Brief Resolved Unexplained Event (BRUE)

Marta Neubauer, MD
John Brancato, MD

Connecticut Children's

What is a Clinical Pathway?

An evidence-based guideline that decreases unnecessary variation and helps promote safe, effective, and consistent patient care.

Objectives of Pathway

- To create a systematic way to manage BRUE in infants at low risk of event recurrence or serious underlying disease
- To aid in the identification of infants with low risk for event recurrence and diagnosis of serious underlying disease
- To avoid unnecessary admissions
- To decrease unnecessary laboratory and radiographic testing

Why is Pathway Necessary?

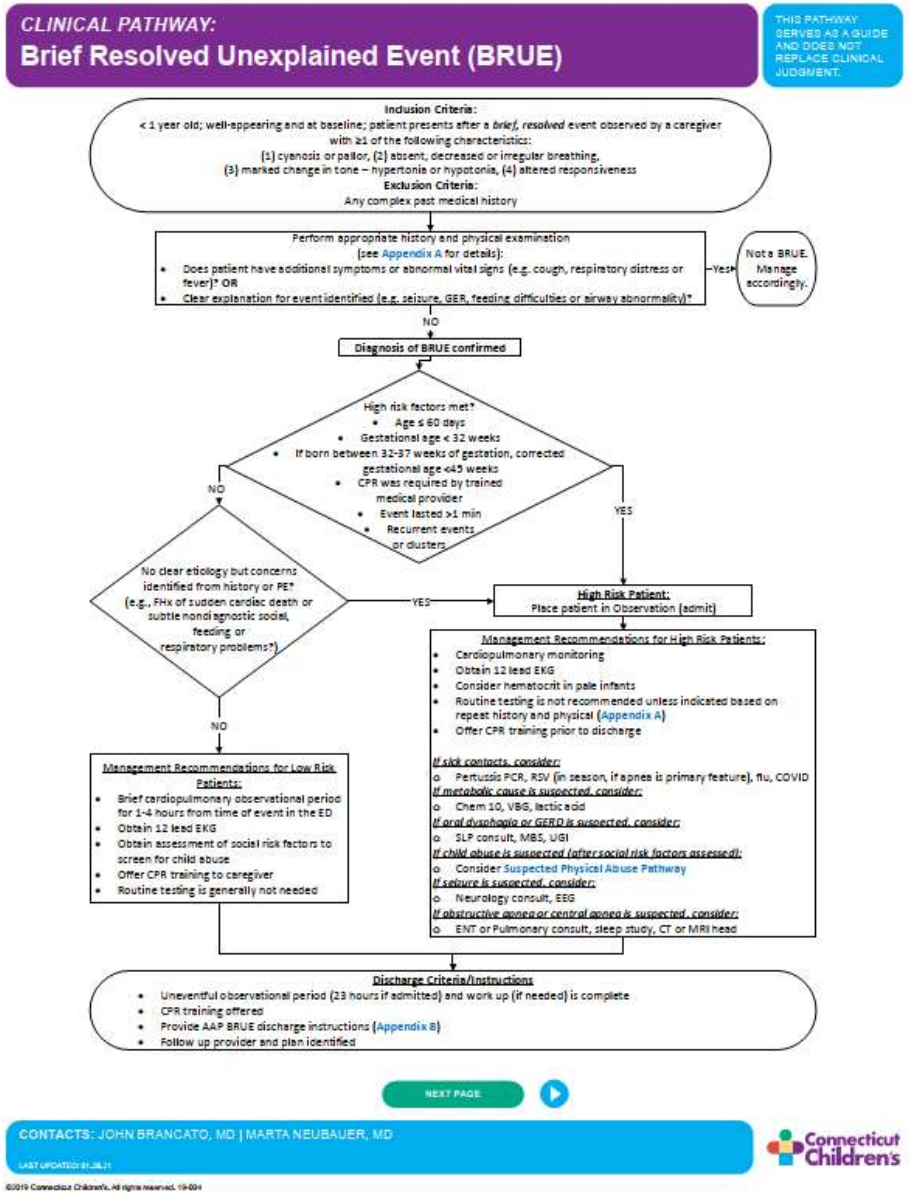
- BRUEs are common and cause a great deal of anxiety for caregivers
- Presentation of BRUEs can be widely variable
  - Involving a constellation of observed, subjective and non-specific symptoms
- BRUE can be the presenting symptom of a broad range of disorders
- For well-appearing low-risk infants, the risk of recurrent event or serious underlying disorder is extremely low

Why is Pathway Necessary?

- Approaches to management of a BRUE can vary widely between providers
- Providers often feel compelled to perform unnecessary testing that rarely leads to a treatable diagnosis
- In 2016, the American Academy of Pediatrics replaced the term ALTE with BRUE while further defining it and making recommendations for lower risk infants

This is the BRUE Clinical Pathway.

We will be reviewing each component in the following slides.



Inclusion Criteria:

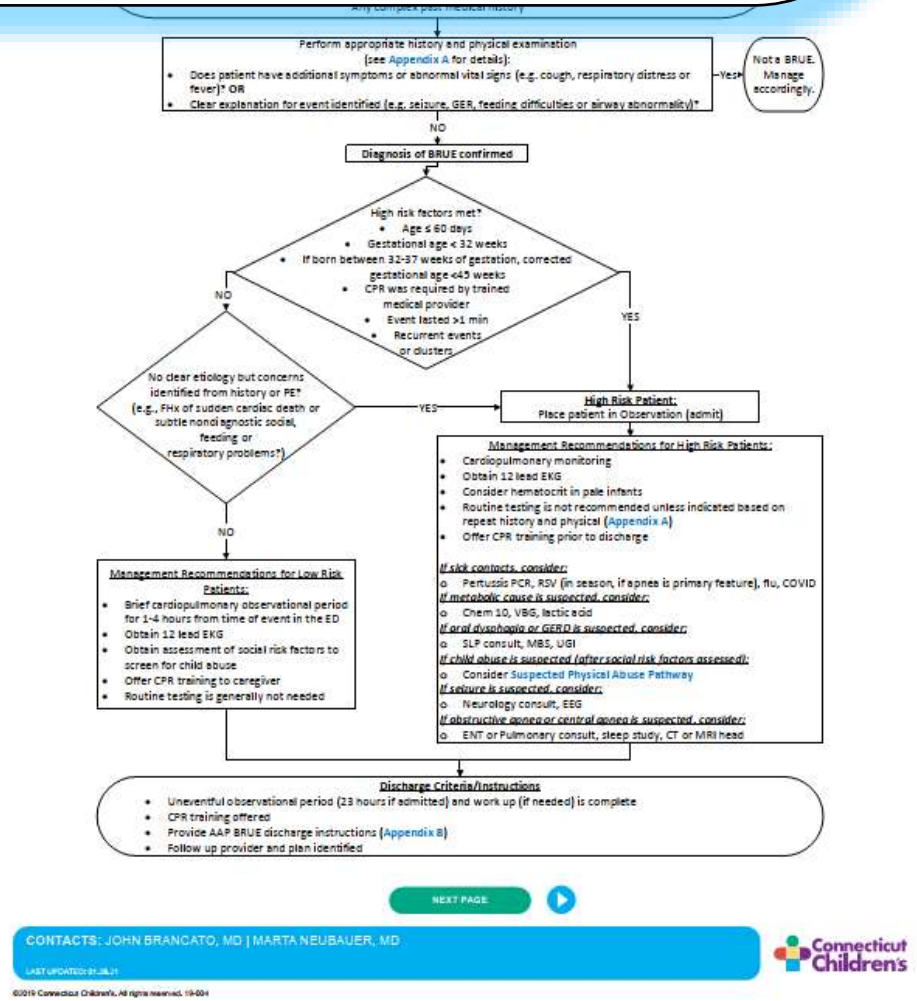
< 1 year old; well-appearing and at baseline; patient presents after a *brief, resolved* event observed by a caregiver with ≥1 of the following characteristics:
(1) cyanosis or pallor, (2) absent, decreased or irregular breathing,
(3) marked change in tone – hypertonia or hypotonia, (4) altered responsiveness

Exclusion Criteria:

Any complex past medical history

Inclusion criteria:

- This pathway is intended for well appearing infants who present with a *brief, resolved* event that was observed by a caregiver with one or more of the following characteristics:
  - cyanosis or pallor,
  - absent, decreased or irregular breathing,
  - marked change in tone – hypertonia or hypotonia,
  - altered responsiveness
- **Children with complex medical history should not be treated on pathway**



