TREATMENT PROTOCOL: CRUSH INJURY / CRUSH SYNDROME

1. Basic airway ❶
2. Spinal motion restriction prn/control bleeding prn
3. Pulse oximetry
4. Oxygen prn
5. Advanced airway prn
6. Cardiac monitor: document rhythm and attach ECG strip if dysrhythmia identified
7. Venous access
8. For pain management:

Fentanyl ❷ ❸ ❻

50mcg slow IV push/IM/IN one time
Pediatric: 1mcg/kg slow IV push/IM or 1.5mcg/kg IN one time
See Color Code Drug Doses/L.A. County Kids ❼

Morphine ❷ ❸ ❻

2-12mg slow IV push, titrate to pain relief
Pediatric: 0.1mg/kg slow IV push
See Color Code Drug Doses/L.A. County Kids ❼

9. Fluid resuscitate, to maximize hydration status prior to release of compressive force

Normal Saline

20ml/kg IV bolus (adult and pediatric)

10. **ESTABLISH BASE CONTACT (ALL)**
11. After fluid bolus complete, continue maintenance fluids

Adults 500ml/hr
Pediatric:
Weight up to 10kg: 4ml/kg/hr
Weight 10-20kg: 40ml/hr plus 2ml/kg/hr for each kg between 10 and 20kg❹
Weight greater than 20kg: 60ml/hr plus 1 ml/kg/hr for each kg above 20 kg❺

12. If pain unrelieved,

Fentanyl ❷❸❻

50-100mcg slow IV push, titrate to pain relief
May repeat every 5min, maximum total adult dose 200mcg
If IV not available, consider 50-100mcg IM/IN
Pediatric: 1mcg/kg slow IV push (over 2 minutes)
May repeat every 5min, maximum pediatric dose 50mcg
If IV not available, consider 1mcg/kg IM or 1.5mcg/kg IN
See Color Code Drug Doses/L.A. County Kids ❼

Morphine ❷❸❻

2-12mg slow IV push, titrate to pain relief
May repeat every 5min, maximum total adult dose 20mg
Pediatric: 0.1mg/kg slow IV push
See Color Code Drug Doses/L.A. County Kids ❼
Maximum pediatric total dose 4mg

13. If **crush injury only**, then release compression, extricate patient and monitor cardiac rhythm for signs of hyperkalemia
14. If the patient is at risk for **CRUSH SYNDROME** (compression of a large muscle group for at least 1 hour) or suspicion of hyperkalemia (peaked T-waves, absent P-waves and/or widened QRS complex):

Calcium Chloride

1gram slow IV push
Pediatrics: See Color Code Drug Doses/L.A. County Kids❼
20mg/kg slow IV push
Maximum single dose 1gram

TREATMENT PROTOCOL: CRUSH INJURY / CRUSH SYNDROME

Flush IV tubing with normal saline prior to administering sodium bicarbonate to prevent precipitation

Sodium Bicarbonate

1mEq/kg slow IV push

Pediatrics: See Color Code Drug Doses/L.A. County Kids ❼

Albuterol

5mg via continuous mask nebulization x2 doses

Pediatric: See Color Code Drug Doses/L.A. County Kids ❼
Less than 1yr of age: 2.5mg x2 doses
1yr of age or older: 5mg x2 doses

If unable to establish vascular access while entrapped

Place tourniquet PRIOR to extrication ❽

15. Release compression and extricate patient ❾

SPECIAL CONSIDERATIONS

❶ Treatment may be compromised by confined space or MCI situation. Ideally, start treatment prior to release of compression. Evaluate for early HERT notification as per Ref. No. 817, Hospital Emergency Response Team. A HERT is utilized in a situation where a life-saving procedure, such as an amputation, is required due to the inability to extricate a patient.

❷ Use with caution: in elderly; if SBP less than 100mmHg; sudden onset acute headache; suspected drug/alcohol intoxication; suspected active labor; nausea/vomiting; respiratory failure or worsening respiratory status

❸ Absolute contraindications: Altered LOC, respiratory rate less than 12 breaths/min, hypersensitivity or allergy

❹ For example, the maintenance rate for a 15kg child is as follows:
40ml/hr + (2ml/kg/hr X 5kg) = 50ml/hr

❺ For example, the maintenance rate for a 30kg child is as follows:
60ml/hr + (1ml/kg/hr X 10kg) = 70ml/hr

❻ Ondansetron 4mg IV, IM or ODT may be administered prior to fentanyl or morphine administration to reduce potential for nausea/vomiting

❼ If the child is taller than the pediatric resuscitation tape and adult size, move to the Adult protocol and Adult dosing

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 If unable to obtain vascular access in a patient at risk for crush syndrome or transport time >30 minutes anticipated, consider placing a tourniquet, if feasible, to the involved limb(s) PRIOR to extrication.