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# **Brief Resolved Unexplained Events: Implications of the new AAP practice guidelines for the practicing pediatrician**

CRAIG DEWOLFE, MD MED  
DIVISION OF HOSPITALIST MEDICINE

# Objectives

- Differentiate Apparent Life Threatening Event from Brief Resolved Unexplained Event (BRUE)
- Apply current literature to limit testing and hospitalization in low risk infants who present with BRUE
- Discuss indications for hospitalization, interventions, and follow-up care among high risk patient presenting with BRUE



## Case

A 4 month old previously healthy full term patient well known to the practice presents:

- 2 hours after a choking episode during a feed.
- He arched his back, became momentarily stiff and turned a ruddy red.
- Event lasted 45 seconds and resolved with gentle stimulation and patting on the back.
- No rhythmic movement & no loss of consciousness.
- He has since returned to baseline with no subsequent events



17th old previously healthy patient well known to you

presents 2 hours after a choking episode during which he was unable to breathe

I think to myself:

Why is the patient here? He should have gone to the ED.

Well that must have been scary. Barring surprises, I should be able to reassure the family and discharge home.

Hmm... Let the work-up begin.

the CXR or reflux studies

abnormal. I'm definitely referring him

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# ALTE / BRUE



Edvard Munch

1893

National Gallery Oslo, Norway



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# Population of an ALTE



National Institutes of Health Consensus Development Conference on Infantile apnea and home monitoring. Pediatrics 1987;79:292-9.

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## In the 30 years since the statement, we have ...

- Defined a population of patients
- Cut the connection with SIDS
  - Erased “Near-miss SIDS” and “Aborted Crib Death” from our lexicon
- Tried monitors and then stopped using them
  - No impact on mortality (as opposed to back to sleep)
  - Increased parental anxiety
- But reached the end of its usefulness
  - Too broad a scope
  - A scary term with little practical benefit



# But is this a BRUE?

- A Brief Resolved Unexplained Event
- Described by Tieder et al, in an AAP Clinical Practice Guideline from May 2016

CLINICAL PRACTICE GUIDELINE Guidance for the Clinician in Rendering Pediatric Care

American Academy  
of Pediatrics



DEDICATED TO THE HEALTH OF ALL CHILDREN™

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

Joel S. Tieder, MD, MPH, FAAP, Joshua L. Bonkowsky, MD, PhD, FAAP, Ruth A. Etzel, MD, PhD, FAAP, Wayne H. Franklin, MD, MPH, MMM, FAAP, David A. Gremse, MD, FAAP, Bruce Herman, MD, FAAP, Eliot S. Katz, MD, FAAP, Leonard R. Krilov, MD, FAAP, J. Lawrence Merritt II, MD, FAAP, Chuck Norlin, MD, FAAP, Jack Percelay, MD, MPH, FAAP, Robert E. Sapien, MD, MMM, FAAP, Richard N. Shiffman, MD, MCIS, FAAP, Michael B.H. Smith, MB, FRCPC, FAAP, for the SUBCOMMITTEE ON APPARENT LIFE THREATENING EVENTS



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# Population of a BRUE



National Institutes of Health Consensus Development Conference on Infantile apnea and home monitoring. Pediatrics 1987;79:292-9.

What distinguishes an ALE from a BRUE?



