

BRUE: Brief, Resolved, Unexplained Event

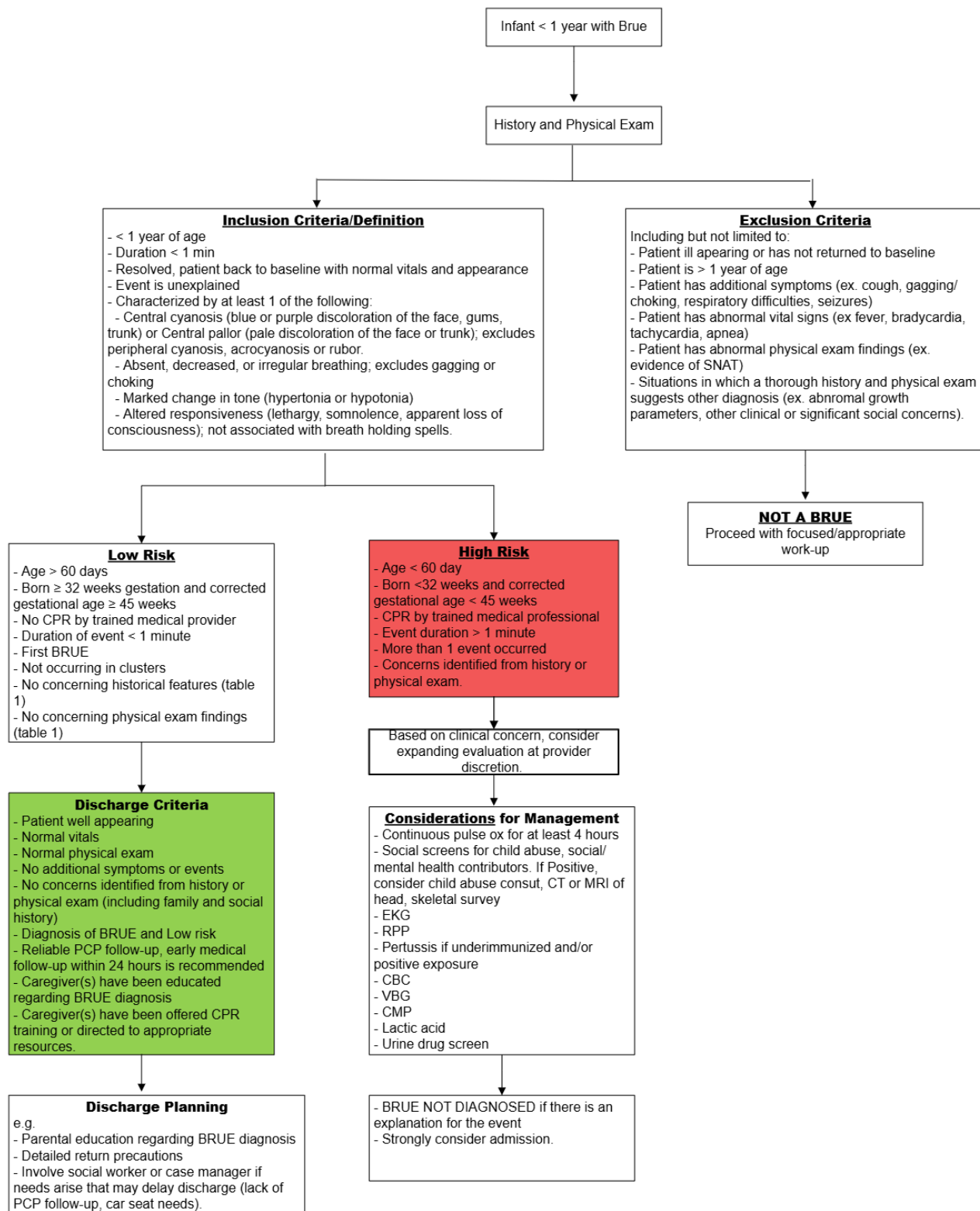
Phoenix Children's Clinical Pathway

Disclaimer: This clinical pathway is intended to provide general guidance and should not replace clinical judgment. It is meant to assist licensed practitioners and other health care providers in clinical decision-making by describing a range of generally acceptable approaches to the diagnosis and management of a particular condition. A particular patient's circumstances should always be taken into account when a practitioner is deciding on a course of management. This clinical pathway is current as of the date of publication and will be reviewed periodically to align with any updated best practices or evidence; however, new development may not be represented in the published version. The treating practitioner assumes all risks associated with care decisions. Phoenix Children's accepts no liability for the content of this clinical pathway or the outcomes a patient might experience where a practitioner consulted the content of this clinical pathway.

