

Prospective Evaluation of an Anaphylaxis Education Mini-Handout: The AAAAI Anaphylaxis Wallet Card

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What is already known about this topic? Few prospective evaluations of handouts used in anaphylaxis education have been published to date.

What does this article add to our knowledge? The American Academy of Allergy, Asthma & Immunology Anaphylaxis Wallet Card is a practical, concise mini-handout for time-challenged pediatric residents, even when studied briefly.

How does this study impact current management guidelines? This unique prospective study provides support for the recommendations found in anaphylaxis guidelines about providing anaphylaxis education materials that aid in recognition of anaphylaxis and prompt first-aid treatment of anaphylaxis.

BACKGROUND: Few anaphylaxis education materials have been prospectively evaluated in randomized controlled trials.

OBJECTIVE: Our objective was to evaluate the American Academy of Allergy, Asthma & Immunology Anaphylaxis Wallet Card (AAAAI-AWC) as an anaphylaxis education mini-handout for health care professionals.

METHODS: We performed a randomized controlled study of the AAAAI-AWC with residents in general pediatrics at Miami Children's Hospital. Participants in the intervention group completed a pretest about anaphylaxis, heard a 3-minute PowerPoint presentation based on the AAAAI-AWC, reviewed the AAAAI-AWC, and discussed it with the presenter. After this, participants took a post-test immediately and a follow-up test 4 weeks later. Participants in the control group took the pretest, were handed an AAAAI-AWC, studied it briefly, then took the post-test immediately and the follow-up test 4 weeks later.

RESULTS: Fifty-five residents participated. Regardless of the amount of time spent studying the AAAAI-AWC, when the pretests were compared with the post-tests and follow-up tests,

residents in both the intervention and control groups were more likely to recognize anaphylaxis symptoms ($P < .05$), name asthma as the most common comorbid disease in children with fatal or near-fatal anaphylaxis ($P < .05$), and recall the names of epinephrine auto injectors ($P < .05$) and the epinephrine doses available in these auto injectors ($P < .05$). When the pretests were compared with the post-tests and the follow-up tests, residents in the intervention group were more likely than controls to identify the body organ systems involved in severe or fatal anaphylaxis correctly ($P < .05$).

CONCLUSION: The AAAAI-AWC is a practical, concise anaphylaxis education mini-handout for pediatric residents, a time-challenged group of health care professionals. © 2013 American Academy of Allergy, Asthma & Immunology (J Allergy Clin Immunol: In Practice 2013;1:181-5)

Key words: Anaphylaxis; Acute systemic allergic reaction; Epinephrine; Adrenaline; Action plan; Food allergy; Anaphylaxis education

The American Academy of Allergy, Asthma & Immunology Anaphylaxis Wallet Card (AAAAI-AWC) (Figure 1) was originally developed as an inexpensive form of medical identification for those unable to afford medical identification jewelry; however, it is also used as an anaphylaxis education mini-handout for patients at risk of anaphylaxis recurrence in the community and for health care professionals.¹

The information about anaphylaxis on the foldable $3\frac{1}{4} \times 3\frac{1}{2}$ -inch AAAAI-AWC is similar to, but more extensive than, the information on the $8\frac{1}{2} \times 11$ -inch AAAAI Anaphylaxis Emergency Action Plan.^{1,2} One exterior surface of the AAAAI-AWC states that anaphylaxis is a sudden, severe allergic reaction; that it can be fatal; and that it is important to know and avoid triggers, recognize symptoms, have an emergency action plan, carry self-injectable epinephrine at all times, inject epinephrine promptly in an allergic reaction, call 911/rescue squad, and train family and friends to help in an emergency. The other exterior surface lists common anaphylaxis symptoms that can occur in the mouth, throat, skin, gut, lungs, and heart (to aid in recognition of anaphylaxis) and notes that some symptoms can be life threatening, and that it is important to act quickly. The interior surfaces of the card can be personalized for patients to list their trigger(s)

