Observe for 5-10 mins
Continue monitoring with vitals every 5 minutes

Has patient improved?
Yes
Go to Mild
No
Go to Moderate - Severe

Inclusion Criteria
≥ 3 months with suspected anaphylaxis
Exclusion Criteria
• Blood transfusion reactions that are not anaphylaxis
• Symptoms clearly attributable to other causes

High clinical concern for anaphylaxis? No
Go to Lower Clinical Concern

• Give epinephrine 0.01mg/kg IM (max 0.3mg) in lateral thigh
• Repeat every 5 min as needed (can give more frequently if symptoms are severe)

• Place on monitors, vitals every 5 minutes
• Place patient supine if tolerated
• Avoid sudden changes in position, especially to standing
• Administer O₂ until O₂ Sat is known, and to keep O₂ saturation > 90%

• If MAP <5th %ile → place IV and administer N/S 20 cc/kg
• If bronchospasm → place IV and give albuterol 20 mg / hr or 8 puffs

Symptoms Suggestive of Anaphylaxis

Mild Symptoms:
• Generalized erythema, hives, angioedema

Moderate Symptoms:
• Chest or throat tightness
• Dyspnea, stridor, wheeze
• Nausea, vomiting, abdominal pain
• Dizziness (prespnce, diaphoresis

Severe Symptoms:
• Cyanosis, saturation <= 92%
• Hypotension, collapse
• Confusion, LOC
• Incontinence

Risk Factors for Anaphylaxis
• Possible exposure to known allergen
• Home anaphylaxis management plan

Adapted from Brown, 2004

Historical factors that increase risk and warrant a lower threshold for epinephrine:
• prior anaphylaxis involving respiratory distress
• hypoxia
• hypotension
• neurologic compromise

From Wang 2017
Score 1-4

Rapid symptom progression or epinephrine indicated per patient action plan?

No

Go to Mild

Yes

Score ≥5

Epinephrine is likely indicated. Huddle with team to discuss

Yes

Give epinephrine 0.01mg/kg IM (max 0.3mg) in lateral thigh

Repeat every 5 mins as needed (can give more frequently if symptoms are severe)

No

Has patient improved?

Yes

Go to Mild

No

Go to Moderate - Severe

Symptoms Suggestive of Anaphylaxis

Mild Symptoms:
- Generalized erythema, hives, angioedema

Moderate Symptoms:
- Chest or throat tightness
- Dyspnea, stridor, wheeze
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Severe Symptoms:
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Risk Factors for Anaphylaxis
- Possible exposure to know allergen
- Home anaphylaxis management plan

Adapted from Brown, 2004

Inclusion Criteria
≥ 3 months with suspected anaphylaxis

Exclusion Criteria
- Blood transfusion reactions that are not anaphylaxis
- Symptoms clearly attributable to other causes
Anaphylaxis v3.0: ED Management – Mild

Resolved after epinephrine or no epinephrine given

**Inclusion Criteria**
≥ 3 months with suspected anaphylaxis

**Exclusion Criteria**
- Blood transfusion reactions that are not anaphylaxis
- Symptoms clearly attributable to other causes

Use “ED Subsequent Anaphylaxis” Phase of Powerplan
if patient has received epinephrine, or has cutaneous symptoms:
- cetirizine PO
- ranitidine PO

**Assess for risk factors**
- History of biphasic or severe reaction
- History of asthma or wheezing
- Time from exposure to symptom onset delayed > 1 hour or unknown

Symptoms resolved AND risk factors absent → No steroids

Symptoms persist OR risk factors present → dexamethasone PO

Evaluate and score hourly and with symptom change

NOT worse or score 1-4 → Go to ED Disposition

worse or score ≥5 → Epinephrine is likely indicated. Huddle with team to discuss.

Go to Moderate - Severe

Steroids with immunotherapy
Score patient using ASAP

Epinephrine given

Inclusion Criteria
≥ 3 months with suspected anaphylaxis

Exclusion Criteria
- Blood transfusion reactions that are not anaphylaxis
- Symptoms clearly attributable to other causes

Epinephrine has been given & observed for 5-10 mins

Score patient using ASAP

Improved or score 1-4

Give epinephrine 0.01mg/kg IM (max 0.3mg) in lateral thigh

Use “ED Subsequent Anaphylaxis” Phase of Powerplan

- Place IV (if not already done)
- Cetirizine PO (unless unable to tolerate PO, then diphenhydramine IV)
- Famotidine IV
- MethylPrednisolone IV

