

Cardiovascular symptoms/signs in infants and toddlers with anaphylaxis



To the Editor:

Among infants and toddlers with anaphylaxis, cardiovascular (CV) symptoms/signs are underrecognized and underreported. The review by Tsuang et al,¹ “Food-induced anaphylaxis in infants: Can new evidence assist with implementation of food allergy prevention and treatment?,” calls attention to diagnostic challenges in infants, and mentions the low frequency of reported CV signs and hypotension.

Current diagnostic criteria for anaphylaxis emphasize low blood pressure (BP), along with other symptoms/signs suggestive of end-organ dysfunction² (Table I). In young children, reliance on BP for evidence of CV involvement is impractical and overlooks compensated shock. Hypotension, a late sign of decreased tissue perfusion, heralds decompensated shock in young children.^{4,5} Hypotension is preceded by signs of compensated shock, including tachycardia, cool or pale distal extremities, cyanosis, decreased mental status, prolonged capillary refill, and tachypnea.⁴ Treatment with epinephrine may be unnecessarily delayed

if a team awaits the presence of hypotension to fulfill criteria for CV involvement.

Moreover, accurate BP measurement in young children can be challenging. Previous studies report less BP documentation among young children than among older children.⁶ A prospective study evaluating BP measurement in the emergency department demonstrated limited value in children 5 years or younger, because the associated fear and anxiety can lead to inaccurate results.⁵ Furthermore, a “reassuring” BP may compromise accurate assessment of heart rate (HR), mental status, and perfusion status. Although studies have reported very low rates of CV involvement in infant anaphylaxis,^{1,6} the true presence of age-appropriate CV involvement is likely underreported.

In infant and toddler anaphylaxis, clinicians should consider physiologically and developmentally appropriate symptoms/signs that signify compensated shock. Such symptoms include tachycardia (not related to crying), change in mental status (lethargy, inconsolability, or hypotonia), poor perfusion (cyanosis or mottling, decreased capillary refill), and tachypnea (Table I).

An accurate HR obtained when a child is consolable can be useful in driving management decisions, such as administration of epinephrine and fluid. Young children with anaphylaxis can have profound tachycardia that resolves with epinephrine.⁷ Because

TABLE I. Limitations and proposed solutions regarding CV symptoms/signs as defined by diagnostic criteria for anaphylaxis in infants and toddlers

NIAID/FAAN CV symptoms/signs*	Infant and toddler challenges	Infant and toddler-specific symptoms	Approaching the infant and toddler
Reduced BP (low systolic BP [age-specific] or >30% decrease in systolic BP) [†]	Hypotension is a late-phase finding of decompensated shock (normal BP in compensated) Acquisition of BP in infants and toddlers can cause crying, may be time-consuming, and can be inaccurate	Tachycardia not caused by crying or activity may be sign of compensated shock especially in presence of other system involvement and other signs of compensated shock ⁴ : ● Cyanosis ● Mottling ● Delayed cap refill ● Mental status change ● Tachypnea	Attempt HR measurement via auscultation, pulse oximetry, or electrocardiogram monitor without causing fear and while the child is calm (For pulse oximetry, consider using big toe and if disposable probe then cover with sock.) Do not allow acquisition of a BP to delay administration of epinephrine or further intervention Consider limiting use of BP when presence of tachycardia could dictate management Use BP when decompensated shock or hemodynamic instability is suspected Encourage positive and playful interaction with infant or toddler and attempt to address all potential causes of discomfort or fear when approaching inconsolability/crying (eg, “hungry,” scared, wet diaper)

TABLE I. (Continued)

NIAID/FAAN CV symptoms/signs*	Infant and toddler challenges	Infant and toddler-specific symptoms	Approaching the infant and toddler
-or- Associated symptoms/ signs of end-organ dysfunction Specifically mentioned in NIAID/FAAN criteria:	Overlap in symptoms with normal infant and toddler behaviors	Crankiness, withdrawn or clingy, inconsolable crying, subdued or less active ³ Mottling of the skin or blue/gray skin ³ Cool extremities, delayed cap refill, weak pulse ⁴	Assess for <i>mental status</i> change including inconsolability, lethargy, hypotonia. Consider including parents/caregivers in this assessment to include baseline Assess for <i>color</i> and <i>perfusion</i>
Hypotonia	Various ways to show hypotonia in infants/ toddlers	Wobbly, floppy, limp, poor head control ³	Encourage interaction that would require participation by patient. Assess tone and attempt comparisons to baseline (either clinician observed or parental report)
Syncope	Hard to define syncope (collapse) in infant/ toddler	Obtunded, lethargic, difficult to arouse	In case of assessing lethargy obtundation, ask parent/caregiver to describe normal “tired” behavior. Encourage interaction that would require participation by patient. Attempt to provide stimuli that will “perk up” patient
Incontinence	Difficult to differentiate from normal in diaper-wearing population ³		

FAAN, Food Allergy & Anaphylaxis Network; NIAID, National Institute of Allergy and Infectious Diseases.