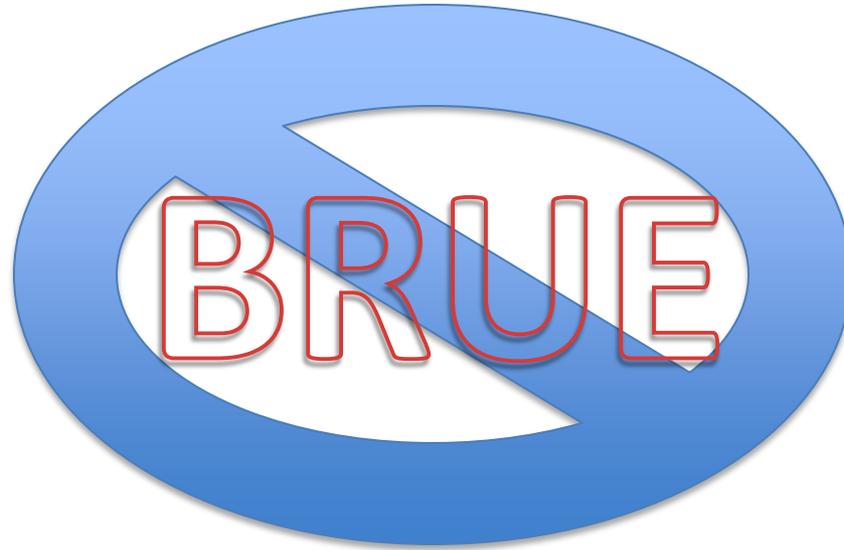
## Case

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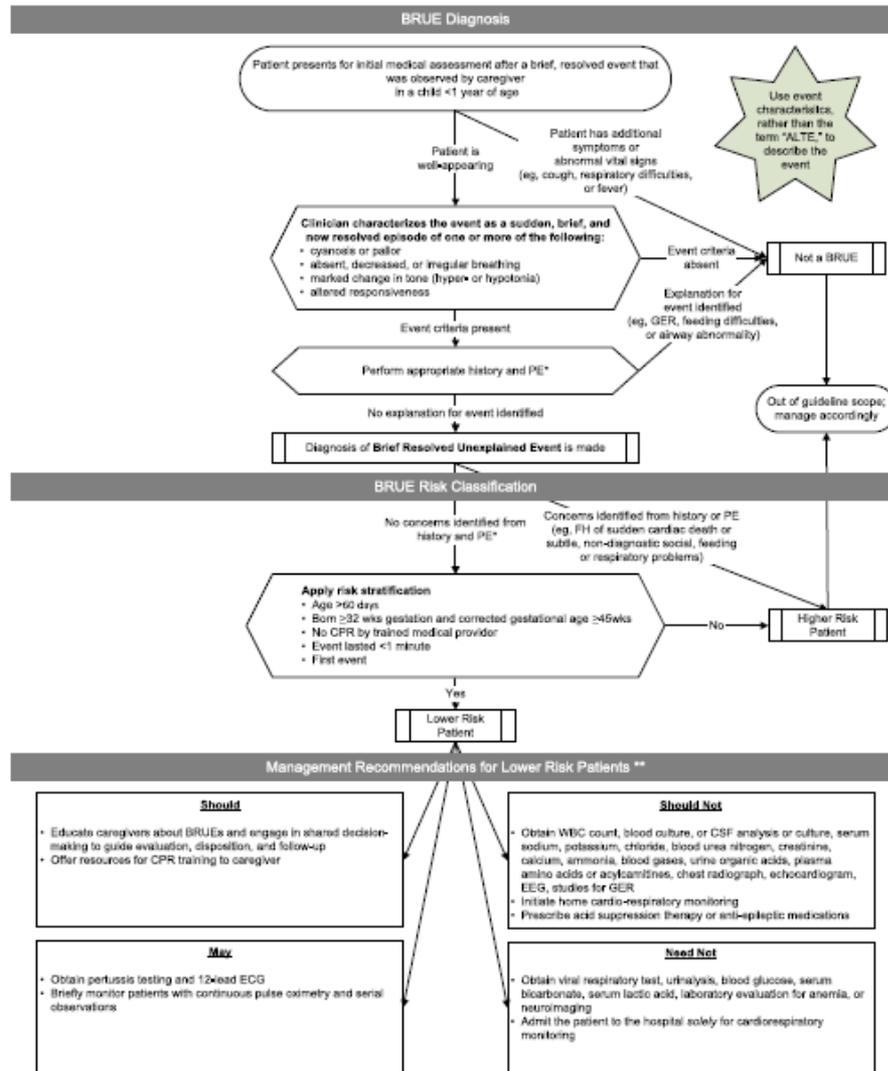
# 4 month old with a choking episode