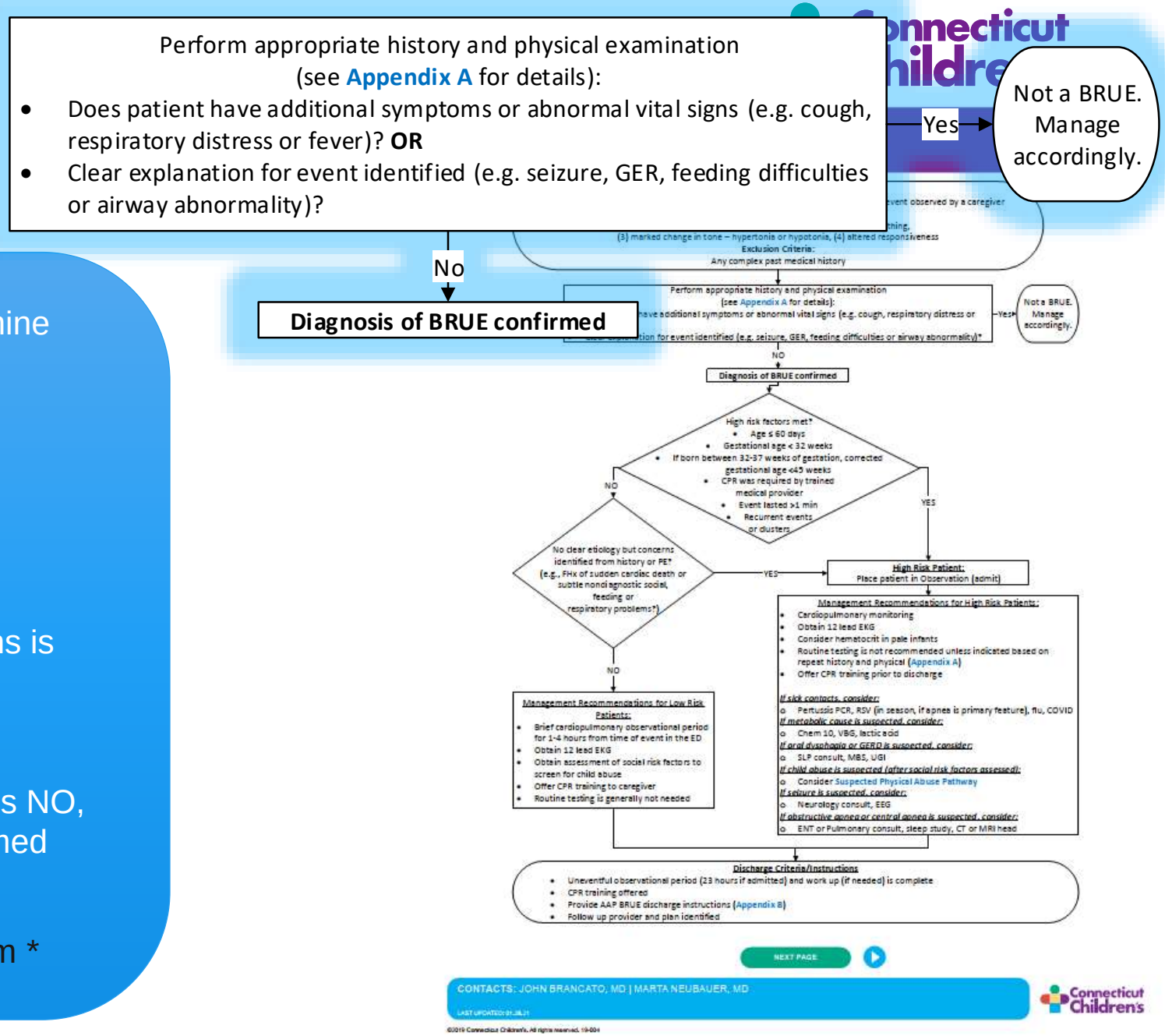
History and physical exam are used to determine whether patient meets criteria for BRUE:

- Does patient have additional symptoms or abnormal vital signs?
  OR
- Clear explanation for event identified?

Yes — If the answer to any of these questions is YES, this is NOT a BRUE. Manage accordingly.

No — If the answer to all of these question is NO, then the diagnosis of BRUE is confirmed

* See Appendix A for examples of pertinent components on the History and Physical Exam *



CLINICAL PATHWAY:
Brief Resolved Unexplained Event (BRUE)
Appendix A: Historical Features to Consider in the Evaluation of a Potential BRUE

THIS PATHWAY SERVES AS A GUIDE AND DOES NOT REPLACE CLINICAL JUDGMENT.

Considerations for Possible Child Abuse:
Multiple or changing versions of the history/circumstances
History/circumstances inconsistent with child's developmental stage
History of unexplained bruising
Incongruence between caregiver expectations and child's developmental stage, including assigning negative attributes to the child
History of the Event:
General description
Who reported the event?
Witness of the event? Parent(s), other children, other adults? Reliability of historian(s)?
State immediately before the event:
Where did it occur (home/elsewhere, room, crib/floor, etc)?
Awake or asleep?
Position: supine, prone, upright, sitting, moving?
Feeding? Anything in the mouth? Availability of item to choke on? Vomiting or spitting up?
Objects nearby that could smother or choke?
State during the event:
Choking or gagging noise?
Active/moving or quiet/flaccid?
Conscious? Able to see you or respond to voice?
Muscle tone increased or decreased?
Repetitive movements?
Appeared distressed or alarmed?
Breathing: yes/no, struggling to breathe?
Skin color: normal, pale, red, or blue?
Bleeding from nose or mouth?
Color of lips: normal, pale, or blue?
End of event:
Approximate duration of the event?
How did it stop: with no intervention, picking up, positioning, rubbing or clapping back, mouth-to mouth, chest compressions, etc?
End abruptly or gradually?
Treatment provided by parent/caregiver (eg, glucose-containing drink or food)?
911 called by caregiver?
State after event:
Back to normal immediately/gradually/still not there?
Before back to normal, was quiet, dazed, fussy, irritable, crying?
Recent History:
Illness in preceding day(s)?
If yes, detail signs/symptoms (fussiness, decreased activity, fever, congestion, rhinorrhea, cough, vomiting, diarrhea, decreased intake, poor sleep)
Injuries, falls, previous unexplained bruising?
Past Medical History:
Pre-/perinatal history
Gestational age
Newborn screen normal (for IEMs, congenital heart disease)?
Previous episodes/BRUE?
Reflux? If yes, obtain details, including management.
Breathing problems? Noisy ever? Snoring?
Growth patterns normal?
Development normal? Assess a few major milestones across categories. Any concerns about development or behavior?

RETURN TO THE BEGINNING

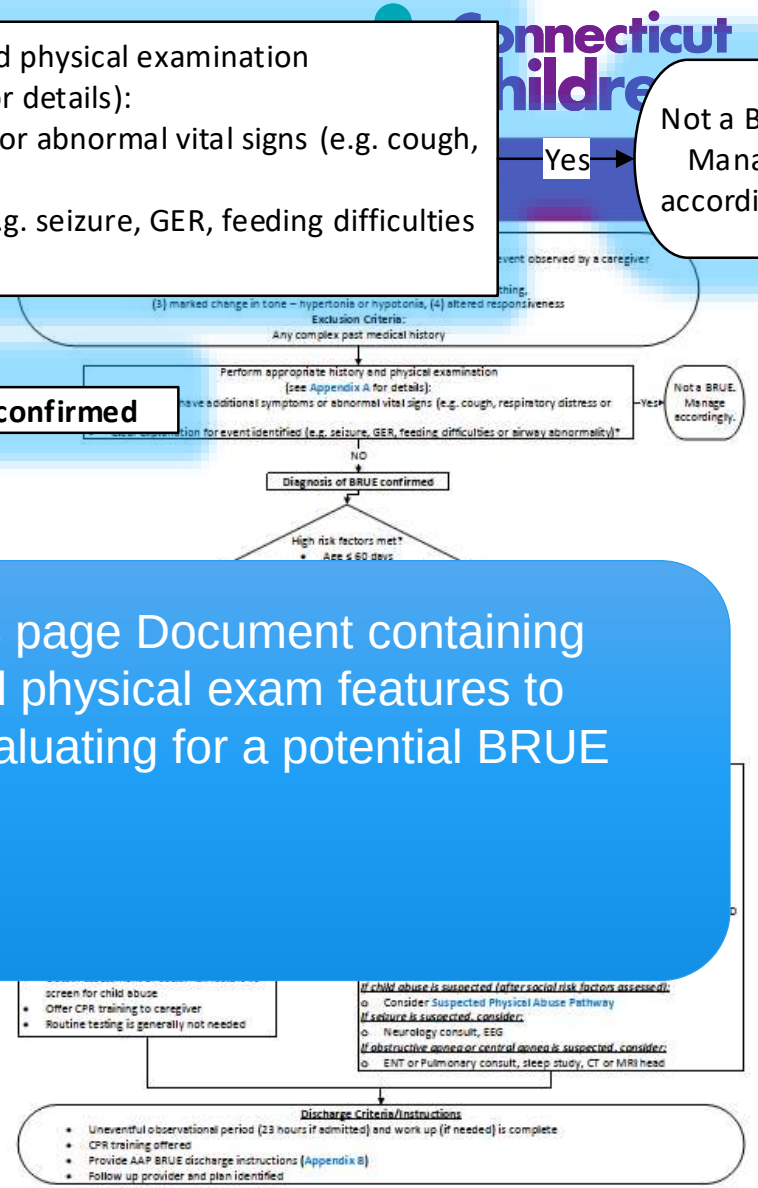
CONTACTS: JOHN BRANCATO, MD | MARTA NEUBAUER, MD

Perform appropriate history and physical examination
(see **Appendix A** for details):

- Does patient have additiona toms or abnormal vital signs (e.g. cough, respiratory distress or fever
- Clear explanation for event ied (e.g. seizure, GER, feeding difficulties or airway abnormality)?

Yes → Not a BRUE. Manage accordingly.

No → sis of BRUE confirmed



Appendix A: is a 3 page Document containing both historical and physical exam features to consider when evaluating for a potential BRUE

This is page A1

NEXT PAGE

CONTACTS: JOHN BRANCATO, MD | MARTA NEUBAUER, MD

©2019 Connecticut Children's. All rights reserved. 19-004

CLINICAL PATHWAY:
Brief Resolved Unexplained Event (BRUE)
Appendix A: Historical Features to Consider in the Evaluation of a Potential BRUE

THIS PATHWAY SERVES AS A GUIDE AND DOES NOT REPLACE CLINICAL JUDGMENT.

