

Epinephrine use in Austin Independent School District after implementation of unassigned epinephrine

Kathryn Neupert, MD^a, Sheeba Cherian, MD^a, and Pooja Varshney, MD^{a,b}



Clinical Implications

- The study of epinephrine use in Austin, TX, public schools after the implementation of unassigned epinephrine is an opportunity to better understand the application of unassigned epinephrine policies and identify areas for improvement in school anaphylaxis management.

TO THE EDITOR:

Anaphylaxis, a potentially life-threatening allergic reaction, has garnered increased awareness and investigation in recent years. The increasing prevalence of food allergy coupled with the knowledge that food allergy is the predominant cause of anaphylaxis in children underscores the significance of studying pediatric anaphylaxis.^{1,2} Other important causes of anaphylaxis in children include insect venom and medications.² Notably, studies have suggested that nearly one quarter to one half of anaphylactic reactions in the school setting occur in children without a history of allergy.^{3,4} As children spend a significant amount of time in school, school personnel must be prepared to recognize and treat anaphylaxis not only for those with a history of allergy, but also for those who experience their first serious reaction in the school setting. Delayed administration of epinephrine and adolescence have been associated with the increased risk of fatal anaphylaxis.^{5,6} Improving access to epinephrine is an important intervention that can improve the safety of children and adolescents in the school setting and potentially reduce the risk of fatal anaphylaxis. Given the critical role of epinephrine in the treatment of anaphylaxis, federal and state legislation has been passed to improve access to epinephrine in schools.^{7,8} Unassigned epinephrine was made available in Austin Independent School District (AISD) schools at the start of the 2015-2016 school year following passage of Texas State Bill 66 in May 2015.⁸ AISD serves approximately 83,000 students in 130 elementary, middle, and high schools. The study of epinephrine use in Austin schools provides an opportunity to better understand the application of stock epinephrine legislation, inform future policy decisions, and identify gaps in school anaphylaxis management.

After obtaining institutional review board approval, we performed a retrospective chart review of all administrations of assigned and unassigned epinephrine in AISD schools during the 2015-2016 and 2016-2017 school years. AISD policy requires completion of a *Post Anaphylaxis Reaction Review* form for each epinephrine administration (EA); this form served as the basis for data collection and is provided as [Figure E1](#) in this article's Online Repository at www.jaci-inpractice.org.

Thirty-one EA were recorded in AISD elementary, middle, and high schools during the study period. [Table 1](#) lists key characteristics. Ten EA occurred in the first academic year, and 21 occurred in the second. Unassigned epinephrine accounted for 68% of epinephrine use. Twenty-two percent of EA occurred in persons with no history of allergy. Forty-five percent of EA occurred in students with known allergy but no assigned epinephrine available. Of the 24 EA in which there was a known allergy, an individual health plan (IHP) was present in 9 instances; assigned epinephrine was available in all 9 of these instances and in 1 instance in which an IHP was not present. Fifty-eight percent of EA in which there was a known allergy lacked assigned epinephrine. Sixty-eight percent of EA were in students aged 12 to 19. Adolescents represented the largest group with a history of allergy but with no assigned epinephrine available. Using the WAO Systemic Reaction Grading Scale,⁹ reactions ranged in severity from grade 1 to 3, with 58% being grade 2. [Figure E2](#) (available in this article's Online Repository at www.jaci-inpractice.org) details reaction severity according to trigger. The median time of EA from onset of the reaction was 10 minutes in the 26 instances in which timing was recorded. Food was the trigger for nearly 50% of reactions treated with epinephrine, with peanut the most commonly implicated food. Thirty-eight percent of unassigned epinephrine use was for patients with known food allergy who did not have assigned epinephrine available. [Figure 1](#) details the triggers and frequency of assigned versus unassigned epinephrine use.

