

**Supplement I. Acute Pancreatitis Task Force on Quality:
Literature Review and Quality Indicator Descriptive Information**

Care Plan Domain: DIAGNOSIS

Quality Indicator:

DIAG-1.1: IF a patient presents with acute onset severe upper abdominal pain with epigastric tenderness, THEN acute pancreatitis should be suspected, and serum lipase and/or amylase levels obtained.

Clinical Recommendation	Acute pancreatitis should be suspected in a patient presenting with acute onset upper abdominal pain with epigastric tenderness. Serum lipase is useful for confirming the diagnosis of acute pancreatitis and levels elevated more than three times above upper limit of normal are diagnostic of acute pancreatitis.
Performance Target	98%
Indicator Type (Structure/Process/Outcome)	Process
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients presenting with characteristic abdominal pain
Rationale (i.e. How does the indicator lead to desired health outcome)?	Timely diagnosis of acute pancreatitis

Supporting Literature

Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Kiriya T, Gabata T, Takada T et al. New diagnostic criteria of acute pancreatitis. J Hepatobiliary Pancreat Sci 2010; 17: 24 – 36.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Shah AM, Eddi R, Kothari ST et al. Acute pancreatitis with normal serum lipase: a case series. JOP 2010 ; 11 : 369 – 72	2C Observational studies Very weak recommendation; alternative approaches are likely to be better under some circumstances
4. Rompianesi G, Hann A, Komolafe O, Pereira SP, Davidson BR, Gurusamy KS. Serum amylase and lipase and urinary trypsinogen and amylase for diagnosis of acute pancreatitis. Cochrane Database Syst Rev. 2017 Apr 21; 4:CD012010. doi: 10.1002/14651858.CD012010.pub2. Review.	1C+ Observational studies Strong recommendation, can apply to most practice settings in most situations
5. Lippi G, Valentino M, Cervellin G. Laboratory diagnosis of acute pancreatitis: in search of the Holy Grail. Crit Rev Clin Lab Sci 2012; 49	3- Expert opinion only Weak recommendation, likely to change as data becomes available

1, 18-31.	
6. Banks PA, Bollen TL, Dervenis C et al. Classification of acute pancreatitis 2012: revision of Atlanta classification and definitions by international consensus. Gut 2013; 62: 102 – 11.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
7. Working Party of the British Society of Gastroenterology.; Association of Surgeons of Great Britain and Ireland.; Pancreatic Society of Great Britain and Ireland.; Association of Upper GI Surgeons of Great Britain and Ireland.. UK guidelines for the management of acute pancreatitis. Gut. 2005 May; 54 Suppl 3:iii1-9. PubMed PMID: 15831893; PubMed Central PMCID: PMC1867800.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
8. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. Gut. 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972	3 Expert opinion only Weak recommendation, likely to change as data becomes available
9. Yadav D, Agarwal N, Pitchumoni CS. A critical evaluation of laboratory tests in acute pancreatitis. Am J Gastroenterol. 2002 Jun;97(6):1309-18. Review. PubMed PMID: 12094843.	3 Expert opinion only Weak recommendation, likely to change as data becomes available
10. Crockett SD, Wani S, Gardner TB, Falck-Ytter Y, Barkun AN; American Gastroenterological Association Institute Clinical Guidelines Committee. American Gastroenterological Association Institute Guideline on Initial Management of Acute Pancreatitis. Gastroenterology. 2018 Mar;154(4):1096-1101. doi: 10.1053/j.gastro.2018.01.032. Epub 2018 Feb 3. PubMed PMID: 29409760.	3 Expert opinion only Weak recommendation, likely to change as data becomes available

Care Plan Domain: DIAGNOSIS

Quality Indicator:

DIAG-1.2: IF a patient is suspected to have acute pancreatitis and the serum amylase and/or lipase levels are not diagnostic, THEN cross-sectional imaging (CT or MRI) should be performed to confirm acute pancreatitis and/or exclude an alternate diagnosis.

Clinical Recommendation	CT should be performed when a definitive diagnosis of acute pancreatitis is suspected and based on clinical manifestations; but not confirmed by laboratory examination and ultrasound. CT enables visualization of objective local images of the pancreas free from the influence of gas bubbles in the alimentary tract and fatty tissues in the abdominal wall and cavity. CT and MRI are comparable in the early assessment of acute pancreatitis.
Performance Target	98%
Indicator Type (Structure/Process/Outcome)	Process, Appropriateness
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients presenting with characteristic abdominal pain in whom pancreatic enzymes are not diagnostic.
Rationale (i.e. How does the indicator lead to desired health outcome)?	Routine use of CT in patients with acute pancreatitis is unwarranted since the diagnosis is apparent in many patients and most have a mild, uncomplicated course. However, if a definitive diagnosis of acute pancreatitis cannot be made on the basis of clinical manifestations and laboratory results, then CT should be performed.

Supporting Literature

Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Kiriya T, Gabata T, Takada T et al. New diagnostic criteria of acute pancreatitis. J Hepatobiliary Pancreat Sci 2010; 17: 24 – 36.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Balthazar EJ. Acute pancreatitis: assessment of severity with clinical and CT evaluation. Radiology 2002; 223: 603 – 13.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
4. Bollen TL, Singh VK, Maurer R et al. Comparative evaluation of the modified CT severity index and CT severity index in assessing severity of acute pancreatitis. AJR Am J Roentgenol 2011; 197: 386 – 92.	1C Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
5. Banks PA, Bollen TL, Dervenis C et al. Classification of acute pancreatitis 2012: revision of Atlanta classification and definitions by	3- Expert opinion only Weak recommendation, likely to change as data becomes available

international consensus. Gut 2013; 62: 102 – 11.	
6. Forsmark CE, Baillie J; AGA Institute Clinical Practice and Economics Committee.; AGA Institute Governing Board.. AGA Institute technical review on acute pancreatitis. Gastroenterology. 2007 May;132(5):2022-44. Review. PubMed PMID: 17484894.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
7. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. Gut. 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972	3- Expert opinion only Weak recommendation, likely to change as data becomes available
8. Dimastromatteo J, Brentnall T, Kelly KA. Imaging in pancreatic disease. Nat Rev Gastroenterol Hepatol. 2017 Feb;14(2):97-109. doi: 10.1038/nrgastro.2016.144. Epub 2016 Nov 9. Review. PubMed PMID: 27826137.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
9. Arvanitakis M, Dumonceau JM, Albert J, et al. Endoscopic management of acute necrotizing pancreatitis:European Society of Gastrointestinal Endoscopy (ESGE) evidence-based multidisciplinary guidelines. Endoscopy. 2018 Apr; 50: 524–546. doi: https://doi.org/10.1055/a-0588-5365	3- Expert opinion only Weak recommendation, likely to change as data becomes available

Care Plan Domain: DIAGNOSIS

Quality Indicator:

DIAG-1.3: IF a patient presents with at least 2 of the following 3 conditions, THEN a diagnosis of acute pancreatitis should be made:

- a. Acute onset upper abdominal pain with epigastric tenderness
- b. Serum pancreatic enzymes elevated greater than three times the upper limit of normal
- c. Findings consistent with acute pancreatitis on cross-sectional imaging (CT or MRI)

Clinical Recommendation	Acute pancreatitis should be diagnosed on the basis of characteristic abdominal pain, elevated pancreatic enzymes, and characteristic findings on imaging.
Performance Target	98%
Indicator Type (Structure/Process/Outcome)	Process
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients suspected to have acute pancreatitis
Rationale (i.e. How does the indicator lead to desired health outcome)?	Timely diagnosis of acute pancreatitis

Supporting Literature

Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Kiriya T, Gabata T, Takada T et al. New diagnostic criteria of acute pancreatitis. J Hepatobiliary Pancreat Sci 2010; 17: 24 – 36.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Banks PA, Bollen TL, Dervenis C et al. Classification of acute pancreatitis 2012: revision of Atlanta classification and definitions by international consensus. Gut 2013; 62: 102 – 11.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
4. Steinberg WM, Buse JB, Ghorbani MLM, Ørsted DD, Nauck MA; LEADER Steering Committee.; LEADER Trial Investigators.. Amylase, Lipase, and Acute Pancreatitis in People With Type 2 Diabetes Treated With Liraglutide: Results From the LEADER Randomized Trial. Diabetes Care. 2017 Jul;40(7):966-972. doi: 10.2337/dc16-2747. Epub 2017 May 5. PubMed PMID: 28476871	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings

Care Plan Domain: ETIOLOGY

Quality Indicator:

ETIO-2.1: IF a patient is diagnosed with acute pancreatitis, THEN a thorough history including: (a) alcohol intake, (b) smoking, and (c) medications should be obtained and documented on presentation.

Clinical Recommendation	<p>A thorough history of alcohol use should be obtained from all patients diagnosed with acute pancreatitis. Particular emphasis should be placed on duration (years) of heavy alcohol use and volume consumed daily. Acute pancreatitis may occur during alcohol withdrawal, and symptoms of alcohol withdrawal syndrome may overlap with clinical evaluation of acute pancreatitis. The amount of alcohol considered to confer risk is greater than 4-5 drinks per day in men, likely less in women, and binge drinking confers higher risk than continuous drinking. Smoking is an additive risk factor.</p> <p>A thorough history of smoking should be obtained from all patients diagnosed with acute pancreatitis. Particular emphasis should be placed on duration (years) and current use (packs/day or equivalent).</p> <p>A definitive diagnosis of drug-induced acute pancreatitis is often difficult. The medication being assigned as the contributory cause of acute pancreatitis must be described in terms of the dose, duration/latency, and the existence of rechallenge.</p>	
Performance Target	<p>a) 98.5%</p> <p>b) 96.5%</p> <p>c) 98%</p>	
Indicator Type (Structure/Process/Outcome)	Process	
Indicator Level (Hospital/Patient)	Patient	
Target Population	Patients diagnosed with acute pancreatitis	
Rationale (i.e. How does the indicator lead to desired health outcome)?	<p>Establishing acute pancreatitis etiology is important because it determines management/treatment. A majority of patients with alcoholic recurrent acute pancreatitis develop chronic pancreatitis over a 15-year time course. Smoking is an additional, but poorly recognized, risk factor for recurrent acute and chronic pancreatitis. Defining a drug as causing acute pancreatitis poses a challenge to clinicians.</p>	
Supporting Literature		
Source	Methodology and GRADE	
1. Kiriya T, Gabata T, Takada T et al. New diagnostic criteria of acute pancreatitis. J Hepatobiliary Pancreat Sci 2010; 17: 24 – 36.	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available</p>	

2. Bank S, Indaram A. Causes of acute and recurrent pancreatitis. Clinical considerations and clues to diagnosis. Gastroenterol Clin North Am. 1999 Sep; 28(3):571-89, viii. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Gullo L, Migliori M, Oláh A, Farkas G, Levy P, Arvanitakis C, Lankisch P, Beger H. Acute pancreatitis in five European countries: etiology and mortality. Pancreas. 2002 Apr; 24(3):223-7.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
4. Tandon M, Topazian M. Endoscopic ultrasound in idiopathic acute pancreatitis. Am J Gastroenterol. 2001 Mar; 96(3):705-9.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
5. Whitcomb DC. Genetic polymorphisms in alcoholic pancreatitis. Dig Dis. 2005; 23(3-4):247-54. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
6. Badalov N, Baradarian R, Iswara K, Li J, Steinberg W, Tenner S. Drug-induced acute pancreatitis: an evidence-based review. Clin Gastroenterol Hepatol. 2007 Jun; 5(6):648-61; quiz 644. Epub 2007 Mar 28. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
7. Al-Haddad M, Wallace MB. Diagnostic approach to patients with acute idiopathic and recurrent pancreatitis, what should be done? World J Gastroenterol. 2008 Feb 21; 14(7):1007-10. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
8. Lowenfels AB, Maisonneuve P, Sullivan T. The changing character of acute pancreatitis: epidemiology, etiology, and prognosis. Curr Gastroenterol Rep. 2009 Apr; 11(2):97-103. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
9. Ahmed Ali U, Issa Y, Hagenars JC, Bakker OJ, van Goor H, Nieuwenhuijs VB, Bollen TL, van Ramshorst B, Witteman BJ, Brink MA, et al. Risk of Recurrent Pancreatitis and Progression to Chronic Pancreatitis After a First Episode of Acute Pancreatitis. Clin Gastroenterol Hepatol. 2016 May;14 (5):738-46. doi: 10.1016/j.cgh.2015.12.040.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
10. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. Gut. 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972	3- Expert opinion only Weak recommendation, likely to change as data becomes available
11. Coté GA, Yadav D, Slivka A, Hawes RH, Anderson MA, Burton FR, Brand RE, Banks PA, Lewis MD, Disario JA, Gardner TB, Gelrud A, Amann ST, Baillie J, Money ME, O'Connell M, Whitcomb DC, Sherman S; North American Pancreatitis Study Group.. Alcohol and	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available

<p>smoking as risk factors in an epidemiology study of patients with chronic pancreatitis. Clin Gastroenterol Hepatol. 2011 Mar;9(3):266-73; quiz e27. doi: 10.1016/j.cgh.2010.10.015.</p>	
<p>12. Nitsche C, Maertin S, Scheiber J, Ritter CA, Lerch MM, Mayerle J. Drug-induced pancreatitis. Curr Gastroenterol Rep. 2012 Apr;14(2):131-8. doi: 10.1007/s11894-012-0245-9. Review. PubMed PMID: 22314811</p>	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available</p>

Care Plan Domain: ETIOLOGY

Quality Indicator:

ETIO-2.2: IF a patient is diagnosed with acute pancreatitis, THEN a medical history should be obtained and documented to include: (a) previous attacks of acute or chronic pancreatitis and (b) family history of pancreatic disease.

Clinical Recommendation	A medical history should include documentation of previous attacks and a family history of pancreatitis or pancreatic cancer.	
Performance Target	a) 96.5% b) 95%	
Indicator Type (Structure/Process/Outcome)	Process	
Indicator Level (Hospital/Patient)	Patient	
Target Population	Patients diagnosed with acute pancreatitis	
Rationale (i.e. How does the indicator lead to desired health outcome)?	A thorough medical history is pertinent to the management of acute pancreatitis	
Supporting Literature		
Source	Methodology and GRADE	
<i>We did not find, in our search, literature to support this indicator. However, it is, in the opinion of our experts, a recommended clinical practice.</i>	3- Expert opinion only Weak recommendation, likely to change as data becomes available	

Care Plan Domain: ETIOLOGY

Quality Indicator:

ETIO-2.3: IF a patient is diagnosed with acute pancreatitis, THEN (a) serum liver chemistry, (b) triglyceride levels, (c) and serum calcium levels should be obtained on presentation.

Clinical Recommendation	The diagnosis of acute biliary pancreatitis can be suggested by measuring serum bilirubin, ALT, AST & ALP at the time of admission. Transient elevation in one or more liver chemistries > 2-3x ULN is suggestive of acute biliary pancreatitis. Baseline serum triglyceride levels should be obtained in all patients with acute pancreatitis. Baseline serum calcium levels should be obtained in patients with acute pancreatitis. Elevated levels are associated with etiology, and low levels are associated with more severe disease.	
Performance Target	a) 98% b) 90% c) 90%	
Indicator Type (Structure/Process/Outcome)	Process, Efficiency	
Indicator Level (Hospital/Patient)	Patient	
Target Population	Patients diagnosed with acute pancreatitis	
Rationale (i.e. How does the indicator lead to desired health outcome)?	Liver chemistries are useful for diagnosing acute biliary pancreatitis. Timely diagnosis of acute biliary pancreatitis facilitates timely surgical/endoscopic intervention.	
Supporting Literature		
Source	Methodology and GRADE	
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available	
2. Kiriya T, Gabata T, Takada T et al. New diagnostic criteria of acute pancreatitis. J Hepatobiliary Pancreat Sci 2010; 17: 24 – 36.	3- Expert opinion only Weak recommendation, likely to change as data becomes available	
3. Bank S, Indaram A. Causes of acute and recurrent pancreatitis. Clinical considerations and clues to diagnosis. Gastroenterol Clin North Am. 1999 Sep; 28(3):571-89, viii. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available	
4. Gulló L, Migliori M, Oláh A, Farkas G, Levy P, Arvanitakis C, Lankisch P, Beger H. Acute pancreatitis in five European countries:	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence	

etiology and mortality. <i>Pancreas</i> . 2002 Apr; 24(3):223-7.	is available
5. Fortson MR, Freedman SN, Webster PD 3rd. Clinical assessment of hyperlipidemic pancreatitis. <i>Am J Gastroenterol</i> . 1995 Dec; 90(12):2134-9.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
6. Yadav D, Pitchumoni CS. Issues in hyperlipidemic pancreatitis. <i>J Clin Gastroenterol</i> . 2003 Jan; 36(1):54-62. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
7. Al-Haddad M, Wallace MB. Diagnostic approach to patients with acute idiopathic and recurrent pancreatitis, what should be done? <i>World J Gastroenterol</i> . 2008 Feb 21; 14(7):1007-10. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
8. Johnson C, Lévy P. Detection of gallstones in acute pancreatitis: when and how? <i>Pancreatol</i> . 2010; 10(1):27-32. doi: 10.1159/000224147. Epub 2010 Mar 19. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
9. Pedersen SB, Langsted A, Nordestgaard BG. Nonfasting Mild-to-Moderate Hypertriglyceridemia and Risk of Acute Pancreatitis. <i>JAMA Intern Med</i> . 2016 Dec 1;176(12):1834-1842. doi: 10.1001/jamainternmed.2016.6875. PubMed PMID: 27820614	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
10. Tenner S, Dubner H, Steinberg W. Predicting gallstone pancreatitis with laboratory parameters: a meta-analysis. <i>Am J Gastroenterol</i> . 1994 Oct;89(10):1863-6. PubMed PMID: 7942684.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
11. Trna J, Vege SS, Pribramska V, Chari ST, Kamath PS, Kendrick ML, Farnell MB. Lack of significant liver enzyme elevation and gallstones and/or sludge on ultrasound on day 1 of acute pancreatitis is associated with recurrence after cholecystectomy: a population-based study. <i>Surgery</i> . 2012 Feb;151(2):199-205. doi: 10.1016/j.surg.2011.07.017. Epub 2011 Oct 5. PubMed PMID: 21975288.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
12. Toskes PP. Hyperlipidemic pancreatitis. <i>Gastroenterol Clin North Am</i> . 1990 Dec; 19(4):783-91. Review. PubMed PMID: 2269517.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
13. Forsmark CE, Baillie J; AGA Institute Clinical Practice and Economics Committee.; AGA Institute Governing Board.. AGA Institute technical review on acute pancreatitis. <i>Gastroenterology</i> . 2007 May;132(5):2022-44. Review. PubMed PMID: 17484894.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
14. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. <i>Gut</i> . 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972	3- Expert opinion only Weak recommendation, likely to change as data becomes available

<p>15. Peng T, Peng X, Huang M, Cui J, Zhang Y, Wu H, Wang C. Serum calcium as an indicator of persistent organ failure in acute pancreatitis. <i>Am J Emerg Med.</i> 2017 Jul;35(7):978-982. doi: 10.1016/j.ajem.2017.02.006. Epub 2017 Feb 4. PubMed PMID: 28291705.</p>	<p>1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available</p>
<p>16. Pokharel A, Sigdel PR, Phuyal S, Kansakar PBS, Vaidya P. Prediction of Severity of Acute Pancreatitis Using Total Serum Calcium and Albumin-Corrected Calcium: A Prospective Study in Tertiary Center Hospital in Nepal. <i>Surg Res Pract.</i> 2017;2017:1869091. doi: 10.1155/2017/1869091. Epub 2017 Dec 19. PubMed PMID: 29410978; PubMed Central PMCID: PMC5749278.</p>	<p>1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence</p>
<p>17. Scherer J, Singh VP, Pitchumoni CS, Yadav D. Issues in hypertriglyceridemic pancreatitis: an update. <i>J Clin Gastroenterol.</i> 2014 Mar;48(3):195-203. doi: 10.1097/01.mcg.0000436438.60145.5a. Review. PubMed PMID: 24172179; PubMed Central PMCID: PMC3939000.</p>	<p>1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence</p>

Care Plan Domain: ETIOLOGY

Quality Indicator:

ETIO-2.4: IF a patient is diagnosed with acute pancreatitis and no clear etiology is evident after history, biochemical testing, and transabdominal ultrasound, THEN an elective CECT, EUS, and/or MRI with MRCP should be performed after the acute phase of pancreatitis has resolved.

