GUIDELINE	
Brief Resolved Unexplained Event (BRUE)	
Scope (Staff):	Medical
Scope (Area):	PMH (PCH)

This document should be read in conjunction with this DISCLAIMER

Aim

This guideline provides an evidence based framework for the uniform and safe management of infants presenting at Princess Margaret Hospital (PMH) / Perth Children's Hospital (PCH) with a Brief Resolved Unexplained Event (BRUE) – *previously referred to as Apparent Life Threatening Event (ALTE).*

Risk

Failure to adhere to this guideline may result in incorrect management of the patient, failure to detect serious underlying medical conditions and possible harm including over-investigation and unnecessary hospital admission.

Definitions

This guideline will refer to all events as BRUE noting that evidence from literature is based on previous ALTE definitions.[1]

BRUE is described as an event observed in an infant (<1 year) which is sudden, brief (<1 minute), now resolved and unexplained involving at least one of:[1]

- **Colour change** - central cyanosis or pallor only
- **Breathing change** – absent, decreased or irregular
- **Marked change in tone** – hypertonia or hypotonia
- **Altered level of responsiveness**

There are many medical causes of BRUE-like events. The term BRUE is applied only when a medical cause of the event is not established.

Key Points

- The incidence previously described for ALTE was approximately 1 case per 1000 live births.
- Recurrences generally occur within the first 24 hours of the first episode.
- In the majority of cases of BRUE, although the cause is not clearly established, it is thought that exaggerated physiological responses to feed/vomit or secretions may contribute.[1-4]

- Episodes of redness are common among healthy infants and is not consistent with BRUE.
- BRUE can be classified into high risk and low risk with differing investigation and management approaches for the two groups.
- Extensive investigation has a low identification yield and is generally unwarranted. Targeted testing is more appropriate and depends on a good clinical history.[1,3]
- The association between Sudden Infant Death Syndrome (SIDS) and BRUE remains to be clarified. Current evidence is that there is minimal risk of subsequent SIDS after a BRUE-like event.[1]
- There is a higher risk of subsequent death after events in infants exposed to maternal smoking (SIDS) and with Non Accidental Injury (NAI) presenting as BRUE.

History

Obtain a thorough history including:

- Description of the event:
  - what alerted caregiver to the problem
  - condition of child at time of event – colour, tone, respiratory effort (duration of apnoea or choking/gagging), responsiveness and any abnormal movements, vomiting
  - time from last feed
  - where was the baby: sleep environment, position
  - awake/asleep
  - degree of intervention/resuscitation required and duration
- Relevant past medical history: prematurity, immunisation, recent illnesses
- Infective symptoms and contacts
- Feeding history: breast or bottle, vomiting or posseting, symptoms of Gastro-oesophageal Reflux Disease (GORD),
- Drug exposure – including maternal medications if breastfeeding
- Developmental delay
- Previous episodes of BRUE
- Family history: SIDS/SUDI, epilepsy, metabolic disorder, cardiac
- Smoking

SIDS Risk Factors

- Prematurity and low birth weight
- Modifiable risk factors including:

- Unsafe sleep practices
  - See https://rednose.com.au/article/what-are-the-risk-factors-for-sudden-unexpected-death-in-infancy-sudi
- Exposure to smoking, before and after birth
- Parental substance use

Examination

- Vital signs including pulse oximetry is essential
- Thorough multisystem examination bearing in mind possible causes
- Basic assessment of all growth parameters, noting dysmorphic features

Differential Diagnoses and Investigations[1-7]

The three most common differentials of BRUE include:

- Gastro-oesophageal Reflux Disease (GORD),
- Lower Respiratory Tract Infection (LRTI)
- Seizures.

Cause	Incidence	Notes	Investigations
GORD	20-50%	Exaggerated physiological airway protection reflexes or 'laryngospasm' Choking and gagging common Do not routinely prescribe acid suppression therapy	Esophageal Impedance and pH studies generally not helpful. Consider upper GI and swallow contrast studies only for aspiration or anatomical abnormalities Consider Speech Therapy evaluation if feeding difficulties.
LRTI • Bronchiolitis • Pneumonia	7-8%	Low incidence of apnoea with bronchiolitis: 1% term infants. More likely if premature	Nasopharyngeal Aspirate (NPA) and CXR considered only if important to management
Neurological • Seizures • Infection • Head injury • Neuromuscular / hypotonia • Cerebral malformation • CNS Tumour	4-11% seizures		EEG may be indicated for recurrent episodes Cranial imaging - may be indicated for trauma or abnormal neurological examination
Serious Bacterial Infection	<3%	BRUE is occasionally 1st presenting symptom Low rates (2.7% of all	NPA: viral, pertussis FBP +/- inflammatory

