

Anaphylaxis in Children: Early Recognition and Evidence-Based Emergency Management

Mohammad Ali Yousef Ibrahim, MD^{1*}, Yazan Fathi Alsaheb Altamimi, MD²

¹Emergency Specialist, Primary Health Care Corporation (PHCC), Umm Slal Health Center, Qatar

²Pediatric Specialist, Primary Health Care Corporation (PHCC), Al Waab Health Centre, Qatar

DOI: <https://doi.org/10.36347/sjams.2026.v14i10.005>

| Received: 19.08.2026 | Accepted: 06.10.2026 | Published: 12.10.2026

*Corresponding author: Mohammad Ali Yousef Ibrahim, MD

Emergency Specialist, Primary Health Care Corporation (PHCC), Umm Slal Health Center, Qatar

Abstract

Review Article

Background: Anaphylaxis is a rapidly evolving systemic hypersensitivity reaction that may cause life-threatening airway, breathing, or circulatory compromise. Recognition is particularly challenging in infants and young children, in whom symptoms may be nonspecific and skin findings may be absent. **Objective:** To provide a clinically focused synthesis of current pediatric anaphylaxis recognition, emergency treatment, observation, discharge planning, and recent therapeutic developments. **Sources:** This narrative review used targeted searches of PubMed/MEDLINE and official international allergy and regulatory websites for English-language guidelines, consensus reports, reviews, observational studies, and regulatory documents available through October 2026. Pediatric evidence and major international guidance were prioritized; landmark older publications were retained when they defined diagnostic criteria or established practice. This was not a systematic review, and no formal risk-of-bias assessment or meta-analysis was undertaken. **Content:** Diagnosis remains clinical and treatment must not await laboratory confirmation. Acute airway, respiratory, or circulatory compromise after a compatible exposure may represent anaphylaxis even without urticaria or hypotension. Intramuscular epinephrine in the mid-anterolateral thigh is first-line therapy. Persistent illness requires repeated assessment, additional intramuscular doses, circulatory support, and early escalation to monitored intravenous epinephrine infusion by experienced teams when refractory anaphylaxis is present. Antihistamines are limited to cutaneous symptoms, and routine corticosteroids are not supported for prevention of biphasic reactions. Observation and disposition should be individualized according to severity, treatment requirements, response, comorbidity, and access to emergency care. **Conclusion:** The most important modifiable factor in pediatric anaphylaxis care is prompt recognition followed by immediate epinephrine. Standardized pathways, caregiver education, reliable access to epinephrine, and risk-based observation can improve consistency and safety.

Keywords: Pediatric anaphylaxis; epinephrine; emergency care; food allergy; children; intranasal epinephrine; biphasic anaphylaxis.

Copyright © 2026 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

1. INTRODUCTION AND REVIEW APPROACH

Anaphylaxis is a serious systemic hypersensitivity reaction with rapid onset and the potential to cause fatal airway, respiratory, or cardiovascular compromise [1–5]. Its clinical course is unpredictable; therefore, diagnosis and treatment should be based on the clinical presentation rather than laboratory confirmation.

Pediatric recognition is complicated by developmental differences. Infants and young children may be unable to report throat tightness, dyspnea, dizziness, or impending collapse and may instead present with persistent crying, sudden lethargy, pallor,

hypotonia, feeding refusal, repetitive vomiting, hoarse cry, or abrupt behavioral change. Cutaneous findings may be absent, particularly in severe reactions [1,3,5].

This narrative review synthesizes the cited international guidance, consensus reports, pediatric reviews, observational evidence, and regulatory documents. Targeted searches emphasized clinical recognition, diagnostic criteria, epinephrine treatment, refractory and biphasic reactions, observation, discharge planning, and newer preventive or delivery strategies. Because this was a narrative synthesis, study selection was not exhaustive and evidence was not formally graded. Recommendations derived mainly from adult evidence or expert consensus are identified as areas of uncertainty.

The review adds a pediatric implementation perspective by integrating age-specific recognition, a practical escalation pathway, risk-based disposition, and emerging delivery options while explicitly separating established emergency care from preventive therapies.

