PedsCases Podcast Scripts

This is a text version of a podcast from Pedscases.com on "**Approach to Brief Resolved Unexplained Events (BRUEs) in Infancy.**" These podcasts are designed to give medical students an overview of key topics in pediatrics. The audio versions are accessible on iTunes or at www.pedcases.com/podcasts.

Approach to Brief Resolved Unexplained Events in infancy (Formerly known as ALTEs)

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PART 1

Introduction

Larissa: Hello, my name is Larissa Shapka. I'm a medical student at the University of Alberta. Joining me today is Dr. Karen Forbes, a pediatrician and medical educator at the University of Alberta. Welcome, Dr. Forbes, and thanks for being here.

Dr. Forbes: My pleasure.

Larissa: This is the first podcast in a two part series discussing an approach to brief resolved unexplained events in infants. For the remainder of the podcast we will refer to these using the acronym BRUE. Pease note that these episodes were previously referred to as apparent life-threatening events, or ALTEs, which will be addressed later on in the podcast.

In this first podcast we will:

1. Describe the clinical presentation of a BRUE
2. Develop a differential diagnosis of these events based on etiology
3. Discuss key considerations for history and physical examination

In the second podcast of this series, our main objectives will be:

1. List appropriate investigations for a BRUE
2. Outline key points in the management of a BRUE

Given the frightening nature of these events and the fact that many patients are brought to medical attention, it's important to have a practical approach to this clinical presentation. We'll be using a clinical case throughout this podcast to highlight important considerations. Let's get started.

You are a third year medical student doing a rotation in the emergency department. Your preceptor asks you to see Luke, a 10 week-old male brought in by EMS.

According to his mother, he had an event where he seemed to stop breathing and turned blue. She called an ambulance, but by the time they arrived Luke appeared back to normal. Currently he is awake and alert. Luke's mother is very concerned about what happened. She is anxious to know what caused this, and whether her son will be okay.

What is the most likely diagnosis in this case? How would you evaluate and manage this patient?

Before we can answer these questions, we first need to be able to recognize the clinical features of a BRUE. Dr. Forbes, could you please explain what a BRUE is?

Definitions

Dr. Forbes: Sure. BRUE stands for 'brief resolved unexplained event'[1]. The following characteristics must be present in order for a diagnosis of BRUE to be made:

- First, the infant must be younger than 1 year old
- Second, as the name suggests, the episode must be sudden, brief, and now resolved, meaning that the infant has returned to baseline by the time you assess them
- Third, the event is characterized by at least one, if not more, of the following features:
    - Cyanosis or pallor
    - Absent, decreased, or irregular breathing
    - Change in muscle tone, either hyper or hypotonia, or
    - Altered level of responsiveness[2]
- Finally, it is important to note that a BRUE is a diagnosis of exclusion. It can only be made if there is no apparent explanation for the episode after history and physical exam.

If an apparent etiology is identified, this event is not a BRUE and should be investigated and managed based on the suspected cause.

BRUEs can be further classified as lower or higher risk events. This categorization is based on the likelihood of the patient having a serious undiagnosed condition or experiencing recurrent events or adverse outcomes. This is important because it affects diagnostic workup and management. We'll elaborate on this later in the podcast.

Larissa: Thanks! I understand BRUE is a new term for episodes that were previously called apparent life-threatening events, or ALTEs. Could you explain the rationale behind this change in terminology?

Dr. Forbes: Of course. In 2016, The American Academy of Pediatrics released new clinical practice guidelines for these types of episodes. As you mentioned, BRUEs were previously called apparent life-threatening events, or ALTEs.

The term ALTE implied that the event was frightening and the observer may have thought the child was actually dying. This definition was problematic for several reasons. It was broad and included nonspecific symptoms that could be due to normal infant physiology, self-limited pathologies, or more serious conditions. In the majority of patients, ALTEs were benign. However, as the name implied there was concern for a child's life being at risk. This characterization led to non-effective investigations or hospitalization while reinforcing parental anxiety.