Illnesses, injuries, emergencies?
Previous hospitalization, surgery?
Recent immunization?
Use of over-the-counter medications?
Family History:
Sudden unexplained death (including unexplained car accident or drowning) in first- or second-degree family members before age 35, and particularly as an infant?
Apparent life-threatening event in sibling?
Long QT syndrome?
Arrhythmia?
Inborn error of metabolism or genetic disease?
Developmental delay?
Environmental History:
Housing: general, water damage, or mold problems?
Exposure to tobacco smoke, toxic substances, drugs?
Social History:
Family structure, individuals living in home?
Housing: general, mold?
Recent changes, stressors, or strife?
Exposure to smoke, toxic substances, drugs?
Recent exposure to infectious illness, particularly upper respiratory illness, paroxysmal cough, pertussis?
Support system(s)/access to needed resources?
Current level of concern/anxiety; how family manages adverse situations?
Potential impact of event/admission on work/family?
Previous child protective services or law enforcement involvement (eg, domestic violence, animal abuse), alerts/reports for this child or others in the family (when available)?
Exposure of child to adults with history of mental illness or substance abuse?

Source: Brief Resolved Unexplained Events (Formerly Apparent Life-Threatening Events) and Evaluation of Lower-Risk Infants Pediatrics Apr 2016, e20160590; DOI: 10.1542/peds.2016-0590

RETURN TO THE BEGINNING

CONTACTS: JOHN BRANCATO, MD | MARTA NEUBAUER, MD

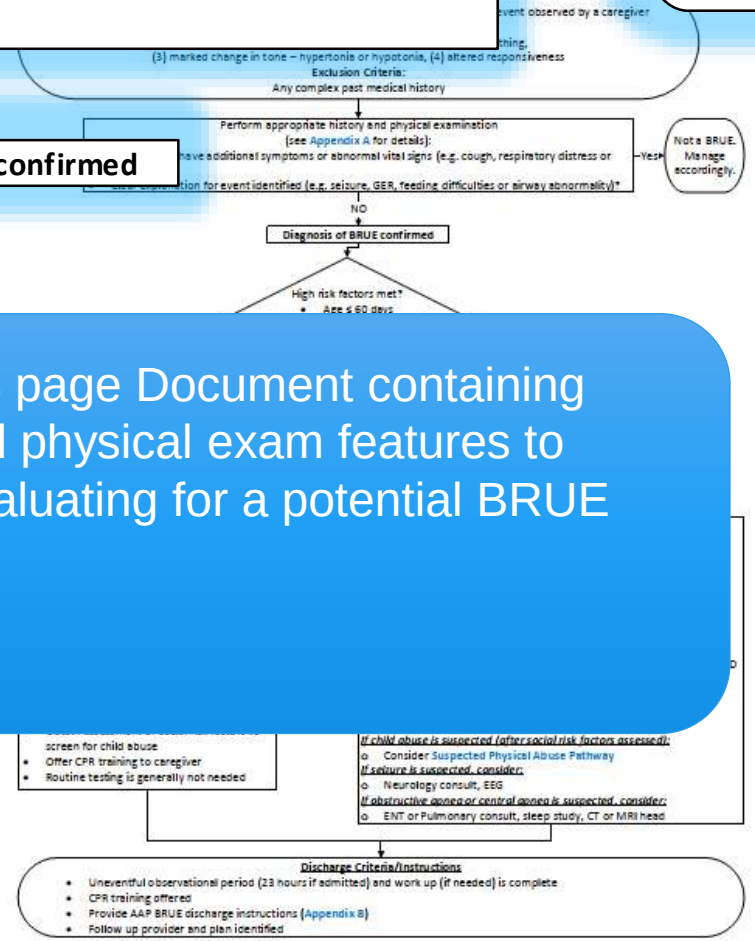
Connecticut Children's

Perform appropriate history and physical examination
(see **Appendix A** for details):

- Does patient have additiona[l] [s]ymptoms or abnormal vital signs (e.g. cough, respiratory distress or fever
- Clear explanation for event [i]dentified (e.g. seizure, GER, feeding difficulties or airway abnormality)?

Yes → Not a BRUE. Manage accordingly.

No → **[D]iagnosis of BRUE confirmed**



Appendix A: is a 3 page Document containing both historical and physical exam features to consider when evaluating for a potential BRUE

This is page A2

NEXT PAGE

CONTACTS: JOHN BRANCATO, MD | MARTA NEUBAUER, MD

Connecticut Children's

©2019 Connecticut Children's. All rights reserved. 19-004

CLINICAL PATHWAY:
Brief Resolved Unexplained Event (BRUE)
Appendix A: Physical Examination Features to Consider in the Evaluation of a Potential BRUE

THIS PATHWAY SERVES AS A GUIDE AND DOES NOT REPLACE CLINICAL JUDGMENT.

General Appearance:
Craniofacial abnormalities (mandible, maxilla, nasal)
Age-appropriate responsiveness to environment
Growth Variables:
Length, weight, occipitofrontal circumference
Vital Signs:
Temperature, pulse, respiratory rate, blood pressure, oxygen saturation
Skin:
Color, perfusion, evidence of injury (eg, bruising or erythema)
Head:
Shape, fontanelles, bruising or other injury
Eyes:
General, extraocular movement, pupillary response
Conjunctival hemorrhage
Retinal examination, if indicated by other findings
Ears:
Tympanic membranes
Nose and Mouth:
Congestion/coryza
Blood in nares or oropharynx
Evidence of trauma or obstruction
Torn frenulum
Neck:
Mobility
Chest:
Auscultation, palpation for rib tenderness, crepitus, irregularities
Heart:
Rhythm, rate, auscultation
Abdomen:
Organomegaly, masses, distention
Tenderness
Genitalia:
Any abnormalities
Extremities:
Muscle tone, injuries, limb deformities consistent with fracture
Neurologic:
Alertness, responsiveness
Response to sound and visual stimuli
General tone
Pupillary constriction in response to light
Presence of symmetrical reflexes
Symmetry of movement/tone/strength

Source: *Brief Resolved Unexplained Events (Formerly Apparent Life-Threatening Events) and Evaluation of Lower-Risk Infants Pediatrics Apr 2016, e20160590; DOI: 10.1542/peds.2016-0590*

RETURN TO THE BEGINNING

CONTACTS: JOHN BRANCATO, MD | MARTA NEUBAUER, MD

LAST UPDATED: 01.28.21

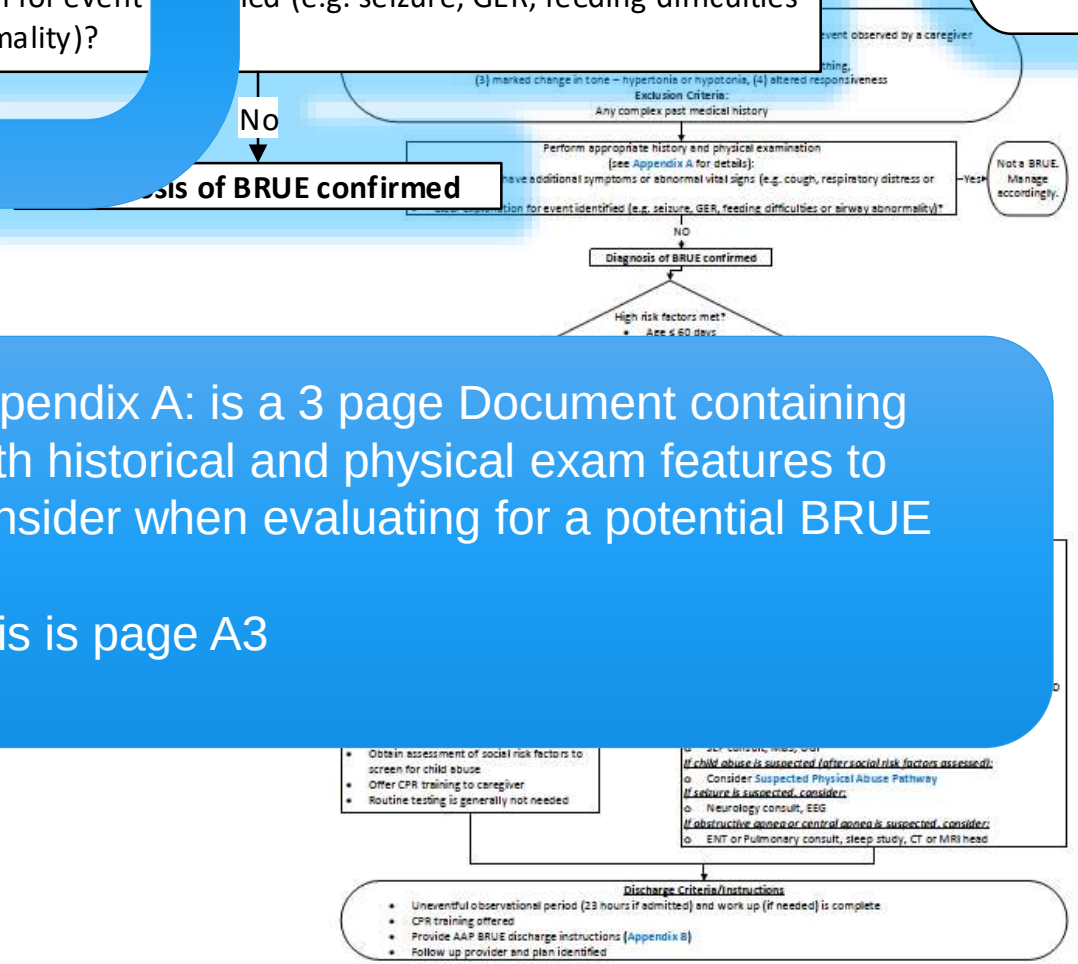
Connecticut Children's

Perform appropriate history and physical examination
(see **Appendix A** for details):

- Does patient have additiona toms or abnormal vital signs (e.g. cough, respiratory distress or fever
- Clear explanation for event ied (e.g. seizure, GER, feeding difficulties or airway abnormality)?