Cause	Incidence	Notes	Investigations
• UTI • Bacteraemia • Meningitis		ALTE) of serious bacterial infection: more likely if premature or <60 days	markers Cultures: blood, urine, CSF Follow febrile infant guideline
Airway obstruction • Foreign body • Congenital anomaly -vascular ring, laryngeal, TOF • Tonsils/adenoids • Choanal atresia • Hypotonia			Upper GI contrast for vascular ring/aberrant anatomy Consider ENT referral
Apnoea: central or obstructive • Apnoeas of prematurity • Breath-holding • Periodic breathing		Periodic breathing (brief pauses up to-10 sec without colour change) Short central apnoea <15 secs is normal in all age-groups Apnoea of prematurity may persist until 5 weeks of corrected age Rarely, breath holding spells- can occur <6months, emotional precipitant	Sleep study occasionally indicated following admission
Surgical Abdomen • Intussusception • Volvulus • Incarcerated hernia			Ultrasound Plain and erect Abdominal X-ray
Cardiac • Arrhythmias/SVT/ long QT • Congenital heart disease • Cardiomyopathy • Vascular ring	Uncommon in BRUE (<1%) and high false positive rate with cardiac investigations		ECG (sensitive but not specific) CXR Holter monitoring
Metabolic • Inborn error of metabolism (IEM) • Hypoglycaemia • Hypocalcaemia • Drug exposure	Rare	Significant unexplained metabolic acidosis – consult metabolic physician	BGL Blood gas Electrolytes (UEC) Urine metabolic screen Urine toxicology Lactate/pyruvate Ammonia, acyl-carnitine

Cause	Incidence	Notes	Investigations
			profile, plasma amino acids Consider coags, LFT's
Inflicted Injury • Poisoning • Smothering • Head trauma (AHT)	Up to 2% Known risk factors: • Delay in presentation • SIDS in siblings, • Recurrent episodes	Subsequent mortality can be as high as 9%[16] Note signs of AHT: vomiting, irritability, seizures, calls to emerg services, focal physical findings on exam (skin, mouth, extremities) Examine nose and mouth for blood	Urine toxicology CXR for rib fractures Cranial imaging Skeletal survey Fundoscopy FBP for anaemia Always involve CPU if ordering multiple investigations
Other • Dehydration • Severe anaemia • Electrolyte disturbance • Anaphylaxis			

Investigations and Management[1-8]

Immediate investigations to be <u>considered</u> in the Emergency Department:

- Blood gas and glucose
- Septic workup where indicated
- NPA for pertussis
- ECG

Low risk BRUE [1,8]

Categorised low risk when there are no concerning features on history or examination AND:

- First and single event
- Nil significant intervention (CPR) required
- Age >60 days
- If premature born ≥ 32weeks gestation and now >45 weeks corrected gestational age
- No cause for event identified
- Normal physical examination and vital signs

Management of low risk BRUE[1,8]

- Generally does not require admission and further investigation.
- If significant caregiver anxiety is present, discussion with general paediatric team is suggested.
    - Brief (1-4 hours) continuous pulse oximetry may be considered. Refer to a general paediatric team.
    - NPA for pertussis and ECG may be performed in selected cases.
- Provide reassurance and written / verbal information and education to caregivers:
    - Fact sheet: BRUE *(pending)*
    - Information about safe infant sleep practices:
        - Brochures are available in ward areas or for download from Red Nose: https://rednose.com.au/downloads/RN2256.1_SafeSleeping_DL_Nov2017%28web%29_.pdf
        - Mobile Apps also available from: https://rednose.com.au/page/mobile-apps
        - Basic Life Support (BLS) training should be recommended to caregivers (PMH / PCH does not recommend specific providers)
- Early follow up with Paediatrician or healthcare provider is recommended
- **Always consider SIDS risk factors and inflicted injury prior to discharge.** [14]

High risk BRUE

- In cases that do not meet criteria for low risk, an underlying cause or serious medical problem may be possible.
- Further investigation and admission under general paediatrics may be warranted.
    - Ward monitoring for up to 24 hours should include continuous pulse oximetry as a minimum.[1,4]
    - Respiratory monitoring (inductance plethysmography) for apnoea and cardiac monitoring may also be considered.

Monitoring

- Referral to infant monitoring clinic is generally not indicated for low risk BRUE.
- Referral process to the Infant Monitoring Service is outlined on the PCH Department of General Paediatrics information page. (https://pch-healthpoint.hdwa.health.wa.gov.au/directory/clinicalservices/DGP/pages/DGP-Clinics.aspx)

- Commercially available home monitors are not recommended but may provide reassurance. Note that apnoea has not been established as the primary event leading to SIDS and that there is no evidence that home monitoring of healthy infants saves lives.
- Refer to Red Nose Information Statement: home monitoring

Related internal policies, procedures and guidelines
Safe Infant Sleeping (Clinical Practice Manual)
Infant Monitoring Service – Referral process to Department of General Paediatrics

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Useful resources
Information sheet for parents using an Apnoea Monitor – via Monitoring Clinic
Rednose Safe Sleeping Brochures and resources. Available to download from: https://rednose.com.au/section/safe-sleeping
eLearning package – SIDS https://rednose.com.au/page/e-learning-education-package (for Health Professionals)

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