



Changes in emergency department concordance with guidelines for the management of stinging insect-induced anaphylaxis 1999–2001 vs 2013–2015



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ABSTRACT

Background: Changes in emergency department (ED) concordance with guidelines for the management of stinging insect-induced anaphylaxis (SIIA) are not known.

Objective: To describe temporal changes in ED concordance with guidelines for the management of SIIAs.

Methods: We analyzed data from 2 multicenter retrospective studies of patients with stinging insect-related acute allergic reactions seen in 1 of 14 North American EDs during 2 periods: 1999 through 2001 and 2013 through 2015. Visits were identified similarly across studies (eg, using *International Classification of Diseases, Ninth Revision, Clinical Modification* codes 989.5, 995.0, and 995.3). Anaphylaxis was defined as an acute allergic reaction with involvement of at least 2 organ systems or hypotension. We compared concordance between periods with 4 guideline recommendations: (1) treatment with epinephrine, (2) discharge prescription for epinephrine auto-injector, (3) referral to an allergist/immunologist, and (4) instructions to avoid the offending allergen.

Results: We compared 182 patients with SIIA during 1999 to 2001 with 204 during 2013 to 2015. Any treatment with epinephrine (before arrival to the ED or in the ED) increased over time (30% vs 49%; $P < .001$). Prescriptions for epinephrine auto-injector at discharge increased significantly (34% vs 57%; $P < .001$), whereas documentation of referral to an allergist/immunologist decreased (28% vs 12%; $P = .002$), and instructions to avoid the offending allergen did not change (23% vs 24%; $P = .94$). Receipt of at least 3 guideline recommendations increased over time; however, the comparison was not statistically significant (10% vs 16%; $P = .15$).

Conclusion: During the nearly 15-year study interval, we observed increased ED concordance with epinephrine-related guideline recommendations for the management of SIIA. Reasons for the decrease in allergy/immunology referrals merit further study.

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Introduction

Stinging insect hypersensitivity has been reported to be one of the most common causes of emergency department (ED) visits for acute allergic reactions, ranging from 18% to 29% of ED visits for acute allergic reactions or anaphylaxis, with stinging insect-induced anaphylaxis (SIIA) being potentially life-threatening.^{1–3} Guidelines recommend that all patients requiring an ED visit for anaphylaxis receive epinephrine as first-line therapy.^{4–10} In addition, guidelines recommend a prescription for an epinephrine auto-injector (EAI), referral to an allergist/immunologist, and an allergy action plan at ED discharge.^{4–10} Referral to an allergist/immunologist

after an ED visit for SIIA is particularly important because venom immunotherapy can prevent future reactions.^{11–13}

Concordance with guideline recommendations for the emergency management of SIIA has been described. In a study from 2001 through 2006, Rudders et al¹⁴ found that 35% of patients with a stinging insect-related systemic reaction received epinephrine. At ED discharge, 68% of patients received an EAI prescription and 10% received a referral to an allergist/immunologist. In another study from 2002 through 2008 conducted by Rudders et al,¹⁵ only 6% of patients with SIIA were treated with epinephrine.

Despite guideline recommendations, previous studies describing the emergency management of SIIA, opportunities for eliminating future reactions, and changes in ED concordance with guidelines for the management of SIIA are not known. We describe temporal changes in ED concordance with guidelines for the management of SIIA.

Methods

Study Design

Data from 2 retrospective studies were compared. The 2 studies were conducted as part of the Multicenter Airway Research Collaboration (MARC), a division of the Emergency Medicine Network (EMNet). The first study, MARC-18, was conducted at 15 EDs in the United States and Canada from 1999 through 2001.¹⁶ The present study, MARC-38, was conducted at 20 EDs, including 14 of the 15 originally participating EDs, but focused on data from 2013 through 2015. These 2 studies used similar methodology, as described in detail elsewhere for MARC-18¹⁶ and as summarized briefly below, with emphasis on the new MARC-38 study.

