Memorial Sloan Kettering Cancer Center

Recognition and Treatment of Contrast Reactions in the Radiology Environment

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Disclosures

- None

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Objectives

- Rationale and background
- Pathophysiology
- Treatment
- Evaluation of process
- Plan to sustain and progress

Guiding Principle

No one should manage contrast reactions better than radiology

American College of Radiology

- Opportunity to update practice
- Followed the lead of the Mayo Clinic

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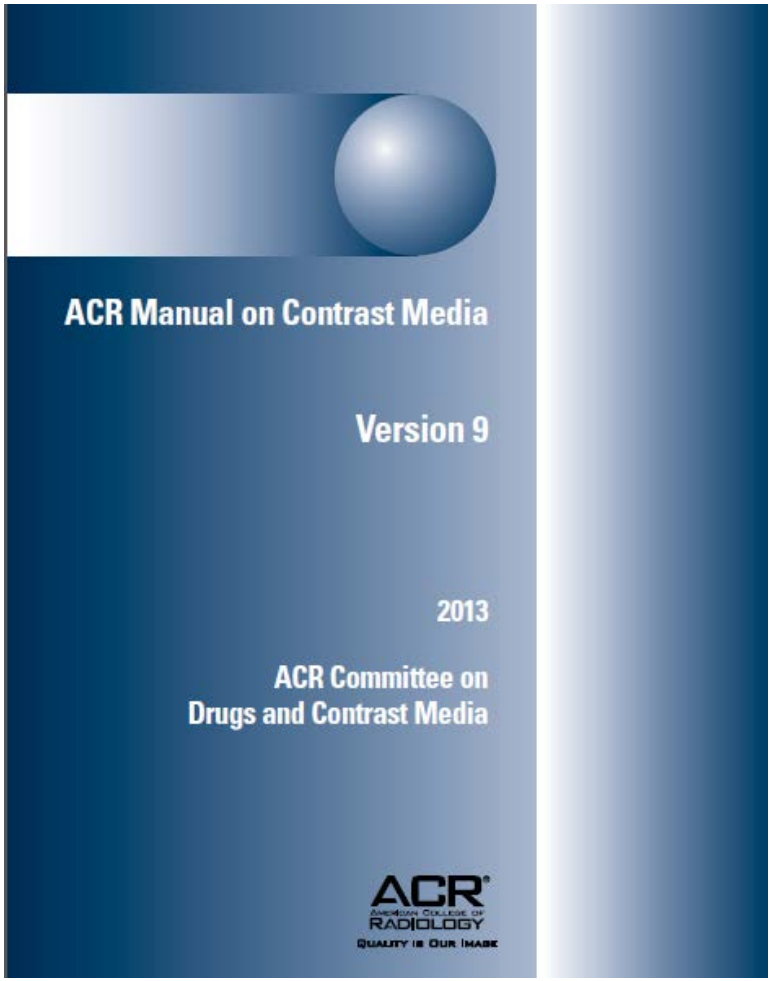
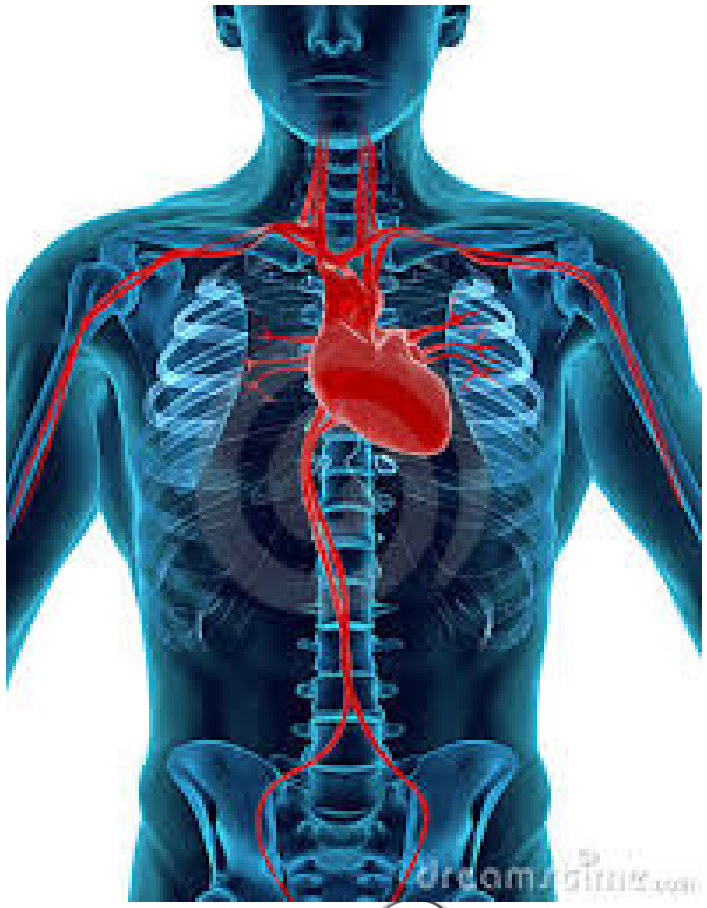


The Body's Response to Contrast

- Physiologic Effects
  - Cardiovascular
  - Neurovascular
  - Renal
  - Clotting cascade
- Adverse Effects
  - Anaphylactoid
  - Non-anaphylactoid

Physiologic Effects: Cardiovascular

- Bradycardia
- Decreased contractility
- Increased pulmonary arterial pressure

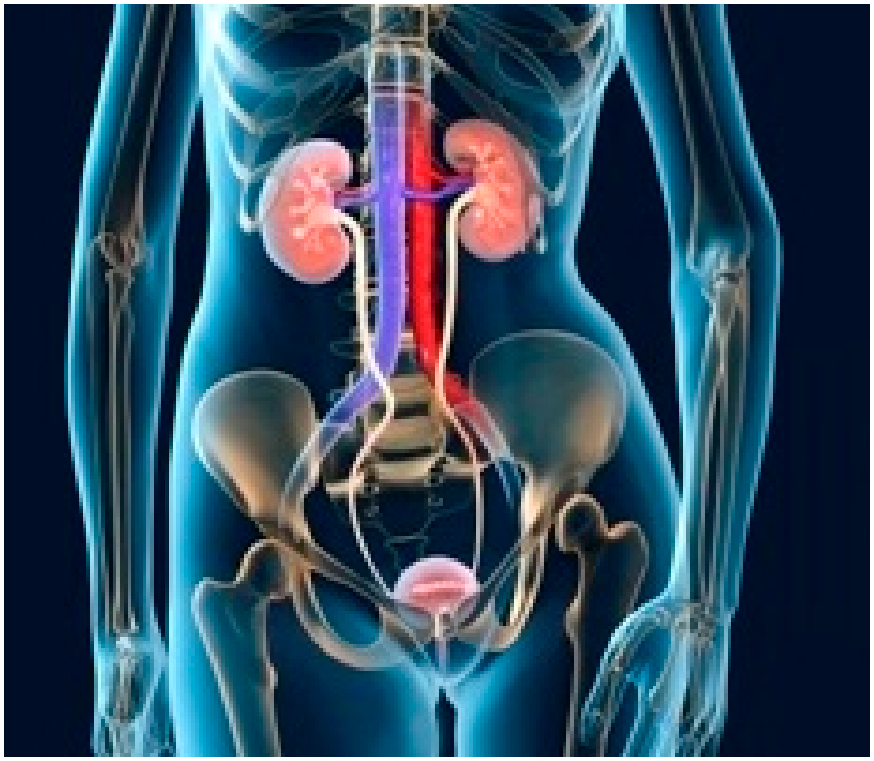


Physiologic Effects: Neurovascular

- Disruption of the blood-brain barrier
- Lowered seizure threshold

Physiologic Effects: Renal

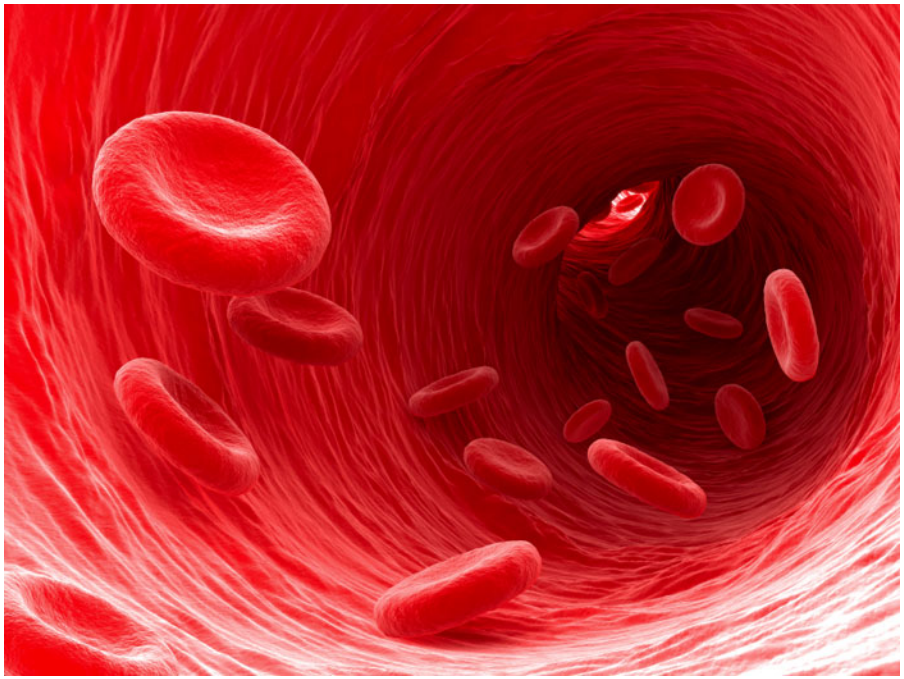
- Regional hypoxia
- Production of O_2 free radicals