**Reduced BP -or- associated symptoms of end-organ dysfunction (eg, hypotonia [collapse], syncope, incontinence).² NIAID/FAAN.

†Low systolic blood pressure for children is defined as <70 mm Hg from 1 mo to 1 y, <(70 mm Hg + [2 × age]) from 1 to 10 y, and <90 mm Hg from 11 to 17 y.

HR is relatively simple to acquire by auscultation, pulse oximetry, or electrocardiogram monitoring, clinicians can respond rapidly to elevations in HR by administering additional doses of epinephrine or fluid boluses, as clinically indicated. In controlled settings, such as food challenges, acquisition of a baseline HR is valuable. In the emergency department, where measuring a true baseline HR is not possible, we recommend using available age cutoffs.

In an infant or toddler with possible anaphylaxis, the presence of tachycardia (excluding nonallergic causes, such as crying and hunger) or other symptoms/signs of compensated shock should suggest CV involvement. We propose using these symptoms/signs as surrogates for hypotension to guide initial management. We recommend continuing to use BP when decompensated shock or hemodynamic instability are suspected because hypotension may signify the need for escalation of clinical interventions, including continuous epinephrine infusion and admission to a pediatric critical care unit.

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Reply to "Cardiovascular symptoms/signs in infants and toddlers with anaphylaxis"



To the Editor:

The response by Pistiner et al,¹ "Cardiovascular symptoms/signs in infants and toddlers with anaphylaxis," further elaborates on unique challenges when assessing for anaphylaxis in young children. Our review highlights that fewer blood pressure measurements have been noted among infants 12 months or younger compared with older children.^{2,3} In addition, blood pressure measurements are likely underreported because measurements can be difficult to obtain in infants due to poorly sized blood pressure cuffs or irritability. Rudders et al⁴ reported that the youngest age groups were significantly less likely to have their blood pressure measured in the emergency department as follows: age less than 2 years, 60%; age 2 to 5 years, 79%; age 6 to 11 years, 95%; age 12 to 18 years, 99% ($P < .001$). It is apparent that further studies are needed to fully characterize anaphylaxis in infants, in particular cardiovascular symptoms.

We have previously noted and agree with Pistiner et al¹ that when blood pressure measurements are not available or cannot be obtained, clinicians may need to rely on other signs and symptoms of hypotension (pale or mottled skin, delayed capillary refill, or lethargy) as has been suggested by Bird et al.⁵ Pistiner et al¹ further propose that heart rate can be used to direct management in anaphylaxis because hypotension is not only difficult to assess in an infant but is also a late sign indicating decompensated shock. The authors admit there are limitations to heart rate measurement because an increase in heart rate may also be secondary to crying or hunger in an infant. Improved methods for obtaining an accurate assessment for cardiovascular compromise would be ideal.

Despite the need for improved evaluation of cardiovascular symptoms in infants, there is recent reassuring data that demonstrate better outcomes in infants compared with older children as previously discussed in our review.² Allergic reactions in infants have been shown to be less severe.^{3,6} Biphasic reactions and hospitalizations are uncommon, and fatalities are rare.^{6,7} Therefore, although milder cardiovascular symptoms may go undetected in some infants, ultimately very few infants experience poor outcomes. This should help practitioners increase confidence in families, when discussing the reassuring safety of early introduction of food allergens or emerging food allergy treatments in infants.

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Developing practice parameters that improve health of patients and populations



To the Editor:

We must compliment Hamilton et al¹ on their review of advances in allergy diagnostic testing. We would like to offer an update in response to the authors' concerns about Allergy Diagnostic Practice Parameters and clarify how the Joint Task Force on Practice Parameters (JTFPP) is evolving to serve the needs of the practicing allergist-immunologist.² The JTFPP is fully engaged in producing not only focused Grading of Recommendations Assessment, Development and Evaluation (GRADE) guidelines but also full-spectrum traditional practice parameters.²⁻⁴

More than 5 years ago, advancements in evidence-based medicine (EBM) led the American Academy of Allergy, Asthma, and Immunology (AAAAI), the American College of Allergy, Asthma, and Immunology (ACAAI), and JTFPP to re-focus selected guidelines using the GRADE method.³⁻⁵ This was for good reason. The Institute of Medicine recommendations for the EBM approach to guidelines had led developers to more carefully evaluate not only the type of evidence (eg, randomized