

# North Carolina Society of Gastroenterology 2024 Annual Meeting



## Updates in the Management of Acute Pancreatitis

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Director, GI-Pancreas Program  
Duke University School of Medicine  
Durham VA Medical Center

Joint Providership



American Society for  
Gastrointestinal Endoscopy

**Disclosures: none**

# Learning Objectives

- Appreciate the burden of acute pancreatitis in the US
- Discuss the evidence behind the mainstays of treatment in acute pancreatitis
- Define pancreatic fluid collections and review management strategies for severe acute pancreatitis with necrosis
- Recognize the quality indicators for patients admitted with acute pancreatitis

# Acute Pancreatitis in the US

**>700,000**  
visits per year

**>250,000**  
admissions per year

**\$2.8 billion**

↓ **Mortality**

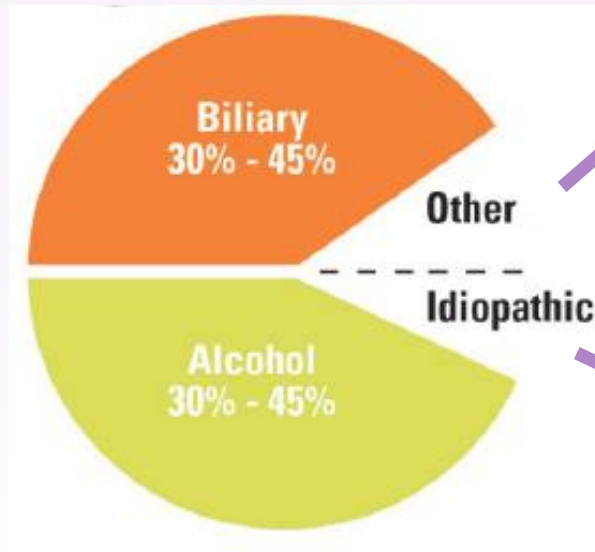
↓ **LOS**

# Revised Atlanta Criteria

*Diagnosis requires 2 of the following 3 criteria:*

1. Epigastric abdominal pain
2. Lipase > 3 times normal
3. Acute pancreatitis on cross-sectional imaging\*

# Etiology



- Hypertriglyceridemia
  - ERCP
  - Autoimmune
  - Medications
  - Hypercalcemia
  - Obstructive
  - Trauma
  - Infection
  - Post Surgical
  - Toxins
  - Neoplasm
  - Scorpion Sting
- ~20%**

**~10%**

# Drug Induced Pancreatitis

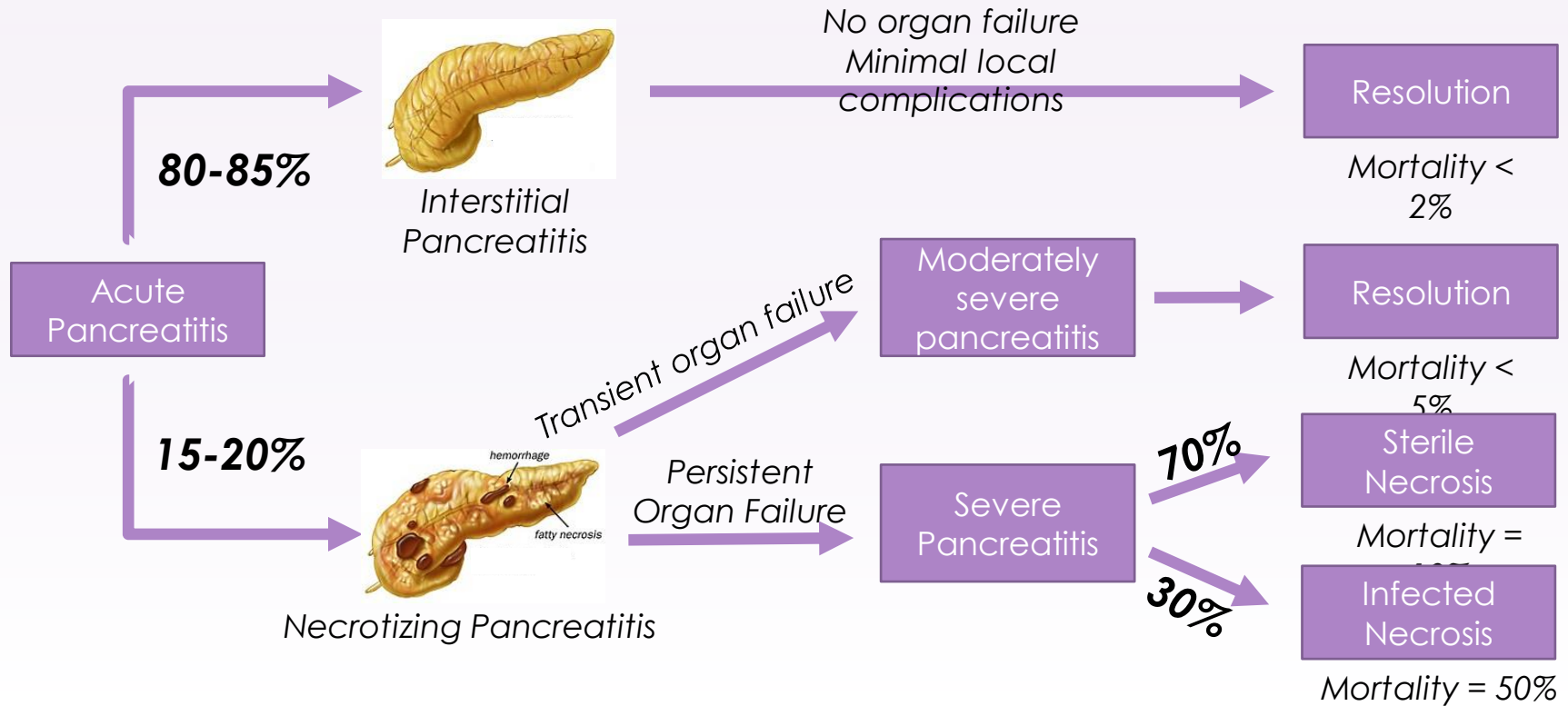
- RARE!

Summary of drug-induced acute pancreatitis based on drug class

Class Ia	Class Ib	Class II	Class III	Class IV
Azodisalicylate	Amiodarone	Chlorothiazide	Atorvastatin	Ampicillin
Bezafibrate	Azathioprine	Clozapine	Carbamazepine	Bendroflumethiazide
Cannabis	Clomiphene	Didanosine	Captopril	Benazepril
Carbimazole	Dexamethasone	Erythromycin	Ceftriaxone	Betamethasone
Codeine	Ifosfamide	Estrogen	Chlorthalidone	Capecitabine
Cytosine	Lamivudine	L-asparaginase	Cimetidine	Cisplatin
Arabinoside	Losartan	Pegaspargase	Clarithromycin	Colchicine
Dapsone	Lynestrenol/methoxyethinylestradiol	Propofol	Cyclosporin	Cyclophosphamide
Enalapril	6-mercaptopurine	Tamoxifen	Gold	Cyproheptadine
Furosemide	Meglumine		Hydrochlorothiazide	Danazol
Isoniazid	Methimazole		Indomethacin	Diazoxide
Mesalamine	Nelfinavir		Interferon/ribavirin	Diclofenac
Metronidazole	Norethindronate/mestranol		Irbesartan	Diphenoxylate
Pentamidine	Omeprazole		Isotretinoin	Doxorubicin
Pravastatin	Premarin		Ketorolac	Ethacrynic acid
Procainamide	Trimethoprim-sulfamethazole		Lisinopril	Famciclovir
Pyritonol			Metolazone	Finasteride
Simvastatin			Metformin	5-fluorouracil
Stibogluconate			Minocycline	Fluvastatin
Sulfamethoxazole			Mirtazapine	Gemfibrozil
Sulindac			Naproxen	Interleukin-2
Tetracycline			Paclitaxel	Ketoprofen
Valproic acid			Ponatinib	Lovastatin
			Prednisone	Mefenamic acid
			Prednisolone	Nitrofurantoin
				Octreotide
				Oxyphenbutazone
				Penicillin

