

ALTE to BRUE- Does it Matter?

Samrat U Das, MD
Associate Professor of Pediatrics
Pediatric Hospitalist

Disclosures

I have nothing to disclose

Objectives

- Discuss clinical presentation of a BRUE and differentiate from ALTE
- Differentiate High vs Low risk BRUE
- Discuss appropriate investigations for a BRUE
- Outline key points in the management of a BRUE

ALTE

ALTE (1986 NIH consensus) was defined as “an 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 plethoric
- marked change in muscle tone (usually marked limpness)
- choking, or gagging.

In some cases, the observer fears that the infant has died.”

ALTE

- Described constellation of observed, subjective, and nonspecific symptoms
- Raised significant challenges for clinicians and parents in the evaluation and care of these pts
- It is true that broad range of disorders can present as an ALTE (eg, child abuse, congenital abnormalities, epilepsy, inborn errors of metabolism, and infections),
- However, for a majority of infants who appear well after the event, the risk of a serious underlying disorder or a recurrent event is extremely low.

ALTE Vs BRUE

The term ALTE was problematic:

- Was broad and included nonspecific symptoms
- Implied concern for a child's life being at risk
- Led to unnecessary investigations and hospitalizations
- Goal of hospitalization was diagnosing the underlying etiology
- Reinforced parental anxiety

ALTE Vs. BRUE

In 2016 the American Academy of Pediatrics released new guidelines for these types of episodes

- The new guidelines on BRUEs:
 - Outline more precise diagnostic criteria
 - Outline a strategy for identifying higher and lower risk patients
 - Recommend how to investigate and manage BRUEs

BRUE and SIDS

Before the terms of BRUE or ALTE existed, these events were called “near-miss SIDS”.

There is no clear association between BRUEs and Sudden Infant Death Syndrome (SIDS)

– BRUEs (as well as ALTEs) are not a risk factor for SIDS

Clinical Features

BRUE stands for brief resolved unexplained event

- Diagnostic criteria:
 - Infant must be <1 year old
 - Episode must be sudden, brief, and now **resolved**
 - Event is characterized by at least one of the following features:
 - Cyanosis or pallor
 - Absent, decreased, or irregular breathing
 - Change in muscle tone, either hyper or hypotonia, or
 - Altered level of responsiveness

BRUE is a diagnosis of **exclusion**

Difference between ALTE & BRUE

- BRUE definition has a strict age limit.
- an event is only a BRUE if there is no other likely explanation
- a BRUE diagnosis is based on the clinician's characterization of features of the event and not on a caregiver's perception that the event was life-threatening
- Clinician should determine whether the infant had episodic cyanosis or pallor, rather than just determining whether "color change" occurred

Difference between ALTE & BRUE

- BRUE expands the respiratory criteria beyond “apnea” to include absent breathing, diminished breathing, and other breathing irregularities.
- instead of the less specific criterion of “change in muscle tone, ” the clinician should determine whether there was marked change in tone, including hypertonia or hypotonia

Difference between ALTE & BRUE

- Because choking and gagging usually indicate common diagnoses such as GER or respiratory infection, their presence suggests an event was not a BRUE
- Use of “altered level of responsiveness” is a new criterion, because it can be an important component of an episodic but serious cardiac, respiratory, metabolic, or neurologic event.

Differential Diagnosis of BRUEs

Common causes:

- Idiopathic
- Gastroesophageal reflux
- Lower respiratory tract infections
- Seizure

More rare causes:

- Airway issues
- Bacterial infections
- Cardiac causes
- Child abuse
- Drugs and toxins
- Inborn errors of metabolism
- Metabolic and endocrine
- Neurologic causes

Differential Diagnosis of BRUEs

Remember:

- BRUE is description of an event; it's not a disease entity in itself
- By definition, BRUEs are unexplained
- In case you have an explanation for the event, it's not a BRUE

Case

EMS arrives in your department with a **child** reported to have been **unresponsive** at home. Patient had normal vital signs for EMS, normal blood glucose, and **no interventions** were performed by medical personnel. The child is currently **awake, alert and acting normally** for EMS and parents.

