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Anaphylaxis in a New York City pediatric emergency department: Triggers, treatments, and outcomes

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Abstract

Background—Anaphylaxis incidence is increasing.

Objective—To characterize anaphylaxis in children in an urban pediatric emergency department (PED).

Methods—Review of PED records for anaphylactic reactions over 5 years.

Results—We identified 213 anaphylactic reactions in 192 children (97 males); 6 were infants; 20 had multiple reactions; median age 8 years; range 4 mo-18 yr. Sixty-two reactions were coded as anaphylaxis; 151 additional reactions met the Second symposium anaphylaxis criteria. There was no increase in incidence over 5 years. The triggers included: foods, 71%; unknown, 15%; drugs, 9%, and other, 5%. Food was more likely to be a trigger in multiple PED visits, P=.03. Epinephrine was administered in 169 (79%) reactions; in 58 (27%) epinephrine was given before arrival in PED. Patients with Medicaid were less likely to receive epinephrine before arrival in PED, P<.001. Twenty-eight (14.6%) patients were hospitalized; 9 in the intensive care unit. For thirteen (6%) of the reactions, two doses of epinephrine were administered; 69% of patients treated with two doses of epinephrine were hospitalized, compared to 12% of patients treated with a single dose, P<.001. Administration of both epinephrine doses before arrival to PED was associated with a lower rate of hospitalization compared to epinephrine administration in the PED, P=.05.

Conclusions—Food is the main anaphylaxis trigger in the urban PED, although the ICD-9 code for anaphylaxis is underutilized. Treatment with two doses of epinephrine is associated with a higher risk of hospitalization; epinephrine treatment before arrival to PED is associated with a decreased risk. Children with Medicaid are less likely to receive epinephrine before arrival in PED.

Keywords

children; anaphylaxis; food allergy; auto-injectable epinephrine; pediatric emergency room; food-induced anaphylaxis; peanut allergy; seafood allergy

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Introduction

Anaphylaxis is a severe, potentially fatal, systemic allergic reaction that occurs suddenly after contact with allergy-causing substances[1]. Diagnostic criteria for anaphylaxis were recently published to help clinicians recognize the full spectrum of signs and symptoms of anaphylaxis[1].

An increase in the incidence of anaphylaxis in general, and specifically food-induced anaphylaxis in children in the industrialized world has been suggested by recent studies[2-5]. However, the true incidence of anaphylaxis remains elusive. Studies published prior to the recently proposed criteria often used a definition that was more restrictive, possibly excluding milder cases of anaphylaxis.

Food is the leading known cause of anaphylactic reactions for children in emergency departments in the U.S. Peanuts, tree nuts, fish and shellfish are the most common anaphylaxis triggers in the U.S. and Europe.[5-7] Risk factors for anaphylaxis include asthma, failure to identify responsible food allergen in the meal, and previous allergic reactions to incriminated foods.[8] Epinephrine is the treatment of choice for anaphylaxis.[9] Delayed administration of epinephrine has been identified as a risk factor for fatal food-induced anaphylaxis.[10] Children in whom the EpiPen® device was used were less likely to be given epinephrine in the hospital and to require subsequent hospital admission[11]. We sought to determine the prevalence of anaphylaxis in children presenting to an urban emergency department, and to characterize triggers, treatments, and the outcomes of anaphylaxis.

Methods

Patients

We reviewed the electronic records of children presenting with anaphylaxis to the Mount Sinai Pediatric Emergency Department (PED) from January 1, 2004 through December 31, 2008. Records of children aged 4 months through 18 years were retrieved using the search stem “anaphyl-” and “allerg-”. Ultimately, charts with ICD-9 codes including, but not limited to “anaphylaxis” [995.0], “anaphylactic reaction” [995.0], “anaphylactic shock” [995.0], “allergic reaction not otherwise specified” [995.3], “adverse food reaction” [995.7], and “allergic urticaria” [708.0] were reviewed. We excluded charts with the ICD-9 code of “allergic rhinitis” [477] and “allergic conjunctivitis” [374.14]. Patients who met criteria for anaphylaxis were included in the study, even if their visit was not given an anaphylaxis diagnostic code. Demographics, insurance, chief complaint, atopic history, suspected trigger, time from exposure to onset of symptoms, symptoms prior to evaluation and during the PED visit, medications administered, physical exam findings, disposition, length of stay, and prescriptions upon discharge were recorded.