id

# What happens to our patients with Acute Pancreatitis?



Adapted from Forsmark et al. *NEJM* 2016



# IAP/APA evidence-based guidelines for the management of acute pancreatitis

World

<sup>a</sup> Internat

<sup>b</sup> Americ

Gastroenterology 2018;154:1096–1101

## AGA SECTION

### American Gastroenterological Association Institute Guideline on Initial Management of Acute Pancreatitis



Seth D. Crockett,<sup>1</sup> Sachin Wani,<sup>2</sup> Timothy B. Gardner,<sup>3</sup> Yngve Falck-Ytter,<sup>4,5</sup> and Alan N. Barkun<sup>6</sup>;  
on behalf of American Gastroenterological Association Institute Clinical Guidelines Committee

Am

Ma

Scott Tenner, MD, MPH, FACG<sup>1</sup>, John Baillie, MB, ChB, FRCP, FACG<sup>2</sup>, John DeWitt, MD, FACG<sup>3</sup> and Santhi Swaroop Vege, MD, FACG<sup>4</sup>

# Severity Assessment



APACHE-II* <sup>10</sup>	1989	At admission and at 48 hours Temperature, MAP, heart rate, respiratory rate, Pao <sub>2</sub> , arterial pH, HCO <sub>3</sub> , sodium, potassium, creatinine, hematocrit, WBC, Glasgow Coma Score, age, chronic health points
BISAP <sup>16</sup>	2008	At admission and at 48 hours BUN (>25 mg/dL), impaired mental status (Glasgow Coma Score <15), SIRS (≥2), age (>60 y), pleural effusion
Glasgow <sup>8</sup>	1984	At admission and at 48 hours Age (>55 y), WBC (>15,000/mL), glucose (>180 mg/dL), BUN (>45 mg/dL), Pao <sub>2</sub> (<60 mm Hg), calcium (<8 g/dL), albumin (<3.2 g/dL), LDH (>600 IU/L)
HAPS <sup>21</sup>	2009	At admission and at 48 hours Abdominal tenderness, hematocrit (>43 mg/dL for men or >39.6 mg/dL for women), creatinine (>2 mg/dL)
JSS <sup>20</sup>	2009	At admission and at 48 hours Base excess (≤3 mEq/L), Pao <sub>2</sub> (≤60 mm Hg or respiratory failure), BUN (≥40 mg/dL) or Cr (≥2 mg/dL), LDH (≥2× upper limit of normal), platelet (≤100,000/mm <sup>3</sup> ), calcium (≤7.5 mg/dL), CRP (≥15 mg/dL), SIRS (≥3), age (≥70 y)
Panc 3 <sup>14</sup>	2007	At admission and at 48 hours Hematocrit (>44 mg/dL), BMI (>30 kg/m <sup>2</sup> ), pleural effusion
POP <sup>15a</sup>	2007	At admission and at 48 hours Age, MAP, Pao <sub>2</sub> :Fio <sub>2</sub> , arterial pH, BUN, calcium
Ranson <sup>4,5</sup>	1974	At admission: age (>55 y), WBC (>16,000/mL), glucose (>200 mg/dL), LDH (>350 IU/mL), AST (>250 IU/mL) At 48 hours: hematocrit (decrease >10%), BUN (increase >5 mg/dL), calcium (<8 mg/dL), Pao <sub>2</sub> (<60 mm Hg), base deficit (>4 mEq/L), fluid sequestration (>6 L)
SIRS <sup>12</sup>	2006	At admission and at 48 hours Temperature (<36°C or >38°C), heart rate (>90/min), respiratory rate (>20/min or PaCo <sub>2</sub> <32 mm Hg), WBC (<4000/mm <sup>3</sup> , >12,000/mm <sup>3</sup> or >10% bands)

# Severity Index

- **B**UN > 25
- **I**MPAIRED MENTAL STATUS
- **S**IRS PRESENT
- **A**GE > 65
- **P**LEURAL EFFUSIONS

- **BISAP = 3** → 57% mortality
- **BISAP = 5** → 22% mortality

***BISAP > 3: consider a setting with close clinical monitoring (i.e. ICU)***

Does trending lipase help prognosticate outcomes in acute pancreatitis?

## Resuscitation Choices:

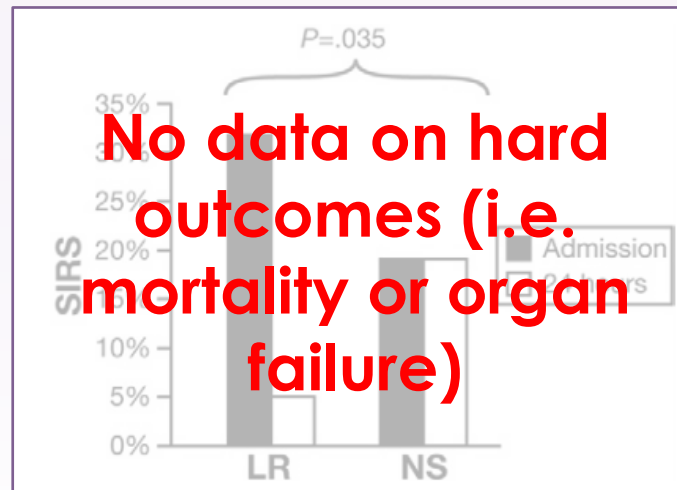
<b>FLUID</b>	<b>NA (mmol/L)</b>	<b>CL (mmol/L)</b>	<b>K (mmol/L)</b>	<b>CA (mg/dL)</b>	<b>LACTATE (mmol/L)</b>	<b>PH</b>
Normal saline solution	154	154	—	—	—	6.0
Lactated Ringer's solution	130	109	4	3	28	6.5

- Recent data suggest that LR may be better in critically ill patients\* and equivocal to NS in noncritical ill patients

