Any signs or symptoms of hypersensitivity reaction/allergic reaction, notify Radiologist and MERIT/Code/Pediatric ICU (5-0570) as appropriate. If a patient is unresponsive at any point, call a “code” as appropriate and call Radiologist to bedside.

This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson’s specific patient population; MD Anderson’s services and structure; and MD Anderson’s clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

1 Caution about steroids in patients with uncontrolled hypertension, diabetes, tuberculosis, systemic fungal infections, peptic ulcer disease, neutropenic colitis or diverticulitis. If allergic, contact primary physician.

Note: See Appendix A on page 7 for Reaction Rebound Prevention
Any signs or symptoms of hypersensitivity reaction/allergic reaction, notify Radiologist and MERIT/Code/Pediatric ICU (5-0570) as appropriate. If a patient is unresponsive at any point, call a “code” as appropriate and call Radiologist to bedside.

### PRESENTING SYMPTOMS

- Urticaria (hives), rash, itching, facial flushing
- Severe or widely disseminated

### TREATMENT

- **No treatment needed in most cases**
- **For moderate itching**, consider:
  - Diphenhydramine 1-2 mg/kg (maximum 50 mg) slow IV push or PO/IM,
  - If allergic to diphenhydramine, contact primary physician for treatment

#### Mild - moderate

- **Monitor O₂ saturation (pulse oximeter), cardiac monitoring, and vital signs, give:**
  - Epinephrine \(^1\) 0.01 mL/kg (maximum 0.5 mL) of 1:1,000 solution subcutaneously every 5 to 15 minutes
  - Hydrocortisone 1-2 mg/kg IV (maximum 100 mg)

#### Severe or widely disseminated

- **Patient symptoms resolved or stable within 3-5 minutes?**
  - Yes
    - Continue monitoring and transfer to appropriate level of care
  - No
    - **Call MERIT team**
    - Continue monitoring and consider transfer to appropriate level of care

#### Patient symptoms improve within 3-5 minutes?

- Yes
  - **Call MERIT and Pediatric ICU teams**
- No
  - Continue monitoring and consider transfer to appropriate level of care

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**Note:** See Appendix A on page 7 for Reaction Rebound Prevention

**Note:** Epinephrine may be used IM, Subcutaneous (in order of preference) 0.01 mg/kg (0.01 mL/kg dose of 1:1,000 solution) for mild reactions, or IV 0.01mg/kg (0.1 mL/kg dose of 1:10,000 solution) for moderate and severe reactions.

---

\(^1\) If resistant to epinephrine, can use Glucagon 20-30 mcg/kg to maximum of 1 mg (Rapid administration of glucagon can cause GI upset - caution to maintain airway)
Any signs or symptoms of hypersensitivity reaction/allergic reaction, **notify Radiologist and MERIT/Code/Pediatric ICU (5-0570) as appropriate.** If a patient is unresponsive at any point, call a “code” as appropriate and call Radiologist to bedside.

### PRESENTING SYMPTOMS

#### Hypotension with Bradycardia/ Vasovagal Reaction (responsive patient)

- Secure airway, IV access and initiate Oxygen via non-rebreather mask at 10-15 L/minute (if unavailable give oxygen via face mask at 6-10 L/minute)
- Call MERIT team
- Monitor $O_2$ saturation (pulse oximeter), cardiac monitoring, and vital signs.
- Legs elevated 60° or more (preferred) or Trendelenburg position
- Keep patient warm
- Rapid infusion (push pull technique) of Intravenous/Intraosseous Normal Saline or Lactated Ringer’s at 20 mL/kg¹

### TREATMENT

**Immediate response?**

- Verify the MERIT team was contacted
- Continue monitoring and consider transfer to appropriate level of care

**Consider Atropine 0.02 mg/kg IV**
- Minimum single dose = 0.1 mg
- Maximum single dose = 0.6 - 1 mg

**Patient symptoms improve within 3-5 minutes?**

- Verify the MERIT team was contacted
- Call Pediatric ICU teams
- Call Code team as appropriate
- If symptoms persist/progress, may repeat Atropine every 3-5 minutes up to Maximum total dose = 1 mg for infant/child, 2 mg for adolescent

