0.97 (0.63-1.49)</td>
<td>1.00</td>
</tr>
<tr>
<td>Death—no. (%)</td>
<td>11 (11)</td>
<td>7 (7)</td>
<td>1.27 (0.45-3.90)</td>
<td>0.63</td>
</tr>
<tr>
<td>Necrotizing pancreatitis—no. (%)</td>
<td>14 (13)</td>
<td>65 (62)</td>
<td>1.06 (0.18-6.12)</td>
<td>0.95</td>
</tr>
<tr>
<td>CTV severely injured</td>
<td>4 (4)</td>
<td>4 (4)</td>
<td>0.39 (0.05-2.44)</td>
<td>1.00</td>
</tr>
<tr>
<td>ICU admission within 24 hours — no (%)</td>
<td>18 (18)</td>
<td>20 (20)</td>
<td>0.99 (0.48-1.99)</td>
<td>0.98</td>
</tr>
<tr>
<td>Mechanical ventilation—no. (%)</td>
<td>12 (12)</td>
<td>14 (14)</td>
<td>0.99 (0.68-1.44)</td>
<td>0.94</td>
</tr>
<tr>
<td>New acute organ failure—no. N/E</td>
<td>164 (18)</td>
<td>123 (19)</td>
<td>0.91 (0.65-1.27)</td>
<td>0.69</td>
</tr>
<tr>
<td>Persistent single organ failure</td>
<td>164 (18)</td>
<td>123 (19)</td>
<td>1.00 (0.65-1.45)</td>
<td>1.00</td>
</tr>
<tr>
<td>Multiple organ failure</td>
<td>164 (18)</td>
<td>123 (19)</td>
<td>1.00 (0.65-1.45)</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Bakker et al. NEJM 2014;371:183-93.

Pancreatitis Pearls

Nutritional Support

- **Mild disease** – generally no need for nutritional support

- **Severe disease** – enteral nutrition significantly reduces mortality, multiple organ failure, systemic infections, and operative procedures. No difference between NJ and NG delivery

Use the gut as early and as often as possible

Timothy B. Gardner, MD, MS, FACG

Pancreatitis Pearls

She has had all of the proper interventions (fluids, enteral feeding, pain control), but still is having pain 3 weeks after admission. Her amylase/lipase trend since admission is shown below:

Hospitalist asks why she is not getting better since her amylase/lipase are normal?
Pancreatitis Pearls

Amylase and Lipase

- There is no prognostic value to following amylase and lipase levels
- Dichotomous and not a continuous variable

Check Amylase and Lipase once on admission and not again

Case: Acute Pancreatitis

4 weeks into hospitalization she is recovering but develops fevers and an elevated WBC count. She has a repeat CT scan and percutaneous sampling demonstrates infection. Surgeon plans for open necrosectomy.
Case: Acute Pancreatitis

4 weeks into hospitalization she is recovering but develops fevers and an elevated WBC count. She has a repeat CT scan and percutaneous sampling demonstrates infection. Surgeon plans for open necrosectomy.

Does the patient need/should the patient have an open necrosectomy?

Pancreatitis Pearls

Infected Pancreatic Necrosis

- Antibiotics and supportive care should be used as first line therapy against infected necrosis
- Delay as long as possible before considering debridement

Pancreatitis Pearls

Open Surgical Debridement Should Almost NEVER be Performed in 2015

- Delay as long as possible any open debridement
- Most often supportive care and aggressive antibiotics will contain the infection

Open surgical debridement should almost never be performed

Case: Acute Pancreatitis

6 weeks into hospitalization she is recovering but develops epigastric pain and projectile vomiting. She has a repeat CT scan.