Semler et al. *NEJM* 2018  
Self et al. *NEJM* 2018

# Fluid Management

- Lactated Ringer's reduces pancreatic acidosis and trypsin activation

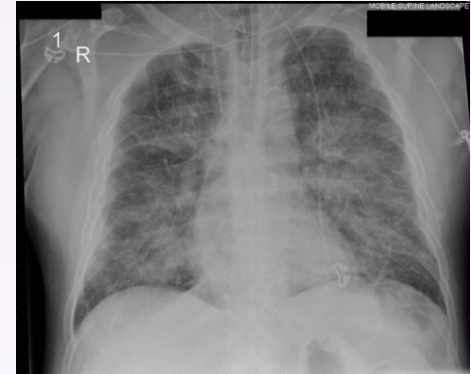
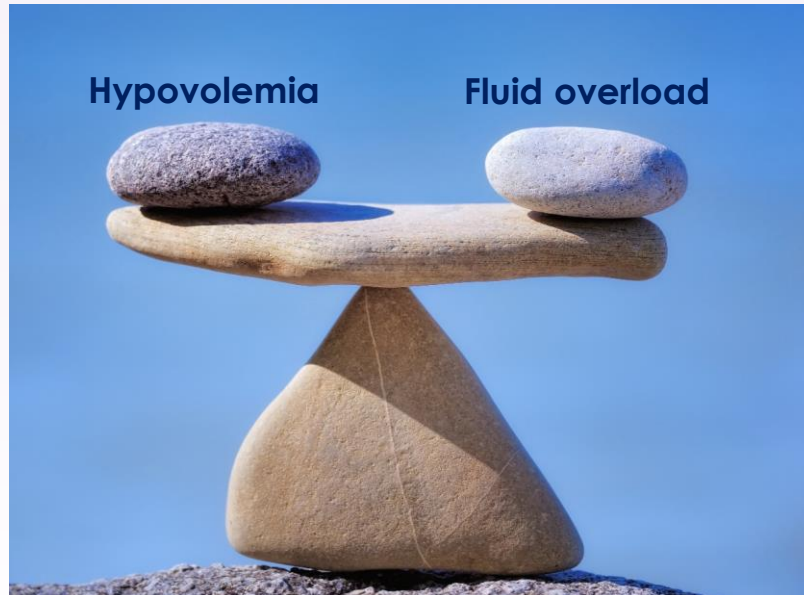


**Lactated Ringers = Normal Saline\***

# Balance is Key

Circulatory collapse

Pancreatic micro-ischemia



# Hydration Strategies in Acute Pancreatitis



**Close monitoring using clinical parameters (Vitals, BUN and Hct) improves outcomes**

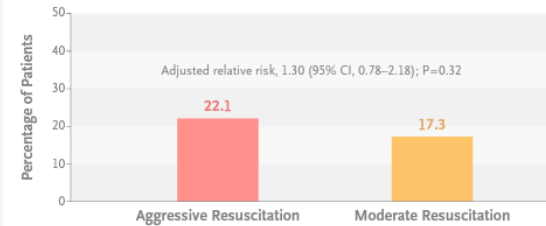
ORIGINAL ARTICLE

## Aggressive or Moderate Fluid Resuscitation in Acute Pancreatitis

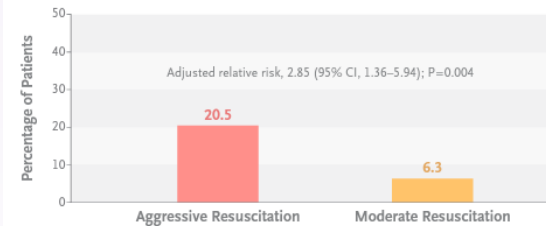
E. de-Madaria, J.L. Buxbaum, P. Maisonneuve, A. García García de Paredes, P. Zapater, L. Guilabert, A. Vaillo-Rocamora, M.Á. Rodríguez-Gandía, J. Donate-Ortega, E.E. Lozada-Hernández, A.J.R. Collazo Moreno, A. Lira-Aguilar, L.P. Llovet, R. Mehta, R. Tandel, P. Navarro, A.M. Sánchez-Pardo, C. Sánchez-Marin, M. Cobreros, I. Fernández-Cabrera, F. Casals-Seoane, D. Casas Deza, E. Lauret-Braña, E. Martí-Marqués, L.M. Camacho-Montaño, V. Ubieto, M. Ganuza, and F. Bolado, for the ERICA Consortium\*

- Key Take-Aways:
  - Start with 10cc/kg bolus if hypovolemic (no bolus if normovolumic) → 1.5cc/kg/hr
  - Careful Monitoring to **maintain EUVOLUMIA**
  - Diuresis is OK in first 72 hours to support euvolemia

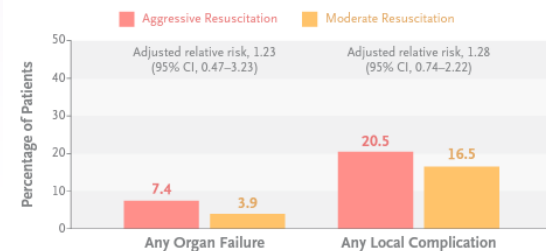
### Moderately Severe or Severe Acute Pancreatitis during Hospitalization



### Fluid Overload



### Secondary Outcomes





**NS=LR**

**Nutrition?**

**Maintain Euvolemia!**

**Early Management Strategies  
in Acute Pancreatitis**

**Drain the fluid?**

**Risk Factor Modification?**

**Imaging?**

# To Eat or Not to Eat?



**Annals of Internal Medicine**

**REVIEW**

## **Early Versus Delayed Feeding in Patients With Acute Pancreatitis**

**Shorter LOS in mild/mod severe AP; no diff in complications**

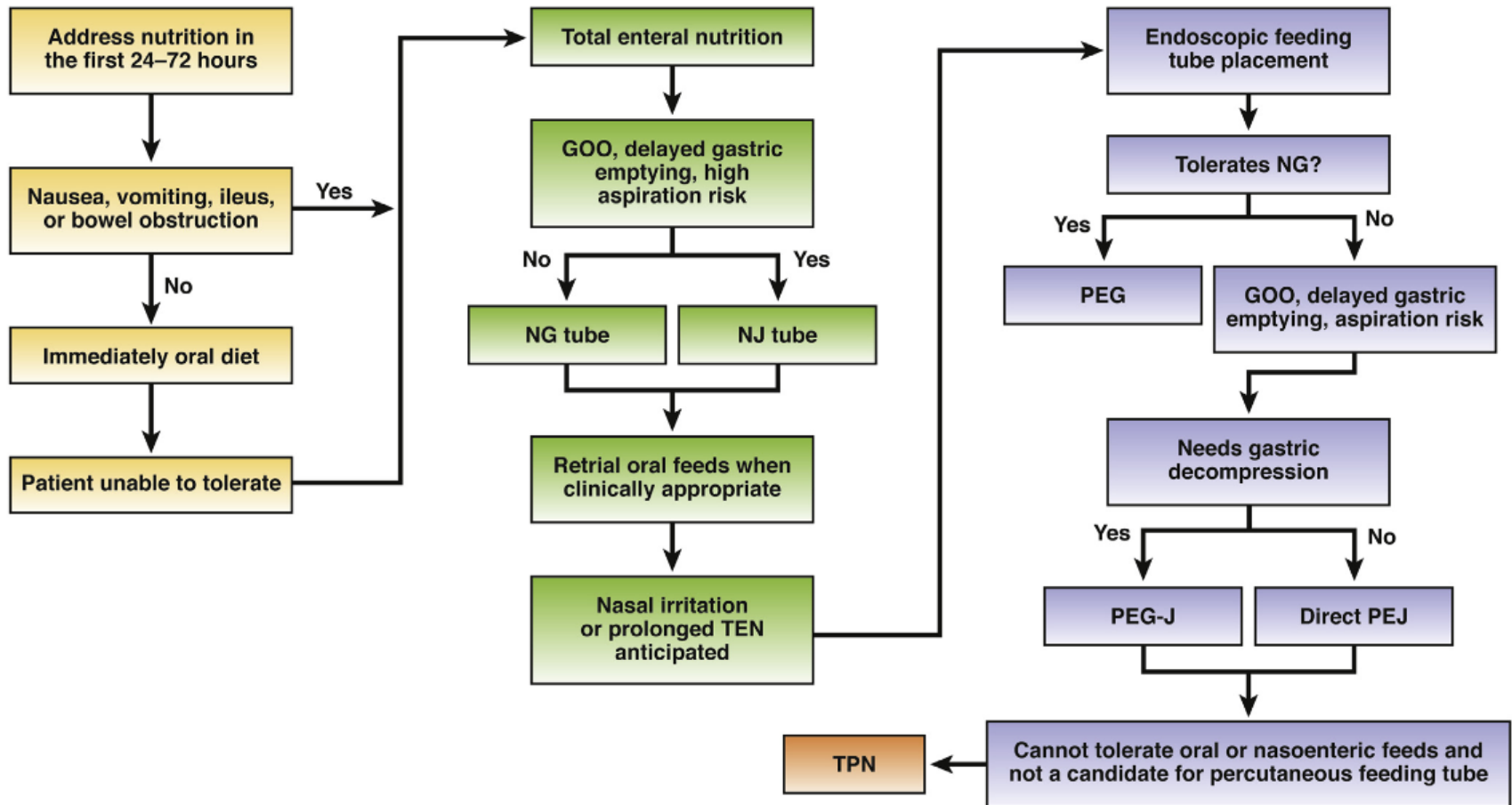
**Equal LOS in severe AP; limited data**

