

Approach to **Apnoea** and **Acute Events** in Infancy / Brief Resolved Unexplained Event (BRUE) – previously called ALTE

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Publication date: January 2021. Version 3

Review date: January 2023

Background

- There is a wide differential diagnosis for **apnoea** in infants. Prior to 2016, the term *ALTE* (Apparent Life Threatening Event) was used as an “umbrella” descriptive term for a change in *breathing, tone, colour or altered level of consciousness*. Causes include:

FIG1: DIFFERENTIAL DIAGNOSIS

- Normal physiological response: laryngospasm, gagging
- Infection : bronchiolitis, Pertussis, sepsis, pneumonia, perinatal viraemia
- Inflicted injury: (shaken baby, drug overdose, Factitious illness or intentional suffocation)
- Airway obstruction: congenital abnormalities, infection, hypotonia
- Abdominal: intussusception, strangulated hernia, malrotation
- Metabolic problems: hypoglycaemia, hypocalcaemia, hypokalaemia, other inborn errors of metabolism
- Cardiac disease: congenital heart disease, arrhythmias, vascular ring, prolonged QT.
- Neurological causes: head injury, seizures, CNS infections (inc, HSV), cerebral malformations
- Toxin / Drugs: accidental or non-accidental

- In reality, many cases have no cause identified after careful evaluation, hence the term BRUE (Brief, Resolved, Unexplained Event) was developed, i.e. BRUEs are effectively a subset of ALTEs.

BRUE Definition:

A sudden, brief (<1min, typically 20-30secs) episode that includes **one or more** of the following features

- Cyanosis or pallor
- Absent, decreased, or irregular breathing
- Marked change in tone (hyper- or hypotonia)
- Altered level of responsiveness

