Cook Children's Medical Center
Clinical Excellence Committee

Evidence based pathway for the diagnosis and treatment of acute pancreatitis

Goals

1. Reduce the use of treatments that may prolong inpatient care, increase cost and increase morbidity
2. Rely on the most up to date evidence based practice in treatment of patients
3. Provide treatment guidelines that can be used by all specialties that care for patients with acute pancreatitis

Inclusion Criteria:

1. Patients 1-17 years old
2. Patients who meet diagnostic criteria for acute pancreatitis

Exclusion Criteria:

1. Patients with signs or symptoms of shock
2. Patients with complicated pancreatic fluid collections
3. Patients with multi-system organ failure
4. Patients 18+ years old

Overview

1. Early initiation of enteral nutrition and fluid resuscitation has been shown to decrease length of stay, lead to fewer ICU admissions and decrease the rate of severe acute pancreatitis compared with patients who are kept NPO for a prolonged period of time.[20,8]

2. Diagnostic Criteria - A patient with at least 2 of the following[19, 25,26]
    a. Abdominal pain compatible with acute pancreatitis
    b. Serum amylase and/or lipase values >3 times the upper limits of normal.
        i. While amylase is part of the diagnostic criteria for pancreatitis, lipase is a superior test, both in terms of sensitivity and specificity, and many guidelines are recommending only lipase levels be obtained, not amylase.[27]
    c. Imaging findings consistent with acute pancreatitis

General Recommendations

1. No guidelines are established to predict the outcome of pediatric patients with acute pancreatitis[19]

2. Initial imaging should be via transabdominal ultrasound for the majority of cases of acute pancreatitis[17]

3. Use of other imaging studies (CT or MRI) are reserved for more complicated cases (i.e. pseudocysts) or in cases where the provider needs to more closely assess the underlying etiology[16]
    a. Contrast enhanced CT abdomen should be used when cases are ambiguous for diagnosis ie delayed presentation when serum markers are low[17]
    b. Contrast enhanced CT abdomen should be delayed by 96 hours from onset of symptoms to accurately identify complications and extent of disease[17]
    c. Contrast enhanced CT abdomen should be considered when the patient's clinical status deteriorates or is persistently severe[19]
    d. MRI abdomen w and w/o contrast should be used in patients with impaired renal function or allergies to Iodinated contrast[17]

4. If the patient is found to have gallstones, on initial imaging, this is consistent with biliary pancreatitis and should be admitted to Pediatric Surgery. If the diagnosis of biliary pancreatitis is made after hospital admission, Pediatric Surgery and GI should be consulted. An ERCP with sphincterotomy and stone extraction with or without stent placement is recommended within 24 hours of admission. Other indications for ERCP include patients with common bile duct obstruction (visible stone on imaging), dilated common bile duct or increasing liver tests without cholangitis. These patients should also undergo laparoscopic cholecystectomy during their admission. [7,18]
    a. These patients should be kept NPO until they undergo the necessary procedures, as part of their management.

5. Initial laboratory testing for patients with their first event of Acute pancreatitis should include[16,6]
    a. Hepatic panel
    b. Triglycerides
    c. Calcium
    d. Lipase
    e. BUN and albumin
        i. High BUN and low albumin levels can be used to assess the likelihood of developing severe pancreatitis[6]
        ii. BUN values of 13 - 20 on admission, or after initial resuscitation, are associated with a high likelihood of developing severe pancreatitis[6]
        iii. BUN of 20 or more on admission, or after initial resuscitation, are associated with an even higher likelihood of developing severe pancreatitis[6]

6. Lipase should not be trended daily as there is no evidence to suggest lipase value is associated with patient's improvement or risk of developing severe pancreatitis[4].

7. Fluid management
    a. Pediatric Patients with Acute pancreatitis should be initially resuscitated with Lactated Ringers[15].
    b. Patients should be given a fluid bolus of crystalloid fluid in the range of 10 to 20 ml/kg during initial resuscitation[14] and should receive additional boluses until signs of dehydration, such as poor perfusion or tachycardia, improve with frequent re-evaluations.
    c. Patients should receive maintenance fluid at a rate of 1.5 to 2 times their typical maintenance rate with D5-LR (to a max of 200 ml/hr) for the first 24 hours. This should be reduced to no more than 1.5 times their typical maintenance rate during hours 24 - 48 of their hospitalization. These patients should undergo close monitoring of urine output after initial resuscitation[20].
    d. Once the patient has begun enteral feeds, consider switching IVF from D5-LR to LR and titrate their fluid rate down, based on the patient's intake and clinical status.

