Overcoming Obstacles to Carrying and Using Self-Injectable Epinephrine

Presented by
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Welcome!

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Today’s Presenter

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Jaffe Professor of Pediatrics, Allergy, and Immunology
Overcoming Obstacles to Carrying and Using Self-Injectable Epinephrine

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Jaffe Professor of Pediatrics, Allergy and Immunology

FARE Webinar
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Disclosures

I have no relevant financial or commercial interests to disclose.

I do not intend to discuss an unapproved or investigative use of a commercial product or device in my presentation.
Bottom Line

• For treatment of anaphylaxis:
  – Prompt injection of epinephrine
Medications

- Epinephrine
  - Opens breathing tubes
  - Supports blood circulation
  - Works immediately

- Antihistamine
  - Reduces itch/hives
  - 30 minutes to effect

- Steroid
  - Maybe reduces later symptoms
  - Hours to effect

- Inhaler (bronchodilator)
  - Reduces wheeze
Obstacles to Self-Inject Epinephrine

- Carry it / have it available
- Use it
  - Promptly
  - Correctly
Selected evidence of issues

- Epinephrine is under-used in anaphylaxis
  - In various studies, only 17-35% with anaphylaxis are treated with epinephrine
- Teenagers and young adults at highest risk of fatal anaphylaxis-related to delayed epinephrine injection
- Misunderstanding anaphylaxis and when to inject
  - 14% of 1885 subjects surveyed who had experienced anaphylaxis reported difficulty deciding when to inject
- Bad rationale for delay
  - Having been OK after a past reaction without treatment
  - Wait for antihistamine to work, rely on other medications
  - Don’t want to go to the ER
- Emotional and behavioral barriers (embarrassment, feeling different)
- Needle phobia
- Unable to activate device properly
- Not carried: Inconvenient or don’t expect a reaction in specific circumstances
Example of Under-Treatment with Epinephrine

- 512 infants, followed 3 years, 134 severe reactions
- Overall, only 30% of severe reactions were treated with epinephrine
  - Severe = wheeze/coughing, or combination of skin and other part of body (e.g., hives/vomit).
- Among 65 reactions when epinephrine was not given but caregiver admitted “should have”.
  - Reaction not recognized (48%)
  - Medicine not on hand (23%)
  - Afraid (12%)
  - Waiting to worsen (6%).
Fatal and Near Fatal Food Allergic Reactions

- Case reports-6 deaths, 7 near deaths
- Peanut (4), nuts (6), milk (2), egg (1)

<table>
<thead>
<tr>
<th></th>
<th>Fatal</th>
<th>Near-Fatal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages</td>
<td>2-16 yrs</td>
<td>9-17 yrs</td>
</tr>
<tr>
<td>Time to epin.</td>
<td>25-180 min (70)</td>
<td>10-130 min (13)</td>
</tr>
<tr>
<td>Location:</td>
<td>School 4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Home 1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Other 1</td>
<td>4</td>
</tr>
</tbody>
</table>

Sampson 1992
Fatalities From Food Induced Anaphylaxis

- 32 fatalities reviewed through registry, 2-33 years
- 50% male:female
- 96% Asthma
- 94% prior reaction
- Only 10% had timely epinephrine

Bock 2001 and 2007
How do we convince people to use autoinjectors?

They are concerned about side effects, needles, they look for other treatments (antihistamines), they want to wait and see, etc.
SAFETY

- Heart rate increase, like exercise
- Jittery, like coffee
- Headache, flush color, like stress
Epinephrine in Anaphylaxis: Higher Risk of Cardiovascular Complications and Overdose After Administration of Intravenous Bolus Epinephrine Compared with Intramuscular Epinephrine

Ronna L. Campbell, MD, PhD, M. Fernanda Bellolio, MD, MS, Benjamin D. Knutson, MD, Venkatesh R. Bellamkonda, MD, Martin G. Fadko, MD, MHA, MBA, David M. Nestler, MD, MS, and Erik P. Hess, MD, MSc Rochester, Minn

- Mayo Clinic Review of anaphylaxis treated in ER (adults)
- 361 doses in 302 patients
- 68% autoinjector, 29% syringe in ER into muscle/fat, and 3% given intravenously (IV)
- Cardiovascular serious side effects
  - 10% IV, 1% muscle injection (older adults)
- Over-dosage
  - 13% IV, 0% muscle injection

Another Argument:
It keeps you from having more problems!
Early Epinephrine

- Review of anaphylaxis Montreal Children’s
- Only pre-hospital epinephrine significantly independently associated with no need for multiple epinephrine doses