Observe for 5-10 min -continue monitoring, vitals every 5 minutes

Improved or score 1-4

- Consider epinephrine 0.01mg/kg IM (max 0.3mg) in lateral thigh
- Repeat every 5 min as needed (can give more frequently if symptoms are severe)
- Start epinephrine drip after 3rd IM dose
- PICU consult, admit to PICU

Go to ED Disposition

NOT improved or score ≥5

!! Steroids with immunotherapy

Exclusion Criteria
- Blood transfusion reactions that are not anaphylaxis
- Symptoms clearly attributable to other causes

NOT improved or score ≥5

Go to ED Disposition

Improved or score 1-4

Mild

Yes
Anaphylaxis v3.0: ED Disposition

**Urgent Care Transfer Recommendations**
Transfer patients who have received IM Epinephrine to the Emergency Department
- Patients should be transported by ALS (or an ambulance crew who is able to give IM epinephrine)
- Patients who have low BP or require more than one dose of epinephrine, consider calling 911 (or Code Blue)
- Patient requiring observation after 1 hour- transfer to ED

**Acute Care Admit Criteria**
- Persistent symptoms beyond rash or score > 5 after 2 epinephrine
- Persistent wheeze or bronchospasm after 1 epinephrine
- Biphasic reaction

**PICU Criteria**
- Persistent MAP <5% ile
- Altered mental status after 1 epinephrine
- ≥ 3 doses of epinephrine given with persistent symptoms beyond rash/ angioedema
- Persistent cardiovascular compromise
- Persistent respiratory distress
- Continuous albuterol for > 1 hour

**Discharge Instructions**
- Provide anaphylaxis discharge materials e.g. FARE Field Guide and Anaphylaxis Emergency Care Plan
- Rx epinephrine auto-injector and provide training
- RASH Hx, discharge with
  - Cetirizine prn
  - Ranitidine prn
- No RASH Hx, discharge with no meds
- Recommend allergist referral
- F/U PCP within 3 days

**Patient received epinephrine?**
- NO: Observe for 1 hour if symptoms are stable, or 1 hour after any symptom progression.
- If anaphylaxis high risk by history: observe for 4 hours from either exposure or any symptom progression.
- YES
  - Meets admission Criteria?
    - NO
      - High risk by history:
        - History of anaphylaxis
        - History of life-threatening allergies (versus environmental)
        - Two systems involved at any point
    - YES: PICU
  - YES: Acute Care

**Assessment**
Observe for 4 hours from the latest of: exposure, epinephrine administration, or any worsening of symptoms
**Inpatient Anaphylaxis** Phase of Anaphylaxis Powerplan

Patients to receive adjunctive medications below:
- Prednisone/prednisolone daily
- If persistent cutaneous symptoms:
  - Cetirizine PRN
  - Ranitidine PRN

**PRN medications**:
- Epinephrine 0.01mg/kg IM (max 0.3mg) in lateral thigh for anaphylaxis
- Albuterol 8 puffs for bronchospasm
- Ondansetron for nausea or vomiting

Be prepared for epinephrine administration – have acute anaphylaxis kit readily available (Omnicell)

**Acute Anaphylaxis Score**

Assisting Providers
- Consider using as a supplemental aid to help in the recognition of anaphylaxis

**Symptoms Suggestive of Anaphylaxis**

**Mild Symptoms**:
- Generalized erythema, hives, angioedema

**Moderate Symptoms**:
- Chest or throat tightness
- Dyspnea, stridor, wheeze
- Nausea, vomiting, abdominal pain
- Dizziness (presyncope), diaphoresis

**Severe Symptoms**:
- Cyanosis, saturation ≤ 92%
- Hypotension, collapse
- Confusion, LOC
- Incontinence

**Discharge Epinephrine**
- Epi Auto-injector in hand (not sent to outside pharmacy) pharmacy to train in use; watch video on Get Well/FRC
- If rash or wheezing:
  - Prednisone x3 days

**Discharge Medications**
- If risk of allergen re-exposure:
  - FARE Field Guide and Anaphylaxis Emergency Care Plan
    - If of allaphylaxis
      - Epi Auto-injector in hand (not sent to outside pharmacy) pharmacy to train in use; watch video on Get Well/FRC
      - If rash or wheezing:
        - Prednisone x3 days

**Discharge: For patients admitted with anaphylaxis**

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
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</tr>
</thead>
<tbody>
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<td>≥ 3 months with suspected anaphylaxis</td>
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<td>Blood transfusion reactions that are not anaphylaxis</td>
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</tr>
</tbody>
</table>

**D/C Criteria**
- ≥12 hours since last epinephrine
- Teaching completed
- PCP F/U arranged within 72 hours
- Allergist referral initiated
- Tolerating PO intake