Yes → Not a BRUE. Manage accordingly.

No → sis of BRUE confirmed



Appendix A: is a 3 page Document containing both historical and physical exam features to consider when evaluating for a potential BRUE

This is page A3

NEXT PAGE

CONTACTS: JOHN BRANCATO, MD | MARTA NEUBAUER, MD

LAST UPDATED: 01.28.21

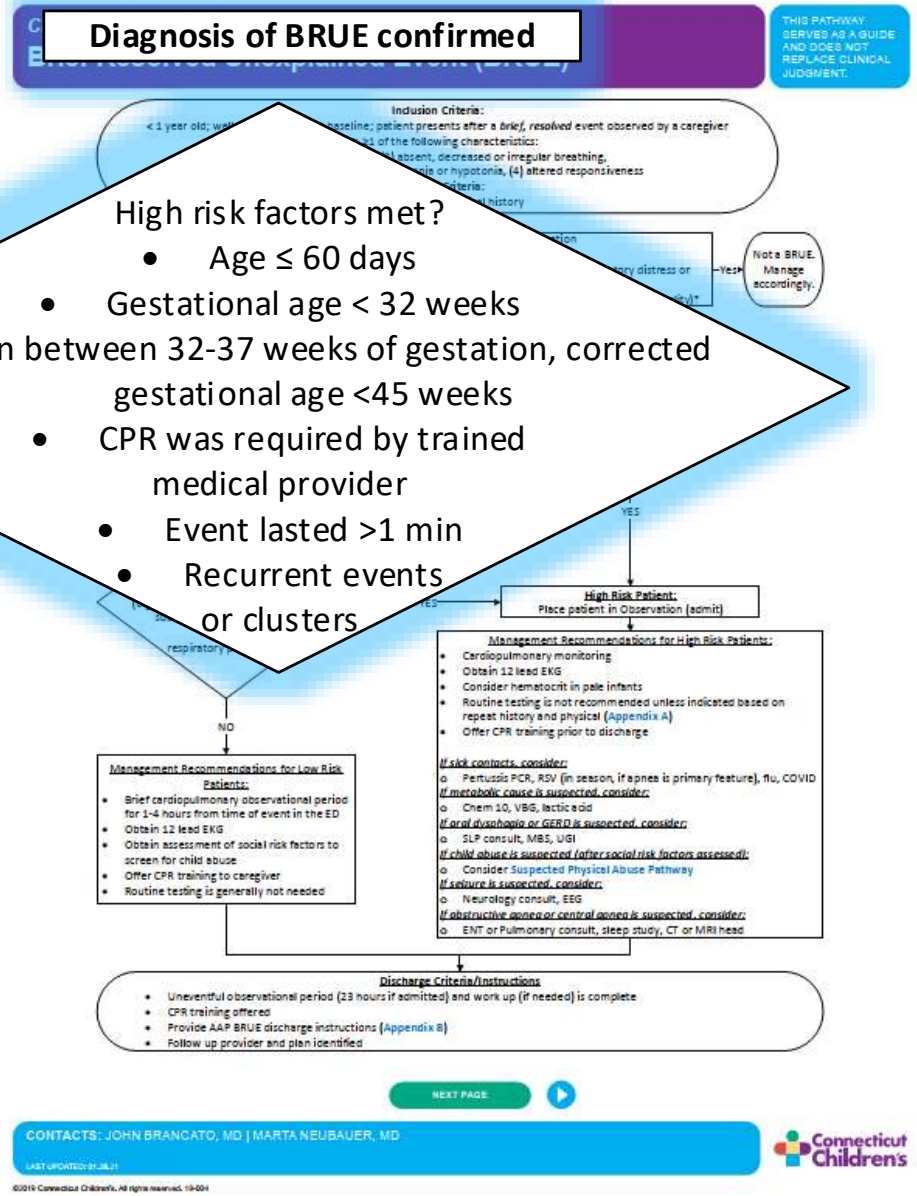
Connecticut Children's

Certain factors have been shown to be associated with higher risk of event recurrence and therefore higher risk of a serious underlying disease

This includes:

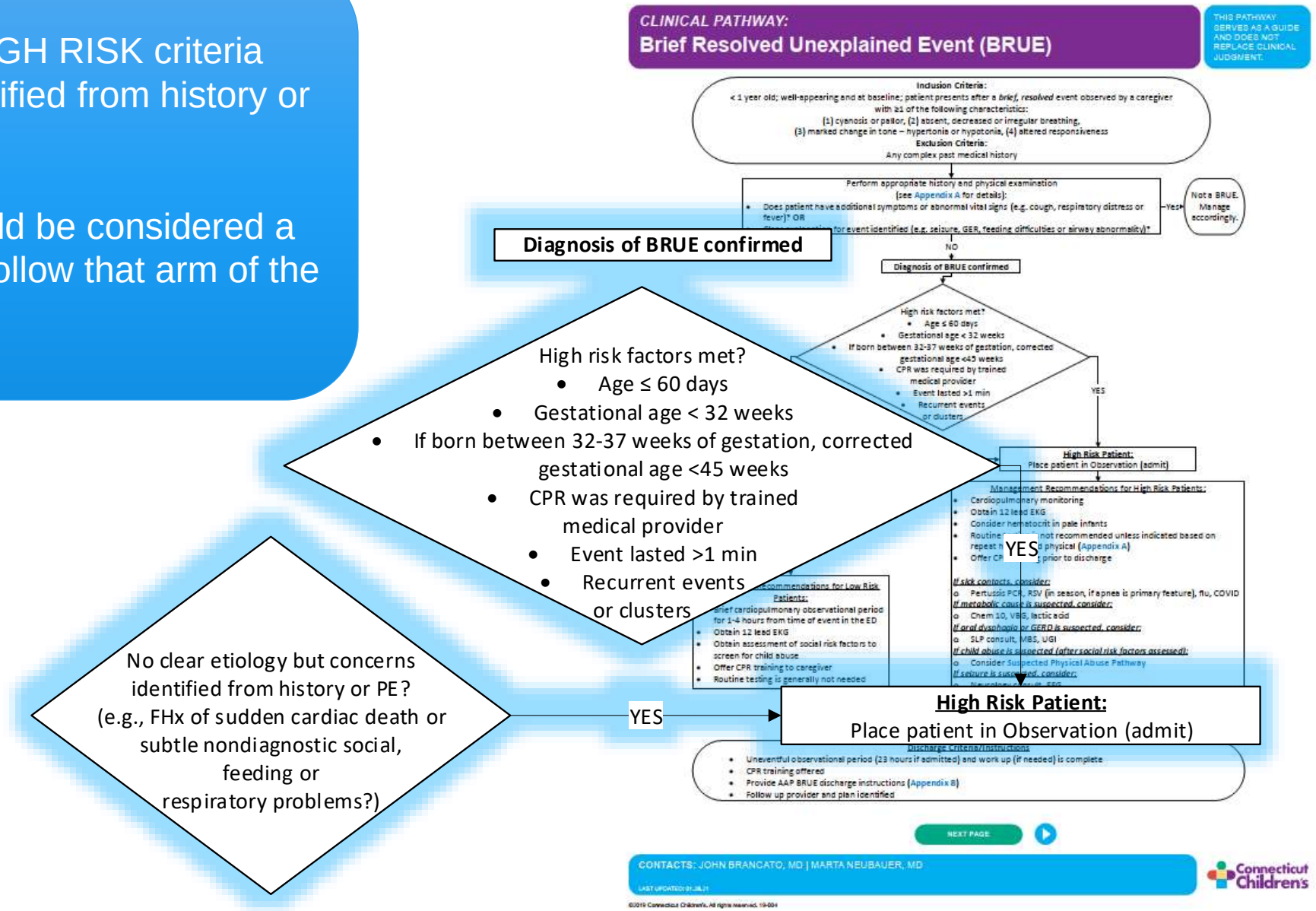
- Young and premature infants
- Infants that required CPR by a trained medical provider
- Any prolonged or repeated events

Infants meeting one or more of these criteria are classified as HIGH RISK



If the infant does not meet HIGH RISK criteria but has subtle concerns identified from history or physical exam

Then the patient should be considered a high risk patient and follow that arm of the pathway.