Clinical Recommendation	In adults with acute pancreatitis, CECT, EUS, and MRI with MRCP are superior to transabdominal ultrasound for identifying structural etiologies for acute pancreatitis such as pre-malignant or malignant neoplasms.
Performance Target	96.5%
Indicator Type (Structure/Process/Outcome)	Process, Appropriateness
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients diagnosed with acute pancreatitis with no clear etiology
Rationale (i.e. How does the indicator lead to desired health outcome)?	Other causes such as pre-malignant or malignant neoplasms should be considered a possible cause of acute pancreatitis in patients with no clear etiology.
Supporting Literature	
Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Bank S, Indaram A. Causes of acute and recurrent pancreatitis. Clinical considerations and clues to diagnosis. Gastroenterol Clin North Am. 1999 Sep; 28(3):571-89, viii. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Tandon M, Topazian M. Endoscopic ultrasound in idiopathic acute pancreatitis. Am J Gastroenterol. 2001 Mar; 96(3):705-9.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
4. Al-Haddad M, Wallace MB. Diagnostic approach to patients with acute idiopathic and recurrent pancreatitis, what should be done? World J Gastroenterol. 2008 Feb 21; 14(7):1007-10. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
5. Munigala S, Kanwal F, Xian H, Scherrer JF, Agarwal B. Increased risk of pancreatic adenocarcinoma after acute pancreatitis. Clin Gastroenterol Hepatol. 2014 Jul;12(7):1143-1150.e1. doi: 10.1016/j.cgh.2013.12.033. Epub 2014 Jan 16. PubMed PMID:	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available

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6. Forsmark CE, Baillie J; AGA Institute Clinical Practice and Economics Committee.; AGA Institute Governing Board.. AGA Institute technical review on acute pancreatitis. Gastroenterology. 2007 May;132(5):2022-44. Review. PubMed PMID: 17484894.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
7. Morales-Oyarvide V, Mino-Kenudson M, Ferrone CR, Gonzalez-Gonzalez LA, Warshaw AL, Lillemoe KD, Fernández-del Castillo C. Acute pancreatitis in intraductal papillary mucinous neoplasms: A common predictor of malignant intestinal subtype. Surgery. 2015 Nov;158(5):1219-25. doi: 10.1016/j.surg.2015.04.029. PubMed PMID: 26077509.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
8. Thorat A, Huang WH, Yeh TS, Jan YY, Hwang TL. Pancreatic ductal adenocarcinoma presenting with acute and chronic pancreatitis as initial presentation: is prognosis better? A comparison study. Hepatogastroenterology. 2014 Oct;61(135):2110-6. PubMed PMID: 25713917.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
9. Thevenot A, Bournet B, Otal P, Canevet G, Moreau J, Buscail L. Endoscopic ultrasound and magnetic resonance cholangiopancreatography in patients with idiopathic acute pancreatitis. Dig Dis Sci. 2013 Aug;58(8):2361-8. doi: 10.1007/s10620-013-2632-y. Epub 2013 Mar 19. PubMed PMID: 23508982.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
10. Rana SS, Bhasin DK, Rao C, Singh K. Role of endoscopic ultrasound in idiopathic acute pancreatitis with negative ultrasound, computed tomography, and magnetic resonance cholangiopancreatography. Ann Gastroenterol. 2012;25(2):133-137. PubMed PMID: 24714266; PubMed Central PMCID: PMC3959389.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available

Care Plan Domain: ETIOLOGY

Quality Indicator:

ETIO-2.5: IF a patient is diagnosed with acute pancreatitis, THEN ERCP is not recommended purely for determination of etiology.

Clinical Recommendation	The diagnostic yield of ERCP is estimated to be low for patients with acute pancreatitis who have a normal endoscopic ultrasound, MRI with MRCP, or both. The role of ERCP in the setting of idiopathic acute pancreatitis remains controversial.	
Performance Target	2%	
Indicator Type (Structure/Process/Outcome)	Process, Appropriateness	
Indicator Level (Hospital/Patient)	Patient	
Target Population	Patients diagnosed with acute pancreatitis	
Rationale (i.e. How does the indicator lead to desired health outcome)?	The diagnostic yield of ERCP is estimated to be low for patients with acute pancreatitis who have a normal endoscopic ultrasound, MRI with MRCP, or both	
Supporting Literature		
Source	Methodology and GRADE	
1. Wilcox, C.M., Varadarajulu, S. and Eloubeidi, M. (2006) Role of Endoscopic Evaluation in Idiopathic Pancreatitis: A Systematic Review. <i>Gastrointestinal Endoscopy</i> , 63, 1037-1045. http://dx.doi.org/10.1016/j.gie.2006.02.024 .	3- Expert opinion only Weak recommendation, likely to change as data becomes available	
2. Mariani A, Arcidiacono PG, Curioni S, Giussani A, Testoni PA. Diagnostic yield of ERCP and secretin-enhanced MRCP and EUS in patients with acute recurrent pancreatitis of unknown aetiology. <i>Dig Liver Dis</i> . 2009 Oct;41(10):753-8. doi: 10.1016/j.dld.2009.01.009. Epub 2009 Mar 10. PubMed PMID: 19278909.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available	
3. Das R, Clarke B, Tang G, Papachristou GI, Whitcomb DC, Slivka A, Yadav D. Endoscopic sphincterotomy (ES) may not alter the natural history of idiopathic recurrent acute pancreatitis (IRAP). <i>Pancreatology</i> . 2016 Sep-Oct;16(5):770-7. doi: 10.1016/j.pan.2016.07.009. Epub 2016 Jul 14. PubMed PMID: 27450967.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available	

Care Plan Domain: ETIOLOGY

Quality Indicator:

ETIO-2.6: IF a patient is diagnosed with acute pancreatitis and the etiology remains unknown after history, biochemical testing, and cross-sectional imaging, THEN the patient should be referred to a pancreatic center of excellence.

Clinical Recommendation	Acute pancreatitis is considered idiopathic if there is no established etiology after history, biochemical testing, and cross-sectional imaging (e.g., transabdominal US, CECT, MRI with MRCP, and/or EUS). The patient should be referred to a tertiary care center with expertise in medical pancreatology. There is debate as to whether one should wait until the second attack to refer.
Performance Target	77.5%
Indicator Type (Structure/Process/Outcome)	Process
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients diagnosed with acute pancreatitis in whom the etiology is unclear after thorough diagnostic work-up
Rationale (i.e. How does the indicator lead to desired health outcome)?	Patients with idiopathic acute pancreatitis require specialized care. Establishing acute pancreatitis etiology is important because it determines management/treatment.

Supporting Literature

Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Bank S, Indaram A. Causes of acute and recurrent pancreatitis. Clinical considerations and clues to diagnosis. Gastroenterol Clin North Am. 1999 Sep; 28(3):571-89, viii. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Tandon M, Topazian M. Endoscopic ultrasound in idiopathic acute pancreatitis. Am J Gastroenterol. 2001 Mar; 96(3):705-9.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
4. Al-Haddad M, Wallace MB. Diagnostic approach to patients with acute idiopathic and recurrent pancreatitis, what should be done? World J Gastroenterol. 2008 Feb 21; 14(7):1007-10. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
5. Johnson C, Lévy P. Detection of gallstones in acute pancreatitis: when	3- Expert opinion only

<p>and how? Pancreatology. 2010; 10(1):27-32. doi: 10.1159/000224147. Epub 2010 Mar 19. Review.</p>	<p>Weak recommendation, likely to change as data becomes available</p>
<p>6. Sheth SG, Conwell DL, Whitcomb DC, Alsante M, Anderson MA, Barkin J, Brand R, Cote GA, Freedman SD, Gelrud A, Gorelick F, Lee LS, Morgan K, Pandol S, Singh VK, Yadav D, Wilcox CM, Hart PA. Academic Pancreas Centers of Excellence: Guidance from a multidisciplinary chronic pancreatitis working group at PancreasFest. Pancreatology. 2017 May - Jun;17(3):419-430. doi: 10.1016/j.pan.2017.02.015. Epub 2017 Feb 28. PubMed PMID: 28268158; PubMed Central PMCID: PMC5525332.</p>	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available</p>

Care Plan Domain: INITIAL ASSESSMENT AND RISK STRATIFICATION

Quality Indicator:

RISK-3.1: IF a patient is diagnosed with acute pancreatitis, THEN intravascular volume depletion/hemoconcentration (orthostatic vital signs, hematocrit, BUN, creatinine) should be assessed and documented.

Clinical Recommendation	Patients with acute pancreatitis should be assessed for hemodynamic status immediately upon presentation, and resuscitative measures begun as needed.	
Performance Target	98.5%	
Indicator Type (Structure/Process/Outcome)	Process	
Indicator Level (Hospital/Patient)	Patient and hospital	
Target Population	Patients diagnosed with acute pancreatitis	
Rationale (i.e. How does the indicator lead to desired health outcome)?	Early resuscitation is linked to better health outcomes	
Supporting Literature		
Source	Methodology and GRADE	
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available	
2. Mounzer R et al. Comparison of existing clinical scoring systems to predict persistent organ failure in patients with acute pancreatitis. Gastroenterology 2012; 142: 1476 – 82.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available	
3. Brown A, Orav J, Banks PA. Hemoconcentration is an early marker for organ failure and necrotizing pancreatitis. Pancreas 2000; 20: 367 – 72.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available	
4. Wu BU, Johannes RS, Sun X et al. Early changes in blood urea nitrogen predict mortality in acute pancreatitis. Gastroenterology 2009; 137: 129 – 35.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available	
5. Gardner TB, Olenec CA, Chertoff JD, Mackenzie TA, Robertson DJ. Hemoconcentration and pancreatic necrosis: further defining the relationship. Pancreas. 2006 Aug; 33(2):169-73. PubMed PMID: 16868483.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available	

<p>6. Lankisch PG, Mahlke R, Blum T, Bruns A, Bruns D, Maisonneuve P, Lowenfels AB. Hemoconcentration: an early marker of severe and/or necrotizing pancreatitis? A critical appraisal. <i>Am J Gastroenterol</i>. 2001 Jul;96(7):2081-5. PubMed PMID: 11467635.</p>	<p>1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available</p>
<p>7. Baillargeon JD, Orav J, Ramagopal V, Tenner SM, Banks PA. Hemoconcentration as an early risk factor for necrotizing pancreatitis. <i>Am J Gastroenterol</i>. 1998 Nov; 93(11):2130-4. PubMed PMID: 9820385.</p>	<p>1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available</p>
<p>8. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. <i>Gut</i>. 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972</p>	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available</p>
<p>9. Yadav D, Agarwal N, Pitchumoni CS. A critical evaluation of laboratory tests in acute pancreatitis. <i>Am J Gastroenterol</i>. 2002 Jun;97(6):1309-18. Review. PubMed PMID: 12094843.</p>	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available</p>
<p>10. Koutroumpakis E, Wu BU, Bakker OJ, Dudekula A, Singh VK, Besselink MG, Yadav D, Mounzer R, van Santvoort HC, Whitcomb DC, Gooszen HG, Banks PA, Papachristou GI. Admission Hematocrit and Rise in Blood Urea Nitrogen at 24 h Outperform other Laboratory Markers in Predicting Persistent Organ Failure and Pancreatic Necrosis in Acute Pancreatitis: A Post Hoc Analysis of Three Large Prospective Databases. <i>Am J Gastroenterol</i>. 2015 Dec;110(12):1707-16. doi: 10.1038/ajg.2015.370. Epub 2015 Nov 10. Erratum in: <i>Am J Gastroenterol</i>. 2016 Aug;111(8):1216. Mounzer, Rawad [added]. PubMed PMID: 26553208.</p>	<p>1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available</p>
<p>11. Lankisch PG, Weber-Dany B, Hebel K, Maisonneuve P, Lowenfels AB. The harmless acute pancreatitis score: a clinical algorithm for rapid initial stratification of nonsevere disease. <i>Clin Gastroenterol Hepatol</i>. 2009 Jun;7(6):702-5; quiz 607. doi: 10.1016/j.cgh.2009.02.020. Epub 2009 Feb 24. PubMed PMID: 19245846.</p>	<p>1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available</p>
<p>12. Aggarwal A, Manrai M, Kochhar R. Fluid resuscitation in acute pancreatitis. <i>World J Gastroenterol</i>. 2014 Dec 28;20(48):18092-103. doi: 10.3748/wjg.v20.i48.18092. Review. PubMed PMID: 25561779; PubMed Central PMCID: PMC4277949.</p>	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available</p>

Care Plan Domain: INITIAL ASSESSMENT AND RISK STRATIFICATION

Quality Indicator:

RISK-3.2: IF a patient is diagnosed with acute pancreatitis, THEN indicators for severity (organ failure, SIRS, age, impaired mental status, and pleural effusion) should be assessed and documented on presentation.

Clinical Recommendation	Patients with acute pancreatitis should be stratified based on severity, into higher and lower risk categories.
Performance Target	98%
Indicator Type (Structure/Process/Outcome)	Process
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients diagnosed with acute pancreatitis
Rationale (i.e. How does the indicator lead to desired health outcome)?	Risk stratification informs triage, management, and admission criteria e.g. admission to critical care units.

Supporting Literature

Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Balthazar EJ. Acute pancreatitis: assessment of severity with clinical and CT evaluation. Radiology 2002; 223: 603 – 13.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Banks PA, Bollen TL, Dervenis C et al. Classification of acute pancreatitis 2012: revision of Atlanta classification and definitions by international consensus. Gut 2013; 62: 102 – 11.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
4. Dellinger EP, Forsmark CE, Layer P et al. Determinant-Based Classification of Acute Pancreatitis Severity: An International Multidisciplinary Consultation. Ann Surg 2012; 256: 875 – 880.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
5. Banks PA, Freeman ML. Practice guidelines in acute pancreatitis. Am J Gastroenterol 2006; 101: 2379 – 400.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
6. Tenner S. Initial management of acute pancreatitis: critical issues during the first 72 hours. Am J Gastroenterol 2004; 99: 2489 – 94.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
7. Heller SJ, Noordhoek E, Tenner SM et al. Pleural effusion as a	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence

predictor of severity in acute pancreatitis . Pancreas 1997; 15: 222 – 5.	is available
8. Wu BU, Johannes RS, Sun X et al. Early changes in blood urea nitrogen predict mortality in acute pancreatitis. Gastroenterology 2009; 137: 129 – 35.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
9. Lankisch PG, Mahlke R, Blum T, Bruns A, Bruns D, Maisonneuve P, Lowenfels AB. Hemoconcentration: an early marker of severe and/or necrotizing pancreatitis? A critical appraisal. Am J Gastroenterol. 2001 Jul;96(7):2081-5. PubMed PMID: 11467635.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
10. Forsmark CE, Baillie J; AGA Institute Clinical Practice and Economics Committee.; AGA Institute Governing Board.. AGA Institute technical review on acute pancreatitis. Gastroenterology. 2007 May;132(5):2022-44. Review. PubMed PMID: 17484894.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
11. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. Gut. 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972	3 Expert opinion only Weak recommendation, likely to change as data becomes available
12. Andersson B, Olin H, Eckerwall G, Andersson R. Severe acute pancreatitis--outcome following a primarily non-surgical regime. Pancreatology. 2006;6(6):536-41. Epub 2006 Nov 10. PubMed PMID: 17106218.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
13. Koutroumpakis E, Wu BU, Bakker OJ, Dudekula A, Singh VK, Besselink MG, Yadav D, Mounzer R, van Santvoort HC, Whitcomb DC, Gooszen HG, Banks PA, Papachristou GI. Admission Hematocrit and Rise in Blood Urea Nitrogen at 24 h Outperform other Laboratory Markers in Predicting Persistent Organ Failure and Pancreatic Necrosis in Acute Pancreatitis: A Post Hoc Analysis of Three Large Prospective Databases. Am J Gastroenterol. 2015 Dec;110(12):1707-16. doi: 10.1038/ajg.2015.370. Epub 2015 Nov 10. Erratum in: Am J Gastroenterol. 2016 Aug;111(8):1216. Mounzer, Rawad [added]. PubMed PMID: 26553208.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
14. Lankisch PG, Weber-Dany B, Hebel K, Maisonneuve P, Lowenfels AB. The harmless acute pancreatitis score: a clinical algorithm for rapid initial stratification of nonsevere disease. Clin Gastroenterol Hepatol. 2009 Jun;7(6):702-5; quiz 607. doi: 10.1016/j.cgh.2009.02.020. Epub 2009 Feb 24. PubMed PMID: 19245846.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
15. Muddana V, Whitcomb DC, Khalid A, Slivka A, Papachristou GI.	1C- Observational studies

<p>Elevated serum creatinine as a marker of pancreatic necrosis in acute pancreatitis. Am J Gastroenterol. 2009 Jan;104(1):164-70. doi: 10.1038/ajg.2008.66. PubMed PMID: 19098865.</p>	<p>Intermediate-strength recommendation, may change when stronger evidence is available</p>
<p>16. Papachristou GI, Papachristou DJ, Avula H, Slivka A, Whitcomb DC. Obesity increases the severity of acute pancreatitis: performance of APACHE-O score and correlation with the inflammatory response. Pancreatology. 2006;6(4):279-85. Epub 2006 Apr 19. PubMed PMID: 16636600.</p>	<p>1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available</p>
<p>17. Aggarwal A, Manrai M, Kochhar R. Fluid resuscitation in acute pancreatitis. World J Gastroenterol. 2014 Dec 28;20(48):18092-103. doi: 10.3748/wjg.v20.i48.18092. Review. PubMed PMID: 25561779; PubMed Central PMCID: PMC4277949.</p>	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available</p>
<p>18. Singh VK, Wu BU, Bollen TL, Repas K, Maurer R, Morteale KJ, Banks PA. Early systemic inflammatory response syndrome is associated with severe acute pancreatitis. Clin Gastroenterol Hepatol. 2009 Nov;7(11):1247-51. doi: 10.1016/j.cgh.2009.08.012. Epub 2009 Aug 15. PubMed PMID: 19686869.</p>	<p>1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available</p>
<p>19. Gao W, Yang H-X, & Ma C-E. The Value of BISAP Score for Predicting Mortality and Severity in Acute Pancreatitis: A Systematic Review and Meta-Analysis. PLOS ONE. 2015 Jun:1-15; doi:10.1371/journal.pone.0130412</p>	<p>1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available</p>

Care Plan Domain: INITIAL ASSESSMENT AND RISK STRATIFICATION

Quality Indicator:

RISK-3.3: IF a patient is diagnosed with acute pancreatitis and has SIRS and/or organ failure, THEN they should be documented to be at risk for severe acute pancreatitis.