The study was approved by the Mount Sinai School of Medicine Institutional Review Board.

Definition and severity of anaphylaxis

The study utilized criteria from the 2006 Second National Institute of Allergy and Infectious Disease/Food Allergy and Anaphylaxis Network Symposium on the definition and management of anaphylaxis.[1] We evaluated the severity of anaphylaxis with a 3-grade scale. (Table EI in the Online Repository)

Data analysis

ANOVA or ANOVA on Ranks tests were used for determining statistical significance ($P<.05$) between continuous variables; a paired t-test or Wilcoxon Signed Rank test was used

when comparing different time points. Dichotomous variables were analyzed using the Chi-square test. SigmaStat 3.5 package was used (SYSTAT Software Inc, 2005).

Results

There were 118,680 encounters for patients through 18 years of age in the PED from 2004 to 2008. The initial screen identified 1220 records suggestive of anaphylaxis. After detailed review of these charts, we identified 213 anaphylactic reactions in 192 patients. These 213 reactions represent 0.18% of all patient encounters. There was no significant change in the incidence of anaphylaxis or in the hospitalization rate over 5 years. (Table EII)

Of the 213 reactions, 109 (51%) occurred in males; median age was 8 years (range; 4 mos-18 yrs). Median length of stay in the PED was 3.5 hours (range; 0.5– 11.4 hours). Symptoms of anaphylaxis included rash/hives (62%), shortness of breath (49%), throat swelling (42%), wheezing (26%), facial swelling (22%), emesis (20%), chest pain (8%), irritability (4%), and diarrhea (2%).

ICD-9 code for anaphylaxis (955.0) is underutilized

Sixty-two reactions were coded as anaphylaxis whereas 151 reactions were coded as an allergic reaction, but fulfilled the criteria of anaphylaxis, or were treated by PED staff as anaphylaxis with epinephrine injection.[1] Epinephrine was administered in 81% of reactions given an anaphylaxis code and in 75% of reactions given an allergic reaction code. Fourteen of the reactions given an allergic reaction code resulted in hospitalization, representing half of all the hospitalizations for anaphylaxis from the PED over five years. There was no significant difference in the severity of reactions amongst those given an anaphylaxis code and those given an allergic reaction code. (Table I) However, patients not given an anaphylaxis code less frequently had hives, shortness of breath, wheezing, vomiting, and abdominal pain as a presenting symptom than those given the anaphylaxis code. (Table I) In particular, children without cutaneous symptoms were less likely to receive an anaphylaxis diagnostic code than those with cutaneous symptoms, 48% vs. 97%, P=.0001.

Foods are the most common trigger of anaphylaxis in PED

Of the 213 anaphylactic reactions, the trigger was identified as foods in 152 (71%), unknown in 32 (15%), drugs in 19 (9%), and other in 10 (5%). There was no significant difference in anaphylaxis triggers between age groups. (Table II)

Among food-related anaphylactic reactions, 85 reactions involved a specific food and 67 reactions involved mixed foods. Children through 6 years of age were significantly more likely to have cow's milk as a trigger (P= .02), but less likely to have fish and/or shellfish as a trigger for anaphylaxis when compared to children age 7 through 18 years of age (P= . 001). (Table II)

Drug-induced reactions included non-steroidal anti-inflammatory drugs (NSAIDS), antibiotics, immunizations, blood product, allergen immunotherapy, and L-dopa and arginine which were administered during a growth hormone stimulation test. The “other” category included mostly anaphylaxis where the only trigger identified was environmental and/or cutaneous exposure, such as a visit to a relative's home or exposure to new pets, and one case of anaphylaxis triggered by an unknown insect bite.

Anaphylaxis severity

Anaphylaxis severity was graded as follows: mild (52%), moderate (41%), or severe (7%). (Table I) There was no statistically significant difference in severity in different age groups (data not shown).