**Explanation of Evidence Ratings**

**For questions concerning this pathway, contact: anaphylaxis@seattlechildrens.org**

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Last Updated: March 2018

Next Expected Review: August 2022
Epinephrine should be Pre-ordered and readily available
- High-risk medications with epinephrine in orderset
- Recent (~24h) exposure to known allergen
- Diagnosis of anaphylaxis this admission
- Home Rx for Epinephrine auto-injector
- Home anaphylaxis action plan

Inclusion Criteria
- ≥ 3 months with suspected anaphylaxis

Exclusion Criteria
- Blood transfusion reactions that are not anaphylaxis
- Symptoms clearly attributable to other causes

Continue to observe for further signs and symptoms

High probability of anaphylaxis?
Yes
Stop Currently-Infusing Medications

Is epinephrine pre-ordered and readily available?
Yes
Call Code Blue
DO NOT DELAY WHILE WAITING FOR TEAM OR RRT TO ARRIVE

No

Give epinephrine 0.01mg/kg (max 0.3mg) intramuscularly (IM) in lateral thigh; repeat as needed

Call RRT
Call provider with STAT page

Call Code Blue
Code Team to give IM epinephrine or providers can order/give epinephrine before they arrive

Observe for 5-10 mins
Continue monitoring with vitals every 5 minutes

Anaphylaxis Resolved

Yes
No

Repeat epinephrine 0.01mg/kg (max 0.3mg) intramuscularly (IM) in lateral thigh
Plan for PICU transfer

Steroids with immunotherapy

If not already done, order one dose each of cetirizine + ranitidine PO/famotidine IV + corticosteroid
Go to the Inpatient Continued Management

Mild Symptoms:
- Generalized erythema, hives, angioedema

Moderate Symptoms:
- Chest or throat tightness
- Dyspnea, stridor, wheeze
- Nausea, vomiting, abdominal pain
- Dizziness (presyncope), diaphoresis

Severe Symptoms:
- Cyanosis, saturation < 92%
- Hypotension, collapse
- Confusion, LOC
- Incontinence

Risk Factors for Anaphylaxis
- Possible exposure to known allergen
- Home anaphylaxis management plan

Adapted from Brown, 2004

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RISK FACTORS
- Neurological
- Abdominal
- Cardiovascular
- Respiratory
- Skin & Mucosa
- Pelvic

Lower Initial Concern: Score Only

Actions based on Anaphylaxis Score:

**SCORE 1 - 4 pt. Acute anaphylaxis may still be developing.** Routine use of epinephrine is not indicated, but may be appropriate if symptoms are recent and progressing rapidly, or if indicated per the patient’s anaphylaxis action plan. Place on monitors, observe closely in an environment with staff trained to monitor and treat for anaphylaxis, prepare to treat if needed.

**SCORE ≥ 5 pts. Acute anaphylaxis is very likely.** In the appropriate clinical context, epinephrine is indicated.

This score is only a guide. The decision to give epinephrine is a clinical decision that may vary by patient.

### ANAPHYLAXIS SCORE ASSISTING PROVIDERS (ASAP)

| SKIN & MUCOSA | 0 Absent: No signs or symptoms  
| 1 Mild: Mild itching; ≥3 hives; flushing, erythema or hives that resolved in past 1 hour after antihistamine  
| 2 Moderate (Mod): Severe itching; >3 hives; flushing, erythema or raised rash (patchy or onset over >1 hour); face or lip edema, angioedema, red eyes  
| 3 Severe: Rapid within the past 1 hour whole body flushing, erythema or hives; tongue or intraoral edema |
| RESPIRATORY | 0 Absent: No signs or symptoms  
| 1 Mild: Occasional sneeze or cough; mild nasal congestion or runny nose; throat tickle; hoarseness  
| 2 Mod: Frequent sneezing or cough; severe nasal congestion or runny nose; subjective trouble swallowing or breathing, throat or chest tightness; chest pain; coarse breath sounds  
| 3 Severe: Stridor, wheeze, drooling or not swallowing, sniff position, dyspnea, diminished breath sounds, hypoxia |
| CARDIOVASCULAR | 0 Absent: No symptoms, normal pulse, no hypotension (MAP = 5 th %ile)  
| 1 Mild: Tired; lightheaded; mildly dizzy; unexplained tachycardia; delayed capillary refill.  
| 2 Mod: Very dizzy/near fainting; pallor; weak pulse; sweaty; somnolent. Infants: listless or lethargic  
| 3 Severe: Hypotension (MAP <5 %ile); cyanosis; confusion; fainting, loss of consciousness, bradycardia, arrest. |
| ABDOMINAL & PELVIC | 0 Absent: No symptoms or signs  
| 1 Mild: Nausea without vomiting; mild abdominal cramps or pain; uterine cramps; urinary incontinence  
| 2 Mod: Mod-severe pain; or vomiting and/or diarrhea =3 total within the past 1 hour (or since epinephrine if it was given in the past hour)  
| 3 Severe: Vomiting and/or diarrhea >3 total within the past 1 hour (or since epinephrine if it was given in past hour) |
| NEUROLOGICAL | 0 Absent: No signs or symptoms  
| 1 Mild: Anxious (without explanation); headache  
| 2 Mod: Feeling of impending doom (like something terrible is about to happen) |
| RISK FACTORS | 0 Absent: No suspected exposure, no history of allergies  
| 1 Moderate Risk: Symptom onset 1-10 hours after possible exposure AND no allergy history; known allergies with no exposure  
| 2 High Risk: Rapid onset, e.g. = 1 hour post exposure (food, drugs, contrast); OR known allergies with possible exposure |