Physiologic Effects Clotting Cascade

Paradoxical

- Inhibits platelets
- Toxicity to endothelium may cause thrombosis



Adverse Effects

- Anaphylactoid
- Non-anaphylactoid

Adverse Effects

- Anaphylaxis
  - Known Antigen
  - IgE mediated
  - Predictable
- Contrast media
  - Antigen?
  - Antibody?
  - Idiosyncratic

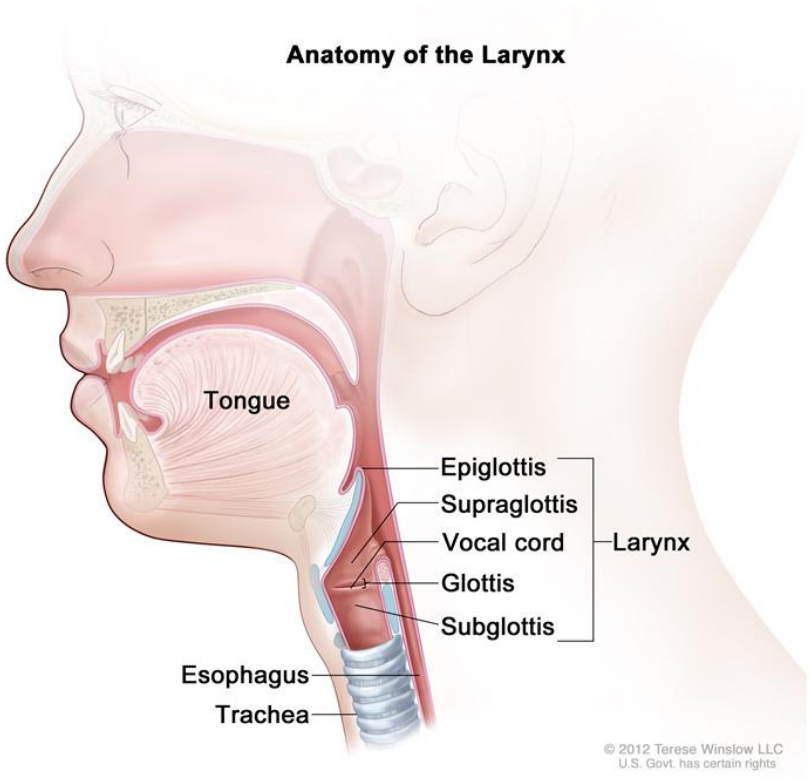
Same downstream effects with vasodilator release
and
identical clinical manifestations

Clinical Manifestation

- Cutaneous

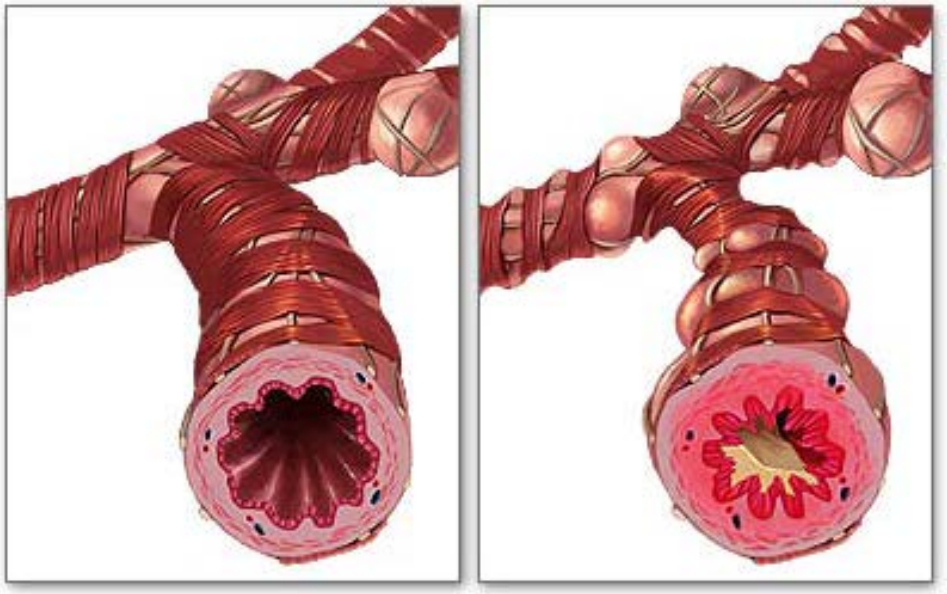
Clinical Manifestations

- Respiratory: Larynx



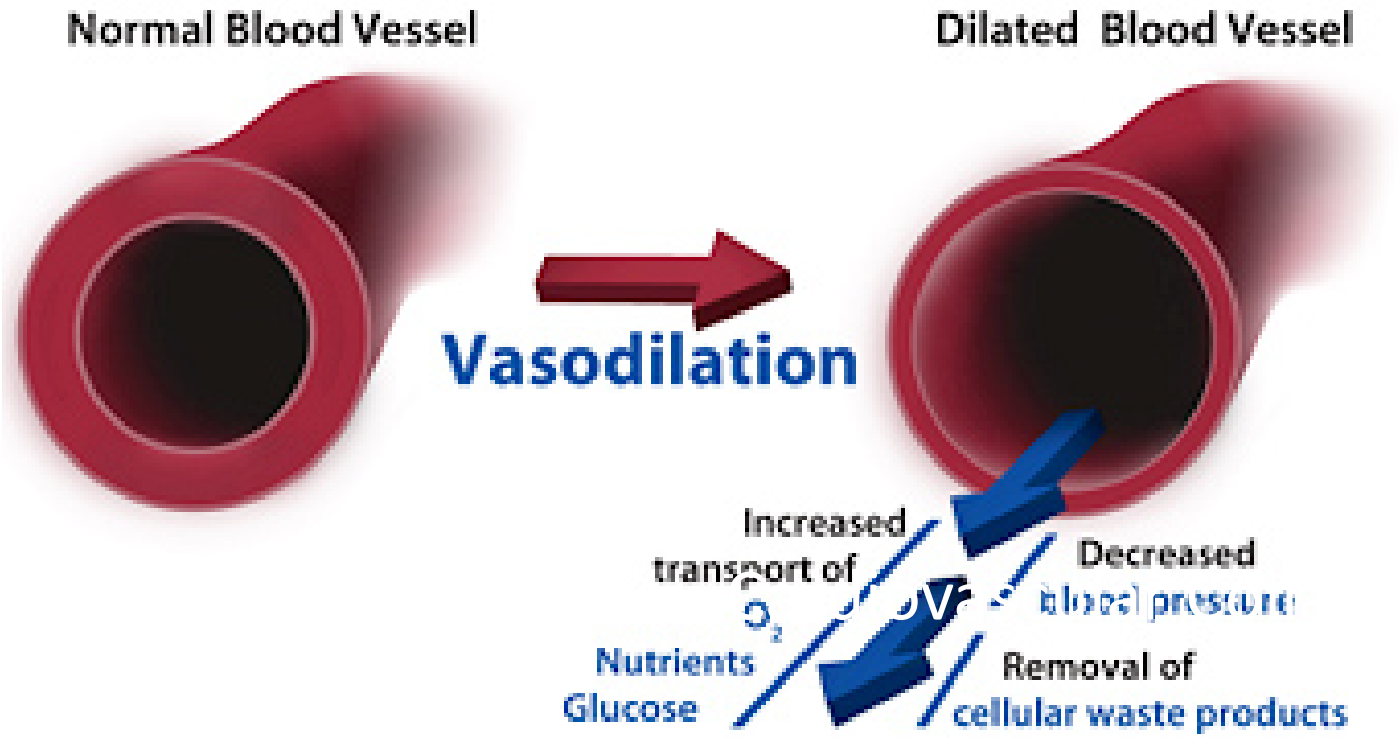
Clinical Manifestations

- Respiratory:
  Lower airways



Clinical Manifestations

- Cardiovascular:
  Peripheral vasculature



Adverse Effects
Non-Anaphylactoid

- Exaggerated physiologic effects
  - Nausea / Vomiting
- More predictable
- Vasovagal
  - Bradycardia with hypotension
- Combined reactions

Adverse Effects

- 70% reactions occur in first 5 minutes
- Majority of reactions are mild/self-limiting
- Severe reaction can have insidious onset
- Delayed reactions possible but unlikely

Management of Reactions

- Team approach

If a contrast reaction is suspected

1. Call for assistance of team members
2. Maintain IV
3. Increase IV fluids
4. Apply oxygen
5. Vital signs and pulse oximetry
6. Listen to lungs

Gauge severity

- Trust your judgment: How do they look?
- Do you need to escalate?
  - Rapid Response
  - Code
  - 911
- Have a low threshold for escalating
- Think ABCD while assessing

A is for…

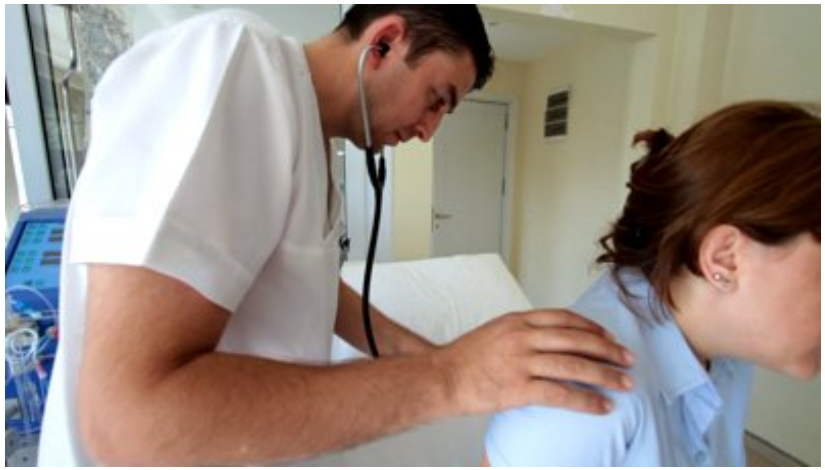
Airway

- Can they speak?
- How do they sound?
  - Is there a change in their voice?
  - Are they using full sentences?
  - Do they seem in distress?