<table>
<thead>
<tr>
<th>Reaction, % (95% CI)</th>
<th>Univariate OR</th>
<th>Multivariate OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.06 (1.00-1.11)</td>
<td>1.1 (1.03-1.2)</td>
</tr>
<tr>
<td>Sex: male</td>
<td>1.41 (0.74-2.69)</td>
<td>1.41 (0.74-2.69)</td>
</tr>
<tr>
<td>Asthma</td>
<td>1.42 (0.70-2.90)</td>
<td>1.42 (0.70-2.90)</td>
</tr>
<tr>
<td>Eczema</td>
<td>1.23 (0.56-2.74)</td>
<td>1.23 (0.56-2.74)</td>
</tr>
<tr>
<td>Use of epinephrine outside ED</td>
<td>0.25 (0.09-0.71)</td>
<td>0.25 (0.04-0.6)</td>
</tr>
<tr>
<td>Use of antihistamines outside ED</td>
<td>0.5 (0.23-0.94)</td>
<td>0.5 (0.20-1.18)</td>
</tr>
<tr>
<td>Use of antihistamines inside ED</td>
<td>3.6 (1.39-9.21)</td>
<td>3.6 (1.39-9.21)</td>
</tr>
<tr>
<td>Severe anaphylaxis</td>
<td>12.4 (5.62-27.29)</td>
<td>17.3 (6.1-49.2)</td>
</tr>
<tr>
<td>Anaphylaxis triggered by peanut</td>
<td>2.15 (1.11-4.19)</td>
<td>2.9 (1.1-8.5)</td>
</tr>
<tr>
<td>Anaphylaxis triggered by tree nut</td>
<td>3.5 (1.22-10.03)</td>
<td>7.2 (2.6-20.2)</td>
</tr>
<tr>
<td>Anaphylaxis triggered by milk</td>
<td>1.7 (0.57-4.87)</td>
<td>5.2 (1.4-20.0)</td>
</tr>
<tr>
<td>Anaphylaxis associated with exercise</td>
<td>0.8 (0.18-3.45)</td>
<td>0.9 (0.15-5.2)</td>
</tr>
<tr>
<td>Anaphylaxis at home</td>
<td>1.2 (0.62-2.40)</td>
<td>1.2 (0.62-2.40)</td>
</tr>
</tbody>
</table>

Importance of Prompt Epinephrine

- Review of epinephrine use in children (prior anaphylaxis/have prescription)
- Referral population to allergy clinic (n=94)
- 45 episodes anaphylaxis (reaction at school-17%)

Gold & Sainsbury *J Allergy Clin Immunol* 2000 106;171-6
Early Treatment of Food-Induced Anaphylaxis with Epinephrine Is Associated with a Lower Risk of Hospitalization

Jude T. Fleming, MD, Sunday Clark, MPH, ScD, Carlos A. Camargo, Jr, MD, DrPH, and Susan A. Rudders, MD

Providence, RI; New York, NY; and Boston, Mass

- Hasbro Children’s 234 anaphylaxis received epi, 70% pre-hospital
- Pre-hospital epi 17% hospitalized, versus in-ED epi 43% hospitalized (p<0.001)
Conclusion

• It’s safe!
• It can reduce risk of hospitalization or more doses
• And you feel better
Don’t forget to teach/learn how to use the device!

- Studies suggest very low rate of correct technique
- Ask your doctor, read package, watch videos, practice with trainer
Summary do far...

- Educate technique (new)
- Discuss benefits (relief and reduced problems)
- Review safety

- Next: Addressing higher risk groups
Lessons from fatalities

• Teen/young adult
• Lack of accessible epinephrine/delay injection
• Having asthma
• Occurs “anywhere” (need to always be prepared)
• Not necessarily a pattern of severe reactions (don’t rely on past experience)
• Epinephrine not “foolproof”
  – Not a back-up to risk-taking
Risk-Taking and Coping Strategies of Food-Allergic Adolescents and Young Adults
Objectives/Methods

• To gain insight on risk-taking behaviors and coping strategies
• To identify correctable risk factors
• Focus groups/Internet survey (174 teens)
### Frequency of Carrying Epinephrine

- 74% of teens report always carrying their autoinjector

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Traveling (n=148)</td>
<td>94%</td>
</tr>
<tr>
<td>At restaurants (n=148)</td>
<td>81%</td>
</tr>
<tr>
<td>Carrying small purse (n=67)</td>
<td>76%</td>
</tr>
<tr>
<td>Haven’t had a recent reaction (n=134)</td>
<td>72%</td>
</tr>
<tr>
<td>Relative’s house (n=149)</td>
<td>71%</td>
</tr>
<tr>
<td>Plan on being careful (n=146)</td>
<td>69%</td>
</tr>
<tr>
<td>At parties (n=145)</td>
<td>68%</td>
</tr>
<tr>
<td>Friends’ houses (n=149)</td>
<td>67%</td>
</tr>
<tr>
<td>On a date (n=77)</td>
<td>64%</td>
</tr>
<tr>
<td>Bar or dance club (n=32)</td>
<td>62%</td>
</tr>
<tr>
<td>School dance or event (n=145)</td>
<td>61%</td>
</tr>
<tr>
<td>Hanging with friends (n=57)</td>
<td>57%</td>
</tr>
<tr>
<td>Wearing tight clothes (n=51)</td>
<td>53%</td>
</tr>
<tr>
<td>Playing sports (n=146)</td>
<td>43%</td>
</tr>
</tbody>
</table>

