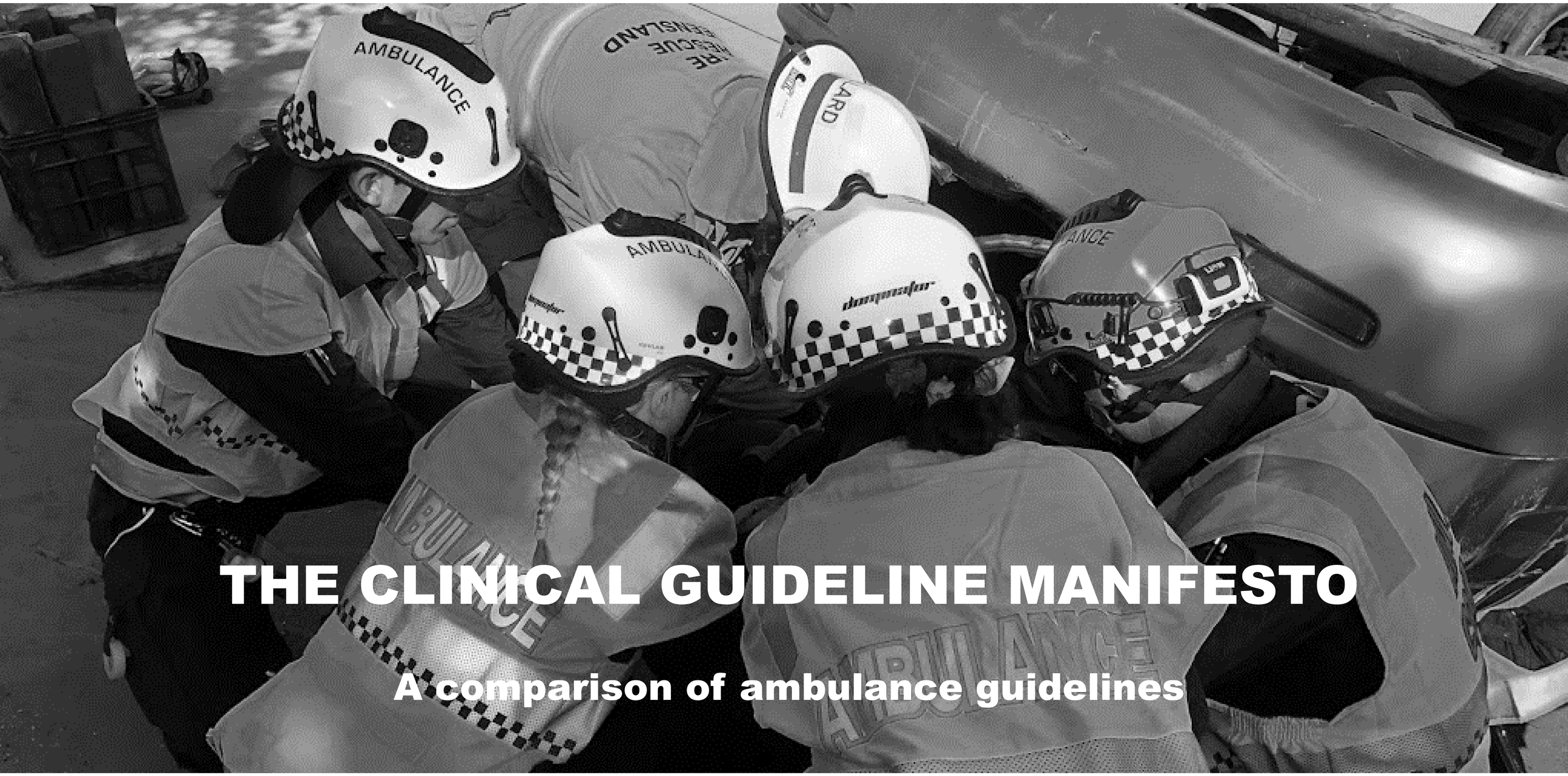
THE SHIFT EXTENSION

Special Edition



THE CLINICAL GUIDELINE MANIFESTO

A comparison of ambulance guidelines

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The sheer volume of information in these posters warrants a large page and as such, a print version of this Special Edition is not possible. That said, the digital format allows readers to zoom in to each poster for clarity. Please use this feature to your advantage.



Episode 15 - Death and Dying - with Dr Sandy Macquarrie



Episode 14 - Police medical response, with Dustin Osbourne



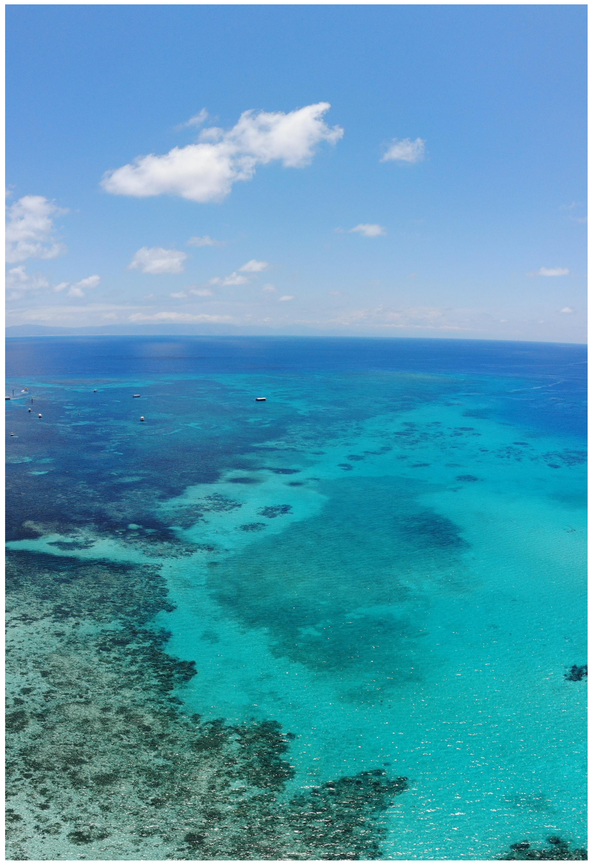
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AMBULANCE
AMBULANCE

Pre-Amble

Differences in Emergency Paramedic Clinical Practice Guidelines across Australia and New Zealand

Matt Wilkinson-Stokes

The ten Australian and New Zealand jurisdictional ambulance services (JASs) are – in the words of one manager – big businesses. Their collective budget was $4.8 billion AUD and $480 million NZD respectively last year, and they treated over 4.5 million of us.[1–3] At the core of these businesses are paramedics, mostly in ambulances, working every day and night to respond to any 000 or 111 call that sounds even vaguely medical-ish.

For those of us who work for these services, our clinical practice is steered – with varying levels of stringency – by Clinical Practice Guidelines (CPGs).[4–12] However, one of the historic quirks of Australasia is that each JAS independently produces their own CPGs, and these guidelines vary wildly across state lines.

This has led to some unusual scenarios. One paramedic works for two different services. Depending on what day of the week it is, she'll be working either side of a state line, and have to give the same chronic patients completely different medications and dosages. (She describes it as 'absurd' and confusing for the patients.) Another paramedic moved from Victoria to Queensland, and technically 'overdosed' a patient by giving them a Victorian dose of intranasal Fentanyl (400 mcg) rather than a more conservative Queensland dose (200 mcg).

It's important to clarify that, when looking at the evidence for many CPG differences, there is regularly no real 'right' or 'wrong' guideline. Multiple treatments can be appropriate, and – to use the example above – both the Victorian and Queensland maximum doses for intranasal Fentanyl are completely reasonable. However, hearing these

stories did make us curious.

Just how many differences are there? Are there any that do matter? Why does a well-resourced, multi-billion-dollar industry differ so much on basic out-of-hospital medical treatment?

What did we do?

We set out to answer the first of these three questions by forming a group of around 40 paramedics, doctors, and nurses – all of whom generously volunteered their time unpaid – to attempt to catalogue the many inconsistencies in paramedic treatment across Australia.[13] To keep it enjoyable and interesting, we charted the differences using colourful posters, covering 33 of the major pathologies that we all treat.[14]

For simplicity, we only looked at if a treatment is offered, and who by (based on clinical level, such as paramedic, ICP, ECP, etc – levels other than this, such as aeromedical, we put together as 'specialist' and provided details in a footnote). Comparing the more complex details like dosages or contraindications, while there were some fascinating differences, proved too time-consuming for our volunteers and too hard to present in simple posters. We also relied largely on the publicly available CPGs; some services still keep some CPGs (such as for ECPs, or aeromedical teams, or where a trial is ongoing) confidential, and weren't willing to share a copy. So this isn't a comprehensive or perfect set of work – it's a rough and ready starting point that aims to raise awareness and kick off a conversation.

These posters have struck a chord, racking up many thousands of readers from nearly 100 countries across the world.

What did we find?

Perhaps unsurprisingly, even a brief glance shows that there is little consistency in paramedic medicine across Australasia.

Here are a handful of the differences we found interesting:

- For cardiac arrest, 2 services provide dual defibrillation, 1 service provides stacked shocks, 8 services provide mechanical compression devices, and 3 provide precordial thump.
- For analgesia during labour, opioids are indicated in 4 services. In another 4, they are contraindicated.
- In fact, across Australasia you'll get any one of 16 different pain medications; 8 of these are available in less than half the services.
- For sedation of an acute behaviour disturbance, patients will get any one of 6 different medications, each of which has totally different safety profiles and effectiveness.
- For hyperkalaemia, 5 services provide calcium and sodium bicarbonate, and 5 do not.
- For a TBI, the target systolic blood pressure varies from >90 mmHg to >120 mmHg.
- 13 different tools are used to identify and triage CVAs.
- Thrombolysis is available to paramedics in 6 services, to ICPs in 1, and not available in 3 services.

- PEEP is available to paramedics in 4 services, ICPs in 2, and not available in 4 services.
- Sedation for CPRIC is available to paramedics in 3 services, ICPs in 5 services, and not available in 3 services.

These findings back up a handful of formal peer-reviewed publications on acute behavioural disturbance,[15] anaphylaxis,[16] back pain,[17] cardiac arrest,[18] obstetric emergencies,[19] sepsis,[20] and is now being researched by our peak national body, the Australasian College of Paramedicine.[21]

We didn't set out to answer our group's second question with this project ("Are there any differences that do matter?"). However, broadly speaking, we do believe that our time spent comparing the CPGs shows that there is no one service who is fundamentally better than the others – each have their strengths and weaknesses.

We also found that these guidelines are constantly in a state of flux, with the services updating them several times a year. That's great news, as that kind of rapid adaptability to new evidence is exactly what you want in the healthcare system.

However, the inconsistencies do come in stark contrast to New Zealand (where the ambulance services work together to write a joint set of guidelines that everyone uses) or the United Kingdom (where, in 2000, dozens of different services came together to form a single central research body that creates national guidelines that are then tailored to each region's needs).[6,22]

Why do CPGs matter?

The use of CPGs isn't just limited to determining what treatment you'll be giving. They have a constant presence that weaves its way throughout the profession:

• Education. For the nearly 8,000 paramedic university students in Australia,[1] memorising your local CPGs is often a rite of passage (although many universities are proactively moving away from this).[23–25] The same is true for those completing a graduate year within a service, who may be regularly quizzed on their guidelines. Incidentally, for university students, it may end up being an unconstructive chore if you get a job interstate and need to re-learn a completely different set of guidelines – or if, like the paramedic discussed before, you work for two services and need to remember two different sets of (often completely opposite) treatments.

• Discipline. In several old-school ambulance services, 'going outside the guidelines' is grounds for an automatic investigation or reprimand,[26] with the paramedic then formally put on notice. Expecting a clinician to be able to rationalise their treatment is completely reasonable; however, the method in which this is implemented can have big impacts on the incentivisation of paramedics and treatment. While some services have been praised for handling this well (such as by having audits that presume the variation was appropriate, and that don't notify the paramedic unless there is serious cause for concern), others implement a presumption of guilt on any variation

from the CPGs that the paramedic is then given the onus of disproving. Medical clinicians have also reflected on this: 'Clinical guidelines can also hurt clinicians professionally. Auditors and managers may unfairly judge the quality of care based on criteria from [guidelines].'[27] This creates a strong disincentive to vary your treatment,[28] even if that is what your patient truly needs. (Some paramedics have told us that it's usually easier to just give your patient a treatment that is 'close enough' and avoid the hassle of an investigation.)

• Legal. Guidelines are even used in Court when things inevitably go wrong. While in the pre-university days paramedics were expected to follow them directly,[29] the increase in education has led the High Court of Australia to grant a little more wiggle-room;[30] nonetheless, great weight is still given to following guidelines (particularly if they are still worded as binding protocols).

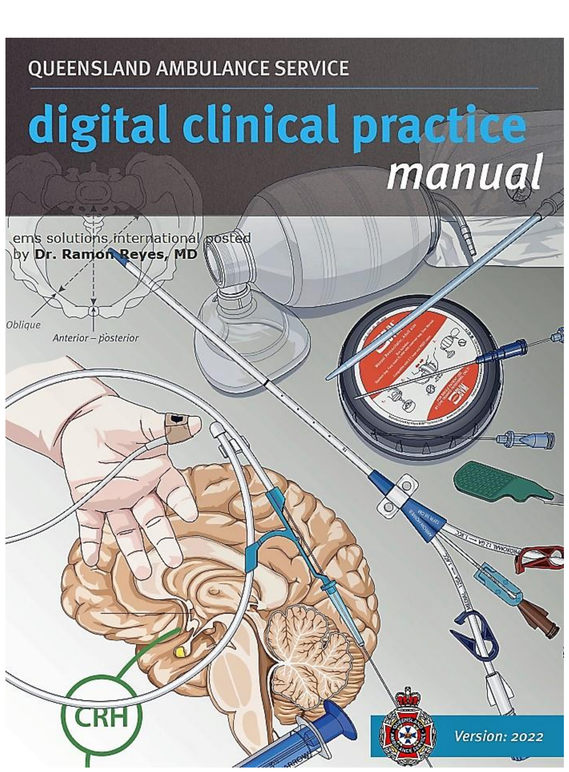
• Culture. Less so today, but historically many paramedics were taught to treat their local CPGs as a source of truth – irrefutable and perfect – with a 'punitive culture that enforces following rules'.[26] One Intensive Care Paramedic, when asked about a treatment offered interstate, stated 'Don't talk to me about what [service] does… They are killing their patients.' This mentality, where any variation from your own guidelines is looked on with suspicion rather than curiosity, persists in some quarters.

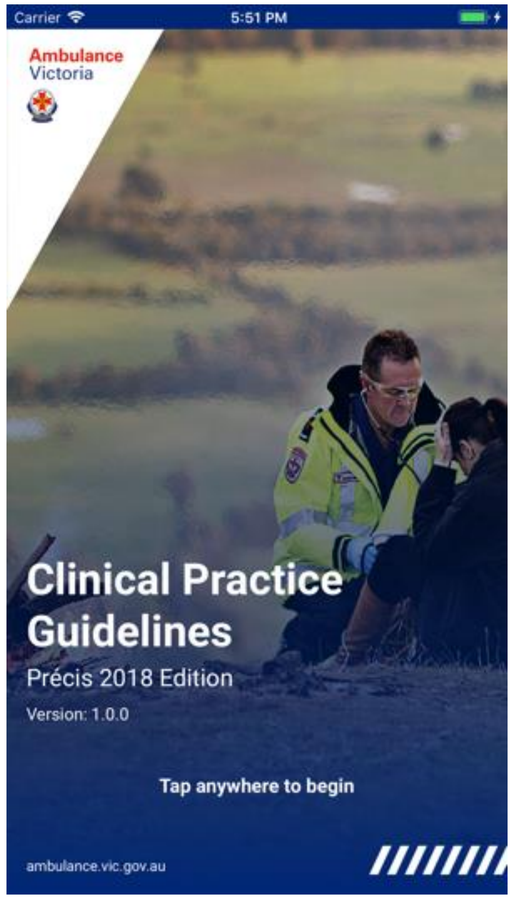
Given their fundamental place in the profession, many non-paramedics would probably assume that all the States and Territories have come together to join resources and produce rigorous, evidence-informed guidelines.

This is – for better and for worse – not the case.

Why are CPGs so different?

Each set of guidelines is written independently by the State or Territory ambulance service, and while they are open access (see the links on page 11 if you're interested in having a look), they are developed independently.[13] (The exception to this is St John New Zealand and Wellington Free Ambulance, who collaborate on a single set of guidelines for the country which each service then has minor variations from.)





In reality, as has been discussed for well over a quarter of a century, medicine is not well-suited to rulebooks.[27,31] For those outside of a clinical background, there can be a perception of medical treatment as black and white, and terms like 'proven' or 'evidence' are readily accepted by patients. However, in practice, most of healthcare is a Sherlock Holmes affair[31,32] of investigation and balancing the probabilities[33] – you can rarely be certain of the exact treatment that will work for your patient, multiple treatments are often equally reasonable, and all treatments carry risks that need to be weighed.

'*Diagnosing an illness is often like trying to put together a complicated jigsaw puzzle with the hitch that you cannot have all the pieces*.'[31 p.33]

(A side note: improving your diagnostic ability is a vexed issue for many paramedics, as many services have no reliable, formal mechanism to subsequently find out if your provisional diagnoses and treatment were correct. This can leave paramedics unable to reflect on and improve their own practice, leading to further over-reliance on guidelines.)

What happens if the guidelines don't cover the treatment you need to give? Writing a single set of guidelines to cover the almost infinite situations paramedics go to is impossible; there is always a regression to the mean. This has also been recognised in medicine, where guidelines are criticised for only providing 'blanket recommendations, rather than a menu of options or recommendations for shared decision making.'[27] This simplification is a major conundrum for paramedics, particularly when your patient needs a completely safe, simple treatment that isn't in the guidelines like the Epley for BPPV28 – do you risk being disciplined by giving it, or just let their condition continue for a little bit longer and give them a potentially avoidable trip to an expensive and overcrowded hospital?

It's strange to think that you would be treated completely differently in Albury to a few hundred meters south in Wodonga, or on the north side of Dixon Street in Coolangatta to the south in Tweed Heads, but that's exactly the case. Some paramedics refer to this phenomenon as 'postcode lottery'. Which ambulance service responds to you – and, consequently, which set of CPGs you fall under – will probably be the single most important factor in deciding your treatment.

Why don't we work together more?

Given the enormous resourcing of these services, some genuinely remarkable innovations that they are testing, and their widely stated commitment to evidence-informed practice, there is a relatively small amount of attention given to the guidelines that every single JAS paramedic operates within.

Ambulance services fall under each State or Territory's government. They have developed largely independently of each other and continue to work that way. Although there is a lot of camaraderie between the services,[34] there are significant disincentives for senior managers to come together when writing guidelines.

- Firstly, doing so would require every service losing control over a critical part of their job. Given that services have a legal duty of care to their patients, this is an anxiety-inducing proposition for most managers. (However, looking at the United Kingdom or New Zealand suggests that this fear is likely unfounded.)

• Secondly, achieving any kind of consistency would of course require a lot of change from most of us – this isn't easy. Changing what drug you carry doesn't just mean buying something different from the store; you have to roll out an education program to thousands of paramedics working different schedules, move drugs across the country (very difficult if they need to be stored a particular way), find a place for it in our often overflowing bags (space is a valuable commodity in the ambulance business), and sometimes even get legislation changed to make it legal.

