

Anaphylaxis: New Developments and Review of EMS Updates

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Patient Case 1

- ▶ EMS dispatched to elementary school for possible allergic reaction. Patient is a 6 y/o female with known peanut allergy managed by an allergist. Patient may have eaten a dessert which contained nuts in class approximately 20 minutes prior to EMS arrival. The school nurse administered PO diphenhydramine. On physical exam the patient skin is very flushed; however, no hives are present. No wheezing is appreciable on auscultation. The patient is tearful and appears quite anxious while sitting in a chair in the nurse's office.
 - ▶ Allergies: Peanut
 - ▶ PMH: asthma
 - ▶ Meds: Advair, montelukast, albuterol, EpiPen
 - ▶ Vitals: BP 100/80 RR 29 SPO2 98% T 37.8 Ht: 45" Wt: 44 pounds

Patient Case 2

- ▶ EMS dispatched to home of a 75 y/o male with AMS and difficulty speaking. Upon entering the residence, the patient is sitting in a recliner next to his wife. Wife states the patient's mentation suddenly decreased which prompted the call for EMS. Patient is responsive but having difficulty following EMS commands as well as speaking. The patient is being treated for community acquired pneumonia and recently started antibiotics.
 - ▶ Allergies: NKDA
 - ▶ PMH: CAD, HTN, BPH
 - ▶ Meds: Aspirin, metoprolol, atorvastatin, enalapril, tamsulosin
 - ▶ Physical exam: rash developing on torso, swollen lips, slight wheeze
 - ▶ Vitals: BP 80/48 RR 26 SPO2 93% T 36.7C

Patient case 3

- ▶ EMS dispatched to hotel for possible allergic reaction. Patient is a 38 y/o male with possible h/o of anaphylaxis to shellfish. Patient complaining of flushing, pruritis, profuse vomiting, and watery diarrhea. Patient was at a French restaurant with his wife and consumed escargot approximately 1 hour before symptoms began. Patient administered 0.3 mg epinephrine 40 minutes after symptoms began with second dose 20 minutes before EMS arrival. Upon EMS arrival, patient is lying on hotel lobby floor vomiting. Patient does not endorse throat tightness or difficulty breathing. Patient flushing and itching resolved but vomiting and diarrhea seem to be worsening.
 - ▶ Allergy: PCN, Shellfish
 - ▶ PMH: Asthma
 - ▶ Meds: Symbicort, montelukast, Xolair, Spiriva
 - ▶ Vitals: BP 100/65 RR 19 SPO2 97% T 37.8

Questions

- ▶ What is anaphylaxis?
- ▶ Can one predict the severity of anaphylaxis based on presenting signs and symptoms?
- ▶ What is the treatment for anaphylaxis?
 - What
 - How
 - Why
 - When

What is Anaphylaxis?

Definitions of Anaphylaxis 7

Worldwide, anaphylaxis definitions in common use are: "a serious, life-threatening generalized or systemic hypersensitivity reaction" and "a serious allergic reaction that is rapid in onset and might cause death."

Anaphylaxis is defined for the purposes of this document as a condition caused by an IgE-mediated reaction. Anaphylactoid reactions are defined as those reactions that produce the same clinical picture as anaphylaxis but are not IgE-mediated. Where both IgE-mediated and non-IgE-mediated mechanisms are a possible cause, the term "anaphylactic" has been used to describe the reaction.³

Anaphylaxis is an acute, life-threatening systemic allergic reaction associated with different mechanisms, triggers, clinical presentations, and severity.²

Definitions:
Anaphylaxis: severe allergic reaction that is rapid in onset and potentially life-threatening. Multisystem signs and symptoms are present including skin and mucous membranes.⁴

There is no universally accepted definition of anaphylaxis.

1. Simmons FE, et al. World Allergy Organ J 2011 Feb;4(2):13-37
2. Wood RA, et al. J Allergy Clin Immunol 2014 Feb;133(2):441-7
3. Lieberman et al. J Allergy Clin Immunol 2005
4. Denver Metro EMS protocols
5. Anonbaron L, et al. Pediatric Allergy and Immunol 2011;726:714