Clinical Recommendation	Clinical scoring systems can predict persistent organ failure in patients with acute pancreatitis.
Performance Target	90%
Indicator Type (Structure/Process/Outcome)	Process
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients diagnosed with acute pancreatitis
Rationale (i.e. How does the indicator lead to desired health outcome)?	It is important to identify patients with acute pancreatitis who are at risk for developing persistent organ failure and severe pancreatitis early in the course of disease.

Supporting Literature

Source	Methodology and GRADE
20. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
21. Banks PA, Bollen TL, Dervenis C et al. Classification of acute pancreatitis 2012: revision of Atlanta classification and definitions by international consensus. Gut 2013; 62: 102 – 11.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
22. Dellinger EP, Forsmark CE, Layer P et al. Determinant-Based Classification of Acute Pancreatitis Severity: An International Multidisciplinary Consultation. Ann Surg 2012; 256: 875 – 880.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
23. Mounzer R et al. Comparison of existing clinical scoring systems to predict persistent organ failure in patients with acute pancreatitis. Gastroenterology 2012 ; 142 : 1476 – 82 .	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
24. Banks PA, Freeman ML. Practice guidelines in acute pancreatitis. Am J Gastroenterol 2006; 101: 2379 – 400.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
25. Tenner S. Initial management of acute pancreatitis: critical issues during the first 72 hours. Am J Gastroenterol 2004; 99: 2489 – 94.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
26. Mofidi R , Duff MD , Wigmore SJ et al. Association between early systemic inflammatory response, severity of multiorgan dysfunction and death in acute pancreatitis . Br J Surg 2006; 93: 738 – 44.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available

27. Buter A, Imrie CW , Carter CR et al. Dynamic nature of early organ dysfunction determines outcome in acute pancreatitis .Br J Surg 2002 ; 89 :298 – 302	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
28. Park JY, Jeon TJ, Ha TH et al. Bedside index for severity in acute pancreatitis:comparison with other scoring systems in predicting severity and organ failure. Hepatobiliary Panreat Dis Int. 2013 Dec; 12(6): 645-50	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
29. Bollen TL, Singh VK, Maurer R et al. Comparative evaluation of the modified CT severity index and CT severity index in assessing severity of acute pancreatitis. AJR Am J Roentgenol 2011; 197: 386 – 92.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
30. Chen L, Lu G, Zhou Q, & Zhan Q. Evaluation of the BISAP Score in Predicting Severity and Prognoses of Acute Pancreatitis in Chinese Patients. Int Surg 2013; 98:6-12	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
31. Senapati, D, Debata PK, Jenasamant SS et al. A prospective study of the Bedside Index for Severity in Acute Pancreatitis (BISAP) score in acute pancreatitis: An Indian perspective. Pancreatology 2014; 335-339	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
32. Kim BG, Noh MH, Ryu CH et al. A comparison of the BISAP score and serum procalcitonin for predicting the severity of acute pancreatitis. Korean J Intern Med 2013; 28:322-329	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
33. Oskarsson V, Mehrabi M, Orsini N et al. Validation of the Harmless Acute Pancreatitis Score in Predicting Non-severe Course of Acute Pancreatitis. Pancreatology 2011; 11:464-468	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
34. Papachristou GI, Muddana V, Yadav D, O'Connell M, Sanders MK, Slivka A, Whitcomb DC. Comparison of BISAP, Ranson's, APACHE-II, and CTSI scores in predicting organ failure, complications, and mortality in acute pancreatitis. Am J Gastroenterol. 2010 Feb;105(2):435-41; quiz 442. doi: 10.1038/ajg.2009.622.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
35. Wu BU, Johannes RS, Sun X et al. The early prediction of mortality in acute pancreatitis: a large population-based study. Gut 2008; 57: 1698Y1703.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
36. Freeman MF, Werner J, van Santvoort HC et al. Interventions for necrotizing pancreatitis. Summary of a multidisciplinary consensus conference. Pancreas 2012; 8: 1176 – 94.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
37. Forsmark CE, Baillie J; AGA Institute Clinical Practice and Economics Committee.; AGA Institute Governing Board.. AGA Institute technical	3- Expert opinion only Weak recommendation, likely to change as data becomes available

review on acute pancreatitis. Gastroenterology. 2007 May;132(5):2022-44. Review. PubMed PMID: 17484894.	
38. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. Gut. 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972	3- Expert opinion only Weak recommendation, likely to change as data becomes available
39. Halonen KI, Pettilä V, Leppäniemi AK, Kemppainen EA, Puolakkainen PA, Haapiainen RK. Multiple organ dysfunction associated with severe acute pancreatitis. Crit Care Med. 2002 Jun;30(6):1274-9. PubMed PMID: 12072681.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
40. Koutroumpakis E, Wu BU, Bakker OJ, Dudekula A, Singh VK, Besselink MG, Yadav D, Mounzer R, van Santvoort HC, Whitcomb DC, Gooszen HG, Banks PA, Papachristou GI. Admission Hematocrit and Rise in Blood Urea Nitrogen at 24 h Outperform other Laboratory Markers in Predicting Persistent Organ Failure and Pancreatic Necrosis in Acute Pancreatitis: A Post Hoc Analysis of Three Large Prospective Databases. Am J Gastroenterol. 2015 Dec;110(12):1707-16. doi: 10.1038/ajg.2015.370. Epub 2015 Nov 10. Erratum in: Am J Gastroenterol. 2016 Aug;111(8):1216. Mounzer, Rawad [added]. PubMed PMID: 26553208.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available

Care Plan Domain: INITIAL MANAGEMENT (BASELINE- 72 HRS)

Quality Indicator:

MGMT-4.1: IF a patient is diagnosed with acute pancreatitis, THEN fluid resuscitation should be initiated (with bolus and maintenance) within 2 hours of the time of diagnosis as directed by assessment of intravascular volume/hemoconcentration.

Clinical Recommendation	Early aggressive intravenous hydration should be initiated within 12-24 hours in patients with acute pancreatitis. Patients should receive an initial volume challenge with a bolus of 20cc/kg of crystalloid over 60-90 minutes.
Performance Target	96.5%
Indicator Type (Structure/Process/Outcome)	Process, Efficiency
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients diagnosed with acute pancreatitis
Rationale (i.e. How does the indicator lead to desired health outcome)?	Early aggressive intravenous hydration is most beneficial in the first 12-24 hours and may have little benefit beyond.
Supporting Literature	
Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Tenner S. Initial management of acute pancreatitis: critical issues during the first 72 hours. Am J Gastroenterol 2004; 99: 2489 – 94.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Fisher JM & Gardner T. The "Golden Hours" of Management of Acute Pancreatitis. Am J Gastroenterol 2012;107:1146-1150	3- Expert opinion only Weak recommendation, likely to change as data becomes available
4. Warndorf MG, Kurtzman JT, Bartel MJ et al. Early fluid resuscitation reduces morbidity among patients with acute pancreatitis. Clin Gastroenterol Hepatol 2011 ; 9 : 705 – 9	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
5. Gardner TB, Vege SS, Pearson RK et al. Fluid resuscitation in acute pancreatitis. Clin Gastroenterol Hepatol 2008; 6: 1070 – 6.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
6. Gardner TB, Vege SS, Chari ST et al. Faster rate of initial fluid resuscitation in severe acute pancreatitis diminishes in-hospital mortality. Pancreatology 2009; 9: 770 – 6.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
7. Wu BU, Hwang JQ, Gardner TH et al. Lactated Ringer's solution	1A/1B- Randomized trials without/with important limitations

reduces systemic inflammation compared with saline in patients with acute pancreatitis. Clin Gastroenterol Hepatol 2011; 9: 710 – 7.	Strong recommendation, likely to apply to most practice settings
8. Wu BU and Conwell DL. Acute Pancreatitis Part I: Approach to Early Management. Clin Gastro Gastroenterol. 2010 May; 8:410-416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
9. Wall I, Badalov N, Baradarian R et al. Decreased morbidity and mortality in patients with acute pancreatitis related to aggressive intravenous hydration. Pancreas 2011; 40: 547 – 50.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
10. Buxbaum JL, Quezada M, Da B, et al. Early Aggressive Hydration Hastens Clinical Improvement in Mild Acute Pancreatitis. Am J Gastroenterol 2017; 112:797-803.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most practice settings
11. Singh VK, Gardner TB, Papachristou GI, et al. An international multicenter study of early intravenous fluid administration and outcome in acute pancreatitis. United European Gastroenterology Journal 2017; 5 (4): 491-498.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
12. Bakker OJ, Issa Y, van Santvoort HC, et al. Treatment options for acute pancreatitis. Nat Rev Gastroenterol Hepatol 11, 462-469 (2014).	3- Expert opinion only Weak recommendation, likely to change as data becomes available
13. Brown A, Orav J, Banks PA. Hemoconcentration is an early marker for organ failure and necrotizing pancreatitis. Pancreas 2000; 20: 367 – 72.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
14. Thomas Kerner et al. Determinants of Pancreatic Microcirculation in Acute Pancreatitis in Rats. Journal of Surgical Research. 1996; 62: 165 – 171	2C-Observational studies Very weak recommendation; alternative approaches are likely to be better under some circumstances
15. Pandol SJ, Saluja AK, Imrie CW, Banks PA. Acute pancreatitis: bench to the bedside. Gastroenterology. 2007 Mar; 132(3):1127-51. Review. Erratum in: Gastroenterology. 2007 Sep; 133(3):1056. PubMed PMID: 17383433.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
16. Nasr JY, Papachristou GI. Early fluid resuscitation in acute pancreatitis: a lot more than just fluids. Clin Gastroenterol Hepatol. 2011 Aug; 9(8):633-4. doi: 10.1016/j.cgh.2011.03.010. Epub 2011 Mar 21. PubMed PMID: 21421079.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
17. Baillargeon JD, Orav J, Ramagopal V, Tenner SM, Banks PA. Hemoconcentration as an early risk factor for necrotizing pancreatitis. Am J Gastroenterol. 1998 Nov; 93(11):2130-4. PubMed PMID: 9820385.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
18. Aggarwal A, Manrai M, Kochhar R. Fluid resuscitation in acute pancreatitis. World J Gastroenterol. 2014 Dec 28;20(48):18092-103. doi: 10.3748/wjg.v20.i48.18092. Review. PubMed PMID: 25561779;	3- Expert opinion only Weak recommendation, likely to change as data becomes available

PubMed Central PMCID: PMC4277949.	
19. Mentula P, Leppäniemi A. Position paper: timely interventions in severe acute pancreatitis are crucial for survival. World J Emerg Surg. 2014 Feb 10;9(1):15. doi: 10.1186/1749-7922-9-15. PubMed PMID: 24512891; PubMed Central PMCID: PMC3926684.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
20. Eastridge BJ, Salinas J, McManus JG, Blackburn L, Bugler EM, Cooke WH, Convertino VA, Wade CE, Holcomb JB. Hypotension begins at 110 mm Hg: redefining "hypotension" with data. J Trauma. 2007 Aug;63(2):291-7; discussion 297-9. Erratum in: J Trauma. 2008 Aug;65(2):501. Convertino, Victor A [corrected to Convertino, Victor A]. PubMed PMID: 17693826.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
21. Yamashita T, Horibe M, Sanui M, Sasaki M, et al. Large Volume Fluid Resuscitation for Severe Acute Pancreatitis is Associated with Reduced Mortality. J Clin Gastroenterol. 2018	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available

Care Plan Domain: INITIAL MANAGEMENT (BASELINE- 72 HRS)

Quality Indicator:

MGMT-4.2: IF a patient is diagnosed with acute pancreatitis, THEN Lactated Ringer's solution should be the preferred crystalloid replacement fluid unless contraindicated.

Clinical Recommendation	Lactated Ringer's may be the preferred crystalloid replacement fluid for acute pancreatitis patients.
Performance Target	80%
Indicator Type (Structure/Process/Outcome)	Process
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients with acute pancreatitis
Rationale (i.e. How does the indicator lead to desired health outcome)?	Early aggressive intravenous hydration is most beneficial in the first 12-24 hours and Lactated Ringer's is the preferred replacement fluid.

Supporting Literature

Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Fisher JM & Gardner T. The "Golden Hours" of Management of Acute Pancreatitis. Am J Gastroenterol 2012;107:1146-1150	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Wu BU, Hwang JQ, Gardner TH et al. Lactated Ringer's solution reduces systemic inflammation compared with saline in patients with acute pancreatitis. Clin Gastroenterol Hepatol 2011; 9: 710 – 7.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
4. Buxbaum JL, Quezada M, Da B, et al. Early Aggressive Hydration Hastens Clinical Improvement in Mild Acute Pancreatitis. Am J Gastroenterol 2017; 112:797-803.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most practice settings
5. Alireza Shaygan-nejad, Abdol Rahim Masjedizadeh et al. Aggressive hydration with Lactated Ringer's solution as the prophylactic intervention for postendoscopic retrograde cholangiopancreatography pancreatitis: A randomized controlled double-blind clinical trial. Res Med Sci 2015;20:838-43.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
6. Lipinski M, Rydzewska-Rosolowska A, Rydzewski A, Rydzewska G. Fluid resuscitation in acute pancreatitis: Normal saline or lactated Ringer's solution? World J Gastroenterol. 2015 Aug 21;21(31):9367-72.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available

doi: 10.3748/wjg.v21.i31.9367. PubMed PMID: 26309362; PubMed Central PMCID: PMC4541388.	
7. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. Gut. 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972	3- Expert opinion only Weak recommendation, likely to change as data becomes available
8. Arvanitakis M, Dumonceau JM, Albert J, et al. Endoscopic management of acute necrotizing pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) evidence-based multidisciplinary guidelines. Endoscopy. 2018 Apr; 50: 524–546. doi: https://doi.org/10.1055/a-0588-5365	3- Expert opinion only Weak recommendation, likely to change as data becomes available

Care Plan Domain: INITIAL MANAGEMENT (BASELINE- 72 HRS)

Quality Indicator:

MGMT-4.3: IF a patient is diagnosed with acute pancreatitis, THEN fluid resuscitation should be titrated according to interval assessment of vital signs, urine output, BUN and hematocrit during the first 48 hours.

Clinical Recommendation	Fluid requirements should be reassessed frequently within 6 hours of admission and over the next 24-48 hours. The goal of aggressive hydration should be to decrease the blood urea nitrogen.	
Performance Target	96.5%	
Indicator Type (Structure/Process/Outcome)	Process	
Indicator Level (Hospital/Patient)	Patient	
Target Population	Patients diagnosed with acute pancreatitis	
Rationale (i.e. How does the indicator lead to desired health outcome)?	Maintaining perfusion of the microcirculation of the pancreas is of critical importance and reassessment at frequent intervals ensures adequate hydration.	
Supporting Literature		
Source	Methodology and GRADE	
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available	
2. Tenner S. Initial management of acute pancreatitis: critical issues during the first 72 hours. Am J Gastroenterol 2004; 99: 2489 – 94.	3- Expert opinion only Weak recommendation, likely to change as data becomes available	
3. Fisher JM & Gardner T. The "Golden Hours" of Management of Acute Pancreatitis. Am J Gastroenterol 2012;107:1146-1150	3- Expert opinion only Weak recommendation, likely to change as data becomes available	
4. Warndorf MG, Kurtzman JT, Bartel MJ et al. Early fluid resuscitation reduces morbidity among patients with acute pancreatitis. Clin Gastroenterol Hepatol 2011 ; 9 : 705 – 9	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available	
5. Gardner TB, Vege SS, Pearson RK et al. Fluid resuscitation in acute pancreatitis. Clin Gastroenterol Hepatol 2008; 6: 1070 – 6.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available	
6. Gardner TB, Vege SS, Chari ST et al. Faster rate of initial fluid resuscitation in severe acute pancreatitis diminishes in-hospital mortality. Pancreatology 2009; 9: 770 – 6.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available	

7. Wu BU, Hwang JQ, Gardner TH et al. Lactated Ringer's solution reduces systemic inflammation compared with saline in patients with acute pancreatitis. Clin Gastroenterol Hepatol 2011; 9: 710 – 7.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
8. Wu BU and Conwell DL. Acute Pancreatitis Part I: Approach to Early Management. Clin Gastro Gastroenterol. 2010 May; 8:410-416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
9. Wall I, Badalov N, Baradaran R et al. Decreased morbidity and mortality in patients with acute pancreatitis related to aggressive intravenous hydration. Pancreas 2011; 40: 547 – 50.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
10. Buxbaum JL, Quezada M, Da B, et al. Early Aggressive Hydration Hastens Clinical Improvement in Mild Acute Pancreatitis. Am J Gastroenterol 2017; 112:797-803.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
11. Singh VK, Gardner TB, Papachristou GI, et al. An international multicenter study of early intravenous fluid administration and outcome in acute pancreatitis. United European Gastroenterology Journal 2017; 5 (4): 491-498.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
12. Brown A, Orav J, Banks PA. Hemoconcentration is an early marker for organ failure and necrotizing pancreatitis. Pancreas 2000; 20: 367 – 72.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
13. Wu BU, Johannes RS, Sun X et al. Early changes in blood urea nitrogen predict mortality in acute pancreatitis. Gastroenterology 2009; 137: 129 – 35.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
14. Haydock MD, Mittal A, Wilms HR, Phillips A, Petrov MS, Windsor JA. Fluid therapy in acute pancreatitis: anybody's guess. Ann Surg. 2013 Feb;257(2):182-8. doi: 10.1097/SLA.0b013e31827773ff. Review.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
15. Gardner TB, Olenec CA, Chertoff JD, Mackenzie TA, Robertson DJ. Hemoconcentration and pancreatic necrosis: further defining the relationship. Pancreas. 2006 Aug; 33(2):169-73. PubMed PMID: 16868483.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
16. Lankisch PG, Mahlke R, Blum T, Bruns A, Bruns D, Maisonneuve P, Lowenfels AB. Hemoconcentration: an early marker of severe and/or necrotizing pancreatitis? A critical appraisal. Am J Gastroenterol. 2001 Jul; 96(7):2081-5. PubMed PMID: 11467635.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
17. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. Gut.	3- Expert opinion only Weak recommendation, likely to change as data becomes available

