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Brief Report

Epinephrine use and outcomes in anaphylaxis patients transported by emergency medical services

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ABSTRACT

Background: Anaphylaxis is a potentially life-threatening allergic reaction that may require emergency medical system (EMS) transport. Fatal anaphylaxis is associated with delayed epinephrine administration. Patient outcome data to assess appropriateness of EMS epinephrine administration are sparse.

Objectives: The objectives of this study are to (1) determine the frequency of epinephrine administration in EMS-transported patients with allergic complaints, (2) identify predictors of epinephrine administration, and (3) determine frequency of emergency department (ED) epinephrine administration after EMS transport.

Methods: A cohort study was conducted from over 5 years. A total of 59187 EMS transports of an Advanced Life Support (ALS) ambulance service were studied.

Results: One hundred and three patient transports for allergic complaints were analyzed. Fifteen patients received EMS epinephrine, and epinephrine was recommended for 2 additional patients who refused, for a total of 17 (17%) patients for whom epinephrine was administered or recommended. Emergency medical system epinephrine administration or recommendation was associated with venom as a trigger (29% vs 8%; odds ratio [OR], 4.70; 95% confidence interval [CI], 1.28–17.22; $P = .013$), respiratory symptoms (88% vs 52%; OR, 6.83; 95% CI, 1.47–31.71; $P = .006$), and fulfillment of anaphylaxis diagnostic criteria (82% vs 49%; OR, 3.50; 95% CI, 0.94–13.2; $P = .0498$). Four (4%) patients received epinephrine after ED arrival.

Conclusion: Low rates of epinephrine administration were observed. The association of EMS administration of epinephrine with respiratory symptoms, fulfillment of anaphylaxis diagnostic criteria, and low rate of additional epinephrine administration in the ED suggest that ALS EMS administered epinephrine based on symptom severity. Additional studies of EMS anaphylaxis management including ED management and outcomes are needed.

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1. Introduction

Anaphylaxis is sudden, potentially life-threatening reaction to a specific trigger. A considerable number of these reactions occur outside a medical setting in the community and require emergency medical transport and care. Prehospital providers are likely to be the first health care professionals to come in contact with these patients.

Although there have been no randomized controlled trials, there is consensus that epinephrine is the treatment of choice for anaphylaxis [1]. Prehospital management of patients with anaphylaxis has not been well studied. The National Association of EMS Physicians published an article outlining the importance of equipping all ambulances with epinephrine to be used in the management of anaphylaxis [2]. All 50 states in the United States allow epinephrine to be carried by emergency vehicles, but only 17 states require that epinephrine be carried by all levels of emergency

medical system (EMS) providers [3]. Although outcomes after emergency department (ED) arrival have been reported among pediatric patients, to our knowledge, this is the first study to evaluate patient management and outcomes after arrival to the ED among both adult and pediatric patients to assess if EMS providers appropriately administer epinephrine in the treatment of anaphylaxis [4].

The objectives of this study are: (1) to determine the frequency of epinephrine administration in patients transported by EMS for anaphylaxis or other allergic complaints, (2) to identify predictors of EMS epinephrine administration among these patients, and (3) to determine the outcomes of patients transported to the ED by emergency medical providers with regard to need for additional epinephrine administration and ED disposition.

2. Methods

2.1. Study design

An observational cohort study was conducted from July 2002 to July 2007. The Mayo Clinic Institutional Review Board approved the study protocol.

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2.2. Setting

Emergency medical system transports of an Advanced Life Support (ALS) ambulance service providing transport for a population of approximately 130 000 over 650 sq mi were studied. Patients were transported to a tertiary care academic ED with 73 000 annual patient visits.

2.3. Participants

A total of 59 187 EMS transports were analyzed for the study. Cases of allergic reactions and anaphylaxis that were transported to our ED were identified by querying our prehospital database using EMS Data Pro (Inspironix, Inc, Sacramento, CA) with the unique identifiers shown in Table 1. All cases were reviewed by a physician to determine if the transport was related to an allergic reaction or anaphylaxis. Interfacility transports were excluded because these patients were evaluated by a physician before the transport, and thus, the EMS management would likely have been based on the physician assessment rather than on the EMS provider's.

2.4. Variables

Variables collected included demographics, allergic trigger (based on suspected trigger at time of ED evaluation), signs and symptoms, epinephrine dose and route of administration, complications of epinephrine dose, ED management, and disposition.