Pain Control

1. Tylenol + NSAIDS should be used initially in treatment of acute pancreatitis.
    1. NSAIDS do not show an increased risk of GI bleed[12]
    2. The addition of Tylenol is consistent with recommendations from the Opioid Stewardship Committee at Cook Children's as part of its efforts to reduce the need for opioids in patients.
    3. When Tylenol and NSAIDS are given at the same time, they have been found to be as effective as opioid therapy.[23,24]
    4. Ensure that patients have good urine output and adequate renal function prior to initiating treatment with NSAIDs.
2. Opioids should be used in treatment of acute pancreatitis when Tylenol + NSAIDs do not lead to pain control and may decrease the risk for supplementary treatments.[11]

Nutrition

1. Patients with mild acute pancreatitis may benefit from early oral/enteral nutrition within 48-72 hours [10,8]
    a. Recommend starting enteral tube feeds, if patient is unable to tolerate PO feeds after 3-5 days[3]
    b. Parenteral nutrition should be used when Enteral nutrition is not possible for prolonged periods of time (longer than 5-7 days)[9]
    c. Enteral nutrition, when started within 48 hours of admission, is associated with reducing the risk of infection, death and hyperglycemia and is also associated with decreased length of stay[13,3]
2. Early full-fat diet in children with mild-moderate pancreatitis is safe and has no difference in outcome compared to initial fasting followed by low-fat diet[2]
3. Low fat diet has not been shown to be protective in pediatric patients with acute pancreatitis[1]
4. There is no need to start patients with mild-moderate pancreatitis on clears before advancing their diet. These patients can immediately go to a full-fat diet when they begin enteral feeds.
5. In the setting of severe pancreatitis, with severe pain and poor oral intake, consider combining enteral nutrition with parenteral nutrition.[3]
6. There is no difference in outcomes when using an NG tube vs NJ tube for feeding in acute pancreatitis.[3,22]
7. If enteral tube feeds are initiated, there is no difference in outcomes when using semi-elemental formula vs standard formula.[21]

Antibiotic use

1. Prophylactic antibiotics should be avoided as they lead to longer length of stay and higher total cost.[5]

Surgical role

1. Cholecystectomy can safely be performed and should be performed before discharge in cases of uncomplicated acute biliary pancreatitis[7,18]
2. Any patient with pancreatitis who was noted to have stones on imaging should either be admitted to surgery or receive a surgery consult during their hospitalization
3. Strongly consider GI or Surgery consult for complex pancreatitis, such as traumatic pancreatic injuries, pancreatic psuedocyst, pancreatic necrosis or abscess. These guidelines are not intended to apply to those situations.

References

1. Szabo, Flora K., MD, PhD, Fei L, PhD, Cruz LA, MD, Abu-El-Haija M, MD. Early enteral nutrition and aggressive fluid resuscitation are associated with improved clinical outcomes in acute pancreatitis. *The Journal of pediatrics*. 2015;167(2):397-402.e1. https://www.clinicalkey.es/playcontent/1-s2.0-S0022347615005375. doi: 10.1016/j.jpeds.2015.05.030.

2. Ledder O, Duvoisin G, Lekar M, et al. Early feeding in acute pancreatitis in children: A randomized controlled trial. *Pediatrics (Evanston)*. 2020;146(3):1. https://search.proquest.com/docview/2449273694. doi: 10.1542/peds.2020-1149.

3. Li J, Yu T, Chen G, et al. Enteral nutrition within 48 hours of admission improves clinical outcomes of acute pancreatitis by reducing complications: A meta-analysis. *PLoS ONE*. 2013;8(6):e64926. https://www.ncbi.nlm.nih.gov/pubmed/23762266. doi: 10.1371/journal.pone.0064926.

4. BANKS PA. Practice guidelines in acute pancreatitis. *The American journal of gastroenterology*. 1997;92(3):377-386. https://www.ncbi.nlm.nih.gov/pubmed/9068455.