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Abbreviations used

AAAAI-AWC- American Academy of Allergy Asthma &
Immunology Anaphylaxis Wallet Card
PL1- Pediatric level 1

for anaphylaxis and the comorbidities, if any, that potentially increase their risk of severe or fatal anaphylaxis. The interior surfaces also state what to do (the exact sequence of steps) when anaphylaxis is suspected or recognized, including the type of auto-injector and the epinephrine dose prescribed.¹

All anaphylaxis guidelines recommend emergency action plans³⁻⁸ as an important aspect of anaphylaxis education.^{9,10} These action plans typically focus on the main principles of recognition of anaphylaxis and the first-aid treatment of anaphylaxis.¹¹⁻¹⁵ Few prospective evaluations of any anaphylaxis education materials have been published to date.^{16,17}

Improvement in basic physician knowledge about anaphylaxis recognition and treatment is an important goal. In a US national random sample of 1130 pediatricians, a substantial proportion (56%) had knowledge deficits that potentially affected their ability to diagnose anaphylaxis correctly and treat it with epinephrine.¹⁸

We hypothesized that the AAAAI-AWC might be a useful anaphylaxis educational tool (mini-handout) for physicians. In this proof-of-concept study, we tested this hypothesis by performing a randomized controlled investigation focused solely on the educational function of the AAAAI-AWC, as reviewed by residents in general pediatrics at Miami Children's Hospital.

METHODS

All general pediatric residents receiving training at Miami Children's Hospital in the summer of 2009 were invited to participate in the study. In the absence of previous published studies in this area, it was not possible to perform a power calculation to determine the appropriate sample size; therefore, a convenience sample of 55 residents was used. The need to obtain written, informed consent from participants was waived by the Western Institutional Review Board. The study was initiated in September 2009, 2 months after the new academic year had started. The residents entered the study over a 10-day period between two academic blocks, because on certain days, some of them were post-call and others were assigned out-of-hospital rotations or vacation time.

Participants were randomly assigned to an active intervention group or a control group, based on alphabetical order by surname and by year of training. They were studied in small groups (<10 residents per group). Each participant took a test titled *Anaphylaxis in the Community: A Quick Quiz* that contained 11 short answer questions on recognition and treatment of anaphylaxis in community settings and 2 demographic questions. This test was designed to be completed in <10 minutes. Ten of the 11 anaphylaxis questions required responses from memory and hand-written answers. The eleventh question required checking off anaphylaxis symptoms from a list of 17 options.

Participants in the intervention group were handed an AAAAI-AWC and given a 3-minute overview of anaphylaxis that consisted of a PowerPoint (Microsoft, Redman, Wash) presentation by an allergy/immunology specialist (V.H.T.) that paraphrased the information contained in the AAAAI-AWC (see Presentation E1 in this article's Online Repository at www.jaci-inpractice.org). The AAAAI-AWC was then reviewed in detail

ANAPHYLAXIS SYMPTOMS

MOUTH	itching, swelling of lips and/or tongue
THROAT*	itching, tightness, closure, hoarseness
SKIN	itching, hives, redness, swelling
GUT	vomiting, diarrhea, cramps
LUNG*	shortness of breath, cough, wheeze
HEART*	weak pulse, dizziness, passing out

Only a few of these symptoms may be present.

**Some symptoms can be life-threatening! ACT FAST!*

ANAPHYLAXIS CAN BE FATAL!

Anaphylaxis is a sudden, severe allergic reaction.

- Be able to recognize symptoms.
- Know and avoid your triggers.
- Have an Emergency Action Plan.
- Carry self-injectable epinephrine at all times.
- Inject epinephrine promptly if you have an allergic reaction.
- Call 911/Rescue Squad.
- Train family and friends to help you in an emergency.