Treatment with multiple doses of epinephrine is associated with increased rate of hospitalization

Twenty-nine anaphylactic reactions (14%) in 28 patients resulted in hospitalization (20 males; median age 8 years; range; 0.9-18 yrs). (Table III) Twenty were admitted to the pediatric floor; 9 were admitted to the Pediatric Intensive Care Unit (PICU). Nine of 13 (69%) patients treated with two doses of epinephrine were hospitalized compared to 18 of 156 patients (12%) treated with a single dose of epinephrine, $P<.001$. Patients treated with two doses of epinephrine were also more likely to be admitted to the PICU when compared with those treated with one dose of epinephrine, $P<.0001$. There was a trend of male patients (20 out of 97, 21%) being hospitalized more often than female patients (8 out of 95, 8%), $P = .02$. Among 184 reactions (86%) discharged to home from PED, 116 (63%) received a prescription for self-injectable epinephrine.

Prompt treatment with multiple doses of epinephrine is associated with a decreased rate of hospitalization

Among the 213 reactions, 169 (79%) were treated with epinephrine; 58 (27%) were treated with 1 or 2 doses of epinephrine prior to arrival in the PED. Forty-four (21%) reactions were not treated with epinephrine at all. (Table III) Of the thirteen patients (6%) who received two doses of epinephrine, both doses were administered in the PED in seven (54%), prior to arrival in the PED in 4 (31%), and one dose was administered at home and one in the PED in 2 patients (15%). When both doses were administered prior to arrival in the PED, these patients were less likely to be hospitalized (25%), when compared with those administered a second or both doses of epinephrine by PED staff (89%). ($P= .05$) There was no significant difference in the number of doses of epinephrine administered and the trigger for the reaction.

Health insurance information was available for 183 patients; 49 had “Medicaid and/or managed Medicaid”, 130 had “other insurance”, and 4 were “self pay”. Seven (19%) patients with Medicaid and/or managed Medicaid received one or more doses of epinephrine prior to presentation to the ER, compared to 49 (47%) with “other insurance” or “self pay”, $P = .006$. (Table IV)

Antihistamines and steroids are administered more frequently than epinephrine for anaphylaxis in PED

Other treatments were administered at the following frequencies: histamine-1 receptor antagonists (92%), steroids (89%), histamine-2 receptor antagonists (46%), albuterol (29%), and intravenous fluids (13%).

Anaphylaxis in infants: lack of blood pressure documentation

We identified 6 infants under the age of 1 year with anaphylaxis. (Table V) In 5 reactions (83%), food was reported as a trigger. Four infants were treated with epinephrine (67%); 1 received two doses of epinephrine (17%), which was not different from the overall study population, as 77% were treated with 1 dose of epinephrine ($P=.6$), and 6.5% were treated with 2 doses of epinephrine ($P= .4$). One 11-month-old infant was admitted to the PICU; five others were discharged home. Blood pressure was recorded in one infant, and only after the second dose of epinephrine was administered. Of the 213 anaphylactic reactions, blood

pressure was documented in only 12.5 % of reactions occurring in patients under age 3 years, compared to 90% of patients 3 years and older, *(P*<.0001).

Food-induced anaphylaxis is more likely to result in repeated PED visits

Twenty patients (10.5%) had repeated emergency room visits for anaphylaxis. (Table VI) Nineteen patients had 2 visits, and 1 patient had 3 visits. Food was more likely to be a trigger for those with repeated visits (35/41) than those with single visits (117/172) (*P*=.03). Patients with repeated PED visits were not different from patients with a single visit in regard to epinephrine treatment and severity of anaphylactic reaction (data not shown).

Biphasic anaphylaxis

Three reactions were diagnosed as biphasic anaphylaxis, representing 1.4% (3/213) of anaphylactic reactions. (Table EIII in the Online Repository)

Discussion

We report on the etiology and management of pediatric anaphylaxis based on the detailed review of over one thousand charts, and with utilization of the current anaphylaxis criteria. Due to the unique location of Mount Sinai PED bordering East Harlem and the Upper East Side neighborhood of New York City, our study represents a diverse patient population; the significant trends we identified can be applied more broadly to improve the management of pediatric anaphylaxis.

