CLINICAL PATHWAY:
Rhabdomyolysis

THIS PATHWAY SERVES AS A GUIDE AND DOES NOT REPLACE CLINICAL JUDGMENT.

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

If CK <1000: consider alternative diagnosis
OR
If patient has muscle pain isolated to bilateral calves with difficulty walking following a viral illness, consider diagnosis of benign acute childhood myositis

Initial Evaluation and Management

Initial Work Up:
- CK, ISTAT chem 10 (send to lab if results abnormal), LFTs, albumin, microscopic urinalysis, urine myoglobin

Consider:
- Utox 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 toxidrome/ingestion
- Consider nephrology consult if concern for AKI[1]

- **If CK elevated > 1000**, give 2nd NS bolus 20mL/kg (max 1 Liter)
- Start 2x MIVF (max rate 200 ml/hr) D5 ½ NS or D5 NS or NS based on provider discretion

Discharge from ED if:
- CK ≤ 5000
- No concern for AKI[1]
- No electrolyte abnormalities
- Tolerating PO

See discharge instructions below

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

Admit to PICU if:
- Severe electrolyte abnormalities
- Need for dialysis

[1] Definition of Acute Kidney Injury
(It should be noted that this definition does not apply to children <1 year of age)

AKI is defined by having ***either***:
- At least a 50% increase in Scr above baseline* **and** new Scr ≥0.5 mg/dL **OR**
- An increase by 0.3 mg/dL from baseline*, **and** new Scr ≥0.5 mg/dL

**If a baseline creatinine is unknown, estimate baseline Cr using the Schwartz Calculation (baseline creatinine = (0.413 * height cm)/120 GFR). For patients with Chronic Kidney Disease (CKD), use the CKiD U25 Calculator.*

Inpatient Management:

Fluids:
- **2X MIVF** (max rate 200 ml/hr) of **D5 ½NS** or **D5 NS** or **NS** based on provider discretion
- Set goal PO fluid parameters: 2x maintenance requirement or minimum 2-3L/day if adult sized

Monitoring:
- CK & Chem 10 at least daily
  - Consider increasing frequency of lab monitoring based on CK trend and electrolyte abnormalities
  - Monitor for hyperkalemia & hyperphosphatemia; If hyperkalemic, obtain EKG and treat; calcium gluconate only indicated if EKG changes present
- UA daily
- Urine output (goal of average of 1-2 mL/kg/hr)
- Blood pressure: to monitor for hypertension

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*

***Consults to Consider**:

Nephrology:
- AKI[1]
- 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

Improving? — No → **Lack of improvement in 72 hours:**
- Evaluate for ongoing muscle breakdown
- Consider nephrology consult

Yes

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- 2mL/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 neurology referral

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LAST UPDATED: 07.16.25

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
- Dextroamphetamine
- Furosemide
- Insulin
- Metformin
- Omeprazole

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

- Atomoxtine
- 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.

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LAST UPDATED: 07.16.25