B is for…

Breathing

- Auscultate
- What is their oxygen saturation?
- Is the amount of oxygen adequate?
- Do you hear wheezing, rales, or stridor?



C is for…

Circulation

- What is heart rate?
- Can you get a blood pressure?
  - Radial pulse present: SBP at least 80 mmHg
  - Femoral pulse: SBP at least 70 mmHg
  - Carotid pulse: SBP at least 60 mmHg

D is for....

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Common Diagnoses

- Cutaneous
  - Hives
  - Angioedema
  - Diffuse Erythema
- Respiratory
  - Bronchospasm
  - Laryngeal edema
  - Pulmonary edema
- Cardiovascular
  - Vasovagal reaction
  - Cardiovascular collapse
- "Other"
  - Anxiety reactions
  - Hypertensive crisis
  - Hypoglycemia
  - Rigors
  - Seizures

Cutaneous Reactions

Hives/Urticaria Signs

- Raised red welts
- May or may not be associated with pruritus

Hives/Urticaria Treatment

	Treatment	Dosing	Pre-medicate for future studies?
All forms	Preserve IV access		A
	Monitor vitals		
Mild (scattered and/or transient)	No treatment is often needed; however, if symptomatic, can consider:		
	Diphenhydramine (Benadryl)	25-50mg PO	
Moderate (more numerous/bothersome)	Consider diphenhydramine (Benadryl)	25-50mg PO	B
	Or		
	Consider diphenhydramine (Benadryl)	25-50mg IM or IVP (do not exceed 25 mg / min)	
Severe (widespread and/or progressive)	Consider diphenhydramine (Benadryl)	25-50 mg IM or IV (do not exceed 25 mg / min	B
	Can also consider Epinephrine (IM)	IM EpiPen or equivalent (0.3ml of 1:1,000 dilution, fixed); can repeat every 5-15 minutes up to three doses	

A: No need for premedication B: Premedicate prior to study C: Future contrast administration should be avoided

Diphenhydramine

- Do not drive after administration
- May cause dizziness, sedation, and hypotension especially in elderly patient
- Use with caution
  - Untreated narrow-angle glaucoma
  - Symptomatic prostatic hypertrophy
  - Bladder neck obstruction

Angioedema Signs

- Local swelling and erythema usually about the face, eyes, and mouth
- Affects mucous membranes

Angioedema Treatment

	Treatment	Dosing	Pre-medicate for future studies?
Mild/Moderate (serious situation, can progress to laryngeal edema)	Monitor airway and vitals		B
	O2	6 L/min nasal cannula or 100% non-rebreather face mask	
	Preserve IV access		
	Elevate head of bed, if possible		
	Consider diphenhydramine (Benadryl)	50mg PO	
	Or		
	Consider diphenhydramine (Benadryl)	50mg IM or IVP (do not exceed 25 mg / min)	
Severe	O2 by mask	100% non-rebreather (NRB) face mask	
	Epinephrine (IM)	IM EpiPen or equivalent (0.3ml of 1:1,000 dilution, fixed); can repeat every 5-15 minutes up to three times total	C
	Or		
	Epinephrine (IV)	Epinephrine (1:10,000)(0.1mg/ml): 0.1 – 0.3 mg IV slowly, repeat every 5-15 minutes as needed up to 1 mg total	

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Epinephrine

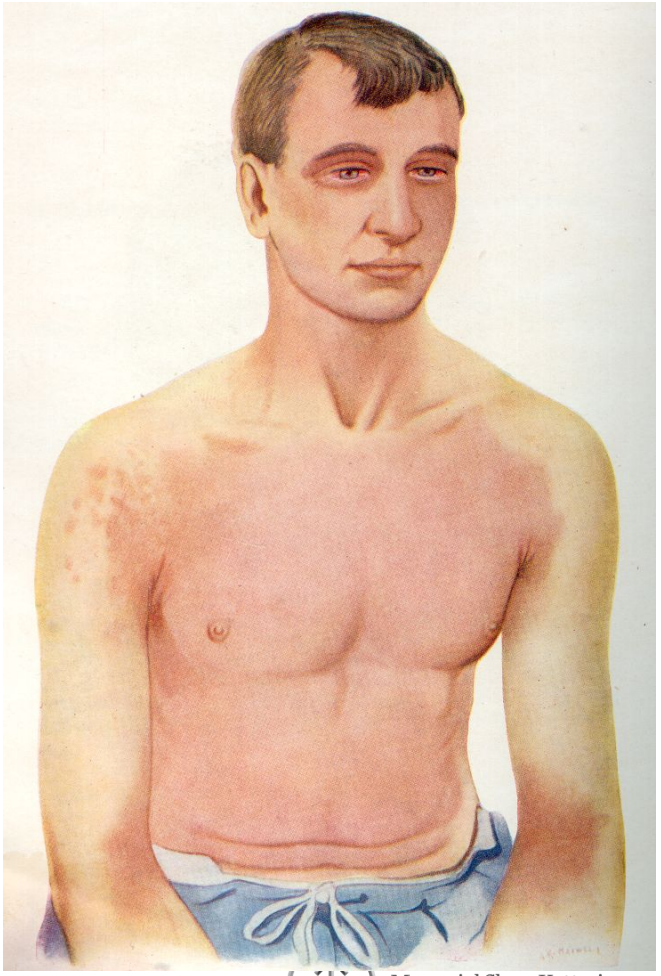
- Acts on alpha and beta receptors of sympathetic system
- Relaxes smooth muscles of bronchi
- Physiologic antagonist of histamine
- Increases blood flow and cardiac output

Epinephrine

- If you treat the patient with epinephrine, followup with post epinephrine protocol as per policy.
- IM will not work in setting of hypotension (cardiovascular collapse or pulselessness)
- Allergy to epinephrine – only a few cases worldwide

Diffuse Erythema Signs

- Often asymptomatic initially but at risk for hypotension
- "Lobster red" appearance



Diffuse Erythema Treatment

	Treatment	Dosing	Pre-medicate for future studies?
All forms	Preserve IV access		
	Monitor vitals		
	Pulse oximeter		
Mild – Normotensive	No other treatment usually needed. Monitor for progression.		B
	Consider diphenhydramine (Benadryl)	25-50mg PO	
	Or		
	Consider diphenhydramine (Benadryl)	25-50mg IM or IVP (do not exceed 25 mg / min)	
Moderate/Severe – Hypotensive	O2	6 L/min nasal cannula or 100% non-rebreather face mask	C
	IV fluids 0.9% normal saline	1,000 ml rapidly	
	Consider calling rapid response team or 911		
If profound or unchanged after fluid bolus can also consider	Epinephrine (IV)	Epinephrine (1:10,000)(0.1mg/ml): 0.1 – 0.3 mg IV slowly, repeat every 5-15 minutes as needed up to 1 mg total	
	Or (if no IV access available)		
	Epinephrine (IM)	IM EpiPen or equivalent (0.3ml of 1:1,000 dilution, fixed); can repeat every 10-15 minutes up to three times total	
Once stabilized and en route to ICU or ER	Consider steroid to prevent rebound in the post reaction period	Hydrocortisone 200mg IVP over 1-3 minutes	

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Respiratory reactions

Bronchospasm Signs

- Anxious patient
- Short of breath
- Often tachycardic
- Expiratory wheezing
- Or inspiratory and expiratory wheezing