While joint guidelines would likely be more thorough, cost less, be legally stronger, and ethically provide benefits for the less-funded areas of the country, that's an awful lot of initial work, cost, and a big loss of control to managers for an unknown amount of gain. Given that we can't even get close to agreeing on what to call ourselves,[35,36] the fact we don't collaborate on guidelines isn't that surprising.

Are evidence-informed guidelines even possible?

There's another reason why we don't see much consistency in guidelines, one which is the dark secret of out-of-hospital medicine: there is little definitive empiric research.

Take these brief examples from three of the more topical interventions:

1. Rapid sequence induction during a TBI. The evidence for this is mixed.[37] Done really well, this treatment probably has a minor benefit. Done incorrectly, and it is almost certainly harmful. To achieve the 'really well' standard consistently requires an enormous amount of ongoing time, effort, and other resources from services. Should services invest time and money in electing to pursue providing a treatment that is possibly beneficial?

2. Out-of-hospital extracorporeal cardiopulmonary resuscitation (the addition of ECMO during CPR). It may improve outcomes, but it is both enormously expensive and all existing studies (four datasets) have major risk of bias.[38,39] How should this be weighed against other possible treatments?

3. Mechanical external chest compression devices (which one ambulance service recently installed on every single ambulance at a cost of roughly $13 million).[40] There is no difference in neurologically intact 30-day survival, and previous research has shown them to not be cost-effective.[40–42] How should cost be taken into account?

There are no easy answers, and differences of opinion are completely reasonable.

As is hinted about in the above examples, this is made more difficult by limited resources. Services cannot do everything, and each treatment they do invest in has an opportunity cost of another investment foregone.

Running a large, randomised trial when you are dealing with life and death is ethically and logistically a mess, so most of our guidelines are often more of a 'best guess' by a handful of experts (often informed by weak evidence) rather than 'proven' treatments. Unsurprisingly, when there is a lack of empirical evidence, experts disagree. During our research, several guideline writers have mentioned the difficulty of being caught between conflicting expert medical opinions – as a paramedic, when several professors of medicine disagree, which one's advice should you follow? Methods that account for this – such as doing a Delphi or discussing certainty of evidence in guidelines – are rarely used or summarised for paramedics in the CPGs they use.

Of course, having this variation across the country provides a perfect opportunity to run natural experiments, comparing the outcomes across each state to determine which treatment works best. Strangely enough, while this occasionally happens,[43] it's rare – again, there isn't any centralised research institute to take ownership of such a project, and getting ethics, logistics, and funding to compare a dozen treatments across the country is extraordinarily painful. While some of the larger services have extremely well-equipped and talented research units, many of the smaller services cannot afford this – and in almost all cases, many paramedic services reasonably view it as an adjunct to their 'core business' of delivering 000- or 111-services, and research consequently tends to receive secondary attention from the organisations.[44]

The benefits of local guidelines

There are some benefits to this variation.

- Innovation is easier when there's variation across the country (perhaps helped slightly by some friendly competition), and the services are constantly trying new things out. Remember: different isn't always wrong.

- Australia is big, and different places need different treatments. The tropical medicine of the far north and the urban population of a major city are totally different beasts, and a one-size-fits-all approach will never be appropriate.

- Paramedics services aim to integrate with their local hospital system. Therefore, if a hospital (or entire health department) has already chosen a particular medication as their preference, it often makes sense to adopt the same medication for continuity of care, even if there is different out-of-hospital evidence.

- Each service falls under completely different laws and regulations. Some are closely tied to the choices of their local hospital system, while others are completely independent entities. Choices regarding guidelines are indirectly influenced by this.

- Path dependence means local variations may be the best approach in many cases. If a service already has a particular service or technology established, it may be much more efficient to choose new treatments that match nicely with those, rather than rebuilding the system from scratch. For example, if a service already has highly trained extended care paramedic system, it may be easy to introduce a range of treatments for clinicians to deliver. If that system isn't in place, it may be more efficient to instead invest in telemedicine for all paramedics to use.

- Local guidelines recognises that budgets vary greatly across services: while Tasmania comes in first with a generous $258 per person, Western Australia struggles to keep up with nearly half that at $135.1 With some of our medications being expensive – the lifesaving Tenecteplase comes in at just under $2000 per dose, multiplied by thousands of paramedics and replaced after shelf-life expiry – some services genuinely just cannot afford to do what others can. (However, it is worth noting that this has not caused any significant difficulties in the United Kingdom or New Zealand, both of whom have local variations to national guidelines.)

The drawbacks of local guidelines

However, of course, there are also problems to this inconsistency.

• While having flexibility is good, having paramedics giving totally different treatments for no reason isn't. It exacerbates inequalities in healthcare and is confusing for paramedics and patients alike.

• More concerningly, some guidelines are massively out of date with current medical practice (this isn't a name and shame article, so we won't point them out here), and patients in those areas are receiving treatments that haven't been practiced in hospitals in years.

• While this variation provides an opportunity for us to learn from each other, we often just aren't. During some recent interviews with the writers of CPGs in Australia, one person was shocked when told what their neighbour state is doing ('They do what?!'), showing just how unaware some are about these variations.

• Similarly, when asking one former guideline writer how they came up with their guidelines, they frankly told us that they just make them up, sometimes with a quick Google search. That person is a highly trained doctor, and the treatments are probably correct – but there's still a risk of error, or bias, or of that one person not keeping up with the mountains of new evidence.[45] It's not a good system, and not what you would expect from billions of dollars of investment.

• Above all, our current system is painfully inefficient. With each service producing their own CPGs we are – very literally – continually writing the same book nine times over.

As some recent, unpublished research ACP have conducted shows, this is compounded by a critical lack of resources to the CPG writers. Given the fundamental nature of CPGs, it would be reasonable to assume that there is a team continually researching the very best evidence and carefully writing guidelines. That just isn't always the case. Some of the bigger services can support this kind of venture, but smaller services can't afford it. The majority of services produce guidelines with a team of 1-2 individuals, estimated to be allocated less than 0.001% of the service's annual budget; a surprisingly small amount for a decision as critical and fundamental as what treatment patients are given.

Since we started this series of posters, we have been contacted multiple times by different CPG writers, who have asked us to produce a poster on a particular topic so that they can quickly review what everyone else is doing while updating their own guidelines. While we are happy to do it, surely our emergency healthcare system shouldn't rely on unpaid volunteers making informal posters. Pooling of resources could allow us to access economies of scale, producing higher-quality medical guidelines for lower overall cost.

What could our guideline development ideally look like?

Given path dependence, achieving consistency nationally would require an extraordinary level of commitment from the services. The services have already demonstrated a great dedication to accountability and transparency, with all ten CPGs now open access. Building on this, what would ideal guideline development look like?

There would be a national research institute – or, better still, a consortium including consumers (patients), paramedics of all levels, researchers, managers, and a variety of other stakeholders – that both produces living systematic reviews on out-of-hospital evidence-informed medicine,[46] and that runs continual experiments to determine best treatment. From this, a rigorous set of national guidelines could be developed using a Delphi method, that each State and Territory can tailor to their local population's needs, logistics, and budget. Ideally, that tailoring wouldn't be based purely on State or Territory at all, but on more meaningful factors like how rural a patient is (a separate set of 'urban' and 'rural' guidelines that cross borders may be more appropriate in Australasia than a separate set for each State and Territory). Culturally, as paramedicine further develops as a profession, these guidelines would be used in their pure sense – to 'guide', rather than prescribe – and they will be just one consideration for a clinician when treating patients.

Paramedicine exists to treat patients, often in emergencies. If we want that treatment to be good, we need to focus on creating rigorous, evidence-informed guidelines.

Enjoy the posters from the Clinical Guideline Series.

Matt

A few points to keep in mind when reading these posters

- They are a snapshot in time. These services tend to update their treatments multiple times per year (this responsiveness is exactly what we would like to see in medicine), and many of these posters will rapidly become out of date. For example, when the analgesia poster was completed, NZ had removed Morphine; it's now been re-introduced to the national guidelines as some services are continuing to use it while some aren't. For the current treatments, refer to the open-access CPGs linked above.
- There is, for almost all treatments, no objective right or wrong.

- The most popular treatment isn't always the best.

- The services don't have the same needs or resources, and differences in guidelines may be in the best interests of patients.

Links to Australasia's emergency paramedic Clinical Practice Guidelines

- Australian Capital Territory
- New South Wales
- New Zealand (both services)
- Northern Territory
- Queensland
- South Australia
- Tasmania
- Victoria
- Western Australia

Note

This article is written solely by Matt and does not reflect the paramedic service or universities he works for. Development and research of CPGs is continuing, and many of the points here may change with time; this article simply aims to raise awareness.

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The

Clinical Guideline

Manifesto

A Poster Series Comparison of Ambulance Guidelines

Project Lead: Matt Wilkinson-Stokes

Differences in Adult Acute Behavioural Disturbance Treatment

Paramedic | Intensive Care | Extended Care | Specialist

Method

Produced November 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 a registered paramedic, 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. Retrieval Paramedic). Standard, routine cares such as verbal de-escalation were omitted for brevity, as were other complaints and/or conditions covered under their own, separate CPG (such as safety, documentation requirements, or atropine post-ketamine for hypersalivation). 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. This excludes agitation resulting from neurological trauma, which is covered in the Traumatic Brain Injury poster.

Jurisdiction (Service)	Terminology used	Tool guiding sedation decision	Sedative selection order	Pharmacology						Intervention		
				Antipsychotic		Benzodiazepine			NMDA antagonist			
				Droperidol	Olanzapine	Midazolam	Lorazepam	Diazepam	Ketamine	Physical restraint	Mechanical restraint	RSI / DSI
Aus. Capital Territory (ACTAS)	Combative and agitated patients	SAT	Droperidol Ketamine Ketamine and Midazolam	✓ (a)		ICP (b)			✓ (c, d)	✓	✓	(e, f)
New South Wales (NSWA)	Management of acute severe behavioural disturbance (MASBD)	No tool; clinician judgement	Droperidol with/without Midazolam Ketamine and Midazolam	✓		✓ (g)			ICP (b)	✓	✓ (g)	
New Zealand (SJNZ)	Agitated Delirium	No tool; clinician judgement	Olanzapine Droperidol Midazolam Ketamine	✓	✓	✓			ICP (g)	✓	✓	ICP (h)
New Zealand (WFA)	Agitated Delirium	No tool; clinician judgement	Olanzapine Droperidol Midazolam Ketamine	✓	✓	✓			ICP (g)	✓	✓	ICP (h)
Northern Territory (SJNT)	Acute behaviour disturbance (ABD)	SAT	Olanzapine Droperidol Ketamine Ketamine + Midazolam	✓ (c)	✓ (a)	ICP			ICP (c)	✓	ICP	ICP (i)
Queensland (QAS)	Acute behavioural disturbance (ABD)	SAT	Droperidol Ketamine or Midazolam	✓ (c, j)	(k)	✓ (l)			ICP (b, l, s)	✓		(e, m)
South Australia (SAAS)	Challenging behaviour	SAT	Lorazepam Droperidol or Midazolam	✓ (c, n)		ICP (c, o, p)	✓			✓	✓	(e, q)
Tasmania (AT)	Acute behavioural disturbance (ABD)	SAT	Diazepam Droperidol with/without Midazolam Ketamine	✓ (c)		ICP		✓ (r)	ICP (l, s)	✓	✓	
Victoria (AV)	Acute behavioural disturbance (ABD)	SAT	Olanzapine Droperidol or Midazolam Ketamine	✓ (t)	✓ (r)	✓ (l, t)			✓ (d, u)	✓	✓	(e)
Western Australia (SJWA)	Disturbed and abnormal behaviour	RASS	Olanzapine Droperidol Ketamine	✓	✓	✓ (v)			✓	✓		(e, w)

(a) Recommended for a SAT score of 1-2 (b) Second line agent (c) Recommended for a SAT score of 2-3 (d) ICP backup must be requested if administered (e) Not explicitly mentioned on the ABD CPG (f) This skill is available to ICPs, however, its is solely indicated for airway compromise (g) Only indicated for physical aggression or violence (h) Indicated if safety remains not easily controlled (i) Indicated for unconsciousness or respiratory failure post ABD sedation (j) If a second dose is administered, an ICP must be requested; they may subsequently be cancelled if this is effective (k) Approved for introduction; not currently available (l) If unresponsive to maximum dose of Droperidol (m) ICP – "High Acuity Response Unit" Paramedic only (n) First line agent for suspected non-medical cause (o) First line agent for suspected medical cause (p) Paramedics may be permitted to do this on consultation (q) ICP – "Retrieval Paramedic" only (r) Recommended for a SAT score of 1 (s) Consultation required (t) Recommended for a SAT score of 2 (u) Recommended for a SAT score of 3 (v) Maintenance of sedation only, consult if post ketamine (w) Indicated for ICPs to facilitate safe transportation

Treatment rationale

Antipsychotics
- Droperidol is a first-generation antipsychotic that works as a D_2 dopaminergic antagonist, with dual antiemetic and antipsychotic properties.
- Olanzapine is a second-generation (atypical) antipsychotic that works on all dopaminergic receptors, and additionally on serotonin receptors.

Benzodiazepines
- A class of drug that binds to an allosteric site on $GABA_A$ receptors, increasing the conductance of chloride anions when the ligand binds to the active site. The increase in intracellular negative ions hyperpolarises the cell. This hyperpolarization increases the stimuli necessary to reach the action potential threshold, decreasing neurotransmission.

Ketamine
- An NMDA Ketamine has a multitude of pharmacodynamic effects, the most relevant of which is its central function as a non-competitive NMDA antagonist, in turn reducing the excitatory effects of glutamate and glycine, and leading to analgesia, disassociation, and ultimately anaesthesia with increasing dosage.

ABD = Acute behavioural disturbance CPG = Clinical practice guideline DSI = Delayed sequence induction ECP = Extended care paramedic ICP = Intensive care paramedic MASBD = Management of acute severe behavioural disturbance JAS = Jurisdictional ambulance service RASS = Richmond agitation sedation scale RSI = Rapid sequence induction SAT = Sedation assessment tool

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Differences in Acute Coronary Syndrome Treatment

Paramedic | Intensive Care | Extended Care | Specialist

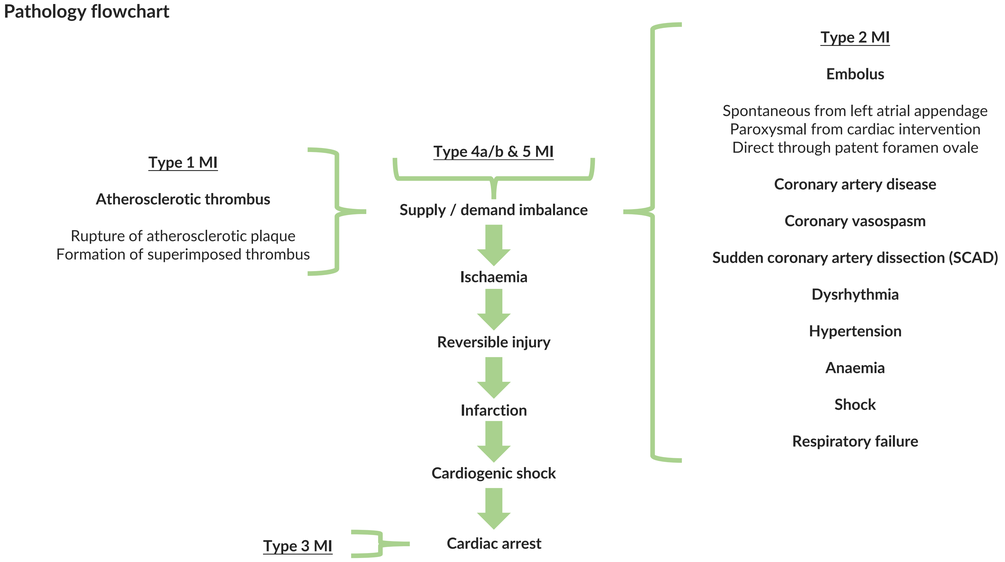
Method

Produced August 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 four 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. Retrieval Paramedic). Standard, routine cares were omitted for brevity, as were other complaints and/or conditions covered under their own, separate CPG (such as cardiogenic shock, dysrhythmias, and treatment in the rare case of paediatric ACS). 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. Management is heavily focussed on Type 1 myocardial infarction.

Jurisdiction (Service)	Pharmacology												Intervention				
	Antiplatelet				Anticoagulant		Thrombolytic	Beta blocker		Nitrates			Opioid	Phlebotomy	pPCI referral	Intubation		
	Aspirin	Clopidogrel	Ticagrelor	Tirofiban	Enoxaparin	Heparin	Tenecteplase	Labetalol	Metoprolol	Glyceryl Trinitrate (sublingual)	Glyceryl Trinitrate (transdermal)	Glyceryl Trinitrate (infusion)	Preferred opioid (if any)			Unassisted (arrest)	KOBI & IFS	DSI & RSI
Aus. Capital Territory (ACTAS)	✓					ICP (a)				✓					✓	ICP	ICP	ICP
New South Wales (NSWA)	✓	✓ (a, c)			✓ (a, c)		✓ (a)			✓					✓	ICP		
New Zealand (SJNZ)	✓	✓ (a, c)			✓ (a, c)	✓ (a, c)	✓ (a)	✓ (a, b, c, d)	✓ (a, b, c, d)	✓	✓ (a, b, c)	ICP (a, c)	Fentanyl		✓	ICP		ICP
New Zealand (WFA)	✓	✓ (a, c)			✓ (a, c)	✓ (a, c)	✓ (a)	✓ (a, b, c, d)	✓ (a, b, c, d)	✓	✓ (a, b, c)	ICP (a, c)	Fentanyl		✓	ICP		ICP
Northern Territory (SJNT)	✓					✓ (a, c, e)	✓ (a, c, e)			✓	✓ (a)				✓	ICP		ICP
Queensland (QAS)	✓	✓ (a and c / d, f)	✓ (a, d, f)	Specialist (e, f, g)	✓ (a, c, d)	✓ (a, d, f)	✓ (a, c, d)		Specialist (e, g, h)	✓		Specialist (e, g)	Fentanyl		✓	ICP		Specialist (i)
South Australia (SAAS)	✓									✓		ICP	Fentanyl		✓	ICP		Specialist (e, j)
Tasmania (AT)	✓	ICP (a, c, e)			ICP (a, c, e)	ICP (a, c, e)	ICP (a, e)			✓					✓	ICP		
Victoria (AV)	✓					✓ (a, c, d, f)	✓ (a, d)			✓	✓				✓	ICP		ICP
Western Australia (SJWA)	✓					✓ (a, e, f)				✓			Fentanyl	✓	✓	✓		ICP

(a) ST elevation (b) Hypertensive (c) Conjunction with lysis (d) Medical consultation for paramedics; not required for ICPs (e) Medical consultation required (f) pPCI (g) ICP – 'Critical Care Flight Paramedic' only (h) Tachycardia or unresponsive to nitrates (i) ICP – 'High Acuity Response Unit' only (j) ICP – 'Retrieval Flight Paramedic' only

Pathology flowchart



Treatment rationale

Definitive therapy
- Three forms of definitive treatment exist for Type 1 myocardial infarction: percutaneous coronary intervention (cardiac catheterisation with angiography, angioplasty and/or stenting or thrombectomy), fibrinolysis (dissolution of a thrombus using fibrinolytics), and, rarely, coronary artery bypass grafting (creating collateral circulation using a harvested vessel).

