BRUE - Brief Resolved Unexplained Events Guideline

INTRODUCTION

Definition:

BRUE (Brief Resolved Unexplained Event) is characterized as a transient episode observed in infants under one year of age, where the observer reports a sudden, brief cessation or alteration in breathing, change in color (pallor or cyanosis), change in muscle tone (increased or decreased), or a marked change in responsiveness. The term underscores the self-limiting nature of the episode, without an apparent cause upon initial assessment.

Incidence:

While the exact frequency of BRUE is difficult to pinpoint due to its broad criteria and reliance on observational reports, it represents a significant number of emergency and primary care visits for infants. The incidents are primarily noted in infants from birth up to 12 months of age.

Etiology:

The causes of BRUE are idiopathic or largely unexplained by definition but are thought to be multifactorial. Potential etiologies can include gastroesophageal reflux (GER), dysphagia and other feeding difficulties, or more rarely, underlying more serious conditions like seizures, cardiac arrhythmias, non-accidental trauma (NAT) or metabolic disorders. The designation of BRUE is used when these episodes resolve spontaneously without intervention.

Differential Diagnosis:

Differential diagnosis for BRUE includes but is not limited to gastroesophageal reflux disease (GERD), epilepsy, breath-holding spells, dysphagia, cardiac arrhythmias, and even rare cases like pertussis, NAT, caregiver fabricated illness or metabolic anomalies. It is crucial to rule out these conditions before confirming a BRUE diagnosis to ensure appropriate management and follow-up.

Diagnosis:

A diagnosis of BRUE is primarily clinical, relying on detailed history-taking and physical examination to rule out more sinister causes and to classify the event as lower or higher risk based on specific criteria.

Table 1: BRUE Low-Risk and High Risk Criteria[1]

Feature	Lower Risk	Higher Risk
Event Duration and Frequency	Single, brief episode lasting less than 1 minute.	Recurrent events or any single event lasting more than 1 minute
Symptoms Observed	Mild cyanosis, brief hypotonia, short apnea that resolves spontaneously.	Prolonged cyanosis, significant changes in muscle tone, persistent apnea requiring intervention.
Medical and Family History	No significant medical or family history of related conditions.	History of neurological, cardiac, or metabolic diseases; family history of SIDS or related conditions.

[1] J. Lawrence Merritt, Ricardo A. Quinonez, Joshua L. Bonkowsky, Wayne H. Franklin, David A. Gremse, Bruce E. Herman, Carole Jenny, Eliot S. Katz, Leonard R. Krilov, Chuck Norlin, Robert E. Sapién, Joel S. Tieder; A Framework for Evaluation of the Higher-Risk Infant After a Brief Resolved Unexplained Event. *Pediatrics* August 2019; 144 (2): e20184101. 10.1542/peds.2018-4101

Response to Event	Quick return to baseline without intervention.	Requires medical intervention, prolonged recovery, or incomplete return to baseline status.
Age and Developmental Context	Older infants 2-12 months, typically developing without delays.	Infants younger than 2 months, or those with developmental delays or health concerns.
Environmental and Social Factors	The event occurs in a safe environment with no suspicion of harm or exposure to toxins.	Potentially unsafe or harmful environments; situations raising concerns about neglect or abuse.

Guideline Inclusion Criteria:

Infants <1 year old at the time of the event

Symptoms Reported by Observer:

- Cyanosis (bluish discoloration of the skin) or pallor.
- Absence, decreased frequency, or irregularity of breathing.
- Significant change in muscle tone, either increased (hypertonia) or decreased (hypotonia).
- Altered level of responsiveness or alertness.

Event Characteristics:

- Sudden onset and brief duration, typically less than one minute.
- Full resolution of symptoms without medical intervention before presentation.

Guideline Exclusion Criteria:

Infants > 1 year old

Presence of fever or other signs suggesting an infectious cause.

Known cardiac, neurological, or metabolic diseases.

Abnormal vital signs

CRITICAL POINTS OF EVIDENCE

Differential Diagnosis:

- Gastroesophageal Reflux Disease (GERD)
- Cardiac Arrhythmias
- Seizure Disorders
- Breath-holding spells
- Dysphagia
- Infections
- Airway abnormalities
- Central Hypoventilation Syndromes
- Metabolic disorders
- Child abuse (Non-accidental trauma)
- Caregiver fabricated illness (medical child abuse)
- Foreign body aspiration