## Other uses of the BRUE Clinical Practice Guideline

- Focuses on event characteristics rather than the term “ALTE”
- Defines a subset of patients who are **asymptomatic** at the time of presentation and ultimately have no “**unexplainable event**”
- Divided them into **high risk / low risk criteria** in order to apply the literature to date
- Set a new research agenda





**FIGURE 1**

Diagnosis, risk classification, and recommended management of a BRUE. \*See Tables 3 and 4 for the determination of an appropriate and negative FH and PE. \*\*See Fig 2 for the AAP method for rating of evidence and recommendations. CSF, cerebrospinal fluid; FH, family history; 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 (eg, cough, respiratory difficulties, or fever)

Use event characteristics, rather than the term "ALTE," to describe the event

**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 absent

Not a BRUE

Explanation for event identified (eg, GER, feeding difficulties, or airway abnormality)

Event criteria present

Perform appropriate history and PE\*

No explanation for event identified

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

Out of guideline scope; manage accordingly



# When would the diagnosis of BRUE be appropriate?

BRUE	
Brief	Resolved by presentation to ED
Resolved	Returned to baseline, normal VS, appearance, exam
Unexplained	Not explained after thorough H&P
Event	Color change, changes in respiration, changes in tone, altered responsiveness



## Case #2: 4 month old presents with apnea

- 4 month old, former term female, well known to your practice was found by the parent asleep on her back, blue around the lips and not breathing
- Unclear duration – but between 20 seconds to a minute
- Parent picked the infant up, percussed the back and pinched the finger
- Within 20 seconds of picking her up, the patient cried out and the color immediately normalized
- No loss of tone, rhythmic movement, or vomiting
- She has been normal since
- No subsequent events (over the next 2 hours)



4 month old with ? Central apnea



**Your exam is normal**

Could this case be described as a BRUE?

Yes

No

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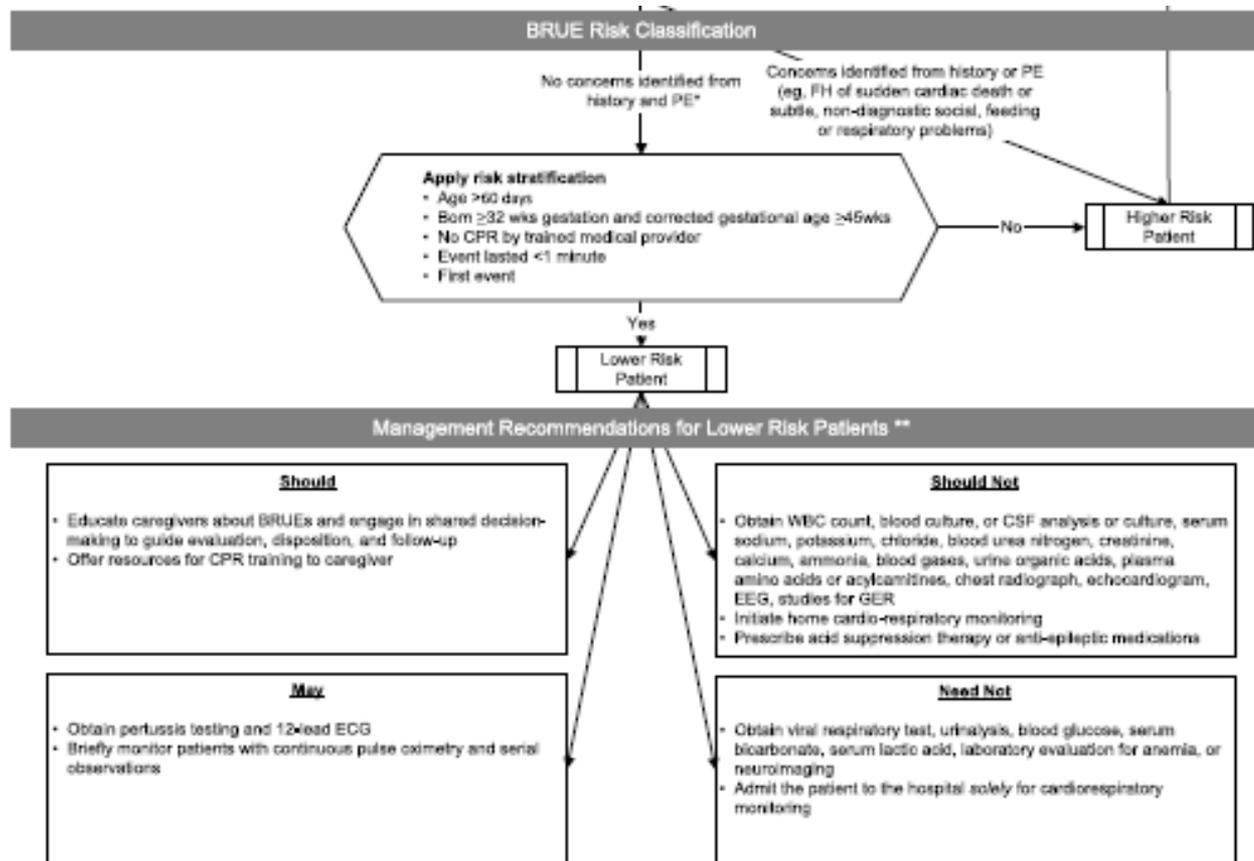
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# What do you do?