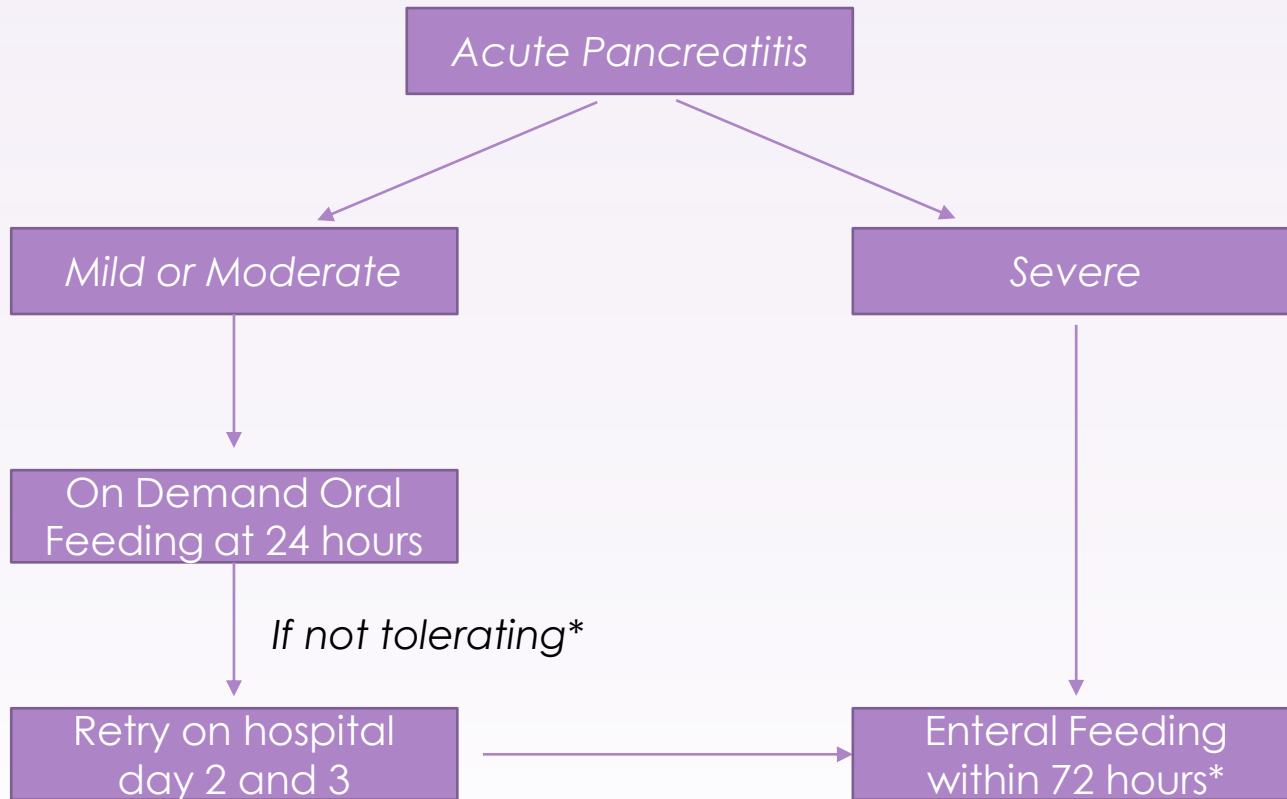
Early versus On-Demand Nasoenteric Tube  
Feeding in Acute Pancreatitis

**No difference in infective  
complications between  
groups in patients with SAP**

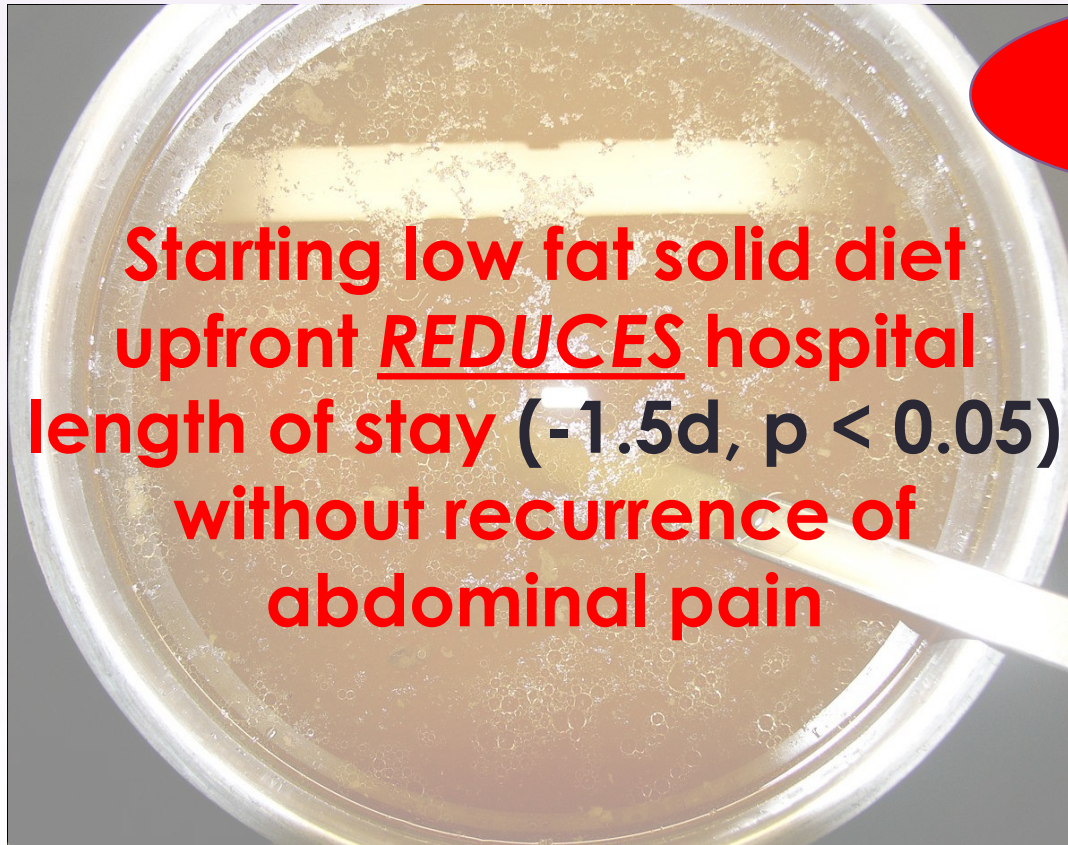
Is post-pyloric  
feeding really  
necessary?

