LRI Emergency Department and Children's Hospital

Brief resolved unexplained event (BRUE)

Staff relevant to:	Clinical staff working within the UHL Children's Hospital.
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Reviewed by:	Author- A Pelivan. Reviewed-A Atkinson
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1. Introduction and Who Guideline applies to

Definition of ALTE/BRUE

In 2016 the American Academy of Pediatrics recommended replacing the term ALTE (Apparent life-threatening event) for the more precisely defined term BRUE (Brief Resolved Unexplained Event) in its 2016 Clinical Practice Guideline Update.

The new definition is: 'an event in an infant <1yr of age, when the observer reports a sudden, brief, and now resolved episode of 1 or more of the following:

- cyanosis or pallor
- absent, decreased or irregular breathing
- marked change in tone (hyper or hypotonia)
- altered level of responsiveness

A BRUE should only be diagnosed when there is no explanation for a qualifying event *after* conducting an appropriate history and physical examination.

Since 2016 the term BRUE has replaced ALTE in the vocabulary of Paediatricians working in the UK. The reason for this change was to precisely distinguish infants at low risk of serious illness from those at high risk; including those who are asymptomatic versus those who are symptomatic during medical review. It was also to avoid the false perception that most episodes are truly 'life-threatening'.
This guideline will reflect the change of terminology as it has been largely adopted by all the professionals working in Emergency Medicine and Paediatrics

This guideline is for the use of medical staff, nurses and other health professionals working within UHL Children's Hospital when caring for infants, children and their families presenting with a current episode of or recent history of BRUE.

Related Documents:

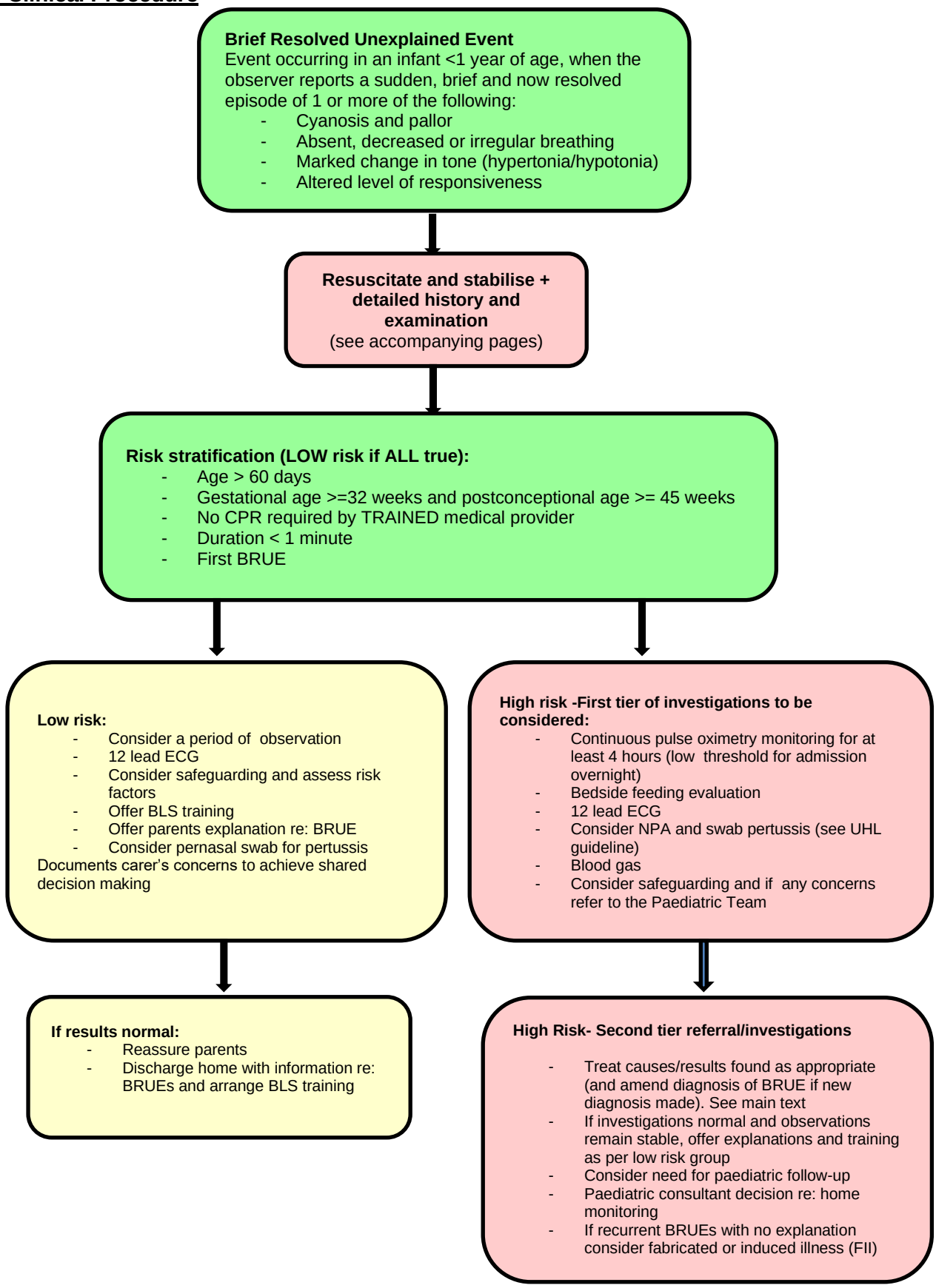
- Infection Prevention UHL Policy B4/2005
- Consent to Examination or Treatment UHL Policy A16/2002
- Basic Life Support or Choking UHL Childrens Hospital Guideline C2/2016
- Pertussis (Whooping Cough) UHL Childrens Medical Guideline C12/2017
- Care of Next Infant (CONI) UHL Obstetric Guideline C38/2013.