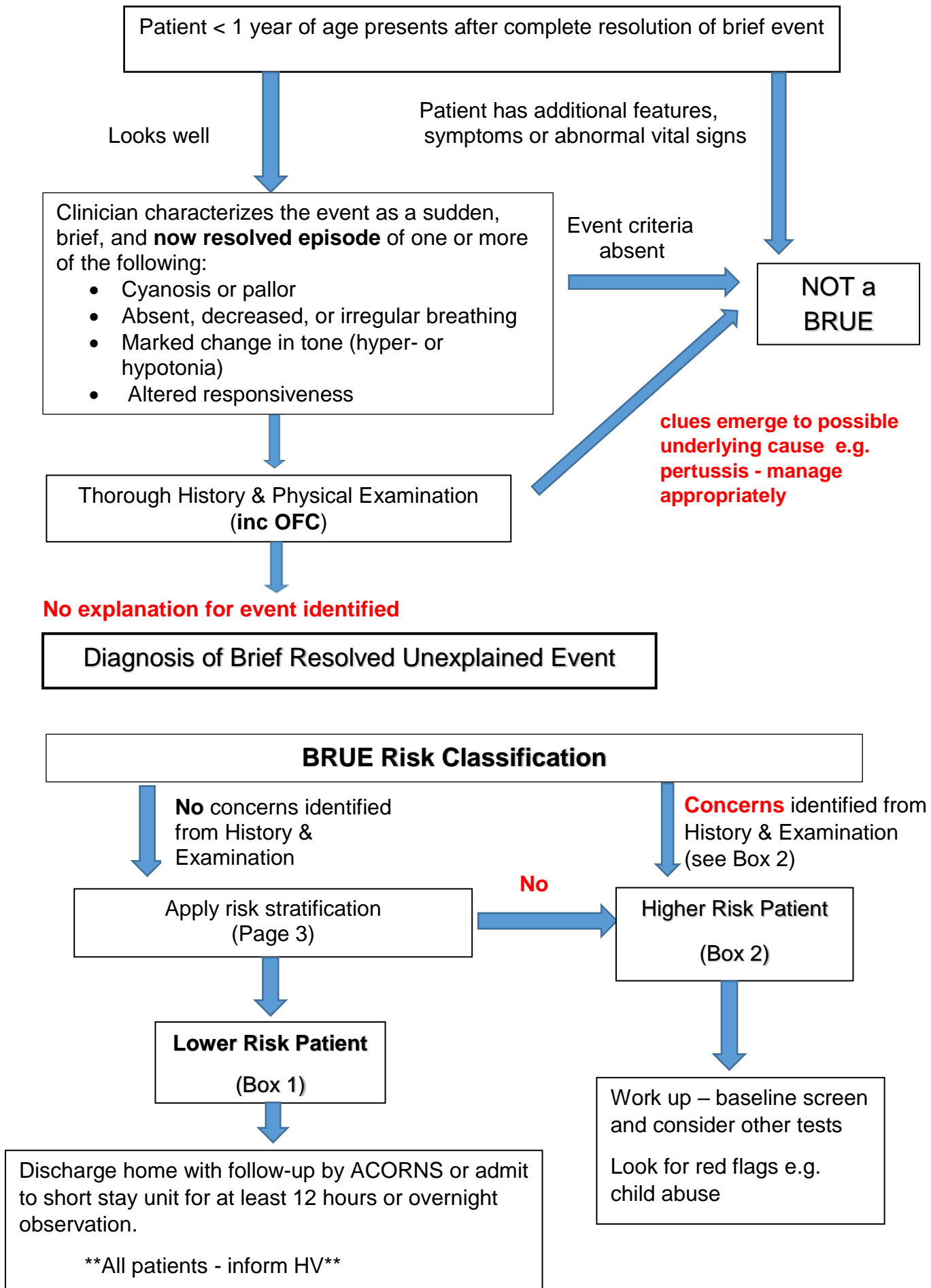
AND

- ***Asymptomatic on presentation (complete return to usual baseline state)***
- ***no other explanation found after a focused history and physical examination.***
- **IT IS A DIAGNOSIS OF EXCLUSION**

ASSESSMENT: During history and examination aim to:

- actively exclude possible causes of the event (see Fig 1)
- Risk-stratify BRUEs : lower or higher risk of repeat event or a serious underlying disorder (e.g. maltreatment) **see p3 for risk, p2 for summary**

Diagnosis, risk classification, and recommended management of a BRUE.



Risk Assessment:

Box 1: LOWER-RISK PATIENTS – fulfils BRUE definition AND ALL criteria below (likely CED discharge. Low risk of recurrence or underlying illness)

- Age >2 months
- Gestational age ≥32 weeks and postconceptional age ≥45 weeks
- Occurrence of only one BRUE (no prior BRUE, and BRUE did not occur in clusters)
- No cardiopulmonary resuscitation (CPR) given
- No concerning features (social risk factors for child abuse, respiratory illness, recent injury, preceding fever, irritability, lethargy, diarrhoea or decreased intake/vomiting)
- No developmental delay or congenital anomalies
- NO family history of BRUE or sudden unexplained death in a sibling.
- Normal physical examination findings

BOX 2: HIGHER-RISK: need investigation and admission

Infants <2 months of age

Those with a history of prematurity (<32 weeks' gestation)

Those with more than one event

Administration of CPR⁴ (higher mortality/risk of recurrence from metabolic/neurodegenerative/inflicted head injury or intentional suffocation)

Symptoms at the time of evaluation (e.g. toxic appearance, lethargy, or respiratory distress)

Significant physiologic compromise during the event, based on a detailed description by the caretaker e.g.) generalized sustained cyanosis or loss of consciousness, and/or need for resuscitation by a trained CPR provider (more than just stimulation).

Dysmorphic features or congenital syndrome

Red flags raising concern for possible abuse (ie, IMAGING + EYES + TOX screen)^{7,-10,}

- irritability, disproportionate OFC of concern or bulging fontanelle
- presence of bruising/ facial petechiae/ **blood from nose with event (see epistaxis in infant guideline)**
- recurrent episodes (esp with negative investigations)
- sibling history of SIDS/BRUEs
- event always witnessed by same caregiver
- events decrease/stop with admission or never witnessed by unbiased observer
- inconsistent account of events, delay in presentation
- studies suggest parental delivery of CPR is a risk factor

Serious case reviews and NICE guidance⁷ remind us to actively consider possibility of child abuse (inflicted injury/suffocation/FII/ sedative or toxin ingestion) when assessing a baby with apnoea.

HISTORY: Take a 1st hand detailed description of the event from the person who witnessed the episode and any emergency personnel

1. Description of event:

- Was infant asleep or awake. What made carer go to child?
- Breathing: yes/no or DIB or shallow
- Colour and colour distribution: normal, cyanosis, pallor, plethora
- Noise- cried out or gasped, cough, stridor or choking sound
- Conscious state: responsive to voice, touch, or visual stimulus.
- Tone: stiff, floppy, or normal
- Eyes- open or closed, staring or bulging or rolled
- Movement including eye movements: purposeful, repetitive, or flaccid
- Was fluid seen before, during or after the event- vomit or spit or blood. Anything from nose.