**NG = NJ feeding  
EQUAL OUTCOMES!**





*\*TPN reserved if not receiving adequate enteral feeding or if gut is compromised*



**Starting low fat solid diet  
upfront REDUCES hospital  
length of stay (-1.5d,  $p < 0.05$ )  
without recurrence of  
abdominal pain**

What should I do if  
they have recurrent  
pain?

Jacobsen et al. *CGH* 2007  
Morales et al. *J Clin Gastroenterol.* 2010

**NS=LR**

**Low Fat Diet ASAP**

**Maintain Euvolemia!**

**Early Management Strategies  
in Acute Pancreatitis**

**Drain the fluid?**

**Risk Factor Modification?**

**Imaging?**

# What additional work-up is needed?


## WHILE ADMITTED

- **Rule out gallstones**
- Medication Reconciliation
- Substance Abuse Counselling
- LFTs, calcium and triglycerides

## AFTER DISCHARGE

- If initial work up negative and/or age > 40, proceed with MRI/MRCP
- If Family history positive for pancreatitis or concern for CF, will consider genetic testing

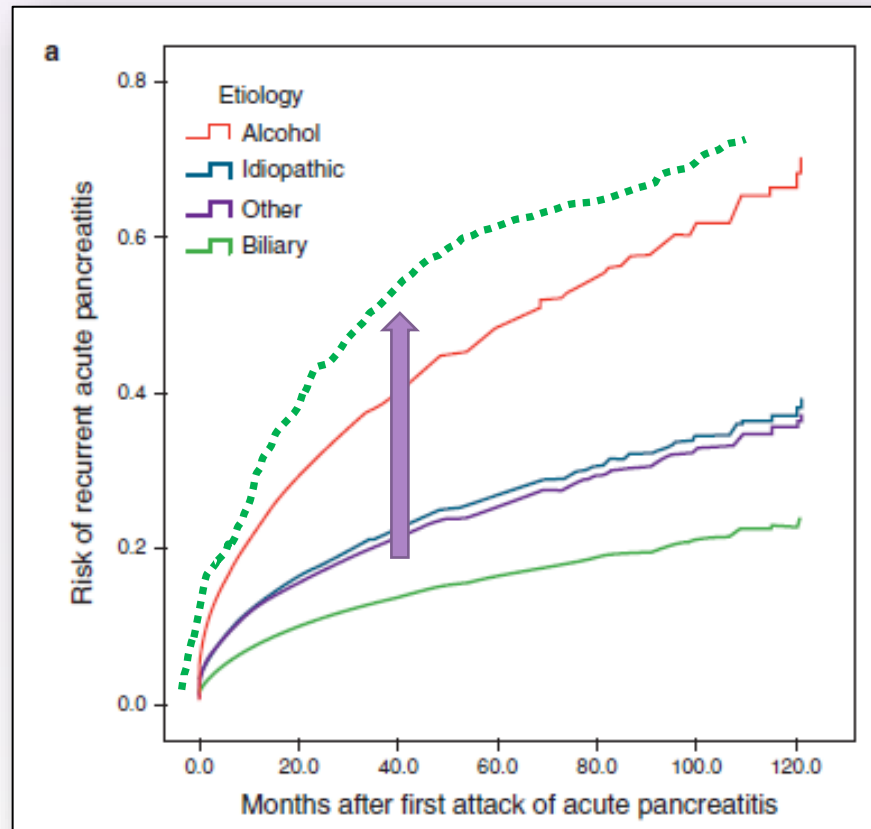
# When is imaging necessary?

<i>Imaging Study</i>	<i>Utility in Assessment in the Acute Setting</i>
Ultrasound	
CT	
MRCP	
EUS	
ERCP	



# Risk Modification

# Recurrent Acute Pancreatitis



Lankisch et al. *Am J Gastroenterol* 2009  
Yadav et al. *Am J Gastroenterol* 2012

# Biliary Pancreatitis

When do you consider ERCP?

	Interval cholecystectomy (n=136)	Same-admission cholecystectomy (n=128)	Risk ratio (95% CI)	p value
<b>Primary endpoint</b>				
Mortality or readmission for gallstone-related complications	23 (17%)	6 (5%)	0.28 (0.12–0.66)	0.002

Take out the gallbladder during this index admission!

Da Costa et al. *Lancet* 2015  
Vege et al. *Gastroenterology* 2018

## The Recurrence of Acute Alcohol-Associated Pancreatitis Can Be Reduced: A Randomized Controlled Trial

ISTO NORDBACK, HANNA PELLI, RIITTA LAPPALAINEN-LEHTO, SATU JÄRVINEN, SARI RÄTY, and JUHANI SAND

Department of Gastroenterology and Alimentary Tract Surgery, Division of Surgery, Gastroenterology and Oncology, Tampere University

- 120 patients randomized to either one intervention during index admission or repeated interventions every 6 months for 2 years:
  1. Information on toxicity of ETOH
  2. Need to reduce ETOH intake
  3. Evaluation of contributing factors
- 36 patients were lost to follow-up

	Initial intervention Only (n = 61)	Repeated interventions at 6-month intervals (n = 59)	P
Total hospital admissions			
Abdominal complaints			
Number of patients, N (%)	16 (26)	7 (12)	.038
Number of admissions	30	15	.004
Recurrent AP <sup>a</sup>			
Number of patients, N (%)	13 (21)	5 (8)	.042
First recurrence			
<6 mo, N (%)	5 (8)	4 (7)	NS
>6 mo, N (%)	8 (13)	1 (2)	.018
Number of episodes			
Overall	20	9	.012
<6 mo	5	4	NS
>6 to 24 mo	15	5	.009
Admissions because of abdominal complaints not fulfilling the criteria of recurrent AP			
Number of patients (%)	3 (5)	2 (3)	NS
Number of admissions	10	6	NS