The child is 4 months old.

What do you want to do next?

Evaluation of BRUE

- Step ONE: **Search for an explanation**
- History (Before, During and After event)
What the infant was doing before the event
 - Were they sleeping or awake?
 - Where they were
 - Whether they were behaving normally
 - Timing in relation to a feed
 - What made the observer check on the baby

Detailed History

- History of the event
 - How did it start?
 - What happened?
 - How did it stop?
 - What happened next?
- Past Medical History
 - Birth details
 - Medications
 - Illnesses
 - Prior hospitalizations
- Family History
 - Sudden death
 - Congenital or heritable diseases
- Is there an explanation in the history?
 - Reflux
 - Choking
 - Trauma
 - Current illness
- Does the history bother you?
 - Sounds like a seizure
 - Required CPR
 - Lasted >1 min

Physical Exam

Head-to-toe *naked* exam

- General appearance
- Return to baseline
 - Any lingering limpness, colour change, or reduced alertness?
- Vital signs
- Height, weight, and head circumference
- Cardiac exam
- Respiratory exam
- Neurological exam
- Developmental assessment.
- Signs of trauma or maltreatment;
 - Observe caregiver's interactions with infant

Evaluation- Physical Exam

Worrisome Findings:

Abnormal vitals

Abnormal tone/mental status

Murmur

Respiratory findings

Organomegaly

Bruising/trauma

Malformation

Evaluation of BRUE

Laboratory and imaging investigations

– Decisions based on risk stratification of events

- Was it a higher or lower risk event?

Risk Assessment

Risk assessment means classifying BRUEs as either higher or lower risk events

- Why bother?
 - Helps you figure out which patients are more likely to have a serious condition as the cause of the episode, and possibly more events in the future
- What to consider:
 - History and physical exam findings
 - Event characteristics
 - Patient characteristics

Lower Risk Patients

To be designated lower risk, the following criteria should be met:

- Age >60 days
- Prematurity: gestational age ≥ 32 weeks and postconceptional age ≥ 45 weeks
- First BRUE (no previous BRUE ever and not occurring in clusters)
- Duration of event <1 minute
- No CPR required by trained medical provider
- No concerning historical features
- No concerning physical examination findings

Investigations (Lower Risk Patients)

In low risk patients:

- Extensive laboratory or imaging studies are unlikely to be helpful
- Extensive workup and hospitalization could expose them to unnecessary risk
- There are guidelines as to what you:
 - Should do
 - May consider
 - Need not do
 - Should not consider
- The guidelines were designed:
 - In response to these events being over investigated in the past
 - In the interest of providing high value care

Investigations(Lower Risk Patients)

In low risk patients, you should:

- Make decisions about evaluation, management and follow-up in partnership with the infant's caregivers
- Teach caregivers about BRUEs and offer info about CPR training

Investigations(Lower Risk Patients)

In low risk patients, you may:

- Order pertussis testing if you suspect an infectious cause(should consider potential exposures, vaccine history (including intrapartum immunization of the mother as well as the infant's vaccination history), awareness of pertussis activity in the community, and turnaround time for results
- Order an ECG as part of a cardiac workup
- Observe infants and monitor oxygen saturations for a short period of time

Investigations(Lower Risk Patients)

In low risk patients, you need not:

- Order viral respiratory testing or a urinalysis as part of an infectious workup
- Order blood glucose, serum bicarbonate, or serum lactic acid to check for inborn errors of metabolism
- Order neuroimaging for suspected child abuse
- Admit the patient just to receive cardiorespiratory monitoring

Investigations(Lower Risk Patients)

In low risk patients, you should not:

- Evaluate for anemia based on lab tests
- Obtain blood work including CBC, electrolytes, renal function, or tests for inborn errors of metabolism
- Sample CSF to look for a subclinical bacterial infection
- Order a chest x-ray, blood gases, echocardiogram, or polysomnograph as part of a cardiopulmonary evaluation
- Order EEG for a neurologic workup
- Order tests for gastroesophageal reflux
- Prescribe anti-epileptics or medications for acid suppression; or
- Send patients home on home apnea monitors

Higher Risk Patients

- Infants who have experienced a BRUE who do not qualify as lower risk patients are, by definition, at higher risk.
- Outcomes data from ALTE studies in the heterogeneous higher-risk population are unclear and preclude the derivation of evidence-based recommendations regarding management.