What is this condition and how should it be treated?
Pancreatitis Pearls

### Acute Fluid Collection
- **Type of Pancreatitis:** Interstitial
- **Time-course, w/t:** <4
- **Solid debris present:** No
- **Encapsulated wall:** No

### Acute Necrotic Collection
- **Type of Pancreatitis:** Necrotic
- **Time-course, w/t:** <4
- **Solid debris present:** Yes
- **Encapsulated wall:** No

### Pseudocyst
- **Type of Pancreatitis:** Interstitial
- **Time-course, w/t:** >4
- **Solid debris present:** No
- **Encapsulated wall:** Yes

### Walled-off Necrosis
- **Type of Pancreatitis:** Necrotic
- **Time-course, w/t:** >4
- **Solid debris present:** Yes
- **Encapsulated wall:** Yes

*The classification provides general guidelines; some collections may be difficult to categorize.

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**Fluid Collections - Treatment**

1. **Acute Fluid/Necrotic Collection**
   - **Treatment:** DELAY

2. **Pseudocyst**
   - **Treatment:** DRAIN

3. **Walled-off Necrosis**
   - **Treatment:** DEBRIDE
Pancreatitis Pearls

Open Debridement

Endoscopic Debridement

Walled Off Necrosis

Laparoscopic Debridement

Percutaneous Debridement


Pancreatitis Pearls

Video-assisted retroperitoneal debridement

Endoscopic transgastric necrosectomy

Pancreatitis Pearls

Are there any comparative effectiveness trials specific to endoscopy?

Pancreatitis Pearls

Endoscopic Transgastric vs Surgical Necrosectomy for Infected Necrotizing Pancreatitis
A Randomized Trial

DIRECT ENDOSCOPIC NECROSECTOMY

vs

VARD$S$

Bakker et al. JAMA 2012; 307(10):1053-61

Pancreatitis Pearls

<table>
<thead>
<tr>
<th>Table 2. Clinical End Points$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Major complications or death, No. (%)$^a$</td>
</tr>
<tr>
<td>Death, No. (%)</td>
</tr>
<tr>
<td>Major complications, No. (%)</td>
</tr>
<tr>
<td>New-onset multiple organ failure$^a$</td>
</tr>
<tr>
<td>Intra-abdominal bleeding requiring intervention</td>
</tr>
<tr>
<td>Enterocutaneous fistula or perforation of a visceral organ requiring intervention</td>
</tr>
<tr>
<td>Pancreatic fistula</td>
</tr>
<tr>
<td>Long-term complications, No. (%)$^a$</td>
</tr>
<tr>
<td>New-onset diabetes</td>
</tr>
<tr>
<td>Use of pancreatic enzymes</td>
</tr>
<tr>
<td>Persisting fluid collections$^a$</td>
</tr>
<tr>
<td>Health care utilization, No.</td>
</tr>
<tr>
<td>No. of necrosectomies, endoscopic or surgical</td>
</tr>
<tr>
<td>New ICU admission anytime after randomization, No. (%)</td>
</tr>
<tr>
<td>Days in hospital after randomization$^a$</td>
</tr>
</tbody>
</table>

Pancreatitis Pearls

This Week’s Case
45 year old with necrotizing gallstone pancreatitis in July 2014

August 2014

Pancreatitis Pearls

This Week’s Case
45 year old with necrotizing gallstone pancreatitis in July 2014
Massive hematemesis and hemorrhagic shock on Tuesday

January 20, 2015
**Pancreatitis Pearls**

**This Week’s Case**
45 year old with necrotizing gallstone pancreatitis in July 2014
Massive hematemesis and hemorrhagic shock on Tuesday

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**Pancreatitis Pearls**

**Treatment of Fluid Collections**
- Proper identification allows for proper management
- Multiple newer techniques to drain collections
- Non-invasive measures appear to be better

**Delay, Drain and Debride collections depending on type**

8 weeks following initial presentation the patient has recovered and is ready for discharge. She is scheduled for outpatient cholecystectomy to prevent future attacks.

Summary of Management

• **Fluids, Fluids, Fluids** in acute pancreatitis

• **Use the gut** in acute pancreatitis

• **Antibiotics** only in documented infection

• **Avoid** open necrosectomy
"Mr. Osborne, may I be excused? My brain is full."