Contents

Key Points:

- Show empathy – Many parents will have thought their baby was critically ill or going to die.
- If an infant is classified as low risk and remains well with normal observations and ECG, it is safe to discharge them with an explanation re: BRUEs and BLS training offered.
- There is a wide variety of causes of an apparent BRUE episode. An accurate history, examination and appropriate investigation / treatment, is essential. Differential diagnoses should be carefully considered.

2. Clinical Procedure



A literature review re: ALTE from 1970-2014 gave sufficient data to give evidence based recommendations for management of 'low risk' infants. Due to the heterogeneity of 'higher risk' infants, no evidence-based guidelines have been developed, however a framework for evaluation was released in 2019 by AAP. Because of a vast array of potential causes, the initial evaluation prioritises the diagnosis of time sensitive conditions for which delayed diagnosis or treatment could impact outcomes.

Incidence

- The true incidence of BRUE is unknown. Most of the data has been collated for the definition of ALTE. Reported incidence of ALTEs was 0.05-6%. Most ALTEs occur in children younger than one year of age. In one study of 65 patients with an ALTE, the peak incidence occurred between one week and two months of age, with most events occurring in infants younger than 10 weeks.
- More boys than girls experience ALTEs.

Aetiology

The underlying causes of these events vary. A BRUE should be viewed as a manifestation of other conditions rather than a diagnosis in and of itself.

Uncovering the cause of the BRUE is very important. In 50% of patients, causation is found, implying that there is a potential for intervention that could eliminate further events. Some of the following categories overlap, and studies quote varying rates of aetiology; overall the distribution is broadly as follows.

