 <p style="text-align: center;">CREDIT VALLEY THE CREDIT VALLEY HOSPITAL</p>	CLINICAL PRACTICE GUIDELINE	PROFESSIONAL PRACTICE
TITLE: Radiopaque Contrast Media		
DATE OF ISSUE: 2002, 05	PAGE 1 OF 13 (Appendix)	NUMBER: CPG 19-2
SUPERCEDES:	ISSUED BY: _____ TITLE: Chief of Medical Staff	
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Purpose:

To provide a guideline to assist Physicians in the management of patients who are scheduled for Radiology tests involving Radiopaque contrast media (RCM) at The Credit Valley Hospital. This guideline focuses on prevention and treatment of adverse reactions such as anaphylactoid reactions and nephrotoxicity.

Selection Criteria:

Inclusion

- all patients receiving RCM at The Credit Valley Hospital - see Appendix 1 for a list of CT scans
- which usually receive IV contrast

I. PREVENTION OF RADIOCONTRAST REACTIONS (1,2)

See Appendix 2, Prevention of Radiopaque Contrast Media Reactions

A. Identifying Patients at Risk

1. High-Risk Patients (Pretreatment Recommended)

Consult with Radiologist prior to study to see if alternate imaging procedure without RCM is available.

Previous anaphylactoid reaction occurring within 20-30 minutes of administering RCM (one or more of the following):

- generalized urticaria
- angioedema
- wheezing, dyspnea
- documented laryngeal edema or voice change
- hypotension (decrease in SBP of \geq 30 mm Hg)

- syncope in supine position
- cardiac dysrhythmia associated with urticaria or angioedema

2. Low-Risk or No Risk (Pretreatment NOT Recommended)

- parotid swelling following RCM
- reaction of any type to iodide or iodine

3. Asthma and/or Atopy

This large group of patients is generally at low-risk but each patient needs individual assessment. It is assumed that the more severe the allergic condition (eg. asthma, allergic rhinitis, drugs, foods, multiple allergies and foreign proteins (venoms, latex)), the greater the patient's atopic reactivity, and thus the greater the risk of any antigen. These patients will be evaluated for individual risk by the attending radiologist, ie will be placed in a low or high-risk category and a decision made regarding the need for pretreatment.

B. Pretreatment Protocol

1. Elective Procedures (1,11)

Prednisone 50 mg orally to be given 13 hours, 7 hours and 1 hour prior to RCM.

Diphenhydramine 50 mg orally/IM/IV to be given 1 hour prior to RCM.

Paediatrics:

prednisone or prednisolone liquid 1 mg/kg/dose (max 50 mg) orally to be given 13 hours, 7 hours and 1 hour prior to RCM.

Diphenhydramine 1 mg/kg/dose (max 50 mg) orally/IM/IV to be given 1 hour prior to RCM.

If the patient cannot be given oral prednisone 50 mg, one of the following equivalent doses of parenteral corticosteroid can be substituted:

hydrocortisone sodium succinate (Solu-Cortef) 200 mg

(*Paediatrics: 5 mg/kg*) OR

methylprednisolone sodium succinate (Solu-Medrol) 40 mg

(*Paediatrics: 1-2 mg/kg*)

2. Emergency Procedures (when 13 hours of pretreatment is not possible) (2,11)

Hydrocortisone sodium succinate (Solu-Cortef) 200 mg (*Paediatrics: 5 mg/kg, max 200 mg*) IV as soon as the procedure is judged essential and repeat q4h until the procedure is complete.

Diphenhydramine (Benadryl) 50 mg (*Paediatrics: 1 mg/kg, max 50 mg*) IM or IV, 1 hour before RCM.

II. TREATMENT OF RCM REACTIONS

A. Generalized Anaphylactoid Reaction (3,11)

1. Call for assistance
2. Suction airway as needed
3. Oxygen 100% by mask (6-10 L/min)
4. Epinephrine* (SC, IV or IT - see methods of administration and dosing below)
5. Normal Saline IV
6. Diphenhydramine 25-50 mg (*Paediatrics: 1-2 mg/kg, max 50 mg*) IV
7. Salbutamol inhaler 100 ug/inhalation for persistent bronchospasm: 2-3 inhalations
8. Ranitidine 50 mg (*Paediatrics: 2.5 mg/kg/dose (max 50 mg)*) IV

Alternatives for epinephrine for patients taking **beta blockers**:

glucagon 1-5 mg IV as a bolus followed by infusion of 5-15 ug/min, isoprenaline (isoproterenol): 1:5000 solution for inj (0.2 mg/mL) IV, 0.5-1 mL diluted to 10 mL with NS, 1 mL (20 ug) increments.

