

SMART TESTING**ABDULHADI AKHTAR, MD**

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Measuring both serum amylase and lipase for acute pancreatitis lowers quality and raises cost

A 43-year-old, previously healthy woman was admitted to the hospital after 1 day of severe epigastric abdominal pain, nausea, and vomiting. She denied alcohol or tobacco use.

Her physical examination revealed normal vital signs and epigastric tenderness without rebound tenderness.

Notable laboratory results:

- Aspartate aminotransferase 149 U/L (reference range 10–35)
- Alanine aminotransferase 140 U/L (10–35)
- Alkaline phosphatase 178 IU/L (35–104)
- Total bilirubin 1.8 mg/dL (0.2–1.3)
- Amylase 1,244 U/L (28–100)
- Lipase 14,628 U/L (7–59).

Abdominal ultrasonography showed a dilated bile duct and gallstones.

The patient was diagnosed with biliary pancreatitis and was treated by placing her on nothing-by-mouth (NPO) status and giving intravenous fluids and analgesics. All symptoms had resolved by hospital day 3. She underwent laparoscopic cholecystectomy and was discharged the following day.

This is a typical case of biliary pancreatitis that was diagnosed and treated appropriately with a positive outcome. But was it necessary or beneficial to measure both the serum amylase and serum lipase to make the correct diagnosis and treat the patient appropriately?

■ IS MEASURING SERUM AMYLASE NECESSARY?

The American College of Gastroenterology practice guidelines suggest that measuring both serum amylase and serum lipase is not neces-

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sary.¹ Serum lipase alone is the preferred test for diagnosing acute pancreatitis, since it is more sensitive than serum amylase, just as specific, rises more quickly, and remains elevated longer.

In a retrospective study of 151 patients with acute pancreatitis,² the sensitivity of lipase was 96.6% and the specificity was 99.4%.² In contrast, the sensitivity of amylase was 78.6% and the specificity was 99.1%.

In another study,³ in 476 patients with acute pancreatitis, lipase had a sensitivity of 91% vs 62% for amylase. Again, specificity was similar between the two tests (92% for lipase and 93% for amylase). The authors concluded that lipase should replace amylase as the first-line laboratory investigation for suspected acute pancreatitis.

Smith et al⁴ reviewed 1,825 patients with acute pancreatitis and similarly concluded that pancreatic lipase is a more accurate biomarker of acute pancreatitis than serum amylase.

■ PRACTICE AT OUR HOSPITAL

Despite this guideline and evidence, concurrent ordering of serum amylase and lipase is common at many institutions.

We evaluated the practice of ordering both serum amylase and lipase for diagnosis of acute pancreatitis at our 300-bed academic medical hospital. From January 2011 through August 2014, our institution completed 26,254 orders for serum amylase and lipase measurement in 13,198 patients. In 9,938 (75%) of the patients, amylase and lipase were ordered concurrently. Of these, 482 patients (4.8%) had either amylase or lipase elevated above the diagnostic threshold, ie, 3 times the upper limit of normal, and 63 of the 482 patients had

an elevation in serum amylase greater than 3 times the upper limit of normal without an elevation in serum lipase.

None of the patients had acute pancreatitis clinically (eg, typical abdominal pain, nausea, vomiting) or on imaging (pancreatic edema). The definitive cause of nonpancreatic hyperamylasemia could not be determined in these patients; they did not have evidence of salivary disorder, malignancy, or tubo-ovarian disease, and the hyperamylasemia was believed to be related to renal disease, diabetic ketoacidosis, infection, or medications, or to be idiopathic.

In 12 patients, the discrepancy between an elevated amylase and normal lipase resulted in additional imaging with computed tomography. Four patients were also unnecessarily kept NPO for 1 to 3 days, depriving them of nutrition and prolonging their hospital stay.

To minimize concurrent ordering of serum amylase and lipase, we introduced a best-practice alert in the computerized physician order entry systems. The alert mentioned that “ordering both serum amylase and lipase in cases of suspected pancreatitis is unnecessary. Serum lipase alone is sufficient.” However, ordering providers could still order both tests if they wanted to.

In the 3 months after the alert was implemented, serum lipase was ordered 1,780 times with 532 (30%) concurrent orders of amylase. Before the alert was instituted, amylase testing was ordered a mean of 450 times per month; afterward, this decreased by about 60%.

