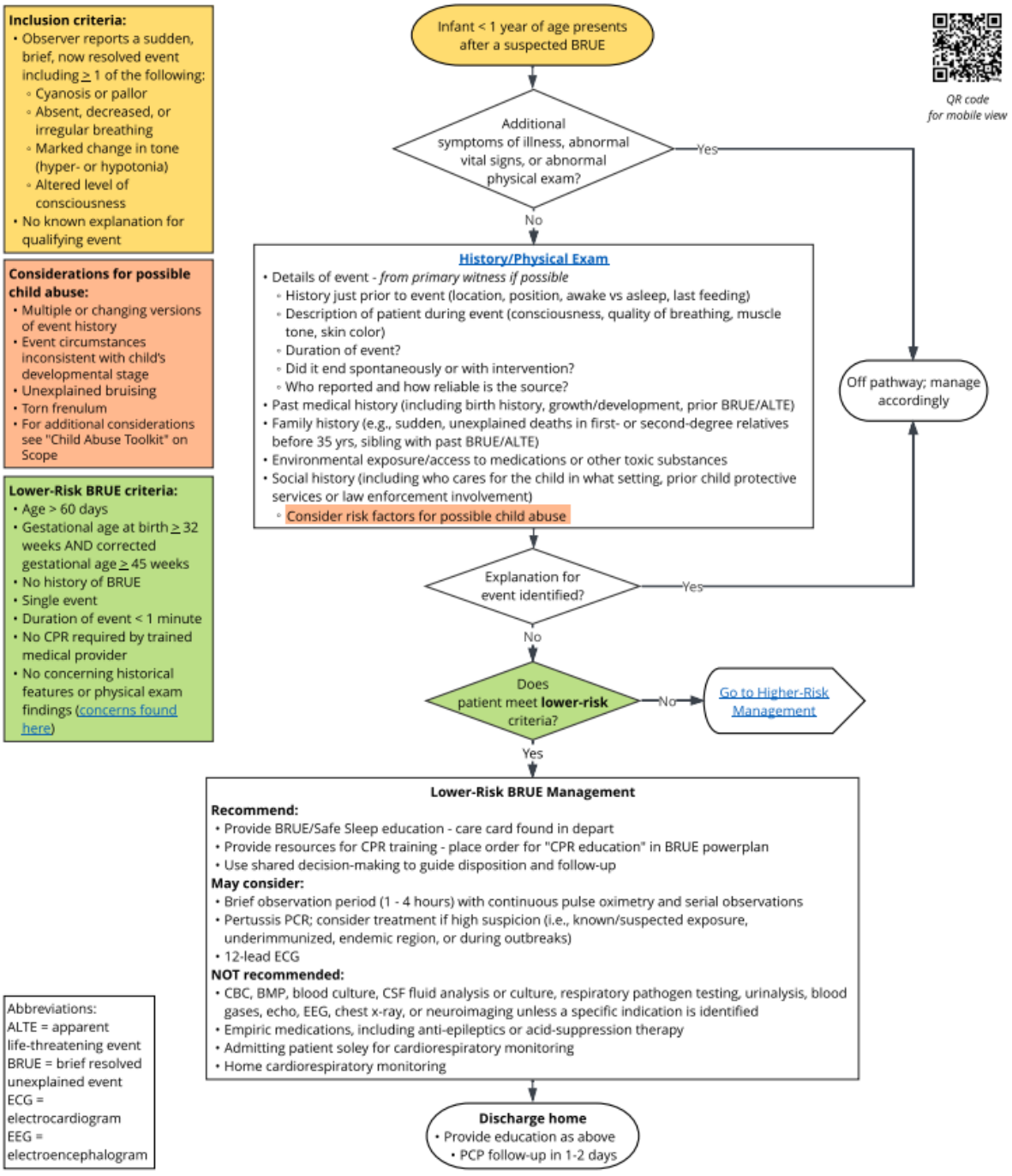
5-2024

Brief Resolved Unexplained Event (BRUE)

