



Rhabdomyolysis

Fluids are the treatment · And do not correct the calcium

FLUIDS, EARLY & LOTS
everything else is secondary

DIAGNOSE IT *the triad is often incomplete — the CK is the test*

THE PRESENTATION

Classic triad of **myalgia, weakness and dark "cola-colored" urine** — but **all three are present in a minority**. Many patients present only with an unexplained acute kidney injury, or are found on the floor after a long lie.

THE CREATINE KINASE

CK more than five times the upper limit of normal is the usual working threshold, typically above 1,000 U/L. **Risk of kidney injury rises substantially above about 5,000**, and markedly above 15,000–20,000. **CK peaks at 24–72 hours** and falls over days — so trend it.

THE URINE CLUE

Dipstick positive for blood, but no red cells on microscopy — that mismatch is **myoglobinuria** and is highly suggestive. Myoglobin clears fast, so a negative dipstick later does not exclude the diagnosis.

FIND THE CAUSE *it is frequently more than one*

Category	Causes
Immobility & compression	Long lie after a fall , unconsciousness, drug or alcohol intoxication, prolonged surgery, crush injury . This is the commonest inpatient and elderly presentation.
Excessive muscle activity	Seizures and status epilepticus, extreme exertion especially unaccustomed or in heat, agitation and restraint, and severe dystonia.
Drugs & toxins	Statins , particularly with fibrates or interacting CYP inhibitors · cocaine, amphetamines, MDMA · alcohol · colchicine · antipsychotics via neuroleptic malignant syndrome · malignant hyperthermia · propofol infusion syndrome.
Metabolic & endocrine	Severe hypokalemia and hypophosphatemia — both impair muscle energetics — plus hypothyroidism, hyperosmolar states and diabetic ketoacidosis.
Infection & other	Influenza and other viral myositis , sepsis, pyomyositis, inflammatory myopathies, and inherited metabolic myopathies in recurrent unexplained cases.

TREAT IT *volume, early and generous — then the electrolytes*

- Aggressive intravenous fluid is the single effective intervention**, and **the earlier it starts the better**. Use isotonic crystalloid, begin before the CK result if the story fits, and continue until the CK is clearly falling.
- Target a urine output of roughly 200–300 mL/hour** in significant cases — considerably higher than usual maintenance goals. This requires large volumes; **monitor for fluid overload**, particularly in the elderly and those with cardiac or renal disease.
- Urinary alkalization and mannitol are not routinely recommended**. Neither has been shown to outperform aggressive isotonic fluid alone, bicarbonate risks worsening hypocalcemia and precipitating calcium phosphate, and mannitol can worsen renal injury and volume status.
- Treat hyperkalemia aggressively** — it is the immediate threat to life, arrives early, and can recur as muscle continues to break down. Continuous cardiac monitoring while potassium is shifting.
- Do not correct asymptomatic hypocalcemia**. Calcium is sequestered in damaged muscle early and is **released back during recovery, causing rebound hypercalcemia**. Giving calcium adds to that load and promotes precipitation. **Treat only symptomatic hypocalcemia or severe hyperkalemia requiring membrane stabilization**.

WATCH FOR THESE *two complications that change the plan entirely*

COMPARTMENT SYNDROME

Can be the **cause** of rhabdomyolysis, or a **consequence** of the swelling and the fluid you are giving. **Pain out of proportion and pain on passive stretch** are the early signs, and **a palpable pulse does not exclude it**. Examine the limbs repeatedly during resuscitation, and involve surgery early for **fasciotomy** — a missed compartment syndrome costs the limb.

ACUTE KIDNEY INJURY

From tubular obstruction by myoglobin casts, direct tubular toxicity and renal vasoconstriction. **Most recover fully with early fluids**. Indications for renal replacement are the usual ones — refractory hyperkalemia, acidosis, volume overload and uremia — and **not the CK level itself**. Also watch for **DIC** in severe crush injury.

MONITORING & THE ELECTROLYTE TIMELINE *the derangements move in a predictable sequence*

Parameter	What happens and when
Potassium	Rises early and can rise again as muscle continues to lyse. The immediate threat to life . Check frequently in the first 24–48 hours with continuous cardiac monitoring.
Calcium	Falls early as calcium deposits in damaged muscle, then rebounds to hypercalcemia during recovery as it is released. This biphasic pattern is exactly why you do not correct the early asymptomatic dip.
Phosphate	Rises from muscle breakdown, contributing to the hypocalcemia through calcium-phosphate precipitation. Avoid phosphate-containing fluids.
Creatine kinase	Peaks at 24–72 hours , then falls. Trend it — a plateau or second rise suggests ongoing injury, a missed compartment syndrome, or a continuing cause.
Renal function & fluid balance	Creatinine and urine output at least daily, more often when unstable. Weigh the patient and watch for pulmonary edema — the volumes required are large and the elderly heart may not tolerate them.

PEARLS & PITFALLS

- Start fluids before the CK comes back**. The benefit is almost entirely determined by how early volume resuscitation begins.
- Dipstick blood without red cells is myoglobinuria** — a fast, free clue available at the bedside.
- Do not give calcium for asymptomatic hypocalcemia**. It rebounds to hypercalcemia during recovery.
- Bicarbonate and mannitol are not routine**. Isotonic fluid in adequate volume is what works.
- Re-examine the limbs**. Compartment syndrome can develop during your resuscitation, and a pulse does not rule it out.
- Ask why**. Recurrent or unexplained episodes need a metabolic myopathy workup, and a statin plus interacting drug is a common and reversible cause.

References: Reviews of rhabdomyolysis and myoglobinuric acute kidney injury · KDIGO acute kidney injury guidance · evidence reviews on bicarbonate and mannitol in rhabdomyolysis.

Educational aid; verify against local protocol, renal function and patient factors.

