Anaphylaxis Knowledge and Practice Preferences of Pediatric Emergency Medicine Physicians: A National Survey

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Objectives To assess the knowledge and practice preferences of anaphylaxis in pediatric emergency medicine (PEM) physicians by practice setting, and to identify factors associated with intramuscular (IM) epinephrine administration and admission of patients with anaphylaxis.

Study design The cohort was a cross-sectional convenience sample; potential participants were recruited using contact information obtained from the American Board of Pediatrics and American Board of Medical Specialties membership databases and were asked to complete a 12 item survey. Board-certified PEM physicians were categorized by practice setting: university hospital, non-university hospital with a residency training program, or community hospital with no residency training program. Management practices based on practice setting are presented as proportions. Multivariate logistic regression identified factors associated with IM epinephrine administration and admission of patients with anaphylaxis for observation.

Results Of the 1114 PEM physicians solicited, 620 (56%) completed the survey. The majority (93.5%) correctly identified epinephrine as the treatment of choice for anaphylaxis, yet only 66.9% used the IM route of administration, and only 37.4% admitted affected patients for observation. Factors associated with the use of IM epinephrine included the presence of a residency program at the site of care (OR, 2.28, 95% CI, 1.3-4.04) and higher volume of anaphylaxis cases (OR, 1.21; 95% CI, 1.06-1.38). Increasing anaphylaxis case volume was associated with decreased likelihood of admission of patients with anaphylaxis (OR, 0.81; 95% CI, 0.72-0.92).

Conclusion Even though the majority of PEM physicians correctly report using epinephrine in pediatric anaphylaxis, not all use the preferred administration route, and many discharge patients home after an abbreviated period. *(J Pediatr 2013;163:841-6)*.

Anaphylaxis, a life-threatening medical emergency requiring prompt recognition and treatment, has been described various ways since it was first reported in the early 1900s. In an attempt to provide a simpler yet comprehensive definition, allergy and immunology experts convened in 2005 and published an update in 2010, both times defining anaphylaxis as 1 of 3 clinical scenarios: (1) the acute onset of a reaction involving the skin, mucosal tissue, or both and at least 1 of the following: respiratory compromise, reduced blood pressure, or symptoms of end-organ dysfunction; (2) 2 or more of the following occurring soon after exposure to a likely allergen for that patient: involvement of the skin/mucosal tissue, respiratory compromise, reduced blood pressure or associated symptoms, and/or persistent gastrointestinal symptoms; or (3) reduced blood pressure after exposure to a known allergen.[1,2] This broad definition may account for the wide range of reported incidence of anaphylaxis. In the general US population, this reported incidence ranges from 100 000 to as high as 500 000 annually, of which two-thirds are new cases and almost 1% are fatal.[3,4] It is estimated that anaphylaxis occurs in 1 of every 170 children, compared with a rate of 30 per 100 000 person-years in adults.[5,6]

Considering the increasing incidence of food allergies, a rise in the prevalence of allergic reactions and anaphylaxis is anticipated.[7] Fatal outcomes have been associated with a delay in administering or failure to administer epinephrine.[8-11] Yet despite the prevalence and severity of anaphylaxis, this condition remains underrecognized and underreported.[3,12] A case-based survey revealed that a large percentage of pediatricians (46%) had difficulty recognizing and treating food-induced anaphylaxis, and nearly one-third underestimated its severity.[13] Another study documented pediatricians' concerns regarding their ability to appropriately care for children with food allergies and devise effective management plans.[14]

The aim of this investigation was to assess anaphylaxis knowledge and practice preferences of pediatric emergency medicine (PEM) physicians by practice

ED	Emergency department
IM	Intramuscular
PEM	Pediatric emergency medicine

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setting, and to identify factors associated with intramuscular (IM) epinephrine administration and admission of patients with anaphylaxis for further observation.

Methods

This was a cross-sectional survey of a convenience sample of board-certified PEM physicians completed in 2009. Potential participants were identified via the members' Web pages of the American Board of Pediatrics and the American Board of Medical Specialties. Of 1394 PEM physicians who were identified, 1185 e-mail addresses were obtainable (85%), and 61 (5.1%) of the physicians had previously opted out of SurveyMonkey surveys. A total of 1124 invitations to participate in the survey were sent out by e-mail via the SurveyMonkey Web site, containing a brief description of the study along with a link to participate in the survey and another link to opt out of the study. Nonrespondents were sent reminder messages weekly for 4 weeks and then intermittently for 12 weeks. No incentive or compensation was offered to survey respondents. The study was reviewed by the Western Institutional Review Board and was deemed exempt from further review.