- Is this a BRUE?
  - Yes
- Would you refer?
  - Your call
- Should she be admitted?
  - Not necessarily



# How do you risk stratify the patient and manage her?



# Low Risk BRUE

- > 60 days
- Born  $\geq 32$  weeks gestation and corrected gestational age  $\geq 45$  weeks
- No CPR by trained medical provider
- Event lasted  $< 1$  minute
- First event



# Work – up for the Low Risk patient with BRUE

- Should:
  - Educate the caregivers and engage in shared decision making about the evaluation, disposition, and follow-up
  - Offer resources related to CPR
- May:
  - Obtain pertussis testing
  - EKG
  - Briefly Monitor with continual pulse ox and observation



## Should NOT

- CBC, Blood culture, CSF, Sodium, potassium, chloride, potassium, BUN, creatinine, calcium, ammonia, blood gas, urine organic acid, plasma amino acid, acyl carnatine, CXR, Echo, EEG, GER studies
- Home monitoring
- Rx acid suppression or anti-epileptic

## Need NOT

- Viral respiratory panel, U/A, blood glucose, bicarbonate, lactic acid, neuroimaging
- Admit the patient for monitoring



# Natural history of the ALTE

- 43% of healthy term infants have at least one 20-second apneic episode <sup>1</sup>
- Similar rates to:
  - Premature infants
  - Infant siblings of patients who died of SIDS
  - Patients with a h/o ALTE
- 30 second apneas only different in premature infants
- 5.3% of parents recall seeing such an event<sup>2</sup>
- 12-14% patients admitted with ALTE were readmitted.
- Greatest risk in “high risk” population

1. Ramanathan R et al. Cardiorespiratory events recorded on home monitors: comparison of healthy infants with those at increased risk for SIDS. JAMA 2001; 285: 2199-207.

2. Mitchell EA et al. Parental reported apnoea, admissions to hospital and sudden infant death syndrome. Acta Paediatr 2001;90:417-22.



## Case

- 2 week old former FT infant presented by ambulance for 3 min episode of turning purple to the face.
- Event occurred shortly after feeding, while lying down.
- Started with grunting and then patient stopped and became cyanotic
- She was unresponsive for 3 minutes: initially with open eyes, then closed. No eye deviation, no abnl movmtns
- She had milk/mucus from mouth
- She started breathing spontaneously
- Mother was concerned and called EMS
- Patient vomited 20 minutes after the event



## Case of 2 week old with self-resolving grunting and facial cyanosis of 3 minute duration.

- ROS: (-)
- Diet: breast / bottle feeds interchangeably 2-3 oz every 3-4 hours
- Family hx: no h/o seizure, no h/o unclear cause of death,
- Social hx: lives with mother and mgm

On presentation to the ED, the patient appeared well with normal vitals and a normal exam.