2. Epidemiology, Triggers, and Pathophysiology

Food is the predominant trigger in children; common allergens include peanut, tree nuts, milk, egg, wheat, fish, and shellfish, with geographic variation [6,7]. Medications, insect venom, latex, and unidentified triggers are also important. Exercise, intercurrent infection, and selected medicines may act as cofactors.

Poorly controlled asthma is clinically relevant in children with respiratory involvement, although no single characteristic reliably predicts reaction severity [3,4].

Anaphylaxis reflects mast-cell and basophil activation with release of histamine, tryptase, leukotrienes, prostaglandins, platelet-activating factor, and other mediators [1,2]. Vasodilation and capillary leakage can produce distributive and relative hypovolemic shock; bronchoconstriction, mucus secretion, and upper-airway edema can cause respiratory failure. The smaller pediatric airway makes modest edema clinically important.

Table 1: Common pediatric triggers and practical considerations

Trigger	Examples	Clinical consideration
Food	Peanut, tree nuts, milk, egg, wheat, fish, shellfish	Leading trigger group in children; accidental exposure is common
Medication	Antibiotics, NSAIDs, anesthetic agents	Assess timing, route, indication, and previous tolerance
Insect venom	Bee, wasp, other Hymenoptera	May produce rapid respiratory or cardiovascular compromise
Latex or healthcare exposure	Gloves and medical equipment	Consider procedural and occupational contexts
Idiopathic	No trigger identified	Failure to identify a trigger does not exclude anaphylaxis

3. Clinical Recognition, Diagnostic Criteria, and Differential Diagnosis

Anaphylaxis is a clinical diagnosis. It should be suspected when an acute illness after a plausible exposure causes airway, breathing, or circulatory compromise, or a rapidly evolving combination of skin/mucosal, respiratory, cardiovascular, and persistent gastrointestinal manifestations. Neither hypotension nor skin involvement is mandatory [1,5,8].

Age-specific recognition

In infants and toddlers, warning features include sudden persistent crying, unusual irritability, lethargy, hypotonia, pallor, feeding refusal, drooling, hoarse cry, repetitive lip licking or tongue thrusting, vomiting, respiratory distress, or collapse. In older children, throat tightness, dyspnea, wheeze, dizziness, abdominal pain,

and a sense of impending collapse may be reported more directly.

Evolution of diagnostic frameworks

The NIAID/FAAN criteria established a practical multisystem framework [8]. The 2020 World Allergy Organization guidance simplified recognition and emphasized that acute laryngeal or respiratory compromise after exposure to a known or highly probable allergen may represent anaphylaxis without skin findings [1]. The 2024 GA²LEN consensus report, published in 2025, further reframed anaphylaxis as a continuum and introduced a clinical support tool intended to improve recognition across heterogeneous presentations [5]. These frameworks are aids, not prerequisites for treatment; a child with evolving airway, breathing, or circulation compromise should receive epinephrine without waiting to satisfy every criterion.

Table 2: Comparison of major diagnostic frameworks

Framework	Practical emphasis	Pediatric implication
NIAID/FAAN	Acute multisystem combinations; reduced blood pressure after known exposure	Useful screening framework but may be difficult to apply when symptoms are evolving
WAO 2020	Skin/mucosal involvement plus significant systemic features, or acute laryngeal/respiratory/cardiovascular compromise after likely exposure	Explicitly supports diagnosis without skin findings in compatible severe presentations
GA ² LEN 2024 consensus, published 2025	Updated definition and clinical support tool across a continuum of systemic hypersensitivity	Promotes earlier pattern recognition and less reliance on hypotension or classical urticaria

Laboratory assessment

Laboratory testing must not delay treatment. When diagnostically useful, an acute serum tryptase sample is generally most informative within approximately 15 minutes to 3 hours after symptom onset, with a baseline sample obtained after complete recovery, commonly at least 24 hours later. Mast-cell activation may be supported when acute tryptase exceeds $(\text{baseline} \times 1.2) + 2 \text{ ng/mL}$. A normal result does not exclude anaphylaxis, especially in food-triggered reactions and children [3,4].