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BRUE Pathway Flow Diagram/Algorithm



Scope and Definitions

Definition of BRUE (Brief, Resolved, Unexplained, Event):

1. Brief (<1 minute), often 20-30 seconds
2. Resolved, patient has returned to their baseline state of health with normal vitals and appearance
3. Unexplained, thus, not explained by another identifiable medical condition such as reflux, breath holding, seizure, respiratory infection, among others.
4. Event, characterized by at least 1 of the following:
 - a. Central cyanosis (blue or purple discoloration of face, gums, trunk), or Central pallor (pale discoloration of the face or trunk); excludes peripheral cyanosis, acrocyanosis or rubor.
 - b. Absent, decreased, or irregular breathing; excludes gagging or choking.
 - c. Marked change in tone (hypertonia or hypotonia).
 - d. Altered responsiveness (lethargy, somnolence, apparent loss of consciousness); not associated with breath holding spells

Inclusion Criteria: Infants (<1yo) presenting to a Phoenix Children's (PC) facility after a brief resolved unexplained event (BRUE), previously referred to as "apparent or acute life-threatening event" (ALTE).

Exclusion Criteria: Infants who do not meet BRUE criteria, including but not limited to:

- Patient is ill appearing or has not returned to baseline
- Event duration \geq 1 minute (or occurring in clusters)
- Patient is > 1 year of age
- Patient has additional symptoms, e.g. cough, gagging/choking, respiratory difficulties, seizures
- Patient has abnormal vital signs, e.g. fever, bradycardia or tachycardia, apnea
- Patient has abnormal findings on physical exam, e.g. evidence of SNAT
- Situations in which a thorough history and physical suggests other medical diagnoses e.g. abnormal growth parameters, other clinical or significant social concerns

Pathway Goals

1. Assist providers with establishing the diagnosis of BRUE (formerly ALTE)
2. Help providers identify infants as "low-risk" or "high-risk" based on likelihood that the infant will have a repeat event or has a serious underlying disorder
3. Familiarize providers with current guidelines and recommendations
4. Emphasize the importance of a thorough history and physical exam with vigilance to child protection concerns.
5. Emphasize parental reassurance, education, CPR training and conservative management when appropriate.

6. Reduce unnecessary and costly medical interventions, including unnecessary admissions and tests.
7. Optimize length of stay for “low-risk” BRUE patients evaluated in the ED and for those that are directly admitted.
8. Provide a patient and family centered approach to care using shared decision making.

Key Clinical Recommendations with Evidence Based Supporting Material

1. Obtain history, including social history, and perform physical exam to determine if patient meets BRUE criteria. BRUE should be diagnosed only when there is no explanation for a qualifying event (ex: reflux, overfeeding as a plausible explanation).
2. If BRUE criteria met, stratify as “low-risk” or “high-risk”
3. If an explanation for an event is identified or if additional symptoms/abnormal vital signs exist then it is, by definition, not a BRUE and does not meet criteria for use of this pathway

Evidence Based Supporting Material

Historically, apparent (or acute) life threatening events account for approx. 0.6-1.7% of all ED visits for infants younger than 1 year of age, with a median age of 1-3 months. The term ALTE (along with ‘near SIDS,’ etc.) are antiquated terms that instill a sense of fear in caregivers and an implicit, secondary motivation to intervene (or perform testing) in providers. The term ALTE is broad, vague and relies heavily on the subjective reporting of a caregiver. An extensive list of common conditions such as infections, reflux and seizures were often considered contributing factors. Additionally, there has been wide variation in the workup and management of ALTE(s).

Several retrospective studies have investigated the effectiveness of routine laboratory workup in infants with ALTE and found no evidence that routine testing improved identification of a cause. Routine screening for diseases and other pathology were found to be extraneous. Over the past decade, studies have revealed low rates of severe conditions associated with ALTE, and have proven that ALTE and SIDS are not linked.

In 2016, the American Academy of Pediatrics published a clinical practice guideline for the newly adapted term, Brief Resolved Unexplained Event (BRUE), with a critical update published in 2019 delineating low and high-risk criteria. The guidelines stress the importance of observation over intervention, emphasizing the lack of benefit provided by laboratory testing in low-risk patients. A considerable change from previous practice is the emphasis on preventing unnecessary admissions to the hospital and on reducing excessive testing.