The new American Academy of Pediatrics guidelines on BRUEs outline more precise diagnostic criteria and recommend a strategy for identifying higher and lower risk patients and responding accordingly.

Larissa: Now are BRUEs related to Sudden Infant Death Syndrome, or SIDS?

Dr. Forbes: Before the terms BRUE or ALTE existed, these types of events were called "near-miss SIDS" or "aborted crib deaths."[3] However, these terms are no longer used because there is no clear association with SIDS. Currently, our understanding of the two conditions suggests that these episodes are thought to be neither a risk factor for nor a precursor to SIDS.

Differential Diagnosis

Larissa: Now that we've reviewed the clinical features of a BRUE, let's discuss possible causes. Dr. Forbes, what would be on your differential diagnosis for a BRUE?

Dr. Forbes: First of all, it's important to remember that a BRUE is description of an event; it's not a disease entity in and of itself. As noted before, by definition, a BRUE is unexplained. With the previous term of ALTE**,** this was not implied and the most common causes identified included gastroesophageal reflux, respiratory infections and seizures.

Larissa: Other than these common causes of frightening episodes in infants, what other etiologies can similarly present as a frightening event?

Dr. Forbes: The list can be quite long. Rare and more serious causes include a wide variety of other conditions, such as: bacterial infections, inborn errors of metabolism, congenital abnormalities, and child abuse. A wide variety of other gastrointestinal, neurologic, respiratory, and cardiac conditions can present as a frightening episode. The cause could be metabolic and endocrine, or related to drugs and toxins or airway issues. However, it is important to realize that infants who fall into the category of rare causes will usually have recurrent events as well as clues on history, physical exam or basic investigations that would guide you to explore these possibilities.

Evaluation

Larissa: That's a lot of possible causes! Given the broad differential, how do you structure your evaluation of patient presenting with an episode like this?

Dr. Forbes: You should focus on collecting a detailed history and performing a full physical examination of the patient. The findings of these evaluations will help you classify the episode and determine your next steps.

Due to the nature of BRUEs, these cases appear unexplained. It can be tricky to know what further evaluations are appropriate. However, the guidelines that exist right now provide criteria for dividing BRUEs into lower and higher risk events. High risk would indicate there is a need to more thoroughly search for causes of the episode. We'll discuss the specific criteria for this in part 2 of this podcast series. At this point, it's just good to know that some of these features relate to signs and symptoms of an underlying condition. Based on this, there are certain critical things to ask on history and look for on physical exam that will help us classify the episode later.

History

Larissa: That makes sense! Let's talk about the history first. What information would you want to know?

Dr. Forbes: In your history you want to get a clear sense of the event. There are many different ways to structure your history, but I always like to break down any episode into 3 stages: what happened before, during, and after the event. It's ideal to get details about the event from the caregiver who observed the episode first hand.

Larissa: How about we start with the circumstances leading up to the episode. What would you ask about?

Dr. Forbes: I would want to find out exactly what the infant was doing before the event and whether they were behaving normally. Specifically, I would ask about where they were and what they were doing, such as whether they were sleeping or awake, and the timing in relation to a feed. I also usually ask the observer what made them go check on the baby if they were, for example, sleeping in another room.

Larissa: Great. Let's move on to figuring out what happened during the event itself. Any tips for this?

Dr. Forbes: Try to collect as much information as you can. I would ask specifically about the infant's level of consciousness, breathing efforts, colour, muscle tone, limb and eye movement. If they tell you the baby was not breathing, ask if they looked like they were trying to breathe, but couldn't, as if they were choking, or if they just had no effort. If they tell you the child turned blue, try to clarify where they noticed the colour change to help determine if it was central or peripheral. You should ask about any abnormal

movements. You also want to find out where the event occurred and how long it lasted. Duration can often be difficult for a frightened observer to accurately recall though, and they often overestimate how long it lasted.

Larissa: What about the details of what happened after the episode itself?