Aspirin, Clopidogrel, Ticagrelor, Tirofiban
- Aspirin inhibits the synthesis of thromboxane A2 by cyclooxygenase enzymes, reducing platelet aggregation and promoting vasodilation.
- Clopidogrel and Ticagrelor are $P2Y_{12}$ inhibitors that antagonise ADP-induced platelet aggregation; Clopidogrel is irreversible, while Ticagrelor is reversible.
- Tirofiban is a reversible IIb/IIIa inhibitor that antagonises platelet aggregation receptors on the phospholipid bilayer.

Enoxaparin and Heparin
- Both form a protein called antithrombin that irreversibly inhibits factors XA and IIA in the coagulation cascade. Enoxaparin is a low molecular weight heparin (LMWH), while 'heparin' refers to unfractioned (also known as 'standard') heparin. Unfractioned heparin is completely reversible (and LMWH partially reversible) by protamine sulfate for subsequent PCI angiography +/- stenting/thrombectomy.

Tenecteplase
- Tissue plasminogen activator ("tPA") that converts plasminogen into plasmin, allowing that plasmin to then cleave fibrin, degrading the fibrin matrix and causing fibrinolysis leading to thrombolysis.

Labetalol and Metoprolol
- Beta blockers antagonise adrenergic beta-1 and, to a lesser extent, beta-2 receptors, reducing inotropy, dromochropy, chromotropy, and decreasing myocardial work - reducing ischaemic injury.

Glyceryl Trinitrate
- Forms nitric oxide in the tunica intima, increasing cGMP, decreasing calcium, causing primarily venodilation. The decrease in preload decreases myocardial demand, reducing hypoxic myocardial injury; additionally, coronary artery vasodilation is theorised to increase collateral circulation, further reducing hypoxic injury (unproven, possibly due to coronary steal). At larger doses it also reduces afterload.
- Three large scale RCTs found no benefit to mortality; the utility of nitrates is limited to analgesia of angina.

Opioids
- Studies suggest opioids reduces the effectiveness of $P2Y_{12}$ inhibitors.

ACS = Acute coronary syndrome CPG = Clinical practice guideline DSI = Delayed sequence intubation ECP = Extended care paramedic ICP = Intensive care paramedic IFS = Intubation facilitated by sedation JAS = Jurisdictional ambulance service KOBI = Ketamine-only breathing intubation pPCI = Primary percutaneous coronary intervention RSI = Rapid sequence induction

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Differences in Adult Cardiogenic Pulmonary Oedema Treatment

Paramedic | Intensive Care | Extended Care | Specialist

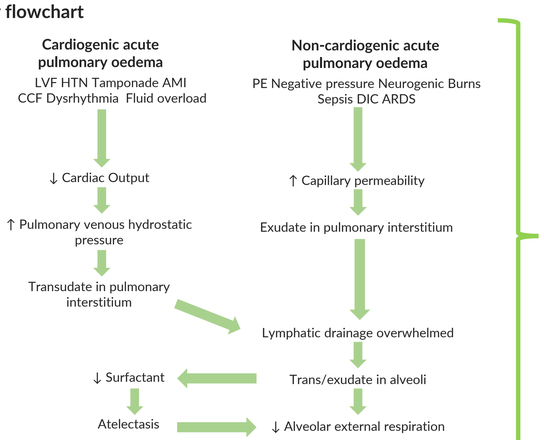
Method

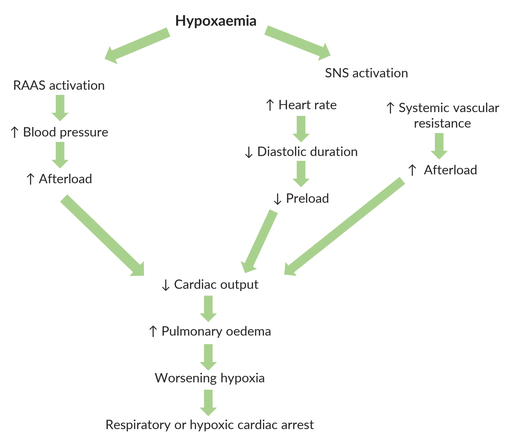
Produced July 2022. This poster is a descriptive analysis and comparison of a specific and discrete cluster of primary sources. All of the ten jurisdictional services have open access Clinical Practice Guidelines (CPGs). Content was extracted by four paramedics, with oversight from two senior lecturers 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. Retrieval Paramedic). Routine cares were omitted for brevity, such as standard Acute Coronary Syndromes or Cardiogenic Shock treatments. 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)	Pharmacology						Intervention				
	Vasodilators			Loop diuretic	Anxiolytic	Bronchodilators	CPAP	PEEP	Endotracheal intubation		
	Glyceryl Trinitrate (sublingual)	Glyceryl Trinitrate (transdermal)	Glyceryl Trinitrate (infusion)	Furosemide	Opioid				Unassisted (arrest)	KOBI & IFS	DSI & RSI
Aus. Capital Territory (ACTAS)	✓					✓ (e)	✓		ICP	ICP	ICP
New South Wales (NSWA)	✓		Specialist (a, b)	ICP			ICP	ICP	ICP		
New Zealand (SJNZ)	✓	✓	ICP		✓		✓	✓	ICP		ICP
New Zealand (WFA)	✓	✓	ICP		✓		✓	✓	ICP		ICP
Northern Territory (SJNT)	✓	✓		ICP	✓		✓	ICP	ICP		ICP
Queensland (QAS)	✓			Specialist (a, b, c)			✓	✓	ICP		Specialist (g)
South Australia (SAAS)	✓		ICP		(d)		ICP		ICP		Specialist (h)
Tasmania (AT)	✓		ICP	ICP	(d)	✓ (f)	ICP		ICP		
Victoria (AV)	✓	✓	(c)	ICP		✓ (f)	✓	✓	ICP		ICP
Western Australia (SJWA)	✓						ICP		✓		ICP

(a) Flight Paramedic only (b) Medical consult required (c) Interhospital transfers only where already established (d) Specifically states morphine is contraindicated; no discussion of other anxiolytics / analgesics (e) Post nitrates (f) To be avoided – only indicated if a history of bronchospasm (g) ICP – "High Acuity Response Unit" only (h) ICP – "Retrievalist Flight Paramedic" under medical consultation only

Pathology flowchart





Treatment rationale

Glyceryl Trinitrate
- Forms nitric oxide in the tunica intima, increasing cGMP, decreasing calcium, causing vasodilation. Vasodilation is beneficial in APO for multiple reasons:
  - It reduces pulmonary blood pressure, in turn reducing the hydrostatic capillary pressure driving oedema formation;
  - The decrease in preload and afterload decreases myocardial demand, reducing hypoxic myocardial injury;
  - Coronary artery vasodilation is theorised to increase collateral circulation, further reducing hypoxic injury (unproven, possibly due to coronary steal).

Furosemide
- Loop diuretic, blocking uptake of sodium, potassium, and chlorine in the ascending limb of the loop of Henle.
- The increased filtrate osmotic pressure reduces fluid reabsorption and causes polyuria – this rapid fluid offloading decreases preload and afterload, reducing myocardial demand and pulmonary hydrostatic pressure.

Continuous Positive Airway Pressure (CPAP)
- Increases expiratory resistance, reducing alveolar collapse from atelectasis; this in turn recruits surface area for external respiration, reducing hypoxaemia.
- CPAP has been shown by meta-analysis to reduce both mortality and intubation rates when compared to both standard care or Bi-PAP.

Positive End Expiratory Pressure (PEEP)
- Counteracting pressure on exhalation, also reducing alveolar collapse from atelectasis, pushing fluid out of the alveoli and into interstitial space, and in turn reducing hypoxaemia.
- In the pre-hospital setting, PEEP is most commonly used as an attachment to intermittent positive pressure ventilation in circumstances where a patient is unable to maintain respiratory drive (either RR or V_T) sufficient for CPAP to be effective.

AMI = Acute myocardial infarction ARDS = Acute respiratory distress syndrome CCF = Congestive cardiac failure CPAP = Continuous positive airway pressure CPG = Clinical practice guideline DIC = Disseminated intravascular coagulopathy DSI = Delayed sequence intubation ECP = Extended care paramedic HTN = Hypertension ICP = Intensive care paramedic IFS = Intubation facilitated by sedation JAS = Jurisdictional ambulance service KOBI = Ketamine-only breathing intubation LVF = Left ventricular failure PEEP = Positive end expiratory pressure RAAS = Renin angiotensin aldosterone system RSI = Rapid sequence induction SNS = Sympathetic nervous system

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Differences in Adult Analgesia

Paramedic | Intensive Care | Extended Care | Specialist

Method

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Jurisdiction (Service)	Pharmacology																												Interventions						
	Paracetamol		Non-sterioidal anti-inflammatory				Analgesic ether	Opioids											NMDA antagonist					Adjuncts	Local anaesthetics			Use of local anaesthetics						RSI (f)
								Morphine			Fentanyl				Tramadol	Codeine	Oxycodone	Ketamine (b)					Midazolam	Lignocaine (c)	Ropivacaine	Cinchocaine	Procedural (d)	Corneal abrasions	Haemorrhoids / perianal fissue	Oral pain (e)	Digital ring block	Fascia iliaca block	
	PO	IV	Aspirin (a)	Ibuprofen	Mefenamic Acid	Parecoxib	Methoxyflurane	IV	IM	SC	IN	IV	IM	SC	Infusion				IV	I M	PO	IN	Infusion											
Aus. Capital Territory (ACTAS)	✓	✓		✓			✓	✓	✓		✓								ICP	ICP				ICP	ICP			ICP							
New South Wales (NSWA)	✓			✓			✓	✓	✓	✓	✓	ICP		ICP			ECP (g)	ECP	ICP	ICP				ICP				✓				ECP		
New Zealand (SJNZ)	✓	ECP	ECP	✓		ECP	✓				✓	✓	✓	✓		✓	ECP	ECP	✓ (h)	✓ (h)	✓ (h)			ICP	✓	ICP	ECP		ECP	ECP	ECP	✓	ICP		
New Zealand (WFA)	✓	ECP	ECP	✓		ECP	✓				✓	✓	✓	✓		✓	ECP	ECP	✓ (h)	✓ (h)	✓ (h)			ICP	✓	ICP	ECP		ECP	ECP	ECP	✓	ICP		
Northern Territory (SJNT)	✓			✓			✓	✓	✓	✓	✓	✓	✓	✓					ICP	ICP			ICP	ICP	ICP			ICP							
Queensland (QAS)	✓			✓			✓	✓	✓	✓ (i)	✓	✓	✓	✓ (i)					ICP	ICP				ICP	ECP & Specialist (j, k)			ECP & Specialist (j, k)				ECP			Specialist (j)
South Australia (SAAS)	✓	✓					✓	✓	✓		✓	✓							ICP					ICP	✓										
Tasmania (AT)	✓						✓	✓	✓	✓	✓	✓	✓	✓					ICP					ICP											
Victoria (AV)	✓	Specialist (12)				Specialist (l)	✓	✓	✓	✓	✓	✓	✓	✓	Specialist (l)				ICP	ICP		✓	ICP		✓			ICP						ICP	
Western Australia (SJWA)	✓			ICP	ICP		✓		ICP	ICP		✓	✓	✓	ICP		ICP		✓	✓		ICP		✓			✓			✓				ICP

(a) Excluding for angina (b) Including both with and without atropine (c) Including cophenylcaine (d) Including, variously, cannulation (both IV and IO), urinary catheterisation, fracture reduction, suturing, fish hook removal, and various other procedures (e) Including from toothache, abscess, or post maxillofacial surgery (f) Several services explicitly authorise RSI for uncontrollable pain, humanitarian reasons, or similar – these are listed here, excluding RSI for all other indications (g) With paracetamol (h) Paramedics are indicated for analgesic dosage range; ICPs are additionally indicated for dissociative dosage range (i) Consultation required (j) ICP – "High Acuity Response Unit" only (k) ECP for suturing, fish hook removal, digital block; Specialist for arterial line placement, thoracostomy (l) ICP – "Mobile Intensive Care Ambulance Flight Paramedic" only

Treatment rationale

Paracetamol
- Paracetamol's mechanism of action is fundamentally unknown; however, it is believed to function selectively in the central nervous system antagonising cyclooxygenase (COX) enzymes by reducing their active form.

NSAIDs
- Unlike paracetamol, NSAIDs both inhibit COX by instead binding to the active site, and furthermore do so systemically - leading to the anti-inflammatory and anti-platelet properties that are mild or absent in paracetamol.
- Aspirin is an irreversible competitive antagonist of COX enzymes – the reduced production of prostanoids by COX-2 in turn leads to the analgesic, antipyretic, and anti-inflammatory properties of aspirin.
- Ibuprofen functions peripherally as a competitive reversible antagonist of COX-1 and COX-2; however, ibuprofen risks out-competing aspirin at COX sites.
- Mefenamic Acid is a competitive antagonist of COX-1 and COX-2.
- Parecoxib is a selective COX-2 inhibitor, acting similarly to reduce pain - however doing so without the platelet aggregation reduction of COX-1 inhibitors.

Methoxyflurane
- Methoxyflurane is an inhaled analgesic which has multiple effects, including functioning centrally to decrease conduction via gap junctions, agonism of GABA receptors, and many others – cumulatively leading to analgesia at low doses (3 – 6 mL) and anaesthesia at high doses (40 – 60 mL).
- While withdrawn from use globally as an anaesthetic during the 2000s due to high dose nephrotoxicity, it has remained in use domestically as an analgesic for temporary relief of traumatic and procedural pain – and it is now being re-introduced for this indication in Europe.

Local anaesthesia
- Lignocaine, and the long-acting ropivacaine and cinchocaine, are local anaesthetics that function in the peripheral nervous system primarily by temporarily attaching to the intracellular side of sodium channels, binding them to their open state; this prevents repolarisation and inhibits neural transmission, leading to regional anaesthesia.

Opioids
- Morphine is an opiate that functions centrally to agonise μ opioid receptor (MOR), δ opioid receptor (DOR) and κ opioid receptor (KOR) that are endogenously agonised by enkephalins, endorphins, and dynorphins, with strongest affinity for MOR.
- Fentanyl is a synthetic opioid that functions centrally as an opioid receptor agonist, with preference for MOR and an affinity that may be up to 100 times greater than morphine (leading to standard dosing regimens with 1/100th of the morphine dose).
- Tramadol is a synthetic opioid that functions centrally with effects on multiple neurotransmitters; as well as preference for MOR agonism, tramadol also functions as a reuptake inhibitor for serotonin and noradrenaline and as a direct antagonist for serotonin, acetylcholine, and NMDA receptors, among many other effects.
- Codeine is a natural opiate, selective central nervous system MOR agonist, and prodrug of morphine.
- Oxycodone is a semi-synthetic opioid (being derived from the opiate thebaine) and selective central nervous system MOR agonist.

Ketamine
- Ketamine has a multitude of pharmacodynamic effects, the most relevant of which is its central function as a non-competitive NMDA antagonist, in turn reducing the excitatory effects of glutamate and glycine, and leading to analgesia, disassociation, and ultimately anaesthesia with increasing dosage.

Midazolam
- Benzodiazepines allosterically enhance the effect of GABA, increasing intracellular chloride and hyperpolarizing the cell. This hyperpolarization increases the stimuli necessary to reach the action potential threshold, decreasing neurotransmission.
- While not leading to analgesia, benzodiazepines do terminate muscular spasm and have anxiolytic properties, both of which may be beneficial in mitigating procedural pain.

CPG = Clinical practice guideline ECP = Extended care paramedic ICP – Intensive care paramedic IM = Intramuscular IN = Intranasal IV = Intravenous JAS = Jurisdictional ambulance service NMDA = N-methyl-D-aspartate RSI = Rapid sequence induction SC = Subcutaneous PO = Per oral

Produced by: Matt Wilkinson-Stokes, Drew Paterson, Angus McLean, Jennifer Kelley, Marc Colbeck, Sonja Maria. Contact: matt.wilkinson-stokes@outlook.com

Differences in Adult Anaphylaxis Treatment

Paramedic | Intensive Care | Extended Care | Specialist

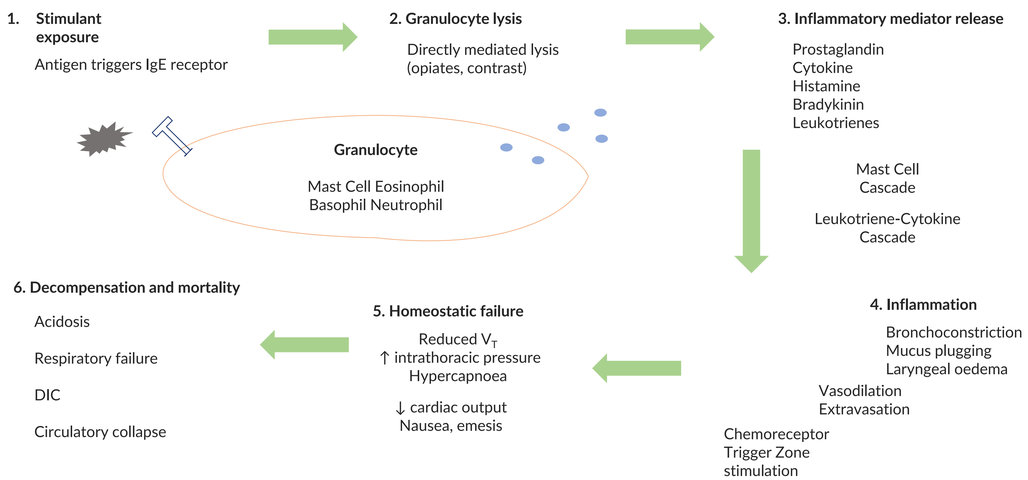
Method

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. Retrieval Paramedic). Routine cares were omitted for brevity, as were medications administered post-anaphylaxis or for non-anaphylactic allergies. 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)	Pharmacology													Intervention		
	Adrenergic						Anticholinergic		Corticosteroid			Inotrope	Electrolyte	Endotracheal intubation		
	Adrenaline (intramuscular)	Adrenaline (nebulised)	Adrenaline (infusion)	Salbutamol (MDI)	Salbutamol (nebulised)	Salbutamol (intravenous)	Ipratropium Bromide (MDI)	Ipratropium Bromide (nebulised)	Hydrocortisone	Dexamethasone	Prednisolone	Glucagon	Magnesium	Unassisted (arrest)	KOBI & IFS	DSI & RSI
Aus. Capital Territory (ACTAS)	✓		ICP	✓ (d)			✓ (d)							ICP	ICP	ICP
New South Wales (NSWA)	✓	✓	ICP (b)	Specialist (e)	✓				✓ (f)			✓ (j)		ICP		
New Zealand (SJNZ)	✓	✓	ICP											ICP		ICP
New Zealand (WFA)	✓	✓	ICP											ICP		ICP
Northern Territory (SJNT)	✓	✓	ICP	✓	✓			✓	✓			✓ (a, j)		ICP		ICP
Queensland (QAS)	✓	✓ (a)	ICP (a)	✓ (a, f)	✓ (a, f)	Specialist (c, g)		(i)	✓ (a, f)			✓ (a, k)		ICP		Specialist (l)
South Australia (SAAS)	✓	✓	ICP	✓	✓		✓	✓	ICP		✓		ICP	ICP		Specialist (c, m)
Tasmania (AT)	✓	✓	ICP	✓	✓	ICP	✓	✓		ICP		✓ (c, j)	ICP	ICP		
Victoria (AV)	✓	✓	ICP	✓	✓		(h)	✓		✓		✓		ICP		ICP
Western Australia (SJWA)	✓		ICP (c)	✓	✓									✓		ICP

(a) Indicated for patients refractory to three IM adrenaline injections (b) Indicated for patients refractory to four IM adrenaline injections (c) Medical consultation required (d) Indicated for patients refractory to IM adrenaline (e) Carried by Special Operations Team paramedic only, where nebulised salbutamol is unavailable (f) Indicated for unresolved wheeze (g) ICP – "Critical Care Flight Paramedic" only (h) Not currently carried, however approved for use if available (i) Not listed on the Anaphylaxis CPG; however, indicated on the relevant drug protocol for bronchospasm (j) Indicated for certain patients on beta blockers (k) Indicated for ongoing hypotension / shock (l) ICP – "High Acuity Response Unit" only (m) ICP – "Retrievalist Flight Paramedic" only

Pathology flowchart



Treatment rationale

Adrenaline
- Alpha-1 agonism causes peripheral vasoconstriction, improving central organ perfusion.
- Alpha-2 agonism decreases insulin secretion and increases glucagon, raising serum glucose.
- Beta-1 agonism causes positive inotropy, chronotropy, dromotropy, lusitropy, and bathmotropy, improving cardiac output and systemic perfusion.
- Beta-2 agonism induces bronchodilation, offsetting obstructive gas trapping and improving tidal volume.
- Beta-3 agonism triggers lipolysis, raising serum glucose.
- Stabilises mast cells, reducing degranulation and release of inflammatory mediators.