Bronchospasm Treatment

All forms	Preserve IV access		
	Monitor vitals		
	Pulse oximeter		
	O2	6 L/min nasal cannula or 100% non-rebreather (NRB) face mask	
Mild	Beta agonist inhaler (Albuterol)	2 inhalations (90 mcg/inhalation) for a total of 180 mcg. Dose can be repeated: 2 to 4 inhalations orally every 10 minutes up to 4 hours. OR	B
		Albuterol inhalation solution 0.083% (2.5 mg/ 3 ml) nebulizer once. May repeat every 10 minutes for 6 doses.	
	Consider sending patient to the ER or calling emergency response team or 911, based upon the completeness of the response		
Moderate	Consider adding Epinephrine (IM)	IM EpiPen or equivalent (0.3ml of 1:1,000 dilution, fixed); can repeat every 5-15 minutes up to three times total	B
	Consider calling emergency response team or 911 based upon the completeness of the response		
Severe	Epinephrine (IV)	Epinephrine (1:10,000)(0.1mg/ml): 0.1 – 0.3 mg IV slowly, repeat every 5-15 minutes as needed up to 1 mg total	C
	Or (if no IV access available)		
	Epinephrine (IM)	IM EpiPen or equivalent (0.3ml of 1:1,000 dilution, fixed); can repeat every 5-15 minutes up to three times total	
	Call emergency response team or 911		

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Laryngeal Edema Signs

- Patient distress, often panicked
- Difficulty speaking – hoarse
- Difficulty swallowing
- **Inspiratory stridor**

Laryngeal Edema Treatment

	Treatment	Dosing	Pre-medicate for future studies?
All forms	Preserve IV access		C
	Monitor vitals		
	Pulse oximeter		
	Epinephrine (IV)	Epinephrine (1:10,000)(0.1mg/ml): 0.1 – 0.3 mg IV slowly, repeat every 5-15 minutes as needed up to 1 mg total	
	Or (if no IV access)		
	Epinephrine (IM)	IM EpiPen or equivalent (0.3ml of 1:1,000 dilution, fixed); can repeat every 5-15 minutes up to three times total	
	Call rapid response team or 911		
Once stabilized and en route to ICU or ER	Consider steroid to prevent rebound in the post reaction period	Hydrocortisone 200mg IVP over 1-3 minutes	

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Cardiovascular Reactions

Vasovagal Reaction Signs

- **Hypotension with bradycardia**
- Pale
- Diaphoretic
- Decreased level of consciousness

Vasovagal Reaction Treatment

Hypotension (systolic blood pressure <90 mmHg)

	Treatment	Dosing	Pre-medicate for future studies?
All forms	Preserve IV access		
	Monitor vitals		
	Pulse oximeter		
	O2 by mask	100% Non-rebreather (NRB) mask	
	Elevate legs at least 60 degrees		
	Consider IV fluids: 0.9% normal saline	1,000 mL rapidly	
Hypotension with bradycardia (pulse <60 bpm) Vasovagal reaction			
Mild	No other treatment usually necessary		A
Severe (patient remains symptomatic despite above measures)	In addition to above measures: Atropine (IV)	0.5 mg IVP; administer slowly, followed by saline flush; can repeat every 3-5 minutes up to 3mg total	C- If occurs after contrast
	Consider calling the emergency response team or 911		

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Cardiovascular Shock Signs

- **Hypotension with tachycardia**
- Possible diffuse erythema or pallor
- Thready, rapid pulse (>100 bpm)

Cardiovascular Shock Treatment

Hypotension (systolic blood pressure <90 mmHg)

	Treatment	Dosing	Pre-medicate for future studies?
All forms	Preserve IV access		
	Monitor vitals		
	Pulse oximeter		
	O2 by mask	100% Non-rebreather (NRB) mask	
	Elevate legs at least 60 degrees		
	Consider IV fluids: 0.9% normal saline	1,000 mL rapidly	
Hypotension with tachycardia (pulse > 100bpm) **Anaphylactoid reaction**			C
After above interventions, If hypotension persists	Epinephrine (IV)	Epinephrine (1:10,000)(0.1mg/ml): 0.1 – 0.3 mg IV slowly, repeat every 5-15 minutes as needed up to 1 mg total	
	Or (if no IV access)		
	Epinephrine (IM)	IM EpiPen or equivalent (0.3ml of 1:1,000 dilution, fixed); can repeat every 5-15 minutes up to three times total	
	Call emergency response team or 911		

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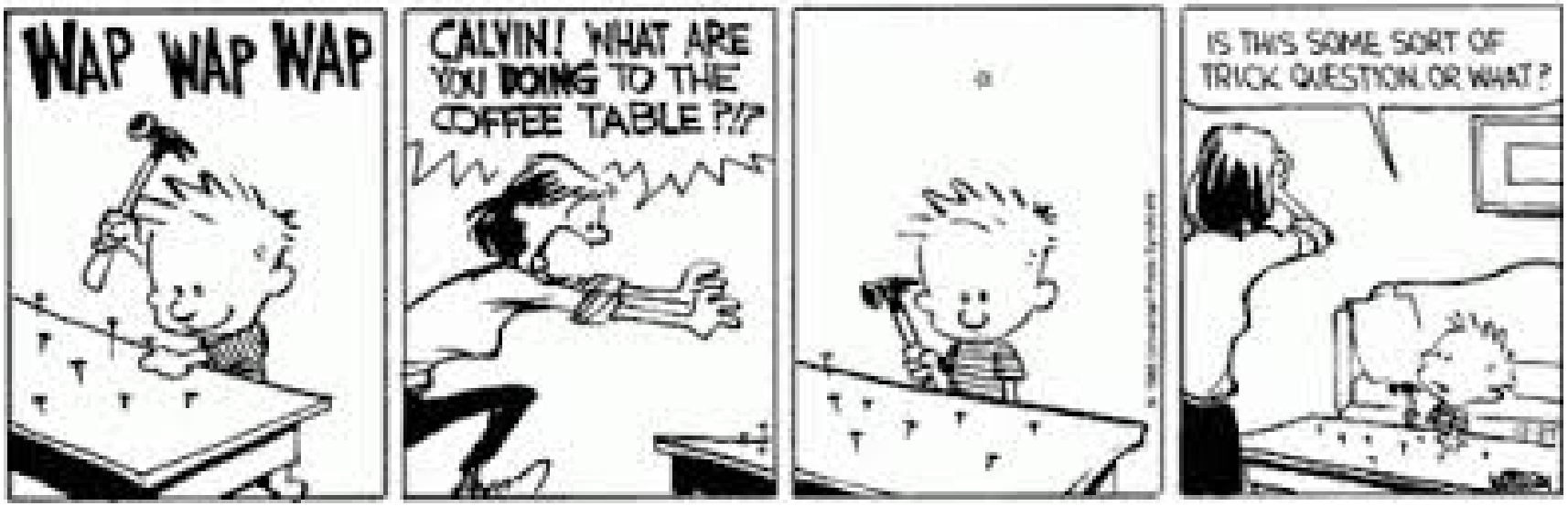
Other Reactions

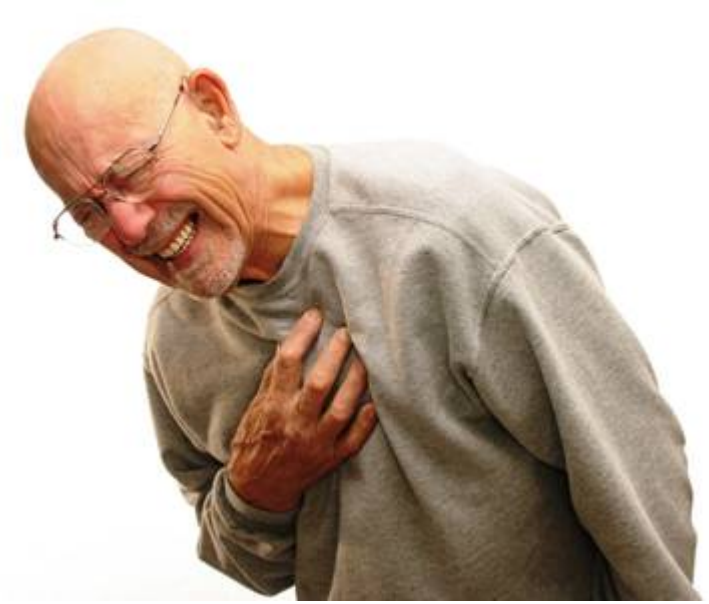


Anxiety Reaction Signs

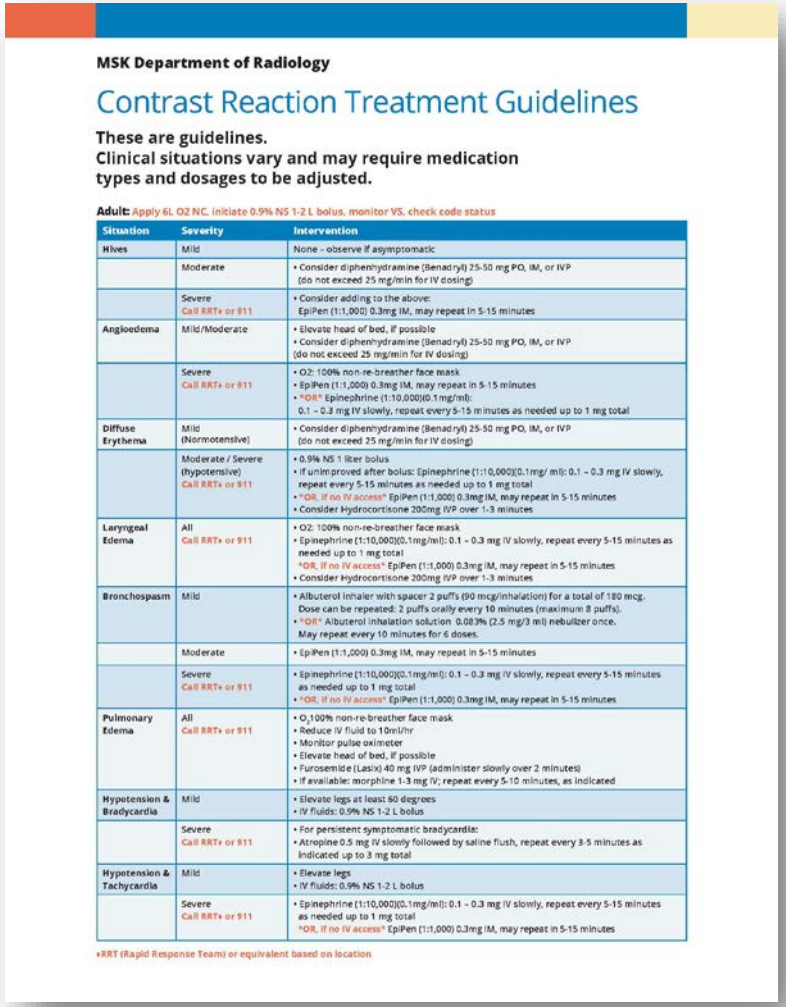
- Difficult to obtain history (Say yes to all symptoms)
- May hyperventilate
- Physical exam
  - Usually normal
  - May be tachycardic or tachypneic