Dr. Forbes: Make sure you find out if the infant required any intervention. Ask about the type of measure used and how long it was performed for. For example, did the infant require gentle or vigorous simulation, mouth-to-mouth resuscitation, or CPR? You want to know if the infant returned back to their baseline state quickly, or if they had a period of decreased arousal afterwards.

Larissa: Okay, once you have a good sense of what happened before, during, and after the event, what else you would want to know?

Dr. Forbes: I would specifically ask about any associated symptoms that would suggest a particular etiology. For gastroesophageal reflux disease, or GERD, I would ask if the infant had any vomiting, regurgitation, apparent choking, or difficulty breathing during the event. As previously mentioned, I would want to know about the timing in relationship to feeding. In particular, I would ask if it happened during a feed, or how long after, and whether they were supine at the time. In considering a respiratory tract or other infection, I would inquire about recent nasal congestion, cough, and fever as well as sick contacts. For the possibility of a seizure, I would determine if the infant was unresponsive or had a loss of muscle tone during the event. I wouldn't expect them to have a history of choking or gagging in a seizure, but might elicit a history of abnormal movements or eye deviation, as well as possibly having a more prolonged unresponsive state after the event.

Remember that if you discover an explanation for the episode based on the history of the event, it's not a BRUE anymore.

Larissa: You should also ask about the infant's general health, family, and social histories. Dr. Forbes, what are the relevant considerations for these?

Dr. Forbes: For the infant's past medical history, I would consider pregnancy and birth histories. It's important to know if the infant was born at term since this is one of the features that will later help us classify the patient as higher or lower risk. If the infant was preterm then it's helpful to know if they had any respiratory difficulties in the neonatal period, specifically related to apneas and bradycardias of prematurity. General history would also need to include recent illness, significant health issues, previous events, feeding difficulties and failure to thrive, as well as usual behavior, sleeping and feeding habits. I'd also ask about vaccination history, any medications the infant was on and those meds present in the home.

When collecting the family history, I would specifically ask about any similar events, SIDS, early infant deaths, genetic, metabolic, cardiac, or neurologic conditions.

Make sure you also collect a social history. Aspects to consider would be whether anyone smokes in the home, and if there are any concerns for non-accidental injury. Recent stressors and supports in the home are also other topics that could be included. A detailed history will help you narrow your differential diagnosis and focus your physical exam.

Larissa: Let's review all of that by returning to our clinical case.

You begin to collect a history from Luke's mother. The event happened just after she placed him in his crib for a nap, about an hour after a feed. When she went to check on him, he was lying on his back, did not seem to be breathing, and had turned blue around the lips. She immediately picked him up and patted him on the back. After that, he seemed to catch his breath and began to cry. Luke's mom does not think there was any choking, and there was no spit up or vomiting. She did not notice any abnormal movements other than the fact that he was limp when she picked him up, but then his tone got better pretty quickly. She felt panicked, and doesn't recall how long the episode lasted – maybe just under a minute? She didn't notice anything out of the ordinary leading up to the event.

On past medical history, Luke was born at term after an uncomplicated pregnancy and delivery. He feeds frequently, doesn't really spit up, and is wetting and soiling his diapers regularly. His sleeping pattern is appropriate for age and there are no developmental concerns. Luke has no significant medical issues. No sick contacts are reported. Family and social histories are unremarkable.

Physical Exam

Larissa: Our next step is the physical exam. Dr. Forbes, could you explain what you would look for?

Dr. Forbes: Certainly. Just like a history, a physical exam is an important diagnostic tool, and should be thorough. Because of the broad differential diagnosis for these frightening episodes, you should perform a complete physical exam.

Start by assessing the infant's general appearance. You want to know whether the baby has returned to normal, or whether they have any lingering limpness, colour change, or reduced alertness, which could suggest a diagnosis other than BRUE. Next you would want to take a complete set of vital signs, including oxygen saturation. Vital signs out of the normal range for age would be concerning at this point. As with any pediatric patient, you should measure height, weight, and head circumference, plotting these measurements on growth curves. Assess for upper airway obstruction or symptoms of an upper respiratory tract infection. Pay attention to the findings of your respiratory, cardiac, and neurological exams, including a developmental assessment. Any abnormal findings should be noted, as they could provide diagnostic clues about an underlying etiology. Be sure to also look for any signs of trauma or maltreatment; observation of the caregiver's interactions with the infant is a key aspect of your examination.