Among the important findings are that the majority (75%) of anaphylactic reactions were not coded as anaphylaxis, but as an allergic reaction. Second, patients who received 2 doses of epinephrine were more likely to be hospitalized; in contrast, early administration of epinephrine (prior to arrival to PED) was associated with lower rate of hospitalization. Third, Medicaid insurance patients were significantly less likely to have received epinephrine prior to the PED compared to non-Medicaid insurance. Last, we identified two specific populations of interest: infants and children with repeated visits to the PED for anaphylaxis. In both populations, the majority of the anaphylactic reactions were triggered by foods.

We confirmed significant miscoding of anaphylaxis[12]; only about one-third of all reactions were given the ICD-9 code (995.0) for anaphylaxis, whereas the majority (71%) were coded as an “allergic reaction”. Reactions that were not coded as anaphylaxis less frequently included the following symptoms: rash and/or hives, shortness of breath, wheezing, vomiting and abdominal pain. This may imply that clinicians have lower suspicion for anaphylaxis in the absence of skin manifestations and regard respiratory and gastrointestinal symptoms as more serious symptoms that are more closely linked with the diagnosis of anaphylaxis.

The majority (71%) of reactions were triggered by foods. About a half of reactions involved a specific food trigger, while another half involved mixed foods and food from restaurants.[13] Children through 6 years of age were significantly more likely to report cow's milk as a trigger for anaphylaxis, but less likely to report seafood (fish or shellfish) when compared to children 7 through 18 years of age. Most anaphylactic reactions were classified as mild. The reactions graded as mild were less likely to be treated with epinephrine than those graded as moderate or severe suggesting that milder symptoms of anaphylaxis may be under recognized as anaphylaxis by patients, caregivers, and PED staff.

We found a high rate of epinephrine treatment of 79% and epinephrine prescription upon discharge of 63% compared to other studies, 16-63% and 16-67%, respectively. [14-17] High

rate of epinephrine treatment was likely related to PED affiliation with an academic center with a prominent allergy and immunology division, and reflected education given to the pediatricians about management of anaphylaxis. Nevertheless, antihistamines (92%) and steroids (89%) were used in a greater percentage of patients than epinephrine (79%), despite lack of evidence of steroid efficacy in anaphylaxis.

Fourteen percent of children presenting with anaphylaxis were hospitalized; those treated with 2 doses of epinephrine were more likely to be hospitalized in general ($P<.001$) and in the pediatric intensive care unit ($P<.0001$) than those treated with one dose or no epinephrine. This could reflect the severity of the anaphylactic reaction, as well as the actual or perceived need for further observation. However, earlier administration of both epinephrine doses (prior to arrival to PED) was associated with a lower rate of hospitalization compared to epinephrine administration in the PED *($P<.0001$)*, a finding we hope to confirm in future studies with a larger cohort of patients. This contrasts to a finding by Banerji et al, where pre-ED treatment with epinephrine was a risk factor for hospitalization for a food-induced allergic reaction.[18] It is difficult to directly compare both studies because we focused on anaphylaxis whereas Banerji et al included all food-induced allergic reactions presenting to the emergency department (ED), a subset of which fulfilled anaphylaxis criteria. Their findings imply that anaphylaxis was more likely treated with epinephrine prior to the ED and was also more likely to result in hospitalization due to increased severity of symptoms compared to non-anaphylactic food-induced allergic reactions.

To our knowledge this is the first report on trends in EpiPen administration of patients with different types of insurance. Patients with Medicaid or managed Medicaid were less likely to have received epinephrine prior to presenting to the PED with anaphylaxis. Whether this is due to factors involving limited access to care or availability of epinephrine auto-injector, reluctance to use the auto-injector, or failure to recognize the signs of anaphylaxis, it is important to recognize that Medicaid patients represent a vulnerable population in whom the management of anaphylaxis may be improved by more effective education.