Children's Mercy Kansas City

BRUE Clinical Pathway Synopsis

BRUE Evaluation and Lower-Risk Management Algorithm



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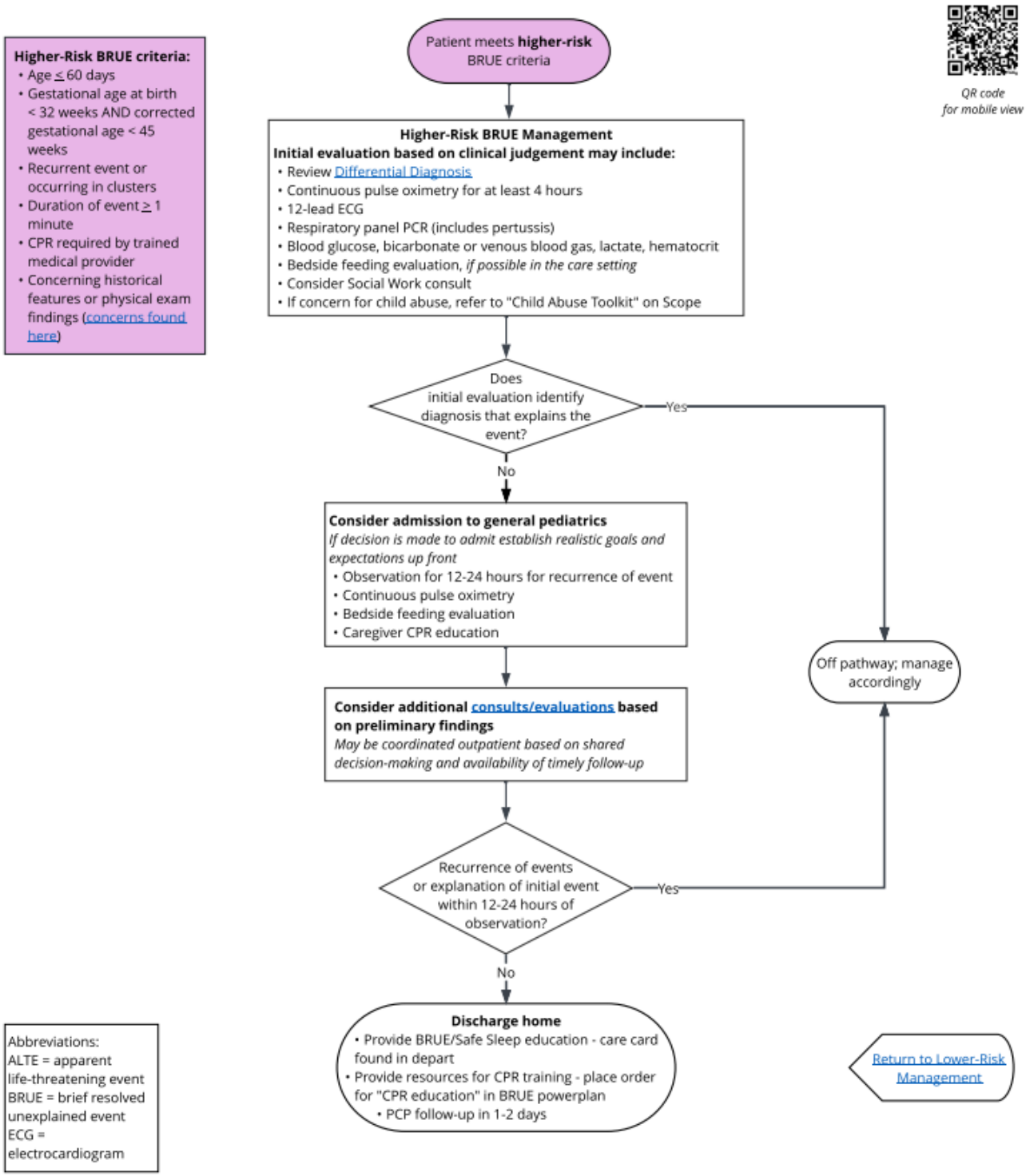
BRUE Higher-Risk Management Algorithm



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Objective of Clinical Pathway

To provide care standards for patients presenting after a presumed Brief Resolved Unexplained Event (BRUE). This clinical pathway provides guidance for assessment, management, and caregiver education associated with BRUE diagnosis.

