Differences in Adult Crush Syndrome Treatment

Paramedic | Intensive Care | Extended Care | Specialist

Method

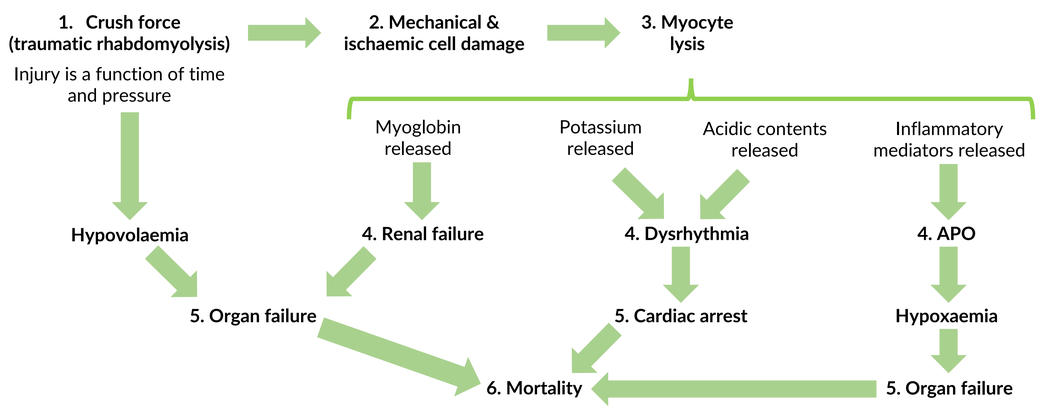
Produced July 2022. This poster is a descriptive analysis and comparison of a specific and discrete cluster of primary sources. All of the ten jurisdictional services have open access Clinical Practice Guidelines (CPGs). Content was extracted by two paramedics, with oversight from two senior lecturers in paramedicine. Scope of practice was classified as 'Paramedic' (undergraduate degree, represented by a ✓), 'Intensive Care Paramedic' (intensive care postgraduate degree), 'Extended Care Paramedic' (primary care postgraduate degree), or 'Specialist' (all other advanced roles, e.g. Retrievalist). Routine cares were omitted for brevity, as were ongoing management of hypotension, blood administration, and similar specific CPGs. Hyperkalaemia has been included due to its specific relevance for crush. This comparison does not review the peer-reviewed, published literature to determine current best practice in treatment. Consequently, no CPG is inferred to be superior or inferior to any other, nor that the most common treatment is necessarily optimal. This resources is created purely to assist making paramedics aware of current Australasian treatment options across JASs.

Jurisdiction (Service)	Crush interventions			Pharmacology							Airway interventions		
					Isotonic, acidic volume loader	Antifibrinolytic		Hyperkalaemia management			Endotracheal intubation		
	Torniquet	Remove crush force	Other interventions	Oxygen target saturations	Pre-loading fluids	Tranexamic acid	Glucose 10%	Calcium gluconate/chloride	Sodium bicarbonate	Salbutamol (nebulised)	Unassisted (arrest)	KOBI, IFS	RSI, DSI
Aus. Capital Territory (ACTAS)	✓ Do not remove (a)	✓	Immobilise limb at heart level	Continuous high flow	✓ Warm fluids			ICP	ICP	✓	ICP	ICP	ICP
New South Wales (NSWA)	✓ Release post removal of crush (b)	✓		>94%	✓ 10 ml/kg initially Prior to release of crush			ICP Prepare prior to crush release	ICP Prepare prior to crush release		ICP		
New Zealand (SJNZ)	✓ Consider release post removal of crush (c)	✓ Immediately if asphyxia, delay up to 20m otherwise to prepare		>94%	✓ 2L	✓	✓ 500 ml 10 minutes prior to release	ICP As weight is being released (d)	ICP As weight is being released (d)	✓ Continuously 10 minutes prior to release	ICP		ICP
New Zealand (WFA)	✓ Consider release post removal of crush (c)	✓ Immediately if asphyxia, delay up to 20m otherwise to prepare		>94%	✓ 2L	✓	✓ 500 ml 10 minutes prior to release	ICP As weight is being released (d)	ICP As weight is being released (d)	✓ Continuously 10 minutes prior to release	ICP		ICP
Northern Territory (SJNT)	No Crush CPG			100% (k)							ICP		ICP
Queensland (QAS)	✓	✓	Elevate limb	92-96%	✓ 20 ml/kg	✓		ICP	ICP	ICP	ICP		Specialist (i)
South Australia (SAAS)		✓		94-98%	✓ 20 ml/kg (h)	✓				✓ (i)	ICP		Specialist (j)
Tasmania (AT)	✓ If > 30 minutes	✓ Immediately if head, torse, or <30 minutes		94-98%	✓ 500 ml				ICP		ICP		
Victoria (AV)	No Crush CPG			Continuous high flow Once stable 92-96%				(g)	(g)		ICP		ICP
Western Australia (SJWA)	(e)	✓ Immediately		94-98%	ICP 20 ml/kg (f) Prior to release of crush	✓		ICP	ICP	ICP Continuously	✓		ICP

DSI = Delayed sequence intubation ICP = Intensive care paramedic IFS = Intubation facilitated by sedation KOBI = Ketamine-only breathing intubation MDI = Metered dose inhaler RSI = Rapid sequence induction

(a) Apply immediately prior to release of lower limb crush, unless fluids already provided (b) Reapply if ECG changes or haemorrhage occurs (c) If limbs do not appear badly injured and transport time > 30 minutes (d) Further as required (e) Torniquets have shown no benefit (f) Further 20 ml/kg/hr, maximum 60 ml/kg, consult for medical advice (g) Hyperkalaemic or significant crush cardiac arrest only (h) Consider repeat post release for crush (h) Medical consult required (i) ICP 'High Acuity Response Unit' only (j) ICP Flight 'Retrieval Paramedic' under medical consult only (k) If crush is treated as a "major trauma"

Pathology flowchart



Treatment rationale

Pre-loading fluids
- Provision of an isotonic, acidic volume filler has three benefits: 1) increased volume causes dilution of toxins; 2) sodium reduces potassium's cardiotoxic effects; and 3) increased glomerular filtration reduces the nephrotoxicity of myoglobin.

Tranexamic acid
- Tranexamic acid prevents the conversion of plasminogen into plasmin, in turn reducing the amount of plasmin available to cleave fibrin and cause thrombolysis.

Calcium gluconate / chloride
- Stabilises myocardial membranes immediately, reducing potassium toxicity.

Sodium bicarbonate
- Sodium bicarbonate has three benefits: 1) sodium reduces potassium's cardiotoxic effects; 2) bicarbonate is alkolising, increasing Ph and moving potassium into cells 0.5-1 mmol/L in 5-10 minutes; and 3) increasing Ph also reduces myoglobin deposits in renal tubules, decreasing nephrotoxicity.

Glucose
- Increases insulin production, moving potassium into cells.

Salbutamol
- Salbutamol stimulates potassium movement into cells by 0.5-1 mmol/L in 30 minutes.

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