For patients with bronchospasm or undergoing prolonged resuscitation or severe reaction:

hydrocortisone sodium succinate (Solu-Cortef) 100 mg IM/IV q3-6h for 2-4 doses
(*Paediatrics: 6 mg/kg/dose IM/IV q4-6h for 2-4 doses*)

OR

methylprednisolone sodium succinate (Solu-Medrol) 40-125 mg IV q6h for 2-4 doses
(*Paediatrics: 1 mg/kg/dose IV q6h for 2-4 doses*)

Epinephrine – Methods of Administration and Dosing**Subcutaneous Injection**

The emergency treatment of an anaphylactoid reaction consists of the subcutaneous injection of 0.1 to 0.3 mL of 1:1000 (1 mg/mL) epinephrine; this may be repeated q15min x 2 (total of 1 mg). (2)

(Paediatrics: 1:1,000 (1 mg/mL) strength – 0.01 mg/kg/dose (0.01 mL/kg/dose) SC (minimum 0.1 mL/dose; max 1 mL/dose), may repeat once in 5 min. (4)

Intravenous Injection

A slow IV injection of 1:10,000 (1 mg/10 mL) epinephrine has been recommended for failure of the subcutaneous route or if peripheral vascular collapse is present. In such situations, begin with 1 mL of epinephrine 1:10,000 which may be repeated every 1 to 5 minutes until a total of 1 mg (10 mL) has been administered. (2)

(Paediatrics: 1:10,000 (0.1 mg/mL) strength – 0.01 mg/kg/dose (0.1 mL/kg/dose) IV (minimum 1 mL/dose; max 10 mL/dose), may repeat once in 5 min. (4)

Other Methods of Administration

In an emergency, epinephrine can be administered via the airway (inhaled, transtracheal, endotracheal). (3) The recommended dose is 3-5 mL of 1:10,000 (0.3-0.5 mg) intratracheally q10-20 min prn. (5)

(Paediatrics: 1:10,000 (0.1 mg/mL) strength – 0.01 mg/kg/dose (0.1 mL/kg/dose) ETT (minimum 1 mL/dose; max 10 mL/dose), may repeat once in 5 min. (4)

B. Urticaria (3,11)

Treatment is usually not necessary for only a few scattered hives or pruritus. However, the patient should be observed closely for other developing systemic symptoms, while maintaining IV access. Only if the urticaria is extensive or bothersome to the patient should treatment be instituted.

Scattered, protracted urticaria

1. Diphenhydramine 25-50 mg (*Paediatrics: 1.25 mg/kg*) IV or IM q2-3h

Profound urticaria

1. Diphenhydramine 25-50 mg (*Paediatrics: 1.25 mg/kg*) IV or IM q2-3h
2. Ranitidine 50 mg IV q8h (*Paediatrics: total daily dose 2-4 mg/kg divided q6-8h*)
3. Consider epinephrine subcutaneous

C. Treatment of Hypotension/Bradycardia (3,11)Isolated hypotension

- monitors in place: ECG, pulse oximeter, BP
- elevate patient's legs
- oxygen by mask (6-10 L/min)
- IV fluid - rapid administration of NS
- if unresponsive: vasopressor eg. dopamine, norepinephrine or epinephrine

Vagal reaction (hypotension and bradycardia)

- monitors in place: ECG, pulse oximeter, BP
- elevate patient's legs
- oxygen by mask (6-10 L/min)
- IV fluid - rapid administration of NS
- Atropine 0.6-1 mg IV, repeat if necessary after 3-5 min to 3 mg total
- *(Paediatrics: give 0.02 mg/kg IV (up to a max of 0.6 mg per dose); repeat if necessary to a total dose of 2 mg)*

D. Treatment of Severe Hypertension (10)

- monitors in place: ECG, pulse oximeter, BP
- labetalol 20-80 mg IV q10-15 min (max total dose 300 mg)
(Paediatrics: 1-3 mg/kg IV single dose or 1mg/kg/h continuous IV infusion)(11)
- Adults: consider nitroglycerin (for MI), hydralazine (for hypertension of pregnancy)