**Yes**

**No**

### Hypotension with Tachycardia

- Secure airway, IV access and initiate Oxygen via non-rebreather mask at 10-15 L/minute (if unavailable give oxygen via face mask at 6-10 L/minute)
- Call MERIT team
- Monitor $O_2$ saturation (pulse oximeter), cardiac monitoring, and vital signs
- Legs elevated 60° or more (preferred) or Trendelenburg position
- Keep patient warm
- Administer rapid infusion of Intravenous/Intraosseous Normal Saline or Lactated Ringer’s at 20 mL/kg¹
- Administer: Epinephrine 0.01 mL/kg² (maximum 0.5 mL) of 1:1,000 solution subcutaneously every 3-5 minutes

**Patient symptoms improve within 3-5 minutes?**

- Verify the MERIT team was contacted
- Call Pediatric ICU teams
- If symptoms persist/proceed, may repeat Epinephrine 0.01 mL/kg² (maximum 0.5 mL) of 1:1,000 solution subcutaneously every 3-5 minutes

**Yes**

**No**

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¹ In patients with myocardial dysfunction or history of dysfunction, give NS 5-10 mL/kg while continuously monitoring for signs of fluid overload and call MERIT and Pediatric ICU teams.

² If resistant to epinephrine, can use Glucagon 20-30 mcg/kg to maximum of 1 mg (Rapid administration of glucagon can cause GI upset - caution to maintain airway)

**Note:** Epinephrine may be used IM, Subcutaneous (in order of preference) 0.01 mg/kg (0.01 mL/kg dose of 1:1,000 solution) for mild reactions, or IV 0.01mg/kg (0.1 mL/kg dose of 1:10,000 solution) for moderate and severe reactions.

**Note:** See Appendix A on page 7 for Reaction Rebound Prevention
Any signs or symptoms of hypersensitivity reaction/allergic reaction, notify Radiologist and MERIT/Code/Pediatric ICU (5-0570) as appropriate.
If a patient is unresponsive at any point, call a “code” as appropriate and call Radiologist to bedside.

**PRESENTING SYMPTOMS**

**TREATMENT**

- **Respiratory Distress (responsive patient)**
  - Secure airway, IV access and initiate oxygen via non-rebreather mask at 10-15 L/minute
  - If unavailable give oxygen via face mask at 6-10 L/minute
  - Call MERIT and Pediatric ICU teams
  - Epinephrine 0.01 mL/kg\(^1\)
    - (maximum 0.5 mL) of 1:1,000 solution
    - subcutaneously every 3-5 minutes
  - Monitor \(O_2\) saturation (pulse oximeter), electrocardiogram, and vital signs

- **Pulmonary Edema**
  - Give furosemide 0.5 – 1 mg/kg IV over 2 minutes (maximum 40 mg)
  - Patient symptoms improve within 3-5 minutes?
    - Yes
      - Verify the MERIT team and Pediatric ICU teams were contacted
      - Continue monitoring and consider transfer to appropriate level of care
    - No
      - Verify the MERIT team was contacted and
      - Call Pediatric ICU teams
      - Call code as appropriate

- **Bronchospasm (Wheezing)**
  - Give Albuterol Nebulizer per Respiratory\(^2\)
  - Patient symptoms improve within 3-5 minutes?
    - Yes
      - Verify the MERIT team was contacted
      - Continue monitoring
      - Consider transfer to appropriate level of care
    - No
      - Verify the MERIT team and Pediatric ICU teams were contacted
      - Call Code team as appropriate
      - Continue monitoring and consider transfer to appropriate level of care.
      - If symptoms persist/progress, may repeat Epinephrine 0.01 mL/kg\(^1\) (maximum 0.5 mL) of 1:1,000 solution subcutaneously every 3-5 minutes

---

Note: Epinephrine may be used IM, Subcutaneous (in order of preference) 0.01 mg/kg (0.01 mL/kg dose of 1:1,000 solution) for mild reactions, or IV 0.01mg/kg (0.1 mL/kg dose of 1:10,000 solution) for moderate and severe reactions.

