

American Family Physician

A peer reviewed journal of the American Academy of Family Physicians

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FPIN's Clinical Inquiries

Evaluation of Apparent Life-Threatening Events in Infants

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Clinical Question

What is the appropriate evaluation for an infant presenting with an apparent life-threatening event (ALTE)?

Evidence-Based Answer

A comprehensive, detailed history and physical examination with pulse oximetry and nondilated funduscopy (to look for traumatic retinal hemorrhage) helps to determine the underlying etiology of an ALTE in 70 percent of infants. (Strength of Recommendation [SOR]: C, based on case series). Initial diagnostic evaluation should include 12-lead electrocardiography (ECG); blood gas analysis; chest radiography; complete blood count (CBC); pertussis and respiratory syncytial virus cultures, if respiratory symptoms are present; serum electrolytes; and urinalysis. (SOR: C, expert opinion and case series). If the initial evaluation does not reveal the underlying etiology of an ALTE, then the following tests should be performed: a barium-contrast upper gastrointestinal series or gastric pH probe to evaluate for reflux; computed tomography of the head or a skeletal survey to evaluate for occult cases of deliberate harm; and electroencephalography (EEG) to help diagnose seizure disorders. (SOR: C, expert opinion and case series).

Evidence Summary

The National Institutes of Health (NIH) define an ALTE as an episode that is characterized by some combination of apnea (central or occasionally obstructive), color change (usually cyanotic or pallid but occasionally erythematous or plethoric), marked change in muscle tone (usually limpness), choking, or gagging. An ALTE typically is frightening to an observer.¹ There are no studies on the appropriate evaluation of an infant presenting with an ALTE that are of higher quality than a case series. However, multiple case series studies and systematic reviews of other observational studies do offer some data that can be extrapolated.

A systematic review of eight nonrandomized studies with varying methodologies found that the most common final diagnoses in infants who presented with ALTEs were gastroesophageal reflux disease, lower respiratory tract infection, and seizure disorders (Table 1).² Baseline investigations in six of eight studies included a combination of blood chemistries, chest radiography, ECG, EEG, and urinalysis. The other two studies did not describe an evaluation protocol. Although the systematic review did report the final diagnoses in infants presenting with an ALTE, it did not evaluate the value or efficiency of the different diagnostic strategies.

Table 1. Common Diagnoses and Evaluation for Infants Presenting with an Apparent Life-Threatening Event

Diagnosis	Tests/evaluations
Gastroesophageal reflux disease	Barium-contrast upper gastrointestinal series or gastric pH probe; radioisotope milk scan
Lower respiratory tract infection	Chest radiography; CBC
Seizure disorder	Brain imaging; CBC; electroencephalography; metabolic studies (serum or urine); serum electrolytes (sodium, glucose, calcium); video surveillance
Choking episode	Barium-contrast upper gastrointestinal series or gastric pH probe; observation
Bronchiolitis, respiratory syncytial virus, or pertussis	Chest radiography; pulse oximetry; respiratory syncytial virus or pertussis culture
Infection or sepsis	Blood gas analysis; blood lactate or bicarbonate level; chest radiography; CBC; lumbar puncture with cerebrospinal fluid analysis; serum electrolytes; urinalysis with culture
Anemia	CBC
Arrhythmia (long QT syndrome)	Electrocardiography
Non-accidental trauma	Dilated funduscopic examination; noncontrast computed tomography of the head; skeletal survey; urine toxicology; video surveillance
Apnea	Continuous pulse oximetry; sleep study

CBC = complete blood count.

Three prospective case series studies, all with limited sample sizes (n = 65, 128, and 128), used the strict NIH definition of ALTE for cases included in the study. Blood lactate level, chest radiography, and radioisotope milk scan (a test for gastroesophageal reflux disease) were the three investigations with the highest percentage of abnormal results.³ However, the clinical significance of these test abnormalities is unclear. A second small study investigated how often anemia, measured by serum hemoglobin level, is present in infants with an ALTE.⁴ No statistically significant difference was found when comparing patients presenting with one ALTE with an age-matched control group (i.e., patients with non-ALTE complaints); however, infants

with recurrent ALTEs had higher rates of anemia (21.6 percent) compared with the control patients (9.3 percent) and patients with only one event (16.9 percent).⁴

A case series focused on child abuse attempted to collect a CBC, urine toxicology, and dilated funduscopic examination on 128 enrolled infants,⁵ with just over one half of the enrolled infants completing the diagnostic evaluations. Eleven of 66 urine toxicology studies were abnormal; five were positive for caffeine and ephedrine/pseudoephedrine and one was positive for diphenhydramine. One child (of 73 children who underwent evaluation) had an abnormal funduscopic examination, revealing bilateral retinal hemorrhages consistent with physical abuse. The number of abnormal blood analysis tests was not reported.

Two retrospective case series studies used definitions of ALTE similar to that of the NIH as an entry requirement. The first series collected detailed history and physical examination data, and ranked 14 additional tests by frequency of utilization.⁶ The three most commonly performed tests were blood culture, CBC, and serum electrolytes. Common discharge diagnoses included pertussis, hypoglycemia, and anemia. Unfortunately, the tests performed did not add any diagnostic information that was not already known from the child's history and physical examination. The second study recorded the most common tests used in 196 ALTE evaluations, along with the percentage of abnormal results for each test.⁷ Sixty-seven percent of 27 radioisotope milk scans were abnormal. Presumably these infants were diagnosed with gastroesophageal reflux disease; however, their final diagnoses are not mentioned in the article. The clinical significance of this finding and its relation to ALTEs is unclear.

Diagnostic studies, with or without a contributory physical examination, that were found to be independently predictive of an underlying etiology in infants presenting with an ALTE included chest radiography, EEG, and respiratory syncytial virus cultures.⁸ When the physical examination is not definitive, a barium-contrast upper gastrointestinal series or gastric pH probe, brain imaging, pneumography (a test that continuously records respiratory pattern), urinalysis or urine culture, and CBC have led to the identification of less-apparent causes of ALTEs; however, there is little definitive evidence to support these tests.

Recommendations from Others

A consensus statement from the European Society for the Study and Prevention of Infant Death stresses a detailed history and physical examination as an initial evaluation to guide all subsequent studies.⁹ Further testing may include CBC, blood gas analysis, brain imaging, chest radiography, ECG, echocardiography, EEG, evaluation for reflux, funduscopic evaluation, serum electrolytes, sleep study, tilt-table testing, toxicology, urinalysis, video surveillance, and virologic and bacterial screening. The European consensus statement does not recommend these tests in any specific order.

Clinical Commentary

This presents a common sense approach to the uncertainty surrounding ALTEs, which are frightening to families and physicians. Family physicians are well trained to manage this uncertainty with a rational diagnostic approach based on careful history and physical

examination. Whether to prescribe home cardiorespiratory monitoring for patients who present with an ALTE remains controversial. Monitors have risks, and they have not been proven to prevent sudden infant death syndrome (SIDS) in infants with prior ALTE. The American Academy of Pediatrics (AAP) recommends the use of monitors in limited situations, such as in premature infants up to 43 weeks postmenstrual age with a history of apnea/bradycardia, and in infants with symptomatic chronic lung disease, continuous positive airway pressure or tracheostomy-dependent airways, or other airway instability. The AAP recommends that physicians advise parents that monitors have not been shown to prevent SIDS, and they should, instead, use proven SIDS prevention strategies, including sleep position, eliminating tobacco exposure, and safe sleeping environments.¹⁰ Another way to help empower anxious families is to counsel them about appropriate stimulation and basic life-saving techniques.

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Author disclosure: Nothing to disclose.

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