III. PREVENTION OF LACTIC ACIDOSIS IN PATIENTS RECEIVING METFORMIN

See Appendix 3 - Guidelines for Prevention of Lactic Acidosis in Patients Receiving Metformin and Radiopaque Contrast Media

Patients who are scheduled for Radiopaque contrast media and who are taking metformin should have a baseline serum creatinine performed prior to receiving RCM. Metformin should be held following RCM. Serum creatinine should be repeated when possible at 48 hours or as soon as possible after that. If creatinine has not increased greater than 10% over baseline, metformin may be restarted.(6,7) If creatinine elevation is prolonged or persistent, follow-up with the family physician or an appropriate specialist is recommended.

A Medical Directive for management of outpatients has been developed. For inpatients, the Radiologist will write orders in the patient chart following the administration of RCM – “Radiology suggests hold metformin until 48 hour creatinine is reviewed. May resume metformin if creatinine has not risen >10%, contact MRP if it has.”

**IV. PREVENTION OF RADIOPAQUE CONTRAST MEDIA - INDUCED
NEPHROTOXICITY (3,8,12)****Risk Factors for Radiopaque Contrast Media-Induced Nephrotoxicity:**

- pre-existing renal failure
- concomitant use of certain drugs (Angiotensin Converting Enzyme Inhibitors (ACEIs), Angiotensin Receptor Blockers (ARBs), Nonsteroidal Antiinflammatory Drugs (NSAIDs), aminoglycosides, cisplatin)
- dehydration (consider holding diuretics)
- moderate albuminuria
- hypertension
- elevated uric acid levels
- multiple RCM studies (suggested minimal interval between dye exposures - 48 h)
- CHF
- cirrhosis
- high RCM dose
- multiple myeloma
- sickle cell disease

If risk factors identified in adult patients see Appendix 4 - Guidelines for Prevention of Radiopaque Contrast Media -Induced Nephrotoxicity for Adults

If risk factors identified in paediatric patients consult Paediatrics and Radiology.

Patients with diabetes with even mild degrees of renal insufficiency are at risk of developing radiocontrast-induced nephropathy (RCIN).

In **one study** acetylcysteine has been shown to be effective in preventing renal impairment when given prophylactically along with hydration in patients with chronic renal insufficiency. (9)

For patients considered to be at risk for nephrotoxicity, the patient should be hydrated and acetylcysteine administration considered. Following administration of RCM, creatinine should be measured at 48 hours.

Evaluation:

Following implementation of the guideline, an evaluation will be carried out to measure the following:

- for high risk patients – availability of creatinine from ordering physician, number of studies deferred, cancelled or altered
- for metformin patients – what were follow-up creatinines and was medical follow-up necessary
- adverse reactions – track to see if increased premedication reduces adverse events

References:

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10. Hypertensive Crisis. Micromedex Healthcare Series Vol 109, Sept 2001.
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Approval:

Department of Imaging: January 2002
Surgical Steering Committee: February 2002
Paediatric Steering Committee: February 2002
ER Steering Committee: February 2002
General Medicine Steering Committee: February 2002
Pharmacy and Therapeutics Committee: March 2002
Professional Practice Committee: April 2002
Clinical Quality Care Committee: April 2002
Medical Advisory Committee: May 2002

Appendix 1

Clinical Indications for CT Exams

Unenhanced CT's (no RCM administered):