Differential diagnosis

Important mimics include acute asthma, vasovagal syncope, foreign-body aspiration, croup, panic or hyperventilation, sepsis, hereditary angioedema, isolated urticaria, toxic ingestion, cardiac arrhythmia, and other causes of shock. Temporal association with an exposure and involvement of more than one organ system increase diagnostic confidence, but treatment should not be delayed when anaphylaxis is clinically likely.

4. Acute Emergency Management

Assessment and treatment should occur simultaneously. Activate emergency support, remove the trigger when feasible, and perform repeated ABCDE assessment with continuous or frequent monitoring of heart rate, blood pressure, oxygen saturation, respiratory effort, perfusion, and mental status.

Immediate epinephrine and positioning

Administer epinephrine 0.01 mg/kg intramuscularly using the 1 mg/mL solution into the mid-anterolateral thigh [1–4]. Maximum doses and device bands vary between guidelines and authorities; local protocols should be followed. Reassess promptly and

repeat intramuscular epinephrine at approximately 5-minute intervals when significant airway, breathing, or circulatory symptoms persist. Epinephrine must not be delayed for intravenous access, laboratory testing, antihistamines, corticosteroids, or precise trigger identification.

Keep the child supine with legs elevated when tolerated, particularly with circulatory compromise. A child with severe respiratory distress may remain in a position of comfort, but sudden standing or walking should be avoided. An unconscious breathing child should be positioned to protect the airway.

Respiratory and circulatory support

Give supplemental oxygen for hypoxemia, severe respiratory distress, or cardiovascular compromise. Establish intravenous or intraosseous access after epinephrine when the reaction is severe or response is inadequate. For shock, administer isotonic crystalloid in 10–20 mL/kg boluses with reassessment after each bolus and adjustment for cardiac or renal comorbidity. Persistent bronchospasm may be treated with an inhaled short-acting beta-2 agonist as an adjunct. Nebulized epinephrine may be considered for significant upper-airway edema under an appropriate protocol, but it does not replace intramuscular epinephrine.

Adjunctive medicines

Non-sedating antihistamines may reduce urticaria or pruritus after stabilization but do not treat airway obstruction, bronchospasm, or shock. Routine corticosteroids are not recommended to prevent biphasic anaphylaxis; their delayed onset makes them unsuitable as emergency therapy. They may be considered for a separate indication, such as a significant asthma exacerbation, without delaying epinephrine [3,4].

Figure 1. Text-based emergency pathway for pediatric anaphylaxis

Step	Action	Escalation trigger
1	Recognize anaphylaxis; call for help; begin ABCDE assessment and monitoring	Any airway, breathing, or circulation compromise
2	Give IM epinephrine 0.01 mg/kg in the anterolateral thigh; position safely	Do not wait for hypotension, rash, IV access, or tests
3	Provide oxygen when indicated; obtain IV/IO access; give crystalloid for shock	Persistent respiratory distress, poor perfusion, or hypotension
4	Reassess at about 5 minutes and repeat IM epinephrine if significant symptoms persist	Ongoing airway, breathing, or circulation compromise
5	After two appropriate IM doses with persistent compromise, treat as refractory anaphylaxis and obtain senior/critical-care support	Prepare monitored IV epinephrine infusion and advanced airway/circulatory support

5. Refractory Anaphylaxis, Biphasic Reactions, and Disposition

Refractory anaphylaxis may be considered when significant respiratory or cardiovascular compromise persists despite two appropriate intramuscular epinephrine doses, with attention to correct dose, route, site, timing, positioning, and fluid

resuscitation [13]. Senior emergency, anesthesia, retrieval, and critical-care support should be activated early.

In a monitored critical-care environment, an intravenous epinephrine infusion may be required. It should use a standardized dilution, infusion pump,

continuous cardiorespiratory and blood-pressure monitoring, and clinicians experienced in titration. Intravenous epinephrine bolus dosing carries substantial risk and should not be used routinely outside cardiac arrest or a specialist-directed exceptional circumstance.

Biphasic anaphylaxis is recurrence after initial resolution without re-exposure. Prediction remains imprecise. Higher-risk features include a severe initial reaction, hypotension, airway or marked respiratory involvement, delayed epinephrine, persistent symptoms, and need for repeated epinephrine [3,4,13].