<p>2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972</p>	
<p>18. Yadav D, Agarwal N, Pitchumoni CS. A critical evaluation of laboratory tests in acute pancreatitis. <i>Am J Gastroenterol</i>. 2002 Jun;97(6):1309-18. Review. PubMed PMID: 12094843.</p>	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available</p>
<p>19. Koutroumpakis E, Wu BU, Bakker OJ, Dudekula A, Singh VK, Besselink MG, Yadav D, Mounzer R, van Santvoort HC, Whitcomb DC, Gooszen HG, Banks PA, Papachristou GI. Admission Hematocrit and Rise in Blood Urea Nitrogen at 24 h Outperform other Laboratory Markers in Predicting Persistent Organ Failure and Pancreatic Necrosis in Acute Pancreatitis: A Post Hoc Analysis of Three Large Prospective Databases. <i>Am J Gastroenterol</i>. 2015 Dec;110(12):1707-16. doi: 10.1038/ajg.2015.370. Epub 2015 Nov 10. Erratum in: <i>Am J Gastroenterol</i>. 2016 Aug;111(8):1216. Mounzer, Rawad [added]. PubMed PMID: 26553208.</p>	<p>1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available</p>
<p>20. Aggarwal A, Manrai M, Kochhar R. Fluid resuscitation in acute pancreatitis. <i>World J Gastroenterol</i>. 2014 Dec 28;20(48):18092-103. doi: 10.3748/wjg.v20.i48.18092. Review. PubMed PMID: 25561779; PubMed Central PMCID: PMC4277949.</p>	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available</p>
<p>21. Arvanitakis M, Dumonceau JM, Albert J, et al. Endoscopic management of acute necrotizing pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) evidence-based multidisciplinary guidelines. <i>Endoscopy</i>. 2018 Apr; 50: 524–546. doi: https://doi.org/10.1055/a-0588-5365</p>	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available</p>

Care Plan Domain: ERCP IN ACUTE PANCREATITIS

Quality Indicator:

ERCP-5.1: IF a patient has acute pancreatitis with cholangitis, THEN they should undergo ERCP with appropriate endotherapy within 24 hours of diagnosis.

Clinical Recommendation	Patients with acute pancreatitis and concurrent acute cholangitis should undergo urgent endoscopic retrograde cholangiopancreatography (ERCP) within 24 hours of admission.
Performance Target	95%
Indicator Type (Structure/Process/Outcome)	Process, Efficiency
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients with acute pancreatitis and cholangitis
Rationale (i.e. How does the indicator lead to desired health outcome)?	Patients with acute pancreatitis and concurrent acute cholangitis should undergo endoscopic retrograde cholangiopancreatography (ERCP) within 24 h of admission. Early intervention of cholangitis could potentially limit complications and risk of mortality.

Supporting Literature

Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Tenner S. Initial management of acute pancreatitis: critical decisions during the first 72 hours. Am J Gastroenterol 2004; 99: 2489 – 94.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Tarnasky P, ERCP peri-cholecystectomy. Book Chapter. ERCP: The Fundamentals, Second Edition. Edited by Peter B. Cotton and Joseph Leung. 2015 John Wiley & Sons, Ltd. Published 2015 by John Wiley & Sons, Ltd.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
4. Ayub K, Imada R, Slavin J. ERCP in gallstone associated acute pancreatitis. Cochrane Database Syst Rev 2004: CD003630.	1C+ Overwhelming evidence from observational studies Strong recommendation, can apply to most practice settings in most situations
5. Kraft M, Lerch MM. Gallstone pancreatitis: when is endoscopic retrograde cholangiopancreatography truly necessary? Curr Gastroenterol Rep. 2003 Apr;5(2):125-32. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
6. Attasaranya S, Fogel EL, Lehman GA. Choledocholithiasis, ascending cholangitis, and gallstone pancreatitis. Med Clin North Am. 2008 Jul;92(4):925-60, x. doi: 10.1016/j.mcna.2008.03.001. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available

<p>7. Tse F, Yuan Y. Early routine endoscopic retrograde cholangiopancreatography strategy versus early conservative management strategy in acute gallstone pancreatitis. <i>Cochrane Database Syst Rev.</i> 2012 May 16;(5):CD009779. doi: 10.1002/14651858.CD009779.pub2. Review. PubMed PMID: 22592743.</p>	<p>1C+ Overwhelming evidence from observational studies Strong recommendation, can apply to most practice settings in most situations</p>
<p>8. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. <i>Gut.</i> 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972</p>	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available</p>
<p>9. Crockett SD, Wani S, Gardner TB, Falck-Ytter Y, Barkun AN; American Gastroenterological Association Institute Clinical Guidelines Committee. American Gastroenterological Association Institute Guideline on Initial Management of Acute Pancreatitis. <i>Gastroenterology.</i> 2018 Mar;154(4):1096-1101. doi: 10.1053/j.gastro.2018.01.032. Epub 2018 Feb 3. PubMed PMID: 29409760.</p>	<p>3 Expert opinion only Weak recommendation, likely to change as data becomes available</p>
<p>10. Arvanitakis M, Dumonceau JM, Albert J, et al. Endoscopic management of acute necrotizing pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) evidence-based multidisciplinary guidelines. <i>Endoscopy.</i> 2018 Apr; 50: 524–546. doi: https://doi.org/10.1055/a-0588-5365</p>	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available</p>

Care Plan Domain: ERCP IN ACUTE PANCREATITIS

Quality Indicator:

ERCP-5.2: IF a patient has biliary pancreatitis and a low probability* of choledocholithiasis, THEN ERCP is not indicated.

Clinical Recommendation	Routine ERCP is not appropriate unless there is a high suspicion of a persistent common bile duct stone, manifested by an elevation in the bilirubin.
Performance Target	5%
Indicator Type (Structure/Process/Outcome)	Process, Appropriateness
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients with acute biliary pancreatitis
Rationale (i.e. How does the indicator lead to desired health outcome)?	ERCP is not necessary in patients with acute pancreatitis without ongoing biliary obstruction *Low Probability of choledocholithiasis (CDL): Normal LFTs and common bile duct diameter $\leq 7\text{mm}$
Supporting Literature	
Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Tarnasky P, ERCP peri-cholecystectomy. Book Chapter. ERCP: The Fundamentals, Second Edition. Edited by Peter B. Cotton and Joseph Leung. 2015 John Wiley & Sons, Ltd. Published 2015 by John Wiley & Sons, Ltd.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Ayub K, Imada R, Slavin J. ERCP in gallstone associated acute pancreatitis. Cochrane Database Syst Rev 2004: CD003630.	1C+ Overwhelming evidence from observational studies Strong recommendation, can apply to most practice settings in most situations
4. Fogel EL, Sherman S. Acute biliary pancreatitis: when should the endoscopist intervene? Gastroenterology. 2003 Jul; 125(1):229-35. Review	3- Expert opinion only Weak recommendation, likely to change as data becomes available
5. Attasaranya S, Fogel EL, Lehman GA. Choledocholithiasis, ascending cholangitis, and gallstone pancreatitis. Med Clin North Am. 2008 Jul;92(4):925-60, x. doi: 10.1016/j.mcna.2008.03.001. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
6. Arvanitakis M, Dumonceau JM, Albert J, et al. Endoscopic management of acute necrotizing pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) evidence-based multidisciplinary	3- Expert opinion only Weak recommendation, likely to change as data becomes available

guidelines. *Endoscopy*. 2018 Apr; 50: 524–546. doi:
<https://doi.org/10.1055/a-0588-5365>

Care Plan Domain: ERCP IN ACUTE PANCREATITIS

Quality Indicator:

ERCP-5.3: IF a patient has biliary pancreatitis and has an intermediate probability* of choledocholithiasis, THEN intraoperative cholangiography should be performed during cholecystectomy or adjunctive imaging (EUS/MRCP) should be performed before discharge.

Clinical Recommendation	At centers where expertise for ERCP is low, diagnostic EUS/MRCP should be performed prior to cholecystectomy when there is intermediate suspicion for choledocholithiasis in patients with acute biliary pancreatitis.
Performance Target	90%
Indicator Type (Structure/Process/Outcome)	Process
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients with acute biliary pancreatitis
Rationale (i.e. How does the indicator lead to desired health outcome)?	When a diagnosis of choledocholithiasis is unclear and expertise for ERCP at a center is low, performing EUS/MRCP prior to cholecystectomy is both a reasonable and cost-effective approach. *Intermediate probability of CDL: Increased LFTs or CBD > 7 mm

Supporting Literature

Source	Methodology and GRADE
1. Tarnasky P, ERCP peri-cholecystectomy. Book Chapter. ERCP: The Fundamentals, Second Edition. Edited by Peter B. Cotton and Joseph Leung. 2015 John Wiley & Sons, Ltd. Published 2015 by John Wiley & Sons, Ltd.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Fogel EL, Sherman S. Acute biliary pancreatitis: when should the endoscopist intervene? Gastroenterology. 2003 Jul; 125(1):229-35. Review	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Attasaranya S, Fogel EL, Lehman GA. Choledocholithiasis, ascending cholangitis, and gallstone pancreatitis. Med Clin North Am. 2008 Jul;92(4):925-60, x. doi: 10.1016/j.mcna.2008.03.001. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
4. Tse F, Yuan Y. Early routine endoscopic retrograde cholangiopancreatography strategy versus early conservative management strategy in acute gallstone pancreatitis. Cochrane Database Syst Rev. 2012 May 16;(5):CD009779. doi: 10.1002/14651858.CD009779.pub2. Review. PubMed PMID:	1C+ Overwhelming evidence from observational studies Strong recommendation, can apply to most practice settings in most situations

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Care Plan Domain: ERCP IN ACUTE PANCREATITIS

Quality Indicator:

ERCP-5.4: IF a patient has biliary pancreatitis but is not a surgical candidate, THEN ERCP with biliary sphincterotomy and stone extraction (if applicable) should be performed before discharge.

Clinical Recommendation	ERCP with endoscopic sphincterotomy is a safe alternative to laparoscopic cholecystectomy to prevent further attacks of acute biliary pancreatitis in high-risk surgical patients and the elderly.
Performance Target	90%
Indicator Type (Structure/Process/Outcome)	Process, Efficiency
Indicator Level (Hospital/Patient)	Patient
Target Population	High-risk surgical patients, elderly patients with acute biliary pancreatitis
Rationale (i.e. How does the indicator lead to desired health outcome)?	High-risk surgical patients and a proportion of elderly patients with significant comorbidities are at high risk for general anesthesia and surgery.

Supporting Literature

Source	Methodology and GRADE
1. Fogel EL, Sherman S. Acute biliary pancreatitis: when should the endoscopist intervene? Gastroenterology. 2003 Jul; 125(1):229-35. Review	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Bignell M, Dearing M, et al. ERCP and Endoscopic Sphincterotomy (ES): A Safe and Definitive Management of Gallstone Pancreatitis with the Gallbladder Left In Situ. J Gastrointest Surg. (2011) 15:2205-2210.	1C Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
3. Pezzilli R. Endoscopic sphincterotomy in acute biliary pancreatitis: A question of anesthesiological risk. World J Gastrointest Endosc. 2009 Oct 15;1(1):17-20. doi: 10.4253/wjge.v1.i1.17. PubMed PMID: 21160646; PubMed Central PMCID: PMC2998844.	1C Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
4. Hernandez V, Pascual I, Almela P, Añon R, Herreros B, Sanchiz V, Minguez M, Benages A. Recurrence of acute gallstone pancreatitis and relationship with cholecystectomy or endoscopic sphincterotomy. Am J Gastroenterol. 2004 Dec;99(12):2417-23. PubMed PMID: 15571590	1C Observational studies Intermediate-strength recommendation, may change when stronger evidence is available

Care Plan Domain: ERCP IN ACUTE PANCREATITIS

Quality Indicator:

ERCP-5.5: IF a patient is diagnosed with biliary pancreatitis and choledocholithiasis is confirmed, THEN ductal clearance should be achieved before discharge.

Clinical Recommendation	Selective postoperative ERCP should be performed for patients recovering from mild to moderate acute biliary pancreatitis, who have been found to have evidence of common bile duct stones on intraoperative cholangiogram following cholecystectomy.
Performance Target	98%
Indicator Type (Structure/Process/Outcome)	Process, Efficiency
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients with acute biliary pancreatitis with an intraoperative cholangiogram positive for choledocholithiasis.
Rationale (i.e. How does the indicator lead to desired health outcome)?	Selective postoperative ERCP in patients positive for choledocholithiasis on intraoperative cholangiogram is more cost-effective than routine preoperative ERCP in patients with increased risk for common bile duct stones.
Supporting Literature	
Source	Methodology and GRADE
1. Tabone LE, Conlon M, Fernando E, Yi S, Sarker S, Fisichella PM, Luchette FA. A practical cost-effective management strategy for gallstone pancreatitis. <i>Am J Surg.</i> 2013 Oct;206(4):472-7. doi: 10.1016/j.amjsurg.2012.12.009. Epub 2013 Apr 28.	1C Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
2. Kuo VC, Tarnasky PR. Endoscopic management of acute biliary pancreatitis. <i>Gastrointest Endosc Clin N Am.</i> 2013 Oct;23(4):749-68. doi: 10.1016/j.giec.2013.06.002. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available

Care Plan Domain: NUTRITION IN ACUTE PANCREATITIS

Quality Indicator:

NUTR-6.1: IF a patient is diagnosed with acute pancreatitis [regardless of severity], THEN enteral feeding is the preferred route of nutrition (over parenteral feeding) unless it is not tolerated or is contraindicated (i.e. bowel obstruction or paralytic ileus)

Clinical Recommendation	Nutritional support via oral or enteral feedings has been shown to be both more cost effective and superior to total parenteral nutrition in preventing pancreatic infectious complications and sepsis related sequelae.	
Indicator Type (Structure/Process/Outcome)	Process, Appropriateness	
Performance Target	98%	
Indicator Level (Hospital/Patient)	Patient	
Target Population	Patients diagnosed with acute pancreatitis	
Rationale (i.e. How does the indicator lead to desired health outcome)?	Oral and enteral nutrition (either with NG or NJ feeding) prevents intestinal mucosal atrophy and preserves the gut mucosal barrier, preventing bacterial translocation across the gut. Additionally TPN is associated with line associated sepsis/infections.	
Supporting Literature		
Source	Methodology and GRADE	
1. Banks PA, Freeman ML. Practice guidelines in acute pancreatitis. Am J Gastroenterol 2006; 101: 2379 – 400.	3- Expert opinion only Weak recommendation, likely to change as data becomes available	
2. Eckerwall GE, Tingstedt BB, Bergenzaun PE, et al. Immediate oral feeding in patients with mild acute pancreatitis is safe and may accelerate recovery- A randomized clinical study. Clin Nutr 20017 Dec; 26(6): 754-63	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings	
3. Jacobson BC, Vander Vliet, MB, Hughes MD, et al. A prospective, randomized trial of clear liquids versus low-fat solid diet as the initial meal in mild acute pancreatitis. Clin Gastroenterol Hepatol. 2007 Aug; 5(8):946-51	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings	
4. Sathiaraj E, Murthy S, Mansard MJ. Clinical trial; oral feeding with a soft diet compared with clear liquid diet as initial meal in mild acute pancreatitis. Ailment Pharmacol Ther. 2008 Sep 15; 28(6):777-81	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings	
5. Moraes JM, Felga GE, Chelbi LA, et al. A full solid diet as the initial meal in mild acute pancreatitis is safe and result in a shorter length of hospitalization; results from a prospective, randomized, controlled, double-blind clinical trial. J Clin Gastroenterol. 2010 Aug; 44(7): 517-22	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings	

