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Epinephrine Administration for Cases of Anaphylaxis in a US School Setting: Results From the EPIPEN4SCHOOLS® Survey

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ABSTRACT

Rationale: This study was designed to describe anaphylactic events and epinephrine auto-injector (EAI) use in US schools.

Methods: This exploratory, cross-sectional, web-based survey of schools participating in the EPIPEN4SCHOOLS® program (Mylan Specialty L.P., Canonsburg, PA) captured details of reported occurrences of anaphylactic events and treatment(s) administered at each responding school during the 2013-2014 school year.

Results: A total of 919 anaphylactic events were reported in 607 schools (11%, n=5683 responding schools). Of the 851 events with data on the use of EAIs, 75% (n=636) were treated with auto-injectors while on school property. Of the 636 events treated by EAI, 49% (n=310) were treated using the EpiPen4Schools' program stock EpiPen® Auto-Injector, and 46% (n=289) were treated using the individual's EpiPen Auto-Injector. Approximately 4% of EAIs used were not EpiPen Auto-Injectors. Fifty-four (9%) received a second epinephrine injection. Of the 204 individuals not treated with an EAI, 77% (n=157) received antihistamines, 13% (n=26) received another treatment, and 8% (n=17) received no treatment. Of the 850 events with data on hospital transport, 80% of individuals (n=677) were transported to the hospital.

Conclusions: Over 10% of schools participating in the EpiPen4Schools survey reported an anaphylactic event. Approximately 25% of anaphylactic events were not treated with epinephrine; of these, the majority were treated with antihistamines. Furthermore, 20% of those treated for an anaphylactic event did not receive follow-up emergency treatment. Considering the potential for biphasic reactions, close medical supervision is imperative after an anaphylactic attack. Thus, these data suggest the value of stocking EAIs and providing continuing education for school personnel and family members.

INTRODUCTION

- Anaphylaxis is a serious, acute, and potentially life-threatening allergic reaction.[1]
- Guidelines recommend prompt intramuscular injection of epinephrine as first-line therapy for anaphylaxis[2]; however, despite the widespread availability of epinephrine auto-injectors (EAIs), epinephrine is often underused.[3-6]
- For most patients who experience anaphylaxis, symptoms resolve within a few hours of treatment, but for the ~20% of patients who experience biphasic anaphylactic reactions, symptoms have been reported to reoccur up to 38 hours after the first reaction, potentially requiring repeated doses of epinephrine.[7,8]
- Triggers such as foods, drugs, biologics, insect stings, latex, and exercise can induce anaphylaxis in some individuals.[1]
  - Furthermore, the prevalence of food allergy may be increasing among school-aged children.[9]
- As children ≥5 years of age in the United States spend much of their day in school, there is a need for school staff to be prepared to manage life-threatening reactions to food and other triggers of anaphylaxis that could be encountered in this setting.

OBJECTIVE

- This study was designed to describe anaphylactic events and EAI use in US schools enrolled in the EPIPEN4SCHOOLS® program (Mylan Specialty L.P.).

METHODS

- This exploratory cross-sectional survey of schools participating in the EpiPen4Schools program assessed anaphylactic events and treatment(s) administered at each responding school during the 2013-2014 school year.

Data source

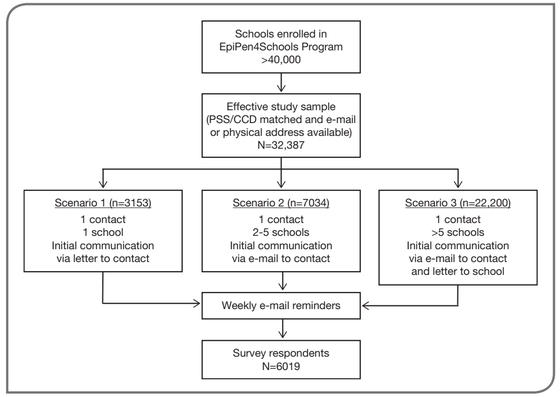
- Survey of schools participating in EpiPen4Schools, a program launched in 2012 that provides EpiPen® Auto-Injectors* (Mylan Specialty L.P.) to qualifying public and private kindergarten, elementary, middle, and high schools in the United States
  - Composed of 15 web-based questions, 8 of which were repeated for each anaphylactic event reported per school
  - Answered by an individual at each school with knowledge of occurrences of anaphylactic reactions and treatment(s) administered during the 2013-2014 school year (eg, school nurse)
  - Study duration: May 21, 2014, to July 9, 2014

*The EpiPen4Schools program provided 2 EpiPen Auto-Injector 2-packs, 2 EpiPen Jr® Auto-Injector 2-packs, or 1 of each 2-pack free of charge.

Sample contact and notification

- US schools registered with the EpiPen4Schools program (>40,000) were matched to Common Core of Data (CCD; US Department of Education, Washington, DC) or to the Private School Universe Survey (PSS; US Department of Education, Washington, DC) databases to obtain demographic and school contact information to request participation in the survey (Figure 1).
  - A total of 32,387 schools had available contact information (Figure 1).
  - 3 possible scenarios occurred for contacting and notifying the respondents, based on the number of schools per contact (Figure 1).
  - A total of 6019 surveys were completed; most questions included a count of missing data, as respondents were not required to answer every question.

