Brief Resolved Unexplained Events (Formerly Apparent Life-Threatening Events) and Evaluation of Lower-Risk Infants: Executive Summary

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EXECUTIVE SUMMARY

This clinical practice guideline has 2 primary objectives. First, it recommends the replacement of the term “apparent life-threatening event” (ALTE) with a new term, “brief resolved unexplained event” (BRUE). Second, it provides an approach to evaluation and management that is based on the risk that the infant will have a repeat event or has a serious underlying disorder.

Clinicians should use the term BRUE to describe an event occurring in an infant younger than 1 year when the observer reports a sudden, brief, and now resolved episode of ≥1 of the following: (1) cyanosis or pallor; (2) absent, decreased, or irregular breathing; (3) marked change in tone (hyper- or hypotonia); and (4) altered level of responsiveness. Moreover, clinicians should diagnose a BRUE only when there is no explanation for a qualifying event after conducting an appropriate history and physical examination (see Tables 2 and 3 in www.pediatrics.org/cgi/doi/10.1542/peds.2016-0591). Among infants who present for medical attention after a BRUE, the guideline identifies (1) lower-risk patients on the basis of history and physical examination, for whom evidence-based guidelines for evaluation and management are offered, and (2) higher-risk patients, whose history and physical examination suggest the need for further investigation, monitoring, and/or treatment, but for whom recommendations are not offered (because of insufficient evidence or the availability of guidance from other clinical practice guidelines specific to their presentation or diagnosis). Recommendations in this guideline apply only to lower-risk patients.
who are defined by (1) age >60 days; (2) gestational age ≥32 weeks and postconceptional age ≥45 weeks; (3) occurrence of only 1 BRUE (no prior BRUE ever and not occurring in clusters); (4) duration of BRUE <1 minute; (5) no cardiopulmonary resuscitation by trained medical provider required; (6) no concerning historical features; and (7) no concerning physical examination findings (Fig 1). This clinical practice guideline also provides implementation support and suggests directions for future research.

The term ALTE originated from a 1986 National Institutes of Health Consensus Conference on Infantile Apnea and was intended to replace the term “near-miss sudden infant death syndrome (SIDS).” An ALTE was defined as “[a]n episode that is frightening to the observer and 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 marked limpness), choking, or gagging. In some cases, the observer fears that the infant has died.” Although the definition of ALTE enabled researchers to establish over time that these events were a separate entity from SIDS, the clinical application of this classification, which describes a constellation of observed, subjective, and nonspecific symptoms, has raised significant challenges for clinicians and parents in the evaluation and care of these infants. Although a broad range of disorders can present as an ALTE (eg, child abuse, congenital abnormalities, epilepsy, inborn errors of metabolism, and infections), for a majority of well-appearing infants, the risk of a recurrent event or a serious underlying disorder is extremely low.

ALTEs can create a feeling of uncertainty in both the caregiver and the clinician. Clinicians may feel compelled to perform tests and hospitalize the patient even though this may subject the patient to unnecessary risk and is unlikely to lead to a treatable diagnosis or prevent future events. Understanding the risk of an adverse outcome for an infant who has experienced an ALTE has been difficult because of the nonspecific nature and variable application of the ALTE definition in research. A recent systematic review of nearly 1400 ALTE publications spanning 4 decades concluded that risk of a subsequent or underlying disorder could not be quantified because of the variability in case definitions across studies. Although there are history and physical examination factors that can determine lower or higher risk, it is clear that the term ALTE must be replaced to advance the quality of care and improve research.

This guideline is intended for use primarily by clinicians providing care for infants who have experienced a BRUE, as well as their families. The guideline may be of interest to payers, but it is not intended to be used for reimbursement or to determine insurance coverage. This guideline is not intended as the sole source of guidance in the evaluation and management of BRUEs and specifically does not address higher-risk BRUE patients. Rather, it is intended to assist clinicians by providing a framework for clinical decision making. It is not intended to replace clinical judgment, and these recommendations may not provide the only appropriate approach to the management of this problem.

This guideline is intended to provide a patient- and family-centered approach to care, reduce unnecessary and costly medical interventions, and improve patient outcomes. It includes recommendations for diagnosis, risk-based stratification, monitoring, disposition planning, effective communication with the patient and family, guideline implementation and evaluation, and future research. In addition, it aims to help clinicians determine the presence of a serious underlying cause and a safe disposition by alerting them to the most significant features of the clinical history and physical examination on which to base an approach for diagnostic testing and hospitalization. Key action statements are summarized in Table 1.