6. Horibe M, Nishizawa t, Suzuki H, et al. Timing of oral refeeding in acute pancreatitis: A systematic review and meta-analysis. United European Gastroenterol J. 2016 Dec; 4(6): 725-732	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
7. Bevan MG, Asrani VM, Bharmal S, Wu LM, Windsor JA, Petrov MS. Incidence and predictors of oral feeding intolerance in acute pancreatitis: A systematic review, meta-analysis, and meta-regression. Clin Nutr. 2017 Jun; 36(3):722-729.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
8. Oláh A, Romics L Jr. Enteral nutrition in acute pancreatitis: a review of the current evidence. World J Gastroenterol. 2014 Nov 21; 20(43):16123-31. doi: 10.3748/wjg.v20.i43.16123. Review. PubMed PMID: 25473164; PubMed Central PMCID: PMC4239498.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
9. Lariño-Noia J, Lindkvist B, Iglesias-García J, Seijo-Ríos S, Iglesias-Canle J, Domínguez-Muñoz JE. Early and/or immediately full caloric diet versus standard refeeding in mild acute pancreatitis: a randomized open-label trial. Pancreatology. 2014 May-Jun; 14(3):167-73. doi: 10.1016/j.pan.2014.02.008. Epub 2014 Mar 14. PubMed PMID: 24854611.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
10. Chebli JM, Gaburri PD, Chebli LA. Oral refeeding in mild acute pancreatitis: an old challenge. World J Gastrointest Pathophysiol. 2011 Dec 15;2(6):100-2. doi: 10.4291/wjgp.v2.i6.100. PubMed PMID: 22180843; PubMed Central PMCID: PMC3240901.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
11. Petrov MS, Kukosh MV, Emelyanov NV. A randomized controlled trial of enteral versus parenteral feeding in patients with predicted severe acute pancreatitis shows a significant reduction in mortality and in infected pancreatic complications with total enteral nutrition. Dig Surg. 2006; 23(5-6):336-44; discussion 344-5. Epub 2006 Dec 12.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
12. Louie BE, Noseworthy T, Hailey D, Gramlich LM, Jacobs P, Warnock GL. 2004 MacLean-Mueller prize enteral or parenteral nutrition for severe pancreatitis: a randomized controlled trial and health technology assessment. Can J Surg. 2005 Aug; 48(4):298-306. PubMed PMID: 16149365	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
13. Casas M, Mora J, Fort E, Aracil C, Busquets D, Galter S, Jáuregui CE, Ayala E, Cardona D, Gich I, Farré A. [Total enteral nutrition vs. total parenteral nutrition in patients with severe acute pancreatitis]. Rev Esp Enferm Dig. 2007 May; 99(5):264-9.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
14. Gupta R, Patel K, Calder PC, Yaqoob P, Primrose JN, Johnson CD. A randomised clinical trial to assess the effect of total enteral and total parenteral nutritional support on metabolic, inflammatory and oxidative	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings

markers in patients with predicted severe acute pancreatitis (APACHE II > or =6). <i>Pancreatology</i> . 2003; 3(5):406-13. Epub 2003 Sep 24.	
15. Yi F, Ge L, Zhao J, Lei Y, Zhou F, Chen Z, Zhu Y, Xia B. Meta-analysis: total parenteral nutrition versus total enteral nutrition in predicted severe acute pancreatitis. <i>Intern Med</i> . 2012; 51(6):523-30. Epub 2012 Mar 15.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
16. Wu XM, Ji KQ, Wang HY, Li GF, Zang B, Chen WM. Total enteral nutrition in prevention of pancreatic necrotic infection in severe acute pancreatitis. <i>Pancreas</i> . 2010 Mar; 39(2):248-51. doi: 10.1097/MPA.0b013e3181bd6370.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
17. Abou-Assi S, Craig K, O'Keefe SJ. Hypocaloric jejunal feeding is better than total parenteral nutrition in acute pancreatitis: results of a randomized comparative study. <i>Am J Gastroenterol</i> . 2002 Sep; 97(9):2255-62.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
18. Li JY, Yu T, Chen GC, Yuan YH, Zhong W, Zhao LN, Chen QK. Enteral nutrition within 48 hours of admission improves clinical outcomes of acute pancreatitis by reducing complications: a meta-analysis. <i>PLoS One</i> . 2013 Jun 6;8(6):e64926. doi: 10.1371/journal.pone.0064926. Print 2013.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
19. Doley RP, Yadav TD, Wig JD, Kochhar R, Singh G, Bharathy KG, Kudari A, Gupta R, Gupta V, Poornachandra KS, Dutta U, Vaishnavi C. Enteral nutrition in severe acute pancreatitis. <i>JOP</i> . 2009 Mar 9; 10(2):157-62.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
20. Oláh A, Pardavi G, Belágyi T, Nagy A, Issekutz A, Mohamed GE. Early nasojejunal feeding in acute pancreatitis is associated with a lower complication rate. <i>Nutrition</i> . 2002 Mar; 18(3):259-62.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
21. McClave SA, Greene LM, Snider HL, Makk LJ, Cheadle WG, Owens NA, Dukes LG, Goldsmith LJ. Comparison of the safety of early enteral vs parenteral nutrition in mild acute pancreatitis. <i>JPEN J Parenter Enteral Nutr</i> . 1997 Jan-Feb; 21(1):14-20.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
22. Petrov MS, Whelan K. Comparison of complications attributable to enteral and parenteral nutrition in predicted severe acute pancreatitis: a systematic review and meta-analysis. <i>Br J Nutr</i> . 2010 May;103(9):1287-95. doi: 10.1017/S0007114510000887. Epub 2010 Apr 7. Review.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
23. Quan H, Wang X, Guo C. A meta-analysis of enteral nutrition and total parenteral nutrition in patients with acute pancreatitis. <i>Gastroenterol Res Pract</i> . 2011; 2011:698248. doi: 10.1155/2011/698248. Epub 2011	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations

Jun 2. PubMed PMID: 21687619	
24. Pan LL, Li J, Shamon M, Bhatia M, Sun J. Recent Advances on Nutrition in Treatment of Acute Pancreatitis. Front Immunol. 2017 Jun 30; 8:762. doi: 10.3389/fimmu.2017.00762. eCollection 2017. Review.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
25. Gramlich L, Kichian K, Pinilla J, Rodych NJ, Dhaliwal R, Heyland DK. Does enteral nutrition compared to parenteral nutrition result in better outcomes in critically ill adult patients? A systematic review of the literature. Nutrition. 2004 Oct;20(10):843-8. Review.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
26. Forsmark CE, Baillie J; AGA Institute Clinical Practice and Economics Committee.; AGA Institute Governing Board.. AGA Institute technical review on acute pancreatitis. Gastroenterology. 2007 May;132(5):222-44. Review. PubMed PMID: 17484894.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
27. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. Gut. 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972	3- Expert opinion only Weak recommendation, likely to change as data becomes available
28. O'Keefe SJ, Broderick T, Turner M, Stevens S, O'Keefe JS. Nutrition in the management of necrotizing pancreatitis. Clin Gastroenterol Hepatol. 2003 Jul;1(4):315-21. PubMed PMID: 15017674.	2C- Observational studies Very weak recommendation; alternative approaches are likely to be better under some circumstances
29. Rinninella E, Annetta MG, Serricchio ML, Dal Lago AA, Miggiano GA, Mele MC. Nutritional support in acute pancreatitis: from physiopathology to practice. An evidence-based approach. Eur Rev Med Pharmacol Sci. 2017 Jan;21(2):421-432. Review. PubMed PMID: 28165542.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
30. Meier R, Ockenga J, Pertkiewicz M, Pap A, Milinic N, Macfie J; DGEM (German Society for Nutritional Medicine)., Löser C, Keim V; ESPEN (European Society for Parenteral and Enteral Nutrition).. ESPEN Guidelines on Enteral Nutrition: Pancreas. Clin Nutr. 2006 Apr;25(2):275-84. Epub 2006 May 6. PubMed PMID: 16678943.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
31. Mentula P, Leppäniemi A. Position paper: timely interventions in severe acute pancreatitis are crucial for survival. World J Emerg Surg. 2014 Feb 10;9(1):15. doi: 10.1186/1749-7922-9-15. PubMed PMID: 24512891; PubMed Central PMCID: PMC3926684.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
32. Crockett SD, Wani S, Gardner TB, Falck-Ytter Y, Barkun AN; American Gastroenterological Association Institute Clinical	3 Expert opinion only Weak recommendation, likely to change as data becomes available

Guidelines Committee.. American Gastroenterological Association Institute Guideline on Initial Management of Acute Pancreatitis. *Gastroenterology*. 2018 Mar;154(4):1096-1101. doi: 10.1053/j.gastro.2018.01.032. Epub 2018 Feb 3. PubMed PMID: 29409760.

Care Plan Domain: NUTRITION IN ACUTE PANCREATITIS

Quality Indicator:

NUTR-6.2: IF a patient is diagnosed with acute pancreatitis, THEN the preferred choice of enteral feeding is a low-fat solid diet as tolerated.

Clinical Recommendation	In mild acute pancreatitis, a diet should be started immediately once a patient's symptoms have improved to the point where they can tolerate oral intake. Initiation of a low fat, solid diet is as safe and effective as starting clear liquids.
Performance Target	90%
Indicator Type (Structure/Process/Outcome)	Process, Appropriateness
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients diagnosed with acute pancreatitis
Rationale (i.e. How does the indicator lead to desired health outcome)?	In mild acute pancreatitis, oral feeding with a low fat, solid diet may accelerate recovery without increased risk of adverse gastrointestinal events (eg pain with re-feeding), and may result in shorter length of hospitalization.
Supporting Literature	
Source	Methodology and GRADE
1. Eckerwall GE, Tingstedt BB, Bergenzaun PE, et al. Immediate oral feeding in patients with mild acute pancreatitis is safe and may accelerate recovery- A randomized clinical study. Clin Nutr 20017 Dec ; 26(6): 754-63	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
2. Jacobson BC, Vander Vliet, MB, Hughes MD, et al. A prospective, randomized trial of clear liquids versus low-fat solid diet as the initial meal in mild acute pancreatitis. Clin Gastroenterol Hepatol. 2007 Aug; 5(8):946-51	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
3. Sathiaraj E, Murthy S, Mansard MJ. Clinical trial; oral feeding with a soft diet compared with clear liquid diet as initial meal in mild acute pancreatitis. Ailment Pharmacol Ther. 2008 Sep 15; 28(6):777-81	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
4. Moraes JM, Felga GE, Chelbi LA, et al. A full solid diet as the initial meal in mild acute pancreatitis is safe and result in a shorter length of hospitalization; results from a prospective, randomized, controlled, double-blind clinical trial. J Clin Gastroenterol. 2010 Aug; 44(7): 517-22	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
5. Horibe M, Nishizawa t, Suzuki H, et al. Timing of oral refeeding in acute pancreatitis: A systematic review and meta-analysis. United European Gastroenterol J. 2016 Dec; 4(6): 725-732	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations

<p>6. Bevan MG, Asrani VM, Bharmal S, Wu LM, Windsor JA, Petrov MS. Incidence and predictors of oral feeding intolerance in acute pancreatitis: A systematic review, meta-analysis, and meta-regression. Clin Nutr. 2017 Jun; 36(3):722-729.</p>	<p>1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations</p>
<p>7. Oláh A, Romics L Jr. Enteral nutrition in acute pancreatitis: a review of the current evidence. World J Gastroenterol. 2014 Nov 21; 20(43):16123-31. doi: 10.3748/wjg.v20.i43.16123. Review. PubMed PMID: 25473164; PubMed Central PMCID: PMC4239498.</p>	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available e</p>
<p>8. Lariño-Noia J, Lindkvist B, Iglesias-García J, Seijo-Ríos S, Iglesias-Canle J, Domínguez-Muñoz JE. Early and/or immediately full caloric diet versus standard refeeding in mild acute pancreatitis: a randomized open-label trial. Pancreatology. 2014 May-Jun; 14(3):167-73. doi: 10.1016/j.pan.2014.02.008. Epub 2014 Mar 14. PubMed PMID: 24854611.</p>	<p>1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings</p>
<p>9. Chebli JM, Gaburri PD, Chebli LA. Oral refeeding in mild acute pancreatitis: an old challenge. World J Gastrointest Pathophysiol. 2011 Dec 15;2(6):100-2. doi: 10.4291/wjgp.v2.i6.100. PubMed PMID: 22180843; PubMed Central PMCID: PMC3240901.</p>	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available</p>

Care Plan Domain: NUTRITION IN ACUTE PANCREATITIS

Quality Indicator:

NUTR-6.3: IF a patient with acute pancreatitis cannot tolerate oral feeding within 72 hours then either nasogastric or nasojejunal assisted enteral feeding should be initiated.

Clinical Recommendation	For management of severe acute pancreatitis, early enteral nutrition started within 48 hours, has been associated with decreased rates of pancreatic infectious complications, organ failure, mortality, and length of stay. Enteral feeding via NG route is as safe and effective as NJ feeding.
Performance Target	90%
Indicator Type (Structure/Process/Outcome)	Process, Appropriateness
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients with acute pancreatitis, unable to tolerate oral feeding in 24-48 hours.
Rationale (i.e. How does the indicator lead to desired health outcome)?	Oral and enteral nutrition (either with NG or NJ feeding) prevents intestinal mucosal atrophy and preserves the gut mucosal barrier, preventing bacterial translocation across the gut. Furthermore, the data shows there is no significant difference in rates of mortality, infectious related complications, pain associated with feeding or LOS between the two routes of enteral nutrition.

Supporting Literature

Source	Methodology and GRADE
1. Banks PA, Freeman ML. Practice guidelines in acute pancreatitis. Am J Gastroenterol 2006; 101: 2379 – 400.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Wu XM, Liao YW, Wang HY, Ji KQ, Li GF, Zang B. When to initialize enteral nutrition in patients with severe acute pancreatitis? A retrospective review in a single institution experience (2003-2013). Pancreas. 2015 Apr;44(3):507-11. doi: 10.1097/MPA.000000000000293. PubMed PMID: 25723878. Apr;44(3):507-11. doi: 10.1097/MPA.000000000000293. PubMed PMID: 25723878.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
3. Petrov MS, Kukosh MV, Emelyanov NV. A randomized controlled trial of enteral versus parenteral feeding in patients with predicted severe acute pancreatitis shows a significant reduction in mortality and in infected pancreatic complications with total enteral nutrition. Dig Surg. 2006; 23(5-6):336-44; discussion 344-5. Epub 2006 Dec 12.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
4. Louie BE, Noseworthy T, Hailey D, Gramlich LM, Jacobs P, Warnock GL. 2004 MacLean-Mueller prize enteral or parenteral nutrition for severe pancreatitis: a randomized controlled trial and health technology	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings

assessment. Can J Surg. 2005 Aug; 48(4):298-306. PubMed PMID: 16149365	
5. Casas M, Mora J, Fort E, Aracil C, Busquets D, Galter S, Jáuregui CE, Ayala E, Cardona D, Gich I, Farré A. [Total enteral nutrition vs. total parenteral nutrition in patients with severe acute pancreatitis]. Rev Esp Enferm Dig. 2007 May; 99(5):264-9.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
6. Gupta R, Patel K, Calder PC, Yaqoob P, Primrose JN, Johnson CD. A randomised clinical trial to assess the effect of total enteral and total parenteral nutritional support on metabolic, inflammatory and oxidative markers in patients with predicted severe acute pancreatitis (APACHE II > or =6). Pancreatology. 2003; 3(5):406-13. Epub 2003 Sep 24.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
7. Yi F, Ge L, Zhao J, Lei Y, Zhou F, Chen Z, Zhu Y, Xia B. Meta-analysis: total parenteral nutrition versus total enteral nutrition in predicted severe acute pancreatitis. Intern Med. 2012; 51(6):523-30. Epub 2012 Mar 15.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
8. Wu XM, Ji KQ, Wang HY, Li GF, Zang B, Chen WM. Total enteral nutrition in prevention of pancreatic necrotic infection in severe acute pancreatitis. Pancreas. 2010 Mar; 39(2):248-51. doi: 10.1097/MPA.0b013e3181bd6370.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
9. Krishnan K. Nutritional management of acute pancreatitis. Curr Opin Gastroenterol. 2017 Mar;33(2):102-106. doi: 10.1097/MOG.0000000000000340. Review. PubMed PMID: 28141617.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
10. Chang Y, Fu H, Xiao Y, Liu J. Nasogastric or nasojejunal feeding in predicted severe acute pancreatitis: a meta-analysis. Critical Care. 2013;17(3):R118. doi:10.1186/cc12790.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
11. Zhu Y, Yin H, Zhang R, Ye X, Wei J. Nasogastric Nutrition versus Nasojejunal Nutrition in Patients with Severe Acute Pancreatitis: A Meta-Analysis of Randomized Controlled Trials. Gastroenterol Res Pract. 2016;2016:6430632. doi: 10.1155/2016/6430632. Epub 2016 Jun 2. PubMed PMID: 27340401; PubMed Central PMCID: PMC4909901.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
12. Márta K, Farkas N, Szabó I, Illés A, Vincze Á, Pár G, Sarlós P, Bajor J, Szűcs Á, Czimmer J, Mosztbacher D, Párniczky A, Szemes K, Pécsi D, Hegyi P. Meta-Analysis of Early Nutrition: The Benefits of Enteral Feeding Compared to a Nil Per Os Diet Not Only in Severe, but Also in Mild and Moderate Acute Pancreatitis. Int J Mol Sci. 2016 Oct 20; 17(10). pii: E1691. PubMed PMID: 27775609; PubMed Central PMCID: PMC5085723.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations

<p>13. Abou-Assi S, Craig K, O'Keefe SJ. Hypocaloric jejunal feeding is better than total parenteral nutrition in acute pancreatitis: results of a randomized comparative study. <i>Am J Gastroenterol</i>. 2002 Sep;97(9):2255-62. PubMed PMID: 12358242.</p>	<p>1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings</p>
<p>14. Singh N, Sharma B, Sharma M, Sachdev V, Bhardwaj P, Mani K, Joshi YK, Saraya A. Evaluation of early enteral feeding through nasogastric and nasojejunal tube in severe acute pancreatitis: a noninferiority randomized controlled trial. <i>Pancreas</i>. 2012 Jan;41(1):153-9. doi: 10.1097/MPA.0b013e318221c4a8. PubMed PMID: 21775915.</p>	<p>1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings</p>
<p>15. Li JY, Yu T, Chen GC, Yuan YH, Zhong W, Zhao LN, Chen QK. Enteral nutrition within 48 hours of admission improves clinical outcomes of acute pancreatitis by reducing complications: a meta-analysis. <i>PLoS One</i>. 2013 Jun 6;8(6):e64926. doi: 10.1371/journal.pone.0064926. Print 2013.</p>	<p>1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations</p>
<p>16. Doley RP, Yadav TD, Wig JD, Kochhar R, Singh G, Bharathy KG, Kudari A, Gupta R, Gupta V, Poornachandra KS, Dutta U, Vaishnavi C. Enteral nutrition in severe acute pancreatitis. <i>JOP</i>. 2009 Mar 9; 10(2):157-62.</p>	<p>1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings</p>
<p>17. Bakker OJ, van Brunschot S, van Santvoort HC, et al. Early versus on-demand nasoenteric tube feeding in acute pancreatitis. <i>N Engl J Med</i>. 2014 Nov 20;371(21):1983-93. doi: 10.1056/NEJMoa1404393. PubMed PMID: 25409371.</p>	<p>1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings</p>
<p>18. Vaughn VM, Shuster D, Rogers MAM, Mann J, Conte ML, Saint S, Chopra V. Early Versus Delayed Feeding in Patients With Acute Pancreatitis: A Systematic Review. <i>Ann Intern Med</i>. 2017 Jun 20;166(12):883-892. doi: 10.7326/M16-2533. Epub 2017 May 16. Review. PubMed PMID: 28505667.</p>	<p>1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations</p>
<p>19. Oláh A, Pardavi G, Belágyi T, Nagy A, Issekutz A, Mohamed GE. Early nasojejunal feeding in acute pancreatitis is associated with a lower complication rate. <i>Nutrition</i>. 2002 Mar; 18(3):259-62.</p>	<p>1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings</p>
<p>20. Petrov MS, McIlroy K, Grayson L, Phillips AR, Windsor JA. Early nasogastric tube feeding versus nil per os in mild to moderate acute pancreatitis: a randomized controlled trial. <i>Clin Nutr</i>. 2013 Oct; 32(5):697-703. doi: 10.1016/j.clnu.2012.12.011. Epub 2012 Dec 31. PubMed PMID: 23340042.</p>	<p>1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings</p>
<p>21. Kumar A, Singh N, Prakash S, Saraya A, Joshi YK. Early enteral nutrition in severe acute pancreatitis: a prospective randomized controlled trial comparing nasojejunal and nasogastric routes. <i>J Clin</i></p>	<p>1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings</p>

Gastroenterol. 2006 May-Jun;40(5):431-4. PubMed PMID: 16721226.	
22. McClave SA, Greene LM, Snider HL, Makk LJ, Cheadle WG, Owens NA, Dukes LG, Goldsmith LJ. Comparison of the safety of early enteral vs parenteral nutrition in mild acute pancreatitis. JPEN J Parenter Enteral Nutr. 1997 Jan-Feb; 21(1):14-20.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
23. Petrov MS, Whelan K. Comparison of complications attributable to enteral and parenteral nutrition in predicted severe acute pancreatitis: a systematic review and meta-analysis. Br J Nutr. 2010 May;103(9):1287-95. doi: 10.1017/S0007114510000887. Epub 2010 Apr 7. Review.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
24. Eatock FC, Chong P, Menezes N, Murray L, McKay CJ, Carter CR, Imrie CW. A randomized study of early nasogastric versus nasojejunal feeding in severe acute pancreatitis. Am J Gastroenterol. 2005 Feb;100(2):432-9. PubMed PMID: 15667504.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
25. Quan H, Wang X, Guo C. A meta-analysis of enteral nutrition and total parenteral nutrition in patients with acute pancreatitis. Gastroenterol Res Pract. 2011; 2011:698248. doi: 10.1155/2011/698248. Epub 2011 Jun 2. PubMed PMID: 21687619	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
26. Pan LL, Li J, Shamoan M, Bhatia M, Sun J. Recent Advances on Nutrition in Treatment of Acute Pancreatitis. Front Immunol. 2017 Jun 30; 8:762. doi: 10.3389/fimmu.2017.00762. eCollection 2017. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
27. Forsmark CE, Baillie J; AGA Institute Clinical Practice and Economics Committee.; AGA Institute Governing Board.. AGA Institute technical review on acute pancreatitis. Gastroenterology. 2007 May;132(5):2022-44. Review. PubMed PMID: 17484894.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
28. Crockett SD, Wani S, Gardner TB, Falck-Ytter Y, Barkun AN; American Gastroenterological Association Institute Clinical Guidelines Committee.. American Gastroenterological Association Institute Guideline on Initial Management of Acute Pancreatitis. Gastroenterology. 2018 Mar;154(4):1096-1101. doi: 10.1053/j.gastro.2018.01.032. Epub 2018 Feb 3. PubMed PMID: 29409760.	3 Expert opinion only Weak recommendation, likely to change as data becomes available
29. Arvanitakis M, Dumonceau JM, Albert J, et al. Endoscopic management of acute necrotizing pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) evidence-based multidisciplinary guidelines. Endoscopy. 2018 Apr; 50: 524–546.	3- Expert opinion only Weak recommendation, likely to change as data becomes available

Care Plan Domain: PHARMACOTHERAPY IN ACUTE PANCREATITIS

Quality Indicator:

PHAR-7.1: IF a patient is diagnosed with acute pancreatitis, THEN severity of pain should be assessed and managed according to institutional guidelines.