2.5. Data source

Data were collected from the electronic medical records and EMS documentation using a standardized data abstraction form that was developed as part of the protocol of the study.

2.6. Statistical methods

Continuous data are presented as median with interquartile range (IQR) based on the skewed distribution of data. Categorical data are presented as percent frequency of occurrence. Univariate logistic regression models were fit to estimate the association between signs and symptoms, fulfillment of National Institute of Allergy and Infectious Disease/Food Allergy and Anaphylaxis Network (NIAID/FAAN) diagnostic criteria for anaphylaxis, and disposition with EMS epinephrine administration or recommendation (Fig.) [5]. [6] Odds ratios (ORs) with corresponding 95% confidence intervals (CIs) were calculated for each association. When one of the variables was zero, a 0.5 continuity correction factor was applied (0.5 added to all cells) to be able to calculate ORs. *P* values (Pearson χ^2 or Fisher exact test as appropriate for sample size) represent 2-sided hypothesis testing unless otherwise noted, and *P* ≤ .05 was considered statistically significant. Statistical analyses were performed using JMP software version 9.0 (SAS Institute Inc, Cary, NC).

Table 1
Unique identifiers

Unique identifiers	
Allergic reaction	Animal bite/sting
Anaphylaxis	Swollen tongue
Bronchospasm	Unresponsive
Hypotension	Wheezing
Environmental	Dyspnea
Rash	Drug reaction

3. Results

Of the 59 187 EMS transports analyzed, there were 199 (0.3%) transports for complaints of allergic reaction or anaphylaxis during the study period. Ninety-two interfacility transport cases were excluded. Of the remaining 107 patients, 4 patients were excluded due to missing data. Thus, the final cohort consisted of 103 patients, and among these, 63 (61%) met NIAID/FAAN diagnostic criteria for anaphylaxis.

3.1. Characteristics of EMS-transported patients with allergic reactions and anaphylaxis

Eighteen (17%) patients were less than the age of 18 years, and 67 (65%) were women. Twelve (12%) patients received epinephrine before the arrival of EMS (Table 2). Medications were the most commonly identified trigger (31%), followed by foods (28%), and insect venom (12%). One hundred patients (97%) presented with mucocutaneous symptoms. Cardiovascular and respiratory symptoms were also common (67% and 58%, respectively), followed by gastrointestinal symptoms (16%) (Table 3). Six patients were admitted to the intensive care unit (ICU) (Table 4). There were no deaths in the cohort and no documented biphasic reactions.

3.2. EMS epinephrine administration

Fifteen patients received epinephrine from EMS personnel, and epinephrine was recommended for 2 additional patients who refused the medication, for a total of 17 (17%) patients for whom epinephrine was administered or recommended. Among these 17 patients, only one had self-administered a dose of epinephrine before EMS arrival. Eleven (65%) of 17 patients received subcutaneous epinephrine, which was in accordance with the EMS protocol at the time of the study. Four (24%) of 17 patients received intravenous (IV) epinephrine. None of the patients received additional epinephrine after ED arrival.

3.3. Outcomes of patients who received EMS-administered IV epinephrine

Among the 4 patients who received IV epinephrine, 3 patients received 0.3 mg of epinephrine, and one patient received 0.5 mg of epinephrine. All patients also received IV fluids and diphenhydramine. The details of the patient presentations and ED course are shown in Table 5.

3.4. Outcomes of patients who received EMS-administered subcutaneous epinephrine

Eleven patients received subcutaneous epinephrine. All patients received 0.3 mg of epinephrine except for a 1-year-old boy who received 0.15 mg of epinephrine and a 36-year-old woman who received 0.1 mg of epinephrine (as directed by the medical control physician).

3.5. Outcomes of patients who did not receive EMS-administered epinephrine

As shown in Table 2, after ED arrival, 4 (4%) additional patients received epinephrine. None of these patients had received epinephrine before EMS arrival or from EMS providers. All patients received subcutaneous epinephrine in the ED. One patient was admitted to the general medical service, one was admitted to the ED observation unit, and 2 were dismissed home. Dispositions of patients who did not receive EMS epinephrine are shown in Table 3.