Many of the findings in this analysis support trends noted in the literature, including the high-risk characteristics of adolescents⁵ and the observation that food is the most common trigger of reactions in the school setting.^{1,3,4} Interestingly, unassigned epinephrine was used more frequently than assigned epinephrine. The majority of unassigned EA were for those with a known allergy but no assigned epinephrine available. A recent study of epinephrine use in New York City schools reported similar findings.¹ In addition, we report an incidence of EA for first-time reactions similar to that described by McIntyre et al³ in an analysis of anaphylaxis in Massachusetts schools. These findings support the necessity of unassigned epinephrine in schools.

This analysis identified key elements to successful school anaphylaxis management as well as areas for improvement. Standardized school policy focusing on anaphylaxis recognition and management is the initial step to successful treatment of serious allergic reactions. The significant increase in EA seen over the 2-year study period may represent increased awareness and recognition of anaphylaxis by AISD school personnel. The relatively short response time to EA also indicates their level of preparedness. In addition, standardized documentation and reporting of EA is an invaluable resource that can be used to optimize school anaphylaxis management. Mandatory reporting of serious allergic reactions and their context will be paramount as stock epinephrine programs become widespread and the body of literature in this area grows.

The data reveal an opportunity to provide further education on known triggers of anaphylaxis and indications for epinephrine. A significant proportion of EA were for reactions to fragrances, which are unlikely to represent anaphylaxis. Evaluation by an allergist can help identify conditions that may mimic anaphylaxis, such as vocal cord dysfunction or asthma.

TABLE I. Characteristics of epinephrine administrations in AISD for the 2015-2016 and 2016-2017 school years

Gender	N	Age	N	Status of patient	N
Male	9	0-11	8	Student	30
Female	16	12-19	21	Staff	0
Not reported	6	Not reported	2	Visitor/other	1
History of allergic reaction	N	Assigned epinephrine available	N	Assigned or unassigned epinephrine administered	N
Yes	24	Yes	10	Assigned	10
No	7	No	20	Unassigned	21
Not reported	0	Not applicable	1	Not reported	0

N = Number of epinephrine administrations.
AISD, Austin Independent School District.

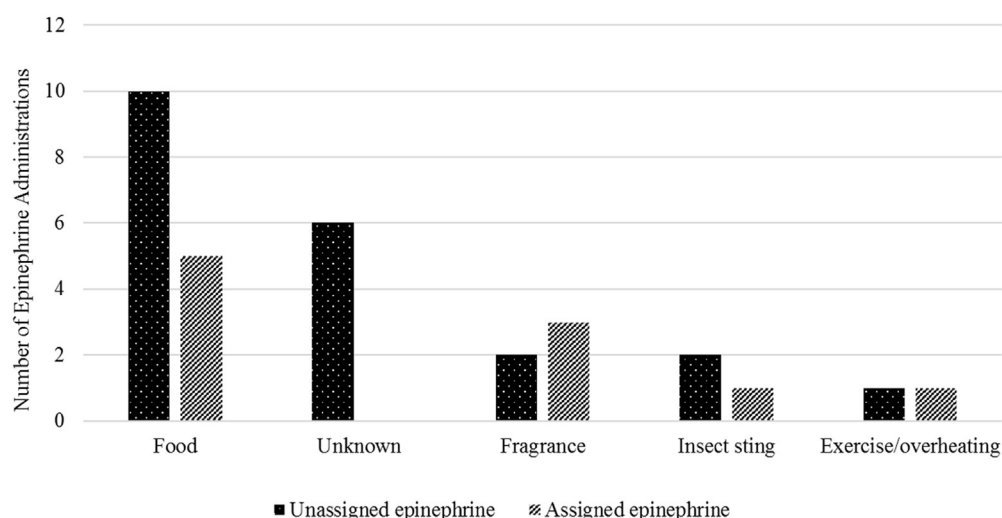


FIGURE 1. Epinephrine administration according to trigger.