5. Ikeda Kurakawa K, Okada A, Jo T, et al. Effects of prophylactic antibiotics on length of stay and total costs for pediatric acute pancreatitis. *Pancreas*. 2020;49(10):1321-1326. https://search.proquest.com/docview/2456414205. doi: 10.1097/MPA.0000000000001682.

6. Farrell P, Hornung L, Farmer P, et al. Who's at risk? A prognostic model for severity prediction in pediatric acute pancreatitis. *Journal of pediatric gastroenterology and nutrition*. 2020;71(4):536-542. https://www.ncbi.nlm.nih.gov/pubmed/32541203. doi: 10.1097/MPG.0000000000002807.

7. da Costa, David W, MD, Bouwense SA, MD, Schepers NJ, MD, et al. Same-admission versus interval cholecystectomy for mild gallstone pancreatitis (PONCHO): A multicentre randomised controlled trial. *The Lancet (British edition)*. 2015;386(10000):1261-1268. https://www.clinicalkey.es/playcontent/1-s2.0-S0140673615002743. doi: 10.1016/S0140-6736(15)00274-3.

8. Birimberg-Schwartz L, Rajiwate S, Dupuis A, Gonska T. Pediatric acute pancreatitis: Changes in management and disease outcomes over 16 years. *Pancreas*. 2021;50(3):341-346. https://www.ncbi.nlm.nih.gov/pubmed/33835964. doi: 10.1097/MPA.0000000000001759.

9. Bistrian BR. Early versus late parenteral nutrition in critically ill children. *The New England journal of medicine*. 2016;375(4):385. https://www.ncbi.nlm.nih.gov/pubmed/27464210.

10. Mirtallo JM, Forbes A, McClave SA, Jensen GL, Waitzberg DL, Davies AR. International consensus guidelines for nutrition therapy in pancreatitis. *JPEN. Journal of parenteral and enteral nutrition*. 2012;36(3):284-291. https://journals.sagepub.com/doi/full/10.1177/0148607112440823. doi: 10.1177/0148607112440823.

11. Basurto Ona X, Rigau Comas D, Urrútia G, Basurto Ona X. Opioids for acute pancreatitis pain. *Cochrane database of systematic reviews*. 2013;2013(7):CD009179. https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD009179.pub2. doi: 10.1002/14651858.CD009179.pub2.

12. Ebbehøj N, Friis J, Svendsen LB, Bülow S, Madsen P. Indomethacin treatment of acute pancreatitis: A controlled double-blind trial. *Scandinavian journal of gastroenterology*. 1985;20(7):798-800. https://www.tandfonline.com/doi/abs/10.3109/00365528509088825. doi: 10.3109/00365528509088825.

13. Szabo, Flora K., MD, PhD, Fei L, PhD, Cruz LA, MD, Abu-El-Haija M, MD. Early enteral nutrition and aggressive fluid resuscitation are associated with improved clinical outcomes in acute pancreatitis. *The Journal of pediatrics*. 2015;167(2):397-402.e1. https://www.clinicalkey.es/playcontent/1-s2.0-S0022347615005375. doi: 10.1016/j.jpeds.2015.05.030.

14. Wall I, Badalov N, Baradarian R, Iswara K, Li JJ, Tenner S. Decreased mortality in acute pancreatitis related to early aggressive hydration. *Pancreas*. 2011;40(4):547-550. https://www.ncbi.nlm.nih.gov/pubmed/21499208. doi: 10.1097/MPA.0b013e318215368d.

15. Farrell PR, Farrell LM, Hornung L, Abu-El-Haija M. Use of lactated ringers solution compared with normal saline is associated with shorter length of stay in pediatric acute pancreatitis. *Pancreas*.

2020;49(3):375-380. https://www.ncbi.nlm.nih.gov/pubmed/32132512. doi: 10.1097/MPA.0000000000001498.

16. Morinville V, Husain S, Bai H, et al. Definitions of pediatric pancreatitis and survey of present clinical practices. *Journal of pediatric gastroenterology and nutrition*. 2012;55(3):261-265. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&NEWS=n&CSC=Y&PAGE=fulltext&D=ovft&AN=00005176-201209000-00006. doi: 10.1097/MPG.0b013e31824f1516.