Angina Pectoris Signs

- Chest pressure which may radiate to left arm or jaw
- Diaphoretic
- **Follow standard acute coronary syndrome protocol**



Pocket Guide and Wall Card



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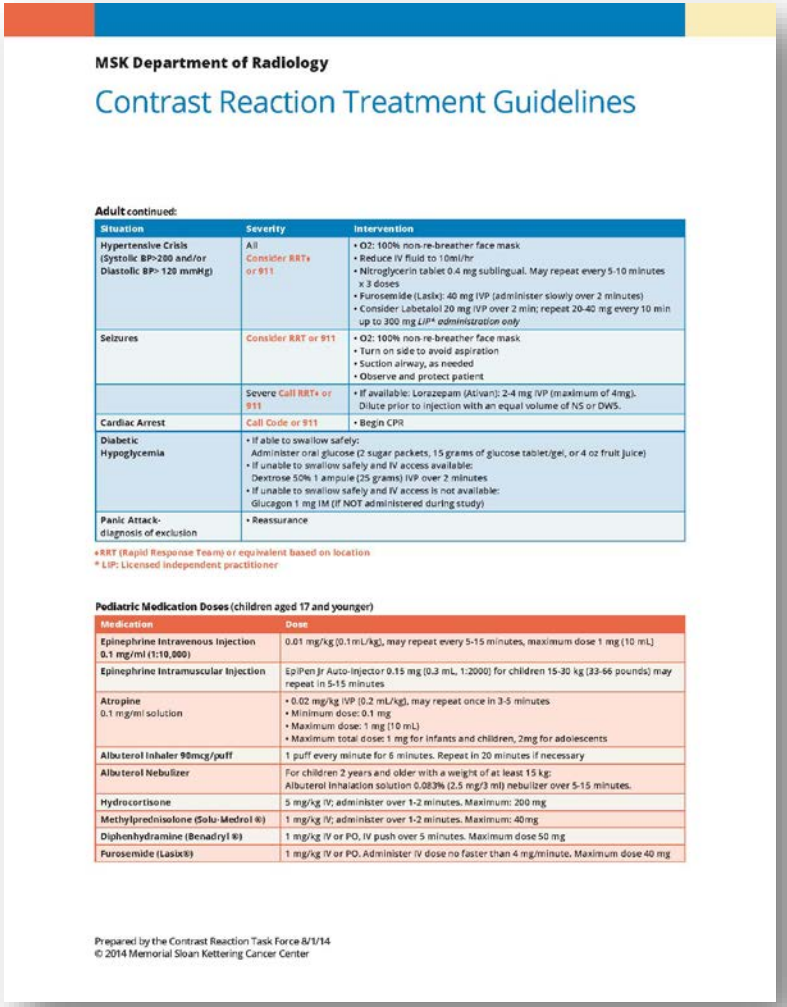
Contrast Reaction Treatment Guidelines

These are guidelines.
Clinical situations vary and may require medication types and dosages to be adjusted.

Adult: Apply 6L O2 NC, initiate 0.9% NS 1-2 L bolus, monitor VS, check code status

Situation	Severity	Intervention
Hives	Mild	None – observe if asymptomatic
	Moderate	• Consider diphenhydramine (Benadryl) 25-50 mg PO, IM, or IVP (do not exceed 25 mg/min for IV dosing)
	Severe Call RRT+ or 911	• Consider adding to the above: EpiPen (1:1,000) 0.3mg IM, may repeat in 5-15 minutes
Angioedema	Mild/Moderate	• Elevate head of bed, if possible • Consider diphenhydramine (Benadryl) 25-50 mg PO, IM, or IVP (do not exceed 25 mg/min for IV dosing)
	Severe Call RRT+ or 911	• O2: 100% non-re-breather face mask • EpiPen (1:1,000) 0.3mg IM, may repeat in 5-15 minutes • *OR* Epinephrine (1:10,000)(0.1 mg/ml): 0.1 – 0.3 mg IV slowly, repeat every 5-15 minutes as needed up to 1 mg total
Diffuse Erythema	Mild (Normotensive)	• Consider diphenhydramine (Benadryl) 25-50 mg PO, IM, or IVP (do not exceed 25 mg/min for IV dosing)
	Moderate / Severe (hypotensive) Call RRT+ or 911	• 0.9% NS 1 liter bolus • If unimproved after bolus: Epinephrine (1:10,000)(0.1mg/ ml): 0.1 – 0.3 mg IV slowly, repeat every 5-15 minutes as needed up to 1 mg total • *OR, if no IV access* EpiPen (1:1,000) 0.3mg IM, may repeat in 5-15 minutes • Consider Hydrocortisone 200mg IVP over 1-3 minutes
Laryngeal Edema	All Call RRT+ or 911	• O2: 100% non-re-breather face mask • Epinephrine (1:10,000)(0.1mg/ml): 0.1 – 0.3 mg IV slowly, repeat every 5-15 minutes as needed up to 1 mg total *OR, if no IV access* EpiPen (1:1,000) 0.3mg IM, may repeat in 5-15 minutes • Consider Hydrocortisone 200mg IVP over 1-3 minutes
Bronchospasm	Mild	• Albuterol inhaler with spacer 2 puffs (90 mcg/inhalation) for a total of 180 mcg. Dose can be repeated: 2 puffs orally every 10 minutes (maximum 8 puffs). • *OR* Albuterol inhalation solution 0.083% (2.5 mg/3 ml) nebulizer once. May repeat every 10 minutes for 6 doses.
	Moderate	• EpiPen (1:1,000) 0.3mg IM, may repeat in 5-15 minutes
	Severe Call RRT+ or 911	• Epinephrine (1:10,000)(0.1mg/ml): 0.1 – 0.3 mg IV slowly, repeat every 5-15 minutes as needed up to 1 mg total • *OR, if no IV access* EpiPen (1:1,000) 0.3mg IM, may repeat in 5-15 minutes
Pulmonary Edema	All Call RRT+ or 911	• O_2 100% non-re-breather face mask • Reduce IV fluid to 10ml/hr • Monitor pulse oximeter • Elevate head of bed, if possible • Furosemide (Lasix) 40 mg IVP (administer slowly over 2 minutes) • If available: morphine 1-3 mg IV; repeat every 5-10 minutes, as indicated
Hypotension & Bradycardia	Mild	• Elevate legs at least 60 degrees • IV fluids: 0.9% NS 1-2 L bolus
	Severe Call RRT+ or 911	• For persistent symptomatic bradycardia: • Atropine 0.5 mg IV slowly followed by saline flush, repeat every 3-5 minutes as indicated up to 3 mg total
Hypotension & Tachycardia	Mild	• Elevate legs • IV fluids: 0.9% NS 1-2 L bolus
	Severe Call RRT+ or 911	• Epinephrine (1:10,000)(0.1mg/ml): 0.1 – 0.3 mg IV slowly, repeat every 5-15 minutes as needed up to 1 mg total *OR, if no IV access* EpiPen (1:1,000) 0.3mg IM, may repeat in 5-15 minutes

+RRT (Rapid Response Team) or equivalent based on location



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Contrast Reaction Treatment Guidelines

Adult continued:

Situation	Severity	Intervention
Hypertensive Crisis (Systolic BP>200 and/or Diastolic BP> 120 mmHg)	All Consider RRT+ or 911	• O2: 100% non-re-breather face mask • Reduce IV fluid to 10ml/hr • Nitroglycerin tablet 0.4 mg sublingual. May repeat every 5-10 minutes x 3 doses • Furosemide (Lasix): 40 mg IVP (administer slowly over 2 minutes) • Consider Labetalol 20 mg IVP over 2 min; repeat 20-40 mg every 10 min up to 300 mg *LIP^ administration only*
Seizures	Consider RRT or 911	• O2: 100% non-re-breather face mask • Turn on side to avoid aspiration • Suction airway, as needed • Observe and protect patient
	Severe Call RRT+ or 911	• If available: Lorazepam (Ativan): 2-4 mg IVP (maximum of 4mg). Dilute prior to injection with an equal volume of NS or DW5.
Cardiac Arrest	Call Code or 911	• Begin CPR
Diabetic Hypoglycemia		• If able to swallow safely: Administer oral glucose (2 sugar packets, 15 grams of glucose tablet/gel, or 4 oz fruit juice) • If unable to swallow safely and IV access available: Dextrose 50% 1 ampule (25 grams) IVP over 2 minutes • If unable to swallow safely and IV access is not available: Glucagon 1 mg IM (if NOT administered during study)
Panic Attack- diagnosis of exclusion		• Reassurance