Colors: 
- Green = Always
- Yellow = Most or some of the time
- Red = Never
Understanding Anaphylaxis

- 61% of teens describing serious reactions consistent with “anaphylaxis” did not self-report having had anaphylaxis
- People may not know what anaphylaxis “is”
- Need to think about when to inject epinephrine and to talk about the symptoms, not just anaphylaxis
### High Risk Group: Emotional

‘High Risk’ (HR) defined by:

- not always carrying autoinjector and eating a food despite a label saying it “may contain” an allergen (n=29)

<table>
<thead>
<tr>
<th>Feeling:</th>
<th>Being HR not associated with:</th>
<th>Feeling:</th>
<th>Being HR associated with:</th>
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</thead>
<tbody>
<tr>
<td>“cautious,”</td>
<td></td>
<td>feeling “less concerned”</td>
<td></td>
</tr>
<tr>
<td>“alert,”</td>
<td></td>
<td>feeling “different”</td>
<td></td>
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<tr>
<td>“limited,”</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>“frustrated,”</td>
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<tr>
<td>“vulnerable,”</td>
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<tr>
<td>“responsible,”</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>“unique”</td>
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</table>
60% of teens tell all their friends about their food allergy (of those who do not, 60% wish schools would)
Preferences for school’s management of food allergy

Ages 13-17

- Make the school "nut free"
- Tables in the lunchroom for kids who bring allergens
- Provide "Allergen-free" tables
- Educate Other Students

Total = 100%
Observations: Suggestions

Misperception of “anaphylaxis”
- Teach symptoms, not just word “anaphylaxis”

Low rate of injector use
- Educate about treatment circumstances
- Review technique and actions to take
  (use injector promptly, inform others, call 911, etc)

Rates of carrying vary by social circumstances, perceived risks, convenience
- Impress need for consistency
- Reminders to carry, especially sport/social activities
- Offer carrying alternatives (purse, holster)
- Injector on site when appropriate (e.g., coach)
Observations: Suggestions

Risk assessments
- Review risks of exposures and discourage risky behavior
- Practice obtaining safe foods under supervision early to instill good habits
- Encourage peer education

Emotional risks: feeling “different” or “less concerned”
- Address bullying
- Discuss emotional impact, peer involvement and education

Quality of life easements
- Increase safe food choices
- “Point person” for safe meals

Poor communication of allergy to friends
- Third party education about allergy directed to friends
Discuss When to Use Epinephrine (symptoms)
Anaphylaxis

“A serious allergic reaction that is rapid in onset and may cause death”

FAAN-NIH Conference 2005
Symptoms: Skin

- Hives
- Swelling (edema)
- Flushing/red
- Itch
- Eczema flare
- Red eyes
Symptoms: Gut

- Nausea
- Vomit
- Diarrhea
- Pain
- Odd taste in mouth
- Uterine contraction/cramp
Symptoms: Respiratory

- Wheeze/asthma
- Throat tight
- Hoarse voice
- Repetitive coughing
- Short breath/trouble breathing
- Turning blue
- Nasal symptoms (runny, congestion)
Symptoms: Circulation

- Hypotension (low blood pressure)
- Shock
- Faint
- Dizzy/lightheaded/confusion
- Poor pulse/thready pulse, fast or slow pulse
- “Impending doom”
Criteria for Anaphylaxis
(anaphylaxis is likely)

1. Sudden onset of an illness (minutes to several hours) with involvement of the skin and/or mouth-lips
AND AT LEAST ONE OF THE FOLLOWING
a. DIFFICULTY BREATHING
b. REDUCED BLOOD PRESSURE

FAAN-NIH Conference 2005
Criteria for Anaphylaxis
(anaphylaxis is likely)

OR

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

a. Skin symptoms/swollen lips/mouth
b. Breathing trouble
c. Reduced blood pressure
d. Persistent gut symptoms (e.g., crampy abdominal pain, vomiting)
OR

3. Reduced blood pressure following exposure to known allergen for that patient (minutes to several hours)
The FAAN/NIH Criteria:

• Indicate when it is likely a person is having anaphylaxis (NOW)

• Do not describe all settings where epinephrine may be needed
  – First aid treatment versus emergency room
  – Progressive symptoms
  – Mild symptoms after an ingestion of a food that previously caused a severe reaction
  – When in doubt, inject!
  – Discuss circumstances with your doctor
Food Allergy & Anaphylaxis Emergency Care Plan

Name: ___________________  D.O.B.: ___________________

Allergy to: ___________________

Weight: __________ lbs.  Asthma:  ☐ Yes (higher risk for a severe reaction)  ☐ No

NOTE: Do not depend on antihistamines or inhalers (bronchodilators) to treat a severe reaction. USE EPINEPHRINE.