**TOTAL SCORE**
Guidelines (i.e. Lieberman 2010) recommend that patients in anaphylaxis be placed supine, based on a pathology study that primarily involved adults:

Pathology series of 214 anaphylaxis deaths (including children)

- 38 anaphylactic shock deaths occurred outside hospital
- 10 had info on postural history
  - 4 died within seconds of a change to more upright posture
  - 6 died after they were propped in a sitting position after loss of consciousness
- Age not mentioned, none reported to be children

“During anaphylactic shock, the capacity of the veins and capillaries expands greatly. While a shocked person is lying down, sufficient blood might return to the vena cava to maintain a reduced circulation, but on the person’s sitting up or standing, this venous return stops; the vena cava will then become empty within seconds. There is then no flow through the right side of the heart, and within a few seconds more, no blood will return to the left side of the heart from the lungs. Pulseless electric activity continues, but in the absence of left ventricular filling there can be no contractions; this prevents coronary arterial flow and leads to myocardial ischemia. In less extreme cases, too, the coronary circulation, which is dependent on the diastolic pressure, is likely to become inadequate, because the blood pressure is the product of the cardiac output and the systemic vascular resistance, both of which are low in cases of anaphylactic shock. If this hypothesis is correct, once the vena cava is empty, epinephrine—no matter where or how it is given—could not circulate and so could not reverse the shock.”

Lieberman J Allergy Clin Imm 2010; Pumphrey J Allergy Clin Imm 2003
**Bronchospasm** or a bronchial spasm is a sudden constriction of the muscles in the walls of the bronchioles. It is caused by the release (degranulation) of substances from mast cells or basophils under the influence of anaphylatoxins. It causes difficulty in breathing which can be very mild to severe.

**Inflamed airways and bronchoconstriction in asthma.** Airways narrowed as a result of the inflammatory response cause wheezing. Bronchospasms appear as the feature of asthma, chronic bronchitis and anaphylaxis.

Alternate diagnoses for the patients with mild symptoms:

- **Resp**: choking event, asthma
- **Cardiac**: vagal syncope, dehydration
- **GI**: gastroenteritis
- **Neurologic**: seizure, postural orthostatic tachycardia (POTS)
- **Infectious**: viral syndrome
- **Allergic**: simple hives, angioedema
- **Psychiatric**: psychogenic stridor, panic attack

Alternate diagnoses for patients with mod/severe symptoms:

- **Resp**: epiglottitis, foreign body aspiration, pulmonary embolism
- **Cardiac**: myocarditis, infarction, other heart disease
- **GI**: caustic ingestion, gastroenteritis
- **Neurologic**: seizure, stroke, increased ICP
- **Infectious**: sepsis, toxic shock syndrome
- **Toxicologic**: exposure (organophosphate) overdose (sedative-hypnotic, ACE inhibitor), scombroid poisoning
- **Psychiatric**: psychogenic stridor, panic attack
Before starting corticosteroids on a hematology/oncology patient, please contact the Hematology-Oncology team to see if there is a contraindication due to current therapy, such as immunotherapy.
What is a Biphasic reaction?