**NS=LR**

**Low Fat Diet ASAP**


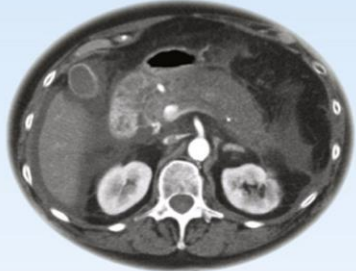
**Maintain Euvolemia!**

**Early Management Strategies  
in Acute Pancreatitis**

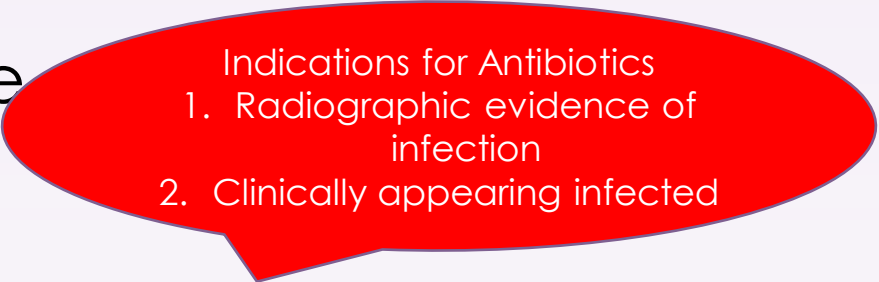
**Drain the fluid?**

**CCY in Index Admission  
ETOH Counselling**

**Rule out gallstones 1<sup>st</sup>  
Malignancy after d/c**

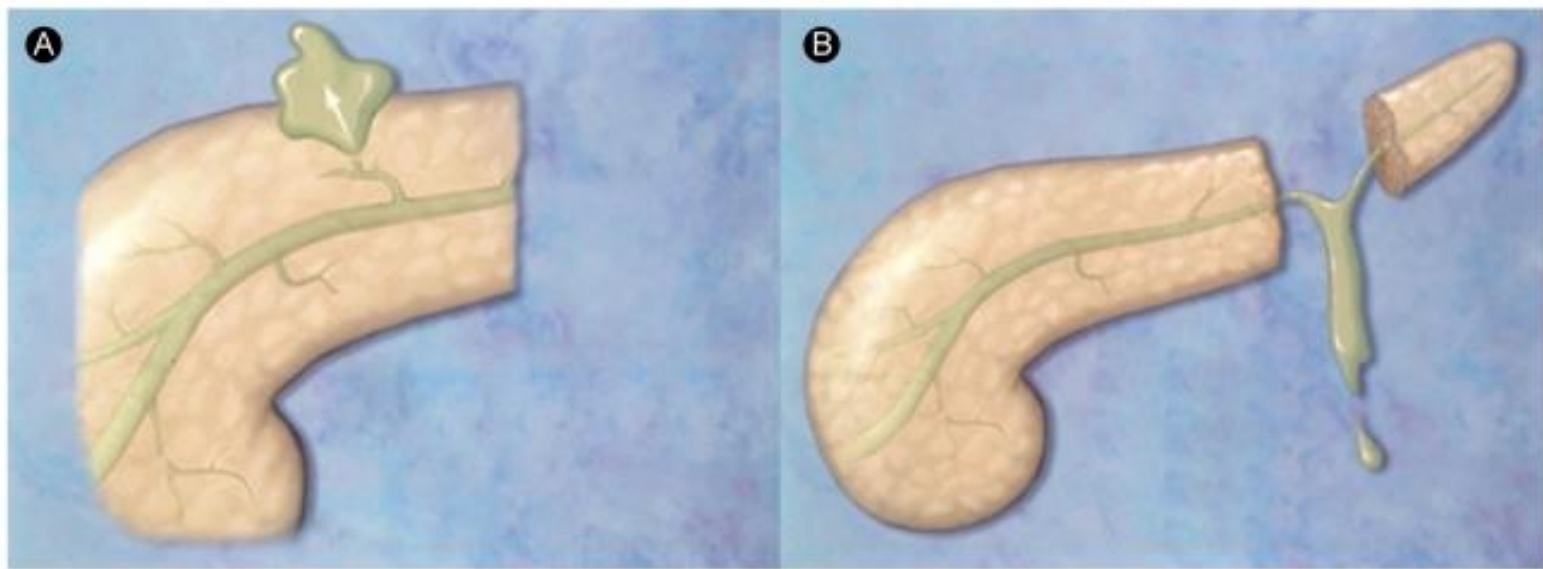
	<p style="text-align: center;"><b>Interstitial edematous pancreatitis</b></p>	<p style="text-align: center;"><b>Necrotizing pancreatitis</b></p>
<p><b>&lt; 4 weeks</b></p>	<p style="text-align: center;"><b>Acute (peri)pancreatic fluid collection</b></p> <p>Homogenous fluid adjacent to pancreas without a recognizable wall</p> 	<p style="text-align: center;"><b>Acute necrotic collection</b></p> <p>Intra and/or extra pancreatic necrotic collection without a well-defined wall</p> 

# Indications for Drainage

- 
- Indications for Antibiotics
1. Radiographic evidence of infection
  2. Clinically appearing infected

- Infected pseudocyst or necrosis (preferably after 4 weeks)
- Ongoing organ failure despite optimal several weeks of medical therapy
- Sterile fluid collection with persistent symptoms (after 4 weeks)
- Disconnected duct from gland necrosis

# Disconnected Duct





# Pancreatic Fluid Collection Drainage

**Transmural drainage** (i.e.  
cystgastrostomy and  
necrosectomy)

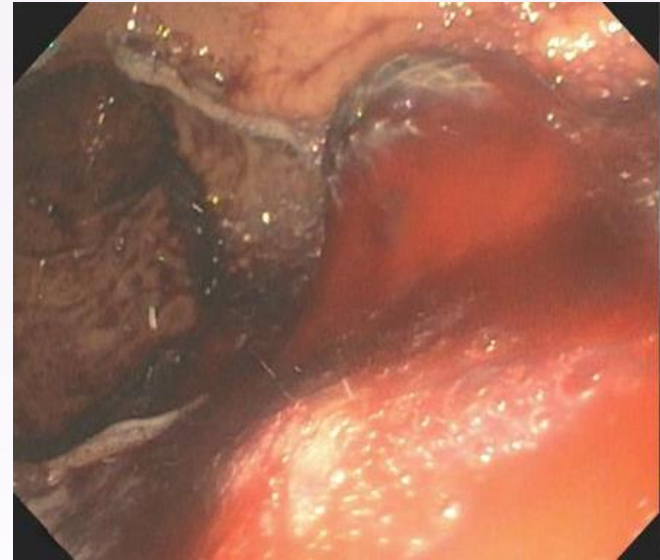
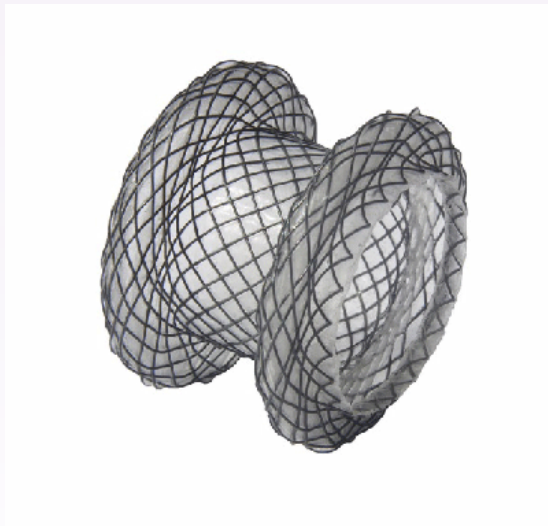
**Transampullary drainage** (i.e.  
disconnected duct syndrome)

**Percutaneous (IR) drainage**

**Surgical drainage** (i.e.  
cystgastrostomy or cystjejunostomy)

Varadarajulu et al. *Gastroenterology* 2013  
Van Brunschot et al. *Lancet* 2018

Warning...



***No longer than 4 weeks!***

Garcia-Alonso et al. *Endoscopy* 2018  
Bang et al. *Gut* 2017

## AGA CLINICAL PRACTICE UPDATE: EXPERT REVIEW

American Gastroenterological Association Clinical Practice Update: Management of Pancreatic Necrosis



# Management of Severe Acute Pancreatitis with Necrosis

### Acute phase (< 2–4 weeks)

- Management of systemic inflammatory response
- Supportive care of associated organ dysfunction
- Nutritional optimization (enteral preferred)
- Avoidance of prophylactic antibiotics
- If concern for infection during acute phase (i.e., retroperitoneal air), consider image-guided percutaneous drainage
- Intra-abdominal hypertension common; clinical abdominal compartment syndrome unusual

### Late phase (≥ 2–4 weeks)

- Continue supportive care of organ dysfunction
- Continue to optimize nutrition (enteral)
- Drainage and debridement indicated when evidence of infection (air in peripancreatic necrosis)
- Consider intervention on necrosis in patient with persistent nutritional failure or organ dysfunction

### Approach to debridement

Dependent on pattern of necrosis and institutional expertise

- **Central retrogastric collection:**
  - Endoscopic transgastric or laparoscopic transgastric approach
- **Retrogastric with paracolic gutter extension:**
  - Percutaneous drainage with step-up to videoscopic retroperitoneal debridement or endoscopic debridement with addition of percutaneous drain as needed
- **Retrogastric collection with extension to the right of the mesenteric vessels:**
  - Endoscopic or laparoscopic transgastric; may need open debridement