3.6. Associations with EMS epinephrine administration

Patients who received epinephrine from EMS personnel were more likely to have venom as a trigger (29% vs 8%; OR, 4.70; 95% CI,

Anaphylaxis is highly likely when any one of the following 3 criteria is fulfilled:

1. Acute onset of an illness (minutes to several hours) with involvement of the skin, mucosal tissue, or both (eg, generalized hives, pruritus or flushing, swollen lips-tongue-uvula)

AND AT LEAST ONE OF THE FOLLOWING

a. Respiratory compromise (eg, dyspnea, wheeze-bronchospasm, stridor, reduced PEF, hypoxemia)

b. Reduced BP or associated symptoms of end-organ dysfunction (eg, hypotonia [collapse], syncope, incontinence)

2. Two or more of the following that occur rapidly after exposure to a likely allergen for that patient (minutes to several hours):

a. Involvement of the skin-mucosal tissue (eg, generalized hives, itch-flush, swollen lips-tongue-uvula)

b. Respiratory compromise (eg, dyspnea, wheeze-bronchospasm, stridor, reduced PEF, hypoxemia)

c. Reduced BP or associated symptoms (eg, hypotonia [collapse], syncope, incontinence)

d. Persistent gastrointestinal symptoms (eg, crampy abdominal pain, vomiting)

3. Reduced BP after exposure to known allergen for that patient (minutes to several hours):

a. Infants and children: low systolic BP (age specific) or greater than 30% decrease in systolic BP*

b. Adults: systolic BP of less than 90 mm Hg or greater than 30% decrease from that person's baseline

PEF, Peak expiratory flow; BP, blood pressure.

*Low systolic blood pressure for children is defined as less than 70 mm Hg from 1 month to 1 year, less than (70 mm Hg + [2 x age]) from 1 to 10 years, and less than 90 mm Hg from 11 to 17 years.

Modified from Sampson, et al.⁶ Used with permission.

Fig. NIAID/FAAN clinical criteria for the diagnosis of anaphylaxis.

1.28–17.22; $P = .013$), respiratory symptoms (88% vs 52%; OR, 6.83; 95% CI, 1.47–31.71; $P = .006$), and specifically, more likely to have tachypnea (35% vs 7%; OR, 7.27; 95% CI, 1.99–26.56; $P = .003$) as compared with patients who did not receive epinephrine from EMS personnel. They were also more likely to meet the NIAID/FAAN criteria for the diagnosis of anaphylaxis (82% vs 57%; OR, 3.50; 95% CI, 0.94–13.2; $P = .0498$) (Table 3). Although differences were not statistically significant, patients who received EMS-administered epinephrine tended to be more likely to be admitted to the ICU (18% vs 3%; OR, 5.92; 95% CI, 1.08–32.4; $P = .055$). There were no significant differences with regard to patient age or sex.

4. Discussion

Medical literature regarding prehospital management of anaphylaxis is sparse [4,7,8]. To the best of our knowledge, there have been no previous studies documenting patient outcomes after ED arrival in a population of both pediatric and adult anaphylaxis patients

transported by EMS. We present a study of a total of 59187 EMS transports between July 2002 to July 2007 of whom 199 (0.3%) were found to have had an allergic reaction or anaphylaxis. After exclusion of interfacility transports, we analyzed 103 cases transported by EMS providers and report outcomes of these patients after arrival to the ED. Emergency medical system epinephrine administration was more likely in patients with venom as a trigger and with respiratory symptoms, particularly tachypnea. They were more likely to meet NIAID/FAAN criteria and tended to be more likely to be admitted to the ICU. After transport to the ED, only 4 (4%) additional patients received epinephrine.

Our finding that 0.3% of EMS transports were for allergic complaints is comparable with the data presented by a retrospective study of emergency transports for allergic reactions published in 2010 by Capps et al [8] in which allergic reactions made up approximately 0.2% of total ambulance workload. In addition, an earlier study showed that 0.4% to 0.9% of EMS transports in a population of 13 million was for allergic reactions [9].

A recent study in pediatric patients showed that 36% of the patients who met criteria for anaphylaxis received epinephrine from EMS personnel [4]. This is almost double the rate in our cohort, where overall, only 17% either received or were recommended epinephrine. Furthermore, only 11% of children in our study received subcutaneous EMS epinephrine. However, our findings are similar to findings by Capps et al [8] who found that overall, 14% of all patients and 8% of children received epinephrine from EMS personnel. Thus, there appears to be significant variation among EMS systems with regard to the use of epinephrine for the management of anaphylaxis [8].