One notable deficiency in school anaphylaxis management revealed in this analysis and others^{1,4} is the significant percentage of unassigned EA for students with a history of allergy without IHPs and assigned epinephrine available. Whether this finding reflects the true percentage of students with a history of anaphylaxis without IHPs and prescribed epinephrine in AISD schools is unclear because this analysis does not extend to the medical records of all AISD students. The data reveal the crucial role of IHPs in ensuring assigned epinephrine availability. An important area to follow prospectively is whether those students who receive unassigned epinephrine subsequently file an IHP with AISD schools.

This analysis has notable limitations. As alluded to above, the sole data source for this analysis is the *Post Anaphylaxis Review* form (Figure E1), which describes those reactions treated with epinephrine. The analysis did not review the IHPs of all allergic students in AISD. Likewise, the institutional review board protocol did not include review of nursing records for reactions not treated with epinephrine. A comparison of the reactions in this analysis to seemingly milder reactions could more completely explore the appropriateness of AISD's anaphylaxis management and possibly identify reactions that should have been treated with epinephrine. Lastly, the *Post Anaphylaxis Review* form (Figure E1) does not distinguish subjective complaints from objective physical examination findings, making it difficult to retrospectively assess reaction severity.

In conclusion, unassigned epinephrine was used more frequently than assigned epinephrine in the first 2 years of a stock epinephrine program in a large urban school district. Unassigned epinephrine was used in students with no history of allergy and in those with a known allergy but without assigned epinephrine. Food allergy was the most common indication for EA. Successful school anaphylaxis management relies on adherence to standardized protocols and accurate reporting of anaphylactic events. These findings highlight the importance of unassigned epinephrine programs and areas for improvement in the management of individuals with anaphylaxis in the school setting.

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^aDepartment of Pediatrics, Dell Medical School, The University of Texas at Austin, Austin, Tex

^bSection of Pediatric Allergy, Asthma & Immunology, Dell Children's Medical Center of Central Texas, Austin, Tex

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Corresponding author: Pooja Varshney, MD, Dell Children's Medical Group/Dell Children's Medical Center of Central Texas, 1301 Barbara Jordan Blvd, Suite 200, Austin, TX 78723. E-mail: pvarshney@ascension.org.

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ONLINE REPOSITORY



POST ANAPHYLAXIS REACTION REVIEW

Demographic Information:

1. Name: _____ Name of School: _____

2. DOB: _____ Status of Person: Student Staff Visitor Gender: M F Student ID, if applicable: _____

Address: _____

3. History of allergy: Y or N If known, specify type of allergy: _____

If yes, was allergy action plan available: Y N Unknown (UNK) History of prior anaphylaxis: Y N UNK

Diagnosis/History of asthma: Y N Unknown

School Plans and Medical Orders (Students Only)

4. Individual Health Care Plan (IHCP) in place? Y N UNK Medical orders/parent authorization for epinephrine? Y N UNK

5. Source of the epinephrine: student-specific stock Expiration date of epinephrine: _____

Epinephrine Administration Incident Reporting

6. Date/Time of occurrence: _____ Vital Signs: BP ____/____ T ____ P ____ R ____ pO₂ _____

7. Person(s) witnessing allergic reaction: _____

8. Specify suspected trigger precipitating this allergic episode:

Food Insect Sting Exercise Medication Latex Other: _____ Unknown

If food was a trigger, please specify suspected food: _____

9. Did reaction begin prior to start of school day? Y N UNK

10. Location where symptoms developed:

Please circle: Classroom Health Office Playground/Athletic field Bus Other: _____

11. How did exposure occur? _____

12. EMS notified at: (time): _____ By whom: _____

Time of EMS arrival: _____

FIGURE E1. Post Anaphylaxis Reaction Review form for each epinephrine administration (EA).