+RRT (Rapid Response Team) or equivalent based on location
* LIP: Licensed Independent practitioner

Pediatric Medication Doses (children aged 17 and younger)

Medication	Dose
Epinephrine Intravenous Injection 0.1 mg/ml (1:10,000)	0.01 mg/kg (0.1 mL/kg), may repeat every 5-15 minutes, maximum dose 1 mg (10 mL)
Epinephrine Intramuscular Injection	EpiPen Jr Auto-Injector 0.15 mg (0.3 mL, 1:2000) for children 15-30 kg (33-66 pounds) may repeat in 5-15 minutes
Atropine 0.1 mg/ml solution	• 0.02 mg/kg IVP (0.2 mL/kg), may repeat once in 3-5 minutes • Minimum dose: 0.1 mg • Maximum dose: 1 mg (10 mL) • Maximum total dose: 1 mg for infants and children, 2mg for adolescents
Albuterol Inhaler 90mcg/puff	1 puff every minute for 6 minutes. Repeat in 20 minutes if necessary
Albuterol Nebulizer	For children 2 years and older with a weight of at least 15 kg: Albuterol Inhalation solution 0.083% (2.5 mg/3 ml) nebulizer over 5-15 minutes.
Hydrocortisone	5 mg/kg IV; administer over 1-2 minutes. Maximum: 200 mg
Methylprednisolone (Solu-Medrol ®)	1 mg/kg IV; administer over 1-2 minutes. Maximum: 40mg
Diphenhydramine (Benadryl ®)	1 mg/kg IV or PO, IV push over 5 minutes. Maximum dose 50 mg
Furosemide (Lasix®)	1 mg/kg IV or PO. Administer IV dose no faster than 4 mg/minute. Maximum dose 40 mg

Prepared by the Contrast Reaction Task Force 8/1/14

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Premedication

- Not a substitute for preparedness and treatment
- Contrast reactions can occur despite premedication
- Steroids are not without risks

Premedication

- Previous severe reactions should not get contrast again
- Per ACR: "*It is most important to target premedication to those who, in the past, have had moderately severe or severe reactions requiring treatment*."
- No randomized controlled clinical trials have demonstrated premedication demonstrated protection against severe life threatening adverse reactions

Risks for Reactions

- History of asthma: ~3x for mild asthma
- Severely atopic individual: 2-3x
- History of shellfish allergy: No increase
- Vomiting after contrast is not an allergic reaction
- Iodine allergies are not possible

Premedication

- Category A:
  - No need for premedication
- Category B:
  - Premedicate prior to study
- Category C:
  - High risk, premedicate and scan only at a center with IV contrast available
  - The risk and benefit of future IV contrast administration should be carefully considered

Premedication

- IV steroids administered less than 4-6 hours prior to contrast injection have **not** been shown to be effective.
- Diphenhydramine (Benadryl®) 50 mg intravenously 1 hour before IV contrast

Premedication Regimen

- Lasser: Prednisone 50 mg orally
  - Plus diphenhydramine (Benadryl®) 50 mg , 1 hour before IV contrast
- Greenberger: Methylprednisolone (Medrol®) 32 mg orally
  - Optional diphenhydramine
- NPO: Hydrocortisone 200mg intravenously

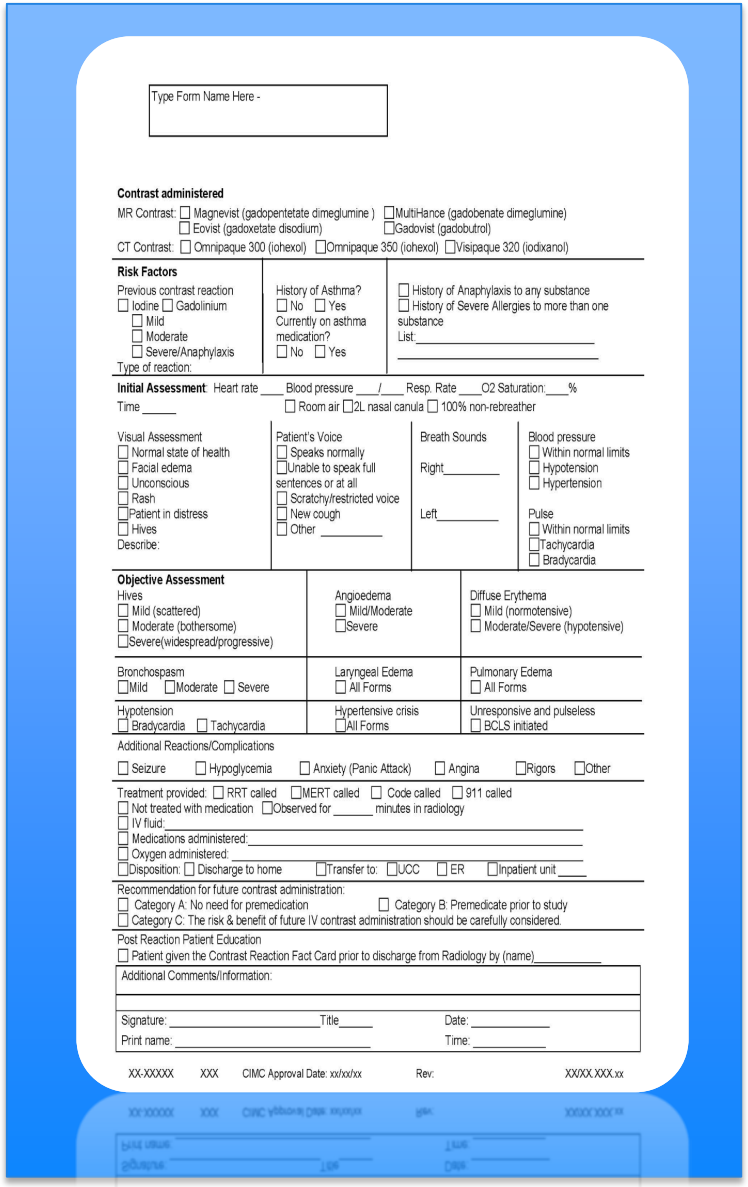
Premedication Breakthrough

- Breakthrough reactions after premedication
  - ~18% chance of a breakthrough reaction
  - When compared to the original reaction:
    - 12% less severe
    - 81% same
    - 8% more severe

Premedication
MRI agents

- Previous class B reaction to a gadolinium agent
  - Different gadolinium agent with premedication
- Previous class C reaction to a gadolinium agent
  - Contrast administration is discouraged, if critical, premedicate, give a different gadolinium agent, perform at the main campus.

Standardized Documentation



Type Form Name Here -

Contrast administered

MR Contrast: ☐ Magnevist (gadopentetate dimeglumine) ☐ MultiHance (gadobenate dimeglumine)
☐ Eovist (gadoxetate disodium) ☐ Gadovist (gadobutrol)

CT Contrast: ☐ Omnipaque 300 (iohexol) ☐ Omnipaque 350 (iohexol) ☐ Visipaque 320 (iodixanol)

Risk Factors

Previous contrast reaction
☐ Iodine ☐ Gadolinium
☐ Mild
☐ Moderate
☐ Severe/Anaphylaxis
Type of reaction:

History of Asthma?
☐ No ☐ Yes
Currently on asthma medication?
☐ No ☐ Yes

☐ History of Anaphylaxis to any substance
☐ History of Severe Allergies to more than one substance
List:_____

Initial Assessment: Heart rate ____ Blood pressure ____/____ Resp. Rate ____ O2 Saturation:____%
Time _____ ☐ Room air ☐ 2L nasal canula ☐ 100% non-rebreather

Visual Assessment
☐ Normal state of health
☐ Facial edema
☐ Unconscious
☐ Rash
☐ Patient in distress
☐ Hives
Describe:

Patient's Voice
☐ Speaks normally
☐ Unable to speak full sentences or at all
☐ Scratchy/restricted voice
☐ New cough
☐ Other _____

Breath Sounds
Right_____
Left_____

Blood pressure
☐ Within normal limits
☐ Hypotension
☐ Hypertension

Pulse
☐ Within normal limits
☐ Tachycardia
☐ Bradycardia

Objective Assessment

Hives ☐ Mild (scattered) ☐ Moderate (bothersome) ☐ Severe(widespread/progressive)	Angioedema ☐ Mild/Moderate ☐ Severe	Diffuse Erythema ☐ Mild (normotensive) ☐ Moderate/Severe (hypotensive)
Bronchospasm ☐ Mild ☐ Moderate ☐ Severe	Laryngeal Edema ☐ All Forms	Pulmonary Edema ☐ All Forms
Hypotension ☐ Bradycardia ☐ Tachycardia	Hypertensive crisis ☐ All Forms	Unresponsive and pulseless ☐ BCLS initiated

Additional Reactions/Complications

☐ Seizure ☐ Hypoglycemia ☐ Anxiety (Panic Attack) ☐ Angina ☐ Rigors ☐ Other

Treatment provided: ☐ RRT called ☐ MERT called ☐ Code called ☐ 911 called
☐ Not treated with medication ☐ Observed for _____ minutes in radiology
☐ IV fluid:_____
☐ Medications administered:_____
☐ Oxygen administered:_____
☐ Disposition: ☐ Discharge to home ☐ Transfer to: ☐ UCC ☐ ER ☐ Inpatient unit ____

Recommendation for future contrast administration:
☐ Category A: No need for premedication ☐ Category B: Premedicate prior to study
☐ Category C: The risk & benefit of future IV contrast administration should be carefully considered.