PERSONAL INFORMATION

Name: _____

Age: _____

Allergy to: _____

Asthma ☐ Yes (*high risk for severe reaction*) ☐ No

Other health problems: _____

WHAT TO DO

- **INJECT EPINEPHRINE**

- | | |
|---|---|
| ☐ EpiPen Jr (0.15) | ☐ Twinject 0.15 mg |
| ☐ EpiPen (0.3 mg) | ☐ Twinject 0.3 mg |

- **Call 911 or Rescue Squad**

- **Emergency contacts:**

home _____ work _____ cell _____

home _____ work _____ cell _____

*IMPORTANT: Asthma puffers and/or antihistamines
can't be depended on in anaphylaxis!*



FIGURE 1. The original foldable 3 1/4 × 3 1/2 -inch AAAAI Anaphylaxis Wallet Card was developed as an inexpensive form of medical identification for patients at risk of anaphylaxis in the community. The exterior surfaces list common anaphylaxis symptoms and remind readers that anaphylaxis can be fatal. The interior surfaces, which can be personalized for each patient, state the sequence of steps that should be taken as soon as anaphylaxis is suspected or recognized. When new epinephrine auto-injectors are introduced for use, the AAAAI updates the information about auto-injectors that is printed on the cards. The AAAAI-AWC is also used as an anaphylaxis education mini-handout. This educational function was tested in this study.

by each resident for up to 10 minutes and discussed with the allergy/immunology specialist for as long as the residents wished. After this, the identical test on anaphylaxis was taken for the second time (post-test), and approximately 4 weeks later, it was taken for the third time (follow-up test).

Participants in the control group took the identical anaphylaxis pretest and were handed an AAAAI-AWC and given up to 10 minutes to review it. They did not see the PowerPoint presentation or have the opportunity to discuss the AAAAI-AWC with the allergy/immunology specialist. After brief self-study of the AAAAI-AWC, they took the identical anaphylaxis post-test, and 4 weeks later, they took the follow-up test.

Participants in both groups were advised that they should not review the material again between the post-test and the follow-up test, which was taken approximately 4 weeks later, and scheduled a few days in advance because of complexities with the residents' on-call rotations.

All responses to the pretest, post-test, and follow-up tests were anonymous. The percentage of residents responding correctly to each question was determined. In addition, each response was graded numerically on a scale from 0 to 10. When all responses were correct, the score was 10. One point was deducted for each incorrect response. If all responses were incorrect, the score was zero. Conversely, all the correct options had to be chosen to get a score of 10. Analysis of the answers to the pretest, post-test, and follow-up test questions was performed by a statistician with the use of independent *t* tests and ANOVA tests.

RESULTS

Fifty-five of 70 residents (78.6%) enrolled in the training program participated in the study. Participants included similar numbers of residents from each of the first 3 years of pediatric training: PL1 (*n* = 17; 31%), PL2 (*n* = 18; 33%), and PL3 (*n* = 18; 33%), as well as two senior residents, PL4 (*n* = 2; 4%). The pretest performance of the residents was generally high and correlated positively with their level of pediatric training, completion of a rotation on the allergy/immunology service, and treating one or more patients with anaphylaxis in the preceding few months.

In four areas, residents in both the intervention and control groups improved their scores significantly during the study ($P < .05$). In the pretest, 11 of 28 residents (39%) in the intervention group and 5 of 27 residents (19%) in the control group correctly identified all 17 potential symptoms of anaphylaxis from the list provided, and these percentages improved in the post-test and the follow-up test (Table I). In the pretest, 16 of 28 residents (57%) in the intervention group and 17 of 27 residents (63%) in the control group correctly stated that asthma was the most common comorbid disease in fatal or near-fatal anaphylaxis in young patients, and these percentages improved in the post-test and the follow-up test (Table I).

In the pretest, 24 of 28 residents (86%) in the intervention group and 26 of 27 residents (96%) in the control group correctly stated the names of one or more types of auto-injectors; these percentages improved in the post-test and in the follow-up test for the intervention group (Table I). In the pretest, only 2 of 28 residents (7%) in the intervention group and 0 of 27 residents (0) in the control group correctly named the two prefilled doses of epinephrine available in auto-injectors; these percentages improved to 23 of 28 (82%) and 19 of 27 (70%) in the post-test, although not in the follow-up test (Table I).

