Rhabdomyolysis

**Inclusion Criteria:** History concerning for rhabdomyolysis with muscle pain, weakness, and/or dark urine

**Exclusion Criteria:** Metabolic muscle disorders, known kidney disease, hx of myocardial damage, multiorgan failure, sickle cell, trauma, burn victim

**Initial Evaluation and Management**

- **Initial Work Up:**
  - CK, ISTAT chem 10 (send to lab if results abnormal), LFTs, albumin, microscopic urinalysis, urine myoglobin
  - Creatinine if concerned for ingestion
  - COVID Test if CK > 1000 (use COVID Screening order set)
  - EKG if electrolyte abnormalities

- **Initial ED Management:**
  - NS bolus 20 mL/kg x1 (max 1 liter)
  - Avoid nephrotoxic medications (i.e. NSAIDS)
  - Consider discontinuing medications that can contribute to rhabdomyolysis (Appendix A)
  - Contact poison control if concern for toxiidrome/ingestion
  - Consider nephrology consult if concern for AKI¹

- **Discharge from ED if:**
  - CK ≤ 5000
  - No concern for AKI
  - No electrolyte abnormalities
  - Tolerating PO

  *See discharge instructions below.

- **Admit to Hospital Medicine if:**
  - CK > 5000 OR
  - Elevated CK and/or 1 of the following:
    - Inability to tolerate PO
    - Inability to ambulate independently
    - Electrolyte abnormalities
    - Concern for AKI

**Inpatient Management:**

- **Fluids:**
  - 2x MIVF (max rate 200 mL/hr) of D5 NS or D5 NS or NS based on provider discretion

- **Monitoring:**
  - CK & Chem 10 at least daily
  - Consider increasing frequency of lab monitoring based on CK trend and electrolyte abnormalities
  - U/A daily
  - Urine output (goal of average of 1-2 mL/kg/hr)
  - Blood pressure: hypertension
  - Electrolyte abnormalities: hyperkalemia & hyperphosphatemia

- **Other Management Considerations:**
  - Avoid nephrotoxic medications (i.e. NSAIDS)
  - Discontinue medications that can contribute to rhabdomyolysis (Appendix A)
  - Treat inciting infection if applicable
  - Bed rest until improving, then assess need for PT prior to discharge
  - Subspecialty consult as indicated*

**Discharge Criteria:**

- CK <8000 with consistent downtrend AND all of the following:
  - Normal renal function and electrolytes
  - Udip heme negative
  - Ability to maintain UOP at 1-2 mL/kg/hr
  - Ability to meet PO fluid parameters
  - Able to ambulate independently
  - PCP follow up in place
  - Follow up with Elite Sports Medicine for return to play guidance for sports-related rhabdomyolysis

**Discharge Instructions:**

- Avoid physical activity, encourage PO hydration, avoid nephrotoxic medications, close follow up until symptoms resolved and CK <500
- Repeat CK, chem 10, UA 2-3 days post-discharge
- Weekly CK until serum CK<500
  - If CK remains elevated for 4-6 weeks, recommend outpatient nephrology referral

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*Consider Acute Kidney Injury (AKI) based on the following criteria:

- 2 months-2yrs: Cr<0.4 mg/dL
- 3yrs-15yrs: Cr<0.7 mg/dL
- >16 yrs: Cr>1.0 mg/dL
- Cr that increases by 50% from baseline or by 0.2 mg/dL

*Consults to Consider:

- Nephrology:
  - AKI
  - Significant electrolyte abnormalities
  - Abnormal UA (proteinuria &/or hematuria)
- Questions re: fluid management
- Persistent hypertension

- Neurology:
  - Recurrent rhabdo
  - Strong family hx of rhabdo
  - Concern for metabolic muscle disorder

- Lack of improvement in 72 hours:
  - Evaluate for ongoing muscle breakdown
  - Consider nephrology consult
### Medications Associated with Rhabdomyolysis

**Anti-arrhythmic:**
- Amiodarone
- Diltiazem

**Anti-infectives:**
- Amoxicillin
- Amphotericin-B
- Azithromycin
- Cefaclor
- Cefdinir
- Clarithromycin
- Daptomycin
- Erythromycin
- Fluconazole
- Fluoroquinolones (e.g. ciprofloxacin, gemifloxacin, levofloxacin, moxifloxacin, ofloxacin)
- Ganciclovir
- Linezolid
- Meropenem
- Trimethoprim-sulfamethoxazole
- Zosyn
- Antiretrovirals (e.g. abacavir, lamivudine, zidovudine, tenofovir, raltegravir, efavirenz, emtricitabine)

**Anti-Lipemics:**
- Atorvastatin
- Ezetimibe
- Fenofibrate
- Fluvastatin
- Gemfibrozil
- Lovastatin
- Pitavastatin
- Pravastatin
- Rosuvastatin
- Simvastatin

**Anesthetics/Pain Control/Paralytics:**
- Acetaminophen
- Diclofenac
- Fentanyl
- Methadone
- Morphine
- Propofol
- Succinylcholine
- Rocuronium

**Anti-hypertensive**
- Amlodipine
- Candesartan
- Losartan
- Ramipril

**Immunosuppressants**
- Cyclosporine

**Neuro/Psychiatric Medications**
- Aripiprazole
- Citalopram
- Clozapine
- Escitalopram
- Haloperidol
- Lamotrigine
- Olanzapine
- Paroxetine
- Pregabalin
- Quetiapine
- Risperidone
- Sertraline
- Valproate
- Venlafaxine

**Miscellaneous:**
- Amphetamines
- Clopidogrel
- Colchicine
- Desmopressin Acetate
- Dextromethorphan
- Furosemide
- Insulin
- Metformin
- Omeprazole

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The following medications are linked to rhabdomyolysis in small, isolated case reports. Clinical discretion is advised.

- Atomoxetine
- Caffeine
- Calcium carbonate
- Carbamazepine
- Chorionic gonadotrophin
- Eptacog alpha
- Filgrastim
- Fluticasone
- Ganciclovir
- Itraconazole
- Montelukast
- Mycophenolate
- Oseltamivir
- Tacrolimus
- Vecuronium

Please reference Lexi-Comp or other drug reference source for additional medications that may have a risk for rhabdomyolysis.