Post Reaction Patient Education
☐ Patient given the Contrast Reaction Fact Card prior to discharge from Radiology by (name)_____

Additional Comments/Information:

Signature: _____ Title_____ Date: _____
Print name: _____ Time: _____

XX-XXXXX XXX CIMC Approval Date: xx/xx/xx Rev: XX/XX.XXX.xx

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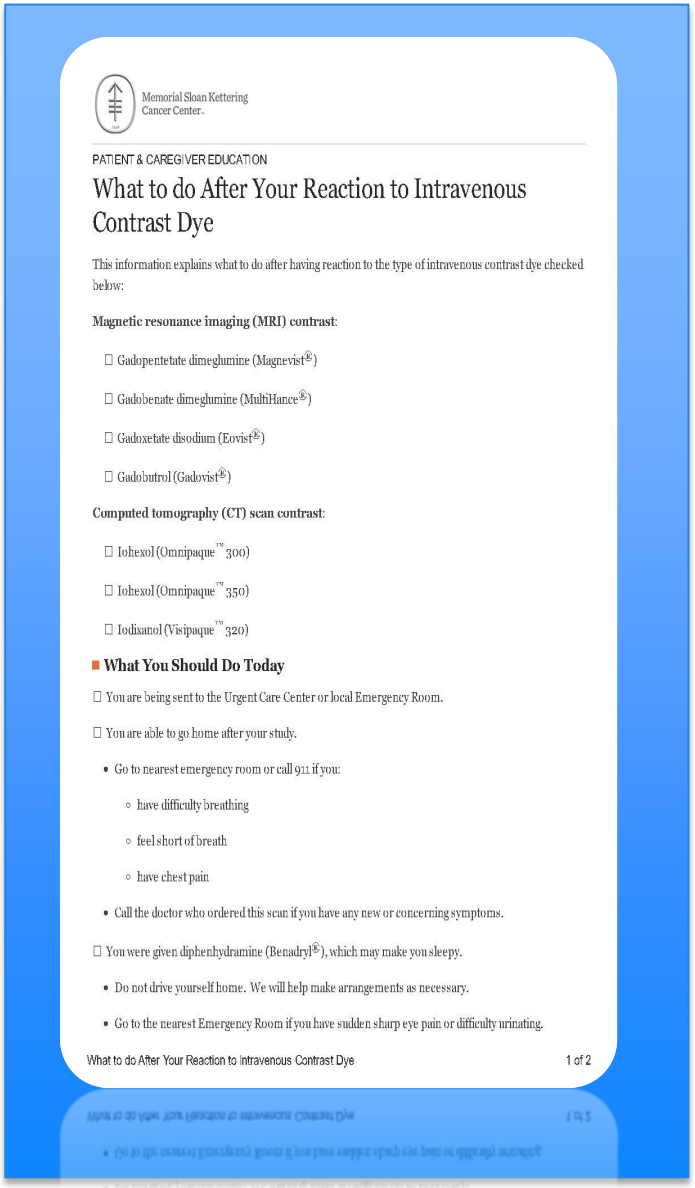
Patient Education



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PATIENT & CAREGIVER EDUCATION

What to do After Your Reaction to Intravenous Contrast Dye

This information explains what to do after having reaction to the type of intravenous contrast dye checked below:

Magnetic resonance imaging (MRI) contrast:

☐ Gadopentetate dimeglumine (Magnevist®)

☐ Gadobenate dimeglumine (MultiHance®)

☐ Gadoxetate disodium (Eovist®)

☐ Gadobutrol (Gadovist®)

Computed tomography (CT) scan contrast:

☐ Iohexol (Omnipaque™ 300)

☐ Iohexol (Omnipaque™ 350)

☐ Iodixanol (Visipaque™ 320)

What You Should Do Today

☐ You are being sent to the Urgent Care Center or local Emergency Room.

☐ You are able to go home after your study.

- Go to nearest emergency room or call 911 if you:
  - have difficulty breathing
  - feel short of breath
  - have chest pain
- Call the doctor who ordered this scan if you have any new or concerning symptoms.

☐ You were given diphenhydramine (Benadryl®), which may make you sleepy.

- Do not drive yourself home. We will help make arrangements as necessary.
- Go to the nearest Emergency Room if you have sudden sharp eye pain or difficulty urinating.

What to do After Your Reaction to Intravenous Contrast Dye 1 of 2

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Sustaining Change

- Contrast Reaction QA Subcommittee
  - Multidisciplinary
- Monthly meeting to review reactions
- Post-reaction huddles

Metrics

- Type of reaction
- Appropriate pre-medications
- Use of contrast reaction documentation form
- Evidence of policy adoption
- Patient education

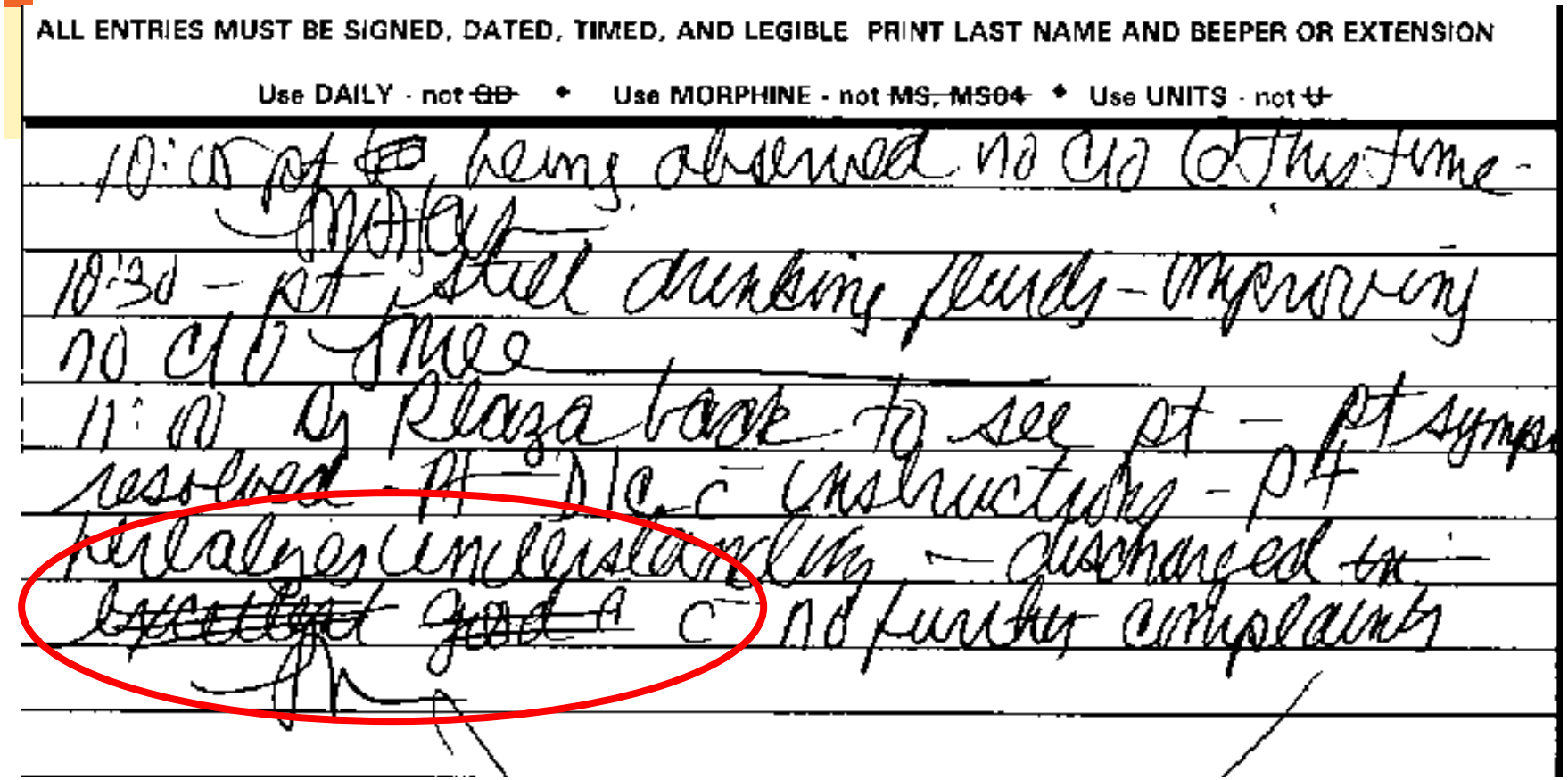
Lessons Learned

- Assessment
  - Initial assessment
    - Vital signs
    - Voice quality
    - Lung sounds
  - Continued assessment