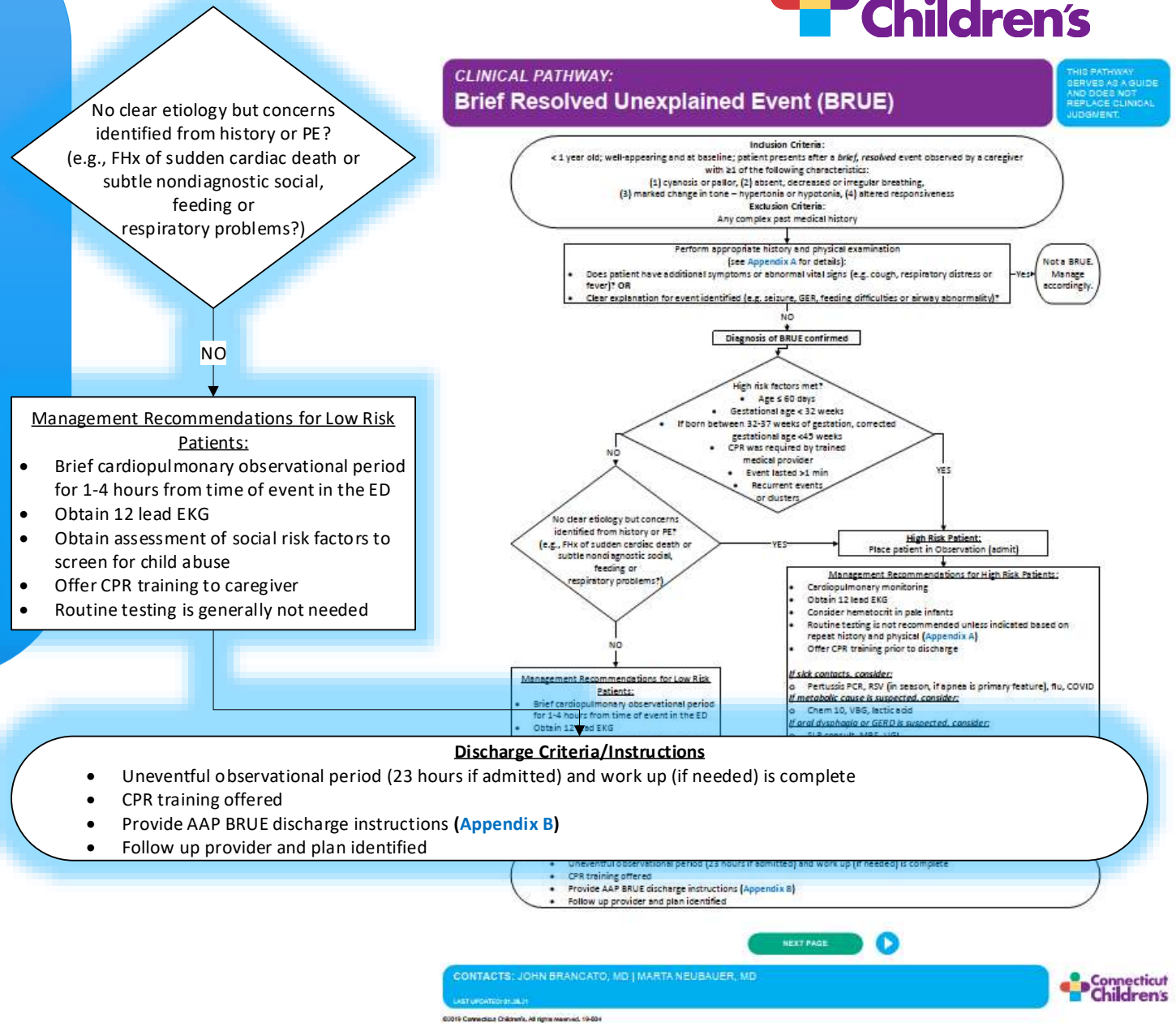


The LOW RISK Patient:

Patient without any High risk factors can be managed in the Emergency Department, and discharged to home after a 1-4 hour observation period.

- All children identified as having a BRUE should undergo:
  - 12 lead EKG
  - An assessment of social risk factors to screen for child abuse

** Other routine testing is generally not indicated

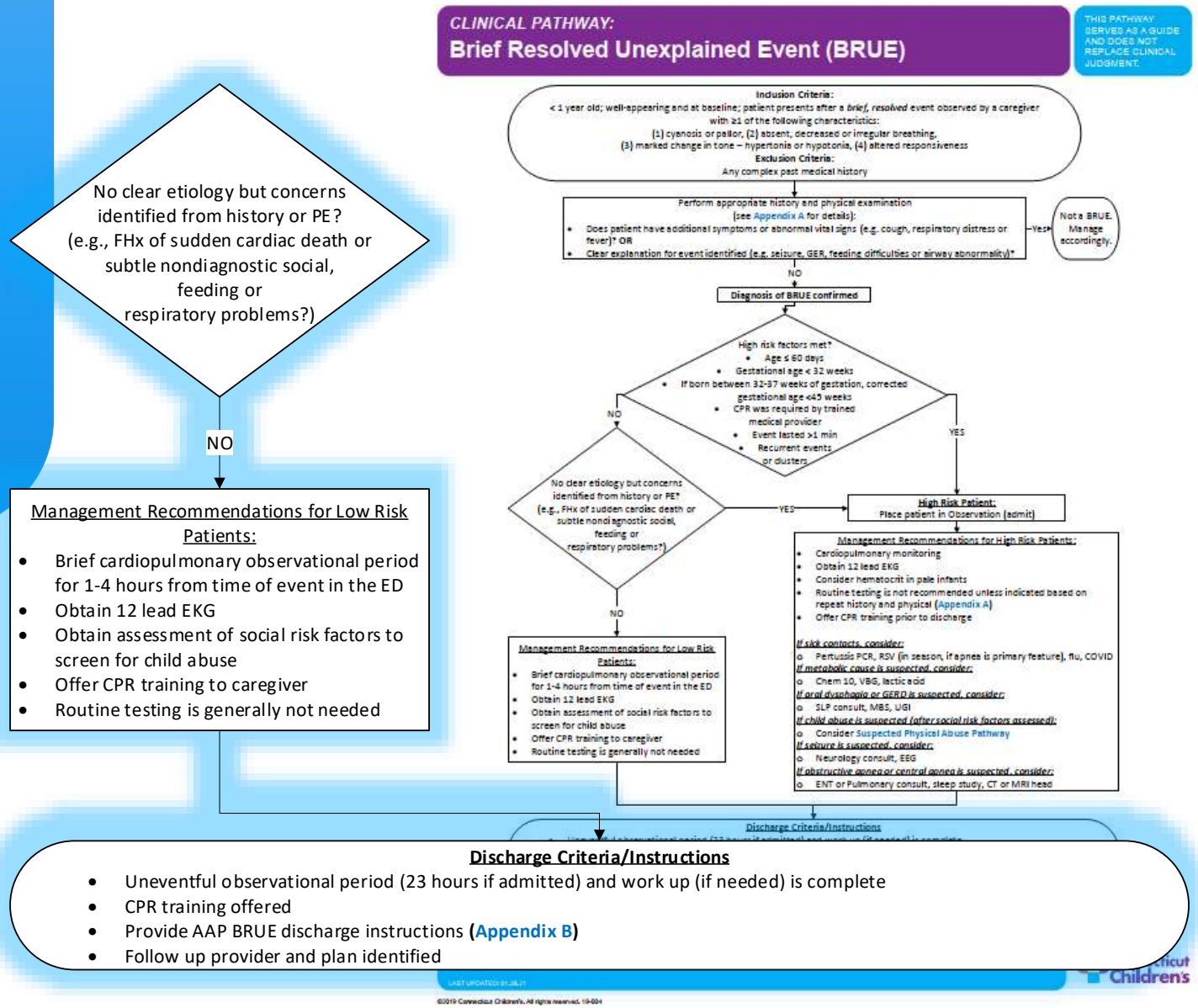


The LOW RISK infant may be discharged from the ED if:

- Observation period has been uneventful
- Any work up (if needed) and assessments have been completed
- CPR training has been offered

Prior to discharge:

- Provide AAP BRUE discharge instructions (Appendix B)
- Identify follow-up provider and ensure follow-up plan is in place



CLINICAL PATHWAY:
Brief Resolved Unexplained Event (BRUE)
Appendix B: AAP BRUE Discharge Instructions (English)

THIS PATHWAY SERVES AS A GUIDE AND DOES NOT REPLACE CLINICAL JUDGMENT.

Brief Resolved Unexplained Event:
What Parents and Caregivers Need to Know

What is a brief resolved unexplained event?

A brief resolved unexplained event (or BRUE for short) occurs suddenly and can be scary for parents and caregivers. A brief resolved unexplained event is a diagnosis made after your baby's doctor or health care professional has examined your baby and determined that there was no known concerning cause for the event.

When a brief resolved unexplained event occurs, babies may seem to stop breathing, their skin color may change to pale or blue, their muscles may relax or tighten, or they may seem to pass out. After a brief period of time, they recover (with or without any medical help) and are soon back to normal.

Though we can never say that a baby who has had a brief resolved unexplained event is at *no* risk for future problems, we can say that babies are at lower risk if

- They are older than 60 days.
- They were born on time (not premature).
- They did not need CPR (cardiopulmonary resuscitation) by a health care professional.
- The brief resolved unexplained event lasted less than 1 minute.
- This was their only such event.

Frequently asked questions after a brief resolved unexplained event

Q: Why did my baby have this event?

A: Your baby's doctor was unable to find a cause based on the results of your baby's examination and cannot tell you why this event happened. If it happens again or your baby develops additional problems, contact your baby's doctor or health care professional. The doctor may decide to have your baby return for another visit.

Q: Should my baby stay in the hospital?

A: Babies who are felt to be at lower risk by their doctors or health care professionals do not need to stay in the hospital. They are safe to go home without doing blood tests or imaging that uses x-rays, and they do not need home monitoring of their heart or lungs.

Q: Does having a brief resolved unexplained event increase my baby's risk for sudden infant death syndrome (SIDS)?

A: No—though the causes of SIDS are not known, events like these do not increase the risk of SIDS. For all babies, it is important to create a safe home and sleeping environment. Your baby should not be exposed to smoky environments. Visit www.HealthyChildren.org/safesleep to learn more about how to create a safe sleeping environment for your baby.

Q: What should I do if it happens again?

A: If you are worried that this new event is life threatening, call 911 or your local emergency numbers. If not, call your baby's doctor if you have any questions or worries and to let the doctor know about the event.

Q: Does my baby need extra care after having a brief resolved unexplained event? Is my baby more delicate or weak?

A: No special care is needed. Continue to love and care for your baby as you normally do.

A few important reminders for parents and caregivers of healthy infants

- Remember to take your baby to regular well-child visits to help keep your child healthy and safe.
- Though your baby is not more likely to need it, it is a good idea for everyone who cares for an infant to learn CPR. If you know CPR, you may also use it one day to help someone else in need. For classes near you, contact your child's doctor, the American Red Cross, the American Heart Association, or a national or local organization that offers training.

