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.

**PREVIOUS HISTORY OF REACTIONS**

- **Previous history of contrast allergy or high-risk¹ of contrast allergy?**
  - Yes
    - Previous anaphylactic or severe reaction to any contrast media?
      - Yes
        - Consider non-contrast/alternate study or follow with management below as clinically indicated:
          - **PROPHYLACTIC TREATMENT**
            - 13 hours prior to procedure and 7 hours prior to procedure:
              - Prednisone² 0.5-0.7 mg/kg (maximum 50 mg/dose) PO or
              - Hydrocortisone² 0.5-1 mg/kg (maximum 100 mg/dose) IV
              - In addition give 1 hour prior to procedure:
                - Prednisone² 0.5-0.7 mg/kg (maximum 50 mg/dose) PO or
                - Hydrocortisone² 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
            - Hydrocortisone² 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
        - Continue with scheduled procedure
      - No
        - No IV contrast and consider non-contrast/alternate study
    - No
      - Continue with scheduled 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.

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

Department of Clinical Effectiveness V3

Approved by The Executive Committee of the Medical Staff on 11/27/2018
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**PRESENTING SYMPTOMS**

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

**TREATMENT**

- **Stop infusion** of contrast and hold procedure until symptoms have improved
- For mild to moderate itching, consider:
  - Diphenhydramine 1-2 mg/kg (maximum 50 mg/dose) IV push over 5 minutes
- If the study has not been completed earlier, consider completing the imaging study if symptoms resolved and patient stable
- Continue monitoring and transfer to appropriate level of care or consider discharge

- **Stop infusion** of contrast and hold procedure
- Place on cardiopulmonary monitoring and check vital signs
- Give:
  - Epinephrine (1:1,000) 0.01 mL/kg (maximum 0.5 mL/dose) IV push\(^1\) over 5 minutes every 5 minutes, followed by
  - Hydrocortisone 2 mg/kg (maximum 100 mg/dose) IV push over 30 seconds, followed by
  - Diphenhydramine 1-2 mg/kg (maximum 50 mg/dose) IV push over 5 minutes
- Continue monitoring and consider transfer to appropriate level of care
- Consider calling MERIT Team
- Call MERIT and PICS Teams

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1. If IV access is not available, may administer epinephrine IM into the antero-lateral mid-third portion of the thigh

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

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

- Airway positioning to ensure patency and suction as needed.
- Initiate oxygen via non-rebreather mask at 10-15 L/minute (if unavailable give oxygen via face mask at 6-10 L/minute).
- Ensure IV access
- Call MERIT Team
- Place on cardiopulmonary monitoring and check vital signs
- Elevate legs 60 degrees or more (preferred) or Trendelenburg position
- Keep patient warm
- Give rapid infusion (push-pull technique) of normal saline or Lactated Ringer’s 20 mL/kg

**Hypotension with Tachycardia**

- Airway positioning to ensure patency and suction as needed.
- Initiate oxygen via non-rebreather mask at 10-15 L/minute (if unavailable give oxygen via face mask at 6-10 L/minute).
- Ensure IV access
- Call MERIT Team
- Place on cardiopulmonary monitoring and check vital signs
- Elevate legs 60 degrees or more (preferred) or Trendelenburg position
- Keep patient warm
- Give rapid infusion (push-pull technique) of normal saline or Lactated Ringer’s 20 mL/kg

**TREATMENT**

- Verify the MERIT Team was contacted
- Continue monitoring and consider transfer to appropriate level of care
- Initiate CPR if HR less than 60 bpm with poor perfusion
- Consider epinephrine (1:1,000) 0.01 mL/kg (maximum 0.5 mL/dose) IV push2 over 5 minutes
- For vasovagal reaction consider atropine 0.02 mg/kg (minimum dose 0.1 mg, maximum dose 0.5 mg) IV push
- Verify the MERIT Team was contacted
- Call Code Team as appropriate
- If symptoms persist/progres, may repeat epinephrine every 5 minutes

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1 In patients with myocardial dysfunction or history of dysfunction, give normal saline 5-10 mL/kg while continuously monitoring for signs of fluid overload and call MERIT and PICS Teams
2 If IV access is not available, may administer epinephrine IM into the anterolateral mid-third portion of the thigh