Epidemiology 8

- ▶ Anaphylaxis prevalence: 0.5-2% of the general population
 - ▶ Appears to be increasing
 - ▶ Underdiagnosis, underreporting, miscoding
 - ▶ Underutilization of epinephrine
 - ▶ No difference regarding age, race, or sex
- ▶ Most common triggers
 - ▶ Food
 - ▶ Medication
 - ▶ Venom
- ▶ Most cases managed by the emergency department
 - ▶ 30-40% of cases in Centura arrive via EMS
- ▶ A variety of definitions exist which are difficult for prehospital or bedside use
- ▶ Death is rare

NIAID/FAAN Anaphylaxis Criteria 9

1. A person has symptoms that involve the skin, nose, mouth or gastrointestinal tract and either:

- Reduced blood pressure
- Difficulty breathing

2. A person was exposed to a suspected allergen, and less than 2 hours of the following occur:

- Reduced blood pressure
- Difficulty breathing
- Skin symptoms or swollen lips
- Gastrointestinal symptoms (e.g., vomiting, diarrhea, or cramping)

3. A person was exposed to a known allergen, and has:

- Reduced blood pressure

Sampson et al. J Allergy Clin Immunol 2006;117:391-7

Signs and Symptoms of Anaphylaxis 10

- **Skin and mucous membrane**
 Itching, lip or tongue swelling, hoarseness, tightness in throat, hives, swelling, flushing
 - Absence of visible oropharyngeal swelling does not exclude the sensation of throat tightness
- **Respiratory**
 Shortness of breathe, wheeze, stridor, hypoxemia, persistent cough
 - Absence of hypoxia does not exclude sensation of shortness of breathe
- **Digestive**
 Persistent abdominal symptoms: Nausea, vomiting, diarrhea, cramping
- **Cardiovascular**
 Hypotension, tachycardia, syncope, pallor
- **Gynecologic**
 Uterine cramping
- **Other**
 Feeling of impending doom
 Metallic taste

Anaphylaxis in Infants 11

MAY BE DIFFICULT TO DETERMINE

- ▶ First exposure
- ▶ Subjective symptoms cannot be described
 - ▶ Chest tightness
 - ▶ Throat tightness
- ▶ Nonspecific signs occurring in healthy infants
 - ▶ Vomiting/diarrhea after feeding
 - ▶ Drooling
 - ▶ Flushing
- ▶ Other nonspecific signs
 - ▶ Sudden onset lethargy
 - ▶ Inconsolable crying



TABLE 1. Symptoms and signs of anaphylaxis in infants*

Anaphylaxis symptoms that infants cannot describe	Anaphylaxis signs that are potentially difficult to interpret in infants, and why	Anaphylaxis signs in infants: obvious but may be nonspecific
General: feeling of warmth, weakness, anxiety, apprehension, impending doom	General: nonspecific behavioral changes such as persistent crying, fussing, irritability, fight	Skin/mucous membranes: rapid onset of hives (especially difficult to discern in infants with acute atopic dermatitis; scratching and excoriations, as such, will be absent in young infants); angioedema (face, tongue, oropharynx)
Skin/mucous membranes: itching of lips, tongue, palate, uvula, ears, throat, nose, eyes, and so forth; mouth-tingling or metallic taste	Skin/mucous membranes: flushing (may also occur with fever, hyperthermia, or crying spells)	Respiratory: rapid onset of coughing, apnea, cyanosis
Respiratory: nasal congestion, throat tightness, chest tightness; shortness of breath	Respiratory: hoarseness, dysphonia (common after a crying spell); drooling; increased secretions (common in infants)	Gastrointestinal: sudden, profuse vomiting
Gastrointestinal: dysphagia, nausea, abdominal pain/cramping	Gastrointestinal: spitting up/regurgitation (common after feeds); loose stools (normal in infants, especially if breast-fed); colicky abdominal pain	Cardiovascular: weak pulse; arrhythmia; diaphoresis/flushing; pallor; collapse/unconsciousness
Cardiovascular: feeling faint, presyncope, dizziness, confusion, blurred vision, difficulty in hearing, palpitations	Cardiovascular: hypotension; measured with an appropriate size blood pressure cuff; low systolic blood pressure for infants is defined as less than 70 mm Hg from age 1 month to 1 year, and less than 70 mm Hg = [2 × age in y] in the first and second years of life; tachycardia, defined as greater than 120-130 beats per minute from the third month to second year of life inclusive; loss of bowel and bladder control (obiquious in infants)	Central nervous system: rapid onset of unresponsiveness, lethargy, or hypotonic seizures
Central nervous system: headache	Central nervous system: drowsiness, somnolence (common in infants after feeds)	