Our finding that patients who received epinephrine from EMS personnel were more likely to meet NIAID/FAAN criteria is similar to

Table 2

Demographics and epinephrine doses received by patients transported by EMS

Demographics	n = 103 (%)
Age, y (IQR)	39 (24–59)
Less than 18 years	18 (17)
Female	67 (65)
Epinephrine given or recommended	
Pre-EMS	12 (12)
EMS	17 (17)
ED	4 (4)
Total	33 (32)

Table 3

(Abbreviations: Epi, epinephrine; RR, respiratory rate; O₂ sat, oxygen saturation; SBP, systolic blood pressure; HR, heart rate.) Association between trigger, signs and symptoms, fulfillment of NIAID/FAAN diagnostic criteria, and ED disposition with EMS epinephrine administration or recommendation

Patient characteristic	Overall (n = 103)	Epi EMS (n = 17)	No-epi EMS (n = 86)	OR (95% CI)	P
Age <18 y	18 (17)	2 (11)	16 (89)	0.58 (0.12–2.8)	.730
Age ≥ 18 y	85 (83)	15 (18)	70 (82)	1.71 (0.35–8.26)	.730
Female	67 (65)	12 (18)	55 (82)	1.35 (0.46–4.20)	.275
Trigger					
Food	29 (28)	3 (18)	26 (30)	0.49 (0.13–1.87)	.384
Medicine	32 (31)	4 (24)	28 (32)	0.64 (0.19–2.13)	.462
Venom	12 (12)	5 (29)	7 (8)	4.70 (1.28–17.22)	.013
Other	7 (7)	0 (0)	7 (8)	0.30 (0.0–4.58)	.597
Unknown	23 (22)	5 (29)	18 (21)	1.6 (0.49–5.05)	.525
Mucocutaneous symptoms	100 (97)	16 (94)	84 (97)	0.38 (0.03–4.46)	.469
Urticaria/flushing	71 (69)	10 (59)	61 (71)	0.58 (0.20–1.71)	.334
Swelling face/lips	27 (26)	4 (24)	23 (27)	0.84 (0.25–2.85)	.781
Swelling tongue	21 (20)	1 (6)	20 (23)	0.21 (0.03–1.65)	.070
Throat tightness	33 (32)	8 (47)	25 (29)	2.17 (0.75–6.26)	.156
Respiratory symptoms	60 (58)	15 (88)	45 (52)	6.83 (1.47–31.71)	.006
Dyspnea	47 (46)	10 (59)	37 (43)	1.89 (0.66–5.44)	.233
Voice change	7 (7)	2 (12)	5 (6)	2.16 (0.38–12.18)	.407
Wheezes	12 (12)	4 (24)	8 (9)	3.00 (0.79–11.41)	.125
Tachypnea (RR > 24)	12 (12)	6 (35)	6 (7)	7.27 (1.99–26.56)	.003
Hypoxia (O ₂ sat ≤ 92)	5 (5)	2 (12)	3 (3)	3.69 (0.57–23.98)	.197
Gastrointestinal symptoms	16 (16)	2 (12)	14 (16)	0.69 (0.14–3.34)	.629
Nausea	8 (8)	1 (6)	7 (8)	0.71 (0.08–6.14)	.743
Vomiting	10 (10)	1 (6)	9 (10)	0.53 (0.06–4.52)	.537
Abdominal pain	3 (3)	0 (0)	3 (3)	0.68 (0.0–12.48)	.294
Diarrhea	2 (2)	0 (0)	2 (2)	0.97 (0.0–20.48)	.393
Cardiovascular symptoms	69 (67)	12 (71)	57 (66)	1.22 (0.39–3.80)	.728
Presyncope	10 (10)	1 (6)	9 (10)	0.53 (0.06–4.52)	.537
Syncope	4 (4)	0 (0)	4 (5)	0.52 (0.0–8.86)	.225
Chest pain	6 (6)	2 (12)	4 (5)	2.73 (0.46–16.28)	.297
Hypotension (SBP ≤ 90)	5 (5)	2 (12)	3 (3)	3.69 (0.57–24.0)	.297
Tachycardia (HR > 100)	47 (46)	9 (53)	38 (44)	1.42 (0.50–4.03)	.509
NIAID/FAAN criteria met	63 (61)	14 (82)	49 (57)	3.50 (0.94–13.2)	.0498
Disposition					
Home	75 (73)	12 (71)	63 (73)	0.88 (0.28–2.76)	.774
ED observation unit	8 (8)	0 (0)	8 (9)	0.26 (0.0–3.91)	.347
General hospital floor	14 (14)	2 (12)	12 (14)	0.82 (0.17–4.06)	1.00
ICU	6 (6)	3 (18)	3 (3)	5.92 (1.08–32.4)	.055