Background/Epidemiology

Within their first year of life, infants may experience brief events characterized by sudden changes in skin color, breathing, muscle tone, or consciousness that are frightening for caregivers and often prompt them to seek emergency medical care (Brand & Fazzari, 2018). These events were previously labeled as apparent life-threatening events (ALTEs), but in 2016, the American Academy of Pediatrics (AAP) published a Clinical Practice Guideline (CPG) which recommended replacing the term ALTE with BRUE, and provided a framework for the evaluation of infants at lower risk for recurrence or an underlying serious diagnosis (Tieder et al., 2016). The term BRUE was defined as a sudden, brief, now resolved event occurring in an infant younger than 1 year of age in which the observer reports at least 1 of the following: (1) cyanosis or pallor; (2) absent, decreased, or irregular breathing; (3) marked change in tone; and (4) altered level of responsiveness without any known explanation (Tieder et al., 2016). A few years later, the AAP published a follow-up article to address the gap in guidance for patients not meeting lower-risk criteria (Merritt et al., 2019).

Due to the change in terminology, variability in clinical presentation, and a lack of specific diagnostic markers, the precise incidence of BRUE is unknown. (Colombo et al., 2019; Ramgopal et al., 2019). For ALTE, the incidence was reported to be 0.6 to 2.46 per 1000 live births and accounted for 0.6 - 0.8% of all emergency visits for patients younger than 1 year (Fu & Moon, 2012). In a systematic review by Brand and Fazzari (2018), post-ALTE mortality was estimated to be 1 in 800, which was noted in subsequent commentary to overestimate post-BRUE mortality (Tieder, 2018).

Since the 2016 AAP guideline was released, several studies have been conducted to assess its utility. In a multicenter retrospective cohort study, application of the AAP risk criteria stratified only 9 - 13% of patients with BRUE as lower-risk (Nama et al., 2022; Tieder et al., 2021). While the criteria offer a high negative predictive value (90%), research is ongoing to better identify the approximately 4% of higher-risk patients diagnosed with serious underlying conditions (Bochner et al., 2021; Tieder et al., 2021). History of a similar event, abnormal medical history, event duration longer than one minute, or altered level of consciousness are stronger predictors of a serious underlying diagnosis (Nama et al., 2022; Tieder et al., 2021). In contrast to the AAP guideline, Nama et al. (2022) also found that patients > 60 days were more likely to have a serious underlying diagnosis.

As BRUE is a diagnosis of exclusion, healthcare providers face the challenge of conducting a thorough evaluation that simultaneously provides reassurance for caregivers and minimizes unnecessary medical interventions, including prolonged observation or admission, laboratory studies, imaging, etc. The BRUE Clinical Pathway provides guidance for identifying patients at lower risk of serious adverse events who may be appropriately managed in the outpatient setting and offers recommendations for higher-risk patients who may require further evaluation.

Target Users

- Physicians (Emergency Medicine, Hospital Medicine, Urgent Care Centers, Outpatient Clinics, Fellows, Residents)
- Advance Practice Providers

Target Population

Inclusion Criteria

- Infants < 1 year of age
- Observer reports a sudden, brief, now resolved event including ≥ 1 of the following:
    - Cyanosis or pallor
    - Absent, decreased, or irregular breathing
    - Marked change in tone (hyper- or hypotonia)
    - Altered level of consciousness
- No known explanation for qualifying event

AGREE II

The Brief Resolved Unexplained Events (Formerly Apparent Life-Threatening Events) and Evaluation of Lower-Risk Infants AAP Clinical Practice Guideline (CPG) provided guidance to the BRUE Clinical Pathway Committee (Tieder et al., 2016). See Table 1 for AGREE II.

Table 1
AGREE II Summary for the AAP Guideline (Tieder et al., 2016)

Domain	Percent Agreement	Percent Justification^
Scope and purpose	100%	The aim of the guideline, the clinical questions posed and target populations **were** identified.
Stakeholder involvement	93%	The guideline **was developed** by the appropriate stakeholders and represents the views of its intended users.
Rigor of development	94%	The process used to gather and synthesize the evidence and the methods to formulate the recommendations **were** explicitly stated. The procedure for updating the guideline was not described in detail.
Clarity and presentation	99%	The guideline recommendations **are** clear, unambiguous, and easily identified; in addition, different management options are presented.
Applicability	88%	Barriers and facilitators to implementation, strategies to improve utilization and resource implications **were addressed** in the guideline.
Editorial independence	96%	The recommendations **were not** biased with competing interests.
Overall guideline assessment	95%	
See Practice Recommendations		

Note: Four Evidence Based Practice (EBP) Scholars completed the AGREE II on this guideline.
^Percentage justification is an interpretation based on the Children's Mercy EBP Department standards.

Practice Recommendations

Please refer to the American Academy of Pediatrics (Tieder et al., 2016) Clinical Practice Guideline for full practice recommendations, evaluation, and treatment recommendations.