A more detailed list of physical exam considerations can be found in the guidelines. Just remember that if your physical exam reveals a possible explanation for the event or concerning findings, the episode can't be called a BRUE. An infant with a BRUE will appear well and there will be no cause for the event identified on history and physical exam.

Larissa: Let's see what the physical exam findings are in our clinical case.

On general inspection, Luke is awake and alert. Heart rate, respiratory rate, blood pressure and oxygen saturation are normal for age. He is afebrile. His height, weight, and head circumference measurements fall within the accepted ranges on the growth charts. You do not find signs of possible trauma or upper airway obstruction. Cardiac, respiratory, and neurological examinations are normal. The rest of the exam is unremarkable.

This concludes our first podcast of a two part series on an approach to frightening events in infants. In this episode, we discussed the clinical presentation of a BRUE, reviewed the differential diagnosis based on etiology, and described key considerations for history and physical exam.

Be sure to check out the second podcast in this series for an approach to investigating and managing BRUEs. Thanks for listening!

PART 2

Introduction

Larissa: Welcome back to our 2 part series on an approach to brief resolved unexplained events, or BRUEs, in infants. My name is Larissa Shapka, and I'm a medical student at the University of Alberta. Joining me today is Dr. Karen Forbes, a pediatrician and medical educator at the University of Alberta.

In the previous podcast, we discussed:

1. The clinical presentation of a BRUE
2. The differential diagnosis based on etiology; and
3. Key considerations for history and physical exam

We were also introduced to the clinical case of Luke, a 10-week-old male who presented to the emergency department after he seemed to stop breathing and turned blue. We will continue to work through Luke's case to apply what we learn in the podcast.

In the second podcast of this series, our main objectives will be:

1. List appropriate investigations for a BRUE
2. Outline key points in the management of a BRUE

Let's start by talking about the final step in the diagnostic workup: laboratory and imaging investigations. Because there is such a wide differential diagnosis for BRUEs, many possible tests could be done. Dr. Forbes, do you have any tips for deciding which tests to order?

Risk Assessment

Dr. Forbes: Risk assessment on the basis of your history and physical exam findings can be a helpful tool.

Larissa: So how would you assess risk for BRUEs?

Dr. Forbes: The guidelines that exist right now provide criteria for dividing episodes up into lower and higher risk events. The whole idea is to figure out which patients are more likely to have a serious condition as the cause of the episode, and possibly more events in the future. Keep in mind that these guidelines and subsequent recommendations for management are just that- guidelines. As always, clinical judgment is key.

An infant could be considered higher risk in one of three ways:

- First, they would automatically be considered higher risk if they show what are called concerning features on history or physical exam. These concerning features could be signs and symptoms of an underlying condition. Alternatively, they could be risk factors predisposing an infant to a serious condition, such as those identified on family history.
- Next, even if there are no red flags on history or physical exam, you should consider the event itself and the patient's age
    - If the BRUE was a recurrent event, lasted longer than a minute, or required CPR from a medical provider that puts the patient in the higher risk category.
    - Finally, if the infant is younger than 60 days, or was born under 32 weeks gestation with a corrected gestational age of less than 45 weeks, this would also indicate higher risk[2]

In contrast, a lower risk patient would:

- Have no "concerning features"[2] on history and physical exam
- Present with a first event which lasted less than a minute and didn't require CPR; and
- Be older than 60 days and have been born at 32 weeks gestation or later (corrected gestational age of at least 45 weeks)[2]

Investigations

Larissa: Practically speaking, how does risk classification affect investigation?