*Modifying: <http://www.merck.com>

Simmons FE, J Allergy Clin Immunol 2007 Sep;120(3):537-40

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Definition of hypotension & resuscitation goals

Age	Critical Hypotension MAP ≤ 1% for age	Hypotension MAP ≤ 5% for age	Resuscitation Goal (Minimum) MAP ≥ 10% for age	Normotension (Median for Age) MAP = 50% for age
0-30 days	32	≤ 39	≥ 42	57
30-90 days	37	≤ 44	≥ 47	62
91 days-1 year	41	≤ 48	≥ 52	68
>1-2 years	41	≤ 48	≥ 53	70
>2-4 years	41	≤ 50	≥ 55	70
>4-6 years	43	≤ 51	≥ 56	70
>6-10 years	46	≤ 54	≥ 58	72
>10-13 years	47	≤ 55	≥ 60	74
>13 years	48	≤ 57	≥ 61	76

Resolution of hypotension = Two blood pressure measurements obtained 15 minutes apart with MAP >10 %ile

Seattle Children's
SEATTLE CHILDREN'S HOSPITAL

Current Denver Metro and Boulder Protocol

UPCOMING UPDATE:

- Generalized or Systemic Reaction
 - Multisystem involvement: skin, mucus membranes and/or GI symptoms
- Definition
 - Multisystem signs and symptoms are presents which may include skin and mucus membranes, GI, respiratory, or cardiovascular symptoms

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Question: What is anaphylaxis?

▶ Answer:

- ▶ A variety of definitions exist
- ▶ For the clinician, keep it simple!
 - ▶ Anaphylaxis is a clinical diagnosis
 - ▶ Look for two system involvement within appropriate clinical context
 - ▶ History?
 - ▶ Recognize a wide spectrum of severity and presentations exist which require clinical judgment
 - ▶ Do not rely on signs of shock

Campbell RL. Ann Allergy Asthma Immunol 113(2014):599-608

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Question:

Can one predict the severity of anaphylaxis based on the presenting signs and symptoms?

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Frequency of Signs and Symptoms of Anaphylaxis

Signs and Symptoms	Percent (%)
Cutaneous	
Urticaria and angioedema	85-90
Flushing	45-55
Pruritus without rash	2-5
Respiratory	
Dyspnea, wheeze	45-50
Upper airway angioedema	50-60
Rhinitis	15-20
Cardiovascular	
Hypotension, dizziness, syncope, diaphoresis	30-35
Gastrointestinal	
Nausea, vomiting, diarrhea, cramping	25-30

Lieberman P, et al. J Allergy Clin Immunol 2010; 126:477-480

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Grading System for Generalized Hypersensitivity Reactions (modified by Lockey)

Grade	Defined by	% without skin involvement
1 - Mild (skin and subcutaneous tissues only)*	Generalized erythema, urticaria, periorbital edema or angioedema	0%
2 - Moderate (features suggesting respiratory, cardiovascular or gastrointestinal involvement)	Dyspnea, stridor, wheeze, nausea, vomiting, dizziness (presyncope), diaphoresis, chest or throat tightness, or abdominal pain	17%**
3 - Severe (hypoxia, hypotension, or neurologic compromise)	Cyanosis or SpO2 <92% at any stage, hypotension (SBP < 90 mm Hg in adults, confusion, collapse, LOC or incontinence)	22%**

SBP, Systolic Blood pressure; LOC, loss of consciousness
 *Mild reactions can be further subclassified into those with and without angioedema
 ** Comment: may have been missed in these
Brown SGA. J Allergy Clin Immunol 2004; 114:371-4

Median Time to Cardiac Arrest

Trigger	Median Time (range)
Iatrogenic	5 min (1-80)
Food	30 min (6-360)
Venom	15 min (4-120)

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Humphrey RS. Clin Exp Allergy. 2000; Aug;30(8):1144-50.

Risk factors for severe anaphylaxis

- ▶ Peanut and tree nut allergy
 - ▶ Especially young people
- ▶ **Asthma – independent risk factor**
- ▶ Pre-existing respiratory or cardiovascular disease
- ▶ Advanced age
- ▶ Previous biphasic anaphylactic reactions
- ▶ Mast cell disease
- ▶ **Delayed epinephrine administration**

Risk factors for fatal food-related anaphylaxis

- Young age
- Asthma
- Nut allergy
- Delay of epinephrine**

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Greenberger P. Ann Allergy Asthma Immunol. 2007;98:232-237(6).
Humphrey RS. Novartis Found Symp. 2004;237:116-128(IV).
Tunginger JW. J Forensic Sci. 1991;36:837-842 (9a).

