Any signs or symptoms of hypersensitivity reaction/allergic reaction, notify Radiologist and MERIT/Pediatric Intensive Care Service (PICS) (x5-0570) as appropriate.

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

Note: Page 1 of this algorithm is intended for Providers; subsequent pages (2-8) are for both Providers and Nurses

PREVIOUS HISTORY OF REACTIONS

No IV contrast and consider non-contrast/alternate study

PROPHYLACTIC TREATMENT

No IV contrast and consider non-contrast/alternate study

Consider non-contrast/alternate study or follow with management below as clinically indicated:

13 hours prior to procedure and 7 hours prior to procedure:

- Prednisone\(^1\) 0.5-0.7 mg/kg (maximum 50 mg/dose) PO or
- Hydrocortisone\(^2\) 0.5-1 mg/kg (maximum 100 mg/dose) IV

In addition give 1 hour prior to procedure:

- Prednisone\(^1\) 0.5-0.7 mg/kg (maximum 50 mg/dose) PO or
- Hydrocortisone\(^2\) 0.5-1 mg/kg (maximum 100 mg/dose) IV and
- Diphenhydramine 1.25 mg/kg (maximum 50 mg/dose) PO or 0.5-1 mg/kg (maximum 50 mg/dose) IV

If emergency procedure required and patient has previous history of mild to moderate reaction:

- Consider non-contrast/alternate study or
- Hydrocortisone\(^2\) 0.5-1 mg/kg (maximum 100 mg/dose) IV every 4 hours until procedure is completed and
- Diphenhydramine 0.5-1 mg/kg (maximum 50 mg/dose) IV, 1 hour prior to procedure

If allergy or contraindications to steroids or in an emergency, premedicate with diphenhydramine 1.25 mg/kg (maximum 50 mg/dose) PO or 0.5-1 mg/kg (maximum 50 mg/dose) IV, 30 to 60 minutes prior to procedure

1 High risk factors include patients with previous anaphylactic reactions to food or medication

2 Caution use of steroids in patients receiving Chimeric Antigen Receptor (CAR)-T cell therapy, uncontrolled hypertension, diabetes, tuberculosis, systemic fungal infections, peptic ulcer disease, neutropenic colitis or diverticulitis. If allergic, contact primary physician. If patient has received CAR-T cell therapy (as denoted in the patient banner in the EHR), contact Pediatric Stem Cell Transplant service.
Pediatric Management of Contrast Media Reactions

Any signs or symptoms of hypersensitivity reaction/allergic reaction, **notify Radiologist and MERIT/Pediatric Intensive Care Service (PICS) (x5-0570) as appropriate.** If a patient is unresponsive at any point, call a “**code**” as appropriate.

**PRESENTING SYMPTOMS**

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

**TREATMENT**

- **Stop infusion** of contrast and hold procedure until symptoms have improved
  - For mild to moderate itching, consider:
    - Diphenhydramine 1 mg/kg (maximum 50 mg/dose) IV push over 5 minutes

- **Stop infusion** of contrast and hold procedure
  - Stay with patient to monitor symptoms, check SpO\textsubscript{2} continuously, and obtain vital signs
  - Give:
    - Epinephrine (1 mg/mL) 0.01 mg/kg (maximum 0.5 mg/dose) IM\textsuperscript{2}, followed by
    - Hydrocortisone 2 mg/kg (maximum 100 mg/dose) IV push over 30 seconds, followed by
    - Diphenhydramine 1 mg/kg (maximum 50 mg/dose) IV push over 5 minutes

- Patient symptoms resolved or stable within 5 minutes?
  - Yes
  - No
    - Call MERIT and PICS Teams

- Patient symptoms improve within 5 minutes?
  - Yes
  - No
    - Continue monitoring and provider to consider transfer to appropriate level of care
    - Consider calling MERIT Team

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

1 For Categories of Acute Reactions to Contrast Media see Page 8
2 Administer epinephrine IM into the antero-lateral mid-third portion of the thigh. Administration via IM route is preferred regardless of platelet count.
Any signs or symptoms of hypersensitivity reaction/allergic reaction, notify Radiologist and MERIT/Pediatric Intensive Care Service (PICS) (x5-0570) as appropriate. If a patient is unresponsive at any point, call a “code” as appropriate.

**Symptoms**

**Treatments**

- **Hypotension** with bradycardia/vasovagal reaction (responsive patient)
  - Airway positioning to ensure patency and suction as needed.
  - Initiate oxygen via non-rebreather mask at 10 L/minute and titrate up to 15 L/minute to maintain oxygen saturation ≥ 92%.
  - Ensure IV access
  - Call MERIT Team
  - Place on cardiopulmonary monitoring and check vital signs
  - Elevate legs ≥ 60º (preferred) or Trendelenburg position
  - Keep patient warm
  - Give of sodium chloride 0.9% (NS) 20 mL/kg IV via rapid infusion (push-pull technique)