1 If resistant to Epinephrine, can use Glucagon 20-30 mcg/kg to maximum of 1 mg (Rapid administration of glucagon can cause GI upset - caution to maintain airway).
2 Albuterol Nebulization - 0.63mg/3mL
Any signs or symptoms of hypersensitivity reaction/allergic reaction, **notify Radiologist and MERIT/Code/Pediatric ICU (5-0570) as appropriate.**

If a patient is unresponsive at any point, call a “code” as appropriate and call Radiologist to bedside.

### Seizures/Convulsions

- Observe and protect patient.
- Turn patient on side to avoid aspiration, ensure suction available
- Secure airway, IV access and initiate oxygen via non-rebreather mask at 10-15 L/min. If unavailable give oxygen via face mask at 6-10 L/min;
- Monitor O₂ saturation (pulse oximeter), cardiac monitoring, and vital signs.
- If seizure activity greater than 1-2 minutes give Lorazepam 0.05-0.1 mg/kg (maximum 4 mg) slow IV push.
- If no IV access, give rectal Diazepam gel 0.2-0.5 mg/kg (maximum 20 mg/dose)
- Call Code and Pediatric ICU teams
- Ensure STAT labs²

**Note:** See Appendix A on page 7 for Reaction Rebound Prevention

**Note:** Epinephrine may be used IM, Subcutaneous (in order of preference) 0.01 mg/kg (0.01 mL/kg dose of 1:1,000 solution) for mild reactions, or IV 0.01mg/kg (0.1 mL/kg dose of 1:10,000 solution) for moderate and severe reactions.

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1 If resistant to Epinephrine, can use Glucagon 20-30 mcg/kg to maximum of 1 mg (Rapid administration of glucagon can cause GI upset - caution to maintain airway).

2 STAT labs: CBC, Chem10, Ionized Calcium, Accuchek with or without Venous Blood Gas (VBG).
**Pediatric Management of Contrast Media Reactions**

This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson’s specific patient population; MD Anderson’s services and structure; and MD Anderson’s clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

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**PRESENTING SYMPTOMS**

- **Hypoglycemia** (blood glucose less than 70 mg/dL)
  - For all forms of Hypoglycemia: secure IV access and secure airway and initiate Oxygen via non-rebreather mask at 10-15 L/minute. If unavailable give oxygen via face mask at 6-10 L/minute.
  - Monitor O₂ saturation (pulse oximeter), cardiac monitoring, and vital signs.
  - If patient is able to swallow safely, observe and give oral glucose:
    - 15 grams of glucose tablets, 15 grams of 40% oral Dextrose gel, or ½ cup or 4 ounces of fruit juice
  - If patient is unable to swallow safely and:
    - IV access is available:
      - Dextrose 50% IV (0.5 – 1 mL/kg) over 2 minutes OR
      - Dextrose 10% IV (2-4 mL/kg) over 2 minutes
    - IV access is not available:
      - Glucagon 0.03 mg/kg (maximum dose of 1 mg) IM or subcutaneous
  - Continue on maintenance IV fluids with Dextrose 10%
  - Recheck blood sugar 15 minutes following intervention
  - May repeat intervention times one or until MERIT arrives

- **Anxiety** (Panic Attack)
  - Assess patient for developing signs and symptoms that may indicate another type of reaction
  - Monitor O₂ saturation (pulse oximeter), cardiac monitoring, and vital signs
  - If no identifiable manifestations and normal oxygenation, consider this diagnosis
  - Page Child Life: 713-404-5746

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**TREATMENT**

- **Hypoglycemia** (blood glucose less than 70 mg/dL)
  - Call MERIT if not resolved within 5-15 minutes:
    - Call Primary Team
    - Call MERIT if clinically indicated

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**Note:** See Appendix A on page 7 for Reaction Rebound Prevention

**Note:** Epinephrine may be used IM, Subcutaneous (in order of preference) 0.01 mg/kg (0.01 mL/kg dose of 1:1,000 solution) for mild reactions, or IV 0.01 mg/kg (0.1 mL/kg dose of 1:10,000 solution) for moderate and severe reactions.
This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson’s specific patient population; MD Anderson’s services and structure; and MD Anderson’s clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