Question: Can one predict the severity of anaphylaxis based on the presenting signs and symptoms

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▶ **Answer: No**

- ▶ Generally; Anaphylaxis develops rapidly but exceptions exist
- ▶ Cutaneous and other mild symptoms can be initial signs of severe anaphylaxis
 - ▶ Cutaneous symptoms absent in up to 20% of cases
- ▶ Severity can differ from patient to patient and in same patient from episode to episode

What is the treatment for anaphylaxis...

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EPINEPHRINE

Antihistamines can be used to treat anaphylaxis initially... Myth

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- ▶ Histamine one of many inflammatory mediators released
- ▶ Slow onset of action
- ▶ Not effective against anaphylaxis
 - ▶ Prophylactic use during controlled immunotherapy not effective*
- ▶ Considered adjunctive therapy international guidelines
- ▶ Antihistamines should never delay epinephrine therapy



*Gorka L, et al. Int Arch Allergy Immunol. 2008;147:241-5.

Corticosteroids prevent biphasic reactions... Myth

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- ▶ Anti-inflammatory
- ▶ Biphasic reaction: return of symptoms within 72 hours
 - ▶ Median 11 hours*
 - ▶ No evidence of benefit
- ▶ Like antihistamines, onset of action SLOW
 - ▶ 4-6 hours
- ▶ Adjunctive therapy
- ▶ Steroids should not delay epinephrine

*Lee Ann Emerg Med 2014; 6:4513
Compton RL, et al. Ann Allergy Asthma Immunol 113(2014):599-608

Epinephrine Mechanism of Action 25

- ▶ At α_1 receptors
 - ▶ Vasoconstriction
 - ▶ Blood Pressure
 - ▶ Mucosal Edema
- ▶ At β_1 receptors
 - ▶ Heart Rate
 - ▶ Contractility
- ▶ At β_2 receptors
 - ▶ Bronchodilation
 - ▶ Mediator release

Epinephrine dosing 26

- ▶ **Adults**
 - ▶ 0.3 mg (0.3 mL of 1 mg/mL) IM in the **ANTEROLATERAL THIGH** q 5 min
 - ▶ May repeat x 1
 - ▶ Epi before IV
- ▶ **Pediatric**
 - ▶ 0.15 mg IM in the **ANTEROLATERAL THIGH** Q 5 min < 25 kg
 - ▶ May repeat x 1
 - ▶ Epi before IV
- ▶ **Units**...no more 1:1000
- ▶ Express dose in **mass/volume** (mg/mL, mcg/mL)

How should epinephrine be administered? 27

Intramuscular ANTEROLATERAL THIGH

Epinephrine Absorption in Adults 28

Injection Route, Site	EpiPen IM Thigh	Ampule IM Thigh	Ampule IM Arm	Ampule SQ Arm	Saline IM Arm	Saline SQ Arm
Average C _{max} (pg/mL)	12,222 ± 3,829	9,722 ± 4,801	1,821 ± 426	2,877 ± 567	1,458 ± 444	1,495 ± 524

Simmons. J Allergy Clin Immunol. 2001 Nov;108(5):871-3

Review of epinephrine administration at 10 Colorado EDs 29

911 administrations in 842 patients Over 2.5 years

Administration Route

Administration site

Intramuscular Epinephrine administration updates 30

UPDATE:

- ▶ Filter needle no longer necessary for intramuscular administration from ampoule*
- ▶ ISMP 2019 update
- ▶ No longer need to account for dead space
- ▶ 33% decrease in dose if failure to do so

* https://www.ama-assn.org/speicalty/2019/11/29/1115.pdf

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When should Epinephrine be administered?

ASAP!

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- *Fatal and Near-fatal Anaphylaxis Reactions to Food in Children and Adolescents*
 - **Study conclusion: Failure to recognize the severity of the reaction and administer epinephrine quickly increases risk of fatal outcome***
- *Anaphylaxis-Related Deaths in Ontario: A Retrospective Review from 1986-2011*
 - **Study Conclusion: 21 of 92 (23%) received epinephrine prior to cardiac arrest****
- *Lessons from the management of Anaphylaxis from a Study of Fatal Reactions*
 - **Study Conclusion: Epinephrine used in 62% of cases but only before cardiac arrest in 14% of cases*****

Delay of epinephrine increases the risk of death

*Sampson HA et al. N Engl J Med. 1992;327:380-4. **Rock SA et al.