- A second wave of reaction after the first wave improved
- Estimated 15% of pediatric anaphylaxis

8 hours after exposure 4 hours after epi Next morning

- Can be less severe, as severe or more severe than the initial reaction
- Up to 25% of fatal and near-fatal food reactions
- Most within 10 hours, reported up to 72 hours after the initial reaction
- If no biphasic reaction by ED discharge (3.5 - 6 hr observation), the chance after that is 4%


Observation

- How long to observe: 4 hours from latest of symptoms, epinephrine, any worsening

Indications for Extended Observation
- Severe reaction of slow onset
- History of previous biphasic reaction
- Marked asthmatic component
- Slow response to treatment
- Ingested antigen (continuous absorption)
- Long distance from care
This pathway was developed through local consensus based on published evidence and expert opinion as part of Clinical Standard Work at Seattle Children’s. Pathway teams include representatives from Medical, Subspecialty, and/or Surgical Services, Nursing, Pharmacy, Clinical Effectiveness, and other services as appropriate.

When possible, we used the GRADE method of rating evidence quality. Evidence is first assessed as to whether it is from randomized trial or cohort studies. The rating is then adjusted in the following manner (from: Guyatt G et al. J Clin Epidemiol. 2011;4:383-94.):

Quality ratings are downgraded if studies:
- Have serious limitations
- Have inconsistent results
- If evidence does not directly address clinical questions
- If estimates are imprecise OR
- If it is felt that there is substantial publication bias

Quality ratings are upgraded if it is felt that:
- The effect size is large
- If studies are designed in a way that confounding would likely underreport the magnitude of the effect OR
- If a dose-response gradient is evident

Guideline – Recommendation is from a published guideline that used methodology deemed acceptable by the team.

Expert Opinion – Our expert opinion is based on available evidence that does not meet GRADE criteria (for example, case-control studies).

**Quality of Evidence:**
- 🌟🌟🌟🌟 High quality
- 🌟🌟🌟 Moderate quality
- 🌟🌟 Low quality
- 🌟🌟🌟 Very low quality

Guideline
Expert Opinion
Version 1.0 (8/29/17): Go live
Version 1.1 (9/1/17): Administrative changes/edits
Version 2.0 (11/10/2017): Famotidine IV substituted for ranitidine IV; administrative changes/edits
Version 3.0 (3/9/2018): ASAP updated; administrative changes/edits
Medical Disclaimer

Medicine is an ever-changing science. As new research and clinical experience broaden our knowledge, changes in treatment and drug therapy are required.

The authors have checked with sources believed to be reliable in their efforts to provide information that is complete and generally in accord with the standards accepted at the time of publication.

However, in view of the possibility of human error or changes in medical sciences, neither the authors nor Seattle Children’s Healthcare System nor any other party who has been involved in the preparation or publication of this work warrants that the information contained herein is in every respect accurate or complete, and they are not responsible for any errors or omissions or for the results obtained from the use of such information.

Readers should confirm the information contained herein with other sources and are encouraged to consult with their health care provider before making any health care decision.
Anaphylaxis Approval & Citation

Approved by the CSW Anaphylaxis for August 29, 2017 Go Live date

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Retrieval Website: http://www.seattlechildrens.org/pdf/Anaphylaxis-pathway.pdf

Search Methods, *Anaphylaxis*, Clinical Standard Work

Studies were identified by searching electronic databases using search strategies developed and executed by a medical librarian, Jackie Morton. Searches were performed in November, 2016. The following databases were searched – on the Ovid platform: Medline, Cochrane Database of Systematic Reviews; Cochrane Central Register of Controlled Trials; elsewhere – Embase, National Guideline Clearinghouse, TRIP and Cincinnati Children’s Evidence-Based Care Guidelines. In Medline and Embase, appropriate Medical Subject Headings (MeSH) and Emtree headings were used respectively, along with text words, and the search strategy was adapted for other databases using their controlled vocabularies, where available, along with text words.

In Medline and Embase, appropriate Medical Subject Headings (MeSH) and Emtree headings were used respectively, along with text words, and the search strategy was adapted for other databases using their controlled vocabularies, where available, along with text words. The time frame searched for some clinical questions was 2006 to the date the search was conducted and included all levels of evidence currently in place for Clinical Effectiveness pathways. Some clinical questions were searched for 1996 to the date of the search and included all levels of evidence currently in place for Clinical Effectiveness pathways. Some clinical questions were searched for 2006 to the date of the search and have no levels of evidence applied. Concepts searched were the diagnosis, grading and treatment of anaphylaxis including the broader concept of hypersensitivities. The search strategy does not include the concept of severity or grade of acuteness; this is to be determined during the review process. All retrieval was limited to English language. The team added 38 citations not retrieved with the search strategy limitations.

Jackie Morton, MLS
May 24, 2017

Flow diagram adapted from Moher D et al. BMJ 2009;339:b2535


Bibliography


Bibliography