Risk-based observation

Observation should start after complete resolution of symptoms and clinical stability following the last epinephrine dose. No single duration fits every child. A practical approach, aligned with local guidance, is:

- Shorter observation may be considered after a rapidly resolved, lower-risk reaction treated promptly with a single dose, provided the child remains asymptomatic and reliable follow-up and emergency access are available.
- At least 6 hours of observation is reasonable when two doses were required, symptoms were prolonged, there is significant asthma or previous biphasic reaction, or access to emergency care is limited.
- Admission for at least 12–24 hours, high-dependency care, or intensive care should be considered after severe respiratory or cardiovascular compromise, more than two epinephrine doses, intravenous epinephrine, persistent symptoms, or clinician concern.

These intervals are examples rather than universal rules and should be reconciled with the selected institutional guideline. An isolated mild allergic reaction without systemic involvement should not be labelled anaphylaxis.

6. Discharge, Community Preparedness, and Health-System Implementation

Before discharge, confirm sustained clinical recovery and provide a written emergency action plan, trigger-avoidance advice, practical epinephrine-device training, instructions to activate emergency medical services after epinephrine use, and allergy referral when appropriate. Prescribing two devices should be considered because a second dose may be required. Plans should be shared with schools, childcare facilities, and other caregivers with family consent.

Implementation barriers include delayed recognition, fear of epinephrine, unavailable or expired devices, inconsistent protocols, limited transport, and inadequate communication. High-impact interventions include accessible epinephrine, standardized weight-based dosing aids, simulation training, structured

reassessment, discharge checklists, and clear referral pathways [11,19].

In low-resource settings, priorities remain early clinical recognition, immediate intramuscular epinephrine, safe positioning, basic airway and breathing support, crystalloid for shock, repeated reassessment, and timely transfer. These measures should take precedence over sophisticated diagnostic testing [11].

7. Emerging Therapies and Current Evidence Gaps **Intranasal epinephrine**

Needle-free intranasal epinephrine may reduce hesitation for some patients and caregivers. In the United States, the approved product uses a 1 mg dose for children weighing 15 to less than 30 kg and a 2 mg dose for patients weighing at least 30 kg; the pediatric expansion applies from four years of age. Product labeling allows a second dose, using a new device, beginning five minutes after the first when symptoms worsen or fail to improve, and patients should have immediate access to two devices. Regulatory authorization and availability in Qatar may differ. Current pediatric evidence is driven largely by pharmacokinetic and pharmacodynamic studies, with less real-world outcome evidence than for intramuscular epinephrine [9]. Intranasal treatment does not replace emergency activation, monitoring, or escalation.

Preventive therapies

Oral immunotherapy can increase the reaction threshold for selected food allergens but does not eliminate risk and requires specialist supervision. Omalizumab was approved by the U.S. Food and Drug Administration in 2024 for reducing reactions to accidental exposure in adults and children aged one year or older with IgE-mediated food allergy [10]. Neither therapy treats acute anaphylaxis.

Uncertainty and research priorities

Pediatric recommendations remain constrained by limited randomized evidence during life-threatening events, age-specific diagnostic uncertainty, and extrapolation from adults. Priorities include prospective pediatric registries, consistent definitions of refractory and biphasic reactions, optimal weight-based epinephrine dosing, comparative effectiveness of delivery systems, and implementation research across emergency departments, primary care, schools, and low-resource settings.

Guidelines differ in epinephrine maximum doses, repeat-dose wording, observation periods, and some adjunctive interventions. Clinicians should therefore use one current institutional pathway consistently while preserving the universal principles of immediate intramuscular epinephrine and repeated reassessment.

8. CONCLUSION

Pediatric anaphylaxis is a time-critical clinical diagnosis. Skin findings and hypotension may be absent, and infants may present only with behavioral, feeding, gastrointestinal, respiratory, or perfusion changes. Immediate intramuscular epinephrine, safe positioning, repeated ABCDE reassessment, and timely respiratory and circulatory support remain the foundation of care.

