PEDIATRIC ONCALL
CHILD HEALTH CARE

REVIEW ARTICLE

RECOGNIZING BENIGN PEDIATRIC CARDIOPULMONARY MIMICS IN THE EMERGENCY DEPARTMENT: A PRACTICAL CLINICAL REVIEW

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ABSTRACT

Infants and children are often brought to the emergency department with events that look cardiopulmonary and catastrophic but are ultimately benign. This review gives a practical emergency framework for lower-risk brief resolved unexplained event, breath-holding spells, reflex or vasovagal syncope, benign chest pain, innocent murmurs, and benign palpitations. The central task is not reflex reassurance; it is to identify the typical benign pattern while screening deliberately for the few features that suggest arrhythmia, myocarditis, seizure, sepsis, structural heart disease, or other serious disease. Across these presentations, the highest-yield actions are stabilization, careful event reconstruction, focused examination, selective electrocardiographic or other targeted testing, and disposition based on physiology and red flags rather than anxiety alone.

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ABBREVIATIONS

BRUE - Brief resolved unexplained event,

ECG - Electrocardiogram

Introduction

Emergency departments frequently evaluate infants and children for events that appear immediately cardiopulmonary: a brief cyanotic spell in infancy, a toddler who collapses after crying, an adolescent who faints at school, a child with chest pain, or a new murmur or palpitation that alarms the family. Many of these presentations are dramatic because they involve color change, altered tone, chest discomfort, or an apparently abnormal cardiac finding, yet the final diagnosis is often benign and self-limited rather than a manifestation of primary cardiopulmonary failure.[1-5]

The emergency task is therefore twofold. The clinician must recognize the reassuring pattern, but only after deliberately screening for the smaller subset with arrhythmia, myocarditis, seizure, sepsis, pulmonary disease, or structural heart disease. A useful review for practicing pediatric clinicians should therefore be organized around bedside sequence: stabilize, reconstruct the event, identify red flags, use testing selectively, and disposition according to risk.[1-5]

Materials And Methods

This narrative review synthesizes current clinical guidelines and peer-reviewed literature relevant to lower-risk brief resolved unexplained events, breath-holding spells, reflex and vasovagal syncope, benign pediatric chest pain, innocent murmurs, and benign palpitations. Sources were organized by emergency presentation and bedside decision points. No formal systematic search, meta-analysis, or new patient-level data collection was performed.

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Results And Discussion

Shared Emergency Department Framework

The first question is whether the child is presently unstable. Persistent respiratory distress, hypoxemia, abnormal perfusion, hypotension, ongoing altered mental status, recurrent collapse during the visit, or failure to return to baseline moves the patient out of the benign pathway immediately. The benign conditions reviewed here are defined largely by resolution, preserved hemodynamics, and the absence of ongoing instability.[1-5]

Once the child is stable, the history usually determines the next step more than any single test. The sequence of events, trigger, posture, color change, tone change, duration, recovery, and return to baseline should be reconstructed carefully. Across conditions, the most important red flags are exertional symptoms, abnormal cardiac examination beyond an innocent-sounding murmur, persistent vital-sign abnormalities, family history of sudden death or cardiomyopathy, prolonged loss of consciousness, focal neurologic findings, hepatomegaly, or a clearly abnormal electrocardiogram.[1-5]

Testing should be driven by the bedside question rather than by anxiety. In these common mimics, broad routine laboratory panels and indiscriminate imaging have low yield. Electrocardiography is often the highest-value first test when a cardiac mimic remains in the differential, while broader evaluation should be reserved for children whose history or examination does not fit a benign pattern.[3-5]

Lower-Risk Brief Resolved Unexplained Event

A brief resolved unexplained event is a diagnosis framework rather than a disease. It applies to an infant younger than 1 year who had a sudden, brief, now-resolved episode involving cyanosis or pallor, altered breathing, marked tone change, or altered

responsiveness and who is back to baseline with no explanation after focused history and examination.[1,2] The key clinical move is risk stratification rather than broad etiologic testing.

Lower-risk criteria include age older than 60 days, gestational age of at least 32 weeks with corrected age at least 45 weeks, a first event lasting less than 1 minute, no cardiopulmonary resuscitation by a trained medical provider, and no concerning historical or examination findings.[1,2,4] In such infants, a brief period of observation with repeat vital signs, pulse oximetry, and a feeding trial is usually more useful than routine complete blood count, chest radiography, neuroimaging, cerebrospinal fluid testing, echocardiography, or empiric acid suppression.[1-5]

The infant no longer belongs in the lower-risk pathway if the story includes fever, trauma, persistent respiratory symptoms, choking with a clear aspiration narrative, poor feeding, recurrent clustered events, abnormal examination findings, or social circumstances that make safe discharge uncertain. In that setting, evaluation should follow the suspected alternative diagnosis rather than a generic BRUE battery.[2,4,5]

Breath-Holding Spells

Breath-holding spells usually occur between 6 and 24 months of age and are classically cyanotic or pallid. Cyanotic spells follow anger or frustration, whereas pallid spells usually follow pain or fright and reflect a vagally mediated reflex with brief bradycardia, pallor, and transient cerebral hypoperfusion.[6] The event is alarming, but recovery is usually rapid and the child is normal between spells.