Additional Questions Posed by the Clinical Pathway Committee

No additional clinical questions beyond those addressed in the AAP CPG were posed for formal literature review.

Recommendation Specific for Children's Mercy

No deviations were made from the AAP guideline regarding practice recommendations, but logistical processes specific to Children's Mercy were added.

- References to educational documents available in depart
- CPR resources available to families
- Referrals based on CMH departments and services

Measures

- Utilization of the BRUE Clinical Pathway
- Utilization of the BRUE powerplans

Value Implications

The following improvements may increase value by reducing healthcare costs and non-monetary costs (e.g., missed school/work, loss of wages, stress) for patients and families and reducing costs and resource utilization for healthcare facilities.

- Decreased risk of overtreatment (i.e., unnecessary laboratory studies or imaging)
- Decreased frequency of admission for those with lower-risk presentations
- Decreased inpatient length of stay

- Decreased unwarranted variation in care

Organizational Barriers and Facilitators

Potential Barriers

- Variability of acceptable level of risk among providers
- Challenges with follow-up faced by some families

Potential Facilitators

- Collaborative engagement across care continuum settings during clinical pathway development
- Anticipated high rate of use of the clinical pathway
- Standardized order set for inpatient and acute care settings

Diversity/Equity/Inclusion

Our aim is to provide equitable care. These issues were discussed prior to making any practice recommendations.

Power Plans

- BRUE *(inpatient)*
  - BRUE Low Risk Admissions Subphase
  - BRUE High Risk Admissions Subphase
- EDP BRUE
  - EDP BRUE Low Risk Subphase
  - EDP BRUE High Risk Subphase

Education Materials

- BRUE, Inpatient Education
  - Found in Cerner depart process
  - Available in English and Spanish
  - Includes safe sleep education
  - Includes information on CPR training for caregivers

Clinical Pathway Preparation

This pathway was prepared by the Evidence Based Practice (EBP) Department in collaboration with the BRUE Clinical Pathway Committee composed of content experts at Children's Mercy Kansas City. If a conflict of interest is identified, the conflict will be disclosed next to the committee member's name.

BRUE Clinical Pathway Committee Members and Representation

- Marsha Dannenberg, MD | Urgent Care | Committee Chair
- Zarmina Ehsan, MD | Pulmonology | Committee Member
- Jessie Fazel, APRN, MSN, RN, RNP-C | Emergency Medicine | Committee Member
- Suzanne Rastorfer, MD | Hospital Medicine | Committee Member

EBP Committee Members

- Kathleen Berg, MD, FAAP | Hospitalist, Evidence Based Practice
- Kori Hess, PharmD | Evidence Based Practice

Clinical Pathway Development Funding

The development of this clinical pathway was underwritten by the following departments/divisions: Emergency Medicine, Hospital Medicine, Pulmonology, Urgent Care, and Evidence Based Practice.

Conflict of Interest

The contributors to the BRUE Clinical Pathway have no conflicts of interest to disclose related to the subject matter or materials discussed.

Approval Process

- This pathway was reviewed and approved by the BRUE Clinical Pathway Committee, Content Expert Departments/Divisions, and the EBP Department; after which they were approved by the Medical Executive Committee.
- Pathways are reviewed and updated as necessary every 3 years within the EBP Department at CMKC. Content expert teams are involved with every review and update.

Review Requested

Department/Unit	Date Obtained
Emergency Medicine	May 2024
Hospital Medicine	May 2024
Pulmonology	May 2024
Urgent Care	May 2024
Evidence Based Practice	May 2024

Version History

Date	Comments
May 2024	Version one – developed algorithms, updated existing powerplans, reaffirmed existing patient education (BRUE, Inpatient – depart)

Date for Next Review

- May 2027

Implementation & Follow-Up

- Once approved, the pathway was presented to appropriate care teams and implemented. Care measurements will be assessed and shared with appropriate care teams to determine if changes need to occur.
- Order sets/power plans consistent with recommendations were created or updated for each care setting
- Education was provided to all stakeholders:
  - Departments of Emergency Medicine, Hospital Medicine, Pulmonology, Urgent Care
- Additional institution-wide announcements were made via email, hospital website, and relevant huddles.

Disclaimer

When evidence is lacking or inconclusive, options in care are provided in the supporting documents and the power plan(s) that accompany the clinical pathway.

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