Salbutamol
- Adrenergic preferencing beta-2 receptors, inducing bronchodilation, improving ventilation and reducing intrathoracic pressure.

Ipratropium Bromide
- Muscarinic cholinergic antagonist, decreasing cGMP, reducing bronchial smooth muscle contraction, improving ventilation and reducing intrathoracic pressure.

Corticosteroids
- Agonises glucocorticoid or mineralocorticoid receptors respectively, inducing a wide range of changes including reducing inflammation and immunosuppression.

Glucagon
- Activates glucagon receptors in the myocardium, increasing cAMP, stimulating the inward funny current (increasing pacemaker rate), increasing pacemaker calcium release from the sarcoplasmic reticulum (increasing pacemaker rate), and enhancing calcium-induced-calcium-release (increasing contractility).

Magnesium
- Smooth muscle dilator via reduction in calcium-induced-calcium-release (due to competitive ryanodine receptor antagonism), leading to bronchodilation; also induced bronchodilation via additional pathways including reduced mast cell degradation and increased nitric oxide.

CPG = Clinical practice guideline DSI = Delayed sequence intubation ECP = Extended care paramedic ICP = Intensive care paramedic IFS = Intubation facilitated by sedation JAS = Jurisdictional ambulance service KOBI = Ketamine-only breathing intubation MDI = Metered dose inhaler RSI = Rapid sequence induction

Produced by: Matt Wilkinson-Stokes, Desiree Rowland, Maddison Spencer, Marc Colbeck, Sonja Maria. Contact: matt.wilkinson-stokes@outlook.com

Differences in Adult Asthma Treatment

Paramedic | Intensive Care | Extended Care | Specialist

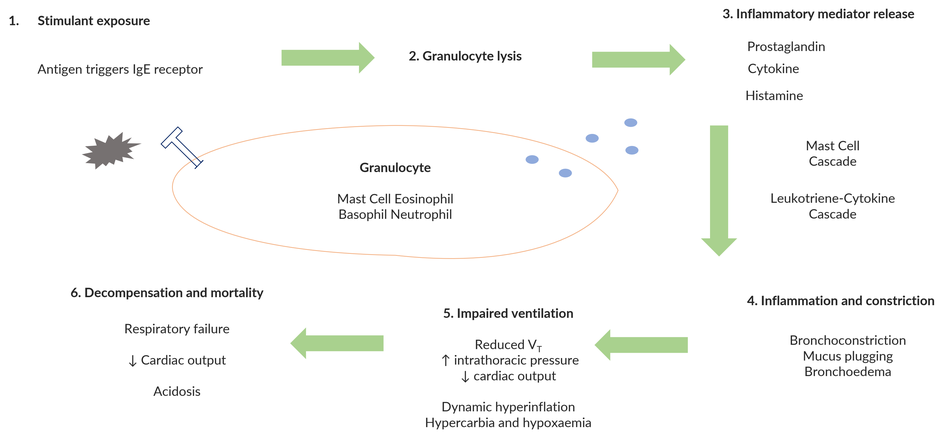
Method

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Jurisdiction (Service)	Pharmacology									Interventions								
	Adrenergic				Anticholinergic	Corticosteroid			Electrolyte	Assessment	Ventilation support			Expiratory chest squeeze	Endotracheal intubation			Apnoeic period (arrest)
	Salbutamol		Adrenaline															
	Nebulised	Intravenous	Intramuscular	Infusion	Ipratropium Bromide	Prednisolone	Dexamethasone	Hydrocortisone	Magnesium	PEFR	CPAP	BiPAP	PEEP		Unassisted (arrest)	KOBI, IFS	RSI, DSI	
Aus. Capital Territory (ACTAS)	✓		✓	ICP	✓			ICP			✓			✓	ICP	ICP	ICP	
New South Wales (NSWA)	✓		✓	ICP	✓	ECP		✓		✓					ICP			
New Zealand (SJNZ)	✓		✓	ICP	✓	✓			ICP	✓			✓		ICP		ICP	
New Zealand (WFA)	✓		✓	ICP	✓	✓			ICP	✓			✓		ICP		ICP	
Northern Territory (SJNT)	✓		✓	ICP	✓			✓	ICP						ICP		ICP	(a)
Queensland (QAS)	✓	Specialist (b)	✓	ICP	✓			✓	ICP		ICP		✓		ICP		Specialist (c)	
South Australia (SAAS)	✓		✓	ICP	✓	✓		ICP	ICP	ECP					ICP		Specialist (d)	
Tasmania (AT)	✓	ICP	✓	ICP	✓	ECP	ICP		ICP					✓	ICP			✓
Victoria (AV)	✓		✓	ICP (e)	✓		✓		Specialist (f)			ICP	✓		ICP		ICP	✓
Western Australia (SJWA)	✓		✓		✓						ICP	ICP	ICP		✓		ICP	

(a) Consider (b) ICP – "Flight Critical Care Paramedic" with medical approval only (c) ICP "High Acuity Response Unit" Paramedic only (d) ICP – "Retrieval Paramedic" only (e) Intravenous boluses available to Paramedics on consultation (d) ICP "Mobile Intensive Care Paramedic Flight Paramedic" only

Pathology flowchart



Treatment rationale

Salbutamol
- Adrenergic preferencing beta-2 receptors, inducing bronchodilation, improving ventilation and reducing intrathoracic pressure.

Ipratropium Bromide
- Muscarinic cholinergic antagonist, decreasing cGMP, reducing bronchial smooth muscle contraction, improving ventilation and reducing intrathoracic pressure.

Adrenaline
- Alpha-1 agonism causes peripheral vasoconstriction, improving central organ perfusion. Alpha-2 agonism reduced insulin and increases glucagon, raising serum glucose. Beta-1 agonism causes positive inotropy, chronotropy, dromotropy, lusitropy, and bathmotropy, improving cardiac output and systemic perfusion. Beta-2 agonism induces bronchodilation, offsetting obstructive gas trapping and improving tidal volume. Beta-3 agonism triggers lipolysis, raising serum glucose. Stabilises mast cells, reducing degranulation and release of inflammatory mediators.

Corticosteroids
- Agonises glucocorticoid or mineralocorticoid receptors respectively, inducing a wide range of changes including reducing inflammation and immunosuppression.

Magensium
- Smooth muscle dilator via reduction in calcium-induced-calcium-release (due to competitive ryanodine receptor antagonism), leading to bronchodilation; also induced bronchodilation via additional pathways including reduced mast cell degradation and increased nitric oxide.

CPAP, BiPAP, PEEP
- CPAP increases expiratory resistance, reducing alveolar collapse from atelectasis; this in turn recruits surface area for external respiration, reducing hypoxaemia.
- BiPAP provides differing air resistance on inspiration and expiration; this may make exhalation easier than CPAP.
- PEEP provides counteracting pressure on exhalation, also reducing alveolar collapse from atelectasis, pushing fluid out of the alveoli and into interstitial space, and in turn reducing hypoxaemia.
- In the pre-hospital setting, PEEP is most commonly used as an attachment to intermittent positive pressure ventilation in circumstances where a patient is unable to maintain respiratory drive (either RR or V_T) sufficient for CPAP.

BiPAP = Biphasic positive airway pressure CPAP = Continuous positive airway pressure CPG = Clinical practice guideline DSI = Delayed sequence induction ECP = Extended care paramedic ICP = Intensive care paramedic IFS = Intubation facilitated by sedation JAS = Jurisdictional ambulance service KOBI = Ketamine only breathing intubation PEEP = Positive end expiratory pressure PEFR = Peak expiratory flow rate RSI = Rapid sequence induction

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Differences in Adult Autonomic Dysreflexia Treatment

Paramedic | Intensive Care | Extended Care | Specialist

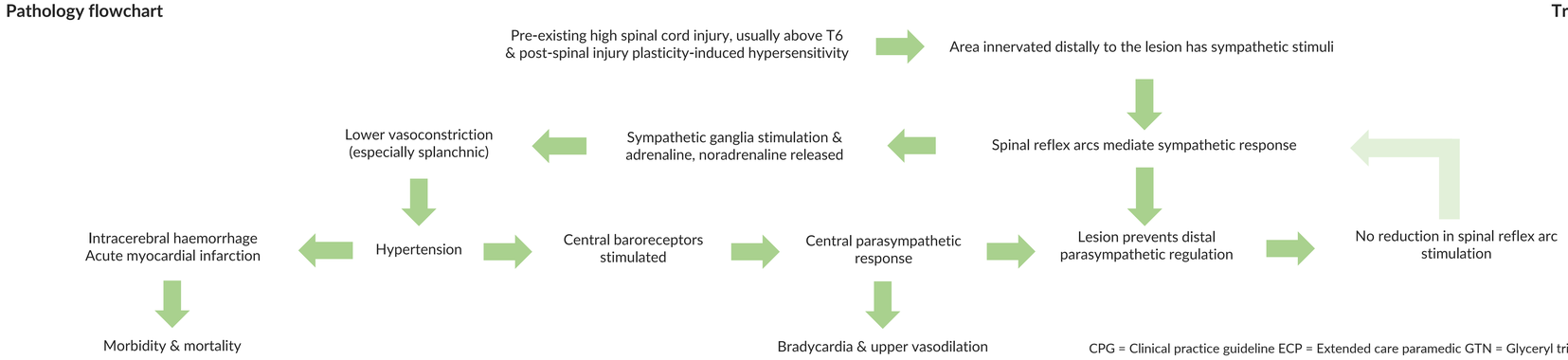
Method

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Jurisdiction (Service)	SBP above which treatment is initiated (mmHg)	Pharmacology							Interventions					
		Vasodilator			Beta blocker		Analgesia	Sedative	Reduce stimuli					Transportation guideline
		Glyceryl trinitrate												
		SL	TD	Infusion	Labetalol	Metoprolol			General instruction to remove stimuli	Avoid abdominal pressure	Loosen clothing	Position upright	Ensure catheter not blocked	
Aus. Capital Territory (ACTAS)	>150 or >20 above resting	✓ (a)					✓ (b)	ICP (b)	✓	✓	✓	✓	✓ (c)	No specific guidance
New South Wales (NSWA)	>170 or >20 above resting	✓ (a)							✓	✓	✓	✓	✓	Must be transported
New Zealand (SJNZ)	>180	✓ (d)	✓	ICP (e)	✓	✓	✓ (f)		✓	✓ (g)	✓	✓	✓	Transport may not be required (h)
New Zealand (WFA)	>180	✓ (d)	✓	ICP (e)	✓	✓	✓ (f)		✓	✓ (g)	✓	✓	✓	Transport may not be required (h)
Northern Territory (SJNT)	>160	✓ (i)					✓		✓	✓	✓	✓	✓	Must be transported
Queensland (QAS)	>160	✓ (i)					✓ (j)		✓	✓	✓	✓	✓	Must be transported
South Australia (SAAS)	>160	ICP (k)		ICP			✓				✓	✓	ECP (l)	Transport may not be required (m)
Tasmania (AT)	>160	✓ (n)					✓						✓	Must be transported
Victoria (AV)	>160	✓ (o)					✓						✓	Must be transported
Western Australia (SJWA)	>160 or >20 above resting	✓ (p)					✓		✓		✓	✓	✓	Must be transported

(a) Dose is 300 mcg, repeated at 5 minutes, with a maximum of 3 doses (b) Any agent may be used with caution (c) Drain 500 mL initially, then 250 mL each 15 minutes until empty (d) Dose is 400-800 mcg, repeated at 3-5 minutes (e) Aim for a SBP 150-170 mmHg (f) Fentanyl is indicated if the stimuli is a fracture or burn (g) If the stimuli is suspected constipation, a carer may be able to give an enema or provide decompaction (h) If several conditions are met: autonomic dysreflexia resolved with SL GTN the only medication given (i) Dose is 400 mcg, repeated at 5-10 minutes, with no maximum dose (j) Morphine or fentanyl may be provided (k) Dose is 300 mcg, repeated at 5 minutes, with no maximum dose (l) Consider contacting an ECP to organise a catheter change (m) Referral is provided for in the CPGs (n) Dose is 400 mcg, repeated at 10 minutes, with no maximum dose (o) Dose is 300-600 mcg, repeated at 10 minutes, with no maximum dose (p) Dose is 400 mcg, repeated at 5 minutes, with no maximum dose

Pathology flowchart



Treatment rationale

Glyceryl trinitrate

- Forms nitric oxide in the tunica intima, increasing cGMP, decreasing calcium, causing primarily venodilation. This venodilation decreases blood pressure, reducing hypertension and aiming to break the dysregulation loop.

Beta blockers

- Beta blockers antagonise adrenergic beta-1 and, to a lesser extent, beta-2 receptors, reducing inotropy, dromochropy, chromotropy, decreasing cardiac output and myocardial workload.

CPG = Clinical practice guideline ECP = Extended care paramedic GTN = Glyceryl trinitrate ICP = Intensive care paramedic JAS = Jurisdictional ambulance service SBP = Systolic blood pressure SL = Sublingual TD = Transdermal

Produced by: Matt Wilkinson-Stokes, Sonja Maria. Contact: matt.wilkinson-stokes@outlook.com

Differences in Adult Bradycardia Treatment

Paramedic | Intensive Care | Extended Care | Specialist

Method

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Jurisdiction (Service)	Pharmacology						Intervention	
	Fluids	Adrenaline		Atropine	Isoprenaline	Dobutamine	Dopamine	Pacing	
		Intravenous bolus	Infusion					Transcutaneous	Transvenous
Aus. Capital Territory (ACTAS)	✓ (a)		ICP	ICP				ICP	
New South Wales (NSWA)		ICP (b)	ICP (b)	ICP (c)				ICP	
New Zealand (SJNZ)		ICP	ICP	ICP (c, d)				ICP (e, f)	
New Zealand (WFA)		ICP	ICP	ICP (c, d)				ICP (e, f)	
Northern Territory (SJNT)		ICP	ICP	✓				ICP	
Queensland (QAS)		ICP		ICP	Specialist (g)			ICP	
South Australia (SAAS)	ICP	ICP	ICP	ICP	Specialist (h)	Specialist (h)	Specialist (h)	ICP	Specialist (h, i)
Tasmania (AT)		ICP (j)	ICP (j)	ICP (c)				ICP (k)	
Victoria (AV)			ICP (b)	ICP (c)				ICP (k)	Specialist (i, l)
Western Australia (SJWA)				✓ (m)				ICP	

(a) If no left ventricular failure present (b) If unresponsive to atropine (c) If unsuccessful, progress to adrenaline and then to pacing (d) Sinus bradycardia, nodal bradycardia, first or second degree block, or undifferentiated narrow complex bradycardia (e) If third degree block or undifferentiated broad complex tachycardia (f) If unsuccessful, progress to adrenaline (g) ICP – 'Flight Critical Care Paramedic' only (h) ICP – 'Retrieval Paramedic' only (i) If transvenous pacing wires in situ (j) If unsuccessful, progress to pacing (k) If unresponsive to atropine and adrenaline (l) ICP - 'Flight Mobile Intensive Care Paramedic' only (m) Not if third degree block or undifferentiated broad complex tachycardia

Treatment rationale

Adrenaline
- Alpha-1 agonism causes peripheral vasoconstriction, improving central organ perfusion. Alpha-2 agonism reduced insulin and increases glucagon, raising serum glucose. Beta-1 agonism causes positive inotropy, chronotropy, dromotropy, lusitropy, and bathmotropy, improving cardiac output and systemic perfusion. Beta-2 agonism induces bronchodilation, offsetting obstructive gas trapping and improving tidal volume. Beta-3 agonism triggers lipolysis, raising serum glucose. Stabilises mast cells, reducing degranulation and release of inflammatory mediators.

Atropine
- Anticholinergic antagonises cardiac vagal stimulation, resulting in unopposed sympathetic stimulation.

Isoprenaline
- A synthetic adrenergic that preferentially agonises Beta-1 and Beta-2 receptors. Beta-1 stimulation causes positive inotropy, chronotropy, dromotropy, and lusitropy, improving cardiac output and systemic perfusion.

Dobutamine
- A synthetic adrenergic derived from isoprenalinethat preferentially agonises Beta-1 and Beta-2 receptors. Beta-1 stimulation causes positive inotropy, chronotropy, dromotropy, and lusitropy, improving cardiac output and systemic perfusion.

Pacing
- Transthoracic pacing provides an electric current via external electrodes to stimulate cardiac depolarisation.
- Transvenous pacing functions similarly, with the electrodes instead placed internally into the right atrium or ventricles via a venous wire.

Fluids
- Increases circulating volume to supplement perfusion, at the risk of acidosis, decreased temperature, dilutional anaemia, increased afterload, and hydrostatic pressure causing fluid shift (such as pulmonary oedema).