For residents in both the intervention and control groups, a significant increase in scores was observed between pretest and post-test, and between pretest and follow-up test, when asked to identify symptoms associated with anaphylaxis from a list ($P < .05$) (Table II).

For residents in both the intervention and control groups, a significant increase in scores was observed between the pretest and the post-test ($P < .05$), and between the pretest and the follow-up test, when asked to state the most common comorbid disease in fatal and near-fatal anaphylaxis in young patients ($P < .05$) (Table II).

For residents in both the intervention and control groups, a significant increase in scores was observed between the pretest and the post-test ($P < .05$), and the pretest and the follow-up test ($P < .05$), when asked to name the two types of auto-injectors available and the two premeasured epinephrine doses available in the United States at the time of the study (Table II).

Residents in the intervention group improved their scores significantly compared with residents in the control group in only one area: 16 of 28 residents (57%) were more likely to correctly identify the body organ systems (throat, lungs, and heart) involved in severe or fatal anaphylaxis when the pretest was compared with the post-test ($P < .05$) and the follow-up test ($P < .05$); 19 of 27 residents (70%) in the control group did not show a significant improvement in either the post-test ($P > .05$) or the follow-up test ($P > .05$).

In three other areas, residents in both the intervention and control groups had good baseline scores, and these did not improve significantly during the study. No significant differences were observed between pretest and post-test or between pretest and follow-up scores ($P > .05$; Table II) in identification of the skin as the body organ system in which the first symptoms are most likely to occur in anaphylaxis in young patients; naming epinephrine as the medication that is likely to be lifesaving in anaphylaxis, and calling 911/emergency medical services as the next step in treatment after administration of epinephrine.

DISCUSSION

The AAAAI-AWC emphasizes prompt recognition of anaphylaxis symptoms, prompt injection of epinephrine with the use of an auto-injector, and prompt activation of emergency medical services.¹ In this prospective evaluation of the anaphylaxis education function of the AAAAI-AWC in a cohort of pediatric residents, studying the AAAAI-AWC for up to 10 minutes was an effective means of improving their knowledge of anaphylaxis, even if they did not participate in a related educational activity and have the opportunity to discuss the AAAAI-AWC with an allergy/immunology specialist.

After reviewing the AAAAI-AWC, regardless of the amount of time spent studying it, participants in both the intervention group and the control group were more likely to recognize anaphylaxis symptoms, name asthma as the most common comorbid disease in children with fatal or near-fatal anaphylaxis, and state the names of the epinephrine auto-injectors available and the fixed premeasured doses of epinephrine available in such auto-injectors. Participants in the intervention group were more likely to name the body organ systems involved in severe or fatal anaphylaxis than those in the control group.

In this study, most of the participants in both the intervention and control groups had a good baseline knowledge of anaphylaxis;

TABLE I. Comparison of residents with correct responses with the pretest, post-test, and follow-up test

Question	Residents with correct responses					
	Intervention group			Control group		
	Pretest, n/N (%)	Post-test, n/N (%)	Follow-up test, n/N (%)	Pretest, n/N (%)	Post-test, n/N (%)	Follow-up test, n/N (%)
Recognize as many anaphylaxis symptoms as are appropriate (from a list)	11/28 (39)	23/28 (82)	22/28 (79)	5/27 (19)	24/27 (89)	22/27 (81)
State the most common comorbidity for severe or fatal anaphylaxis	16/28 (57)	24/28 (86)	23/28 (82)	17/27 (63)	24/27 (89)	23/27 (85)
State two types of epinephrine auto-injectors that are available	24/28 (86)	27/28 (96)	28/28 (100)	26/27 (96)	27/27 (100)	25/27 (93)
State the two premeasured epinephrine doses available in these auto-injectors	2/28 (7)	23/28 (82)	12/28 (43)	0/27 (0)	19/27 (70)	7/27 (26)

TABLE II. Comparison of correct responses with the pretest, post-test, and follow-up test