Clinical Recommendation	Alternative approaches to improving pain management practice involve education about pain assessment and treatment combined with methods designed to change the institutional culture and practice of pain management. Adequate control of pain is important for appropriate management of acute pancreatitis and parenteral analgesics are usually needed.	
Performance Target	95%	
Indicator Type (Structure/Process/Outcome)	Process, Appropriateness	
Indicator Level (Hospital/Patient)	Patient	
Target Population	Patients with acute pancreatitis	
Rationale (i.e. How does the indicator lead to desired health outcome)?	Pain is the cardinal symptom of acute pancreatitis and its relief is a clinical priority. A critical step to providing good pain management is pain assessment. Inadequately managed pain can lead to adverse physical and psychological patient outcomes for individual patients and their families.	
Supporting Literature		
Source	Methodology and GRADE	
1. Weissman DE, Griffie J, Muchka S, Matson S. Building an institutional commitment to pain management in long-term care facilities. <i>J Pain Symptom Manage.</i> 2000 Jul;20(1):35-43. PubMed PMID: 10946167.	3- Expert opinion only Weak recommendation, likely to change as data becomes available	
2. Cohen MZ, Easley MK, Ellis C, Hughes B, Ownby K, Rashad BG, Rude M, Taft E, Westbrook JB; JCAHO.. Cancer pain management and the JCAHO's pain standards: an institutional challenge. <i>J Pain Symptom Manage.</i> 2003 Jun;25(6):519-27. PubMed PMID: 12782432.	3- Expert opinion only Weak recommendation, likely to change as data becomes available	
3. Wells N, Pasero C, McCaffery M. Improving the Quality of Care Through Pain Assessment and Management. In: Hughes RG, editor. <i>Patient Safety and Quality: An Evidence-Based Handbook for Nurses.</i> Rockville (MD): Agency for Healthcare Research and Quality (US); 2008 Apr. Chapter 17. PubMed PMID: 21328759.	3- Expert opinion only Weak recommendation, likely to change as data becomes available	

Care Plan Domain: PHARMACOTHERAPY IN ACUTE PANCREATITIS

Quality Indicator:

PHAR-7.2: IF a patient is diagnosed with biliary pancreatitis and has evidence of cholangitis, THEN they should be started on appropriate antibiotics.

Clinical Recommendation	Antibiotics should be given for an extrapancreatic infection, such as cholangitis, catheter-acquired infections, bacteremia, urinary tract infections, and pneumonia.	
Performance Target	99%	
Indicator Type (Structure/Process/Outcome)	Process	
Indicator Level (Hospital/Patient)	Patient	
Target Population	Patients with acute pancreatitis and evidence of cholangitis	
Rationale (i.e. How does the indicator lead to desired health outcome)?	Extrapancreatic infections are a major cause of morbidity and mortality in patients with acute pancreatitis	
Supporting Literature		
Source	Methodology and GRADE	
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. <i>Am J Gastroenterol.</i> 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available	
2. Wu BU and Conwell DL. Acute Pancreatitis Part I: Approach to Early Management. <i>Clin Gastro Gastroenterol.</i> 2010 May; 8:410-416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available	
3. Bakker OJ, Issa Y, van Santvoort HC, et al. Treatment options for acute pancreatitis. <i>Nat Rev Gastroenterol Hepatol</i> 11, 462-469 (2014).	3- Expert opinion only Weak recommendation, likely to change as data becomes available	
4. Working Party of the British Society of Gastroenterology.; Association of Surgeons of Great Britain and Ireland.; Pancreatic Society of Great Britain and Ireland.; Association of Upper GI Surgeons of Great Britain and Ireland.. UK guidelines for the management of acute pancreatitis. <i>Gut.</i> 2005 May;54 Suppl 3:iii1-9. PubMed PMID: 15831893; PubMed Central PMCID: PMC1867800.	3- Expert opinion only Weak recommendation, likely to change as data becomes available	
5. Mayerle J, Simon P, Lerch MM. Medical treatment of acute pancreatitis. <i>Gastroenterol Clin N Am</i> 33 (2004) 855–869	3- Expert opinion only Weak recommendation, likely to change as data becomes available	
6. Adler DG, Chari ST, Dahl TJ et al. Conservative management of infected necrosis complicating severe acute pancreatitis. <i>Am J Gastroenterol</i> 2003; 98: 98 – 103.	2C- Observational studies Very weak recommendation, alternative approaches are likely to be better under some circumstances	

7. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. Gut. 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972

3- Expert opinion only

Weak recommendation, likely to change as data becomes available

Care Plan Domain: PHARMACOTHERAPY IN ACUTE PANCREATITIS

Quality Indicator:

PHAR-7.3: IF a patient is diagnosed with acute pancreatitis, THEN prophylactic antibiotics should not be prescribed.

Clinical Recommendation	Routine use of prophylactic antibiotics in patients with severe acute pancreatitis is not recommended. Prevention of fungal infections in patients with acute pancreatitis is also not recommended.
Performance Target	10%
Indicator Type (Structure/Process/Outcome)	Process, Appropriateness
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients with acute pancreatitis with no clinical evidence of infection
Rationale (i.e. How does the indicator lead to desired health outcome)?	There is concern about the emergence of fungal superinfections with the use of prophylactic broad-spectrum antibiotics. Further, prevention of fungal infections in patients with acute pancreatitis has not been shown to be beneficial.

Supporting Literature

Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Wu BU and Conwell DL. Acute Pancreatitis Part I: Approach to Early Management. Clin Gastro Gastroenterol. 2010 May; 8:410-416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Bakker OJ, Issa Y, van Santvoort HC, et al. Treatment options for acute pancreatitis. Nat Rev Gastroenterol Hepatol 11, 462-469 (2014).	3- Expert opinion only Weak recommendation, likely to change as data becomes available
4. Working Party of the British Society of Gastroenterology.; Association of Surgeons of Great Britain and Ireland.; Pancreatic Society of Great Britain and Ireland.; Association of Upper GI Surgeons of Great Britain and Ireland.. UK guidelines for the management of acute pancreatitis. Gut. 2005 May;54 Suppl 3:iii1-9. PubMed PMID: 15831893; PubMed Central PMCID: PMC1867800.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
5. Mayerle J, Simon P, Lerch MM. Medical treatment of acute pancreatitis. Gastroenterol Clin N Am 33 (2004) 855–869	3- Expert opinion only Weak recommendation, likely to change as data becomes available
6. Adler DG, Chari ST, Dahl TJ et al. Conservative management of	2C- Observational studies

infected necrosis complicating severe acute pancreatitis. Am J Gastroenterol 2003; 98: 98 – 103.	Very weak recommendation, alternative approaches are likely to be better under some circumstances
7. De Vries A , Besselink MG , Buskens E et al. Randomized controlled trials of antibiotic prophylaxis in severe acute pancreatitis: relationship between methodologic quality and outcome. Pancreatology 2007; 7: 531 – 8.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
8. Isenmann R, Runzi M, Kron M et al. Prophylactic antibiotic treatment in patients with predicted severe acute pancreatitis: a placebo-controlled, double-blind trial. Gastroenterology 2004; 126: 997 – 1004	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
9. Jiang K, Huang W, Yang XN et al. Present and future of prophylactic antibiotics for severe acute pancreatitis. World J Gastroenterol 2012; 18:279 – 84.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
10. Jafri NS, Mahid SS , Idstein SR et al. Antibiotic prophylaxis is not protective in severe acute pancreatitis: a systematic review and meta-analysis . Am J Surg 2009; 197: 806 – 13.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
11. Guru Trikudanathan et al. Intra-Abdominal Fungal Infections Complicating Acute Pancreatitis: A Review. Am J Gastroenterol. 2011; 106: 1188 – 1192	3- Expert opinion only Weak recommendation, likely to change as data becomes available
12. Villatoro E, Mulla M, Larvin M. Antibiotic therapy for prophylaxis against infection of pancreatic necrosis in acute pancreatitis. Cochrane Database of Systematic Reviews 2010, Issue 5. Art.No.: CD002941. DOI: 10.1002/14651858.CD002941.pub3.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
13. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. Gut. 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972	3- Expert opinion only Weak recommendation, likely to change as data becomes available
14. Crockett SD, Wani S, Gardner TB, Falck-Ytter Y, Barkun AN; American Gastroenterological Association Institute Clinical Guidelines Committee. American Gastroenterological Association Institute Guideline on Initial Management of Acute Pancreatitis. Gastroenterology. 2018 Mar;154(4):1096-1101. doi: 10.1053/j.gastro.2018.01.032. Epub 2018 Feb 3. PubMed PMID: 29409760.	3 Expert opinion only Weak recommendation, likely to change as data becomes available
15. Arvanitakis M, Dumonceau JM , Albert J, et al. Endoscopic management of acute necrotizing pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) evidence-based multidisciplinary	3- Expert opinion only Weak recommendation, likely to change as data becomes available

guidelines. *Endoscopy*. 2018 Apr; 50: 524–546. doi:
<https://doi.org/10.1055/a-0588-5365>

Care Plan Domain: PHARMACOTHERAPY IN ACUTE PANCREATITIS

Quality Indicator:

PHAR-7.4: IF a patient is predicted to have severe acute pancreatitis, THEN probiotic agents should not be prescribed.

Clinical Recommendation	Probiotics should not be given in patients with predicted severe acute pancreatitis.
Performance Target	2%
Indicator Type (Structure/Process/Outcome)	Process, Appropriateness
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients predicted to have severe acute pancreatitis
Rationale (i.e. How does the indicator lead to desired health outcome)?	A very well-conducted randomized control clinical trial demonstrated increased mortality associated with routine use of probiotics

Supporting Literature

Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Besselink MG, van Santvoort HC, Buskens E et al. Probiotic prophylaxis in predicted severe acute pancreatitis: a randomised, double-blind, placebo-controlled trial. Lancet 2008; 371: 651 – 9.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
3. Sun S, Yang K , He X et al. Langenbecks Probiotics in patients with severe acute pancreatitis: a metaanalysis . Arch Surg 2009; 394: 171 – 7.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
4. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. Gut. 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972	3- Expert opinion only Weak recommendation, likely to change as data becomes available
5. Arvanitakis M, Dumonceau JM , Albert J, et al. Endoscopic management of acute necrotizing pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) evidence-based multidisciplinary guidelines. Endoscopy. 2018 Apr; 50: 524–546. doi: https://doi.org/10.1055/a-0588-5365	3- Expert opinion only Weak recommendation, likely to change as data becomes available

Care Plan Domain: DIAGNOSIS AND MANAGEMENT OF EARLY COMPLICATIONS (72 HRS- 4 WKS)

Quality Indicator:

COMP-8.1: IF a patient diagnosed with acute pancreatitis fails to improve clinically within 72 hours of hospital admission, THEN a CECT scan or MRI with contrast should be performed unless contraindicated.

Clinical Recommendation	CECT or MRI is useful for staging disease severity and detecting local complications. It should be considered in patients who fail to improve clinically* within 72 hours of hospital admission.
Performance Target	92.5%
Indicator Type (Structure/Process/Outcome)	Process, Efficiency
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients with acute pancreatitis who do not improve clinically within 72 hours of hospital admission and/or Patients with abdominal pain with unclear diagnosis
Rationale (i.e. How does the indicator lead to desired health outcome)?	CECT scan is the imaging modality of choice to stage disease severity and detect local complications. It has been shown to have a sensitivity of close to 100% after 4 days for necrosis. MRI is an excellent alternative for patients who cannot undergo CECT. This facilitates diagnosis, early assessment of disease severity, prevention of more serious complications, and prediction of clinical outcomes. <i>*Failure to improve clinically: persistent pain, fever, nausea, unable to begin oral feeding</i>

Supporting Literature

Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Kiriyaama , Gabata T , Takada T et al. New diagnostic criteria of acute pancreatitis. J Hepatobiliary Pancreat Sci 2010; 17: 24 – 36.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Balthazar EJ. Acute pancreatitis: assessment of severity with clinical and CT evaluation. Radiology 2002; 223: 603 – 13.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
4. Bollen TL, Singh VK, Maurer R et al. Comparative evaluation of the modified CT severity index and CT severity index in assessing severity of acute pancreatitis. AJR Am J Roentgenol 2011; 197: 386 – 9.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
5. Arvanitakis M, Dumonceau JM , Albert J, et al. Endoscopic	3- Expert opinion only

management of acute necrotizing pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) evidence-based multidisciplinary guidelines. *Endoscopy*. 2018 Apr; 50: 524–546. doi: <https://doi.org/10.1055/a-0588-5365>

Weak recommendation, likely to change as data becomes available

**Care Plan Domain: DIAGNOSIS AND MANAGEMENT OF EARLY COMPLICATIONS
(72 HRS- 4 WKS)**

Quality Indicator:

COMP-8.2: IF a patient has worsening or persistent abdominal distension in association with severe acute pancreatitis, THEN they should be evaluated for possible abdominal compartment syndrome and if confirmed, managed appropriately.

Clinical Recommendation	Abdominal compartment syndrome is defined by the World Society of Abdominal Compartment Syndrome (WSACS) as a life-threatening sustained elevation of the intraabdominal pressure (IAP) that is associated with new onset organ failure or acute worsening of existing organ failure.
Performance Target	90%
Indicator Type (Structure/Process/ Outcome)	Process
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients with severe acute pancreatitis
Rationale (i.e. How does the indicator lead to desired health outcome)?	Abdominal compartment syndrome during an episode of acute pancreatitis is associated with high mortality and morbidity.

Supporting Literature

Source	Methodology and GRADE
1. Xu J, Cui Y, Tian X. Early Continuous Veno-Venous Hemofiltration is Effective in Decreasing Intra-Abdominal Pressure and Serum Interleukin- 8 Level in Severe Acute Pancreatitis Patients with Abdominal Compartment Syndrome. Blood Purif 2017; 44:276-282	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
2. Van Brunschot S, Schut AJ, Bouwense SA, et al. Abdominal Compartment Syndrome in Acute Pancreatitis A systematic review. Pancreas 2014; 43: 665-674	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Kirkpatrick AW, Roberts DJ, De Waele J, et al. Intra-abdominal hypertension and the abdominal compartment syndrome: updated consensus definitions and clinical practice guidelines from the World Society of the Abdominal Compartment Syndrome. Intensive Care Med (2013) 39:1190–1206	3- Expert opinion only Weak recommendation, likely to change as data becomes available
4. Pupelis G, Plaudis H, Zeiza K, Drozdova N, Mukans M, Kazaka I.	1C- Observational studies

<p>Early continuous veno-venous haemofiltration in the management of severe acute pancreatitis complicated with intra-abdominal hypertension: retrospective review of 10 years' experience. <i>Ann Intensive Care</i>. 2012 Dec 20;2 Suppl 1:S21. doi: 10.1186/2110-5820-2-S1-S21. Epub 2012 Dec 20. PubMed PMID: 23281603; PubMed Central PMCID: PMC3527156.</p>	<p>Intermediate-strength recommendation, may change when stronger evidence is available</p>
<p>5. Mentula P, Leppäniemi A. Position paper: timely interventions in severe acute pancreatitis are crucial for survival. <i>World J Emerg Surg</i>. 2014 Feb 10;9(1):15. doi: 10.1186/1749-7922-9-15. PubMed PMID: 24512891; PubMed Central PMCID: PMC3926684.</p>	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available</p>
<p>6. Pupelis G, Zeiza K, Plaudis H, Suhova A. Conservative approach in the management of severe acute pancreatitis: eight-year experience in a single institution. <i>HPB (Oxford)</i>. 2008;10(5):347-55. doi: 10.1080/13651820802140737. PubMed PMID: 18982151; PubMed Central PMCID: PMC2575676.</p>	<p>1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available</p>
<p>7. Xu J, Tian X, Zhang C, Wang M, Li Y. Management of abdominal compartment syndrome in severe acute pancreatitis patients with early continuous veno-venous hemofiltration. <i>Hepatogastroenterology</i>. 2013 Oct;60(127):1749-52. PubMed PMID: 23933789</p>	<p>1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available</p>

**Care Plan Domain: DIAGNOSIS AND MANAGEMENT OF EARLY COMPLICATIONS
(72 HRS- 4 WKS)**

Quality Indicator:

COMP-8.3: IF a patient with necrotizing pancreatitis has characteristic findings of infection on imaging, or clinically deteriorates, THEN infected necrosis should be suspected and appropriate antibiotics prescribed.