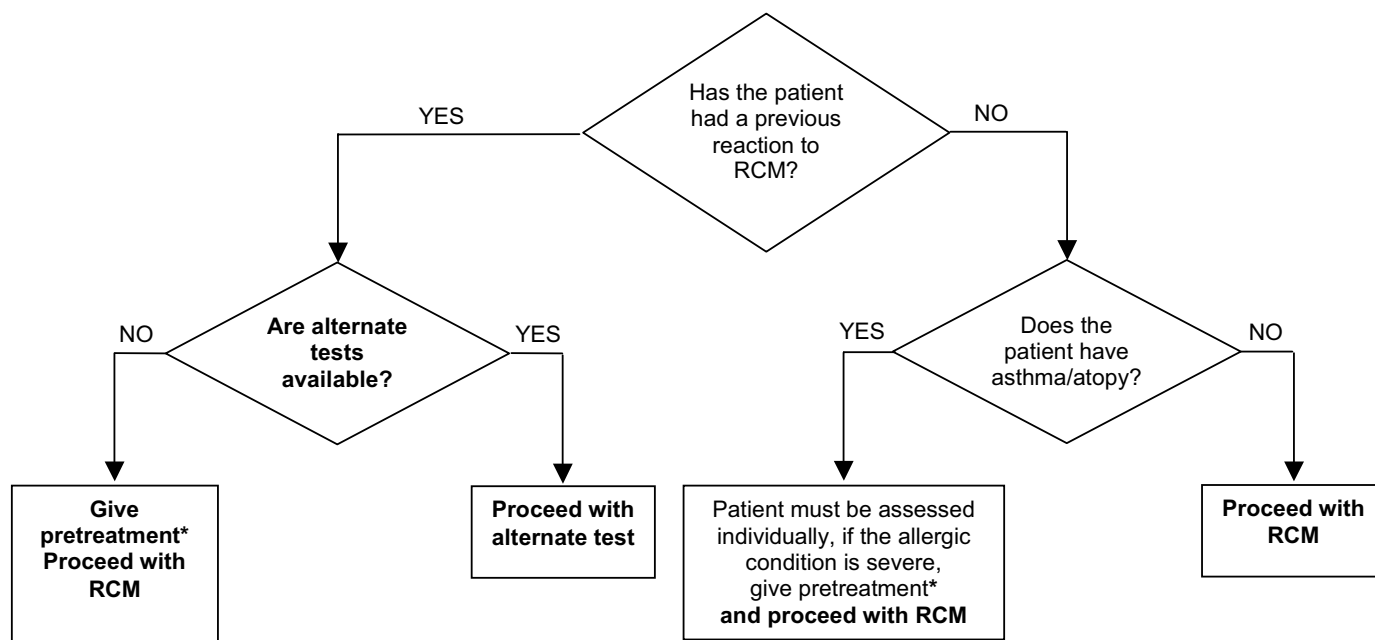
Head CT no contrast	<ul style="list-style-type: none"> - stroke, rule out bleed - rule out subarachnoid hemorrhage - headache, no neurologic findings - investigation of infectious sinus disease - facial bone fractures - TM joints - middle ear pathology and cholesteatoma
Neck CT	<ul style="list-style-type: none"> - cervical spine fractures - other bony spinal canal pathology
CT Chest	<ul style="list-style-type: none"> - investigation of pulmonary nodules for calcification - bronchiectasis - interstitial lung disease
Abdomen/Pelvis	<ul style="list-style-type: none"> - abdomen pain NYD - renal colic - lymphoma follow up
CT Lumbar Spine	<ul style="list-style-type: none"> - rule out disc herniation or stenosis - rule out bone lesion - assess for fracture
Bony Pelvis and Extremities	<ul style="list-style-type: none"> - assessment of fractures - assessment of bone lesions

Enhanced CT Examinations (RCM administered):

Head CT's	<ul style="list-style-type: none">- tumor assessment- investigation of seizures- orbital pathology- acoustic neuromas- Circle of Willis (CTA)
CT Neck	<ul style="list-style-type: none">- assessment of masses- tumor evaluation- carotid/vertebral CT angiogram
CT Chest	<ul style="list-style-type: none">- evaluation and staging of tumors- aneurysm assessment- aortic dissection- pulmonary CTA for embolism
CT Abdomen/Pelvis	<ul style="list-style-type: none">- investigation, staging and follow up of malignancies- assessment of liver lesions- assessment of kidney lesions- assessment of pancreatitis- abdominal aortic aneurysm- rule out abscess- adrenal mass assessment
Lumbar Spine	<ul style="list-style-type: none">- post operative disc versus scar (MRI preferred)
Extremities	<ul style="list-style-type: none">- soft tissue mass evaluation

* In case of any doubt contact a Radiologist.

Prevention of Radiopaque Contrast Media Reactions



*Pretreatment:

1. Elective Procedures

Prednisone 50 mg orally to be given 13 hours, 7 hours and 1 hour prior to RCM.
Diphenhydramine 50 mg orally/IM/IV to be given 1 hour prior to RCM.