Table 1. Possible aetiological causes

Gastrointestinal (approximately 50%)	GE reflux, swallowing abnormalities, Intussusception, volvulus
Neurological (Approximately 30%)	Head injury, seizures, vasovagal reflex, CNS infection, hypotonia, other neurological conditions
Respiratory (Approximately 20%)	Respiratory infections including URTI, pertussis and RSV Breath holding spells, obstructive sleep apnoea (OSA), upper airway problems
Cardiac (up to 5%)	Arrhythmias, prolonged Q-T interval, WPW syndrome, CHD, vascular ring
Metabolic & Infective (less than 5%)	Inborn errors of metabolism, hypoglycaemia, hypocalcaemia, UTI
Child abuse (less than 5%)	Suffocation; rarely apnoea may be a manifestation of child abuse (shaken baby, drug overdose, Fictitious illness by proxy syndrome)
Other Causes:	Toxin / Drugs: accidental or non-accidental
NO IDENTIFIABLE CAUSES (approximately 50%)	

In the remaining 50% of patients, a specific diagnosis is never made, i.e. the "idiopathic" category. This *may* yet indicate the onset of a serious underlying condition that requires timely evaluation and treatment to reduce the morbidity and mortality.

What do you need to do?

Show empathy – many parents will have thought their baby was critically ill or going to die.

History:

1. **Description of the event :**

a. What alerted the caregiver to a problem? (Condition of child)
b. Behavioural state – awake or asleep, (activity at time of the event)
c. Breathing efforts
d. Colour
e. Tone
f. Seizure like activity – abnormal movements, including eye movements
g. Speed of recovery
h. Interventions used by caregivers – degree of resuscitation required; gentle/vigorous stimulation, Blowing air in face, mouth-mouth breathing/CPR

2. **Circumstances and environment prior to event:**

a. Relationship of the event to feeding and history of vomiting
b. Sleep position – prone/supine/side
c. Environment – nature and type of sleeping arrangement, chair, lounge, crib, car seat, bed as well as type of bed and clothing

3. **Recent illness and family history:**

a. History of coryza/URTI in infant and family members
b. Family history of SIDS, other deaths

4. **Past medical history:**

a. Antenatal, Birth details, postnatal problems; prematurity
b. Feeding history
c. Medications
d. Allergies
e. Immunization
f. Development
g. Family history: including SIDS, congenital malformations

Examination:

Detailed general physical examination – monitor oxygen saturation level and BP

Neurological state and fontanelle
Cardiorespiratory examination
Abdominal examination for mass and inguinoscrotal abnormalities
Examine whole infant for evidence of injury, this may include funduscopic examination for retinal haemorrhages.
Dysmorphic features and growth chart

Identify lower risk patients (if ALL true)

- Age >60 days

- Born at >32 weeks gestation and corrected gestational age> 45 weeks
- First ALTE/BRUE event ever
- Event lasted <1 minute
- No CPR provided by trained medical provider
- No concerning historical features
- No concerning physical examination findings

These points are extremely significant; subtle history points/examination findings cannot be ignored.

Investigations / Management:

Low Risk Infants:

AAP 2016 guidelines for BRUE recommendations are as below. Appendix A briefly shows level of evidence for these recommendations.

It is recommended that these 6 points are usually completed for any low risk patients, and any reasons for not completing them are documented clearly.

1. Consider brief monitoring with continuous pulse oximetry / serial vital observations.
2. Consider 12 lead ECG.
3. Must have brief assessment of safeguarding risk factors to detect child abuse as part of ever BRUE assessment (not a formal medical safeguarding assessment unless indicated).
4. All parents/carers must receive some explanation about BRUE episodes, how these are investigated, and potential causes relevant to their child's presentation.
5. Resources for BLS/CPR training must be offered; (can be done in the department, or can be arranged by nursing staff via Daycare). Shared decision-making regarding final investigations and management for an individual patient should take place. This means any significant parent/carer concerns should be discussed with seniors, documented and considered.
6. Consider sending a pernasal swab for pertussis (based upon the risks of delayed diagnosis, see UHL guideline).

High Risk Infants:

Each of the differential causes and investigation/management points listed above might apply to a given BRUE case. They should be considered as to their relevance in any high risk case, with all causes/factors treated as they are identified. AAP framework for high risk infants suggests an initial tier of investigations followed by a secondary tier of investigations if no explanation was found.