The survey was designed by a pediatric allergist and a PEM fellow to assess PEM physicians' knowledge and management of anaphylaxis. Its content was based on the anaphylaxis action plan and anaphylaxis wallet card (a compact, folded card from the American Academy of Allergy, Asthma, and Immunology Anaphylaxis Education Task Force designed in 2005, listing the symptoms of anaphylaxis along with an action plan).[15] The survey comprised 12 questions. The first 4 questions focused on demographic data (ie, type of emergency room setting, number of years in practice, age group, and number of patients with anaphylaxis seen in a year), and the next 8 questions examined physicians' practices in managing patients presenting to the emergency department (ED) with anaphylaxis (ie, medication preference, preferred route of epinephrine administration, duration of patient monitoring, discharge medications, prescription for home autoinjectors, referral to a specialist, and referral to educational Web sites) and previous practice with a placebo autoinjector. ED settings were differentiated as university hospital, non-university hospital with a residency training program, and community hospital with no residency training program. Of note, "anaphylaxis" was not defined for the respondents. This was intentional, because we also wished to evaluate the PEM physicians' understanding of this term.

The survey was then pilot-tested by members of the Department of Emergency Medicine at Miami Children's Hospital, as well as a board-certified allergist/immunologist. The final survey took approximately 10-15 minutes to complete and was distributed via an e-mail link to a Web-based survey.

Data were collected using SurveyMonkey software (SurveyMonkey, Portland, Oregon) and then imported into an SPSS version 15.0 database (SPSS, Chicago, Illinois). Demographic data and responses to survey items are presented as proportions with 95% CIs. Multivariate logistic regression was used to identify factors associated with IM epinephrine administration and admission of patients with anaphylaxis for further observation. Variables for these analyses were identified a priori and included respondent's years in practice and age, presence of a residency program at the practice site, whether the practice site was a university setting (vs a community setting), and annual volume of anaphylaxis cases. Data are reported as ORs with 95% CIs.

Results

Of the 1124 physicians invited to participate in the survey, 10 (0.9%) no longer practiced PEM, rendering them ineligible for participation. Of the remaining 1114 PEM physicians, 620 (56%) responded and 29 (3%) opted out. The remaining 465 physicians did not respond (neither participated nor opted out of the study). All of the 620 respondents who participated completed all survey items.

The majority of respondents had been in practice for longer than 10 years, worked at a setting with a residency training program, and saw fewer than 16 cases per year. The sole demographic characteristic that differed among the 3 sites was a higher proportion of physicians aged >55 years in community hospitals without a residency program (**Table I**).

Table II presents physicians' self-reported management practices for patients with anaphylaxis. Although epinephrine was the most commonly used medication, the preferred route differed among respondents, with community PEM physicians the least likely to use the preferred IM route. Community PEM physicians also were more likely to observe patients for an abbreviated time period (<4 hours) compared with university PEM physicians (**Table II**).

Reported outpatient management practices for pediatric anaphylaxis cases are summarized in **Table III**. The majority of providers prescribe H1 blockers, and nearly all prescribe an epinephrine autoinjector to discharged patients. A smaller percentage (75%) provide instruction in autoinjector use. Of note, nearly three-quarters of respondents reported referring patients to an allergy/immunology specialist, and a minority recommend educational Web sites (**Table III**).

We used multivariate logistic regression to explore the factors associated with the preferred IM route of epinephrine administration (**Table IV**). The 2 factors associated with the use of IM epinephrine were the presence of a residency program at the site of care and increasing volume of anaphylaxis cases treated by the respondent. We performed a second logistic regression with the same variables to explore the factors associated with admission for patients with anaphylaxis for observation. Increasing anaphylaxis case volume was associated with a decreasing odds of admission (OR, 0.81; 95% CI, 0.72-0.92; $P = .001$).

Discussion

We found that although the vast majority of PEM physicians (94%) correctly identified epinephrine as their preferred choice for treating anaphylaxis, there remain significant