- **Hypotension** with tachycardia
  - Airway positioning to ensure patency and suction as needed.
  - Initiate oxygen via non-rebreather mask at 10 L/minute and titrate up to 15 L/minute to maintain oxygen saturation ≥ 92%.
  - Ensure IV access
  - Call MERIT Team
  - Place on cardiopulmonary monitoring and check vital signs
  - Elevate legs ≥ 60º (preferred) or Trendelenburg position
  - Keep patient warm
  - Give of sodium chloride 0.9% (NS) 20 mL/kg IV via rapid infusion (push-pull technique)
  - Give epinephrine (1 mg/mL) 0.01 mg/kg (maximum 0.5 mg/dose) IM
  - Verify the MERIT Team was contacted
  - Continue monitoring and consider transfer to appropriate level of care

- **Hypotension** (unresponsive patient)
  - Airway positioning to ensure patency and suction as needed.
  - Initiate oxygen via non-rebreather mask at 10 L/minute and titrate up to 15 L/minute to maintain oxygen saturation ≥ 92%.
  - Ensure IV access
  - Call MERIT Team
  - Place on cardiopulmonary monitoring and check vital signs
  - Elevate legs ≥ 60º (preferred) or Trendelenburg position
  - Keep patient warm
  - Give of sodium chloride 0.9% (NS) 20 mL/kg IV via rapid infusion (push-pull technique)
  - Give epinephrine (1 mg/mL) 0.01 mg/kg (maximum 0.5 mg/dose) IM
  - Verify the MERIT Team was contacted
  - Call MERIT Team
  - Place on cardiopulmonary monitoring and check vital signs
  - Call PICS Team
  - If symptoms persist/progress, provider to consider repeating epinephrine every 5 minutes

Note: See Appendix A on Page 7 for Reaction Rebound Prevention

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**Disclaimer:** This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient's care. This algorithm should not be used to treat pregnant women.

---

1. Hypotension is defined as:
   - Age 0 – 28 days: SBP < 60 mmHg
   - Age 1 – 10 years: SBP < [70 + (2 x age in years)] mmHg

2. Bradycardia is defined as:
   - Age 0 – 1 year: < 100 bpm
   - Age 2 – 4 years: < 80 bpm

3. In patients with myocardial dysfunction or history of dysfunction, provider to consider normal saline 5-10 mL/kg while continuously monitoring for signs of fluid overload and calling MERIT and PICS Teams

4. Administer epinephrine IM into the antero-lateral mid-third portion of the thigh. Administration via IM route is preferred regardless of platelet count

5. Tachycardia is defined as:
   - Age 0 – 12 months: HR > 160 bpm
   - Age 1 – 10 years: HR > 120 bpm
   - Age 10 – 17 years: HR > 110 bpm

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Department of Clinical Effectiveness V4
Approved by the Executive Committee of the Medical Staff on 07/08/2019
Pediatric Management of Contrast Media Reactions

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient’s care. This algorithm should not be used to treat pregnant women.

Any signs or symptoms of hypersensitivity reaction/allergic reaction, notify Radiologist and MERIT/Pediatric Intensive Care Service (PICS) (x5-0570) as appropriate. If a patient is unresponsive at any point, call a “code” as appropriate.

### PRESENTING SYMPTOMS

- **Respiratory distress (responsive patient)**
  - Airway positioning to ensure patency and suction as needed. Initiate oxygen via non-rebreather mask at 10 L/minute and titrate up to 15 L/minute to maintain oxygen saturation ≥ 92%.
  - Ensure IV access
  - Call MERIT and PICS Teams
  - Place on cardiopulmonary monitoring and check vital signs
  - Give epinephrine (1 mg/mL) 0.01 mg/kg (maximum 0.5 mg/dose) IM. may repeat once in 5 minutes if no improvement

- **Pulmonary edema as diagnosed by provider**
  - Obtain order from provider to give furosemide 1 mg/kg (maximum 40 mg/dose) IV over 2 minutes
  - Patient symptoms improve within 5 minutes?
    - Yes
      - Verify the MERIT Team and PICS were contacted
      - Continue monitoring and consider transfer to appropriate level of care
    - No
      - Verify the MERIT Team was contacted and PICS Team
      - Call code as appropriate

- **Bronchospasm (wheezing) as diagnosed by provider**
  - Obtain provider order to give:
    - Albuterol 0.63 mg nebulized
    - Methylprednisolone 1 mg/kg (maximum 40 mg/dose) IV push over 5 minutes
  - Patient symptoms improve within 5 minutes?
    - Yes
      - Verify the MERIT Team was contacted
      - Continue monitoring
      - Consider transfer to appropriate level of care
    - No
      - Verify the MERIT Team and PICS were contacted
      - Call Code Team as appropriate
      - Continue monitoring and consider transfer to appropriate level of care

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1. **Note:** See Appendix A on Page 7 for Reaction Rebound Prevention

1. **Administer epinephrine IM into the antero-lateral mid-third portion of the thigh. Administration via IM route is preferred regardless of platelet count.
Pediatric Management of Contrast Media Reactions

Any signs or symptoms of hypersensitivity reaction/allergic reaction, notify Radiologist and MERIT/Pediatric Intensive Care Service (PICS) (x5-0570) as appropriate.