Clinical Recommendation	Infected necrosis should be considered in patients with pancreatic or extrapancreatic necrosis who deteriorate or fail to improve after 7 – 10 days of hospitalization. In these patients, either (i) initial CT-guided fine-needle aspiration (FNA) for Gram stain and culture to guide use of appropriate antibiotics or (ii) empiric use of antibiotics after obtaining necessary cultures for infectious agents, without CT FNA, should be given.
Performance Target	98%
Indicator Type (Structure/Process/Outcome)	Process
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients with acute pancreatitis and pancreatic necrosis
Rationale (i.e. How does the indicator lead to desired health outcome)?	Infected pancreatic necrosis is associated with high morbidity and mortality.

Supporting Literature

Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. Gut. 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Arvanitakis M, Dumonceau JM, Albert J, et al. Endoscopic management of acute necrotizing pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) evidence-based multidisciplinary guidelines. Endoscopy. 2018 Apr; 50: 524–546. doi:	3- Expert opinion only Weak recommendation, likely to change as data becomes available

**Care Plan Domain: DIAGNOSIS AND MANAGEMENT OF EARLY COMPLICATIONS
(72 HRS- 4 WKS)**

Quality Indicator:

COMP-8.4: IF a patient with necrotizing pancreatitis has suspected infection on appropriate intravenous antibiotics and clinically deteriorates, THEN minimally invasive drainage should be performed.

Clinical Recommendation	Minimally invasive drainage should be considered as the initial therapy for culture-positive patients, with surgical intervention reserved for patients in whom treatment fails.
Performance Target	95%
Indicator Type (Structure/Process/Outcome)	Process
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients with acute pancreatitis and peripancreatic fluid collections who have failed IV antibiotic therapy
Rationale (i.e. How does the indicator lead to desired health outcome)?	Minimally invasive drainage should be considered before surgical intervention
Supporting Literature	
Source	Methodology and GRADE
1. Baril NB, Ralls PW, Wren SM et al. Does an infected peripancreatic fluid collection or abscess mandate operation? Ann Surg 2000; 231: 361 – 7.	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
2. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. Gut. 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Mentula P, Leppäniemi A. Position paper: timely interventions in severe acute pancreatitis are crucial for survival. World J Emerg Surg. 2014 Feb 10;9(1):15. doi: 10.1186/1749-7922-9-15. PubMed PMID: 24512891; PubMed Central PMCID: PMC3926684.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
4. Trikudanathan G, Attam R, Arain MA, Mallery S, Freeman ML. Endoscopic interventions for necrotizing pancreatitis. Am J Gastroenterol. 2014 Jul;109(7):969-81; quiz 982. doi:	3- Expert opinion only Weak recommendation, likely to change as data becomes available

10.1038/ajg.2014.130. Epub 2014 Jun 24. Review. PubMed PMID: 24957157.	
5. Working Group IAP/APA Acute Pancreatitis Guidelines. IAP/APA evidence-based guidelines for the management of acute pancreatitis. Pancreatology. 2013 Jul-Aug;13(4 Suppl 2):e1-15. doi: 10.1016/j.pan.2013.07.063. PubMed PMID: 24054878.	3- Expert opinion only Weak recommendation, likely to change as data becomes available

**Care Plan Domain: DIAGNOSIS AND MANAGEMENT OF EARLY COMPLICATIONS
(72 HRS- 4 WKS)**

Quality Indicator:

COMP-8.5: IF a patient with severe acute pancreatitis demonstrates signs of clinically significant hemorrhage, THEN appropriate workup for potential vascular complications (e.g. pseudoaneurysm and/or thrombosis) should be documented.

Clinical Recommendation	A CT angiogram should be ordered in any patient with severe acute pancreatitis, who develops sudden hemodynamic instability with a drop in hemoglobin without any other overt evidence of GI bleeding.	
Performance Target	97%	
Indicator Type (Structure/Process/Outcome)	Process	
Indicator Level (Hospital/Patient)	Patient	
Target Population	Patients with severe acute pancreatitis suspected to have pseudoaneurysm	
Rationale (i.e. How does the indicator lead to desired health outcome)?	Pseudoaneurysms typically result from erosion into the gastroduodenal or splenic artery, and may develop in approximately 10% of patients with a pancreatic fluid collection. A pseudoaneurysmal bleed may manifest as a sudden drop in the hemoglobin, hemodynamic instability, or sudden increase in the size of the fluid collection. A CT angiogram can help identify a pseudoaneurysm so that appropriate management can be pursued.	
Supporting Literature		
Source	Methodology and GRADE	
<i>We did not find, in our search, literature to support this indicator. However, it is, in the opinion of our experts, a recommended clinical practice.</i>	3- Expert opinion only Weak recommendation, likely to change as data becomes available	

Care Plan Domain: SURGERY IN ACUTE PANCREATITIS

Quality Indicator:

SURG-9.1: IF a patient has acute biliary pancreatitis, THEN surgery should be consulted to consider cholecystectomy prior to discharge.

Clinical Recommendation	In patients with mild acute pancreatitis, found to have gallstones in the gallbladder, a cholecystectomy should be performed before discharge to prevent a recurrence of acute pancreatitis.
Indicator Type (Structure/Process/Outcome)	Process
Performance Target	98%
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients with acute pancreatitis and cholelithiasis
Rationale (i.e. How does the indicator lead to desired health outcome)?	Performing a cholecystectomy before discharge prevents recurrence of acute pancreatitis. Recurrence rates for acute biliary pancreatitis when cholecystectomy is not performed range anywhere from 15% to 61%.
Supporting Literature	
Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Ayub K, Slavin J, Imada R. Endoscopic retrograde cholangiopancreatography in gallstone-associated acute pancreatitis. Cochrane Database of Systematic Reviews. 2004; Issue 3. Art. No.: CD003630. DOI: 10.1002/14651858.CD003630.pub2.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
3. Uhl W, Muller CA, Krahenbuhl L et al. Acute gallstone pancreatitis: timing of cholecystectomy in mild and severe disease. Surg Endosc 1999 1: 1070 – 6.	2C Observational studies Very weak recommendation; alternative approaches are likely to be better under some circumstances
4. Somashekar G. Krishna et al. Cholecystectomy during index admission for gallstone pancreatitis lowers 30-day readmission rates: Analysis of the Nationwide Readmission Database	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
5. Nguyen GC, Rosenberg M, Chong RY, et al. Early cholecystectomy and ERCP are associated with reduced readmissions for acute biliary pancreatitis: a nationwide, population-based study. Gastrointest Ensoc. 2012 Jana; 75(1): 47-55	1C- Observational studies Intermediate-strength recommendation, may change when stronger evidence is available

6. Kamal A, Akhuemonkhan E, Akshintala V, et al. Effectiveness of Guideline-Recommended Cholecystectomy to Prevent Recurrent Pancreatitis. <i>Am J Gastroenterol</i> 2017 Mar; 112(3): 503-510	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
7. Da Costa DW, Bouwense SA, Schepers NJ, et al. Same-admission versus interval cholecystectomy for mild gallstone pancreatitis (PONCHO): a multicentre randomized controlled trial. <i>Lancet</i> 2015 Sep 26;386 (10000): 1261-1268	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
8. Aboulian A, Chan T, Yaghoubian A, et al. Early cholecystectomy safely decreases hospital stay in patients with mild gallstone pancreatitis: a randomized prospective study. <i>Ann Surg.</i> 2010; 251: 615 - 19.	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings
9. Mark C. van Baal et al. Timing of cholecystectomy after mild biliary pancreatitis: A systematic review. <i>Annals of Surgery.</i> 2012; 255: 860 - 866	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
10. Larson SD, Nealon WH, Evers BM. Management of gallstone pancreatitis. <i>Adv Surg.</i> 2006; 40: 265 - 84.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
11. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. <i>Gut.</i> 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972	3 Expert opinion only Weak recommendation, likely to change as data becomes available
12. Crockett SD, Wani S, Gardner TB, Falck-Ytter Y, Barkun AN; American Gastroenterological Association Institute Clinical Guidelines Committee.. American Gastroenterological Association Institute Guideline on Initial Management of Acute Pancreatitis. <i>Gastroenterology.</i> 2018 Mar;154(4):1096-1101. doi: 10.1053/j.gastro.2018.01.032. Epub 2018 Feb 3. PubMed PMID: 29409760.	3 Expert opinion only Weak recommendation, likely to change as data becomes available

Care Plan Domain: SURGERY IN ACUTE PANCREATITIS

Quality Indicator:

SURG-9.2: IF a patient has acute biliary pancreatitis complicated by necrosis or peripancreatic fluid collection, THEN cholecystectomy should be deferred until active inflammation subsides and fluid collection(s) resolve or stabilize.

Clinical Recommendation	In a patient with necrotizing biliary acute pancreatitis, in order to prevent infection, cholecystectomy is to be deferred until active inflammation subsides and fluid collections resolve or stabilize.	
Performance Target	92.5%	
Indicator Type (Structure/Process/Outcome)	Process	
Indicator Level (Hospital/Patient)	Patient	
Target Population	Patients with necrotizing gallstone-induced acute pancreatitis and/or peripancreatic fluid collection	
Rationale (i.e. How does the indicator lead to desired health outcome)?	Adequate time should be given for necrosis or peripancreatic fluid collection to stabilize or resolve spontaneously. Operating too early may unnecessarily expose the fluid collection to contaminants, increasing the risk of late infection.	
Supporting Literature		
Source	Methodology and GRADE	
1. Uhl W, Muller CA, Krahenbuhl L et al. Acute gallstone pancreatitis: timing of cholecystectomy in mild and severe disease. Surg Endosc 1999 1: 1070 – 6.	1C Observational studies Intermediate-strength recommendation, may change when stronger evidence is available	
2. Nealon WH, Bawduniak J, Walser EM. Appropriate timing of cholecystectomy in patients who present with moderate to severe gallstone-associated acute pancreatitis with peripancreatic fluid collections. Ann Surg. 2004; 239: 741–49.	1C Observational studies Intermediate-strength recommendation, may change when stronger evidence is available	

Care Plan Domain: SURGERY IN ACUTE PANCREATITIS

Quality Indicator:

SURG-9.3: IF a patient has an asymptomatic pseudocyst(s) and pancreatic and/or extra-pancreatic necrosis, THEN drainage interventions should not be performed.

Clinical Recommendation	Asymptomatic pseudocysts and pancreatic and / or extrapancreatic necrosis do not warrant intervention regardless of size, location, and / or extension.	
Performance Target	10%	
Indicator Type (Structure/Process/Outcome)	Process	
Indicator Level (Hospital/Patient)	Patient	
Target Population	Patients with asymptomatic pseudocyst(s) and pancreatic and / or extra-pancreatic necrosis	
Rationale (i.e. How does the indicator lead to desired health outcome)?	Avoids surgical complications	
Supporting Literature		
Source	Methodology and GRADE	
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3 Expert opinion only Weak recommendation, likely to change as data becomes available	
2. Banks PA, Freeman ML. Practice guidelines in acute pancreatitis. Am J Gastroenterol. 2006; 101: 2379 - 400.	3 Expert opinion only Weak recommendation, likely to change as data becomes available	
3. Freeman MF, Werner J, van Santvoort HC et al. Interventions for necrotizing pancreatitis. Summary of a multidisciplinary consensus conference. Pancreas 2012; 8 : 1176 – 94.	3 Expert opinion only Weak recommendation, likely to change as data becomes available	
4. Adler DG, Chari ST, Dahl TJ et al. Conservative management of infected necrosis complicating severe acute pancreatitis. Am J Gastroenterol. 2003; 98: 98 - 103.	2C Observational studies Very weak recommendation, alternative approaches are likely to be better under some circumstances	
5. van Santvoort HC, Bakker OJ, Bollen T et al. A conservative and minimally invasive approach to necrotizing pancreatitis improves the outcome. Gastroenterology. 2011; 141: 1254 - 63.	1C Observational studies Intermediate-strength recommendation, may change when stronger evidence is available	
6. Runzi M, Niebel W, Goebell H et al. Severe acute pancreatitis: non-surgical treatment of infected necrosis. Pancreas. 2005; 30: 195 - 9.	2C Observational studies Very weak recommendation, alternative approaches are likely to be better under some circumstances	
7. Dubner H, Steinberg W, Hill M et al. Infected pancreatic necrosis and	2C Observational studies	

peripancreatic fluid collections: serendipitous response to antibiotics and medical therapy in three patients. <i>Pancreas</i> . 1996. 12(3); 298 - 302.	Very weak recommendation, alternative approaches are likely to be better under some circumstances
8. Hartwig W, Maksan SM, Foitzik T et al. Reduction in mortality with delayed surgical therapy of severe pancreatitis. <i>J Gastrointest Surg</i> . 2002; 6: 481 - 7.	1C Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
9. Besselink MG, Berwer TJ, Shoenmaeckers EJ et al. Timing of surgical intervention in necrotizing pancreatitis. <i>Arch Surg</i> . 2007; 142: 1194 - 201.	1C Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
10. Garg PK , Sharma M , Madan K e t al. Primary conservative treatment results in mortality comparable to surgery in patients with infected pancreatic necrosis. <i>Clin Gastroenterol Hepatol</i> . 2010; 8: 1089 - 94.	1C Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
11. Mouli VP, Vishnubhatla S, Garg PK. Efficacy of conservative treatment, without necrosectomy, for infected pancreatic necrosis: a systematic review and meta-analysis. <i>Gastroenterology</i> . 2013; 144: 333 – 40.	1C+ Overwhelming evidence from observational studies Strong recommendation; can apply to most practice settings in most situations
12. Larson SD, Nealson WH, Evers BM. Management of gallstone pancreatitis. <i>Adv Surg</i> . 2006; 40: 265 - 84.	3 Expert opinion only Weak recommendation, likely to change as data becomes available
13. Mentula P, Leppäniemi A. Position paper: timely interventions in severe acute pancreatitis are crucial for survival. <i>World J Emerg Surg</i> . 2014 Feb 10;9(1):15. doi: 10.1186/1749-7922-9-15. PubMed PMID: 24512891; PubMed Central PMCID: PMC3926684.	3- Expert opinion only Weak recommendation, likely to change as data becomes available

Care Plan Domain: SURGERY IN ACUTE PANCREATITIS

Quality Indicator:

SURG-9.4: IF a patient has symptomatic necrotizing pancreatitis, THEN open necrosectomy should not be performed as a first-line treatment.

Clinical Recommendation	In specialized centers, the primary methods for management of necrotic collections have undergone a paradigm shift away from open surgical necrosectomy and toward minimally invasive techniques. In symptomatic patients with infected necrosis, minimally invasive methods of necrosectomy are preferred to open necrosectomy
Performance Target	10%
Indicator Type (Structure/Process/Outcome)	Process
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients with acute pancreatitis and symptomatic infected necrosis
Rationale (i.e. How does the indicator lead to desired health outcome)?	The traditional approach to the treatment of necrotizing pancreatitis with secondary infection of necrotic tissue is open necrosectomy to completely remove the infected necrotic tissue. This invasive approach is associated with high rates of complications (34 to 95%) and death (11 to 39%) and with a risk of long-term pancreatic insufficiency. As an alternative to open necrosectomy, less invasive techniques, including percutaneous drainage, endoscopic (transgastric) drainage, and minimally invasive retroperitoneal necrosectomy, are increasingly being used.

Supporting Literature

Source	Methodology and GRADE
1. Banks PA, Freeman ML. Practice guidelines in acute pancreatitis. Am J Gastroenterol. 2006; 101: 2379 - 400.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Freeman MF, Werner J, van Santvoort HC et al. Interventions for necrotizing pancreatitis. Summary of a multidisciplinary consensus conference. Pancreas 2012; 8 : 1176 – 94.	1C Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
3. Adler DG, Chari ST, Dahl TJ et al. Conservative management of infected necrosis complicating severe acute pancreatitis. Am J Gastroenterol. 2003; 98: 98 - 103.	2C Observational studies Very weak recommendation, alternative approaches are likely to be better under some circumstances
4. van Santvoort HC, Bakker OJ, Bollen T et al. A conservative and minimally invasive approach to necrotizing pancreatitis improves the outcome. Gastroenterology. 2011; 141: 1254 - 63.	1C Observational studies Intermediate-strength recommendation, may change when stronger evidence is available
5. van Santvoort HC , Besselink MG , Bakker OJ et al. A step-up approach or open necrosectomy for necrotizing pancreatitis. New Engl	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings

J Med 2010 Apr 22; 362 (16): 1491 – 502.	
6. Bakker OJ , van Santvoort HC , van Brunschott S et al. Endoscopic transgastric vs surgical necrosectomy for infected necrotizing pancreatitis; a randomized trial . JAMA 2012; 307: 1053 – 61.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
7. Vege SS, Baron TH. Management of pancreatic necrosis in severe acute pancreatitis. Clin Gastroenterol Hepatol. 2004; 99: 2489 - 94.	2C Observational studies Very weak recommendation, alternative approaches are likely to be better under some circumstances
8. van Baal MC, van Santvoort HC, Bollen 9. TL et al. Systematic review of percutaneous catheter drainage as primary treatment for necrotizing pancreatitis. Br J Surg. 2011; 98: 18 - 27.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
10. Larson SD, Neelson WH, Evers BM. Management of gallstone pancreatitis. Adv Surg. 2006; 40: 265 - 84.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
11. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. Gut. 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972	3 Expert opinion only Weak recommendation, likely to change as data becomes available
12. Mentula P, Leppäniemi A. Position paper: timely interventions in severe acute pancreatitis are crucial for survival. World J Emerg Surg. 2014 Feb 10;9(1):15. doi: 10.1186/1749-7922-9-15. PubMed PMID: 24512891; PubMed Central PMCID: PMC3926684.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
13. Trikudanathan G, Attam R, Arain MA, Mallery S, Freeman ML. Endoscopic interventions for necrotizing pancreatitis. Am J Gastroenterol. 2014 Jul;109(7):969-81; quiz 982. doi: 10.1038/ajg.2014.130. Epub 2014 Jun 24. Review. PubMed PMID: 24957157.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
14. van Brunschot S, van Grinsven J, van Santvoort HC, Bakker OJ, Besselink MG, Boermeester MA, Bollen TL, Bosscha K, Bouwense SA, Bruno MJ, Cappendijk VC, Consten EC, Dejong CH, van Eijck CH, Erkelens WG, van Goor H, van Grevenstein WMU, Haveman JW, Hofker SH, Jansen JM, Laméris JS, van Lienden KP, Meijssen MA, Mulder CJ, Nieuwenhuijs VB, Poley JW, Quispel R, de Ridder RJ, Römken TE, Scheepers JJ, Schepers NJ, Schwartz MP, Seerden T, Spanier BWM, Straathof JWA, Strijker M, Timmer R, Venneman NG, Vleggaar FP, Voermans RP, Witteman BJ, Gooszen HG, Dijkgraaf MG, Fockens P; Dutch Pancreatitis Study Group.. Endoscopic or	1A/1B- Randomized trials without/with important limitations Strong recommendation; likely to apply to most clinical settings