Anaphylaxis in infants is under-recognized.[4] We identified 6 infants with anaphylaxis under the age of one year; the youngest was 4 months old. Although 4 infants in our sample received at least one dose of epinephrine, there was little documentation of blood pressure. Anaphylaxis may be missed without the measurement of blood pressure. The recent World Allergy Organization Guidelines for the Assessment and Management of Anaphylaxis emphasize that age appropriate criteria should be used for documenting hypotension and tachycardia.[7]

Twenty children were seen in the PED for repeated visits for anaphylaxis. The majority of these patients (85%) had food as a trigger for their multiple anaphylactic reactions, consistent with the findings by Gold[11]. Although they had experienced food-induced anaphylaxis before, they were not more likely to administer epinephrine prior to arrival in the PED. Hompes et al reported that 26% of affected patients had a previous reaction, utilizing data from questionnaires to allergy clinics and private practices in Germany. [19]

Limitations to our study include relatively small number of patients, anaphylactic episodes from a single PED in New York City, and retrospective design. We did not find changes in the incidence of anaphylaxis unlike recently reported by Rudders and Lin et al, who examined anaphylaxis from 2001 to 2006 and 1990 to 2006, respectively[5, 20]. However, our study may not be powered to detect such change since it is not population-based, and also focuses on a different time period (2004 to 2008). The large referral population of food allergic patients at the Mount Sinai Medical Center (MSMC) may skew towards food-

induced anaphylaxis. However, MSMC is located in an urban area in New York City and treats a diverse population of children. The retrospective design was also a limitation due to inconsistent details provided by the varying PED providers caring for the patient.

Conclusions

Diagnosis and proper management of anaphylaxis remain challenging for the patients and PED providers. Diagnosis of anaphylaxis is based on clinical criteria; accurate diagnosis is critical for proper management; documentation of blood pressure should be enforced for all ages, including infants. More effort is needed to educate patients and PED providers that epinephrine is the first line treatment for anaphylaxis. Patients with Medicaid insurance are a vulnerable population that needs better education and follow up.

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Abbreviations

PED	Pediatric Emergency Department
ICU	Intensive Care Unit
PICU	Pediatric Intensive Care Unit

Key Messages or Clinical Implications

Foods are the main anaphylaxis triggers although the ICD-9 code for anaphylaxis is underutilized. Hospitalization rates are increased with multiple doses of epinephrine and decreased with early epinephrine treatment. Children with Medicaid should be targeted with focused education.

Table I
Coding of anaphylactic reactions, associated symptoms and severity grading

	Coded As			
Symptoms	**Anaphylaxis* n=62 (%)**	**Allergic Reaction** n=151 (%)**	***P* value**	**Total n=213 (%)**
Rash/Hives	60 (97)	73 (48)	**< .0001**	133 (62)
SOB	45 (73)	59 (39)	**< .0001**	104 (49)
Wheezing	27 (44)	29 (19)	**.0007**	56 (26)
Throat swelling	23 (37)	67 (44)	.3	90 (42)
Vomiting	21 (34)	22 (15)	**.009**	43 (20)
Face swelling	18 (29)	28 (19)	.2	46 (22)
Abdominal pain	10 (16)	6 (4)	**.007**	16 (8)
Chest pain	10 (16)	8 (5)	**.02**	18 (8)
Coughing	8 (13)	24 (16)	.7	32 (15)
Diarrhea	2 (3)	2 (1)	.4	4 (2)
Irritability	2 (3)	7 (5)	.9	9 (4)
Severity Grading				
Mild	34 (55)	75 (49)	.6	109 (52)
Moderate	23 (37)	63 (42)	.6	86 (41)
Severe	3 (5)	12 (8)	.6	15 (7)

* ICD-9 code for anaphylaxis 995.0; 2 patient records did not allow for severity grading

** Alternative ICD-9 codes included: “allergic reaction not otherwise specified” [995.3], “adverse food reaction”[995.7], “allergic urticaria” [708.0]; **1 patient record did not allow for severity grading

