

# The Influence of Systems and Settings on the Management of Anaphylaxis



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Harold Samuel, founder of one of the largest property companies in the United Kingdom, once said, “There are three things that matter in property: location, location, location.”<sup>1</sup> In this issue of *The Journal of Allergy and Clinical Immunology: In Practice*, Prosty et al<sup>2</sup> describe the impact of location on the management of food-induced anaphylaxis (FIA). The influence of anaphylaxis setting was pronounced. There are several features of reaction “location, location, location” that may drive this pattern, and understanding these factors may help to improve early use of epinephrine autoinjectors (EAI) to manage pediatric FIA in the community and anaphylaxis more broadly.

Using the Cross-Canada Anaphylaxis registry, Prosty et al analyzed 3604 children and adolescents (<18 years of age) presenting to 11 Canadian emergency departments (EDs) for FIA over an 11-year period (February 2011–February 2022).<sup>2</sup> The EDs spanned 5 Canadian provinces—albeit most patients were recruited from Québec (75.8%). Patients were either prospectively recruited using a standardized questionnaire (38.7%) or retrospectively recruited via medical record review using a standardized data extraction form (61.3%). Episodes of anaphylaxis fulfilled at least one of the National Institute of Allergy and Infectious Diseases–Food Allergy and Anaphylaxis Network (NIAID-FAAN) criteria. Cases were excluded if symptoms began more than 8 hours after allergen exposure or if they resolved in less than 1 hour or before ED arrival. Anaphylaxis was classified as mild, moderate, or severe based on signs and symptoms in accordance with a modified grading scale applied to each reaction by independent reviewers.<sup>3</sup> Among cases with known locations of FIA (85.0%), the most frequent location was home (68.1%) followed by school or daycare (12.8%). Restaurants (7.4%) and other miscellaneous locations (eg, park, car, party—11.4%)

rounded out the remainder of cases. When comparing locations, prehospital EAI were more likely to be used in school and daycare settings (66.7%) than at home (36.7%). EAI use was also greater at work (50%), in restaurants (44.5%), and in other locations (40.2%) compared with use at home. Logistic regression confirmed that prehospital EAI use was higher at school/daycare compared with home, restaurants, or other locations after adjustment for reaction severity, sex, age, asthma, previously known food allergy, and atopic dermatitis. Prehospital EAI use was least common for home and school/daycare reactions in British Columbia compared with other provinces (home: adjusted odds ratio [aOR]: 0.88 [95% confidence interval [CI], 0.81–0.95]; school/daycare: aOR: 0.85 [95% CI, 0.79–0.90]), but not in restaurants. Interestingly, across provinces, no reaction location was associated with reaction severity or rates of hospitalization, and almost 20% of patients did not receive EAI either pre- or in-hospital.

Community rates of prehospital EAI use for anaphylaxis in pediatric populations are low, approximately 21% as outlined by a recent meta-analysis.<sup>4</sup> Although Prosty et al demonstrate a higher rate in FIA (40.5% overall), it remains clear that most patients experiencing anaphylaxis in the community do not receive standard-of-care treatment. Multiple practice guidelines describe this standard of anaphylaxis care, which primarily involves prompt, early epinephrine use.<sup>3,5,6</sup> By identifying differential rates of prehospital EAI use based on location, Prosty et al have raised important questions regarding location-specific barriers to anaphylaxis standard of care for patients with FIA.

First, the lowest rate of prehospital EAI was at home suggesting substantial barriers preventing standard of care at home. As Prosty et al astutely outline, parental or guardian factors (ie, diagnostic and management uncertainty, fear of harm, tendency to adopt a watchful waiting approach, etc) in those patients with known food allergy and access to an EAI are likely factors contributing to low rates of home EAI in the present study. In these cases, educational interventions in clinics and the community are certainly warranted to improve EAI use in this population. Similarly, if emergency medical services (EMS) are activated to a home and an EAI is not administered when clinically indicated, educational interventions aimed at improving recognition of FIA and subsequent EAI use in EMS personnel likely make sense. However, it is not clear based on the present study if EMS activation is associated with a change in the likelihood of prehospital EAI use or if EMS activation interacts with location to influence prehospital EAI use.

Furthermore, the present study did not include patients for whom appropriate treatment of nonsevere FIA at home with EAI led to prompt resolution of symptoms without recurrence and without the need for activation of EMS and subsequent ED visit—a patient preference-sensitive approach that may improve both health and economic outcomes for patients and for health

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care systems.<sup>7,8</sup> The decreased rates of prehospital EAI use at home may therefore represent an overestimation of the barriers to standard of care at home as this treat-at-home population was not included. Still, Prosty et al describe unmet needs for patients with clear evidence of anaphylaxis who arrive to the ED without prehospital epinephrine.

There are additional considerations for those with anaphylaxis without prehospital epinephrine managed in the ED. First and foremost is whether a patient has access to an EAI. Clearly prior diagnosis of anaphylaxis increases the likelihood of a personal EAI device being prescribed. In line with this, known food allergy significantly increased odds for prehospital epinephrine use (aOR: 1.40; 95% CI, 1.36-1.45) in the Prosty analysis. There are many other reasons for lack of ready EAI access, but the data from Prosty et al yet again suggest that location, or perhaps more accurately, policy related to location is likely important. For example, in Québec, where most patients from this multiprovince study reside, each regional school board or childcare center has its own protocol based on anaphylaxis treatment recommendations published by *Allergy Québec*. Crucially, all these protocols share the requirement to have a minimum of 1 EAI in stock on location. This removes a primary barrier to prehospital EAI use—lack of ready access to an EAI. For patients without a known food allergy (approximately 38% of patients in the present study) or those patients for whom EAI cost may be prohibitive, this simple policy could enable early use of EAI.<sup>9,10</sup> When coupled with training programs that ensure appropriate administration and monitoring, which were also elements required of Québec protocols, standard of care is more likely even in unexpected cases. Still, other factors may influence EAI use, as British Columbia schools have similar policies but demonstrated a lower rate of EAI use in schools and daycares.

Additional factors related to schools/daycares may help explain increased rates of prehospital EAI use such as the presence of a school/daycare nurse, reduction of a delayed bystander effect in an institutional setting due to trainings, or an increased fear of liability for inaction. The opposite of each of these factors could explain why restaurants were observed to have reduced rates of prehospital EAI use compared with schools/daycares, not to mention the lack of policy mandating EAI stocking and training for restaurants.

In summary, location matters because of the systems and policies in place that promote early EAI use. Schools/daycares are locations that more frequently have these policies, and they clearly demonstrate increased rates of appropriate EAI use for pediatric FIA. Although prehospital EAI use at home may be wanting, educational interventions aimed at reducing parental or EMS uncertainty regarding FIA diagnosis and treatment are likely warranted. This will help the most frequent location of FIA be a location where effective FIA treatment can occur more frequently. At the Dartmouth Institute for Health Policy and Clinical Practice, Dr. Paul Batalden once stated, “every system is designed to get the results it gets.” In line with this thinking, Prosty et al illustrate the importance of system design and policy to foster early EAI use, no matter the location.

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