Paediatrics:

prednisone or prednisolone liquid 1 mg/kg/dose (max 50 mg) orally to be given 13 hours, 7 hours and 1 hour prior to RCM.

Diphenhydramine 1 mg/kg/dose (max 50mg) orally/IM/IV to be given 1 hour prior to RCM.

If the patient cannot be given oral prednisone 50 mg, one of the following equivalent doses of parenteral corticosteroid can be substituted:

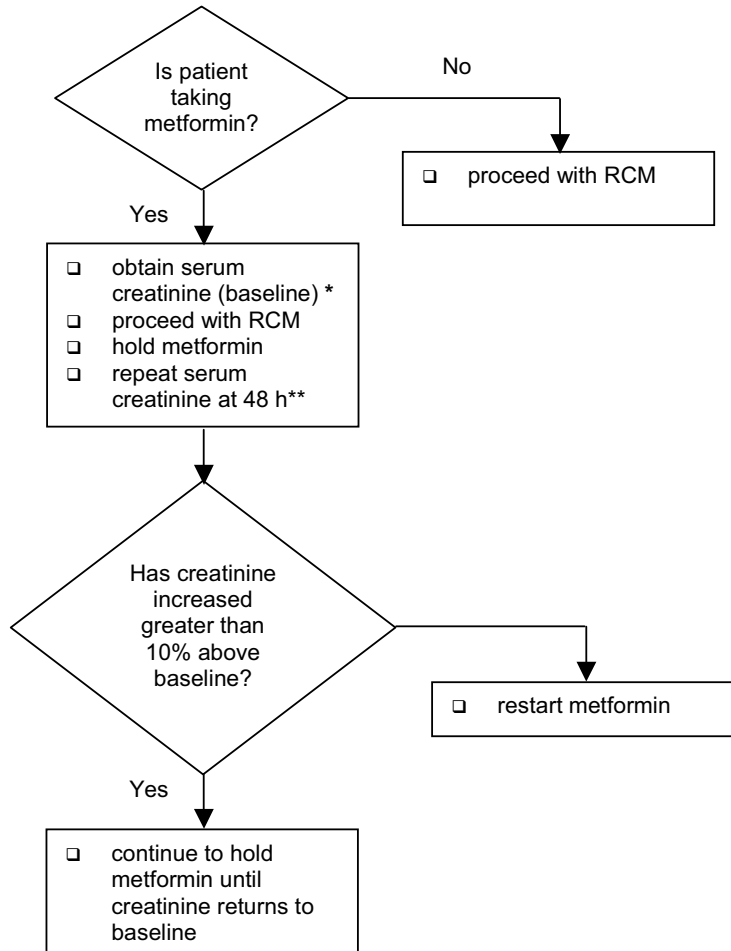
hydrocortisone sodium succinate (Solu-Cortef) 200 mg
(*Paediatrics: 5 mg/kg*) OR
methylprednisolone sodium succinate (Solu-Medrol) 40 mg
(*Paediatrics: 1-2 mg/kg*)

2. Emergency Procedures (When 13 hours of pretreatment is not possible)

Hydrocortisone sodium succinate (Solu-Cortef) 200 mg (*Paediatrics: 5 mg/kg*) IV as soon as the procedure is judged essential and repeat q4h until the procedure is complete. Diphenhydramine (Benadryl) 50 mg (*Paediatrics: 1 mg /kg*) IM or IV, 1 hour before RCM.

Appendix 3

Guidelines for Prevention of Lactic Acidosis in Patients Receiving Metformin and Radiopaque Contrast Media