Table II

Triggers of anaphylaxis

Type of Trigger	Total n=213 n (% of triggers)	0-6 years n=89	7-18 years n=124	*P* value (0-6 years vs 7-18 years)
Drugs	19 (9)	7	12	0.83
Unknown	32 (15)	9	23	0.13
Other	10 (5)	3	7	0.66
Food	152 (71)	70	82	0.07
Specific Food Triggers, n=% of specific food triggers (n=85 (56% of food triggers)				
Seafood (Fish/Shellfish)	22 (26)	2	20	**0.001**
Peanut	17 (20)	12	5	0.06
Tree nuts	17 (20)	11	6	0.16
Fruits/Vegetables	9 (11)	4	5	0.8
Cow's milk	6 (7)	6	0	**0.02**
Chicken egg	4 (5)	3	1	0.5
Wheat	4 (5)	3	1	0.5
Meat/Poultry	3 (4)	1	2	0.9
Seeds	2 (2)	2	0	0.4
Soy	1 (1)	1	0	0.9
Other Mixed Food Triggers, n (% of other mixed food triggers) (n=67 (44% of food triggers)				
Food establishment*	26 (39)	8	18	0.1
Unsure/Multiple foods ingested	13 (19)	5	8	1.0
Baked goods	13 (19)	3	10	0.14
Commercially packaged foods	6 (9)	2	4	0.69
Candy	6 (9)	4	2	0.41
Other	3 (4)	3	0	0.19

* Food establishment include: mainly Chinese and Indian restaurants

Table III

Treatment with epinephrine (epi)

	Total (%) n=213	No epi n=44	1 epi n=156	2 epi n=13
Hospitalizations	29 (13)	2 (5)	18 (12)	9 (69)*
Admitted to floor	20 (9)	1 (2)	15 (10)	4 (31)
Admitted to PICU	9 (4)	1 (2)	3 (2)	5 (38)**
Median length of hospital stay (days)	1	1.5	1	1
Severity[1]				
Mild	109 (52)	28 (63)	79 (51)	2 (15)
Moderate	86 (41)	15 (34)	64 (41)	7 (54)
Severe	15 (7)	2 (1)	9 (5)	4 (30)

*P=.001 when comparing to 1 dose of epi

**P=.0001 when comparing to 1 dose of epi

[1]Three patient records did not allow for severity grading

Table IV

Health insurance information1

	Medicaid/managed Medicaid n=49	Other insurance or self-pay n=134
Severity		
Mild	23[2]	68[3]
Moderate	22	52
Severe	3	11
Disposition		
Home	41	116
Floor	6	11
PICU	2	6
First Epinephrine Administration		
Prior to PED	7	49*
In the PED	30	56

*P=.006 when comparing the location of epinephrine administration between Medicaid/managed Medicaid vs other insurance + self pay

PICU, Pediatric Intensive Care Unit; PED, Pediatric Emergency Department

[1]Number of cases with no identified/reported insurance: 30

[2]One case could not be assigned a severity grading

[3]Two cases could not be assigned a severity grading

Table V

Anaphylaxis in subjects under 1 year of age

Age (months)/sex	Trigger	Symptoms	Severity	Treatment	Treatment administered by	Disposition
4 M	Amoxicillin	Hives, mild wheezing, swelling of hands and feet	Mild	1 dose epinephrine, 2 normal saline boluses, methylprednisolone, famotidine diphenhydramine	Parents (diphenhydramine), ED (other medications)	Home
6 F	Rice cereal and formula	Rash, wheezing	Moderate	1 dose epinephrine and prednisone	PMD	Home
7 M	Breastfeeding (after mother ate smoked fish for the first time)	Hives, swelling, cough	Mild	1 dose epinephrine, diphenhydramine, prednisone	OSH ED prior to transfer to our ED	Home
11 M	Peanut butter	Eye and facial swelling, perioral cyanosis, hives	Severe	2 doses of epinephrine	ED	PICU
11 M	Egg	Vomiting, eye and periorbital swelling, mild wheezing, urticaria	Mild	albuterol and diphenhydramine	ED	Home
11 F	Unclear	Vomiting, cough, rash, mild dyspnea, swelling	Mild	diphenhydramine	Parents	Home

ED, Emergency Department; OSH, Outside Hospital; PMD, Primary Medical Doctor; PICU, Pediatric Intensive Care Unit