Dr. Forbes: Well, in patients at lower risk of a serious underlying disease or recurrent BRUE, extensive laboratory or imaging studies are unlikely to be helpful. Extensive workup and hospitalization could even expose these infants to unnecessary risk.
For lower risk patients there are some guidelines as to what you should, may, need not, and should not consider. We'll look at the recommended courses of action, as well as steps to avoid.

Let's start with the things you **should** do:

- As always, decisions about evaluation, management and follow-up should be made in partnership with the infant's caregivers
- You should also make sure you teach caregivers about BRUEs and offer them information about CPR training[1]

It **may** be reasonable to:

- Order pertussis testing if you suspect an infectious cause
- Order an ECG as part of a cardiac workup
- Observe infants and monitor their oxygen saturations for a short period of time (a few hours) to ensure they stay well. We will touch on this when we talk about management[1]

In most cases, it's **not necessary** to:

- Order viral respiratory testing or a urinalysis as part of an infectious workup
- Order blood glucose, serum bicarbonate, or serum lactic acid to check for inborn errors of metabolism
- Order neuroimaging for suspected child abuse
- Admit the patient just to receive cardiorespiratory monitoring[1]

Remember, these are patients with no concerning findings on history or physical exam.

In response to these events being over investigated in the past, and in the interest of providing high value care, the guidelines set out things you should not do in low risk patients. In low risk patients, you **should not**:

- Evaluate for anemia based on lab tests
- Obtain bloodwork including CBC, electrolytes, renal function, or tests for inborn errors of metabolism.
- Sample CSF to look for a subclinical bacterial infection.
- Order a chest x-ray, blood gases, echocardiogram, or polysomnograph as part of a cardiopulmonary evaluation
- Order EEG for a neurologic workup
- Order tests for gastroesophageal reflux
- Prescribe anti-epileptics or medications for acid suppression; or
- Send patients home on home apnea monitors[1]

Once again, more on this to come in the management section of the podcast.

These are all the newest guidelines for patients with a low risk BRUE. However, patients at higher risk likely need more thorough investigations for less common causes. You would work them up based on your degree of clinical suspicion of a concerning underlying etiology, focusing on the particular area of concern.

Of course, if the frightening event was not considered to be a BRUE at all, that is, if a cause is apparent, the workup should be tailored accordingly.

Larissa: Let's apply what we just learned to our clinical case.

To recap, Luke is a previously well 10 week old male presenting to the emergency department after he seemed to stop breathing and turned blue. His mom thinks the event lasted just under a minute and he recovered after he was picked up and patted on the back. No choking, vomiting, or abnormal movements were reported during the episode. He was born at term and family and social histories are unremarkable. There are no significant findings on physical exam.

Based on the history and physical exam, you have no explanation for Luke's event. You make the diagnosis of a BRUE, and apply the risk classification criteria. Luke is older than 60 days, and was born over 32 weeks gestation. This was his first event. It lasted less than a minute and didn't require CPR, so you feel he is at lower risk of having a serious underlying condition or recurrent episodes. Based on this, you decide not to order any laboratory or imaging investigations.

Management

Larissa: Now that we know how to evaluate a patient with a BRUE, we'll move on to discussing management. Dr. Forbes, what does this include?

Dr. Forbes: The management of an event varies. If it is truly a low risk BRUE, then your management will be focused on education. If there are signs and symptoms that suggest an underlying etiology, it will involve treating the apparent cause, as well as possible inpatient observation. In all cases, you should provide follow-up and support for parents and caregivers.

Larissa: Let's review each of these aspects in more detail.

Dr. Forbes: As mentioned earlier, some patients with BRUEs have concerns identified on history and physical exam. These are higher risk situations, so you should appropriately treat the suspected underlying condition. If more events occur despite intervention, you should reassess the diagnosis and pursue further investigations as warranted.

If there are no red flags on history and physical exam, then it was most likely an isolated event that is idiopathic in nature. In these cases, no medical treatment is required. For example, antiepileptics and acid suppression therapy should not be prescribed for these

lower-risk patients. It is important to realize, though, that you still have to manage these patients in terms of the parental anxiety surrounding the event. Given this, we may still consider a period of observation.