2. Intervention + recovery

- Duration of event
- What made it stop: self-resolved, repositioned, stimulation (what sort/how vigorous- did they shake baby to wake?)
- Any CPR- was this mouth to mouth only or included chest compressions- trained or untrained deliverer?
- Recovery: Rapid or gradual
- Residual symptoms

3. Prior to event:

- Who was present before and after- get accounts from each
- Environment: cot , car seat or moses basket, sleeping supine or prone, co-sleeping, room temperature, clothing, bedding
- Relationship of the event to feeding and history of vomiting
- Availability of items that could be swallowed, cause choking or suffocation.
- Preceding 24 hours : Fever, DIB, cough, lethargy, irritability, vomiting, diarrhoea, reduced intake, recent immunisations.
- Ask about weight, growth, or head circumference

4. Other history:

- Past medical history including previous events
- Sick contacts
- Family history of sudden death or childhood illness or similar events.
- Mental health or postnatal difficulties in carers? (Consider [screening questions](#))
- What medication in home- any chance of accidental ingestion
- What medication OTC or herbal in preceding 24 hours
- Term or pre-term. SCBU course
- Social history- current or previous SW (see triage paperwork)

MANAGEMENT

- iii)** EXAMINE carefully - remember the wide differential diagnosis. 1-3% of infant apnoeas are attributed to child abuse. A study of 274 infants found positive toxicology screens in 20%⁸. Undress infant fully and document presence/absence of any bruises/petechiae or injuries. Look inside the mouth. If child is irritable-Feel for crepitus/tenderness. Do OFC.
- iv)** Define problem + Risk-stratify- does the presentation fit with BRUE definition? (see p1). If there are clues to possible underlying condition- work-up/manage appropriately.
- v)** **If the criteria for low-risk BRUE is met - no investigations needed.**
- Observe for 4 hours in CED (repeat obs). Early referral to ACORNS.
 - check parents feel reassured and capable of caring for their infant at home.
 - (if event was during/soon after a feed) explain that transient choking or gagging can lead to an acute event in healthy infants and usually is benign. The likely mechanism is immature reflex (laryngospasm).
 - discharge by paediatric middle-grade or above
 - give ACORN leaflet + ACORN review

**** All patients - inform liaison HV ****

NB) IF there is history of feeding difficulties/recurrent episodes/parental anxiety or poor weight gain - admit to ward + consider GOR treatment.

- vi)** If, Higher risk patient - then admit for 24 hours or more of observation/appropriate investigation on ward (see below for tests).

INVESTIGATIONS for higher risk or patients being admitted to ward

Baseline Tests ^{4,5,6} :

- OFC + weight chart
- FBC, U+E, LFTS, glucose, blood gas with lactate, \pm blood culture, urinalysis
- \pm LP (if safe), swabs for RSV and pertussis
- ECG (low cost, check QT)
- \pm CXR
- Neuroimaging (see red-flags), facial petechiae/injuries, suspected seizures, vomiting, bulging fontanelle / loss of skills/ change in OFC or shaking history ** and arrange for formal fundoscopy. **Dutch surveillance study found 1/3 of carers shook their babies to rouse after apnoea.
- \pm Toxicology screen (urine/serum) –if history of altered behaviour, recurrent events or red flags.

If relevant features present: Consider

- Metabolic work up – acylcarnitine, urine organic acids, plasma amino acids
- Sleep study/ENT referral/ discussing with gastro team for pH or impedance study

DISCHARGE following ward admission

- It is not unusual for a lack of diagnosis after a period of observation^{2, 3, 11}. Most cases do not recur. Considerable research shows there is no proven association between ALTE and SIDS⁴. Interventions which have reduced the incidence of SIDS (such as “back to sleep”) have not reduced the incidence of ALTEs¹¹. A true BRUE is therefore not a precursor to SIDS
- Home apnoea monitors have not been shown to reduce the incidence of ALTEs or SIDS- they can provoke anxiety and alarm erroneously and should be discussed on individual case basis.
- **All infants admitted should be seen for an out-patient review after discharge, ideally by the consultant involved in the case.**
- Safeguarding team to inform HV upon discharge and social worker (if they have one) of attendance.

References:

1. Infantile Apnoea and Home Monitoring. National Institutes of Health Consensus Statement 1986 Sep 29-Oct 1;6(6):1-10.
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
3. McGovern MC, Smith MB. Causes of apparent life threatening events in infants: a systematic review. *Arch Dis Child*. 2004;89(11):1043–1048
4. Kaji AH, Claudius I, Santillanes G, et al. Apparent life-threatening event: multicenter prospective cohort study to develop a clinical decision rule for admission to the hospital. *Ann Emerg Med*. 2013;61(4):379–387.e4
5. Royal Children’s Hospital Melbourne, 2017 BRUE guidance
6. AAP: Practice Recommendations for BRUE
7. NICE guidance – When to Suspect Child Maltreatment and RCPCH 2nd Child Protection Companion
8. Pitetti RD, Whitman E, Zaylor A . Accidental and non-accidental poisonings as a cause of apparent life-threatening events in infants. *Pediatrics*. 2008
9. Fu LY, Moon RY. Apparent life-threatening events: an update. *Pediatr Rev*. 2012; 33(8):361-368. **(Review)**
10. Sarohia and Platt. ALTE: practical advice and evaluation . *Pediatr Emerg Med Pract*. 2014 Apr;11(4):1-14
11. Tate C, Sunley R. *Arch Dis Child Educ Pract Ed* 2018;**103**:95–98. doi:10.1136/archdischild-2016-311249