Higher Risk Patients

- However, some studies suggest that higher-risk BRUE patients may be more likely to have a serious underlying cause, recurrent event, or an adverse outcome.
- For example, infants younger than 2 months may be more likely to have a congenital or infectious cause and be at higher risk of an adverse outcome.
- Infants who have experienced multiple events or a concerning social assessment for child abuse may warrant increased observation to better document the events or contextual factors.

Investigations(Higher Risk Patients)

Higher risk patients:

- May need more thorough investigations for less common causes
- Should be worked up based on your degree of clinical suspicion of a concerning underlying etiology
- Focus on that particular area of concern

Management

- General approach:
 - For low risk patients, management is focused on education
 - If there are signs and symptoms that suggest an underlying etiology, it will involve:
 - Treating the apparent cause
 - Possible inpatient observation
 - In all cases, provide follow-up and support for caregivers
 - Discharge criteria: stable social situation, capacity for follow-up, offer CPR training

Medical Treatment

- If concerns were identified on history and physical exam:
 - Treat the suspected underlying condition
 - If more events occur despite intervention:
 - Reassess the diagnosis
 - Pursue further investigations as warranted

Medical Treatment

- If no concerns were identified on history and physical exam:
 - The event is most likely isolated and idiopathic
 - No medical treatment is needed
 - Manage parental anxiety
- You may consider a brief period of observation

Hospitalization

- In general, only consider admitting patients who have high risk events
- Once admitted:
 - Regularly assess the infant
 - Monitor their cardiorespiratory function and oxygen saturations
- Regardless of when discharge occurs, arrange close follow-up and support

Hospitalization

- Infants with lower risk events don't need to be admitted just for cardiorespiratory monitoring
- However, it may be reasonable to admit them for a clearly defined period of time (24-48 hours) if:
 - There is a great deal of parental anxiety
 - Timely outpatient follow-up is not available
- As another option for a lower-risk patient, you can also consider monitoring them for a short amount of time (1-4 hours)
 - Continuous pulse oximetry monitoring and serial observation

Home Apnea Monitoring

- Home apnea monitoring is generally discouraged
- Patients with lower risk events should not receive home cardio-respiratory monitoring
 - It does not seem to improve outcomes
 - It can increase parental anxiety
- Monitoring may be warranted in a small subset of high risk cases
 - This decision would likely be made with a pediatric pulmonary medicine specialist
 - Make sure you provide proper instruction to caregivers

Caregiver Education

Reassure caregivers that:

- BRUE does not imply SIDS risk
- Home monitoring is not preventative and is generally discouraged
 - Provide information about:
 - Infant safety, especially safe sleeping practices
 - Appropriate intervention
 - Not shaking infants to revive them if they are unresponsive
 - Basic CPR training
 - Psychosocial supports available