Initial tier of investigations to be considered includes the following (based on history and findings on examination):

- Continuous pulse oximetry monitoring for at least 4 hours
- Hourly observations for the first 4 hours
- Bedside feeding evaluation
- ECG
- Consider nasopharyngeal aspirate (NPA) for respiratory viruses
- Consider pernasal swab for Pertussis
- Blood gas (can be performed in the HOT LAB)
- Consider safeguarding risk factors.
- If concerned about non accidental injury then liaise with paediatric team for assessment and necessary investigations.

If recurrent BRUEs, the patient will need to be admitted.

Secondary tier evaluations

These can include investigations related to: Gastroenterology, ENT, Respiratory, Child abuse expert, Neurology, Cardiology, Genetics.

Depending on family preference and other circumstances it is reasonable to perform the secondary tier of evaluations after discharge. It is also reasonable to admit the infant to the hospital for a period of observation, continuous prolonged oximetry and clinical swallow evaluation/ SALT review.

If BRUEs continue to occur, the following additional investigations could be considered:

- Intraluminal impedance pH monitoring
- Oesophago-gastroduodenoscopy with biopsy
- Arterial blood gas
- CXR
- Brain MRI and CT
- Echocardiogram
- Urine organic acids
- Plasma aminoacids
- Plasma acylcarnitines
- Consider overnight oxygen saturations monitoring

Home Monitoring:

Arrange parent basic life support training prior to discharge or within 24 hours.

Despite work-up and monitoring, 50% of children remain undiagnosed. Home monitoring is recommended in children with severe idiopathic BRUEs, those who require vigorous stimulation or CPR, children with two or more siblings who died from SIDS; these can usually be followed up via the CONI Plus scheme. Home monitoring is controversial; false alarms, parental anxiety, inappropriate use of monitors, and inadequate training of caregivers make home monitoring difficult. According to AAP recommendations there is a lack of efficacy of home monitoring in the prevention of death and hence the absolute need to counsel parents in this regard. The decision for home monitoring should be made by the Paediatric consultant caring for the baby.

If home monitoring is considered:

Parents require supportive care and education. Contact the liaison HV / CONI Plus scheme for apnoea monitors; these children need regular follow-up. Discontinue home monitoring if the infant has not experienced BRUEs during the last 3 months; after documenting the infant's ability to handle stress of immunisations and URTIs prior to discontinuation.

Please refer to the UHL Guideline: Care Of Next Infant (CONI) Scheme C38/2013.

Relation to Sudden Infant Death Syndrome (SIDS)

In the majority of patients SIDS occurs without warning and without previous BRUEs. Approximately 7% of infants who die from SIDS have a history of BRUEs. The risk of SIDS in children with a BRUE increases when the event is linked to central hypoventilation syndrome, seizure disorders, and cardiac arrhythmias including sinus bradycardia, Wolff-Parkinson-White syndrome, and prolonged QT syndrome; by this stage the term BRUE is insufficient if these co-morbidities exist.

Outcome

Overall outcome of infants who experience a BRUE can be divided into:

❖ low-risk patients, having a very good predicted outcome.

❖ high-risk patients, for whom prognosis is heterogenous, depending on the subgroup of presenting features and investigation results that applies. BRUE can be a heralding event for serious underlying medical conditions, e.g. seizure disorder or other neurological conditions.

Although short-term follow-up studies in patients with BRUE episodes indicate some relative population deficiencies in neurodevelopment; the long-term neurodevelopmental, cognitive, and gross motor developmental skills appear to be the same as in control patients.

Education and Training

Basic life support training is mandatory and provided annually to all UHL clinical staff.

Monitoring Compliance

None identified

Supporting References

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Key Words

Apparent Life Threatening Event, ALTE, Brief Resolved Unexplained Event, BRUE

The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs.
As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) A Pelivan- previous author A Atkinson- updated Feb 2023	**Executive Lead** Chief Nurse
Details of Changes made during review: 2023- updated re teaching of BLS and added consider overnight oxygen saturations monitoring if recurrent episodes. Added hourly observations for first four hours in high risk cases. Aetiology table updated – removed sepsis, meningitis and septicaemia Flowchart and layout update	