We are now considering eliminating serum amylase testing, as suggested by prior studies⁵ and the American Society of Clinical Pathology.⁶

■ ELIMINATING NEEDLESS EXPENSES

The relentless and unsustainable rise in healthcare costs has prompted physician-led groups such as the American Board of Internal Medicine Foundation and the American College of Physicians to focus on ways to cut waste and incorporate high-value, cost-conscious care into clinical practice.

In 2009 alone, waste in total healthcare expenditures was estimated at \$765 billion. More than half of this astronomical figure was attributed to unnecessary and inefficiently de-

livered services, expenditures that physicians can directly avoid with changes to their practice.^{7,8} Unnecessary laboratory tests such as serum amylase are just one of many wasteful practices.

Hospitals have much to lose when unnecessary tests are ordered. For inpatient hospital admissions in the United States, payment is based on the diagnosis-related group system, in which hospitals are paid a fixed amount per diagnosis. There is no additional reimbursement for laboratory tests. An unnecessary test such as serum amylase in suspected cases of acute pancreatitis thus becomes an expense with no corresponding benefit.

The cost of performing a serum amylase test for a typical laboratory is around \$4 to \$6. Serum amylase testing at our hospital resulted in unnecessary expense of about \$35,000 annually. If we add the costs of additional imaging and prolonged hospitalization, the expenses are substantially more.

Despite this, most hospitals have been unwilling or unable to tackle the problem. This may be due to respect for physician autonomy, seemingly small financial loss, or organizational inertia. For the entire healthcare system, these seemingly minor costs add up. For example, from 2011 to 2014, Medicare Part B alone spent \$19.4 million on serum amylase testing.

Ordering unnecessary laboratory tests is not a problem specific to our hospital, but rather a common problem encountered at many hospitals. Recognizing the widespread practice of ordering amylase, the Choosing Wisely initiative shared new recommendations from the American Society for Clinical Pathology supporting the use of lipase instead of amylase in suspected acute pancreatitis.⁷

Physicians who continue to order these tests show a disregard for evidence-based medicine, patient care, and healthcare costs.

■ CLINICAL BOTTOM LINE

Concurrent use of amylase and lipase testing to diagnose acute pancreatitis is an unnecessary expense for the hospital and can negatively affect patient care as it can lead to additional tests and prolonged hospitalization. Steps should be taken to minimize ordering of amylase by educating physicians and instituting best-practice alerts, or by eliminating the test altogether. ■

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AMYLASE TESTING

REFERENCES

1. Banks PA, Freeman ML, Practice Parameters Committee of the American College of Gastroenterology. Practice guidelines in acute pancreatitis. *Am J Gastroenterol* 2006; 101:2379–2400.
2. Gomez D, Addison A, De Rosa A, Brooks A, Cameron IC. Retrospective study of patients with acute pancreatitis: is serum amylase still required? *BMJ Open* 2012; 2. pii:e001471.
3. Hofmeyr S, Meyer C, Warren BL. Serum lipase should be the laboratory test of choice for suspected acute pancreatitis. *S Afr J Surg* 2014; 52:72–75.
4. Smith RC, Southwell-Keely J, Chesher D. Should serum pancreatic lipase replace serum amylase as a biomarker of acute pancreatitis? *ANZ J Surg* 2005; 75:399–404.
5. Volz KA, McGillicuddy DC, Horowitz GL, Wolfe RE, Joyce N, Sanchez LD. Eliminating amylase testing from the evaluation of pancreatitis in the emergency department. *West J Emerg Med* 2010; 11:344–347.
6. American Society for Clinical Pathology. Do not test for amylase in cases of suspected pancreatitis. Instead, test for lipase. Choosing Wisely; 2016. www.choosingwisely.org/clinician-lists/american-society-clinical-pathology-testing-for-amylase/. Accessed August 3, 2017.
7. Smith M, Saunders R, Stuckhardt L, McGinnis JM; Committee on the Learning Health Care System in America, eds. Best Care at Lower Cost: The Path to Continuously Learning Health Care in America. Washington, DC: The National Academies Press; 2013. www.hep.fsu.edu/~wahl/artic/NAP/HealthCare13444.pdf. Accessed August 3, 2017.
8. American College of Physicians. Eliminating healthcare waste and overordering of tests. www.acponline.org/clinical-information/high-value-care/medical-educators-resources/curriculum-for-educators-and-residents/curriculum-version-3. Accessed August 3, 2017.

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