CPG = Clinical practice guidelines ECP = Extended care paramedic ICP = Intensive care paramedic JAS = Jurisdictional ambulance service

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Differences in Breech Management

Paramedic | Intensive Care | Extended Care | Specialist

Method

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Jurisdiction (Service)	Presentations suitable for delivery	Analgesia		Positioning				Manually reposition a compressed cord	Encourage mother to push	Aim for 'hands off' approach	Rotate so back uppermost	Legs not birthing	Arms not birthing - extended	Arms not birthing - flexed	Head not birthing	Routinely prepare for neonatal resuscitation
		Methoxyflurane	Opioids	Squatting / standing	Lithotomy	All fours	Unmodified Sims' (avoid delivery)					Assist legs	Løveset's manoeuvre	Sweep arms	Modified Mauriceau-Smellie-Veit manoeuvre	
Aus. Capital Territory (ACTAS)	Frank (a)	✓ (b)	(c)	✓ (d)				✓	✓ (e)	(f)	(g)	✓ (h)	✓	✓	✓	✓ (i)
New South Wales (NSWA)	Frank or complete (j)	✓	(c)	✓ (d)		✓ (d)		✓	(e)	✓	✓		✓		✓	✓
New Zealand (SJNZ)	(k)	✓	✓ (l)				✓									
New Zealand (WFA)	(k)	✓	✓ (l)				✓									
Northern Territory (SJNT)	Frank or complete (m)	✓	(c)	✓ (d)	✓ (d)			✓	✓ (e)	✓	✓	✓	✓		✓	✓
Queensland (QAS)	Frank, footling, or complete	✓	✓ (n)	✓ (d)	✓ (d)	✓ (d)		✓	✓	✓	(g)	✓	✓	✓	✓	✓
South Australia (SAAS)	No CPG															
Tasmania (AT)	No CPG															
Victoria (AV)	Frank or complete (o)	✓	(c)	✓ (d)	✓ (d)	✓ (p)			✓	✓	✓	✓	✓		✓	
Western Australia (SJWA)	Frank or complete (o)	✓	✓ (q)		✓		✓ (r)								✓	✓

(a) Footling or complete breeches cannot be delivered by paramedics and must be transported, regardless of progress of birth (b) Discontinue after delivery as methoxyflurane is a uterine relaxant (c) Contraindicated (d) Position so foetus is hanging (e) If presentation suitable for delivery only; otherwise, encourage mother to breath through contractions (f) Hold gently at the hips (g) CPG states that the back should be kept uppermost; however, it does not explicitly state if the foetus should be rotated if the back is not already uppermost (h) Flex knee, pull ankle (i) Expect a 'stunned' neonate (j) Footling 'preferred' hospital (k) If the baby appears at the vaginal opening or the patient wants to push, support birth; minimal further guidance provided in CPG (l) Precaution (m) If footling or single presenting hand or arm, hospital preferred (n) Morphine is the preferred analgesic for labour (o) Footling or or single presenting hand or arm cannot be delivered by paramedics and must be transported, regardless of progress of birth (p) If back not uppermost (q) Morphine contraindicated; fentanyl precaution (r) If cord prolapse

CPG = Clinical practice guideline ECP = Extended care paramedic ICP = Intensive care paramedic JAS = Jurisdictional ambulance service

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Differences in Adult Thermal Burns Treatment

Paramedic | Intensive Care | Extended Care | Specialist

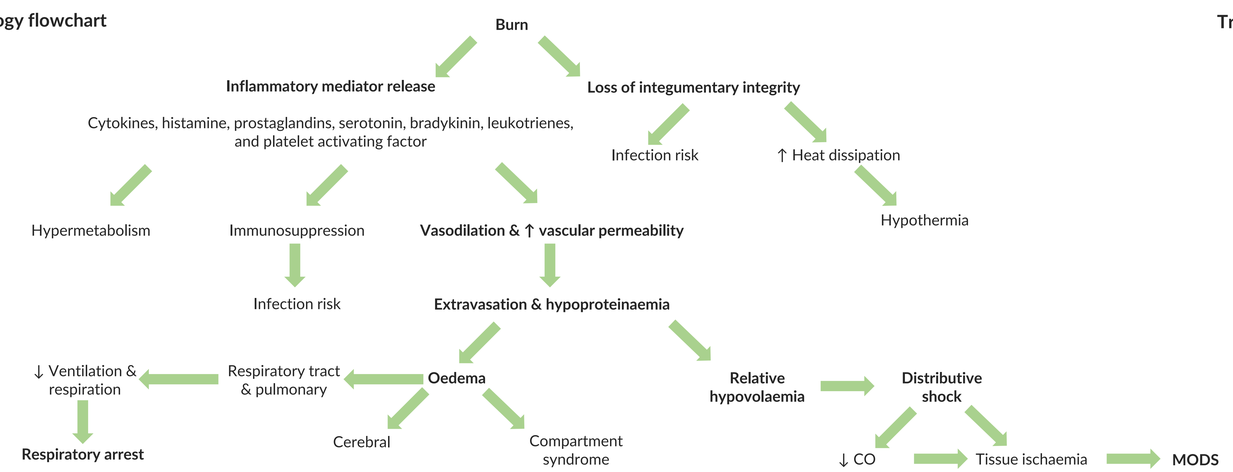
Method

Produced October 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. Retrieval Paramedic). Standard, routine cares such as oxygenation were omitted for brevity, as were other complaints and/or conditions covered under their own, separate CPG (such as analgesia, eye injuries, or distributive shock). 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)	Assessment	Pharmacology					Intervention										
	TBSA	Fluids	Nebulised water	Bronchodilators	Nebulised adrenaline	Burn gel	Remove clothing / jewellery	Elevate limb	Cling wrap	Protect against hypothermia	Cool running water	Debridement & blister aspiration	Escharotomy	Intubation: Unassisted (arrest)	Intubation: KOBI & IFS	Intubation: RSI & DSI	PEEP
Aus. Capital Territory (ACTAS)	Rule of 9s	✓ SBP >90 mmHg			(a)	✓	✓	✓	✓ (b)	✓	✓ 20 mins (c)			ICP	ICP	ICP	✓
New South Wales (NSWA)	Palm Rule of 9s	✓ 10 mL/kg bolus, then 10 mL/kg/hr		(d)		✓ (e)	✓	✓	✓ (f)		✓ Minimum 20 mins (g, h)	(i)	Physician	ICP			ICP
New Zealand (SJNZ)	Palm	✓ 1L, repeat PRN (j)		✓ (k)	✓ (l)	✓ (m)	✓		✓	✓	✓ Minimum 20 mins	ECP		ICP		ICP	✓
New Zealand (WFA)	Palm	✓ 1L, repeat PRN (j)		✓ (k)	✓ (l)	✓ (m)	✓		✓	✓	✓ Minimum 20 mins	ECP		ICP		ICP	✓
Northern Territory (SJNT)	Palm Rule of 9s	✓ 2 mL/kg x TBSA (n)	✓	✓ (k)	(o)	✓ (p)			✓ (f)	✓	✓ 20 mins		(q)	ICP		ICP	ICP
Queensland (QAS)	Palm Rule of 9s Lund Browder	✓ 15 mL/kg x TBSA every hour (r)		(d)	(d)	✓ (s)			✓	✓	✓ 20-60 mins		(q)	ICP		Specialist (t)	✓
South Australia (SAAS)	Rule of 9s	✓ 20 mL/kg maximum				✓ (p)			✓ (f)	✓	✓ 20 mins	ECP	Specialist (u)	ICP		Specialist (u, v)	
Tasmania (AT)	Rule of 9s	✓ 2 mL/kg x TBSA over 8 hours		(w)				✓	✓ (f)	✓	✓ Maximum 20 mins (g)			ICP			
Victoria (AV)	Rule of 9s	✓ Weight x TBSA over 2 hours		(w)			✓	✓	✓ (f)	✓	✓ 20 mins (g, h)	(i)		ICP		ICP	✓
Western Australia (SJWA)	Rule of 9s	✓ 2 mL/kg x TBSA 50% over 8 hours		✓ (k)		✓ (m, p)	✓	✓	(b)	✓	✓ Minimum 20 mins	✓		✓		ICP	

(a) Not explicitly mentioned in Burns CPG; however, is indicated for upper airway swelling specifically (b) Dressing rather than cling wrap (c) Cold water recommended rather than cool (d) Not explicitly mentioned in Burns CPG; however, is indicated for bronchospasm generally (e) Only if no running water and TBSA < 20%, and not to be applied after cooling (f) Apply longitudinally and allow for swelling (g) Avoid ice (h) Alternative is to submerge the burn in cool water, with the water changed every 2-3 minutes, or to apply saline (i) Clean with normal saline; not formal debridement (j) Only if hypovolaemic, malperfused, or TBSA >20% (k) If bronchospasm present (l) If stridor present (m) Can be applied after cooling (n) If TBSA >20%, to be administered over 8 hours (o) Not explicitly mentioned in Burns CPG; however, is indicated for stridor (p) Only if no clean cool water, and to be removed at 20 minutes (q) CPG states this may be necessary in the pre-hospital environment; no further information provided on who is authorised to perform the procedure or which regions it is available in (r) If weight >100 kg, additional 200 mL/hr (s) Only if <10% TBSA and not circumferential (t) ICP – "High Acuity Response Unit" Paramedic only (u) ICP – "Retrieval Paramedic" only (v) Medical consult required (w) Not explicitly mentioned in Burns CPG; however, is indicated for smoke inhalation specifically

Pathology flowchart



Treatment rationale

Fluid resuscitation
- Fluids can reduce distributive shock and offset myocardial depression, although excess fluid can result in fluid creep, acidosis, decreased temperature, dilutional anaemia, increased afterload, and hydrostatic pressure causing fluid shift (such as pulmonary oedema).

Burn gel
- Hydrogels are both hydrophilic and water insoluble, providing a moist environment while cooling the wound, and may facilitate autolytic debridement.

Cling wrap
- Cling wrap is non-adherent, provides a basic level of protection against infection, and reduces air circulation over the wound that stimulates pain.

Cool running water
- Cool running water is correlated with reduced burn depth, time to re-epithelialisation, mortality, and duration of hospitalisation.

Debridement
- Debridement is the removal of non-viable tissue to facilitate re-epithelialisation.

Escharotomy
- An incision through the eschar – either prophylactic or reactive – to reduce compartment syndrome or ventilatory compromise (from impaired chest wall expansion) due to burn-induced swelling and loss of elasticity.

CO = Cardiac output CPG = Clinical practice guideline ECP = Extended care paramedic ETT = Endotracheal intubation ICP = Intensive care paramedic IFS = Intubation facilitated by sedation JAS = Jurisdictional ambulance service KOBI = Ketamine-only breathing intubation MODS = Multiple organ dysfunction syndrome PEEP = Positive end expiratory pressure PRN = Pro re nata RSI = Rapid sequence induction TBSA = Total body surface area

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Differences in Adult Medical Cardiac Arrest Treatment

Paramedic | Intensive Care | Extended Care | Specialist

Method

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Jurisdiction (Service)f	Intervention												Pharmacology										
	Circulation							Airway			Access									CPRIC Sedation			
	Compression-Ventilation ratio	Pad placement other than anterior-lateral	Defibrillation mode	Stacked shocks	Dual defibrillation	Mechanical compression device	Precordial thump	OPA / NPA	LMA	ETT (unassisted)	IO	Gastric aspiration	Adrenaline	Amiodarone	Calcium Gluconate / Chloride	Lignocaine	Fluids	Magnesium sulphate	Sodium bicarbonate	Midazolam	Fentanyl	Ketamine	Rocuronium
Aus. Capital Territory (ACTAS)	30:2 with pause 15:1 no pause – LMA/ETT		Manual				✓ (a)	✓	✓	ICP	✓	✓	✓	ICP (b)	ICP (c)		✓	ICP (d)	ICP (e)	(u)			
New South Wales (NSWA)	30:2 with pause		Manual			✓ (v)		✓	✓	ICP	ICP	ICP	✓	ICP (f)	ICP (c)	ICP (f)	✓ (g)		ICP (p)	✓		ICP	
New Zealand (SJNZ)	30:2 with pause 15:2 with pause – respiratory arrest 10/min no pause - LMA/ETT (w)	Anterior-posterior for persistent VF/VT	Manual		Under medical advice only	✓	✓ (a, h)	✓	✓	ICP	✓		✓ (i)	✓ (j)			✓ (k)					ICP	ICP (l)
New Zealand (WFA)	30:2 with pause 15:2 with pause – respiratory arrest 10/min no pause - LMA/ETT (w)	Anterior-posterior for persistent VF/VT	Manual		Under medical advice only	✓	✓ (a, h)	✓	✓	ICP	✓		✓ (i)	✓ (j)			✓ (k)					ICP	ICP (l)
Northern Territory (SJNT)	30:2 with pause					✓		✓	✓	ICP	✓	✓	✓	✓ (b, j, m)	✓ (c)		✓ (n)	✓ (o)	✓ (p)			ICP	
Queensland (QAS)	30:2 with pause 6-10/min no pause – LMA/ETT	Alternate position after 3 shocks	AED for first shock	✓ (q)		ICP		✓	✓	ICP	ICP	✓	✓	✓ (r)	ICP (c)			ICP (o)	ICP (p)	ICP	ICP		
South Australia (SAAS)	30:2 with pause 6-10/min no pause – LMA/ETT					✓		✓	✓	ICP	✓	✓	✓	✓ (b)			✓ (s)			✓			
Tasmania (AT)	30:2 with paus 8-10/min no pause – LMA/ETT							✓	✓	ICP	✓		✓	ICP			✓	ICP (o)	ICP (p)				
Victoria (AV)	30:2 with pause 15:1 no pause – LMA/ETT		Manual			✓ (t)		✓	✓	ICP	ICP	✓	✓	ICP (b, m)	ICP (c)		✓ (n)		ICP (p)		✓	✓	
Western Australia (SJWA)	30:2 with pause Continuous – LMA/ETT		Manual			✓		✓	✓	✓	✓	ICP	✓	✓ (b, m)									

(a) For paramedic-witnessed and monitored VF/VT arrest (b) After third shock if in a shockable rhythm (c) Cardiac arrest secondary to hyperkalaemia (d) First drug if Torsades; fourth drug if VF (e) >15 minutes arrest, hyperkalaemia, cardioactive drug overdose (f) VF, VT, or Torsades only (g) Arrest secondary to anaphylaxis (h) Where defibrillator is not immediately available (i) Cease after 15-20 minutes if VF persists and administer further amiodarone instead (j) If in VF or VT after first shock (k) 2-3 litres if in PEA (l) If intubated; sedative also required (m) Repeat after fifth shock (n) 20 ml/kg if in PEA due to hypovolaemia, anaphylaxis, or asthma (o) Torsades (p) Hyperkalaemia, crush, or cardioactive drug overdose (q) Paramedic-witnessed shockable arrest (r) Refractory to three shocks; again after five shocks (s) Up to 30 ml/kg if hypovolaemic or obstructive cause (t) Available to all paramedics, however, in practice only carried by ICP units (u) No CPRIC guideline, however, ICP may sedate to permit basic airway management (v) Currently being installed in all vehicles (w) With LMA in situ, if compressions are causing ineffective ventilations, a pause in compressions may be inserted

Treatment rationale

Defibrillation
- Triggers widespread depolarisation of the myocytes, potentially terminating dysrhythmias and allowing a perfusing rhythm to be restored.
- Stacked shocks is the provision of multiple defibrillations directly after each other.
- Dual defibrillation is the placement of two different defibrillators (four sets of pads) with two stacked shocks provided in different anatomical locations.

External compressions
- Compressions facilitate some blood flow, speculated to be either by the cardiac pump theory (external compression of the ventricles mimics systole) or by the thoracic pump theory (increased thoracic pressure relative to abdominal pressure pulls blood distally).
- Mechanical compression devices provide external compression via a pumping mechanism placed over the sternum.

Precordial thump
- A single strong blow by the base of a closed fist to the sternum, believed to produce a minor depolarisation that may terminate dysrhythmias.

Gastric aspiration
- Aspiration of the gastric contents via a catheter placed through either an LMA or ETT to reduce regurgitation and maintain a secure airway.

Adrenaline
- Alpha-1 agonism causes peripheral vasoconstriction, improving central organ perfusion.
- Alpha-2 agonism decreases insulin secretion and increases glucagon, raising serum glucose.
- Beta-1 agonism causes positive inotropy, chronotropy, dromotropy, lusitropy, and bathmotropy, improving cardiac output and systemic perfusion.
- Beta-2 agonism induces bronchodilation, offsetting obstructive gas trapping and improving tidal volume.
- Beta-3 agonism triggers lipolysis, raising serum glucose.
- Stabilises mast cells, reducing degranulation and release of inflammatory mediators.

Amiodarone
- An anti-dysrhythmic working in all Vaughan-Williams classes, most importantly in prolonging the sinoatrial, atrioventricular, and ventricular repolarisation periods, and in slowing conduction in the sinoatrial and atrioventricular nodes.

Calcium
- An electrolyte that stabilises the cardiac membrane immediately.

Lignocaine
- Local anaesthetic and antidysrhythmic that function in the nervous system primarily by temporarily attaching to the intracellular side of sodium channels, binding them to their open state; this prevents repolarisation and inhibits neural transmission, potentially terminating dysrhythmias.

Magnesium sulphate
- An electrolyte that is used as a cofactor in multiple processes, with antidysrhythmic, anticonvulsive, vasodilative, and bronchodilative effects.

Sodium bicarbonate
- Sodium bicarbonate reduces potassium's cardiotoxic effects and is alkolising, increasing Ph and moving potassium into cells.

CPR Induced Consciousness
- A phenomenon where sufficient cerebral perfusion is established by CPR to illicit life-like responses from a patient (such as blinking, hand movements, and similar) despite an ongoing non-perfusing rhythm. In some instances, this may interfere with external compressions or airway maintenance.

Fluids
- Increases circulating volume to supplement perfusion, at the risk of acidosis, decreased temperature, dilutional anaemia, increased afterload, and hydrostatic pressure causing fluid shift (such as pulmonary oedema).

AED = Automatic external defibrillator CPG = Clinical practice guideline CPRIC = Cardiopulmonary resuscitation induced consciousness ECP = Extended care paramedic ETT = Endotracheal intubation ICP = Intensive care paramedic IO = Intraosseous JAS = Jurisdictional ambulance service LMA = Laryngeal mask airway NPA = Nasopharyngeal airway OPA = Oropharyngeal airway PEA = Pulseless electrical activity VF = Ventricular fibrillation VT = Ventricular tachycardia

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Differences in Adult Traumatic Cardiac Arrest Treatment

Paramedic | Intensive Care | Extended Care | Specialist

Method

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Jurisdiction (Service)	Interventions																Pharmacology			
	Guideline			Assessment	Haemorrhage & circulation							Airway & ventilation				Access				
	Separate traumatic arrest guideline	Treatment priority	Transport guidance	Ultrasound	Arterial torniquet	Haemostatic dressing	Pelvic binder	Other splinting	External aortic compression	REBOA	Thoracotomy	Airway	Intubation	Thoracostomy – needle	Thoracostomy – finger / tube	IO	Adrenaline	Fluids	Packed red blood cells	Extended life plasma
Aus. Capital Territory (ACTAS)	✓	Reversible causes (simultaneous ECC if feasible)	If witnessed, transport If unwitnessed, remain at scene	Physician	✓	✓	✓	✓			Physician	Basic	ICP	ICP	Physician	✓	✓	✓ 20 mL/kg (Max 2 L)	Physician	
New South Wales (NSWA)	✓	Reversible causes (simultaneous ECC if feasible)	If penetrating, transport	Physician	✓	Specialist (a)	✓				Physician	LMA / ETT	ICP	ICP	Physician	ICP	✓ After reversible causes corrected	✓ 250 mL PRN (Max 1 L)	Physician	
New Zealand (SJNZ)	✓	No ECC	Transport		✓		✓	✓					ICP	✓	ICP	✓	✓ (b)	✓ 2–3 L	ICP	
New Zealand (WFA)	✓	No ECC	Transport		✓		✓	✓					ICP	✓	ICP	✓	✓ (b)	✓ 2–3 L	ICP	
Northern Territory (SJNT)	✓	Reversible causes (simultaneous ECC if feasible)	Transport		✓		✓	✓			Physician	LMA / ETT / FONA	ICP	✓	ICP	✓	✓ If resources allow	✓ 20 mL/kg	ICP	
Queensland (QAS)	✓	Reversible causes (simultaneous ECC if feasible)		Specialist (d)	✓	✓	✓				Physician	Basic / LMA / ETT	ICP	✓	Specialist (d)	ICP	✓ After reversible causes corrected	✓ 20 mL/kg (Further as required)	Specialist (d, f)	Specialist (d)
South Australia (SAAS)		Reversible causes (simultaneous ECC if feasible)			✓	✓	✓	✓	✓			LMA / ETT	ICP	✓		✓	✓ After reversible causes corrected	✓ 30 mL/kg		
Tasmania (AT)				Specialist (h)	✓		✓	✓			Physician		ICP	ICP (g)	Specialist (h)	✓	✓ After reversible causes corrected			
Victoria (AV)	✓	Reversible causes (simultaneous ECC if feasible)	If penetrating trauma in PEA, transport if <20 minutes to trauma facility	Specialist (e)	✓	✓	✓			(c)	(c)	LMA / ETT / FONA	ICP	✓	Specialist (e)	ICP	✓ After reversible causes corrected	✓ 20 mL/kg	Specialist (e)	
Western Australia (SJWA)	✓	Reversible causes (simultaneous ECC if feasible)	Transport if <25 minutes to ED		✓	✓	✓					Basic / LMA	✓	✓	ICP	✓	✓ During transport	✓ During transport	ICP	

(a) Special Operations team paramedic only (b) Adrenaline administration is listed as 'very low priority' (c) Explicitly considered and rejected during a 2019 review, with two identified cases potentially benefitting during the 6-year retrospective window (d) ICP – "High Acuity Response Unit" Paramedic only (e) ICP – "Flight Mobile Intensive Care Ambulance" Paramedic only (f) ICP – "Flight Critical Care Paramedic" only (g) Pulseless electrical activity arrest only (h) ICP – "Flight Intensive Care Paramedic" only

Treatment rationale

REBOA
- Resuscitative endovascular balloon occlusion of the aorta involves insertion of a femoral arterial catheter that is advanced into the aorta so an occlusive balloon can be inflated to prevent distal haemorrhage.