17. Zhao K, Adam SZ, Keswani RN, Horowitz JM, Miller FH. Acute pancreatitis revised atlanta classification and the role of cross-sectional imaging. *American journal of roentgenology (1976)*. 2015;205(1):W32-W41. https://www.ncbi.nlm.nih.gov/pubmed/26102416. doi: 10.2214/AJR.14.14056.

18. Cucher D, Kulvatunyou N, Green DJ, Jie T, Ong ES. Gallstone pancreatitis: A review. *The Surgical clinics of North America*. 2014;94(2):257-280. https://www.ncbi.nlm.nih.gov/pubmed/24679420. doi: 10.1016/j.suc.2014.01.006.

19. Banks PA, Bollen TL, Dervenis C, et al. Classification of acute pancreatitis—2012: Revision of the atlanta classification and definitions by international consensus. *Gut*. 2013;62(1):102-111. http://dx.doi.org/10.1136/gutjnl-2012-302779. doi: 10.1136/gutjnl-2012-302779.

20. Szabo, Flora K., MD, PhD, Fei L, PhD, Cruz LA, MD, Abu-El-Haija M, MD. Early enteral nutrition and aggressive fluid resuscitation are associated with improved clinical outcomes in acute pancreatitis. *The Journal of pediatrics*. 2015;167(2):397-402.e1. https://www.clinicalkey.es/playcontent/1-s2.0-S0022347615005375. doi: 10.1016/j.jpeds.2015.05.030.

21. Oláh A, Romics L. Evidence-based use of enteral nutrition in acute pancreatitis. *Langenbecks Arch Surg*. 2010;395(4):309-316. https://link.springer.com/article/10.1007/s00423-010-0631-4. doi: 10.1007/s00423-010-0631-4.

22. EATOCK FC, CHONG P, MENEZES N, et al. A randomized study of early nasogastric versus nasojejunal feeding in severe acute pancreatitis. *The American journal of gastroenterology*. 2005;100(2):432-439. https://www.ncbi.nlm.nih.gov/pubmed/15667504. doi: 10.1111/j.1572-0241.2005.40587.x.

23. Ebbehøj N, Friis J, Svendsen LB, Bülow S, Madsen P. Indomethacin treatment of acute pancreatitis: A controlled double-blind trial. *Scandinavian journal of gastroenterology*. 1985;20(7):798-800. https://www.tandfonline.com/doi/abs/10.3109/00365528509088825. doi: 10.3109/00365528509088825.

24. Pezzilli R, Morselli-Labate AM, Corinaldesi R. NSAIDs and acute pancreatitis: A systematic review. *Pharmaceuticals*. 2010;3(3):558-571. https://www.ncbi.nlm.nih.gov/pubmed/27713268. doi: 10.3390/ph3030558.

25. Morinville V, Husain S, Bai H, et al. Definitions of pediatric pancreatitis and survey of present clinical practices. *Journal of pediatric gastroenterology and nutrition*. 2012;55(3):261-265. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&NEWS=n&CSC=Y&PAGE=fulltext&D=ovft&AN=00005176-201209000-00006. doi: 10.1097/MPG.0b013e31824f1516.

26. Abu-El-Haija M, Kumar S, Quiros J, et al. Management of acute pancreatitis in the pediatric population: A clinical report from the north american society for pediatric gastroenterology, hepatology and nutrition pancreas committee. *Journal of pediatric gastroenterology and nutrition*. 2018;66(1):159176. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&NEWS=n&CSC=Y&PAGE=fulltext&D=ovft&AN=00005176-201801000-00033. doi: 10.1097/MPG.0000000000001715.

27. Ismail OZ, Bhayana V. Lipase or amylase for the diagnosis of acute pancreatitis? *Clinical biochemistry*. 2017;50(18):1275-1280. https://dx.doi.org/10.1016/j.clinbiochem.2017.07.003. doi: 10.1016/j.clinbiochem.2017.07.003.

This guideline is intended to assist providers in decision making by providing the current state of evidence and recommendations for the management of acute pediatric pancreatitis. This guideline is not meant to replace clinical judgement and will not be appropriate for all cases of acute pediatric pancreatitis.

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A special thanks to the Schwarz Library for their assistance with literature searches and citations.

Approved by Clinical Excellence Committee: July 2022

Due for review by Clinical Excellence Committee on or before: July 2025