Larissa: So how do you decide whether to admit a patient for hospital observation?

Dr. Forbes: Knowing when to hospitalize a patient can be tricky, so first let's discuss the benefits and risks to better understand when it might be indicated.

Inpatient observation allows you to observe any recurrent episodes and quickly intervene as needed, easily conduct diagnostic investigations, and monitor family or social dynamics in sensitive situations. It also may help reduce parent or caregiver anxiety, but keep in mind it can also have the opposite effect.

In general, you should only consider admitting higher risk patients - those with concerning features upon evaluation. This includes infants who whose events required intervention, those with abnormal history, physical exam or diagnostic test findings, or who require additional investigation. Once admitted, you should regularly assess infants and monitor their cardiorespiratory function and oxygen saturations. Regardless of when discharge occurs, it is important to arrange close follow-up and support for all patients.

Infants with lower-risk BRUEs- so those with no red flags on history and physical exam- don't need to be admitted to hospital if the only reason would be for cardiorespiratory monitoring. However, if there is a great deal of parental anxiety or if timely outpatient follow-up is not available, it may be reasonable to admit an infant for a clearly defined period of time, for example 24- 48 hours to ensure that no further events occur. Creating a shared understanding of the timeline of admission is important as parents may feel comforted knowing their child is being observed by medical personnel, and anxiety can increase at time of discharge.

As another option for a lower-risk patient, you can also consider monitoring them for a short amount of time, say 1-4 hours to ensure that they remain well. During this time, you could consider continuous pulse oximetry monitoring and serial observation.

Larissa: What about once a patient returns home? Is apnea monitoring needed?

Dr. Forbes: That's an excellent question. Parents commonly ask for this as a method for reassurance. However, home apnea monitoring is controversial and it is generally discouraged. Current guidelines indicate that patients with lower-risk BRUEs should not receive home cardio-respiratory monitoring since it has not been "shown to improve outcomes."[2]

It's important to note that there are a variety of home apnea monitors available for purchase on the market, so parents can still purchase them even if not medically indicated. You should also know that these devices only monitor an infant's breathing by

way of detecting motion, and alert caregivers when no motion is detected, suggesting a possible apnea.

Our current evidence suggests that they do not reduce the risk or severity of recurrent BRUEs, cardiorespiratory events, or SIDS, and do not prevent death. While it may be initially reassuring to a parent, monitoring is not benign. We need to consider how it affects caregivers. Not only can monitors be difficult to use, they can also instill a false sense of security, lead to false alarms, and actually increase parental anxiety.

That being said, monitoring may be warranted in a small subset of higher risk cases, such as infants with chronic lung disease or unstable airways, and premature infants who have had multiple apneic and bradycardic events. The decision to send an infant home on some sort of monitoring would likely be made in conjunction with a pediatric pulmonary medicine specialist. In the higher risk cases where home monitoring is in fact indicated, it is important to provide proper instruction to parents and caregivers.

Larissa: Speaking of caregiver education, let's talk a bit more about this topic. BRUEs can be emotional and frightening events, often surrounded by uncertainty, so it's important to support parents and caregivers. Dr. Forbes, what do you find helpful when counseling caregivers?

Dr. Forbes: I find that caregivers often have questions about the relationship between BRUEs and SIDS, and whether home apnea monitoring is needed. I often start by reassuring them that a BRUE does not imply SIDS risk, and that home monitoring is not preventative and is generally discouraged. You can also take the opportunity to remind them about infant safety, especially safe sleeping practices. Educating parents about appropriate intervention can also help reduce anxiety about future events. It is advisable that all parents receive basic CPR training and be instructed not to shake infants to revive them if they are unresponsive. You may also want to provide caregivers with information about psychosocial supports available to them.

Larissa: Let's review the management of a BRUE by returning to our clinical case.