Thoracotomy
- Resuscitative thoracotomy is the surgical opening of the thorax in order to directly access organs, usually performed for the purpose of aortic clamp, direct cardiac massage, or pericardial aspiration to relieve a cardiac tamponade.

Thoracostomy
- Thoracostomy is a smaller incision into the thorax for the purpose of decompressing gas or fluid.

Blood products
- Blood products restore circulating volume without causing dilutional anaemia and acidosis as saline fluids do.
- Packed red blood cells restore oxygen carrying capacity.
- Extended life plasma is thawed fresh frozen plasma (FFP) that contains coagulation factors.

CPG = Clinical practice guideline ECC = External chest compressions ECP = Extended care paramedic ED = Emergency department ETT = Endotracheal intubation FONA = Front of neck airway, including cricothyroidotomy ICP = Intensive care paramedic IO = Intraosseous JAS = Jurisdictional ambulance service LMA = Laryngeal mask airway PEA = Pulseless electrical activity PRN = Pro re nata REBOA = Resuscitative endovascular balloon occlusion of the aorta

Produced by: Matt Wilkinson-Stokes, Michael Williams, Alex Telford, Samuel Paton, Marc Colbeck, Sonja Maria. Contact: matt.wilkinson-stokes@outlook.com

Differences in Adult Cardiogenic Shock Treatment

Paramedic | Intensive Care | Extended Care | Specialist

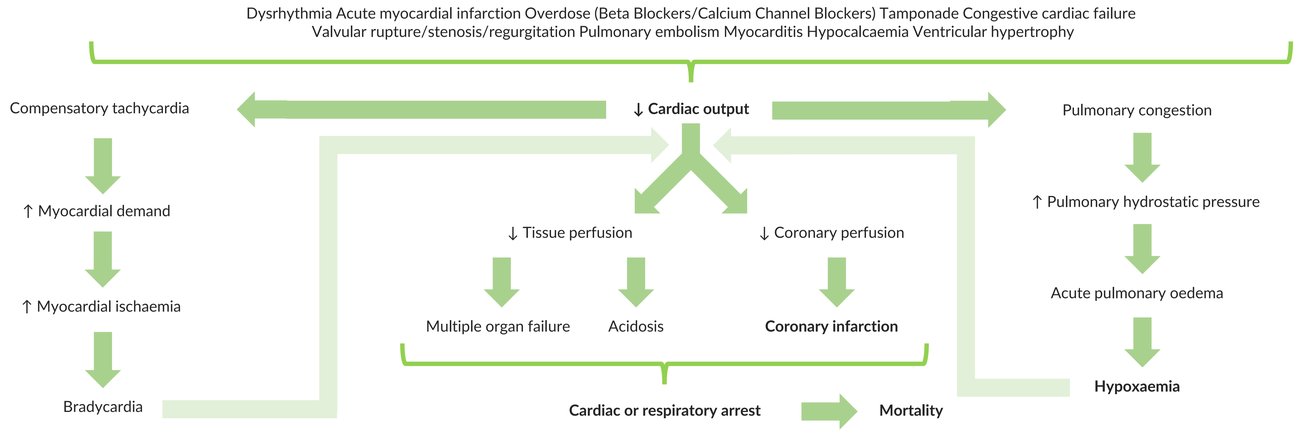
Method

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Jurisdiction (Service)	**Pharmacology**						**Interventions**	
	Oxygenation & $Sp0_2$ target	Fluids	Adrenaline: Infusion	Adrenaline: Intravenous bolus	Noradrenaline	Metaraminol	Isoprenaline	CPAP & PEEP	Positioning
Aus. Capital Territory (ACTAS)	✓ 94% (a)	✓ (c, d, f)	ICP (b)					(e)	
New South Wales (NSWA)	(e)	✓ (c)	ICP					(e)	
New Zealand (SJNZ)	(e)	✓ (d, f, j)	ICP (h)	ICP (h)		ICP (g)		(i)	
New Zealand (WFA)	(e)	✓ (d, f, j)	ICP (h)	ICP (h)		ICP (g)		(i)	
Northern Territory (SJNT)	✓ >95%	✓ (d)	ICP	ICP	ICP			✓	"Position appropriately"
Queensland (QAS)	✓ 92-96%	✓	ICP	ICP	Specialist (l)	Specialist (k)	Specialist (l)	✓	
South Australia (SAAS)	✓ 94-98%	✓ (c)	ICP	ICP	Specialist	Specialist (p)	Specialist (p)	(e)	
Tasmania (AT)	(e)	ICP (d)	ICP	ICP				(e)	
Victoria (AV)	(e)	ICP (d)	ICP	ICP	Specialist (o)	(m)		✓	
Western Australia (SJWA)	✓ Consider	✓ (f)			ICP	Specialist (n)		ICP	Sitting or semi recumbent

(a) Do not hyperoxygenate (b) If systolic blood pressure <90 mmHg with acute pulmonary oedema, or if fluids ineffective (c) If systolic blood pressure <90 mmHg (d) If lungs clear (e) Not discussed on CPG (f) Poor perfusion (g) If systolic blood pressure <100 mmHg (h) If unresponsive to metaraminol or if both hypotensive and bradycardic (i) Caution required (j) Use caution if left ventricular failure (k) ICP – "High Acuity Response Unit" paramedic only (l) ICP – "Flight Critical Care Paramedic" under consultation only (m) Available to ICPs for undifferentiated hypotension; not discussed on cardiogenic shock CPG (n) ICP – "Flight Critical Care Paramedic" only (o) ICP – "Mobile Intensive Care Ambulance Flight Paramedic" only (p) ICP – "Retrieval Paramedic" under consult only

Pathology flowchart



Treatment rationale

Adrenaline
- Alpha-1 agonism causes peripheral vasoconstriction, improving central organ perfusion.
- Alpha-2 agonism decreases insulin secretion and increases glucagon, raising serum glucose.
- Beta-1 agonism causes positive inotropy, chronotropy, dromotropy, lusitropy, and bathmotropy, improving cardiac output and systemic perfusion.
- Beta-2 agonism induces bronchodilation, offsetting obstructive gas trapping and improving tidal volume.
- Beta-3 agonism triggers lipolysis, raising serum glucose.
- Stabilises mast cells, reducing degranulation and release of inflammatory mediators.

Fluids
- Increases circulating volume to supplement perfusion, at the risk of acidosis, decreased temperature, dilutional anaemia, increased afterload, and hydrostatic pressure causing fluid shift (such as pulmonary oedema).

Metaraminol
- Direct effect at alpha adrenoreceptors; however, it also causes both vesicle exocytosis of noradrenaline, and also is a competitive agonist for alpha receptors with noradrenaline – both of these mechanisms lead to increased free noradrenaline, in turn causing some indirect beta effects

Isoprenaline
- A synthetic adrenergic that preferentially agonises Beta-1 and Beta-2 receptors. Beta-1 stimulation causes positive inotropy, chronotropy, dromotropy, and lusitropy, improving cardiac output and systemic perfusion.

CPAP = Continuous positive airway pressure CPG = Clinical practice guideline ECP = Extended care paramedic ICP = Intensive care paramedic JAS = Jurisdictional ambulance service PEEP = Positive end expiratory pressure $Sp0_2$ = Peripheral arterial oxygen saturation

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Differences in Confirmation of Death

Paramedic | Intensive Care | Extended Care | Specialist

Method

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Jurisdiction (Service)	Separate 'obvious death' criteria	Heart sounds						Breath sounds					Carotid pulse			Central stimulus					Painful stimulus			Fixed pupils +/- dilation	ECG	Repetition of all steps	Notification of reportable deaths	Contact GP if not reportable
		Minimum 10 seconds	30 seconds	1 minute	2 minutes	5 minutes	No time guide	30 seconds	1 minute	2 minutes	5 minutes	No time guide	Minimum 10 seconds	1 minute	No time guide	Mandibular pressure	Trapezius squeeze	Supraorbital pressure	Sternal rub	No guide	Pinching antecubital fossa	Nail bed pressure	No guide					
Aus. Capital Territory (ACTAS)	✓						✓					✓			✓		Optional	Optional	Optional		Optional			✓		✓ At 3-5 minutes	✓	
New South Wales (NSWA)	✓					✓					✓				✓					✓			✓	✓	Optional		✓	Optional
New Zealand (SJNZ)	✓	✓							✓ (a)				✓ (b)											✓	✓ (c)	✓ At 10 minutes (d)	✓	✓
New Zealand (WFA)	✓	✓							✓ (a)				✓ (b)											✓	✓ (c)	✓ At 10 minutes (d)	✓	✓
Northern Territory (SJNT)	✓		✓					✓							✓								✓	✓	✓	✓	(e)	✓	
Queensland (QAS)	✓		✓					✓							✓				✓					✓			✓	✓
South Australia (SAAS)	✓			✓					✓				✓ (f)											✓				
Tasmania (AT)	✓			✓				✓							✓				✓					✓	Optional		✓	✓
Victoria (AV)	✓				✓					✓					✓ (f)	✓		✓	✓		✓	✓		✓	Optional (g)	(h)	✓	Optional
Western Australia (SJWA)	✓					✓					✓				✓ (i)									✓	✓ (j)		✓	✓

Also known as Verification of Death, Declaration of Life Extinct, and Recording of Life Extinct.

(a) Entire thorax and abdomen to be exposed (b) Femoral pulse also acceptable, or the brachial pulse in patients under 1 year age, for a minimum of 10 seconds (c) 6-lead ECG showing asystole or pacemaker. If bradycardic ventricular beats are present, wait until asystole presents before verifying death. (d) To capture auto-resuscitation (e) No repetition required, however, procedures are to be performed a minimum of 10 minutes after cessation of resuscitation to capture auto-resuscitation (f) Any pulse is acceptable (g) If performed, to be recorded for a minimum of 2 minutes (h) No repetition required, however, procedures are "ideally" to be evaluated 5-10 minutes after cessation of resuscitation to capture auto-resuscitation (i) Any central pulse acceptable (j) Asystole for 30 seconds

CPG = Clinical practice guideline ECG = Electrocardiogram ECP = Extended care paramedic GP = General practitioner ICP = Intensive care paramedic JAS = Jurisdictional ambulance service

Produced by: Matt Wilkinson-Stokes, Evelyn Colbeck, Marc Colbeck, Sonja Maria. Contact: matt.wilkinson-stokes@outlook.com

Differences in Chronic Obstructive Pulmonary Disease Treatment

Paramedic | Intensive Care | Extended Care | Specialist

Method

Produced October 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 a registered paramedic, 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. Retrieval Paramedic). Standard, routine cares such as oxygenation with permissive hypoxaemia/hypercapnoea and positioning to optimise ventilation were omitted for brevity, as were other complaints and/or conditions covered under their own, separate CPG (such as anxiolysis). 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)	Pharmacology										Interventions							
	Adrenergic				Anticholinergic	Corticosteroid			Antibiotics		Assessment	Ventilation support				Endotracheal intubation		
	Salbutamol		Adrenaline															
	Nebulised	Intravenous	Intramuscular	Infusion	Ipratropium Bromide	Prednisolone	Dexamethasone	Hydrocortisone	Amoxycillin +/- Clavulanic Acid	Doxycycline	PEFR	CPAP	BiPAP	PEEP	Chest pressure during exhalation	Unassisted (arrest)	KOBI, IFS	RSI, DSI
Aus. Capital Territory (ACTAS)	✓				✓			ICP				✓ (a)				ICP	ICP	ICP
New South Wales (NSWA)	✓				✓	ECP		✓	ECP (b)	ECP (b)						ICP		
New Zealand (SJNZ)	✓ (c)			ICP	✓ (c)	✓			ECP	ECP	✓			✓		ICP		ICP
New Zealand (WFA)	✓ (c)			ICP	✓ (c)	✓			ECP	ECP	✓			✓		ICP		ICP
Northern Territory (SJNT)	✓				✓			✓				ICP		ICP		ICP		ICP
Queensland (QAS)	✓	Specialist (d)	✓	ICP	✓			✓						✓		ICP		Specialist (e)
South Australia (SAAS)	✓ (f)				✓ (f)	✓		ICP			ECP	ICP				ICP		Specialist (g)
Tasmania (AT)	✓				✓	ECP	ICP								✓	ICP		
Victoria (AV)	✓				✓		✓						ICP	✓		ICP		ICP
Western Australia (SJWA)	✓				✓							ICP	ICP	ICP		✓		ICP

(a) With bronchodilators (b) PO for low-moderate, IV for high risk (c) Nebulise with air rather than oxygen if available; if oxygen is used and Sp02 is greater than 92%, alternative 5 minutes on with 5 minutes off (d) ICP – "Flight Critical Care Paramedic" with medical approval only (e) ICP "High Acuity Response Unit" Paramedic only (f) Limit oxygen exposure to 6 minutes if possible (g) ICP – "Retrieval Paramedic" only

Pathology flowchart

1. One or more Chronic Obstructive Pulmonary Disease (COPD) aetiologies

Chronic bronchitis
Chronic inflammation of bronchi
Goblet cell hyperplasia
Excess mucus production

Emphysema
Alveolar walls break down
Bullae form
High compliance

Chronic Asthma remodeling
Goblet cell hyperplasia
Increased smooth muscle mass
Decreased bronchial diameter

2. Partially irreversible airway disorder limiting exhalation (obstructive) rather than inhalation (restrictive)

Chronic hypercarbia and hypoxaemia, mild medullary desensitisation to hypercarbia

+/- Pathogen or antigen

3. Acute Exacerbation of Chronic Obstructive Pulmonary Disease (AECOPD)

4. Dynamic airway collapse

Bernoulli effect reduces pressure in constricted airways

Transmural pressure increases with forced expiration

Airways collapse under pressure

Decreased exhalation

5. Dynamic hyperinflation

Decreased gas exchange
Hypercarbia and hypoxaemia

Reduced V_T
↑ intrathoracic pressure
↓ cardiac output

6. Morbidity / mortality

Respiratory failure

Acidosis

↓ Cardiac output

Treatment rationale

Salbutamol
- Adrenergic preferencing beta-2 receptors, inducing bronchodilation, improving ventilation and reducing intrathoracic pressure.

Ipratropium Bromide
- Muscarinic cholinergic antagonist, decreasing cGMP, reducing bronchial smooth muscle contraction, improving ventilation and reducing intrathoracic pressure.

Adrenaline
- Alpha-1 agonism causes peripheral vasoconstriction, improving central organ perfusion. Alpha-2 agonism reduced insulin and increases glucagon, raising serum glucose. Beta-1 agonism causes positive inotropy, chronotropy, dromotropy, lusitropy, and bathmotropy, improving cardiac output and systemic perfusion. Beta-2 agonism induces bronchodilation, offsetting obstructive gas trapping and improving tidal volume. Beta-3 agonism triggers lipolysis, raising serum glucose. Stabilises mast cells, reducing degranulation and release of inflammatory mediators.

Corticosteroids
- Agonises glucocorticoid or mineralocorticoid receptors respectively, inducing a wide range of changes including reducing inflammation and immunosuppression.

Antibiotics
- Amoxycillin bactericidal antibiotics that function by inhibiting the creation of bacterial cell walls, ultimately leading to bacterial disintegration during attempted replication
- Clavulanic Acid has minimal bactericidal effects on its own, but it inhibits the production of β-lactamase enzymes that confer antibiotic resistance – due to this it may be combined with Amoxycillin
- Doxycycline is a bacteriostatic that blocks bacterial reproduction by inhibiting protein synthesis

PEFR
- Measurement of the maximum volume of active expiration, usually recorded in litres per minute, used to classify asthma severity.

CPAP, BiPAP, PEEP
- CPAP increases expiratory resistance, reducing alveolar collapse from atelectasis; this in turn recruits surface area for external respiration, reducing hypoxaemia.
- BiPAP provides differing air resistance on inspiration and expiration; this may make exhalation easier than CPAP.
- PEEP provides counteracting pressure on exhalation, also reducing alveolar collapse from atelectasis, and in turn reducing hypoxaemia.
- In the pre-hospital setting, PEEP is most commonly used as an attachment to intermittent positive pressure ventilation in circumstances where a patient is unable to maintain respiratory drive (either RR or V_T) sufficient for CPAP.

BiPAP = Biphasic positive airway pressure CPAP = Continuous positive airway pressure CPG = Clinical practice guideline DSI = Delayed sequence induction ECP = Extended care paramedic ICP = Intensive care paramedic IFS = Intubation facilitated by sedation IV = Intravenous JAS = Jurisdictional ambulance service KOBI = Ketamine only breathing intubation PEEP = Positive end expiratory pressure PEFR = Peak expiratory flow rate PO = Per oral RSI = Rapid sequence induction

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Differences in Adult Crush Syndrome Treatment

Paramedic | Intensive Care | Extended Care | Specialist

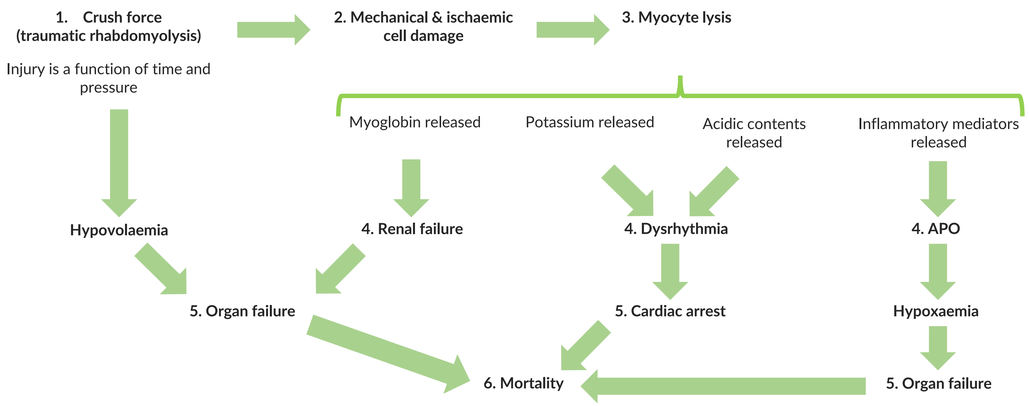
Method

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. Retrieval Paramedic). 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		
						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 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 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

(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.
- Must be balanced against risk of acidosis, decreased temperature, dilutional anaemia, increased afterload, and hydrostatic pressure fluid shift (such as pulmonary oedema).