Lessons Learned

- Documentation
  - Physician documentation of assessment
    - Allergic Reaction
    - Physiologic Reaction
  - Reliance on nursing documentation

Careful documentation practices


ALL ENTRIES MUST BE SIGNED, DATED, TIMED, AND LEGIBLE PRINT LAST NAME AND BEEPER OR EXTENSION

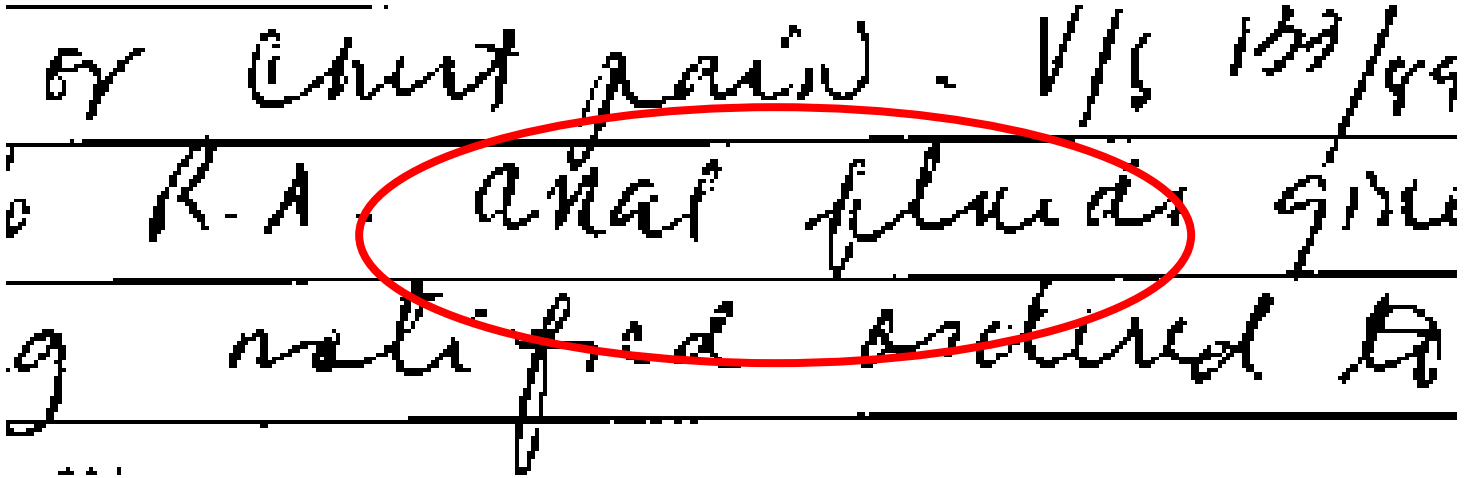
Use DAILY - not ~~QD~~ • Use MORPHINE - not ~~MS, MSO4~~ • Use UNITS - not ~~U~~

10:15 pt ~~[illegible]~~ being observed no c/o this time - [illegible]

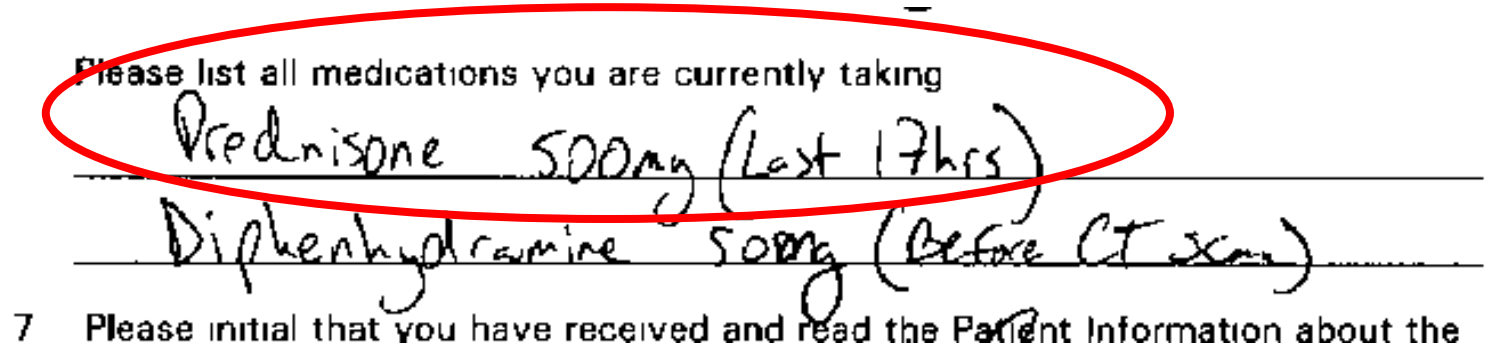
10:30 - pt tol drinking fluids - improving no c/o this time

11:00 D/c Plaza back to see pt - pt symptoms resolved - pt D/c instructions - pt verbalizes understanding - discharged to ~~[illegible]~~ good A/C no further complaints

Watch handwriting
(for those still on paper)



Review premedication carefully


Please list all medications you are currently taking

Prednisone 500mg (Last 17hrs)

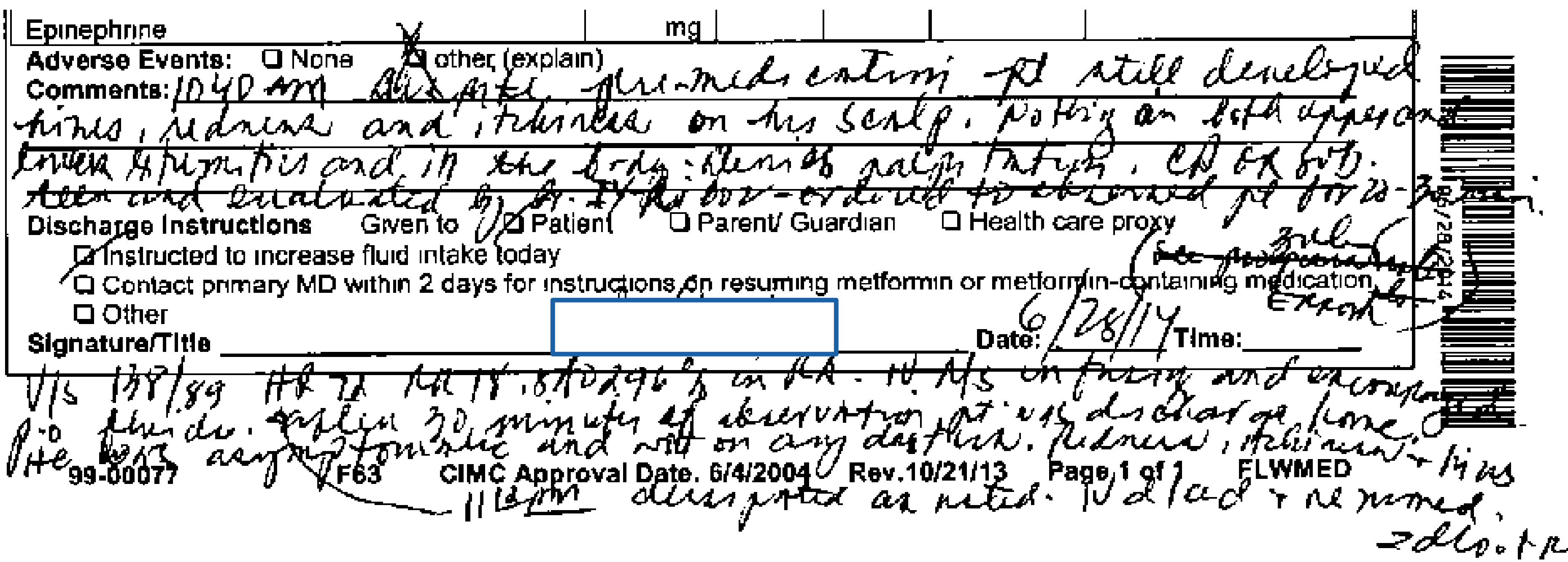
Diphenhydramine 50mg (Before CT scan)

7 Please initial that you have received and read the Patient Information about the

Avoid "patient premedicated per protocol"

Clarity is critical

- Don't cram or squish
- Timeline helpful demonstrating continuous assessment


Epinephrine mg

Adverse Events: ☐ None ☒ other (explain)

Comments:

Discharge Instructions Given to ☒ Patient ☐ Parent/ Guardian ☐ Health care proxy

☒ Instructed to increase fluid intake today

☐ Contact primary MD within 2 days for instructions on resuming metformin or metformin-containing medication

☐ Other

Signature/Title Date: 6/28/14 Time:

99-00077 F63 CIMC Approval Date. 6/4/2004 Rev.10/21/13 Page 1 of 1 FLWMED

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Continued Education Plan

- eLearning platform
- Annual required content and exam
- BCLS within radiology
- Education of responding departments
- All areas where contrast is used
- Simulation?

Summary

- Airway and breathing
  - Expiratory wheezing think bronchospasm
  - Inspiratory wheezes or stridor think laryngeal edema
- Circulation
  - Hypotension with bradycardia
    - Vasovagal reaction
  - Hypotension with tachycardia
    - Cardiogenic shock

Thanks to the core process improvement team

- Andy Plodkowski, MD
- Jerrold Teitcher, MD
- Matthew Kennedy, RN
- Rommel De'OCampo, RT

Thank you to ARIN

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