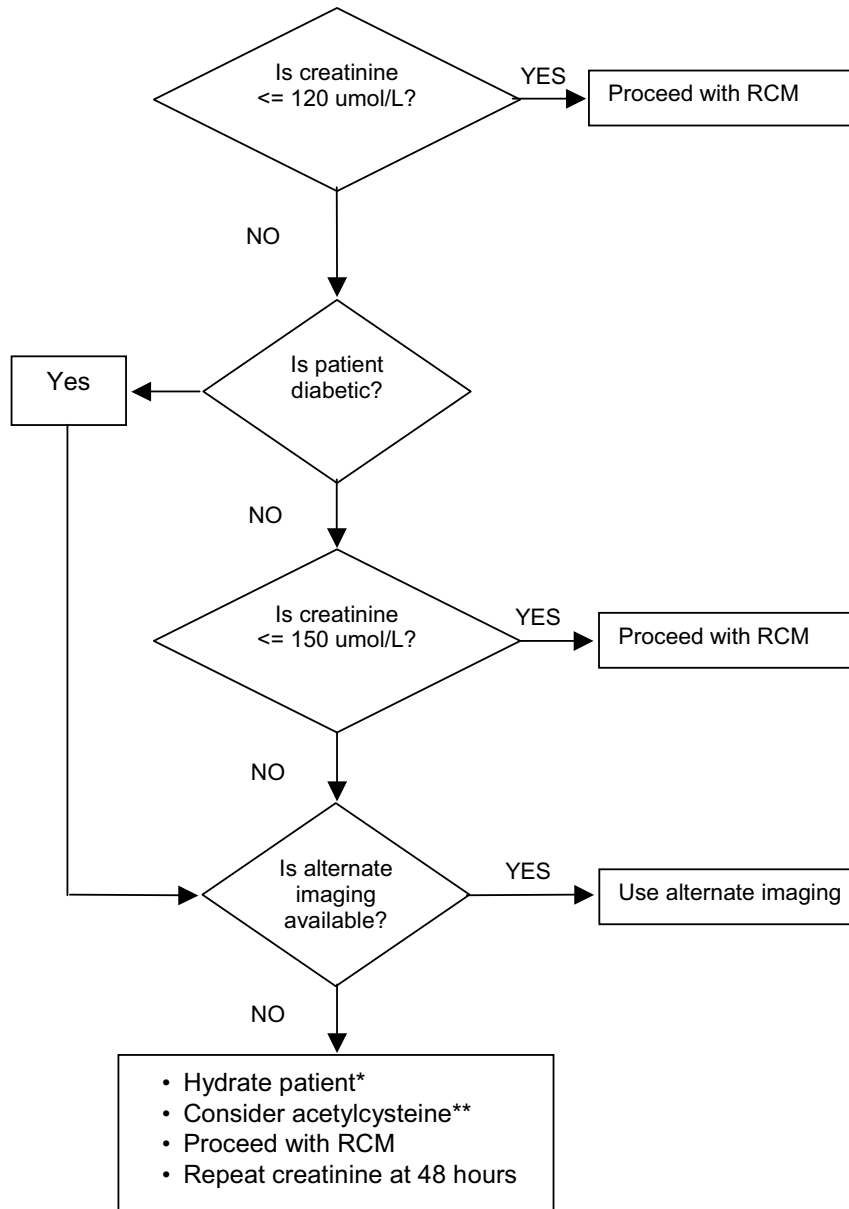
* If patient's creatinine is >120 umol/L, follow algorithm in Appendix 4 in addition to this algorithm.

No

** serum creatinine should be repeated when possible at 48 hours or as soon as possible after that

Guidelines for Prevention of Radiopaque Contrast Media Induced Nephrotoxicity for Adults (3,8,12)

Obtain serum creatinine in patients at risk (see below)



***Guidelines for Hydration**

- for inpatients, give 0.45% NS infused at 1 mL/kg/h overnight prior to RCM and then continued for at least 8 h following RCM
- for outpatients, give 0.45% NS @ 100 mL/h for 3-4 h before the procedure and continue at least 3-4 h after the procedure
- if patients can drink, the hydration may be given orally

****Acetylcysteine (9)**

- dose 600 mg orally twice daily on the day before and the day of administration of the RCM
note: Acetylcysteine (Mucomyst, Parvolex) is only available in injectable form. To prepare the oral dose, withdraw 600 mg (3 mL) from the multidose vial and mix in a soft drink. Use within one hour of mixing.

Other Risk Factors for Radiocontrast-Induced Nephrotoxicity:

- pre-existing renal failure
- concomittant use of certain drugs (Angiotensin Converting Enzyme Inhibitors (ACEIs), Angiotensin Receptor Blockers (ARBs), Nonsteroidal Antiinflammatory Drugs (NSAIDs), aminoglycosides, cisplatin)
- dehydration (consider holding diuretics)
- moderate albuminuria
- hypertension
- elevated uric acid levels
- multiple RCM studies (suggested minimal interval between dye exposures - 48 h)
- CHF
- cirrhosis
- high RCM dose
- multiple myeloma
- sickle cell disease