Extremely reactive to the following allergens:

THEREFORE:

☐ If checked, give epinephrine immediately if the allergen was LIKELY eaten, for ANY symptoms.

☐ If checked, give epinephrine immediately if the allergen was DEFINITELY eaten, even if no symptoms are apparent.

FOR ANY OF THE FOLLOWING:

SEVERE SYMPTOMS

LUNG
Short of breath, wheezing, repetitive cough

HEART
Pale, blue, faint, weak pulse, dizzy

THROAT
Tight, hoarse, trouble breathing/swallowing

MOUTH
Significant swelling of the tongue and/or lips

SKIN
Many hives over body, widespread redness

GUT
Repetitive vomiting, severe diarrhea

OTHER
Feeling something bad is about to happen, anxiety, confusion

OR A COMBINATION OF SYMPTOMS FROM DIFFERENT BODY AREAS.

1. INJECT EPINEPHRINE IMMEDIATELY.

2. Call 911. Tell emergency dispatcher the person is having anaphylaxis and may need epinephrine when emergency responders arrive.
   • Consider giving additional medications following epinephrine:
     » Antihistamine
     » Inhaler (bronchodilator) if wheezing
   • Lay the person flat, raise legs and keep warm. If breathing is difficult or they are vomiting, let them sit up or lie on their side.
   • If symptoms do not improve, or symptoms return, more doses of epinephrine can be given about 5 minutes or more after the last dose.
   • Alert emergency contacts.
   • Transport patient to ER, even if symptoms resolve. Patient should remain in ER for at least 4 hours because symptoms may return.

MILD SYMPTOMS

NOSE
Itchy/runny nose, sneezing

MOUTH
Itchy mouth

SKIN
A few hives, mild itch

GUT
Mild nausea/discomfort

FOR MILD SYMPTOMS FROM MORE THAN ONE SYSTEM AREA, GIVE EPINEPHRINE.

FOR MILD SYMPTOMS FROM A SINGLE SYSTEM AREA, FOLLOW THE DIRECTIONS BELOW:

1. Antihistamines may be given, if ordered by a healthcare provider.
2. Stay with the person; alert emergency contacts.
3. Watch closely for changes. If symptoms worsen, give epinephrine.

MEDICATIONS/DOSES

Epinephrine Brand or Generic: ___________________

Epinephrine Dose:  ☐ 0.15 mg IM  ☐ 0.3 mg IM

Antihistamine Brand or Generic: ___________________

Antihistamine Dose: ___________________

Other (e.g., inhaler-bronchodilator if wheezing): ___________________
Needle Phobia

- Discuss
- Practice with trainer
- Discuss possible medically supervised self-injection with clean syringe/needle if willing
Emergency Room Phobia?

Misunderstanding of Inject/ 911?

• Misunderstanding “I don’t want to use the epinephrine because if I do I have to go to the emergency room.”

• Understanding: “Injecting epinephrine relieves symptoms. I go to the emergency room to be monitored for my severe allergic reaction because symptoms may come back or other treatments may be needed.”
Selected evidence of issues

- Epinephrine is **under-used** in anaphylaxis
  - In various studies, only 17-35% with anaphylaxis are treated with epinephrine
- Teenagers and young adults at highest risk of fatal anaphylaxis-related to delayed epinephrine injection
- **Misunderstanding anaphylaxis** and when to inject
  - 14% of 1885 subjects surveyed who had experienced anaphylaxis reported difficulty deciding when to inject
- **Bad rationale for delay**
  - Having been OK after a past reaction without treatment
  - Wait for antihistamine to work, rely on other medications
  - Don’t want to go to the ER
- **Emotional** and behavioral barriers (embarrassment, feeling different)
- **Needle phobia**
- **Unable to activate** device properly
- **Not carried**: Inconvenient or don’t expect a reaction in specific circumstances
Selected Solutions

- Emphasize safety of epinephrine
- Emphasize benefits of epinephrine
- Address solutions to improve carrying/access
- Review symptoms for injection
- Review technique of injection
- Practice scenarios of when to inject
- Address emotional barriers
- Peer education

- Rehearse!
References (selected)


Thank you!

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