Table VI

Patients with visits for repeated anaphylactic reactions

Age at time of visit	Sex	Trigger	Known Food Allergy	Past Medical History	Severity	Epinephrine Administration	Dispo
14	M	Shrimp	Shrimp	None other listed	Mild	1 - ED	Home
16		Shrimp			Severe	1 - ED	PICU
8		Shrimp, pizza, cheeseburger			Moderate	2 - ED	PICU
0. 9*	M	Peanut Butter	Egg, Peanuts	None other listed	Severe	2 - ED	PICU
1		Lo Mein			Moderate	1 - ED	Home
17	F	Unknown	None	Asthma	Moderate	2 - 1 was Self	Floor
18		Unknown		Penicillin allergy	Moderate	Admin	Floor
15	F	Cookie with walnut	Peanut, Shellfish, Tree	Asthma	Mild	1 - ED 1 - EMS	Floor
18		Food from restaurant	nuts	Atopic Dermatitis	Moderate	1 - Self Admin	Home
1	F	Milk	Milk, Egg, Peanuts,	None other listed	Severe	1 - PMD	Floor
1		Soymilk	Kiwi, Pineapple, Soy		Severe	1 - Parents	Home
12	F	Food from restaurant	Seafood	Asthma	Moderate	0	Home
14		Wheat	Wheat	Penicillin/Sulfa Allergy	Moderate	1 - ED	Home
6	F	Cookie with peanuts	Peanut	None other listed	Mild	1 - ED	Home
10		Food likely contaminated with nuts			Mild	2 - Mother	Home
8	M	Smoothie	Milk, Egg	None other listed	Mild	1 - PMD	Home
9		Cookie (egg)			Mild	1 - ED	Home
10	M	Unknown	None	Asthma	Mild	1 - ED	Home
10		Unknown		Atopic Dermatitis	Mild	1 - ED	Home
7	M	Spring roll	Peanut	Seizure Disorder Asthma	Mild	0	Home
9		Pastry	Seafood	Allergic Rhinitis	Moderate	1 - Mother	Home
13	M	Chinese food	Peanut Allergy	Asthma	Moderate	1 - ED	Home
15		Cookie with peanut			Moderate	1 - ED	Home
4	M	Pear	Nuts, Lentils, Egg	Asthma	Mild	1 - Mother	Home
6		Pasta with lentil and egg white		Allergic Rhinitis	Mild	1 - School	Home
2	F	Chicken	Wheat, Milk, Soy, Fish,	Atopic Dermatitis None other listed	Mild	1 - ED	Home
3		Indian food	Nuts		Mild	1 - ED	Home

Age at time of visit	Sex	Trigger	Known Food Allergy	Past Medical History	Severity	Epinephrine Administration		Dispo
2	M	Lasagna with egg	Egg, Soy, Wheat,	Asthma	Mild	0		Home
2		Peanut	Peanut	Atopic Dermatitis	Moderate	0		Home
13	M	Seafood	Seafood	None other listed	Mild	1 - ED	Home	
14		Pork chops fried in oil that also fried shrimp			Mild	1 - ED	Home	
11	F	Crab	Shellfish allergy	Asthma	Moderate	1 - ED	Home	
13		Shrimp			Mild	1 - ED	Home	
15	F	?While exercising	None	Unknown Allergen	Mild	1 - Nurse	Home	
15		Unknown Trigger		MSG	Mild	1 - Self Admin	Home	
10	F	Food at school contaminated with nuts Toast contaminated with peanut butter	Nut allergy	Asthma	Severe	1 - Self Admin	Home	
10					Moderate	1 - School	Home	
1	M	Wheat trial	Eggs, Lentils, Milk,	Asthma	Mild	2 - 1 was Self	Home	
1		Potato crackers	Nuts, Sesame, Wheat	Allergic Rhinitis	Moderate	Admin	Home	
3		Bagel			Mild	1 - ED 1 - ED	Home	

*No food allergies listed for first visit - found to be food allergic there afterwards.

M, Male; F, Female; ED, Emergency Department; EMS, Emergency Medical Services; Self Admin, Self Administered; PMD, Primary Medical Doctor; Dispo, Disposition