**SUBCOMMITTEE ON BRIEF RESOLVED UNEXPLAINED EVENTS (FORMERLY REFERRED TO AS APPARENT LIFE THREATENING EVENTS); OVERSIGHT BY THE COUNCIL ON QUALITY IMPROVEMENT AND PATIENT SAFETY**

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**FIGURE 1**
Diagnosis, risk classification, and recommended management of a BRUE. *Refer to Tables 3 and 4 in www.pediatrics.org/cgi/doi/10.1542/peds.2016-0591 for the determination of an appropriate and negative history and PE. **Refer to Figure 2 in www.pediatrics.org/cgi/doi/10.1542/peds.2016-0591 for the American Academy of Pediatrics method for rating of evidence and recommendations. CPR, cardiopulmonary resuscitation; CSF, cerebrospinal fluid; ECG, electrocardiogram; FH, family history; GER, gastroesophageal reflux; PE, physical examination; WBC, white blood cell.

### BRUE Diagnosis

- Patient presents for initial medical assessment after a brief, resolved event that was observed by caregiver in a child <1 year of age
- Patient is well-appearing
- Patient has additional symptoms or abnormal vital signs (e.g., cough, respiratory difficulties, or fever)

**Clinician characterizes the event as a sudden, brief, and now resolved episode of one or more of the following:**
- Cyanosis or pallor
- Absent, decreased, or irregular breathing
- Marked change in tone (hyper- or hypotonia)
- Altered responsiveness

**Event criteria present**
- Perform appropriate history and PE*
- No explanation for event identified

**Diagnosis of Brief Resolved Unexplained Event is made**

**Not a BRUE**
- Event criteria absent
- Explanation for event identified (e.g., GER, feeding difficulties, or airway abnormality)

**Out of guideline scope; manage accordingly**

### BRUE Risk Classification

- No concerns identified from history and PE*
- Apply risk stratification
  - Age >60 days
  - Born <32 wks gestation and corrected gestational age >45wks
  - No CPR by trained medical provider
  - Event lasted <1 minute
  - First event

**Higher Risk Patient**

**Lower Risk Patient**

### Management Recommendations for Lower Risk Patients **

**Should**
- Educate caregivers about BRUEs and engage in shared decision-making to guide evaluation, disposition, and follow-up
- Offer resources for CPR training to caregiver

**Should Not**
- Obtain WBC count, blood culture, or CSF analysis or culture, serum sodium, potassium, chloride, blood urea nitrogen, creatinine, calcium, ammonia, blood gases, urine organic acids, plasma amino acids or acylcarnitines, chest radiograph, echocardiogram, EEG, studies for GER
- Initiate home cardio-respiratory monitoring
- Prescribe acid suppression therapy or anti-epileptic medications

**May**
- Obtain pertussis testing and 12-lead ECG
- Briefly monitor patients with continuous pulse oximetry and serial observations

**Need Not**
- Obtain viral respiratory test, urinalysis, blood glucose, serum bicarbonate, serum lactate acid, laboratory examination for anemia, or neuroimaging
- Admit the patient to the hospital solely for cardiorespiratory monitoring
### TABLE 1 Summary of Key Action Statements for Lower-Risk BRUEs