**Important: MULTIDISCIPLINARY APPROACH!**

Adapted from Baron et al. *Gastroenterology* 2020

**NS=LR**

**Low Fat Diet ASAP**

**Maintain Euvolemia!**

**Early Management Strategies  
in Acute Pancreatitis**

**Only if symptomatic. No prophylactic antibiotics!**

**CCY in Index Admission  
ETOH Counselling**

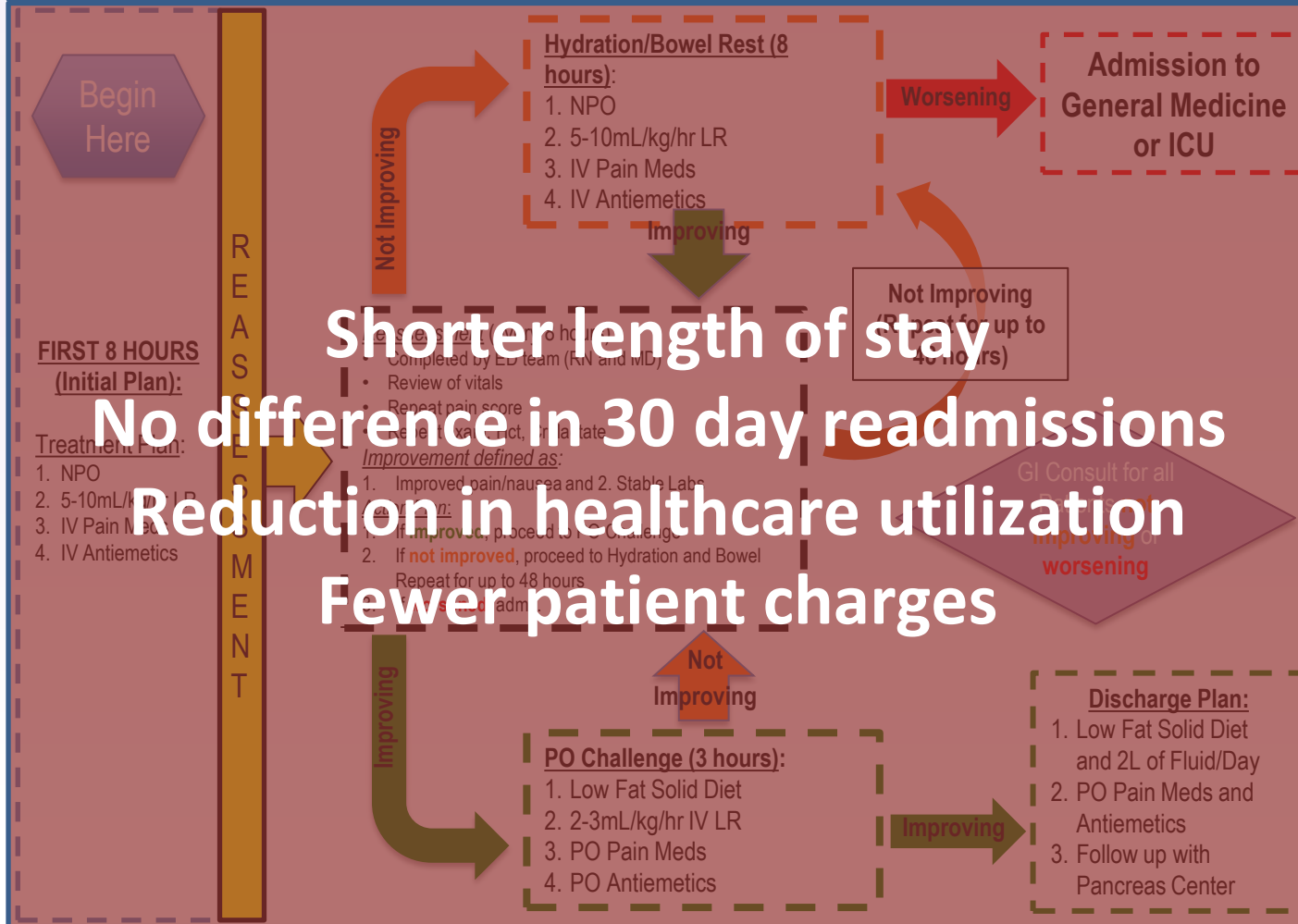
**Rule out gallstones 1<sup>st</sup>  
Malignancy after d/c**

# Adherence to Guidelines

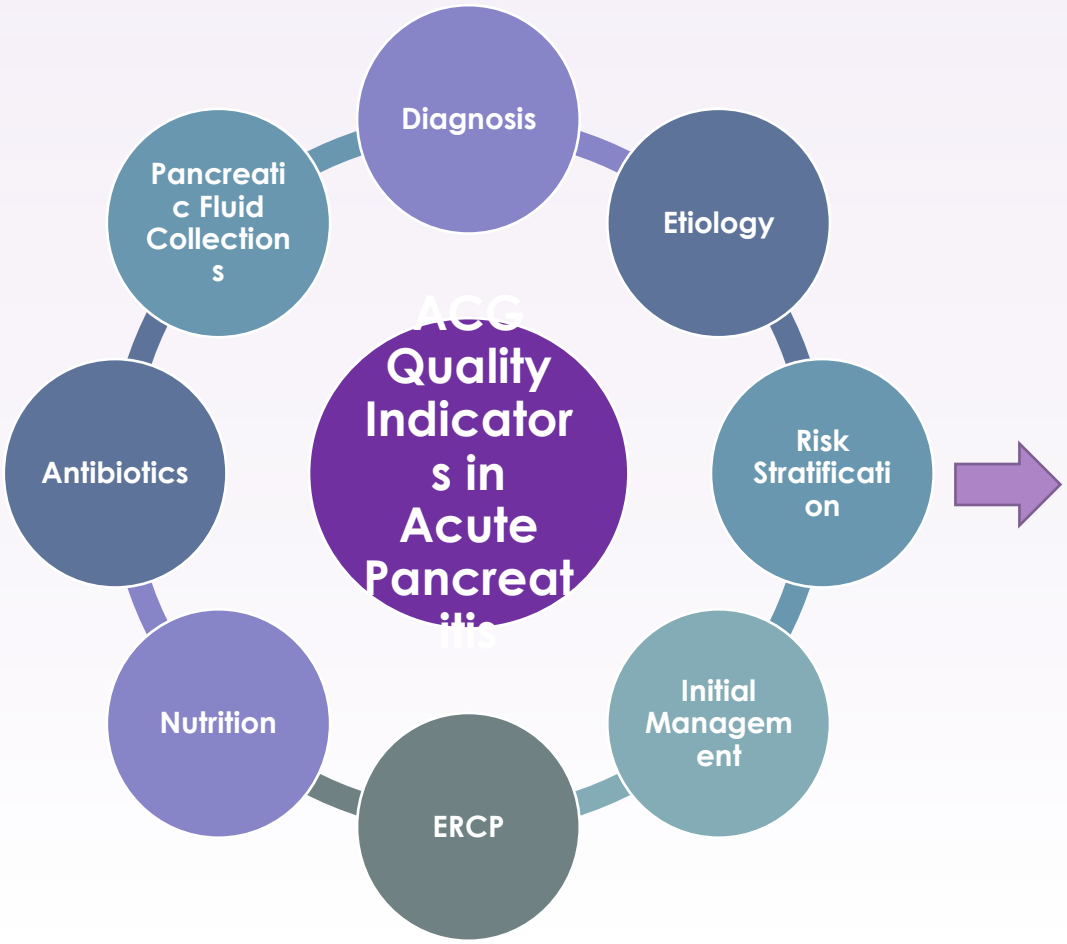
## Enforcement of Guideline Based Care



## ED Observation for Mild Acute Pancreatitis



**Shorter length of stay**  
**No difference in 30 day readmissions**  
**Reduction in healthcare utilization**  
**Fewer patient charges**



**Table 1.** Acute Pancreatitis Quality Measures

Quality measure	Description
Cholecystectomy before discharge	Percentage of patients aged 18 years and older with a diagnosis of acute biliary pancreatitis who undergo cholecystectomy during the same hospital admission.
Early oral feeding	Percentage of patients aged 18 years and older with a diagnosis of acute pancreatitis who receive oral feeding within 24 hours of admission to the hospital.
Parenteral nutrition	Percentage of patients aged 18 years and older with a diagnosis of acute pancreatitis who receive parenteral nutrition during their hospitalization.

