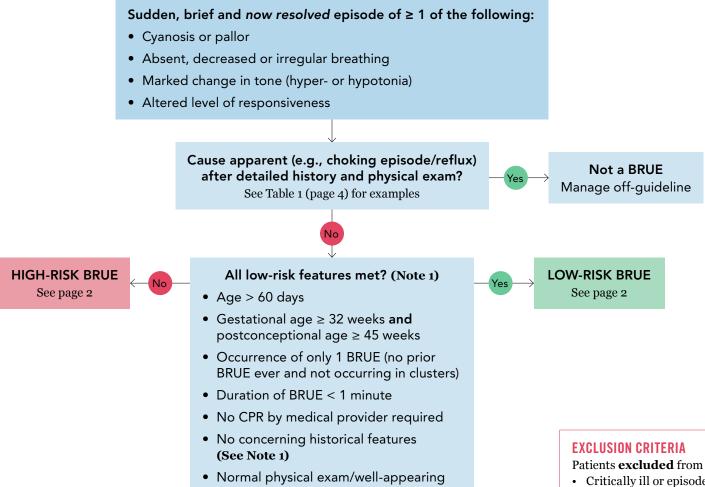


(Infants age < 1 year)

Aim: To reduce variation in management and unnecessary resource utilization for patients with BRUE.



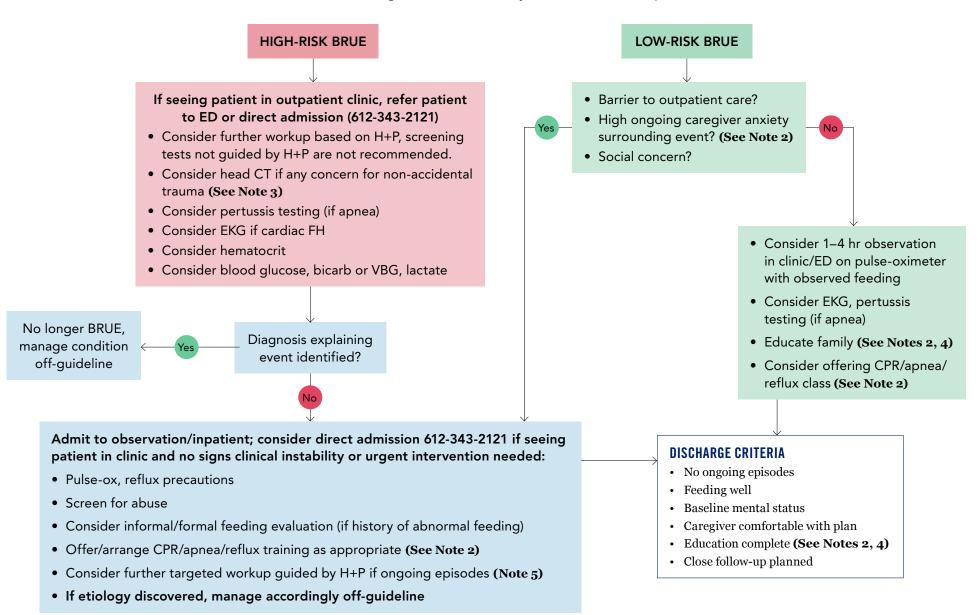
Patients **excluded** from this guideline:

- · Critically ill or episode not resolved
- Complex chronic condition
- Apparent cause to episode (e.g., choked on milk, obvious reflux event, bronchiolitis, periodic breathing)
- Young infants with a temperature $< 36.0 \text{ or } \ge 38.0 \text{ should be evaluated}$ per febrile infant guideline.

(Infants age < 1 year)



Aim: To reduce variation in management and unnecessary resource utilization for patients with BRUE.



(Infants age < 1 year)



Aim: To reduce variation in management and unnecessary resource utilization for patients with BRUE.

NOTE 1

A recent study (Tieder et.al. Pediatrics 2021) found that 87% of patients presenting with BRUE had at least 1 AAP higher-risk factor. Revisits occurred in 6.9% of ED and 10.7% of hospital discharges. A serious diagnosis was made in 4.0% (82) of cases; 45% (37) of these diagnoses were identified after the index visit. The most common serious diagnoses included seizures (1.1% [23]) and airway abnormalities (0.64% [13]). Risk is increased for a serious underlying diagnosis for patients discharged from the ED with a history of a similar event, an event duration > 1 minute, an abnormal medical history, and an altered responsiveness (P < .05). AAP risk criteria for all outcomes had a negative predictive value of 90% and a positive predictive value of 23%.

A second, similar, study by Bochner et. al. found that among 980 infants hospitalized after an ED visit for a BRUE without an explanatory diagnosis at admission, 363 (37.0%) had an explanatory diagnosis identified during hospitalization. In 805 (82.1%) infants, diagnostic testing, specialty consultations, and observed events did not contribute to an explanatory diagnosis, and, in 175 (17.9%) infants, they contributed to the explanatory diagnosis (7.0%, 10.0%, and 7.0%, respectively). A total of 15 infants had a serious diagnosis (4.1% of explanatory diagnoses; 1.5% of all infants hospitalized with a BRUE), the most common being seizure and infantile spasms, occurring in 4 patients.