Despite Luke appearing well after his BRUE, his mom is very anxious, so you decide to monitor his vitals in the emergency room for a couple of hours. When you reassess him later his nurse tells you that he has been stable. At this time, you think Luke is ready to be discharged home. Luke's mom is apprehensive, and wonders if he can have a monitor at home. You reassure her that home apnea monitoring is not needed, but provide her with information about learning CPR since she is interested. You also arrange for prompt follow-up with his pediatrician in the community.

Prognosis

Larissa: There's one last topic we'll talk about, and that's patient outcomes. Dr. Forbes, what should listeners know about the prognosis after a BRUE?

Dr. Forbes: A patient's prognosis really depends on the underlying cause of their event. Infants with more serious underlying causes typically have poorer outcomes as related to the underlying etiology. For the majority of lower risk patients, there is no reason to believe they will have any long-term sequelae. Of course, with anything that has uncertainty, this can make it challenging when counseling caregivers.

Larissa: Now let's conclude our clinical case.

Almost a year has passed since you last saw Luke in the emergency department, and you are now on rotation in a community clinic. Much to your surprise, your next patient is Luke. His mom has brought him in for a scheduled checkup. She remembers you from the hospital and updates you on how he is doing. She happily reports that he has not had any other events and is healthy and well.

Summary

Before we leave, we'll summarize the key points of this podcast series as related to the objectives:

1. A BRUE is a sudden, brief, and now resolved event in an infant younger than 1 year. It involves 1 or more of: cyanosis or pallor; absent, decreased, or irregular breathing; change in muscle tone; or altered level of responsiveness[1]. BRUEs remain unexplained after history and physical exam.
2. A wide variety of conditions can manifest as BRUE. But remember that in the end, they are unexplained events.
3. A diagnostic workup for an event includes a detailed history and complete physical exam. Laboratory or imaging investigations may be conducted based on whether the patient meets the criteria for having experienced a lower or higher risk episode. Keep in mind that guidelines recommend against taking certain steps in the cases of low risk patients.
4. The management of a BRUE varies. In higher risk patients where red flags are identified on history and physical exam, management should focus on addressing these. Inpatient observation may be warranted in some cases, but in all cases it is important to provide education to parents and caregivers.
5. Currently there is no clear association between BRUEs and SIDS. BRUEs are not thought to lead to or be a risk factor for SIDS. Home monitoring is generally discouraged. It is more important to encourage infant CPR training and remind caregivers of safe sleeping practices.

That concludes our podcast series on approach to brief resolved unexplained events in infants! Be sure to check out the additional resources about BRUEs on PedsCases.com.

Thank you so much for listening!

References:

1. Tieder JS, Bonkowsky JL, Etzel RA. Brief resolved unexplained events (formerly apparent life-threatening events) and evaluation of lower-risk infants: Executive summary. *Pediatrics.* 2016; 137(5):e2 0160591.
2. 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.
3. National Institutes of Health Consensus Development Conference on Infantile Apnea and Home Monitoring, Sept 29 to Oct 1, 1986. *Pediatrics*. 1987;79(2):292–299.
4. Corwin, M. Acute events in infancy including brief resolved unexplained event (BRUE).UpToDate. 2016 Oct 11[cited 2016 Dec 04]. Available from: https://www.uptodate.com/contents/acute-events-in-infancy-including-brief-resolved-unexplained-event-brue?source=search_result&search=BRUE&selectedTitle=1~22
5. Scollan-Koliopoulos, M., Koliopoulos,. Evaluation and Management of Apparent Life-threatening Events in Infants. *Pediatr Nurs*. 2010;36(2):77-84.
6. Tieder JS, Altman RL, Bonkowsky JL, et al Management of apparent life-threatening events in infants: a systematic review. *J Pediatr*. 2013;163(1):94–99, e91–e96.
7. Adams M, Chad E, Ward DO, & Garcia, K. L. Sudden Infant Death Syndrome. *Am Fam Physician.* 2015 Jun 1;91(11):778-783.
8. Sarohia M, & Platt S. Apparent life-threatening events in children: practical evaluation and management**.** *Pediatr Emerg Med Pract.* 2014 Apr;11(4):1-14; quiz 15.

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