# In my opinion, this case is "higher risk" because

The Age of the patient **A**

The Self-Resolving  
Nature of the Event **B**

The associated  
Grunting **C**

The facial Cyanosis **D**

The duration **E**

The fact that it is the  
first event **F**

None of the above **G**

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## 2 week old with self-resolving grunting and facial cyanosis of 3 minute duration.

- Patient was admitted to the hospitalist service with a BRUE and possible GER / apneic event
- No events for 36 hours
- She remained well with a normal exam
- She was provided anticipatory guidance, ABC teaching / CPR referral, and asked to f/u with her pediatrician in the next 24-48 hours.



## 2 week old with self-resolving grunting and facial cyanosis of 3 minute duration.

- She returned 2 days later with another cyanotic episode of 3 minute duration associated with a “pause in breathing” and a “wheezing type sound”.
  - No change in tone, no abnl movements
  - Last feed several hours prior
  - No precipitating events (quiet prior)
  - Since last hospitalization, using less feeds: (1 oz supplementation after breast feeding)
  - Exam normal? Seemingly low tone



## 2 week old with recurrent admission for self-resolving central apnea and cyanosis.

- Patient readmitted
- Imaging for NAT
  - Head U/S
  - Ophtho eval
  - Skeletal Survey
- CXR
- Metabolic Panel
- Nutrition and lactation evals
- EKG: Non specific T-wave changes with possible LVH
- Neurology and pulmonary consults



## 2 week old with recurrent admission for self-resolving central apnea and cyanosis.

- Neurology recommended:
  - EEG: intermittent multi-focal spike waves
  - MRI: concerns for a metabolic or genetic disease
- Genetics
  - Elevated lactic acid ?
  - Ammonia, lactate/pyruvate, carnitine (normal)
  - Remainder of genetic w/up (-)
  - Gene sequencing in process
- Cardiology performed Echo (ASD, unrelated)
- **No additional events for 5 days**
- Discharge with 2 subsequent visits. Working dx: Mitochondrial d/o NOS



# Teaming with our subspecialists

- Metabolic team has continued to follow patient
  - Growth / Development
  - Diagnostic work-up: missense alteration in COX412, a mitochondrial disorder
- Anticipatory guidance related to labs to obtain in the event of a recurrence
- No subsequent events, developing normally



# Intent of hospitalization

- Prevent a progression of illness that would result in CR failure
- Identify new symptoms that would allow for a diagnosis
- Reassure family (self) and provide anticipatory guidance, including CPR teaching
- Ensure follow-up



## In Summary

- We need not unnecessarily scare patients with the term ALTE
- Choking is choking – treat it accordingly
- BRUE should be the diagnosis for appropriate patients
- Low risk patients are not committed to a diagnostic work-up or admission
- High risk patients would warrant further observation and possible diagnostic work-up / treatment.
- The team at Children's is here to help you!



# Thank you! Questions?

- Differentiate Apparent Life Threatening Event from Brief Resolved Unexplained Event (BRUE)
- Apply current literature to limit testing and hospitalization in low risk infants who present with BRUE
- Discuss indications for hospitalization, interventions, and follow-up care among high risk patient presenting with BRUE





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**Wilhelmina Bradford (Program Coordinator for 3<sup>rd</sup> and 4<sup>th</sup> year programs)**

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**CNMC residents, faculty, and associates, both on-site and in the community**

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## Thank You!

**Victor Abdow**

**Moheb Andrawis**

**Millie Ariza**

**Leah Brasch**

**Linda Goldstein**

**Steven Hirsch**

**Shannon Price**

**Amy Pullman**

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