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.

CPG = Clinical practice guidelines DSI = Delayed sequence intubation ECP = Extended care paramedic ICP = Intensive care paramedic IFS = Intubation facilitated by sedation JAS = Jurisdictional ambulance service KOBI = Ketamine-only breathing intubation MDI = Metered dose inhaler RSI = Rapid sequence induction

Produced by: Ryan Parry, Matt Wilkinson-Stokes, Marc Colbeck, Sonja Maria. Contact: matt.wilkinson-stokes@outlook.com

Differences in Adult Dysglycaemia Treatment

Paramedic | Intensive Care | Extended Care | Specialist

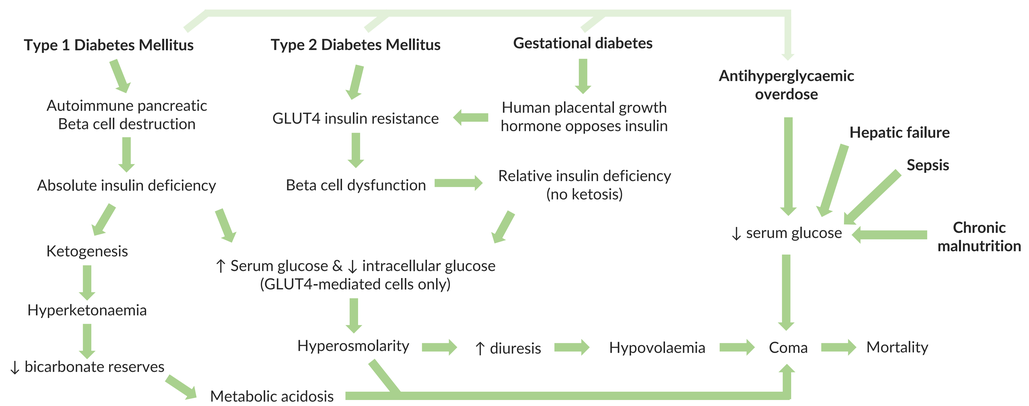
Method

Produced January 2023. 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 a registered paramedic, 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. Retrieval Paramedic). Standard, routine cares such as encouraging the patient to eat (for hypoglycaemia) or take their own medications were omitted for brevity, as were other complaints and/or conditions covered under their own, separate CPG. 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)	**Does the service have a hyperglycaemia guideline, as well as a hypoglycaemia guideline?**	**Pharmacology**						**Interventions**				
		Glucose			Glucagon	Fluid replacement (a)	Insulin	Diabetes services referral	Ketone measurement	Urinalysis	Insulin pump management	Is non-transport provided for in the guidelines?
		Oral	Intravenous	Buccal (Neonates)								
Aus. Capital Territory (ACTAS)	✓	✓	✓		✓	✓					✓ (b)	✓
New South Wales (NSWA)	✓	✓	✓		✓	✓			ECP	ECP		✓
New Zealand (SJNZ)	✓	✓	✓	✓	✓	✓ (c)	(d)	ECP	ECP	ECP		✓
New Zealand (WFA)	✓	✓	✓	✓	✓	✓ (c)	(d)	ECP	ECP	ECP		✓
Northern Territory (SJNT)	✓	✓	✓		✓	✓						✓
Queensland (QAS)	✓	✓	✓		✓	✓	Specialist (e)	✓	ECP			✓
South Australia (SAAS)		✓	✓	✓	✓		Specialist (f)		ECP			✓
Tasmania (AT)	✓	✓	✓		✓	✓	Specialist (g)		ECP			✓
Victoria (AV)	✓	✓	✓		✓	✓						✓
Western Australia (SJWA)	✓	✓	✓		✓	✓						

(a) This refers to fluid replacement for hyperglycaemia dehydration, not to line flushing post glucose administration (b) Paramedics may turn off the pump if a bystander on scene knows how to; if alone, they are not authorised to (c) Caution is noted due to cerebral oedema risk (d) There is a note that a GP may request this; it is unclear what the paramedic role would be in this instance (e) ICP – 'Flight Critical Care Paramedic' under consult (f) ICP – 'Retrieval Paramedic' (g) ICP – 'Intensive Care Flight Paramedic' under consult

Pathology flowchart



Treatment rationale

Glucose
- Glucose is a principal energy source for the body, being combined with oxygen in aerobic metabolism to produce ATP.

Glucagon
- A hormone produced by the pancreatic alpha cells, triggering hepatic glycogenolysis and raising serum glucose.
- Also has smooth muscle vasodilatory effects.
- Additionally activates glucagon receptors in the myocardium, increasing cAMP, stimulating the inward funny current (increasing pacemaker rate), increasing pacemaker calcium release from the sarcoplasmic reticulum (increasing pacemaker rate), and enhancing calcium-induced-calcium-release (increasing contractility).

Fluid replacement
- Increases circulating volume to supplement perfusion, at the risk of acidosis and dilutional anaemia.

Insulin
- A hormone produced by the pancreatic beta cells, triggering GLUT4 proteins (present in around 2/3 of the body's cells) to move glucose intracellularly, and lowering serum glucose.

CPG = Clinical practice guideline ECP = Extended care paramedic GP = General practitioner ICP = Intensive care paramedic IV = Intravenous JAS = Jurisdictional ambulance service PO = Per oral

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Differences in Foreign Body Airway Obstruction Treatment

Paramedic | Intensive Care | Extended Care | Specialist

Method

Produced January 2023. 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 a registered paramedic, 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. Retrieval Paramedic). Standard, routine cares such as positioning and encouragement were omitted for brevity, as were other complaints and/or conditions covered under their own, separate CPG (such as airway securing). 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. Oxygenation is only marked when explicitly listed on the CPG.

Jurisdiction (Service)	How is acuity classified?	Partial obstruction	Complete obstruction - conscious			Complete obstruction - unconscious									Abdominal thrusts (Heimlich)
		Oxygen	Back blows	Chest thrusts	Oxygen	Chest thrusts	Finger sweep	Laryngoscopy / Magill forceps	Ventilate if obstruction not cleared?	Intubation	Cricothyrotomy	Transtracheal ventilation	Oxygen	Push obstruction past carina?	
Aus. Capital Territory (ACTAS)	Partial vs complete obstruction	✓ (a)	✓ (b, c)	✓ (d, e, f)	✓ (g)	✓ (h, i)		✓ (j)		ICP	ICP		✓ (g)		
New South Wales (NSWA)	Effective vs ineffective cough	✓ (k)	✓ (b, c)	✓ (d, e)	✓ (k)			✓							
New Zealand (SJNZ)	Adequate vs inadequate ventilation		✓ (b, c, f)	✓ (d, e)		✓ (l)	✓ (b)	✓ (l)	✓	ICP (m)	ICP			✓	Contraindicated
New Zealand (WFA)	Adequate vs inadequate ventilation		✓ (b, c, f)	✓ (d, e)		✓ (l)	✓ (b)	✓ (l)	✓	ICP (m)	ICP			✓	Contraindicated
Northern Territory (SJNT)	Effective vs ineffective cough		✓ (b, c, f)	✓ (d, e, f)		✓		✓		ICP (n)	ICP (o)				
Queensland (QAS)	Mild vs severe obstructions		✓ (c, p)	✓ (d, p)				✓	✓	✓	Specialist (q)	Specialist (q)	✓		Contraindicated
South Australia (SAAS)								No CPG							
Tasmania (AT)	Complete vs incomplete obstruction		✓ (b, c)	✓ (d, e)			✓	✓		ICP (r)	ICP (r)				
Victoria (AV)			✓ (b, c)	✓ (d, e)		✓		✓	✓	ICP (r)	ICP (r)				
Western Australia (SJWA)	Mild vs severe obstructions		✓ (b, c)	✓ (d, e)				✓	✓	✓	✓				

(a) States to provide 'maximum' (b) First intervention (c) Up to five, then progress/return to chest thrusts (d) Second intervention (e) Up to five, then progress/return to back blows (f) Head down if possible (g) '100%' (h) Up to five before intubation (i) If intubation fails, return to chest thrusts and perform continuously (j) Attempt after five chest thrusts (k) Consider (l) If finger sweep unsuccessful, perform five chest thrusts before progressing to laryngoscopy (m) Insert tube as far as possible, then retract to correct length; this aims to displace the obstruction beyond the carina (n) If below glottis (o) If above glottis (p) Perform in any order (q) ICP – 'High Acuity Response Unit' paramedic only (r) Not discussed on 'Foreign Body Choking' or 'Upper Airway Obstruction' CPG, however, indicated on procedure CPG

CPG = Clinical practice guideline ECP = Extended care paramedic ICP = Intensive care paramedic JAS = Jurisdictional ambulance service

Produced by: Matt Wilkinson-Stokes, Marc Colbeck, Sonja Maria. Contact: matt.wilkinson-stokes@outlook.com

Differences in Major Haemorrhage Treatment

Paramedic | Intensive Care | Extended Care | Specialist

Method

Produced September 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 a registered paramedic, 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. Retrieval Paramedic). Standard, routine cares such as warming the patient to prevent coagulopathy were omitted for brevity, as were other complaints and/or conditions covered under their own, separate CPG (such as amputations, primary or secondary post-partum haemorrhage, or wound closure). 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)	Assessment	Interventions									Pharmacology						Additional information
	Ultrasound	Direct pressure	Raising limb	Arterial torniquet	Haemostatic dressing	Israeli / Olaes bandage	Splinting (pelvic, traction, other)	Wound packing	External aortic compression	REBOA	Topical adrenaline	Tranexamic Acid	Fibrinogen	Packed red blood cells (+/- calcium)	Extended life plasma (+/- calcium)	Fluids	
Aus. Capital Territory (ACTAS)	Physician	✓	✓	✓	✓	✓	✓	✓						Physician		✓ 90 mmHg (a)	Warm fluids Ignore spinal immobilisation while life threatening haemorrhage
New South Wales (NSWA)	Physician	✓	✓	✓	Specialist (b)	Specialist (b)	✓	Specialist (b)				Specialist (m)		Physician		✓ Radial pulse (a, c)	
New Zealand (SJNZ)	Specialist (m)	✓	(d)	✓ (e)	✓		✓	✓			✓	✓		Specialist (m)		✓ (f)	Warm fluids Remove penetrating object if in a limb Ignore spinal immobilisation while life threatening haemorrhage
New Zealand (WFA)	Specialist (m)	✓	(d)	✓ (e)	✓		✓	✓			✓	✓		Specialist (m)		✓ (f)	Warm fluids Remove penetrating object if in a limb Ignore spinal immobilisation while life threatening haemorrhage
Northern Territory (SJNT)	ICP	✓		✓	✓		✓					ICP		ICP		✓ 90-100 mmHg (g)	Fluid temperature control
Queensland (QAS)	Specialist (i)	✓ (h)	✓	✓	✓	✓	✓	✓				✓	Specialist (i)	Specialist (I, r)	Specialist (i)	✓ Radial pulse (j, k)	
South Australia (SAAS)		✓ (h)		✓			✓		✓			✓				✓ GCS M6	
Tasmania (AT)	Specialist (m)	✓		✓			✓							Specialist (m)		✓ Carotid pulse	
Victoria (AV)	Specialist (n)	✓		✓	✓		✓	✓		(o)				ICP		✓ 70 mmHg (g)	
Western Australia (SJWA)		✓		✓	Specialist (q)	ICP	✓	✓				✓	ICP	ICP		✓ 70 mmHg (p)	

(a) For TBI, >100 mmHg (b) Special Operations team paramedic only (c) Do not administer fluids for penetrating truncal trauma (d) No role unless distal limb venous bleeding (e) Consider releasing the torniquet if bleeding can be controlled and transport time is >30 minutes; if still uncontrolled, reapply (f) For uncontrolled haemorrhage, administer fluids while signs of severe shock; for controlled haemorrhage, administer fluids while if signs of hypovolaemia or poor perfusion (g) For TBI, 120 mmHg (h) Also pressure to pressure points and indirect pressure (i) ICP – "High Acuity Response Unit" Paramedic only (j) For TBI, 100-120 mmHg (k) For TBI, hypertonic saline (l) ICP – "Flight Critical Care Paramedic" only (m) ICP – "Flight Intensive Care Paramedic" only (n) ICP – "Flight Mobile Intensive Care Ambulance" Paramedic (o) Explicitly considered and rejected during a 2019 review, with two identified cases potentially benefitting during the 6-year retrospective window (p) For TBI, 90 mmHg (q) 'Clinical Support Paramedic' only (r) ICP – "Flight Critical Care Paramedic" only

Treatment rationale

Haemostatic dressing
- Infusion of dressings with prothrombotics, including minerals, chitosan, or acetylated glucosamine, that work via several mechanisms (including, variously, platelet activation, clotting cascade activation, and acting as a physical barrier) to increase thrombus formation and stabilisation.

External aortic compression
- Compression of the aorta via pressure cephalically and left lateral to the umbilicus. Occlusion of the aorta reduces distal circulation and minimises haemorrhage.

REBOA
- Resuscitative endovascular balloon occlusion of the aorta involves insertion of a femoral arterial catheter that is advanced into the aorta so an occlusive balloon can be inflated to prevent distal haemorrhage.

Topical adrenaline
- Alpha-1 agonism causes peripheral vasoconstriction, reducing haemorrhage.

Calcium gluconate / chloride
- Offsets the hypocalcaemia caused by rapid transfusion of blood products with citrate preservative.

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.

Fibrinogen
- A precursor to fibrin, activated by thrombin, that may be depleted in major haemorrhage.

Fluids
- Increases circulating volume to supplement perfusion, at the risk of acidosis, decreased temperature, coagulopathy, dilutional anaemia, increased afterload, and hydrostatic pressure causing fluid shift (such as pulmonary oedema) or dislodging clots.

Blood products
- Blood products restore circulating volume without causing dilutional anaemia and acidosis as saline fluids do.
- Packed red blood cells restore oxygen carrying capacity.
- Extended life plasma is thawed fresh frozen plasma (FFP) that contains coagulation factors.

CPG = Clinical practice guideline ECP = Extended care paramedic HEMS = Helicopter Emergency Medical Services, here used to refer to private providers ICP = Intensive care paramedic JAS = Jurisdictional ambulance service REBOA = Resuscitative endovascular balloon occlusion of the aorta TBI = Traumatic brain injury

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Differences in Adult Medical Hyperkalaemia Treatment

Paramedic | Intensive Care | Extended Care | Specialist

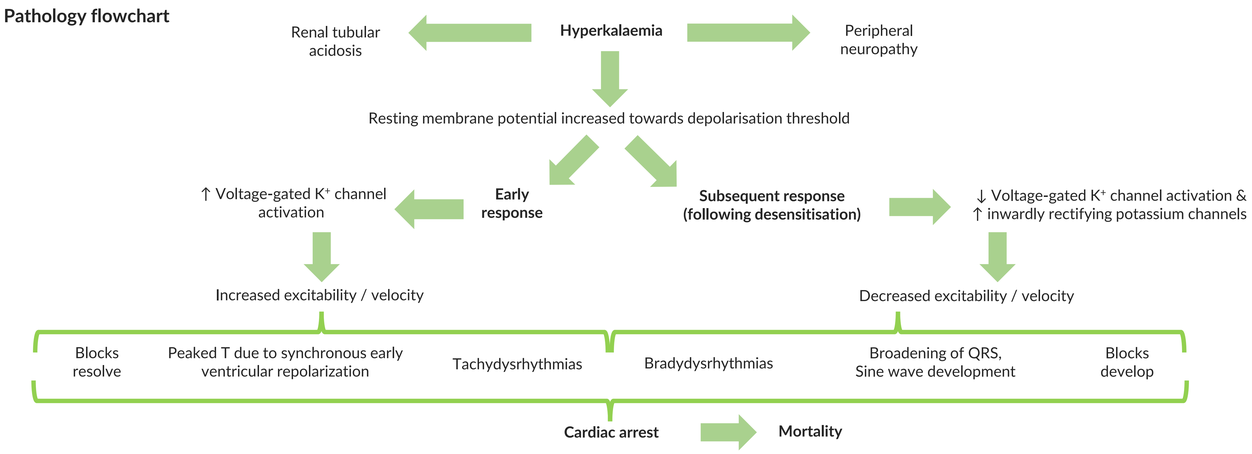
Method

Produced January 2023. 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. Retrieval Paramedic). Routine cares were omitted for brevity, as were specific CPGs such as crush, arrest, or dysrhythmia. 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)	Is there a medical hyperkalaemia CPG?	Pharmacology				Other
		Fluids	Calcium gluconate/chloride	Sodium bicarbonate	Salbutamol	
Aus. Capital Territory (ACTAS)	✓	✓ (a)	ICP (a, b, c)	ICP (a, b, c)	✓ (a)	
New South Wales (NSWA)	✓	✓ (a, b)	ICP (a, b)	ICP (a, b)		
New Zealand (SJNZ)	(d)					If RSI required, suxamethonium is contraindicated Hypo/erthermia may cause hyperkalaemia
New Zealand (WFA)	(d)					If RSI required, suxamethonium is contraindicated Hypo/erthermia may cause hyperkalaemia
Northern Territory (SJNT)	✓	✓ (a)	ICP (a)	ICP (a, e)	✓ (a)	If RSI required, suxamethonium is contraindicated Post RSI, EtC02 goal is 20-25 mmHg
Queensland (QAS)	✓	✓ (a)	ICP (a, b, f)	ICP (a, b)	ICP (a)	
South Australia (SAAS)	(d)					
Tasmania (AT)	(d, g)			(b)		
Victoria (AV)	(g)		(b)	(b)		
Western Australia (SJWA)	(h)		ICP (a)	ICP (a)		

(a) Indicated if ECG changes present (b) Indicated if hyperkalaemic arrest (c) Repeat at 10-15 minutes (d) Hyperkalaemia is discussed on crush CPG (e) If calcium gluconate is ineffective (f) Indicated if haemodynamic changes present (g) Hyperkalaemia is discussed on arrest CPG (h) Although no specific CPG, use of medications in hyperkalaemia is discussed on specific drug CPGs

Pathology flowchart



Treatment rationale

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.
- Must be balanced against the risk of acidosis, decreased temperature, dilutional anaemia, increased afterload, and hydrostatic pressure causing fluid shift (such as pulmonary oedema).

Calcium gluconate / chloride
- Stabilises myocardial membranes immediately, reducing potassium toxicity. Does not reduce serum potassium.

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 any associated nephrotoxicity.