We used a standardized protocol and data abstraction forms. All data abstractors were required to participate in a webinar training session and satisfactorily ($\geq 80\%$ correct) complete abstraction from 2 practice charts. Investigators at 20 EDs examined ED visits for stinging insect-related acute allergic reactions. More specifically, sites performed chart reviews for randomly selected patients (children and adults) presenting to the ED during a 12- to 36-month period from January 1, 2013 through December 31, 2015 with a physician-diagnosed, stinging insect-related acute allergic reaction. The following *International Classification of Diseases, Ninth Revision (ICD-9)* or *Tenth Revision, Canada (ICD-10-CA)* codes were used for inclusion in the present study: 989.5 (toxic effect of venom), T63.3 to T63.4 (toxic effect of venom of spider or other arthropods), 995.0 and T78.2 (other anaphylactic shock), and 995.3 and T78.4 (allergy, unspecified). A list of all patients with the relevant ICD-9 or ICD-10-CA codes was submitted to the EMNet Coordinating Center, and a random number-generating macro in Excel (Microsoft Corp, Redmond, Washington) was used to rank the list, with the first 50 patients being those randomly identified to undergo chart review. Repeat visits by individual subjects were excluded. The same approach was used in the MARC-18 study.¹⁶ The institutional review board at each of the 20 participating hospitals approved the study.

Data Collection

The structured chart review was performed to collect patients' demographic characteristics, allergy history, and details of their stinging insect-related acute allergic reaction, including pre-hospital, ED, and hospital management. Symptoms and signs were extracted from all available sources (ie, pre-hospital, ED, and inpatient records), and any positive findings were counted. Discharge instructions were recorded for patients sent home from the ED.

Definitions

Stinging insect-induced anaphylaxis was defined based on a slightly modified version of the Food Allergy and Anaphylaxis Network (FAAN) and the National Institute of Allergy and Infectious Disease (NIAID) clinical criteria.¹⁷ Briefly, anaphylaxis was defined as an allergic reaction involving at least 2 organ systems or hypotension before arrival to or in the ED. Hypotension was defined as systolic blood pressure lower than $(70 \text{ mm Hg} + [\text{age} \times 2])$ for children younger than 10 years, lower than 90 mm Hg for children 10 to 17 years old, and lower than 100 mm Hg for adults at least 18 years old. The same definition was used in the MARC-18 study.¹⁶

A known allergy to the offending allergen was determined with the following question: "Does the patient have a known allergy to the insect or spider that caused the current reaction?" Other known allergic problems included allergic reactions to other insects or spiders, allergic reactions to foods, allergic reactions to other sources (eg, medications, latex), asthma, allergic rhinitis, atopic dermatitis, idiopathic urticaria, and other. Pre-ED treatment included self-treatment or treatment by emergency medical services or providers before arriving to the hospital.

Outcomes

The outcomes of interest were concordance with 4 recommended guidelines: (1) pre-ED or ED treatment with epinephrine; (2) discharge prescription for an EAI, (3) referral to an allergist/immunologist, and (4) an allergy action plan at ED discharge. In addition to each recommendation, we also analyzed the number of recommended guidelines followed.

Statistical Analysis

Data were collected at each site and transferred without patient identifiers to the EMNet Coordinating Center for merger and analyses. All analyses were performed using STATA 14.0 (StataCorp, College Station, Texas). Data are presented as proportions, means with standard deviations, and medians with interquartile ranges. Comparisons between the 2 periods (1999–2001 vs 2013–2015) were performed using χ^2 test, Fisher exact test, Student *t* test, and Kruskal-Wallis test, as appropriate. All *P* values are 2-tailed, with a *P* value less than .05 considered statistically significant.

Results

Of the 617 patients identified from 1999 through 2001, 596 were enrolled at sites participating in MARC-18 and MARC-38. Of these 596 patients, 182 (31%) had SIIA according to FAAN and NIAID clinical criteria and were included in the present analysis. Of the 828 patients identified from 2013 through 2015, 611 were enrolled at sites participating in the 2 studies. Of these, 148 (24%) had SIIA and were included in the present analysis. Patients in the cohort of 2013 through 2015 were older; however, the 2 cohorts did not differ for other demographic characteristics. Moreover, the 2 cohorts were equally likely to arrive to the ED by ambulance (Table 1).

Overall, patients in the 2013 through 2015 cohort were more likely to receive care concordant with recommended guidelines for the emergency management of anaphylaxis (Table 1). Any treatment with epinephrine (before arrival to the ED or in the ED) for these patients with SIIA increased over time (30% vs 49%; $P < .001$). Although variation in care across sites was observed during the 2 periods (0–86% in 1999–2001 and 0–90% in 2013–2015), 64% of sites

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