<table>
<thead>
<tr>
<th>Action Statement</th>
<th>Evidence Quality</th>
<th>Strength of Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A. Need not admit infants to the hospital solely for cardiorespiratory monitoring.</td>
<td>B</td>
<td>Weak</td>
</tr>
<tr>
<td>1B. May briefly monitor patients with continuous pulse oximetry and serial observations.</td>
<td>D</td>
<td>Weak</td>
</tr>
<tr>
<td>1C. Should not obtain chest radiograph.</td>
<td>B</td>
<td>Moderate</td>
</tr>
<tr>
<td>1D. Should not obtain a measurement of venous or arterial blood gas.</td>
<td>B</td>
<td>Moderate</td>
</tr>
<tr>
<td>1E. Should not obtain an overnight polysonomograph.</td>
<td>B</td>
<td>Moderate</td>
</tr>
<tr>
<td>1F. May obtain a 12-lead electrocardiogram.</td>
<td>C</td>
<td>Weak</td>
</tr>
<tr>
<td>1G. Should not obtain an echocardiogram.</td>
<td>C</td>
<td>Moderate</td>
</tr>
<tr>
<td>1H. Should not initiate home cardiorespiratory monitoring.</td>
<td>B</td>
<td>Moderate</td>
</tr>
<tr>
<td>2A. Need not obtain neuroimaging (CT, MRI, or ultrasonography) to detect child abuse.</td>
<td>C</td>
<td>Weak</td>
</tr>
<tr>
<td>2B. Should obtain an assessment of social risk factors to detect child abuse.</td>
<td>C</td>
<td>Moderate</td>
</tr>
<tr>
<td>3A. Should not obtain neuroimaging (CT, MRI, or ultrasonography) to detect neurologic disorders.</td>
<td>C</td>
<td>Moderate</td>
</tr>
<tr>
<td>3B. Should not obtain an EEG to detect neurologic disorders.</td>
<td>C</td>
<td>Moderate</td>
</tr>
<tr>
<td>3C. Should not prescribe antiepileptic medications for potential neurologic disorders.</td>
<td>C</td>
<td>Moderate</td>
</tr>
<tr>
<td>4A. Should not obtain a WBC count, blood culture, or cerebrospinal fluid analysis or culture to detect an occult bacterial infection.</td>
<td>B</td>
<td>Strong</td>
</tr>
<tr>
<td>4B. Need not obtain a urinalysis (bag or catheter).</td>
<td>C</td>
<td>Weak</td>
</tr>
<tr>
<td>4C. Should not obtain chest radiograph to assess for pulmonary infection.</td>
<td>B</td>
<td>Moderate</td>
</tr>
<tr>
<td>4D. Need not obtain respiratory viral testing if rapid testing is available.</td>
<td>C</td>
<td>Weak</td>
</tr>
<tr>
<td>4E. May obtain testing for pertussis.</td>
<td>B</td>
<td>Weak</td>
</tr>
<tr>
<td>5A. Should not obtain investigations for GER (eg, upper gastrointestinal tract series, pH probe, endoscopy, barium contrast study, nuclear scintigraphy, and ultrasonography).</td>
<td>C</td>
<td>Moderate</td>
</tr>
<tr>
<td>5B. Should not prescribe acid suppression therapy.</td>
<td>C</td>
<td>Moderate</td>
</tr>
<tr>
<td>6A. Need not obtain measurement of serum lactic acid or serum bicarbonate.</td>
<td>C</td>
<td>Weak</td>
</tr>
<tr>
<td>6B. Should not obtain a measurement of serum sodium, potassium, chloride, blood urea nitrogen, creatinine, calcium, or ammonia.</td>
<td>C</td>
<td>Moderate</td>
</tr>
<tr>
<td>6C. Should not obtain a measurement of venous or arterial blood gases.</td>
<td>C</td>
<td>Moderate</td>
</tr>
<tr>
<td>6D. Need not obtain a measurement of blood glucose.</td>
<td>C</td>
<td>Weak</td>
</tr>
<tr>
<td>6E. Should not obtain measurements of urine organic acids, plasma amino acids, or plasma acylcarnitines.</td>
<td>C</td>
<td>Moderate</td>
</tr>
<tr>
<td>7A. Should not obtain laboratory evaluation for anemia.</td>
<td>C</td>
<td>Moderate</td>
</tr>
<tr>
<td>8A. Should offer resources for CPR training to caregiver.</td>
<td>C</td>
<td>Moderate</td>
</tr>
<tr>
<td>8B. Should educate caregivers about BRUEs.</td>
<td>C</td>
<td>Moderate</td>
</tr>
<tr>
<td>8C. Should use shared decision making.</td>
<td>C</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

CPR, cardiopulmonary resuscitation; CT, computed tomography; GER, gastroesophageal reflux; WBC, white blood cell.

### REFERENCES


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*Pediatrics* originally published online April 25, 2016;

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An error occurred in the American Academy of Pediatrics article, titled “Clinical Practice Guideline: Brief Resolved Unexplained Events (Formerly Apparent Life-Threatening Events) and Evaluation of Lower-Risk Infants: Executive Summary” (Pediatrics 2016;137(5):e20160591; http://pediatrics.aappublications.org/content/pediatrics/137/5/e20160591.full.pdf). In the algorithm (Fig 1), under Management Recommendations for Lower-Risk Infants, “laboratory evaluation for anemia” should have appeared in the “Should Not” box, not the “Need Not” box. The corrected algorithm appears in the online version of this article.

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An erratum has been published regarding this article. Please see the attached page for:
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