Figure 1. Preparation of samples and notification procedures.



CCD, Common Core of Data; PSS, Private School Universe Survey.

Data analysis

- Characteristics of participating schools (eg, census region, grade levels of responding schools, type and source of EAIs stocked) and of anaphylactic events (eg, individual who experienced the anaphylactic event, previously known allergies, the trigger that initiated the anaphylactic event, treatment administered) were reported using descriptive statistics.
  - Relative frequency of each characteristic was calculated by dividing the total number for each response category of the relevant variable across all schools by the combined number of responses across all schools.
  - Missing responses were excluded.

RESULTS

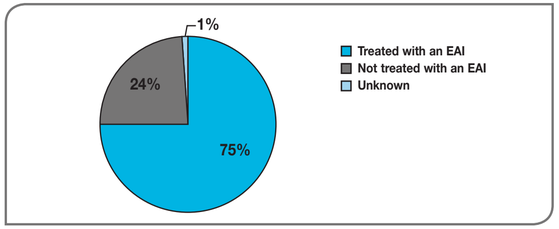
Events

- A total of 5683 schools responded to questions on the occurrence of anaphylactic events.
- A total of 919 anaphylactic events were reported in 607 schools (11%).

Treatment with EAIs

- Of the 851 events with data on the use of EAIs, 75% (n=636) were treated with an EAI, 24% (n=204) were not treated with an EAI, and 1% (n=11) had unknown data regarding administration of epinephrine with an EAI (Figure 2).

Figure 2. Use of EAIs for treatment of anaphylactic events (n=851).



EAI, epinephrine auto-injector.

- Of the 636 events treated by EAI while on school property, 49% (n=310) were treated using the EpiPen4Schools' program stock EpiPen Auto-Injector, 46% (n=289) were treated with a personal EpiPen Auto-Injector, and 4% (n=27) were treated with other types of EAIs (Table).
  - Approximately 9% of events (54/636) treated by EAI required a second injection of epinephrine.

Table. Source and Type of EAI for Treatment of Anaphylactic Events

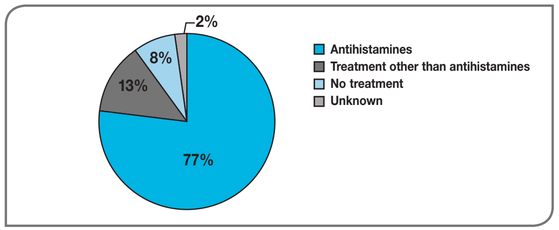
Source of EAI, n (%)	Total events (N=636)
School stock EpiPen Auto-Injector	310 (49)
Personal EpiPen Auto-Injector	289 (45)
EAI other than EpiPen Auto-Injector	27 (4)
EAI of unknown type or source	9 (1)
Question was left blank	1 (0)

EAI, epinephrine auto-injector.

Alternative treatments

- Of those 204 events reported as not being treated with an EAI, 77% (n=157) were treated with antihistamines, 13% (n=26) were treated with an agent other than antihistamines, 8% (n=17) received no treatment, and data on alternative treatments were unknown for 2% of events (n=4) (Figure 3).
  - Other treatments included epinephrine injection from a vial, nebulizers and inhalers, and unknown treatments administered by emergency medical personnel.

Figure 3. Treatment of anaphylactic events with therapies other than an EAI (n=204).



EAI, epinephrine auto-injector.

- Of the 850 events with available data, 80% of individuals (n=677) were transported to the hospital.

STRENGTHS AND LIMITATIONS

- This is the first comprehensive analysis of anaphylactic events and use of EAIs in US schools, providing details of >900 events.
- This exploratory survey was subject to limitations such as response bias and potential measurement errors, including systematic and random variance resulting from the respondents (eg, failing to carefully read a question or misreporting an event).
- Responses were limited by the level of detailed information retained at the schools related to anaphylaxis and were subject to respondent recollection of the events.
- Survey response rate was 19%, likely due to factors such as the timing of the survey at the end of the school year, and the lack of direct and verifiable contact information for some respondents.

SUMMARY AND CONCLUSIONS

- More than 10% of schools participating in the EpiPen4Schools survey reported an anaphylactic event, suggesting that anaphylaxis is not uncommon in US schools.
- Approximately 25% of anaphylactic events were not treated with epinephrine; of these events, the majority (77%) were treated with antihistamines.
- A total of 54 anaphylactic events (~9%) required a second dose of epinephrine.
- Furthermore, ~20% of patients were not provided with follow-up emergency medical treatment after an anaphylactic event; in the approved product labels for EAIs available in the US, immediate emergency medical follow-up treatment is recommended following the administration of epinephrine to treat an anaphylactic event.
- These results highlight the value of stocking EAIs in the school setting and providing continuing education for school personnel and family members.

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