

Base Hospital Contact: Required for patients at risk for crush syndrome ① or prolonged entrapment > 30 minutes. ②

1. For multi-system trauma, treat in conjunction with [TP 1244, Traumatic Injury](#)
2. Assess airway and initiate basic and/or advanced airway maneuvers prn ([MCG 1302](#))
3. Provide spinal motion restriction (SMR) if indicated ([MCG 1360](#))
For alert patients, logroll patient off backboard (if used during extrication) and onto gurney prior to transport ③
4. Administer **Oxygen** prn ([MCG 1302](#))
5. For anticipated prolonged extrication (> 30 minutes)
Consider activating the Hospital Emergency Response Team (HERT), [Ref. 817](#)
6. Establish vascular access immediately ([MCG 1375](#)) ④
7. **Normal Saline 1L IV/IO rapid infusion** as soon as possible and prior to release of compressive force
Repeat x1 for a **total of 2 liters**
Reassess after each 250 mL increment for evidence of volume overload (pulmonary edema); stop infusion if pulmonary edema develops
CONTACT BASE to obtain order for additional **Normal Saline** if persistent entrapment ④
8. Initiate cardiac monitoring ([MCG 1308](#))
Assess for signs of hyperkalemia
9. Apply blanket to keep patient warm
10. If evidence of hyperkalemia (peaked T-waves in multiple leads, absent p-waves, and/or widened QRS complex) administer: ⑤
Calcium Chloride 1gm (10mL) slow IV/IO push, repeat x1 for persistent ECG abnormalities
Sodium Bicarbonate 50mEq (50mL) slow IV/IO push, repeat x1 for persistent ECG abnormalities
Albuterol 5mg (6mL) via neb, repeat continuously until hospital arrival
CONTACT BASE for persistent ECG abnormalities to obtain order for additional medications ⑥
11. For pain management: refer to [MCG 1345, Pain Management](#)
12. For CRUSH INJURY without risk of crush syndrome
Release compression and extricate patient
Monitor cardiac rhythm for signs of hyperkalemia
13. Consider pre-positioning a tourniquet prior to extrication in order to prevent hemorrhage upon release of compression
14. For patients at risk for CRUSH SYNDROME ①, administer the following medications 5 minutes

Treatment Protocol: CRUSH INJURY / SYNDROME

Ref. No.1242

prior to extrication: ④ ⑤ ⑥ ⑦

Calcium Chloride 1gm (10mL) slow IV/IO push

Sodium Bicarbonate 50mEq (50mL) slow IV/IO push

Albuterol 5mg (6mL) via mask nebulization x2 for a total dose of 10mg

If unable to establish vascular access while entrapped

Place tourniquet PRIOR to extrication ⑧

15. For patients within 3 hours of injury with uncontrolled extremity hemorrhage despite pressure and tourniquets ([MCG 1370](#))

Tranexamic Acid (TXA) 1 gram in 50-100mL Normal Saline IV/IO, infuse over 10 minutes ⑨

SPECIAL CONSIDERATIONS

- ❶ Crush syndrome is a systemic illness characterized by dysrhythmias and shock. It results from toxins released from crushed muscle tissue into the blood stream. Patients are at risk for crush syndrome if they have all of the following: 1) circumferential compression causing crush injury; AND 2) involvement of a large muscle group (lower extremity including the thigh(s) and/or pelvic girdle or upper extremity including the pectoral girdle); AND 3) entrapment for at least 1 hour. The risk of crush syndrome increases with the amount of muscle involved and the duration of the entrapment.
- ❷ For patients requiring transport to a Trauma Center per [Ref. 506](#), contact the receiving Trauma Center for Base Medical Direction and notification. If the Base Hospital is contacted and the Base redirects transport to a Trauma Center, Base personnel will notify the Trauma Center.
- ❸ A backboard is not required for spinal motion restriction (SMR) and may cause harm as well as increased pain. Patients should not be transported on a backboard for the purpose of SMR. If a backboard is used for extrication, patients who are alert should then be logrolled onto the gurney prior to transport. The backboard may be used during patient transport for splinting of multiple simultaneous extremity fractures or to assist with maneuvering the unconscious patient. In all cases, the backboard should be removed immediately if causing respiratory compromise.
- ❹ Patients with significant crush injury at risk for crush syndrome require large volumes of fluid resuscitation. Patients with prolonged entrapment will require maintenance fluids. IO access should be considered when attempts at IV access are not successful if: 1) prolonged entrapment is likely (> 30 minutes) and/or 2) there are signs of hyperkalemia and/or 3) there is risk of crush syndrome requiring medication administration.
- ❺ Flush the IV line with normal saline after each medication. Administration of Calcium and Bicarbonate together will cause precipitation of the medication.
- ❻ The duration of action of the medications is approximately 30 minutes. Contact Base to discuss re-dosing the medications if persistent signs of hyperkalemia or if the patient will not arrive at the hospital within 30 minutes.
- ❼ These medications should be administered prior to release of the compressive force to prevent complications from the cellular toxins that enter the circulation upon extrication of the patient. Calcium stabilizes the cardiac muscle and should be administered first.
- ❽ Tourniquet placement PRIOR to extrication is a last resort for patients who are at risk for crush syndrome in whom vascular access cannot be established or when transport time is anticipated to be > 30 minutes. The tourniquet must completely occlude venous and arterial flow in order to protect the patient from crush syndrome. Establish vascular access and cardiac monitoring immediately after extrication and be prepared to treat symptoms of crush syndrome.
- ❾ In patients meeting an indication for TXA, administer fluid resuscitation with Normal Saline and TXA concurrently.