Risk Prediction:

There is insufficient evidence to guide the management of higher-risk infants. A large retrospective study found that of patients classified as high risk and requiring hospitalization, 4% were diagnosed with a serious underlying condition (seizures/epilepsy, airway abnormalities, severe dysphagia, or gastroesophageal reflux).

Risk Stratification

High Risk BRUE:

1. Age < 60 days
2. Born < 32 weeks gestation and corrected gestational age <45 weeks
3. CPR by trained medical professional, event lasted > 1 minute
4. More than 1 event occurred
5. Concerns identified from history or PE

Low Risk BRUE:

1. Age > 60 days
2. Born ≥ 32 weeks gestation and corrected gestational age ≥ 45 weeks
3. No CPR by trained medical provider
4. Duration of event < 1 minute
5. First BRUE. No previous BRUE ever. Not occurring in clusters
6. No concerning historical features (Table 1)
7. No concerning physical examination findings (Table 1)

Admission Criteria

1. Event meets criteria for BRUE and deemed 'high risk' after risk stratification.
 2. Concerns identified from history or physical examination, e.g. FHx of sudden cardiac death, concern for abuse.
 3. No PCP identified and/or reasonable attempts to provide outpatient follow up with PCP cannot be confirmed.
- *Decision to admit is based on clinician discretion after considering the entire clinical picture*

Considerations for Management

Initial evaluation and management considerations for higher-risk patients (ambulatory or ED setting):

- Continuous pulse oximetry for at least 4 hours
- Social screens for child abuse, social, and mental health contributors. If positive, consider child protection/abuse consult, CT or MRI of head, skeletal survey, and/or other SNAT workup.
- EKG
- Respiratory PCR panel
- Pertussis respiratory PCR if under-immunized and/or positive exposure
- Hemoglobin/hematocrit
- Blood glucose, bicarbonate level or VBG, lactic acid
- Urine Drug Screen

If there is an explanation for event, it is no longer considered a BRUE. Please refer to Table 2 for possible differential diagnoses to consider. Please note that this list is by no means exhaustive, and an individualized

approach to diagnosis and management of the higher risk BRUE patient is recommended. If an event does not meet any of the explanations, then strongly consider admission.

Discharge Criteria

- Patient is well appearing with normal vital signs, normal physical exam, and no additional symptoms or events.
- No concerns identified from history or physical examination (including family and social history).
- Diagnosis of BRUE is made and considered 'low risk' after risk stratification.
- Reliable PCP follow-up; early medical follow-up within 24 hours is recommended.
- Caregiver(s) have been educated regarding BRUE diagnosis.
- Caregiver(s) have been offered CPR training or directed to appropriate resources.

Patient and Family Education/Discharge Planning

- Parental education regarding BRUE diagnosis
- Detailed return precautions
- Involve social worker or case manager upon admission if needs arise that may delay discharge (ex: lack of PCP follow up, car seat needs, etc.)

References

1. Arane, K., Claudius, I., Goldman, RD. (2017, January). Brief resolved unexplained events: New diagnosis in infants. *Canadian Family Physician*. 63(1): 39-41.
2. Bin, S., Chow, J., (2017, February 1). PEM Pearls: Brief resolved unexplained events (BRUE).
3. [Online]. <https://www.aliem.com/2017/02/pem-brief-resolved-event-brue/>.
4. Clinical practice guidelines: Brief resolved unexplained event (BRUE). The Royal Children's Hospital, Melbourne, Australia. [Online].
5. https://www.rch.org.au/clinicalguide/guideline-index-Brief_Resolved_Unexplained_Event_BRUE/.
6. Hauk, L., (2017, March 1). AAP releases guideline on brief resolved unexplained events (BRUEs) and evaluation of lower-risk infants. *American Family Physician*. 95(5): 330-331.
7. 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
8. Mittel, M. et al., (2017, March). ED pathway for evaluation of infants with a BRUE. Children's Hospital of Philadelphia. [Online]. <https://www.chop.edu/clinicalpathway/briefresolvedunexplainedevent-clinical-pathway/>. Poets, C.F., Apparent life-threatening events (ALTE) or brief resolved unexplained events (BRUE). (2017). *Pediatrics and Child Health (United Kingdom)*. 27:5 (215-221).
9. Nasser, N. et al. (2022, September). Risk Prediction After a Brief Resolved Unexplained Event. *Hospital Pediatrics*. 12(9): 772-785