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Early epinephrine decreases risk of hospitalization*

- ▶ Early defined as epi admin before the ED.
- ▶ In real world, anyone not self administering epi is late
- ▶ 75% of patients arrived via EMS
 - ▶ 50% self administered
 - ▶ 25% EMS admin
- ▶ ED length of stay shorter for early epi group.

Fatal Anaphylaxis**	
Trigger	Median Time (range)
Iatrogenic	5 min (1-80)
Food	30 min (6-360)
Venom	15 min (4-120)

*Fleming JJ et al. J Allergy Clin Immunol Pract. 2015 Jan-Feb;3(1):57-62.
**Pumphrey RS. Clin Exp Allergy. 2000 Aug;30(8):1144-50.

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Delay of epinephrine increases risk of biphasic reaction

▶ Biphasic reaction: symptoms returning 1 to 72 hours

▶ Risk factors:

- ▶ Delays in epinephrine*
- ▶ Sub-optimal dosing**
- ▶ Severe initial symptoms

*Lee JM et al. Pediatrics 2000;104(4):762.
**Ellis AK et al. Ann Allergy Asthma Immunol. 2007;98(1):64.

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Epinephrine is Dangerous... Myth

- ▶ Cardiac ischemia rare and secondary to overdose or IV bolus
- ▶ Kounis Syndrome?
 - ▶ Mast cells in cardiac anatomy
 - ▶ Number of mast cells in cardiac anatomy increased in patients with coronary artery disease*
- ▶ **No contraindications exist IF dosed and administered appropriately** □

*Triggiani M, et al. Clin Exp Immunol 2008;153(suppl 1):9-11

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Other Considerations

- ▶ Empty Ventricle/vena cava Syndrome
 - ▶ classically distributive shock
 - ▶ Increased vascular permeability
 - ▶ Vasodilation
 - ▶ Depressed myocardial function
 - ▶ Pulmonary vasospasm + decreased LV preload = decreased cardiac output
- ▶ Supine or Trendelenburg recommended
- ▶ Fatal within minutes
- ▶ Epinephrine likely unresponsive

Initial treatment of anaphylaxis

1. Place the patient in a supine position. If the patient is hypotensive, place them in the Trendelenburg position. If the patient is hypotensive and has respiratory distress, place them in the Trendelenburg position with the head of the bed elevated. 2. Administer epinephrine 0.1-0.5 mg (0.01-0.05 mg/kg) intramuscularly. 3. Administer oxygen. 4. Administer antihistamines. 5. Administer corticosteroids. 6. Administer beta-2 agonists. 7. Administer fluids. 8. Administer vasopressors. 9. Administer epinephrine. 10. Administer epinephrine. 11. Administer epinephrine. 12. Administer epinephrine. 13. Administer epinephrine. 14. Administer epinephrine. 15. Administer epinephrine. 16. Administer epinephrine. 17. Administer epinephrine. 18. Administer epinephrine. 19. Administer epinephrine. 20. Administer epinephrine. 21. Administer epinephrine. 22. Administer epinephrine. 23. Administer epinephrine. 24. Administer epinephrine. 25. Administer epinephrine. 26. Administer epinephrine. 27. Administer epinephrine. 28. Administer epinephrine. 29. Administer epinephrine. 30. Administer epinephrine. 31. Administer epinephrine. 32. Administer epinephrine. 33. Administer epinephrine. 34. Administer epinephrine. 35. Administer epinephrine. 36. Administer epinephrine. 37. Administer epinephrine. 38. Administer epinephrine. 39. Administer epinephrine. 40. Administer epinephrine. 41. Administer epinephrine. 42. Administer epinephrine. 43. Administer epinephrine. 44. Administer epinephrine. 45. Administer epinephrine. 46. Administer epinephrine. 47. Administer epinephrine. 48. Administer epinephrine. 49. Administer epinephrine. 50. Administer epinephrine. 51. Administer epinephrine. 52. Administer epinephrine. 53. Administer epinephrine. 54. Administer epinephrine. 55. Administer epinephrine. 56. Administer epinephrine. 57. Administer epinephrine. 58. Administer epinephrine. 59. Administer epinephrine. 60. Administer epinephrine. 61. Administer epinephrine. 62. Administer epinephrine. 63. Administer epinephrine. 64. Administer epinephrine. 65. Administer epinephrine. 66. Administer epinephrine. 67. Administer epinephrine. 68. Administer epinephrine. 69. Administer epinephrine. 70. Administer epinephrine. 71. Administer epinephrine. 72. Administer epinephrine. 73. Administer epinephrine. 74. Administer epinephrine. 75. Administer epinephrine. 76. Administer epinephrine. 77. Administer epinephrine. 78. Administer epinephrine. 79. Administer epinephrine. 80. Administer epinephrine. 81. Administer epinephrine. 82. Administer epinephrine. 83. Administer epinephrine. 84. Administer epinephrine. 85. Administer epinephrine. 86. Administer epinephrine. 87. Administer epinephrine. 88. Administer epinephrine. 89. Administer epinephrine. 90. Administer epinephrine. 91. Administer epinephrine. 92. Administer epinephrine. 93. Administer epinephrine. 94. Administer epinephrine. 95. Administer epinephrine. 96. Administer epinephrine. 97. Administer epinephrine. 98. Administer epinephrine. 99. Administer epinephrine. 100. Administer epinephrine.