13. Parent/Guardian notified of epinephrine administration (time): _____ By whom: _____

14. RN Notified (time): _____ CM Notified (date/time): _____

15. Symptoms (Check all that apply):

<u>Respiratory</u>	<u>GI</u>	<u>Skin</u>	<u>Cardio-Vascular</u>	<u>Other</u>
☐ Cough	☐ Abdominal Discomfort	☐ Rapid swelling	☐ Chest discomfort	☐ Sweating
☐ Difficulty Breathing	☐ Diarrhea	☐ Flushing	☐ Cyanosis	☐ Irritability
☐ Hoarse Voice	☐ Difficulty swallowing	☐ General itching	☐ Dizziness	☐ Loss of Consciousness
☐ Stuff/Runny Nose	☐ Oral itching	☐ General rash	☐ Faint/Weak pulse	☐ Metallic taste
☐ Swollen throat/tongue	☐ Nausea	☐ Hives	☐ Headache	☐ Red eyes
☐ Shortness of breath	☐ Vomiting	☐ Lip swelling	☐ Hypotension	☐ Swollen conjunctiva
☐ Stridor		☐ Localized rash		☐ Sneezing
☐ Tightness (chest/throat)		☐ Paleness		
☐ Wheezing				
☐				

16. Medications given:

Benadryl (amt): _____ mg liquid or tablet or N/A By whom: _____

First Epinephrine Dose (amt): _____ Site: _____ Time: _____ By whom: _____

2nd Epinephrine Dose (amt): _____ Site: _____ Time: _____ By whom: _____

Epinephrine prescribed by: _____

17. Condition of student upon arrival of EMS:

Disposition

18. Transported to: Hospital Home Other: _____

19. Transported by: Ambulance Parent/Guardian Other: _____

20. Outcome: _____

School Nurse Follow-up

21. Was parent/guardian advised to follow-up with student's medical provider? Y N

22. Were arrangements made to restock epinephrine? Y N date: _____

Form Completed by: _____ Date: _____
(please print)

Signature: _____ Title: _____

FIGURE E1. (Continued)

Internal Student Health Services Follow-up

1. Any barriers to delivery of care that resulted in delay of care?

2. Discuss and list with clinical manager with areas to improve.

Follow-Up Actions (by whom):

Campus RN Signature

Date

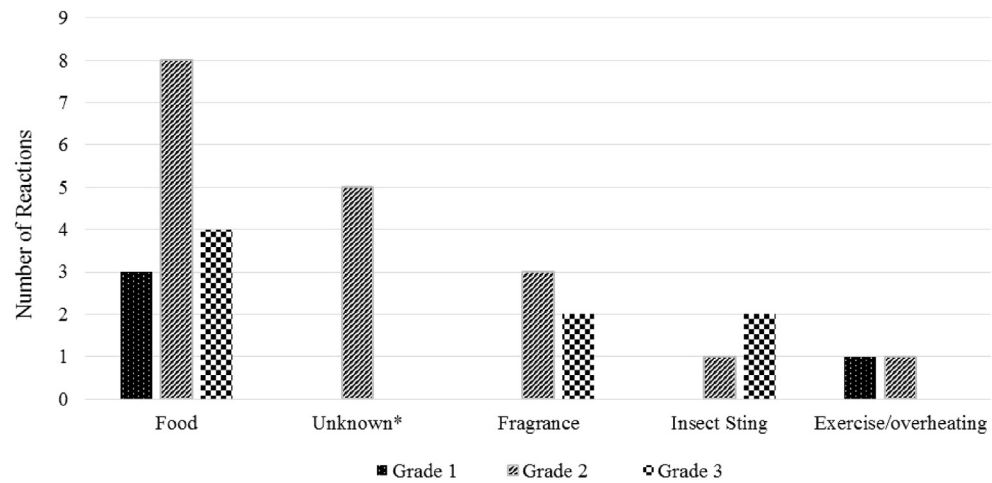
Clinical Manager Signature

Date

Director of Children's/AISD Student Health Services Signature

Date

FIGURE E1. (Continued)



*Unable to classify 1 reaction with an unknown trigger due to insufficient information

FIGURE E2. Severity of reactions according to trigger.

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