Persistent compromise after two appropriate intramuscular doses should prompt treatment as refractory anaphylaxis, early critical-care involvement, and consideration of a monitored intravenous epinephrine infusion. Observation must be risk based, and discharge is incomplete without epinephrine access, device training, a written action plan, and appropriate follow-up. New delivery systems and preventive therapies expand options but complement rather than replace established emergency management.

REFERENCES

- Cardona V, Ansotegui IJ, Ebisawa M, *et al.*, World Allergy Organization anaphylaxis guidance 2020. *World Allergy Organ J.* 2020;13(10):100472.
- Muraro A, Worm M, Alviani C, *et al.*, EAACI guidelines: Anaphylaxis (2021 update). *Allergy.* 2022;77(2):357–377.
- Golden DBK, Wang J, Wasserman S, *et al.*, Anaphylaxis: A 2023 practice parameter update. *Ann Allergy Asthma Immunol.* 2024;132(2):124–176.
- Wang J, Lieberman JA, Wallace DV, Wasserman S, Golden DBK. Anaphylaxis in practice: A guide to the 2023 practice parameter update. *J Allergy Clin Immunol Pract.* 2024;12(9):2325–2336.
- Dribin TE, Muraro A, Camargo CA Jr, *et al.*, Anaphylaxis definition, overview, and clinical support tool: 2024 consensus report—a GA²LEN project. *J Allergy Clin Immunol.* 2025;156(2):406–417.e6.
- Cardona V. Overview of allergic disease: Anaphylaxis - WAO White Book on Allergy 2026. *World Allergy Organ J.* 2026;19(3):101338.
- Sicherer SH, Sampson HA. Food allergy: A review and update on epidemiology, pathogenesis, diagnosis, prevention, and management. *J Allergy Clin Immunol.* 2018;141(1):41–58.
- Sampson HA, Muñoz-Furlong A, Campbell RL, *et al.*, Second symposium on the definition and management of anaphylaxis: Summary report. *J Allergy Clin Immunol.* 2006;117(2):391–397.
- Crescioli G, Giovannini M, Pessina B, *et al.*, Epinephrine nasal spray for the treatment of anaphylaxis: Perspectives in pediatrics. *Curr Opin Allergy Clin Immunol.* 2025;25(6):511–517.
- U.S. Food and Drug Administration. FDA approves first medication to reduce allergic reactions to multiple foods after accidental exposure. 2024.
- Alsabri M, Mourid MR, Alaswad M, *et al.*, Management of pediatric anaphylaxis in the emergency department in low-resource settings: A narrative review. *Curr Emerg Hosp Med Rep.* 2024;12(4):169–178.
- Marseglia GL, Tosca MA, Miraglia del Giudice M, *et al.*, Novelties in the pragmatic management of anaphylaxis in pediatric age. *Eur J Pediatr.* 2026;185(7):480.
- Dribin TE, Motosue MS, Campbell RL, *et al.*, Persistent, refractory, and biphasic anaphylaxis: A multidisciplinary Delphi study. *J Allergy Clin Immunol.* 2020;146(5):1089–1096.
- Caliskan N, Okur R, Kacar A, Ozceker D. Pediatric anaphylaxis in emergency care: A detailed analysis of demographic and laboratory findings. *Med Bull Sisli Etfal Hosp.* 2025;59(4):533–539.
- Mansour A, *et al.*, Pediatric anaphylaxis in the emergency department: From mechanisms to personalized care. *Cureus.* 2025;17(10):e94988.
- Simons FER, Arduoso LRF, Bilò MB, *et al.*, World Allergy Organization anaphylaxis guidelines: Summary. *J Allergy Clin Immunol.* 2011;127(3):587–593.e22.
- Campbell RL, Li JT, Nicklas RA, Sadosty AT. Emergency department diagnosis and treatment of anaphylaxis: A practice parameter. *Ann Allergy Asthma Immunol.* 2014;113(6):599–608.
- Turner PJ, Worm M, Ansotegui IJ, *et al.*, Time to revisit the definition and clinical criteria for anaphylaxis? *World Allergy Organ J.* 2019;12(10):100066.
- Wang J, Sicherer SH. Guideline implementation and emergency preparedness in pediatric food allergy. *Pediatr Allergy Immunol.* 2024;35:e14100.