From your doctor

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN™

RETURN TO THE BEGINNING

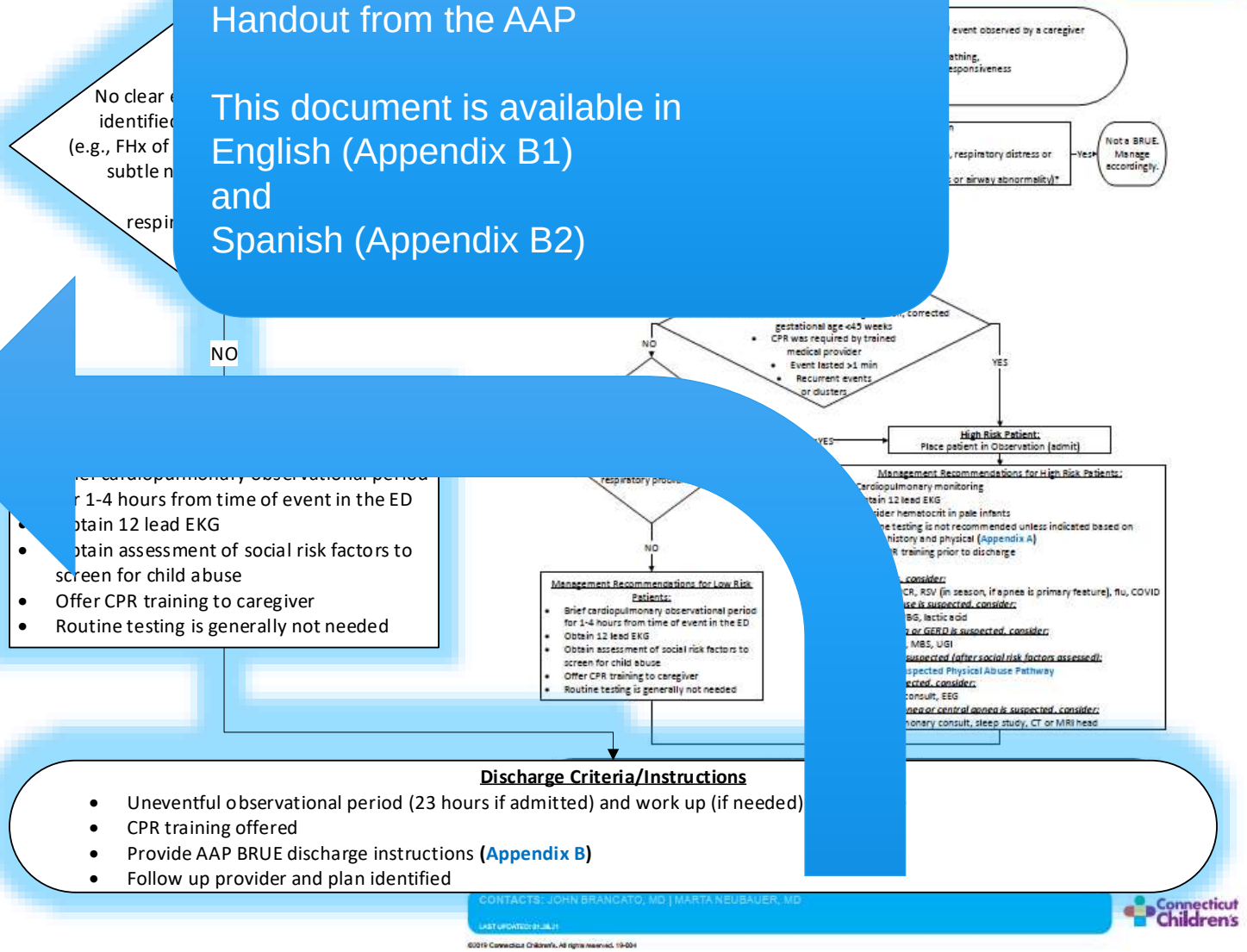
CONTACTS: JOHN BRANCATO, MD | MARTA NEUBAUER, MD

LAST UPDATED: 01.28.21

Connecticut Children's

Appendix B: The BRUE Caregiver Handout from the AAP

This document is available in English (Appendix B1) and Spanish (Appendix B2)