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

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**Presenting Symptoms**

- **Respiratory Distress (responsive patient)**
  - Airway positioning to ensure patency and suction as needed. Initiate oxygen via non-rebreather mask at 10-15 L/minute (if unavailable give oxygen via face mask at 6-10 L/minute).
  - Ensure IV access
  - Call MERIT and PICS Teams
  - Place on cardiopulmonary monitoring and check vital signs
  - Give epinephrine (1:1,000) 0.01 mL/kg (maximum 0.5 mL/dose) IV push1 over 5 minutes every 5 minutes

- **Pulmonary Edema**
  - Give furosemide 0.5-1 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
      - Call PICS Team
      - Call code as appropriate

- **Bronchospasm (wheezing)**
  - Give:
    - Albuterol 0.63 mg/3mL nebulized per Respiratory Therapy
    - 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
      - If symptoms persist/progress, may repeat epinephrine every 5 minutes

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1 If IV access is not available, may administer epinephrine IM into the antero-lateral mid-third portion of the thigh

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

PRESENTING SYMPTOMS

TREATMENT

Facial/Laryngeal Edema (stridor)
- Airway positioning to ensure patency and suction as needed. Initiate oxygen via non-rebreather mask at 10-15 L/minute (if unavailable, give oxygen via face mask at 6-10 L/minute). Ensure IV access.
- Call Code, PICS Team, and STAT Airway Team
- Place on cardiopulmonary monitoring and check vital signs
- Give epinephrine (1:1,000) 0.01 mL/kg (maximum 0.5 mL/dose) IV push\(^1\) over 5 minutes every 5 minutes
- Consider dexamethasone 0.5 mg/kg (maximum 10 mg/dose) IV push over 1-4 minutes
- 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, 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 10-15 L/minute (if unavailable give oxygen via face mask at 6-10 L/minute). Ensure IV access.
- Place on cardiopulmonary monitoring and check vital signs
- If seizure activity greater than 1 to 2 minutes give lorazepam 0.05-0.1 mg/kg (maximum 4 mg/dose) IV; may repeat in 10 minutes
- If no IV access, give diazepam gel rectally (note-round dose to nearest 2.5mg, 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

\(^1\) If IV access is not available, may administer epinephrine IM into the antero-lateral mid-third portion of the thigh
\(^2\) STAT labs: CBC, basic metabolic panel with total calcium, capillary blood glucose, and venous blood gas (VBG)
**TREATMENT**

● For all forms of hypoglycemia: secure IV access and airway

● Initiate oxygen via non-rebreather mask at 10-15 L/minute (if unavailable give oxygen via face mask at 6-10 L/minute)

● Monitor oxygen saturation (pulse oximetry), cardiac monitoring, and vital signs

● If patient has normal mental status and is able to swallow safely, give oral glucose and observe:
  ○ 15 grams of glucose tablets, 1 tube (15 g) of 40% oral dextrose gel, ½ cup (4 ounces) of fruit juice, or ¾ cup non-diet soda

● If patient has altered mental status or is unable to swallow safely and:
  ○ IV access is available:
    - Patients 5 kg and greater: dextrose 50% (1 mL/kg, maximum 25 mL) IV over 2 minutes or
    - Patients less than 5 kg: dextrose 10% (5 mL/kg) IV over 2 minutes
  ○ IV access is not available: give glucagon IM or subcutaneously:
    - Less than 25 kg: 0.5 mg
    - Greater than or equal to 25 kg: 1 mg
  ● Continue maintenance IV fluids with dextrose 10%
  ● Re-check blood sugar 15 minutes following intervention and then hourly when receiving maintenance dextrose IV fluids
  ● May repeat intervention until MERIT Team arrives

**PRESENTING SYMPTOMS**

**Hypoglycemia (blood glucose less than 70 mg/dL)**

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- Call MERIT
- Continue monitoring and consider transfer to appropriate level of care

**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

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If a patient is unresponsive at any point, call a “code” as appropriate.
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><strong>Allergic-like</strong></th>
<th><strong>Physiologic</strong></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><strong>Allergic-like</strong></th>
<th><strong>Physiologic</strong></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><strong>Allergic-like</strong></th>
<th><strong>Physiologic</strong></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

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