APPENDIX A: Reaction Rebound Prevention

<table>
<thead>
<tr>
<th>Drug</th>
<th>Recommended Dose</th>
<th>Daily Maximum dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrocortisone (Solu-Cortef)</td>
<td>5 mg/kg IV; administer over 1-2 minutes</td>
<td>200 mg per day</td>
</tr>
<tr>
<td>Methylprednisolone (Solu-Medrol)</td>
<td>1 mg/kg IV; administer over 1-2 minutes</td>
<td>40 mg per day</td>
</tr>
</tbody>
</table>

NOTE: While IV corticosteroids may help prevent a short-term recurrence of an allergic-like reaction, they are not useful in the acute treatment of any reaction. However, these may be considered for patients having severe allergic-like manifestations prior to transportation to an emergency department of inpatient unit.
**Mild Reactions**

Signs and symptoms appear self-limited without evidence of progression (e.g., limited urticaria with mild pruritis, transient nausea, one episode of emesis) and include:

<table>
<thead>
<tr>
<th>Allergic-like</th>
<th>Physiologic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited urticaria/pruritus</td>
<td>Limited nausea/vomiting</td>
</tr>
<tr>
<td>Limited cutaneous edema</td>
<td>Transient flushing/warmth/chills</td>
</tr>
<tr>
<td>Limited “itchy”/“scratchy” throat</td>
<td>Headache/dizziness/anxiety/altered taste</td>
</tr>
<tr>
<td>Nasal congestion</td>
<td>Mild hypertension</td>
</tr>
<tr>
<td>Sneezing/conjunctivitis/rhinorrhea</td>
<td>Vasovagal reaction that resolves spontaneously</td>
</tr>
</tbody>
</table>

**Moderate Reactions**

Signs and symptoms are more pronounced and commonly require medical management. Some of these reactions have the potential to become severe if not treated and include:

<table>
<thead>
<tr>
<th>Allergic-like</th>
<th>Physiologic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diffuse urticaria/pruritus</td>
<td>Protracted nausea/vomiting</td>
</tr>
<tr>
<td>Diffuse erythema, stable vital signs</td>
<td>Hypertensive urgency</td>
</tr>
<tr>
<td>Facial edema without dyspnea</td>
<td>Isolated chest pain</td>
</tr>
<tr>
<td>Throat tightness or hoarseness without dyspnea</td>
<td>Vasovagal reaction that requires and is responsive to treatment</td>
</tr>
<tr>
<td>Wheezing/bronchospasm, mild or no hypoxia</td>
<td></td>
</tr>
</tbody>
</table>

**Severe Reactions**

Signs and symptoms are often life-threatening and can result in permanent morbidity of death if not managed appropriately and severe reactions include:

<table>
<thead>
<tr>
<th>Allergic-like</th>
<th>Physiologic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diffuse edema, or facial edema with dyspnea</td>
<td>Vasovagal reaction resistant to treatment</td>
</tr>
<tr>
<td>Diffuse erythema with hypotension</td>
<td>Arrhythmia</td>
</tr>
<tr>
<td>Laryngeal edema with stridor and/or hypoxia</td>
<td>Convulsions, seizures</td>
</tr>
<tr>
<td>Wheezing/bronchospasm, significant hypoxia</td>
<td>Hypertensive emergency</td>
</tr>
<tr>
<td>Anaphylactic shock (hypotension plus tachycardia)</td>
<td></td>
</tr>
</tbody>
</table>

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1 Cardiopulmonary arrest is a nonspecific end-stage result that can be caused by a variety of the following severe reactions, both allergic-like and physiologic; if it is unclear what etiology caused the cardiopulmonary arrest, it may be judicious to assume the reaction is/was an allergic-like one. Pulmonary edema is a rare severe reaction that can occur in patients with tenuous cardiac reserve (cardiogenic pulmonary edema) or in patients with normal cardiac function (noncardiogenic pulmonary edema). Noncardiogenic pulmonary edema can be allergic-like or physiologic; if the etiology is unclear; it may be judicious to assume that the reaction is/was an allergic-like one.
SUGGESTED READINGS


This practice consensus algorithm is based on majority expert opinion of the Contrast Media Reaction Work Group at the University of Texas MD Anderson Cancer Center. It was developed using a multidisciplinary approach that included input from the following core group members:

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