CONTACTS: JOHN BRANCATO, MD | MARTA NEUBAUER, MD

LAST UPDATED: 01.28.21

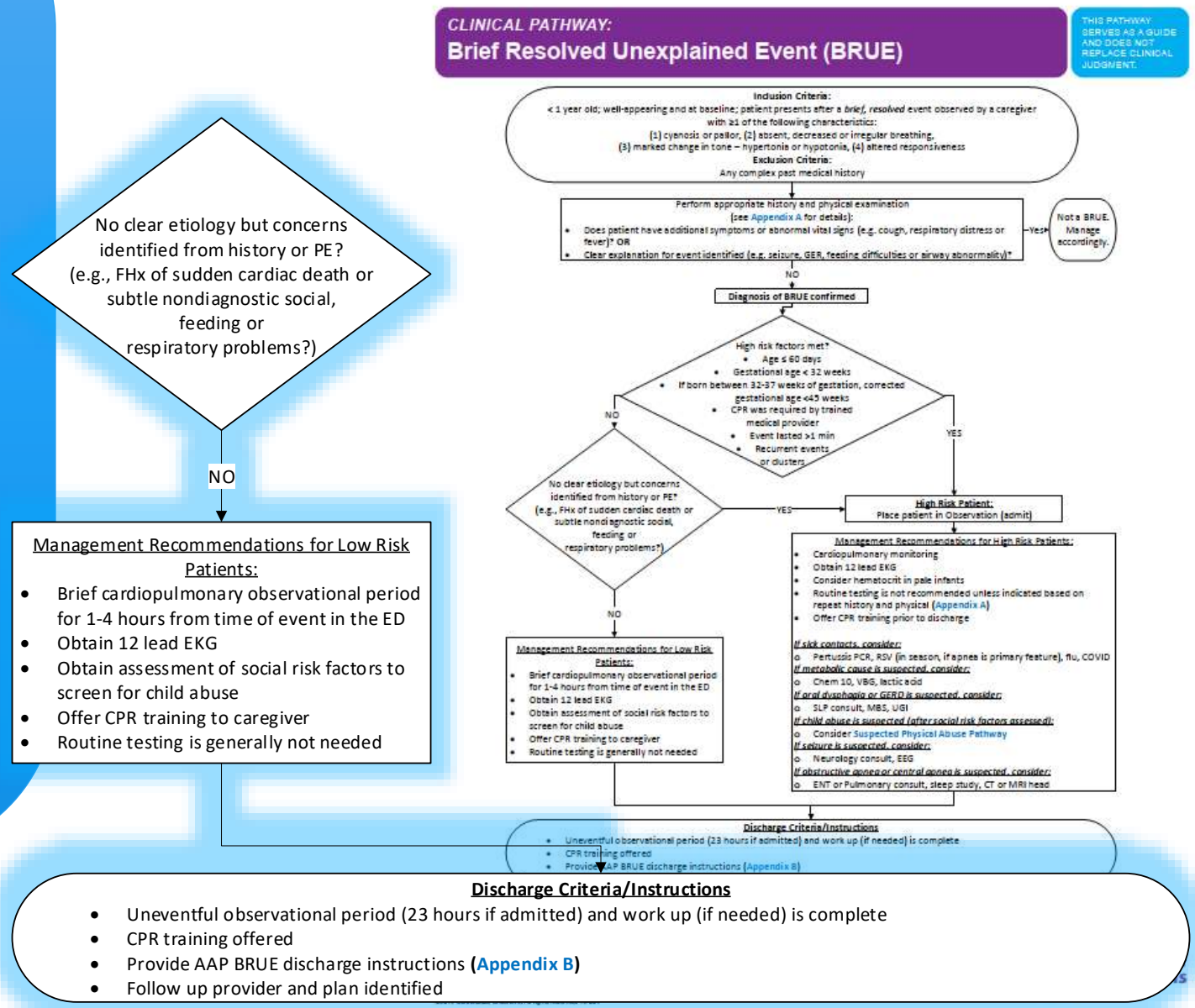
Connecticut Children's

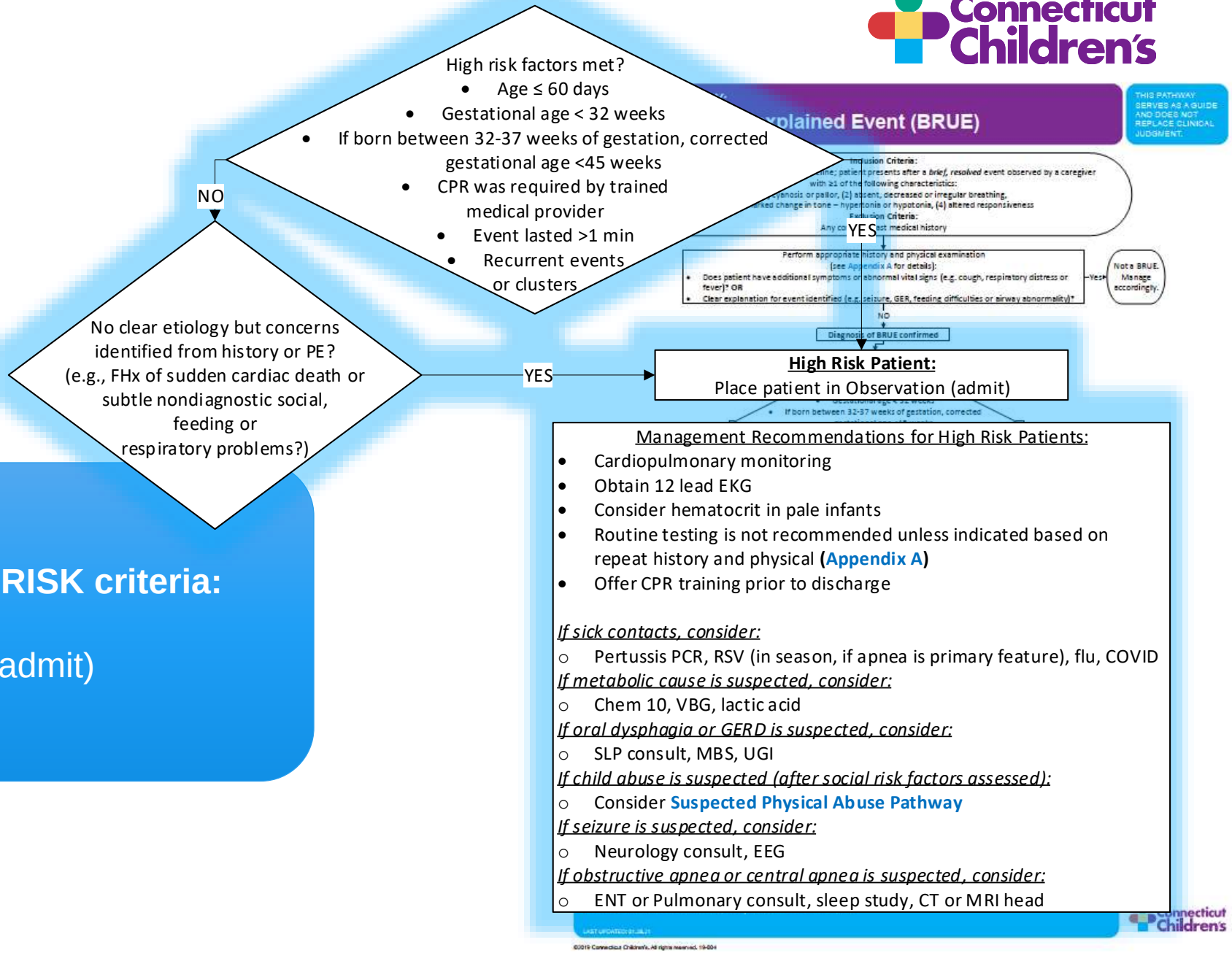
©2019 Connecticut Children's. All rights reserved. 19-004

CPR training should be offered to all caregivers prior to discharge

In order to make sure this does not create additional anxiety, we recommend the following script:

"Your child has been diagnosed with a BRUE, brief resolved unexplained event, which can be a very scary event to have experienced. We do *NOT* believe your child is at an increased risk of requiring CPR, but we think it's good for all parents to know CPR skills. Therefore we would like to use this opportunity to offer you some CPR education by watching an approximately 20 minute video.
This video is just for education, but if you would like to get certified, our Family Resource Center offers CPR certification classes.
Would you like me to put it on the television?"





If the infant does meets HIGH RISK criteria:

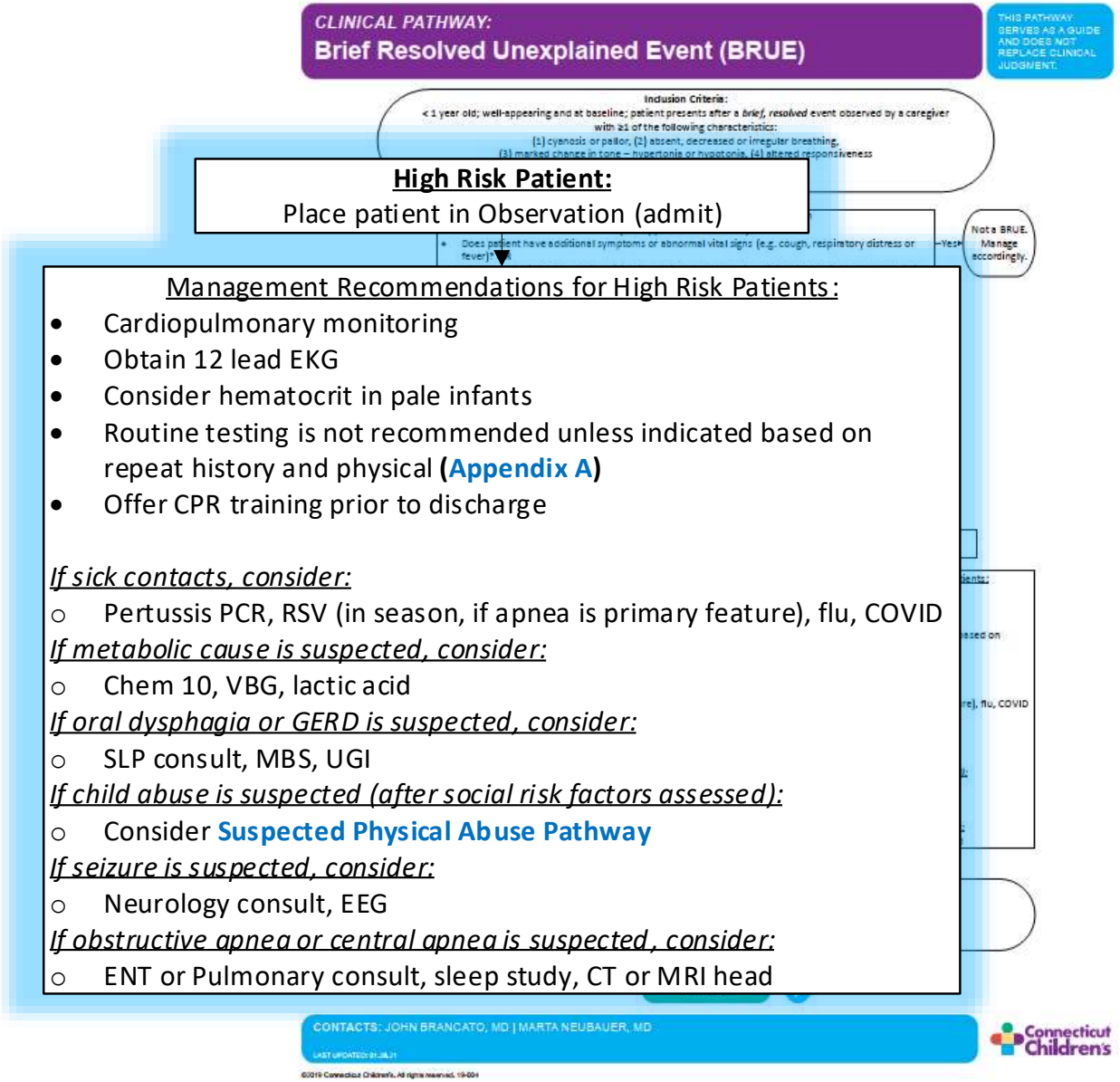
- Place patient in observation (admit)

Similar to low risk patients, **HIGH RISK patients** should also have:

- cardiopulmonary monitoring
- 12 lead EKG
- CPR offered to caregiver

HOWEVER, high risk patients warrant a longer period of observation.

** **Routine testing is generally not recommended for high risk patients unless new findings are discovered on repeat history and physical.**