Evidence Supports

- **Lower-Risk Management:** There is strong support for managing lower-risk infants with minimal interventions, focusing on careful history-taking and physical examinations without extensive testing or hospital admissions unless indicated by specific risk factors. ***(Strong recommendation, High-quality evidence)***
- **Safety of Non-hospital Observation:** For lower-risk BRUE patients, observational management without extensive diagnostics in a hospital setting is supported, emphasizing that unnecessary hospitalization does not improve outcomes. ***(Strong recommendation, Moderate-quality evidence)***

Evidence Lacking/Inconclusive

- **Predictive Value of Diagnostic Tests:** There is limited evidence regarding the predictive value of extensive diagnostic testing (such as neuroimaging and comprehensive metabolic testing) in altering the clinical outcomes for BRUE patients, particularly those classified as lower risk.[2] ***(Weak recommendation, Low-quality evidence)***
- **Long-term Outcomes:** The evidence is inconclusive on the long-term outcomes of infants after a BRUE episode, including the risk of recurrent events and whether these events predict more serious underlying conditions. ***(Weak recommendation, Low-quality evidence)***
- **Effectiveness of Specific Interventions:** The benefits of specific interventions such as home monitoring and routine use of certain diagnostic tools (like polysomnography) in preventing future BRUE episodes or detecting serious conditions remain unclear. ***(Weak recommendation, Low-quality evidence)***

Evidence Refutes (Against)

- **Routine Use of Extensive Testing:** The evidence strongly refutes the routine use of extensive testing for lower-risk BRUE patients, including genetic testing, comprehensive metabolic evaluations, and neuroimaging, when the initial evaluation does not indicate a higher risk. ***(Strong recommendation, High-quality evidence)***
- **Hospitalization for Monitoring:** There is a consensus against routine hospitalization for cardiorespiratory monitoring of lower-risk infants, as it does not lead to better diagnostic or therapeutic outcomes and may increase healthcare costs and parental anxiety. ***(Strong recommendation, High-quality evidence)***
- **Overuse of Diagnostic Imaging:** Routine imaging like chest radiographs head CT or MRIs is not recommended without specific indications, as these can lead to unnecessary radiation exposure and healthcare utilization without improving patient care. ***(Strong recommendation, Moderate-quality evidence)***

PRACTICE RECOMMENDATIONS AND CLINICAL MANAGEMENT

Patient Assessment/Diagnosis

Comprehensive History and Physical Examination:

- **History:** It's crucial to obtain a detailed account of the event, including its duration, associated symptoms (like changes in color, breathing, tone, and responsiveness), feeding history (type, route and tolerance) and any potential triggers or preceding activities.
- **Physical Examination:** Should focus on identifying any signs of underlying conditions that could have contributed to the BRUE. This includes examining for signs of trauma, neurological anomalies, or respiratory distress.
- Should also include obtaining a medical and family history (i.e. seizures, SIDS, arrhythmias, sudden death, etc).

Risk Stratification:

- Patients who present with a BRUE should be stratified into lower and higher risk categories based on their age, history and physical examination. Lower-risk patients typically have no concerning history, normal physical examinations, and no worrisome features in their BRUE episode description. Higher-risk patients

[2] Tieder JS, Bonkowsky JL, Etzel RA, et al. Brief Resolved Unexplained Events (Formerly Apparent Life-Threatening Events) and Evaluation of Lower-Risk Infants. Pediatrics. 2016;137(5):e20160590

might exhibit features such as a significant medical history, abnormal physical findings, or severe symptoms during the episode.

Vital Signs Monitoring:

- Continuous monitoring of vital signs during the initial assessment can provide critical data on the stability of the infant and help identify any underlying instability or disorders.

Laboratory Testing

Recommended only if the initial evaluation suggests higher risk or if specific symptoms or history indicate a potential underlying condition that needs further exploration.

Imaging

Not routinely recommended unless indicated by atypical findings or a high-risk assessment.

Management

Observation vs. Intervention:

- **Lower-risk Patients:** These patients can often be managed with observation alone, without the need for extensive diagnostic testing or hospital admission, unless new symptoms arise or the initial assessment changes.
- **Higher-risk Patients:** Might require more immediate and aggressive interventions, including further diagnostic testing and potentially hospital admission.

Consults and referrals

Consider referral to specialists if initial assessment indicates potential underlying conditions not directly explainable as a typical BRUE. Speech therapy and/or Lactation consultation is especially helpful if history suggests dysphagia or overfeeding with choking.

PATIENT DISPOSITION

Admission Criteria

Generally not required for typical, low-risk BRUE; consider if high-risk features are present.

PICU Admission Criteria

Appropriate for infants with severe presentations that require intensive monitoring or intervention

Discharge Criteria

Stability with normal observation during the brief monitoring period, parental reassurance achieved, and follow-up care planned.

Follow-up

Routine follow-up with primary care or as directed by clinical findings during the event assessment.