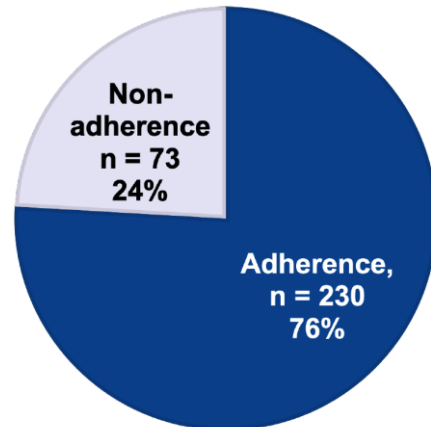
Vivian et al. *Am J Gastroenterol* 2019  
 Mosko et al. *Clin Gastroenterol Hepatol* 2020



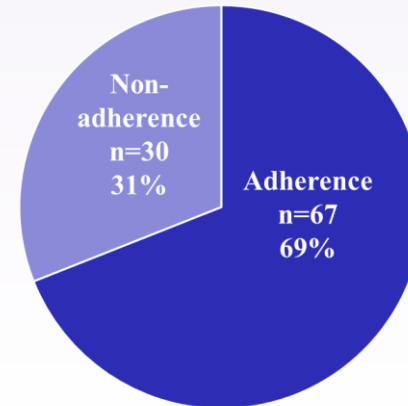
# How is Duke doing with this?

- Population: Retrospective cohort of 309 adults with a diagnosis of acute pancreatitis admitted to DUH, DRH, or DRaH from 10/7/2019-10/7/2020

**Primary Outcome: Initiation of Oral Feeding within 1 day of Admission**



**Primary Outcome: Adherence to Same-admission CCY in Patients with GP**



Hein A et al. Am J Gastro 2021  
Namasingh N et al. Am J Gastro 2021

# How can we be better?

- **Acute Pancreatitis Order Set**
- **Consult Surgery when suspected Gallstone Pancreatitis!!**

The screenshot shows a clinical order set interface. At the top, there are navigation tabs: "Sidebar Summary", "Problem Orient...", "Bedsid...", and "Orders". Below these, there are buttons for "Manage Orders" and "Order Sets", along with an "Options" dropdown. A search bar contains the text "Place orders or order sets" and has a "+ New" button and a "Next" button. Below this is a section titled "Order Sets & Panels" with a table listing order sets. The table has columns for "Name" and "User Version Name". One order set is listed: "GEN GI Acute Pancreatitis". Below the table is a section titled "Diet / Nutrition" with a list of diet options, each with a checkbox:

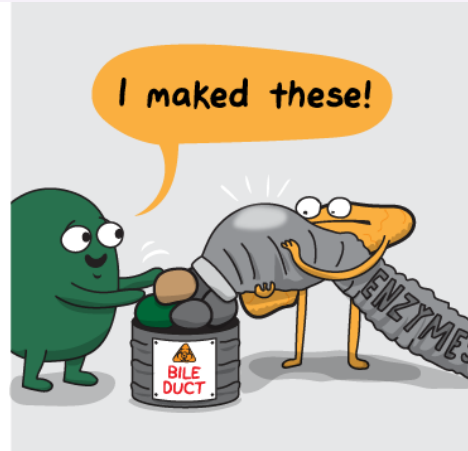
- Diet low fat low cholesterol - Consistency Advanced (Mech Soft)
- Diet clear liquid
- Diet NPO except for sips and ice chips
- Diet NPO  
Until Specified

There are also some bullet points under "Diet / Nutrition":

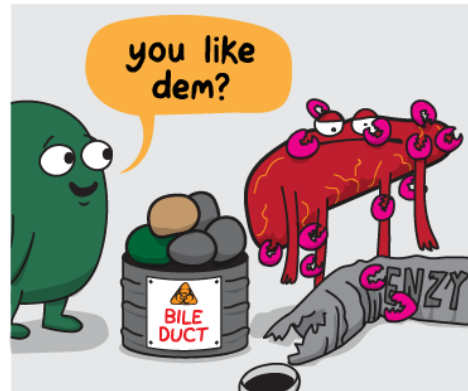
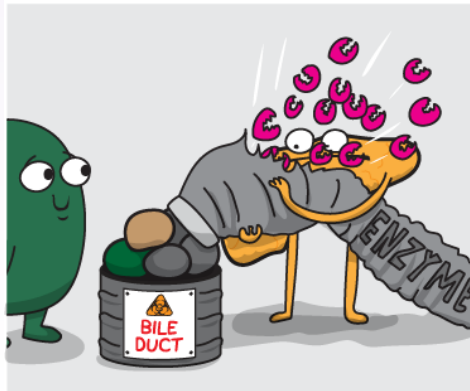
- Most patients with acute pancreatitis do not need to be made strictly NPO. If NPO, reassess daily.
- Clear liquid diet probably of low utility and most patients who can tolerate oral intake can be placed on low fat diet.
- If unable to tolerate oral nutrition, strongly consider placement of nasoenteral feeding tube and initiation of tube feeding by hospital day #3.



©2015 The Awkward Yeti



theAwkwardYeti.com



**Thank you for  
your attention!**

**Questions?**

[Darshan.Kothari@duke.edu](mailto:Darshan.Kothari@duke.edu)

## **CME/MOC Question:**

**A 47 year old female with hypertension presents to the ED with acute onset epigastric pain with nausea and vomiting and is found to have a lipase of 4000 (ULN 70) and imaging findings consistent with acute pancreatitis. She only takes HCTZ. Her social history of notable for tobacco use and 1-2 drinks per week. Her LFTs are normal and her ultrasound shows gallstones. She receives IV fluids, analgesia and is initially bowel rest. By hospital day 1, her pain improves and her diet is advanced to a low fat solid diet. Prior to discharge, which of the following should be done?**

- A. Stop HCTZ**
- B. Consult social work for alcohol cessation resources**
- C. Surgical consultation for cholecystectomy**
- D. MRCP to rule out choledocholithiasis**
- E. Send IgG4 subclasses**

Joint Providership



American Society for  
Gastrointestinal Endoscopy

## CME/MOC Question:

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- B. Consult social work for alcohol cessation resources
- C. Surgical consultation for cholecystectomy**
- D. MRCP to rule out choledocholithiasis
- E. Send IgG4 subclasses

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**CME/MOC Answer: Correct Choice: C**

**Most common cause of acute pancreatitis is gallstones and with documented cholelithiasis, patients should undergo cholecystectomy during this index admission.**

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