Abbreviations: Epi, epinephrine; RR, respiratory rate; O₂ sat, oxygen saturation; SBP, systolic blood pressure; HR, heart rate.

findings of a previous study of EMS management of allergic reactions, where paramedics were more likely to administer epinephrine to patients with respiratory and circulatory compromise [8]. These results suggest that paramedic epinephrine administration was appropriately based on symptom severity. Likewise, the association between venom as a trigger and EMS-provided epinephrine is consistent with previous findings demonstrating a more rapid onset of arrest in patients who had fatal anaphylaxis secondary to venom (median time to arrest, 15 minutes) as compared with food (30 minutes) [10].

Our data showing that only 4% of patients received epinephrine after ED arrival could be viewed as further evidence that most

patients who urgently required epinephrine received it from EMS providers. Alternatively, it could be argued that ED providers are also underrecognizing and undertreating anaphylaxis, as has been suggested in some studies [11,12]. Of note, 3 of 5 patients in our cohort who had hypotension did not receive EMS epinephrine. Furthermore, our results stand in contrast to findings by Tiyyagura et al [4] who found that, in a cohort of pediatric patients, nearly all patients who did not receive epinephrine from EMS providers received it after arrival to the ED. Thus, additional studies of EMS anaphylaxis management including outcomes after ED arrival are needed to definitively determine if EMS providers are appropriately administering epinephrine to anaphylaxis patients.

Administration of IV epinephrine is associated with risk of cardiovascular complications and overdose, making administration challenging for even experienced health care providers [13–17]. The dosing of EMS-administered IV epinephrine in our study would be inappropriate based on current World Allergy Organization guidelines for the treatment of anaphylaxis, given that patients did not receive intramuscular (IM) epinephrine before IV [18]. Furthermore, the remaining cases of EMS-administered epinephrine in our study was via the subcutaneous route, which is known to have lesser absorption rates as compared with IM route [19,20]. However, the dosing provided by the EMS providers was in concordance with the local EMS protocol for severe anaphylaxis at the time of the study. The protocol has since been updated to recommend IM epinephrine as first-line treatment for anaphylaxis and requires EMS providers to obtain physician-provided medical direction before the administration of IV epinephrine for patients not in cardiac arrest.

Although delayed administration of epinephrine has been shown to result in adverse outcomes, currently, there is no consensus regarding availability of epinephrine for use in anaphylaxis among EMS providers [21,22]. In Minnesota, all ambulances are required to carry epinephrine since 2002. However, not all states require ambulances to be equipped with epinephrine nor are all levels of emergency medical technicians fully authorized to administer the medication during an anaphylactic emergency [23]. Standardized guidelines for EMS anaphylaxis management should be considered, given the possible life-threatening nature of anaphylaxis and relatively uncommon occurrence among EMS transports. Guidelines would need to take into consideration the various levels of training of EMS providers.

Our study has the limitations of a retrospective study. The ability of the study to identify and include all cases of anaphylaxis in our cohort depended on the unique identifiers used. Although our list of identifiers was fairly exhaustive, some cases of anaphylaxis may not have been included. We defined anaphylaxis based on the NIAID/FAAN diagnostic criteria; however, these criteria are not universally accepted. Our patient population was mainly of White origin, and the results may not be generalizable to other populations. Furthermore, our study only included ALS EMS providers and did not include other levels of EMS providers. Hence, the findings may not apply to EMS systems, which rely heavily on basic life support providers for their care.

5. Conclusion

Although low rates of epinephrine administration were observed, the association of EMS administration of epinephrine with respiratory symptoms, fulfillment of NIAID/FAAN diagnostic criteria for anaphylaxis, and low rate of additional epinephrine administration in the ED suggest that ALS EMS-administered epinephrine was based on symptom severity. Additional studies of EMS anaphylaxis management including management and outcomes after ED arrival are needed. Standardized guidelines for EMS anaphylaxis management should be considered given the life-threatening nature of anaphylaxis, its relatively uncommon occurrence among EMS transports, and various levels of EMS provider training.