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

**PRESENTING SYMPTOMS**

- **Facial/laryngeal edema (stridor)**
  - Airway positioning to ensure patency and suction as needed. Initiate oxygen via non-rebreather mask at 10 L/minute and titrate up to 15 L/minute to maintain oxygen saturation ≥ 92 %. Ensure IV access.
  - Call Code, PICS Team, and STAT Airway Team
  - Place on cardiopulmonary monitoring and check vital signs
  - Give epinephrine (1 mg/mL) 0.01 mg/kg (maximum 0.5 mg/dose) IM\(^1\); may repeat once in 5 minutes if no improvement
  - Provider to consider dexamethasone 0.5 mg/kg (maximum 10 mg/dose) IV push over 1 minute
  - Provider to consider racemic epinephrine (2.25%) 0.05-0.1 mL/kg (maximum 0.5 mL/dose) nebulized; may repeat in 20 minutes
  - Note: If facial edema is mild and reaction does not progress, provider to consider diphenhydramine 1-2 mg/kg (maximum 50 mg/dose) IV push over 5 minutes and observe

- **Seizures/convulsions**
  - Airway positioning to ensure patency, turn patient on side to avoid aspiration and suction as needed. Consider calling STAT Airway Team if airway is compromised.
  - Initiate oxygen via non-rebreather mask at 10 L/minute and titrate up to 15 L/minute to maintain oxygen saturation ≥ 92 %. Ensure IV access.
  - Place on cardiopulmonary monitoring and check vital signs
  - If seizure activity greater than 1 minute, obtain provider order for lorazepam 0.05-0.1 mg/kg (maximum 4 mg/dose) IV; may repeat in 10 minutes
  - If no IV access, obtain provider order for diazepam gel rectally (note-round dose to nearest 2.5 mg, not to exceed 20 mg/dose)
    - 2-5 years: 0.5 mg/kg
    - 6-11 years: 0.3 mg/kg
    - 12 years and older: 0.2 mg/kg
  - Call Code and PICS Teams
  - Ensure STAT labs\(^2\) are drawn

Note: See Appendix A on Page 7 for Reaction Rebound Prevention

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\(^1\) Administer epinephrine IM into the antero-lateral mid-third portion of the thigh. Administration via IM route is preferred regardless of platelet count.

\(^2\) STAT labs: CBC, basic metabolic panel with total calcium, capillary blood glucose, and venous blood gas (VBG)
Any signs or symptoms of hypersensitivity reaction/allergic reaction, notify Radiologist and MERIT/Pediatric Intensive Care Service (PICS) (x5-0570) as appropriate.

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

**PRESENTING SYMPTOMS**

- Hypoglycemia (blood glucose < 70 mg/dL)
  - See Hypoglycemia Management algorithm
- Anxiety (panic attack)
  - Assess patient for developing signs and symptoms that may indicate another type of reaction
  - Place on cardiopulmonary monitoring and check vital signs
  - If no identifiable manifestations and normal oxygenation, consider this diagnosis
  - Page Child Life: 713-404-5746

If not resolved within 15 minutes:
- Call Primary Team
- Call MERIT if clinically indicated

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

<table>
<thead>
<tr>
<th>Drug</th>
<th>Recommended Dose</th>
<th>Daily Maximum Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dexamethasone (Decadron®)</td>
<td>0.5 mg/kg IV; administer over 1-4 minutes</td>
<td>10 mg per day</td>
</tr>
<tr>
<td>Hydrocortisone (Solu-CORTEF®)</td>
<td>5 mg/kg IV; administer over 30 seconds</td>
<td>200 mg per day</td>
</tr>
<tr>
<td>Methylprednisolone (SOLU-Medrol®)</td>
<td>1 mg/kg IV; administer over 5 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 or inpatient unit.
# CATEGORIES OF ACUTE REACTIONS

### 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. 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 without 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 with 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


Pediatric Management of Contrast Media Reactions

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DEVELOPMENT CREDITS

This practice consensus statement is based on majority opinion of the Contrast Media Reaction Work Group at the University of Texas MD Anderson Cancer Center. These experts included:

Jose Antonio Cortes, MD (Pediatrics)†
Maria Cristina Diaz, EdD(c), MS, RN, CNOR (Nursing Education)
Olga N. Fleckenstein*
Yu-Fan Ma, MSN, RN, CRN (Nursing)
Maria Estela Mireles, PharmD (Pharmacy Clinical Programs)
Ajaykumar Morani, MD, MBBS (Diagnostic Radiology - Body Imaging)†
Amy Pai, PharmD*
Beatriz Rozo, MSN, RN, CPNP (Pediatrics)
Danna G. Stone, MBA, BSN, RN, CRN (Diagnostic Imaging - Nursing)
Sireesha Yedururi, MBBS (Diagnostic Radiology - Body Imaging)

† Core Development Team Leads
* Clinical Effectiveness Development Team