Prognosis

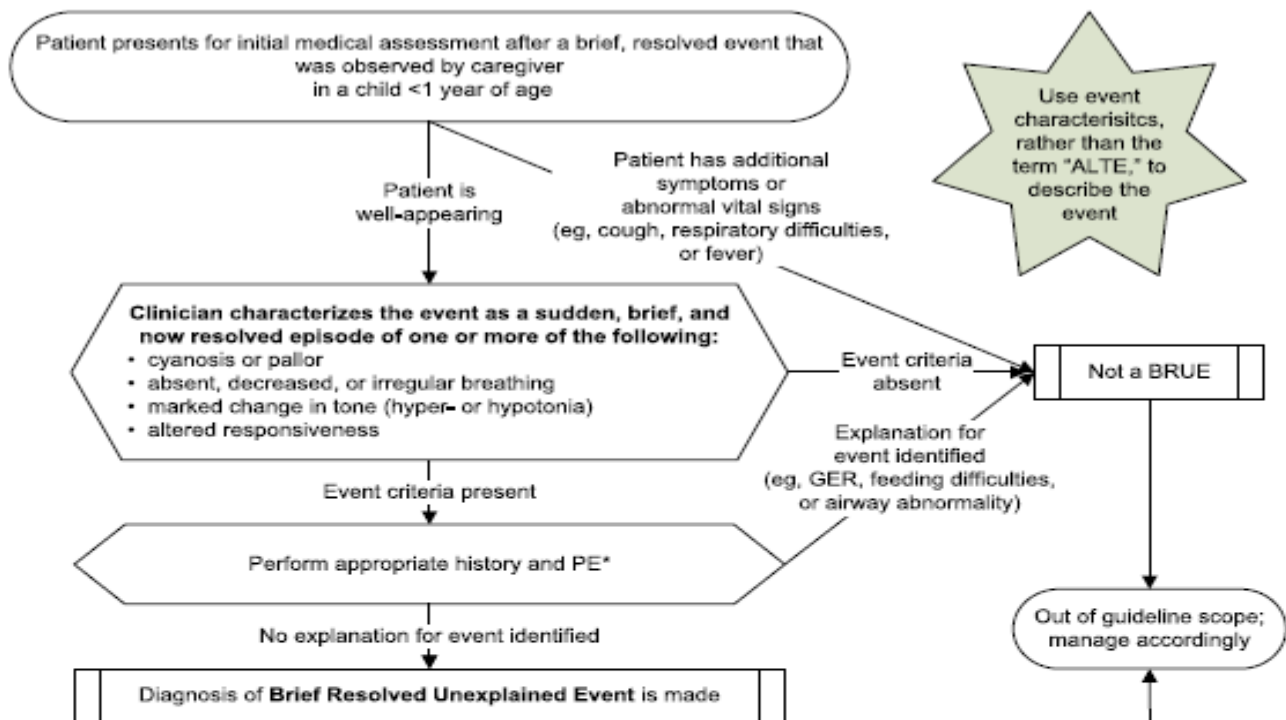
- Depends on the underlying cause of the event
 - Infants with more serious underlying causes typically have poorer outcomes
 - For the majority of lower risk patients, there is no reason to believe there will be long-term sequelae
- Given the uncertainty, it can be challenging to counsel caregivers about prognosis

References

1. Tieder JS, Bonkowsky JL, Etzel RA. Brief resolved unexplained events (formerly apparent life-threatening events) and evaluation of lower-risk infants: Executive summary. *Pediatrics*. 2016; 137(5):e2 0160591.
2. Tieder JS, Bonkowsky JL, Etzel RA, et al. Clinical Practice Guideline: Brief Resolved Unexplained Events (Formerly Apparent Life-Threatening Events) and Evaluation of Lower-Risk Infants. *Pediatrics*. 2016;137(5):e20160590.
3. National Institutes of Health Consensus Development Conference on Infantile Apnea and Home Monitoring, Sept 29 to Oct 1, 1986. *Pediatrics*. 1987;79(2):292–299.
4. Brand DA, Altman RL, Purtill K, Edwards KS. Yield of diagnostic testing in infants who have had an apparent life-threatening event. *Pediatrics*. 2005;115(4):885–893
5. Scollan-Koliopoulos, M., Koliopoulos,. Evaluation and Management of Apparent Life-threatening Events in Infants. *Pediatr Nurs*.2010;36(2):77-84.
6. Tieder JS, Altman RL, Bonkowsky JL, et al Management of apparent life-threatening events in infants: a systematic review. *J Pediatr*.2013;163(1):94–99, e91–e96.
7. Adams M, Chad E, Ward DO, & Garcia, K. L. Sudden Infant Death Syndrome. *Am Fam Physician*. 2015 Jun 1;91(11):778-783.

Thank You

BRUE Diagnosis



BRUE Risk Classification