Table 4

Presenting signs and symptoms of patients who were admitted to ICU

Age Sex	EMS management	Presenting signs/symptoms and ED course
77, M	No medications administered	Patient presented with sudden onset of shortness of breath, swollen tongue, lips, eyes, and throat, with stridor and wheezing that began shortly after taking a laxative. Patient's BP was 94/59 mm Hg and had normal oxygen saturations. In the ED, he received nebulized albuterol, IM steroids, and diphenhydramine. Epinephrine was considered, but patient had concomitant CHF exacerbation. Nasopharyngoscopy was performed to rule out laryngeal edema.
75, M	25 mg of IV diphenhydramine	Patient presented with rash, pruritus, urticaria, tongue, and lip swelling after taking sulfamethoxazole-trimethoprim. Patient had normal saturations, but BP was 102/60 mm Hg (significantly lower than baseline). He received IV steroids, IV diphenhydramine, and H2 antihistamines.
28, M	Endotracheal intubation followed by 0.3 mg of subcutaneous epinephrine and 2 doses of 0.25 mg IM epinephrine	Patient was found at home cyanotic and unresponsive after eating Chinese food. Upon arrival to the ED, he was hemodynamically stable and was found to have urticaria. He received nebulized albuterol via endotracheal tube, IV steroids, and H2 antihistamines.
70, F	0.3 mg of subcutaneous epinephrine, 50 mg of IV diphenhydramine, nebulized albuterol	Patient experienced weakness, shortness of breath, nausea, and vomiting, which began 20 min after taking levofloxacin for a COPD exacerbation. She was hypotensive (BP, 59/39 mm Hg) with saturations of 88%. Upon arrival in the ED, she was hemodynamically stable and received IV fluids, steroids, and H2 antihistamines.
49, F	50 mg of IV diphenhydramine	Patient presented with lower lip edema, tongue swelling, and throat tightness that developed shortly after using new toothpaste. She was normotensive and had normal oxygen saturations. In the ED, she received IV steroids and H2 antihistamines. She was found to have mild vocal cord edema on nasopharyngoscopy but symptomatically improved and was admitted to the ICU for close airway observation.
24, F	0.3 mg of subcutaneous epinephrine, 25 mg of IV diphenhydramine.	Patient presented with shortness of breath, tongue swelling, hives, pruritus, and tightness of throat with an unknown trigger. Her blood pressure was 107/67 mm Hg with normal oxygen saturations. In the ED, she received IV steroids and H2 antihistamines. She was admitted to the ICU for close airway observation.

Abbreviations: M, male; F, female; BP, blood pressure; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease.

Table 5

Presenting signs and symptoms and ED course of patients who received EMS IV epinephrine

Age Sex	EMS management	Presenting signs/symptoms and ED course
82, F	IV fluids, 50 mg IV diphenhydramine, 2.5 mg nebulized albuterol, 0.5 mg of 1:1000 IV epinephrine	Patient presented with angioedema of the tongue, diffuse urticaria, and dyspnea secondary to a medication reaction. She was normotensive (118/93 mm Hg) but in moderate respiratory distress. Symptoms improved after EMS-administered epinephrine; no complications were documented. She was admitted to the general medical floor for additional monitoring.
68, F	IV fluids, 50 mg of IV diphenhydramine, 0.3 mg of 1:10000 IV epinephrine	Patient's blood pressure was 82/60 mm Hg. She had tongue and lip swelling, throat tightness, hoarse voice, and diffuse urticaria secondary to a medication reaction. After treatment with EMS IV epinephrine, she developed ventricular bigeminy and received IV lidocaine from EMS providers. She stabilized in the ED without any additional epinephrine and was admitted to cardiology.
18, M	IV fluids, 50 mg IV diphenhydramine, 0.3 mg of 1:10000 IV epinephrine	Patient was stung multiple times on the back as well as on the upper lip by a bee. He reported dyspnea and facial swelling. The blood pressure (157/99 mm Hg) was not documented until after epinephrine administration. Symptoms improved, and he was observed in the ED observation unit for approximately 6 h and dismissed home.
55, M	IV fluids, 50 mg IV diphenhydramine, 0.3 mg of 1:1000 IV epinephrine	Patient was stung by a bee on his leg and developed dyspnea. EMS personnel found him diaphoretic, pale, and bradycardic with a systolic blood pressure of 90 mm Hg, while lying supine on the ground. Patient's symptoms improved after EMS IV epinephrine, and he was dismissed home directly from the ED after approximately 3 h of observation.

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