The history is the diagnostic anchor. A stereotyped trigger-pattern-recovery sequence strongly favors breath-holding over seizure or malignant arrhythmia. During an active spell, the emergency intervention is supportive: place the child safely supine or side-lying, protect from injury, and reassess once the event resolves. Prolonged postevent confusion, events during sleep, no recognizable trigger, or focal neurologic findings should prompt reconsideration of the diagnosis.[6]

Iron deficiency is clinically important because treatment can reduce spell frequency even when frank anemia is absent.[6-8] A reasonable approach is to evaluate hemoglobin and iron status in children with recurrent or severe spells and to arrange outpatient supplementation and follow-up when deficiency is found.[7,8]

Reflex and Vasovagal Syncope

Most pediatric syncope is benign and reflex-mediated rather than cardiac. The physiology usually involves transient autonomic imbalance with vasodilation, relative bradycardia, venous pooling, reduced preload, and brief global cerebral hypoperfusion.[9-12] A typical history includes prolonged standing, heat exposure, dehydration, missed meals, pain, emotion, or seeing blood, followed by a prodrome of lightheadedness, nausea, tunnel vision, or diaphoresis and then rapid recovery.

Every child with true syncope deserves a careful cardiac history, focused examination, and a 12-lead electrocardiogram. ECG is the highest-yield screening test because it can identify prolonged QT interval, pre-excitation, conduction disease, or other rhythm clues, whereas routine broad laboratory testing has low value unless the history suggests anemia, pregnancy, infection, intoxication, or electrolyte disturbance.[9-12]

Supine positioning and hydration address the immediate physiology in most benign cases. Admission or cardiology consultation is more appropriate for exertional syncope, syncope without prodrome, abnormal ECG, abnormal cardiac examination, family history of sudden death, persistent chest pain or dyspnea, or recurrent unexplained episodes.[9-12]

Benign Chest Pain

Most pediatric chest pain is noncardiac. The patterns most useful to recognize in the emergency department are musculoskeletal chest wall pain, costochondritis, precordial catch syndrome, and idiopathic noncardiac chest pain.[13-17] Pain that is sharp, brief, localized, reproducible with palpation, related to posture or movement, or worsened by deep inspiration in an otherwise well child strongly supports a benign source.

Precordial catch syndrome is especially important because it produces sudden, stabbing, well-localized pain, often near the left sternal border, that lasts seconds to minutes and resolves spontaneously.[16] Costochondritis usually produces focal tenderness at one or more costochondral junctions and may follow coughing, strain, or an upper respiratory illness.[17]

Red flags that justify broader testing include exertional pain, syncope, palpitations preceding pain, persistent dyspnea, abnormal vital signs, hypoxemia, toxic appearance, significant trauma, known heart disease, or an examination concerning for myocarditis or pericarditis. In those cases, ECG, chest radiography, or troponin testing can be targeted appropriately; they are low-yield in classic precordial catch or reproducible chest wall pain.[13-17]

Innocent Murmurs and Benign Palpitations

In childhood, most murmurs beyond infancy are innocent rather than structural. Innocent murmurs are typically systolic, soft, short, vibratory or musical, localized, and sensitive to position, fever, or anxiety.[18-20] A murmur in a well child with normal pulses, growth, oxygenation, and exercise tolerance is very different from a murmur in a toxic infant, a cyanotic child, or a child with hepatomegaly or poor perfusion.

Urgent echocardiography is usually unnecessary from the emergency department when the remainder of the history and examination is clearly reassuring. Diastolic murmurs, harsh or holosystolic murmurs, abnormal second heart sound findings, cyanosis, diminished pulses, exertional symptoms, or syncope should lower the threshold for cardiology evaluation.[18-20]

Palpitations are similarly common and are often caused by sinus tachycardia, anxiety, fever, dehydration, stimulants, or isolated ectopy rather than unstable arrhythmia.[21-25] The history should distinguish sustained sudden-onset racing from occasional skipped or thumping beats. A 12-lead ECG should be obtained, but many children will have a normal tracing between episodes. Isolated premature beats in a well child with a reassuring examination and normal baseline ECG usually require explanation, trigger reduction, and follow-up rather than emergency antiarrhythmic treatment.[21-25]

Disposition and Counseling

Disposition should be based on physiology and red flags rather than on the emotional force of the presentation. Children who are back to baseline, have a typical benign story, a reassuring examination, and no concerning ECG findings can usually be discharged with clear return precautions and appropriate follow-up. Observation or admission is more appropriate when the diagnosis remains uncertain, events recur, the family cannot reliably recognize deterioration, or the child has abnormal vital signs, hypoxemia, poor perfusion, hepatomegaly, exertional symptoms, prolonged postevent confusion, or failure to return to baseline.[1-5,9-25]

Counseling should name the working diagnosis, explain why a dangerous cardiopulmonary process is less likely today, and specify the symptoms that should prompt immediate reevaluation: a longer or different event, exertional syncope, persistent color change, abnormal breathing, persistent chest pain or dyspnea, or another episode without return to baseline. Clear physiologic explanation is part of safe emergency management, not an optional extra.

Synthesis and Clinical Implications

These presentations matter not because they are rare curiosities, but because they are common, emotionally charged, and capable of generating both overtesting and dangerous misses. A pathophysiology-based emergency approach improves care because it starts where real bedside decisions begin: is the child stable, does the history fit a typical benign sequence, are there cardiac or neurologic red flags, and does the ECG or examination support a need for broader evaluation?[1-25]

Conclusion

For practicing pediatric clinicians, the central advantage of this framework is operational. It allows the team to reassure more confidently when the pattern is truly benign, while preserving sensitivity for the smaller group with arrhythmia, myocarditis, structural heart disease, seizure, or other serious pathology. That balance—avoiding both reflex reassurance and reflex overtesting—is the core emergency medicine task.

Compliance with Ethical Standards

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