<p>surgical step-up approach for infected necrotising pancreatitis: a multicentre randomised trial. <i>Lancet</i>. 2018 Jan 6;391(10115):51-58. doi: 10.1016/S0140-6736(17)32404-2. Epub 2017 Nov 3. PubMed PMID: 29108721.</p>	
<p>15. Chang YC. Is necrosectomy obsolete for infected necrotizing pancreatitis? Is a paradigm shift needed? <i>World J Gastroenterol</i>. 2014 Dec 7;20(45):16925-34. doi: 10.3748/wjg.v20.i45.16925. Review. PubMed PMID: 25493005; PubMed Central PMCID: PMC4258561.</p>	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available</p>
<p>16. Arvanitakis M, Dumonceau JM, Albert J, et al. Endoscopic management of acute necrotizing pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) evidence-based multidisciplinary guidelines. <i>Endoscopy</i>. 2018 Apr; 50: 524–546. doi: https://doi.org/10.1055/a-0588-5365</p>	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available</p>

Care Plan Domain: STRUCTURE OF CARE

Quality Indicator:

STRU-10.1: IF a patient is diagnosed with acute pancreatitis and has the following, THEN the severity should be classified and documented as moderately severe acute pancreatitis:

a. Organ failure that resolves within 48 hours (transient organ failure) and/or

b. Local or systemic complications without persistent organ failure

Clinical Recommendation	Moderately severe acute pancreatitis is characterized by the presence of transient organ failure or local or systemic complications in the absence of persistent organ failure.
Performance Target	92.5%
Indicator Type (Structure/Process/Outcome)	Process
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients with acute pancreatitis
Rationale (i.e. How does the indicator lead to desired health outcome)?	Early identification of patients with moderately severe disease could potentially limit complications and risk of mortality

Supporting Literature

Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Banks PA, Bollen TL, Dervenis C et al. Classification of acute pancreatitis 2012: revision of Atlanta classification and definitions by international consensus. Gut 2013; 62: 102 – 11.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Dellinger EP, Forsmark CE, Layer P et al. Determinant-Based Classification of Acute Pancreatitis Severity: An International Multidisciplinary Consultation. Ann Surg 2012; 256: 875 – 880.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
4. Forsmark CE, Baillie J; AGA Institute Clinical Practice and Economics Committee.; AGA Institute Governing Board.. AGA Institute technical review on acute pancreatitis. Gastroenterology. 2007 May;132(5):2022-44. Review. PubMed PMID: 17484894.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
5. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van	3- Expert opinion only

<p>Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. Gut. 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972</p>	<p>Weak recommendation, likely to change as data becomes available</p>
<p>6. Crockett SD, Wani S, Gardner TB, Falck-Ytter Y, Barkun AN; American Gastroenterological Association Institute Clinical Guidelines Committee.. American Gastroenterological Association Institute Guideline on Initial Management of Acute Pancreatitis. Gastroenterology. 2018 Mar;154(4):1096-1101. doi: 10.1053/j.gastro.2018.01.032. Epub 2018 Feb 3. PubMed PMID: 29409760.</p>	<p>3 Expert opinion only Weak recommendation, likely to change as data becomes available</p>

Care Plan Domain: STRUCTURE OF CARE

Quality Indicator:

STRU-10.2: IF a patient is diagnosed with acute pancreatitis, and has persistent organ failure (>48 hours), THEN the severity should be classified and documented as severe acute pancreatitis.

Clinical Recommendation	Severe acute pancreatitis is characterized by persistent organ failure.
Performance Target	98%
Indicator Type (Structure/Process/Outcome)	Process
Indicator Level (Hospital/Patient)	Patient
Target Population	Patients with acute pancreatitis
Rationale (i.e. How does the indicator lead to desired health outcome)?	Early identification of patients with severe disease could potentially limit complications and risk of mortality.
Supporting Literature	
Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Banks PA, Bollen TL, Dervenis C et al. Classification of acute pancreatitis 2012: revision of Atlanta classification and definitions by international consensus. Gut 2013; 62: 102 – 11.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Dellinger EP, Forsmark CE, Layer P et al. Determinant-Based Classification of Acute Pancreatitis Severity: An International Multidisciplinary Consultation. Ann Surg 2012; 256: 875 – 880.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
4. Forsmark CE, Baillie J; AGA Institute Clinical Practice and Economics Committee.; AGA Institute Governing Board.. AGA Institute technical review on acute pancreatitis. Gastroenterology. 2007 May;132(5):2022-44. Review. PubMed PMID: 17484894.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
5. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. Gut. 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972	3- Expert opinion only Weak recommendation, likely to change as data becomes available

7. Crockett SD, Wani S, Gardner TB, Falck-Ytter Y, Barkun AN; American Gastroenterological Association Institute Clinical Guidelines Committee.. American Gastroenterological Association Institute Guideline on Initial Management of Acute Pancreatitis. Gastroenterology. 2018 Mar;154(4):1096-1101. doi: 10.1053/j.gastro.2018.01.032. Epub 2018 Feb 3. PubMed PMID: 29409760.

3 Expert opinion only

Weak recommendation, likely to change as data becomes available

Care Plan Domain: STRUCTURE OF CARE

Quality Indicator:

STRU-10.3: IF a patient is diagnosed with severe acute pancreatitis, THEN the patient should be managed in a center with expertise in surgery, pancreaticobiliary endoscopy, interventional radiology, intensive care, and nutrition or transferred to a center that does.

Clinical Recommendation	Patients with severe pancreatitis should be managed in a multidisciplinary setup with the availability of surgeons, gastroenterologists, radiologists, intensivists and dietitians.	
Performance Target	90%	
Indicator Type (Structure/Process/Outcome)	Structure of Care	
Indicator Level (Hospital/Patient)	Hospital	
Target Population	NA	
Rationale (i.e. How does the indicator lead to desired health outcome)?	Patients with severe pancreatitis should be managed in a multidisciplinary setup with the availability of surgeons, gastroenterologists, radiologists, and intensivists. An early identification of patients with severe pancreatitis and those likely to develop complications and transfer to an appropriate facility is imperative. Outcomes have improved with multidisciplinary management and prudent use of minimal invasive techniques.	
Supporting Literature		
Source	Methodology and GRADE	
1. da Costa DW, Boerma D, van Santvoort HC. Staged multidisciplinary step-up management for necrotizing pancreatitis.Br J Surg 2014;101:e65-79. [PMID: 24272964] (Source 53, page)	3- Expert opinion only Weak recommendation, likely to change as data becomes available	

Care Plan Domain: STRUCTURE OF CARE

Quality Indicator:

STRU-10.4: IF an institution manages patients with acute pancreatitis, THEN the hospital should have EUS/ERCP services available, or a transfer agreement with a facility that has those capabilities.

Clinical Recommendation	Hospitals managing patients with acute pancreatitis should have endoscopic capabilities.
Performance Target	98%
Indicator Type (Structure/Process/Outcome)	Structure of Care
Indicator Level (Hospital/Patient)	Hospital
Target Population	NA
Rationale (i.e. How does the indicator lead to desired health outcome)?	Endoscopy plays a pivotal role in the management of acute pancreatitis; especially in emergent cases such as cholangitis and biliary obstruction

Supporting Literature

Source	Methodology and GRADE
1. Tenner S, Baillie J, DeWitt J et al. American College of Gastroenterology Guideline: Management of Acute Pancreatitis. Am J Gastroenterol. 2013 Sep; 108(9):1400-15; 1416.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
2. Tenner S. Initial management of acute pancreatitis: critical decisions during the first 72 hours. Am J Gastroenterol 2004; 99: 2489 – 94.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
3. Tarnasky P, ERCP peri-cholecystectomy. Book Chapter. ERCP: The Fundamentals, Second Edition. Edited by Peter B. Cotton and Joseph Leung. 2015 John Wiley & Sons, Ltd. Published 2015 by John Wiley & Sons, Ltd.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
4. Ayub K, Imada R, Slavin J. ERCP in gallstone associated acute pancreatitis. Cochrane Database Syst Rev 2004: CD003630.	1C+ Overwhelming evidence from observational studies Strong recommendation, can apply to most practice settings in most situations
5. Kraft M, Lerch MM. Gallstone pancreatitis: when is endoscopic retrograde cholangiopancreatography truly necessary? Curr Gastroenterol Rep. 2003 Apr;5(2):125-32. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
6. Attasaranya S, Fogel EL, Lehman GA. Choledocholithiasis, ascending cholangitis, and gallstone pancreatitis. Med Clin North Am. 2008 Jul;92(4):925-60, x. doi: 10.1016/j.mcna.2008.03.001. Review.	3- Expert opinion only Weak recommendation, likely to change as data becomes available
7. Tse F, Yuan Y. Early routine endoscopic retrograde cholangiopancreatography strategy versus early conservative	1C+ Overwhelming evidence from observational studies Strong recommendation, can apply to most practice settings in most situations

<p>management strategy in acute gallstone pancreatitis. Cochrane Database Syst Rev. 2012 May 16;(5):CD009779. doi: 10.1002/14651858.CD009779.pub2. Review. PubMed PMID: 22592743.</p>	
<p>8. van Dijk SM, Hallensleben NDL, van Santvoort HC, Fockens P, van Goor H, Bruno MJ, Besselink MG; Dutch Pancreatitis Study Group.. Acute pancreatitis: recent advances through randomised trials. Gut. 2017 Nov;66(11):2024-2032. doi: 10.1136/gutjnl-2016-313595. Epub 2017 Aug 24. Review. PubMed PMID: 28838972</p>	<p>3- Expert opinion only Weak recommendation, likely to change as data becomes available</p>

Supplement II: Rating Instructions Given to Panelists

The RAND/UCLA (Fitch et al, 2001) suggests panelists adhere to strict criteria when ranking proposed indicators. Please review and adhere to the criteria below as you complete your ratings:

1. Rate indicators on a scale of validity from 1 (definitely not valid) to 9 (definitely valid). Validity pertains to the indicator's ability to measure quality of care and its potential to improve clinical practice.
2. Do NOT consider cost implications or feasibility of implementation.
3. Ratings should be based on your personal clinical judgments and available scientific evidence, and not on what you think other panelists might say or believe.
4. The indicators should be viewed from the perspective of an “average” patient who presents to an “average” physician at an “average” hospital.
5. Indicators should not necessarily apply to any one specific patient, but rather should pertain to the overall care of acute pancreatitis patients.

Supplement III: Results of Round 2 Post-Meeting Questionnaire

Acute Pancreatitis Task Force on Quality: Post-Meeting Questionnaire* Results (N=12)

Question	Not at all/ a little	Somewhat	Pretty much/ very much
Literature review	n (%)	n (%)	n (%)
How completely did you read it?	1 (8.3)	4 (33.3)	7 (58.3)
How objective was it?	0 (0.0)	2 (16.7)	10 (83.3)
How informative was it?	1 (8.3)	1 (8.3)	10 (83.3)
How much did it influence your first round ratings?	1 (8.3)	4 (33.3)	7 (58.3)
Round 1 Rating (First Online Survey of all Proposed Indicators)			
How easy did you find the task?	2 (16.7)	4 (33.3)	6 (50)
How onerous did you find the task?	4 (33.3)	6 (50)	2 (16.7)
How clear were the instructions?	2 (16.7)	1 (8.3)	9 (75)
How much did it influence your Round 1 ratings? (Due to effects of fatigue, memory, different times to rate, format of instrument, etc)	4 (33.3)	2 (16.7)	6 (50)
How useful did you find the online Qualtrics survey tool?	2 (16.7)	1 (8.3)	9 (75)
Round 2 Rating (On-site panel meeting)			
How well did the moderator function as group leader?	0 (0.0)	0 (0.0)	12 (100)
How informative was the discussion?	0 (0.0)	0 (0.0)	12 (100)
How argumentative was the discussion?	3 (25)	6 (50)	3 (25)
How much did the feedback from the first round ratings influence your second round ratings?	2 (16.7)	2 (16.7)	8 (66.7)
How much did the discussion influence your second round ratings?	0 (0.0)	3 (25)	9 (75)
Overall Experience			
How well do you believe your own ratings reflect the validity of quality indicators for acute pancreatitis (AP)?	0 (0.0)	0 (0.0)	12 (100)
How well do you believe the panel's ratings will reflect the validity of quality indicators for AP?	0 (0.0)	1 (8.3)	11 (91.7)
How much do you believe this panel process can lead to an official set of recommendations for quality indicators in AP?	0 (0.0)	1 (8.3)	11 (91.7)

**Modified from: Wani, S., et al., Development of quality indicators for endoscopic eradication therapies in Barrett's esophagus: the TREAT-BE (Treatment with Resection and Endoscopic Ablation Techniques for Barrett's Esophagus) Consortium. Gastrointest Endosc, 2017. 86(1): p. 1-17.e3.*

Supplement IV: List of Acute Pancreatitis Quality Indicators Found to be *Not* Valid

Not valid acute pancreatitis quality indicators**

No.	Quality Indicator	Validity Median Ranking	Type(s) of measure
1	IF a patient is confirmed to have acute pancreatitis, THEN the time interval between onset of abdominal pain and presentation should be documented	7	Process
2	IF a patient is diagnosed with acute pancreatitis, THEN biochemical testing for diabetes mellitus and ketoacidosis should be obtained on admission.	6	Process, Efficiency
3	IF a patient diagnosed with acute pancreatitis is younger than 35 years and any of the following conditions are met: a) the etiology remains unknown after initial evaluation, b) they have repeated episodes of pancreatitis after the presumed etiologic factor is removed, c) they have a family history of pancreatitis or pancreatic cancer, THEN genetic testing for susceptibility mutations should be initiated.	8	Process
4	IF a patient is diagnosed with acute pancreatitis, and has no physiologic signs of organ failure and no local or systemic complications, THEN the severity should be classified and documented as mild acute pancreatitis.	8	Process
5	IF a patient is diagnosed with acute pancreatitis, THEN a transabdominal ultrasound should be performed on all patients at presentation.	6.5	Process
6	IF a patient is diagnosed with acute pancreatitis with no cardiovascular and/or renal comorbidities, THEN they should receive intravenous fluid replacement with the goal of maintaining urine output ≥ 0.5 ml/kg/h and mean arterial pressure ≥ 70 mm Hg.	7	Process
7	IF a patient is diagnosed with acute pancreatitis with cardiovascular and/or renal comorbidities, THEN normal saline should be the preferred replacement fluid.	6	Process
8	IF a patient is suspected to have severe hypertriglyceridemia-induced acute pancreatitis, THEN triglyceride levels should be obtained on admission and at 24 and 48 hour intervals after admission.	7	Process
9	IF a patient is suspected to have severe hypertriglyceridemia-induced acute pancreatitis, and persistently elevated triglyceride levels >1000 at 48 hours, THEN hematology should be consulted to consider plasmapheresis.	6.5	Process
10	IF a patient presents with hypertriglyceride-induced pancreatitis and has elevated blood sugar levels on presentation, THEN intravenous insulin therapy should be instituted immediately	7	Process
11	IF a patient has gallstone-induced acute pancreatitis and an intermediate probability* of choledocholithiasis, and ERCP expertise at the center is high, THEN cholecystectomy (if applicable) with intraoperative cholangiogram should be performed. *Intermediate probability of CDL: Increased LFTs or CBD > 7 mm	7	Process
12	IF a patient is diagnosed with gallstone-induced acute pancreatitis and cholecystectomy is deferred due to early complications, THEN adjunct imaging (e.g. EUS, MRCP) should be performed to assess for choledocholithiasis before discharge in patients with intermediate probability* for choledocholithiasis. *Intermediate probability of CDL: Increased LFTs or CBD > 7 mm	7	Process
13	IF a patient is diagnosed with biliary pancreatitis and a high probability* of choledocholithiasis, THEN they should undergo ERCP with appropriate endotherapy before discharge. *High probability of CDL: Increased LFTs and CBD > 7 mm or CDL noted on imaging	9	Process, Efficiency
14	IF a patient is diagnosed with acute pancreatitis [regardless of severity], THEN enteral feeding should be initiated within the first 24-48 hours	8	Process, Efficiency
15	IF a patient diagnosed with acute pancreatitis has significant pain that requires analgesia, THEN initial management should be parenteral [non- morphine] narcotics.	7	Process, Appropriateness
16	IF a patient diagnosed with acute pancreatitis resumes oral intake, THEN ongoing pain management should be converted to oral analgesia.	8	Process, Efficiency
17	IF a patient is diagnosed with acute pancreatitis and is suspected to have infected fluid collection, THEN CT or EUS- guided FNA should be performed prior to initiating antibiotics.	5.5	Process, Appropriateness
18	IF a patient diagnosed with acute pancreatitis has a Modified Marshall score ≥ 2 , THEN they should be admitted to an intensive care unit.	7	Process
19	IF a patient is diagnosed with severe acute pancreatitis and has abdominal compartment syndrome, THEN surgery and nephrology should be consulted for evaluation and treatment.	7.5	Process
20	IF a patient diagnosed with acute pancreatitis has suspected infected or culture - positive peripancreatic fluid collections, THEN appropriate intravenous antibiotics should be initiated.	9	Process
21	IF an institution manages patients with acute pancreatitis, THEN the institution should track and document their average annual case volume	7	Structure of Care, Outcome
22	IF a patient presents with acute onset upper abdominal pain with epigastric tenderness and acute pancreatitis is suspected, THEN initial diagnostic evaluation (laboratory and imaging) should be completed prior to admission.	8	Process, Efficiency, Structure of Care
23	IF an institution manages patients with acute pancreatitis, THEN a specific etiology should be identified in at least 80% of cases.	7	Structure of Care, Outcome
24	IF an institution manages patients with acute pancreatitis, THEN the institution should track and document their surgeons' annual cholecystectomy case volume	6.5	Structure of Care, Outcome
25	IF an institution manages patients with severe acute pancreatitis, THEN the hospital should have an intensive care unit staffed by critical care specialists.	8.5	Structure of Care
26	IF a patient with severe acute pancreatitis is transferred to a tertiary hospital, THEN the time interval between onset of symptoms, first admission, and transfer should be recorded.	7	Structure of Care, Efficiency

**Indicators categorized as not valid either 1) had median ranking < 7 and/or did not meet statistical criteria for expert panel agreement (i.e. BIOMED Classical, p-value, and IPRAS) or 2) were eliminated from consideration based on a $\geq 80\%$ vote by the expert panel during Round 2.