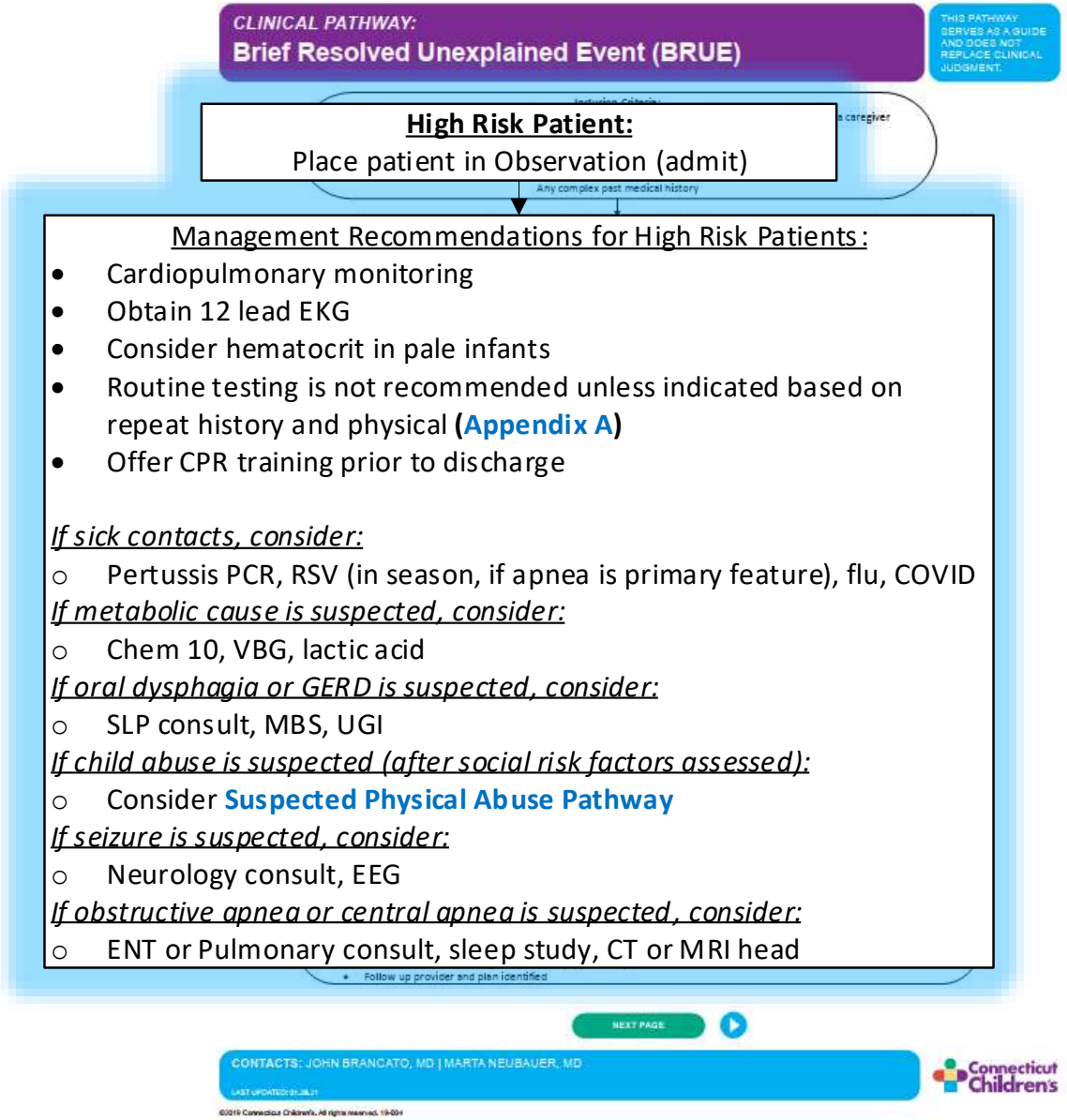


The HIGH RISK patient:

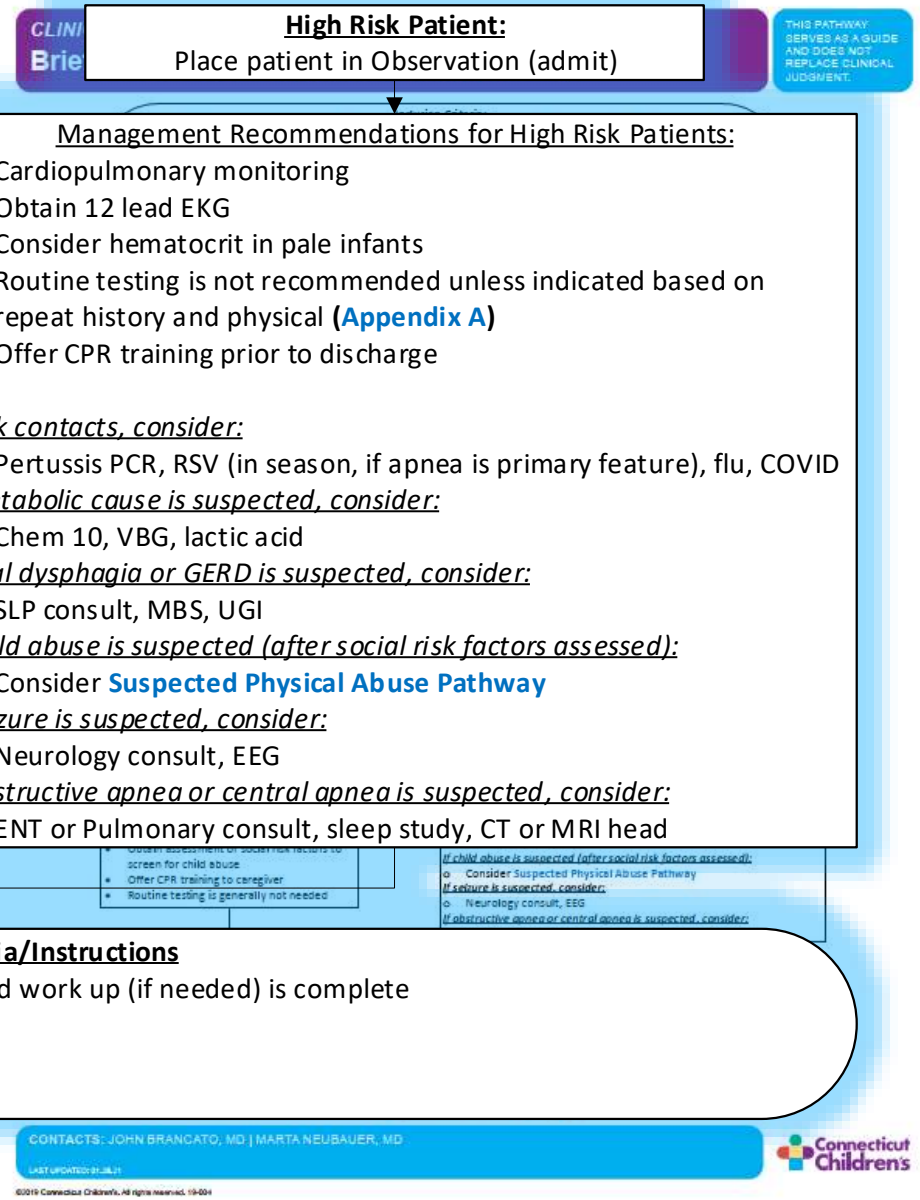
Once admitted further History and Physical Examination may lead to further work-up.

The following are examples of times when further work up should be considered:

- When there are known sick contacts
- If metabolic cause is suspected
- If oral dysphagia or GERD is suspected
- When child abuse is suspected
- If seizure is suspected



Discharge criteria and Instructions are the same for HIGH RISK and LOW RISK patients



Review of Key Points

- Thorough history and physical exam is needed to confirm diagnosis of BRUE
- Risk stratify patients to high or low risk for event recurrence or serious underlying disease risk
- Recent clarification in June 2019 Pediatrics regarding the BRUE 2016 AAP Clinical Guidelines
  - Under the heading PATIENT FACTORS THAT DETERMINE A LOWER RISK, the second bulleted item which currently says
    - "Prematurity: gestational age ≥ 32 weeks and postconceptional age ≥ 45 weeks"
  - should be replaced with:
    - "Gestational age not >32 weeks"
    - " If born between 32-37 weeks of gestation, corrected gestational age ≥45 weeks"
- If low risk, 1-4 hours observation is recommended
  - EKG and child abuse screening should be obtained
  - Offer CPR training to caregivers
- If high risk, admit for observation with appropriate work-up only if needed based on history and physical exam

Use of Order Set

ED MD (BRUE) Brief, resolved unexplained event [111]

Pathway

Pathway

☑ Initiate Clinical Pathway: BRUE	Once, Starting today For 1 Occurrences

Nursing

Nursing

☑ Cardiorespiratory monitoring	STAT, Continuous, Starting today May be off Monitor? No
☑ EKG 12 lead	Once - Now, Starting today For 1 Occurrences Previous EKG's? Clinical Indication for EKG:
☑ Education: CPR training video for caregivers with patent/guardian	Until discontinued, Starting today Education required: CPR training video for caregivers with parent/guardian

Labs

There are Order Sets for both the Emergency Department and for admission to the hospital

Order Set use helps ensure the pathway is followed properly.

It also helps in collecting Quality Metrics

Use of Order Set

Admit to MS: Brief Resolved Unexplained Event (BRUE) [3001252005]

General

ADT

☐ Admit to Inpatient	Attending: Diagnosis: Patient Class: Inpatient
☐ Place Patient in Observation	Attending: Diagnosis: Patient Class: Observation Accomodation Code: Observation

Pathway

☑ Initiate Clinical Pathway: Brief Resolved Unexplained Event (BRUE)	Until discontinued, Starting today

Nursing

Isolation

☐ Airborne isolation status	Details
☐ Contact isolation status	Details
☐ Brown Contact Isolation Status	Details
☐ Droplet isolation status	Details

Vital Signs

☑ Vital signs-TPR, BP and O2 sats	Routine, Every 4 hours Additional instructions: BP site/location: Additional instructions:
☐ Vital signs-TPR	Routine, Every 4 hours Additional instructions:
☐ BP checks all 4 extremities	Routine, Once For 1 Occurrences

The Order sets contain options for all of the testing and interventions discussed in the pathway.

Quality Metrics

- Percentage of eligible patients with use of BRUE order set
- Percentage of low risk patients that are admitted
- Percentage of patients with ECGs obtained
- Percentage of patients with 2 ECGs and/or echocardiogram and/or cardiology consult
- Number of patients that return to the ED within 30 days
- Percent of admitted patients who receive a diagnosis other than BRUE (and type of diagnosis)

Pathway Contacts

- Marta Neubauer, MD,
  - Pediatric Hospital Medicine
- John Brancato, MD
  - Pediatric Emergency Medicine

References

- Tieder JS, Bonkowsky JL, Etzel RA, et al. Clinical Practice Guideline: Brief Resolved Unexplained Events (Formerly Apparent Life-Threatening Events) and Evaluation of Lower-Risk Infants. *Pediatrics.* 2016;137 (5):e20160590.

Thank You!

About Connecticut Children's Clinical Pathways Program

The Clinical Pathways Program at Connecticut Children's aims to improve the quality of care our patients receive, across both ambulatory and acute care settings. We have implemented a standardized process for clinical pathway development and maintenance to ensure meaningful improvements to patient care as well as systematic continual improvement. Development of a clinical pathway includes a multidisciplinary team, which may include doctors, advanced practitioners, nurses, pharmacists, other specialists, and even patients/families. Each clinical pathway has a flow algorithm, an educational module for end-user education, associated order set(s) in the electronic medical record, and quality metrics that are evaluated regularly to measure the pathway's effectiveness. Additionally, clinical pathways are reviewed annually and updated to ensure alignment with the most up to date evidence. These pathways serve as a guide for providers and do not replace clinical judgment.