NOTE 2

Key points for family education:

- BRUE ≠ Near-miss SIDS
- Approx. 9/10 patients do not have future BRUEs
- · Home monitors are **not** recommended
- Children's Minnesota Respiratory Therapy offers weekly CPR classes: please call the CPR hotline at 651-220-5279 for both campuses

St, Paul Apnea Program - 651-220-6267

- **GER/Reflux Class:** 1:1 family education with Apnea Program RN includes management of reflux symptoms (with or without danny sling for upright positioning), CPR and 24/7 RN telephone support.
- Apnea Home Monitor Class: 1:1 family education
 with Apnea Program RN and Medical Equipment
 company includes overview of normal and abnormal
 infant breathing patterns, equipment, home apnea
 monitor alarm response, CPR and 24/7 RN telephone
 support post discharge.

Minneapolis Apnea Program - 612-813-5831

- **GER/Reflux Class:** 1:1 family education with Apnea Program RN includes management of reflux symptoms (with or without danny sling for upright positioning), CPR and 24/7 RN telephone support.
- Apnea Home Monitor Class: 1:1 family education
 with Apnea Program RN and Medical Equipment
 company includes overview of normal and abnormal
 infant breathing patterns, equipment, home apnea
 monitor alarm response, CPR and 24/7 RN telephone
 support post discharge.
- CPR Class: 1:1 family education with Apnea Program RN for CPR instruction.

NOTE 3

In one study multivariate analysis revealed odds ratio for abusive head trauma were 4.9 with a 911 call (P = .037), 5.3 with vomiting (P = .024) and 11.9 with irritability (P = .0197). Clinicians should have a high index of suspicion for abuse and evaluate for bruising, torn frenulum, inconsistent event description, Munchhausen syndrome by proxy and a family history of abuse.

NOTE 4

GER is suspected in approx. 50% of BRUE cases, but causality is difficulty to prove. No studies have assessed if GER medications are useful. Recommend educating families on side effects of medications and desire to avoid in children.

Reflux precautions may include:

- · Assess for overfeeding
- Burp during feeding
- · Hold upright after feeding
- · Consider elevating HOB
- · Consider Danny sling
- Reflux/apnea class: (See Note 2)
- Avoid smoke exposure

NOTE 5

Considerations for additional workup if ongoing episodes or concerns on history/exam.

Consider consultation if concern for specific underlying etiology:

- Gastroenterology
- Otolaryngology
- Pulmonary or sleep expert
- · Child abuse expert
- Neurology
- · Cardiology
- · Biochemical genetics

Consider additional testing in combination with specialty consultation:

- Videofluoroscopic swallowing study for "silent" aspiration not seen in bedside evaluation
- Continuous prolonged oximetry to characterize recurring events
- Sleep study to characterize and quantify central versus obstructive apnea
- Prolonged (12-24 hours) EEG
- · BMP and ammonia for metabolic disturbance

Children's

(Infants age < 1 year)

Aim: To reduce variation in management and unnecessary resource utilization for patients with BRUE.

TABLE 1: Examples of additional H+P features to assess

(See AAP guideline Tieder et. al. 2016 for more details)

Event	Exam	Past history	Family history	Social history
What happened before/after	Bruising/torn frenulum? Vomiting?	Birth and perinatal history, gestational age, newborn screen	Sudden unexplained death (single-car accident/ drowning)?	Exposure to smoke/ molds/toxins?
Duration + location	Engages with caregiver?	History of bruising?	BRUE/ALTE/SIDS in family member?	Recent stressors?
Is the story consistent and plausible?	Tone and strength?	History of reflux?	Long QT syndrome or other arrhythmia?	Support system and access to resources?
Interventions (back blows, CPR, 911)?	Fontanelle soft?	Previous BRUE or concerning movements?	Genetic/neurologic diseases?	Previous CPS/ law enforcement involvement?
Recent illness or changes? Use of OTC medications?	Cardiac and lung sounds?	Development and growth normal?	Substance abuse or mental illness?	Exposure to infectious diseases (e.g., pertussis)?

(Infants age < 1 year)



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TABLE 2: Potential Causes of BRUE in Higher-Risk Infants

(See AAP Framework Merritt et.al. 2019 for more details)

Child maltreatment	Gastrointestinal	Pulmonary	Other
 Abusive head trauma Purposeful suffocation Medical child abuse Poisoning 	 GERD Oropharyngeal dysphagia Laryngospasm Nasopharyngeal reflux Tracheoesophageal fistula Esophageal stricture Extraesophageal vascular slings Cricopharyngeal achalasia 	 Obstructive apnea Upper airway structural abnormality Lower airway structural abnormality (e.g., laryngomalacia and laryngeal cleft) Respiratory dysrhythmias Central apnea Meningitis Head trauma Congenital central hypoventilation syndrome Congenital brain abnormality Parenchymal disease Infection Pneumonitis from "microaspiration" 	 Anemia Periodic breathing
Neurology	Cardiology	Infectious disease	Inborn errors of metabolism
 Epilepsy and seizures Structural brain abnormalities Progressive neurologic disease Infantile spasms Neuromuscular disorder Tuberous sclerosis Benign neonatal epilepsy syndrome Maternal myotonic dystrophy 	 Cardiac arrhythmias Congenital heart disease LQTS Cardiomyopathy (dilated or hypertrophic) 	 Bacterial infections (e.g., sepsis, meningitis, pneumonia and urinary tract infections) Respiratory viruses, including RSV Pertussis Viral meningitis 	 Urea cycle disorders Fatty acid oxidation disorders Organic acidemias Lactic acidemias

Children's

(Infants age < 1 year)

Aim: To reduce variation in management and unnecessary resource utilization for patients with BRUE.

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