APPENDIX B: CRUSH INJURY, MONITORING AND MANAGEMENT CONSIDERATIONS

			Phase 1 Entrapment	**Phase 2** Extrication	**Phase 3** Immediately Following Extrication	**Phase** 4 Prolonged Field Care
FLUIDS						
	Best	IV or IO crystalloids	Initial bolus: 2L, continue 1L/h	Continue 1L/h	Titrate to UOP 100–200mL/h	Titrate to UOP 100–200mL/h
	Better	Oral electrolyte solution	Continue	Continue	Continue. Goal UOP 100–200mL/h	Continue. Goal UOP 100–200mL/h
	Minimum	Rectal electrolyte solution	Continue	Continue	Continue. Goal UOP 100–200mL/h	Continue. Goal UOP 100–200mL/h
Telemedicine: Consult on management						
Monitoring: 15-minute to hourly vital signs, examination, urine output documented on flowsheet						
VITAL SIGNS						
	Best	Portable monitor with ECG	Record every 15 minutes	Record every 15 minutes	Record every 15 minutes	Record every 1 hour
	Better	Check intermittent vital signs	Every 15 minutes	Every 15 minutes	Every 15 minutes	Record every 1 hour
	Minimum	Monitor pulse and mental status	Every 15 minutes	Every 15 minutes	Every 15 minutes	Record every 1 hour
UOP	Best	Place Foley catheter	N/A	N/A	Record UOP every 1 hour	Record UOP every 2 hours
	Minimum	Capture urine in premade or improvised graduated cylinder				
Urine myoglobinuria	Best	Laboratory monitoring	N/A	N/A	N/A	Every 6 hours
	Better	Assess urine color (red, brown, or even black)				
	Minimum	Dark urine (red, brown, or even black)				
Potassium and cardiac arrhythmia	Best	Laboratory monitoring of potassium levels	N/A	N/A	Check	Every 4-6 hours
		12-lead ECG	N/A	N/A	Check	Every 4-6 hours
	Better	Laboratory monitoring of potassium levels	N/A	N/A	Check	Every 4-6 hours
		3–5 lead ECG	Initiate	Continue	Continue	Continue
	Minimum	Close monitoring of vitals and circulatory examination	Initiate	Continue	Continue	Continue
Treatments for Hyperkalemia (>5.5mEq/L) or Cardiac Arrhythmia						
Calcium gluconate (10%)	Best	10mL IV over 2–3 minutes	N/A	N/A	Monitor; repeat as required	
Insulin (regular) and D50		10 units IV push + 50mL D50	N/A	N/A		
Albuterol (2.5mg/3mL vial)		10mg (4 vials) in nebulizer	N/A	N/A		
Sodium polystyrene sulfonate (Kayexalate)		15–30g suspended in 50–100mL liquid, oral or rectal	N/A	N/A		
Calcium gluconate 10%	Better	10mL IV over 10 minutes				

			Phase 1 Entrapment	**Phase 2** Extrication	**Phase 3** Immediately Following Extrication	**Phase** 4 Prolonged Field Care
Alternate: calcium chloride 10%						
Insulin (regular) and D50		10 units IV push + 50mL D50	N/A	N/A	Monitor; repeat as required	
Any individual or combination of above, as available	Minimum	See above	N/A	N/A		
Management of Injured Extremity						
Extremity compartment syndrome	Best	Clinical assessment • 6 Ps* • Rigid compartment	---	---	Fasciotomy: only if qualified medical personnel or teleconsultation available	
	Minimum				Cool limb (evaporative or environmental cooling, no ice/snow)	
Tourniquet (for crush management)	Best	If adequate fluids are unavailable, or arrhythmia cannot be managed during entrapment and extrication	If entrapment time >2 hours, consider tourniquet. Place two tourniquets side by side and proximal to the injury	If the patient meets criteria for tourniquet conversion or removal, and fluids are available, initiate crush injury protocol before loosening tourniquet.		
Tourniquet (for irreversible injury)		A limb that is cool, insensate, tensely swollen, and pulseless is likely dead. Patient may develop shock and kidney damage, and may die.				Consider fasciotomy. If no improvement, place two tourniquets side by side and proximal to the injury. Amputation anticipated
Pain						
			Per TCCC	Per TCCC	Per TCCC	Refer to Pain/sedation to CPG
Infection Control						
Antibiotics	Best	Portable monitor with ECG	Ertapenem, 1g IV/day (1g, 10mL saline or sterile water)			
	Better	Check intermittent vital signs	Cefazolin, 2g IV every 6 to 8 hours; clindamycin (300–450mg by mouth three times daily or 600mg IV every 8 hours); or moxifloxacin (400mg/day; IV or by mouth)			
	Minimum	Monitor pulse and mental status	---	---	Ensure wounds cleaned and dressed, and hygiene of wounds and patient optimized to the extent possible given environment.	

N/A, not applicable; UOP, urine output. *6 Ps: Pain persisting despite adequate analgesia is most important symptom, followed by paresthesia, pallor, paralysis, poikilothermia, pulselessness