Patient Case 1 37

- ▶ Any risk factors for severe anaphylaxis present?
 - ▶ **Asthma**
 - ▶ Nut allergy
 - ▶ Young age
 - ▶ Delay of epinephrine
- ▶ What interventions need to be made?
 - ▶ Epinephrine
 - ▶ Dose and route?
 - ▶ 0.15 mg IM in the **ANTEROLATERAL THIGH**
 - ▶ Place patient in supping position
 - ▶ Transport to ED

Patient case 2 38

- ▶ Differential
 - ▶ Anaphylaxis, ACE angioedema, Stroke, STEMI, Sepsis.
 - ▶ Anaphylaxis:
 - ▶ Recent antibiotic use
 - ▶ Multisystem involvement
 - ▶ ACE angioedema:
 - ▶ Lip swelling concerning
 - ▶ Rash, wheeze, hypotension not present
 - ▶ Stroke,
 - ▶ Difficulty speaking should prompt an evaluation for stroke
 - ▶ STEMI
 - ▶ EKG indicated once stable

Patient Case 2 continued... 39

- ▶ What's the problem
 - ▶ Anaphylaxis
 - ▶ Recent antibiotics
 - ▶ Multisystem involvement
 - ▶ Decreased mentation due to hypotension probable
 - ▶ Beta blocker = increased severity of anaphylaxis
 - ▶ What intervention should be done?
 - ▶ Epinephrine 0.3 mg IM in the anterolateral thigh (**Epi before IV**)
 - ▶ Place patient in supine position
 - ▶ Establish IV access
 - ▶ 20 ml/kg IV crystalloid bolus
 - ▶ Subsequent epinephrine 0.3 mg IM x 1 if no improvement in 5-10 min
 - ▶ Prepare IV Epi infusion per protocol if second epi fails

Case 3 40

- ▶ What risk factors are present?
 - ▶ Known allergy
 - ▶ **ASTHMA**
 - ▶ Delay of epinephrine?
- ▶ What intervention should be done?
 - ▶ Third dose of epinephrine 0.3 mg IM in the anterolateral thigh
 - ▶ Establish IV access
 - ▶ Diphenhydramine, methylprednisolone, ondansetron per protocol

Conclusions 41

Diagnosis

- ▶ Anaphylaxis is a clinical diagnosis
- ▶ Remember Sampson Criteria
- ▶ Look for multiple system involvement
- ▶ Recognize a wide spectrum of presentations and severity exists
- ▶ Anaphylaxis is unpredictable

2. A person was exposed to a suspected allergen, and two or more of the following occur OR

- Reduced blood pressure
- Difficulty breathing
- Skin symptoms or swollen lips
- Gastrointestinal symptoms (e.g., vomiting, diarrhea, or cramping)

Treatment 42

- ▶ Epinephrine is the only medication indicated to treat anaphylaxis.
- ▶ Patients meeting criteria probably have anaphylaxis and probably should receive epinephrine.
- ▶ Prevention of epinephrine administration delays is the only modifiable risk factor for death, hospitalization and biphasic reactions.
- ▶ Epinephrine is safe if administered appropriately.



Thank you