OUTCOME MEASURES

- Rate of hospital readmissions related to recurrent BRUE or development of related conditions.
- Number and type of diagnostic tests ordered for patients with a BRUE diagnosis.
- Number of emergency department visits for BRUE or similar symptoms following the initial episode.

PREVENTION

- **Safe sleep practices**
  - Adherence to safe sleep guidelines as recommended by the American Academy of Pediatrics to reduce risks associated with sleep environments. Smoking cessation guidance is also indicated.
- **Caregiver Education**
  - Educating caregivers about BRUE, including what to monitor for and when to seek further medical attention, is essential. Offering community infant CPR training may also be helpful for caregivers. This helps in reducing anxiety and equipping them with the knowledge to handle potential future events.
- **Feeding Techniques**
  - Instruction on proper feeding techniques and positions to prevent episodes that might be related to feeding difficulties or gastroesophageal reflux.
- **Monitoring for Risk Factors**
  - Early identification and monitoring of infants with known risk factors for BRUE, such as prematurity, a history of recurrent respiratory infections, or a family history of similar episodes.

Methods

Existing External Guidelines/Clinical Pathways

Existing External Guideline/Clinical Pathway	Organization and Author	Last Update
Children's Mercy Kansas City - BRUE	Children's Mercy Kansas City - BRUE	May 2024
CHOP - BRUE algorithm	CHOP - BRUE algorithm	Feb 2025
Connecticut Children's - BRUE algorithm	Connecticut Children's - BRUE algorithm	Jan 2021
John Hopkins BRUE	John Hopkins BRUE	Aug 2024
Nationwide Children's BRUE Clinical Pathway	Nationwide Children's BRUE Clinical Pathway	April 2024
Texas Children's Hospital BRUE	Texas Children's Hospital BRUE	Feb 2019

Any published clinical guidelines have been evaluated for this review using the **AGREE II criteria**. The comparisons of these guidelines are found at the end of this document. **AGREE II criteria** include evaluation of: Guideline Scope and Purpose, Stakeholder Involvement, Rigor of Development, Clarity of Presentation, Applicability, and Editorial Independence.

Review of Relevant Evidence: Search Strategies and Databases Reviewed

Search Strategies	Document Strategies Used
Search Terms Used:	BRUE, Brief Resolved Unexplained Event, SUID, SIDS, ALTE, Apparent Life-Threatening Event
Years Searched - All Questions	2000 - 2025
Language	English
Age of Subjects	0-18 years old
Search Engines	PubMed, Scholar Google
EBP Web Sites	
Professional Organizations	www.Healthychildren.org American Academy of Pediatrics (AAP) Pediatric Academic Societies (PAS) American College of Emergency Physicians (ACEP)
Joint Commission	
Government/State Agencies	CDC - U.S. Centers for Disease Control and Prevention (www.cdc.gov) American Academy of Pediatrics (www.aap.org)
Other	

Evaluating the Quality of the Evidence

The GRADE criteria were used to evaluate the quality of evidence presented in research articles reviewed during the development of this guideline. The table below defines how the quality of evidence is rated and how a strong versus a weak recommendation is established.

Recommendation	
Strong	Desirable effects clearly outweigh undesirable effects or vice versa
Weak	Desirable effects closely balanced with undesirable effects
Type of Evidence	
High	Consistent evidence from well-performed RCTs or exceptionally strong evidence from unbiased observational studies
Moderate	Evidence from RCTs with important limitations (e.g., inconsistent results, methodological flaws, indirect evidence, or imprecise results) or unusually strong evidence from unbiased observational studies
Low	Evidence for at least 1 critical outcome from observational studies, from RCTs with serious flaws or indirect evidence
Very Low	Evidence for at least 1 critical outcome from unsystematic clinical observations or very indirect evidence

References

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EBOC Project Owner: Dr. Marion Forbes, MD (PCRS)

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Guideline Revision History	
May 2025	Version 1.0 of BRUE guideline developed and published to EBOC

BRUE EBOC Team:
Marion Forbes, MD (PCRS)
Jason Fullmer, MD
Chidi Ugwu, MD (ED)
Michael Swindle, MD (PCRS)
Arnie Fenrich, MD (CARDS)
Byron Holt, MD (CARDS)
Brian Kang, MD (Pulmonology)
Carmen Garudo, EBOC PM

EBOC Leadership Committee:
Lynsey Vaughan, MD
Sarmistha Hauger, MD
Patty Click, DNP
Sheryl Yanger, MD
Lynsey Vaughan, MD
Tory Meyer, MD
Nilda Garcia, MD
Meena Iyer, MD
Amanda Puro, MD