10. Tate, C., Sunley, R., (2017, September, 18). Brief resolved unexplained events (formerly apparent life threatening events) and evaluation of lower-risk infants. *Arch Dis Child. Edu Pract Ed*. DOI: 10.1136/archdischild-2016-311249.
11. Tieder, J. (2016, June 26, 12:00 pm). Associate professor. *Brief resolved unexplained events lecture*. Seattle Children's Hospital. Seattle, WA.. [Online].
12. Tieder, J. et al. (2016, May). Brief resolved unexplained events (formerly known as apparent life-threatening events) and evaluation of lower-risk infants: Executive summary. [Erratum appears. (2016, August)]. *Pediatrics*. 138(2). Pii: e20161488. doi:101542/peds. 2016-1488]. *Pediatrics*. 137(5). DOI: 10.1542/peds.2016-0591. [Online]. <https://pediatrics.aappublications.org/>.
13. Tieder JS, Bonkowsky JL, Etzel RA, et al; Subcommittee on Apparent Life Threatening Events. Clinical Practice Guideline: Brief Resolved Unexplained Events (Formerly Apparent Life-Threatening Events) and Evaluation of Lower-Risk Infants. *Pediatrics*. 2016;137(5):e20160590. *Pediatrics* July 2019; 144 (1): e20191360. 10.1542/peds.2019-1360
14. Triemstra, J. (2017, July 1). The cost of hospital admission: Brief resolved unexplained events. *Pediatric Annals*. 46(7): e262-e264.
15. [Online]. AAP.org. BRUE Key Diagram Driver. Caregiver Handouts. Brief resolved unexplained events: What parents and caregivers need to know.
16. Smith, J. D., & Johnson, L. K. (n.d.). *Brief resolved unexplained event clinical pathway*. Pathways. Retrieved December 11, 2024, from <https://pathways.chop.edu/clinical-pathway/brief-resolved-unexplained-event-clinical-pathway>

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Table 1: History & Physical Exam Considerations

History	Findings
Event Characteristics	Preceding illness or injury Event Description: Location, position, feeding, environment, timing of event Choking, gagging Tone, movement Mental status Level of distress Color change- pallor, red, blue Breathing ability- apnea, shallow breathing, or difficulty breathing Duration, interventions, return to baseline
Pertinent Past	Prematurity (gestational age < 32 weeks) Previous episode, BRUE diagnosis Newborn screening results Growth and development Breathing problems Reflux Medications
Family	Sudden unexplained death Cardiac disease, arrhythmias Metabolic/genetic disease
Social	Environment, exposures, illness contacts Family structure, individuals in home Caretakers Stressors Specific/relevant social history (e.g. sleeping/co-sleeping, sleep surface) Considerations for possible child abuse: Previous children service/law involvement Inconsistency of event history, history not compatible with age Unexplained PE findings (e.g. bruising)

Physical Exam	Findings
Vital Signs	Temp, HR, RR, BP, oxygen saturation
Growth	Weight, head circumference
General appearance	Craniofacial abnormalities, age-appropriate responsiveness
Head/neck	Shape, fontanelles, evidence of injury, neck mobility
Eyes	Pupillary response, conjunctival hemorrhage
Otolaryngology	TMs, congestion/coryza, blood presence, torn frenulum or evidence of bruising or other trauma
Cardiorespiratory	Increased work of breathing, abnormal breath sounds. Abnormal rhythm, rate, auscultation findings
GI/GU	Organomegaly, masses, distension, tenderness, GU abnormalities
Extremities	Muscle tone, deformity
Neurologic	Alertness, tone, reflexes, movement and strength symmetry
Skin	Color, perfusion, bruising, erythema

Table 2: Differential Diagnoses

Diagnosis Category	Differentials
Child Maltreatment	Abusive head trauma Non-accidental trauma Suffocation Medical child abuse Poisoning/Ingestion
Gastrointestinal	GERD Over-feeding Dysphagia/aspiration Laryngospasm TE fistula Esophageal stricture Vascular slings/rings Achalasia
Pulmonary	Structural airway abnormalities Obstructive apnea Central apnea Parenchymal disease Periodic breathing

Neurologic	Seizures Structural brain abnormalities Progressive neurological disease Infantile spasms Neuromuscular disease
Cardiac	Arrhythmias Congenital heart disease Long QT syndrome Cardiomyopathy
Hematologic	Anemia Bleeding
Infectious Diseases	Sepsis Meningitis Encephalitis Pneumonia UTI Respiratory infections (RSV, pertussis, etc.) Other bacterial/viral infections
Metabolic/Inborn Errors of Metabolism	Urea cycle disorders Fatty acid oxidation disorders Organic acidemias Lactic acidemias