Question	Intervention group		Control group	
	Pretest vs post-test	Pretest vs follow-up test	Pretest vs post-test	Pretest vs follow-up test
Name the body organ system in which first symptoms of anaphylaxis are most likely to occur	7.14 vs 6.96	7.14 vs 8.21	6.67 vs 6.67	6.67 vs 6.11
P value	.05	.05	.05	.05
Name other body organ systems involved in severe or fatal anaphylaxis	4.41 vs 7.57	4.41 vs 5.91	4.99 vs 5.50	4.99 vs 4.94
P value	.05*	.05*	.05	.05
State the most common co-morbidity for severe or fatal anaphylaxis	5.71 vs 8.21	5.71 vs 7.68	6.30 vs 8.52	6.3 vs 8.33
P value	.05*	.05*	.05*	.05*
Recognize as many anaphylaxis symptoms as are appropriate (from a list)	8.16 vs 9.74	8.16 vs 9.84	8.41 vs 9.9	8.41 vs 9.8
P value	.05*	.05*	.05*	.05*
State the medication most likely to be life-saving in anaphylaxis	9.18 vs 9.28	9.18 vs 8.93	9.14 vs 9.26	9.14 vs 9.26
P value	.05	.05	.05	.05
State 2 other classes of medication used in anaphylaxis and why they are not first choice	8.93 vs 9.29	8.93 vs 9.46	9.07 vs 9.81	9.07 vs 9.26
P value	.05*	.05*	.05*	.05*
State 2 types of epinephrine auto-injectors that are available	5.71 vs 9.11	5.71 vs 7.23	6.3 vs 8.52	6.3 vs 6.67
P value	.05*	.05*	.05*	.05*
State the 2 premeasured epinephrine doses available in these auto-injectors	1.07 vs 8.21	1.07 vs 4.64	0 vs 7.22	0 vs 2.78
P value	.05*	.05*	.05*	.05*
Describe what an outpatient with anaphylaxis should do after epinephrine injection	7.5 vs 7.95	7.5 vs 8.39	8.3 vs 9.07	8.3 vs 8.15
P value	.05	.05	.05	.05

Mean values are shown.

*Statistically significant, $P < .05$.

moreover, the control group did receive some information about anaphylaxis, although it was less extensive than the information received by the active intervention group. It might therefore be important to repeat the study in a sample of health care professionals that is uninformed, or less well-informed, about this disease and receives no anaphylaxis-related intervention at all.

In one area, related to the epinephrine doses available in auto-injectors, knowledge gained by studying the AAAAI-AWC as

documented in the post-test was forgotten by some participants by the time of the follow-up test, suggesting that review of the AAAAI-AWC at regular intervals should be recommended to facilitate retention of information.

For ethical, logistical, and patient-related reasons, there are few randomized controlled trials of any interventions in the acute management of anaphylaxis.¹⁹ In the absence of such trials, the best available external evidence with which to answer clinical

questions needs to be used.²⁰ Some interventions in potentially fatal diseases such as anaphylaxis might not require randomized controlled trials.²⁰ However, others such as anaphylaxis education materials can readily be prospectively evaluated in such trials, as shown in the study reported here in which an anaphylaxis mini-handout served as a practical concise resource for time-challenged pediatric residents.

This study confirms the need for additional investigations of anaphylaxis education strategies. It will obviously be important to evaluate the AAAAI-AWC with residents in other specialties and with other health care professionals to determine whether the results can be generalized beyond their usefulness in pediatric residents.

Studying the AAAAI-AWC as an anaphylaxis education mini-handout for health care professionals is not intended to be a substitute for investigating the AAAAI-AWC as a mini-handout for patients at risk of anaphylaxis in community settings or their parents or caregivers. Rather, it confirms the usefulness of the approach and suggests that randomized controlled studies of anaphylaxis education materials are feasible for patients at risk and/or for the parents or caregivers of patients at risk. This is critically important because anaphylaxis education, although essential, has not to date necessarily translated into improved treatment of acute anaphylaxis in community settings.²¹

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