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

CPG = Clinical practice guideline ECG = Electrocardiogram ECP = Extended care paramedic EtC02 = End tidal carbon dioxide ICP = Intensive care paramedic JAS = Jurisdictional ambulance service RSI = Rapid sequence induction

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Differences in Adult Hyperpyrexia and Hyperthermia Treatment

Paramedic | Intensive Care | Extended Care | Specialist

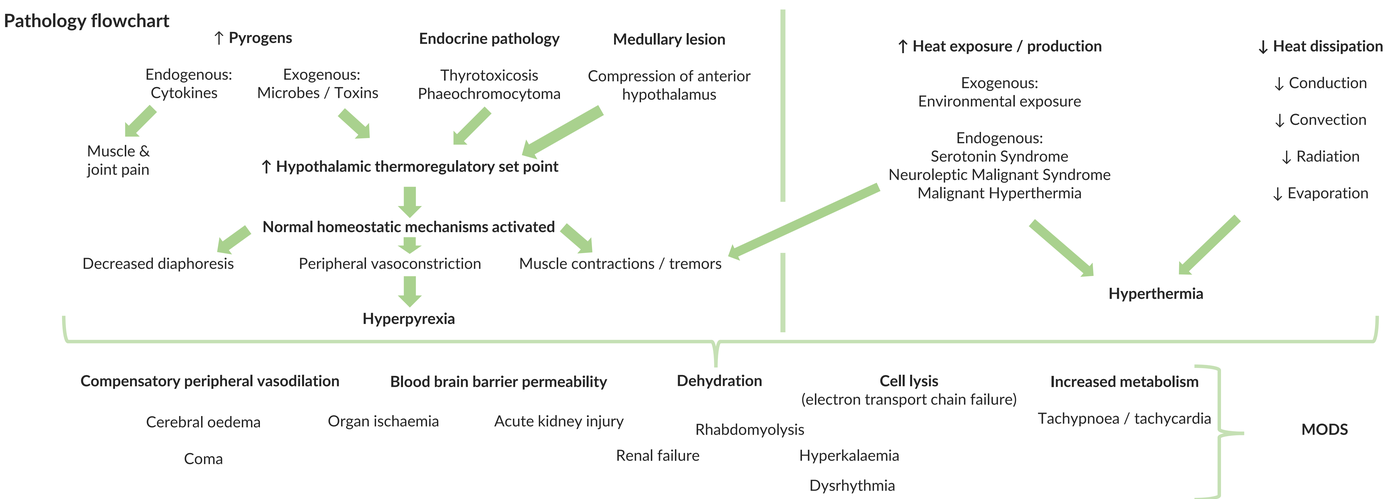
Method

Produced September 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 three 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. Retrieval Paramedic). Standard, routine cares such as oxygen and oral fluids were omitted for brevity, as were other complaints and/or conditions covered under their own, separate CPG (such as psychostimulant overdose or agitation). This chart only specifies treatments that are specifically mentioned in the CPG. 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.

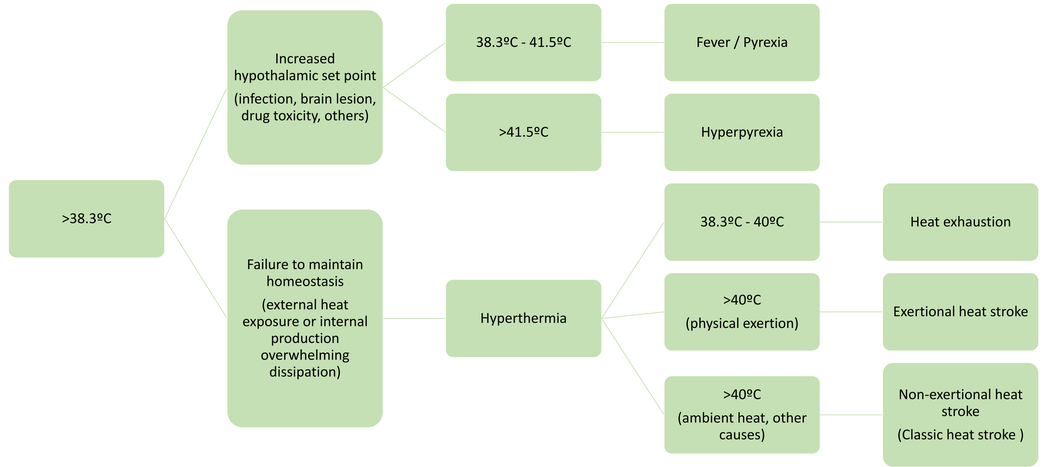
Jurisdiction (Service)	Intervention										Pharmacology			
	Position supine	Remove clothing	Spray	Ensure airflow	Actively fan	Ice packs to axillae / groin / neck	Ice bath / cold shower	Intubation	Oesophageal temperature probe	Target temperature	Paracetamol	Antiemetic	Fluids	Cool fluids
Aus. Capital Territory (ACTAS)			✓	✓	✓	✓ (a)	✓ (b)			< 38		✓	✓	✓ (c)
New South Wales (NSWA)		✓				✓					✓	✓	✓	
New Zealand (SJNZ)	✓	✓	✓	✓	✓	✓ (a)				< 38	✓	✓	✓	
New Zealand (WFA)	✓	✓	✓	✓	✓	✓ (a)				< 38	✓	✓	✓	
Northern Territory (SJNT)		✓	✓	✓	✓	✓		ICP (d)		38 – 40	✓	✓	✓	✓
Queensland (QAS)		✓	✓	✓	✓	✓		ICP			✓	✓	✓	✓
South Australia (SAAS)	No CPG													
Tasmania (AT)		✓	✓	✓	✓	✓		ICP		< 38		✓	✓	✓
Victoria (AV)	✓	✓	✓	✓	✓	✓	✓ (b)	ICP	ICP	< 40 within 30 minutes	✓	✓	✓	✓
Western Australia (SJWA)	✓	✓	✓	✓	✓	✓	✓ (b, e)					✓	✓	✓

(a) Avoid direct contact with skin (b) If available (c) Approximately 4 degrees Celsius (d) If unconscious / imminent respiratory failure (e) Maximum 15 minutes

Pathology flowchart



Classifications



CPG – Clinical practice guideline ECP = Extended care paramedic ICP = Intensive care paramedic JAS = Jurisdictional ambulance service MODS = Multiple organ dysfunction syndrome

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Differences in Adult Nausea and Emesis Treatment

Paramedic | Intensive Care | Extended Care | Specialist

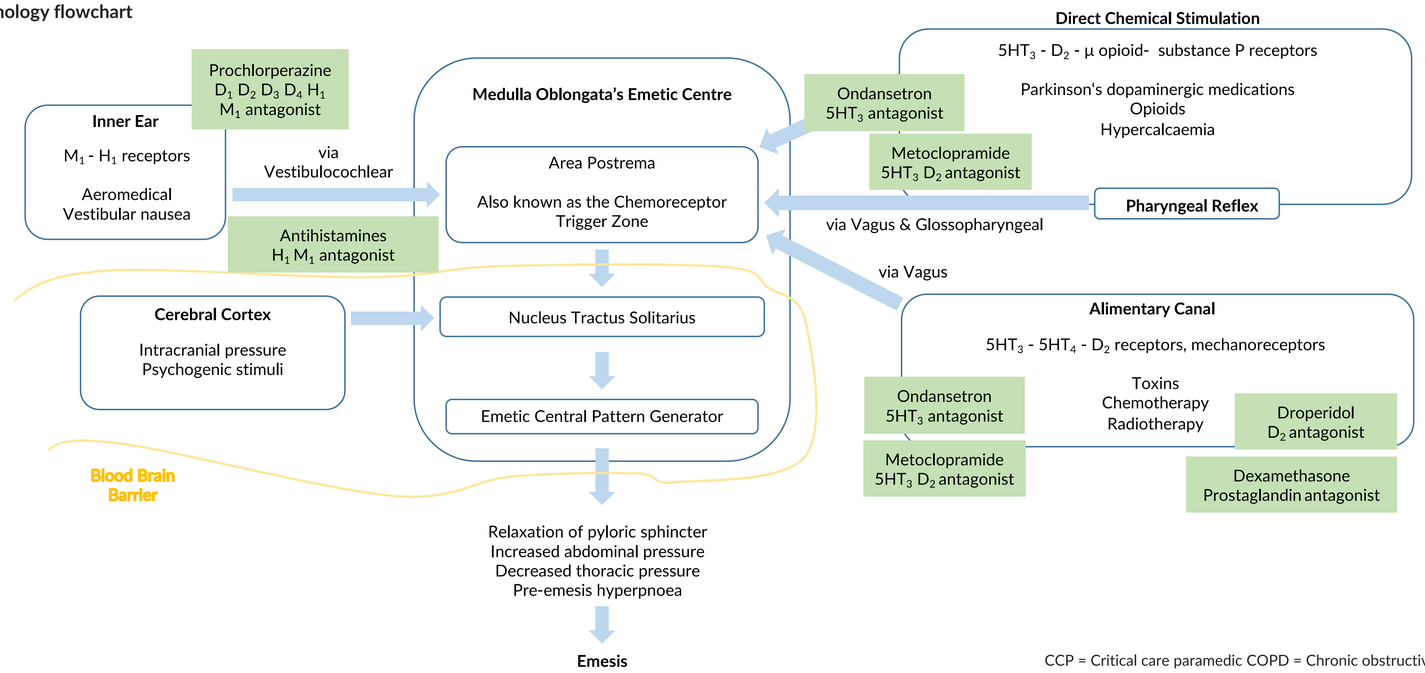
Method

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. Retrieval Paramedic). Routine cares were omitted for brevity. 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)	**Pharmacology**									**Intervention**
	Ondansetron (intramuscular)	Ondansetron (per oral)	Ondansetron (intravenous)	Prochlorperazine (intramuscular)	Metoclopramide (intramuscular)	Metoclopramide (intravenous)	Droperidol	Levomepromazine	Dexamethasone	Gastric aspiration for airway protection
Aus. Capital Territory (ACTAS)	✓	✓	✓	✓			(a)			✓
New South Wales (NSWA)	✓	ECP	✓		✓	✓	✓			✓
New Zealand (SJNZ)	✓		✓	ECP			ECP	ECP		
New Zealand (WFA)	✓		✓	ECP			ECP	ECP		
Northern Territory (SJNT)	✓	✓	✓	✓					✓ (b)	ICP
Queensland (QAS)	✓	✓	✓				(a)		(c)	✓
South Australia (SAAS)	✓	✓	✓				(a)			✓
Tasmania (AT)	✓		✓	✓	✓	✓	(a)		(d)	ICP
Victoria (AV)	✓	✓	✓	✓					(e)	✓
Western Australia (SJWA)	✓	✓	ICP		ICP	ICP	(a)			Specialist (f)

(a) Available under Agitated Patient CPG; not currently indicated for nausea and emesis (b) Where an existing palliative care plan authorises its use (c) Available under Croup CPG; not currently indicated for nausea and emesis (d) Available under Bronchospasm CPG, COPD CPG, Croup CPG, COVID 19 CPG; not currently indicated for nausea and emesis (e) Available under Bronchospasm CPG, Stridor CPG, COPD CPG, Croup CPG; not currently indicated for nausea and emesis (f) ICP - "Critical Care Paramedic" only (note: due to terminology differences this is not the same as the baseline ICP level, and not synonymous to the CCP level in Queensland or New South Wales)

Pathology flowchart



Treatment rationale

Ondansetron
- Primarily functions as serotonin 5-HT3 antagonist.
- Considered the optimal drug option for post-operative nausea, with some benefit for ocular trauma, spinal cord immobilisation, and narcotic-associated nausea. It is also recommended for traumatic brain injury due to lower likelihood of adverse effects.

Prochlorperazine
- Primarily a D1, D2, D3 and D4 dopaminergic antagonist, and has some effect on H1 histamine and M1 acetylcholine receptors.
- More likely to be effective for vestibular nausea, and consequently is recommended for aeromedical use.

Metoclopramide
- D2 dopaminergic antagonist at low doses, and a weak 5-HT3 serotonin antagonist at higher doses, and also stimulates a small amount of gastrointestinal acetylcholine release (improving gastric motility and tone, reducing nausea and reflux).
- Recommended for migraines, with some benefit for gastrointestinal causes and narcotic-associated nausea.

Droperidol
- A D2 dopaminergic antagonist, with dual antiemetic and antipsychotic properties.

Levomepromazine
- Antagonist of multiple receptors, including adrenergic, dopamine, histamine, muscarinic, and serotonin (not included on pathology chart to left due to this complexity).
- As it also has analgesic and antipsychotic effects, it is primarily used in palliative care.

Dexamethasone
- Mechanism of action is theorised to be blockage of prostaglandin synthesis.

Antihistamines
- Antihistamines antagonise the H1 histamine receptors (and, often, the M1 cholinergic muscarinic receptors as well) stimulated by the vestibulocochlear nerve, and are effective for motion sickness.

CCP = Critical care paramedic COPD = Chronic obstructive pulmonary disease CPG = Clinical practice guideline ECP = Extended care paramedic ICP = Intensive care paramedic JAS = Jurisdictional ambulance service

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Differences in Palliation and End of Life care

Paramedic | Intensive Care | Extended Care | Specialist

Method

Produced January 2023. 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 a registered paramedic, 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. Retrieval Paramedic). Standard, routine cares such as non-pharmacological antiemetic techniques were omitted for brevity, as were other complaints and/or conditions covered under their own, separate CPG (such as management of deceased persons). 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)	Interaction with patient's palliative care team	Pharmacology																	Interventions		
		Administer patient's own medications if outside normal scope?	Subcutaneous administration guidance	Antidopaminergic		Benzodiazepine		Analgesic					Anticholinergic		Antiemetic				Adrenergic	Urinary catheter insertion	Vital signs	Other
				Droperidol	Haloperidol	Midazolam	Clonazepam	Morphine	Hydromorphone	Fentanyl	Oxycodone	Paracetamol (IV)	Hyoscine butylbromide	Atropine	Ondansetron	Metoclopramide	Levomepromazine	Prochlorperazine	Salbutamol			
Aus. Capital Territory (ACTAS)	No CPG																				
New South Wales (NSWA)	Consider consulting	Consult	Upper limb preferred	✓ (a, b)		✓ (c and d, a and f)		✓ (c, e)			ECP								✓ (c)	ECP		
New Zealand (SJNZ)	Consult if possible	✓ (g)	May use existing SC line	✓ (d, e, h)		✓ (c, d, h, i)		✓ (c, d, e, i, j)		✓ (c, d, e, i, j)	ECP	ECP	ECP (k, r)		ECP (l, q)		ECP (b, d, q)			ECP	Avoid discomfort (e.g. sphygmomanometry)	ECP: Manage syringe driver SC line placement
New Zealand (WFA)	Consult if possible	✓ (g)	May use existing SC line	✓ (d, e, h)		✓ (c, d, h, i)		✓ (c, d, e, i, j)		✓ (c, d, e, i, j)	ECP	ECP	ECP (k, r)		ECP (l, q)		ECP (b, d, q)			ECP	Avoid discomfort (e.g. sphygmomanometry)	ECP: Manage syringe driver SC line placement
Northern Territory (SJNT)	Consult if possible	✓ (s)		✓ (b, d)		✓ (d, f)		✓		✓				✓ (r)								✓ Antiemetic acupressure
Queensland (QAS)	Consult if possible							Consult		Consult					✓							
South Australia (SAAS)	Consult if possible	Consult		ECP (b, d)		ECP (a, d)	ECP (a, d)	ECP (c, e, m)	ECP (c, e)	ECP (c, e)			ECP (r)		ECP (b)	ECP (b)				ECP		✓ SC line placement
Tasmania (AT)	No CPG																					
Victoria (AV)	Consult if possible	✓ (g)	Do not use existing SC line unless trained			✓ (d, n)		✓ (c with d or e, m, o, p)		✓ (c with d or e, o, p)					✓ **(b)**			✓ **(b)**			Not required	Registered community palliative care service patients only
Western Australia (SJWA)	No CPG																					

(a) Restlessness and agitation (b) Nausea or emesis (c) Breathlessness (d) Agitation / anxiety (e) Pain (f) If droperidol contraindicated or ineffective (g) If able to safely do so (h) If opioid ineffective (i) No maximum dose (j) Available transdermal as well as intravenous, intramuscular, and subcutaneously (k) For abdominal colic (l) Available to paramedics but not discussed in CPG m) Preferred opioid due to longer half life (n) Only if agitation is not due to pain; do not combine with morphine (o) Dosage calculated by a phone app (p) Do not combine with midazolam q) Droperidol ineffective r) Excessive respiratory secretions (s) Must consult afterwards

CPG = Clinical practice guideline ECP = Extended care paramedic ICP = Intensive care paramedic IV = Intravenous JAS = Jurisdictional ambulance service SC = Subcutaneous

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Differences in Postpartum Haemmorrhage Treatment

Paramedic | Intensive Care | Extended Care | Specialist

Method

Produced October 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 a paramedic, 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. Retrieval Paramedic). Standard, routine cares such as oxygen were omitted for brevity, as were other complaints and/or conditions covered under their own, separate CPG, such as analgesia. 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)	CPG for secondary postpartum haemorrhage?	Interventions								Pharmacology								Other
		Position supine	Third stage ongoing: Fundal massage	Third stage ongoing: Active management of third stage	Control genital tract / peritoneal haemorrhage	Fundal massage	Maternal bladder empty	Breastfeeding infant	External aortic compression	Bimanual compression	Oxygen target	Fluids	Adrenaline infusion for suspected amniotic fluid embolism	Oxytocin: IV / IM	Oxytocin: Infusion	Ergometrine	Tranexamic Acid	Packed Red Blood Cells	
Aus. Capital Territory (ACTAS)	Combined CPG	✓	✓ (a)		✓	✓ (b)	✓	✓			Continuous high flow	✓ (c)							Bring linen for blood weighing
New South Wales (NSWA)	Combined CPG		✓ (d)		✓	✓ (d)					>94%	✓ (e)		✓	ICP				Bring linen for blood weighing
New Zealand (SJNZ)	Primary PPH CPG only (f)		✓	✓ (g)	✓	✓				✓	>94%	✓ (c, e, h)	ICP	✓ (i)			✓	Specialist (j)	Warm the patient (k)
New Zealand (WFA)	Primary PPH CPG only (f)		✓	✓ (g)	✓	✓				✓	>94%	✓ (c, e, h)	ICP	✓ (i)			✓	Specialist (j)	Warm the patient (k)
Northern Territory (SJNT)	Primary PPH CPG only	✓	✓ (l)	ICP	✓	✓ (d)	✓	✓	✓		92-96%	✓		✓	ICP (m)		ICP (n)		Maintain normothermia
Queensland (QAS)	Separate CPG			✓	✓	✓	✓	(o)	✓	✓	92-96%	✓		✓	ICP		✓ (p)	Specialist (q)	Do not raise patient legs
South Australia (SAAS)	Combined CPG	(r)	✓ (d)		✓	✓ (d)	✓	✓	✓		94-98%	✓ (s)					✓ (p, t)	Specialist (u)	Maintain normothermia (v) Bring linen for blood weighing
Tasmania (AT)	Combined CPG			(w)			✓				Continuous high flow	✓				ICP (g)			
Victoria (AV)	Primary PPH CPG only (f)		✓ (l)	(x)	✓	✓ (d)	✓	✓	✓		Continuous high flow	✓		✓ (y)					
Western Australia (SJWA)	Combined CPG			(x)	✓	✓		✓	✓		94-98%	✓					✓ (z)		Maintain normothermia

(a) Indicated "as a last resort, in the event of torrential PPH with signs of hypovolaemia" while placenta is in situ (b) Continuously; uterus may relax when massage is ceased (c) Warm fluids (d) Cease when contracted (e) Cease fluids when haemodyanamically stable (f) Some notes on management of Secondary PPH included in the Additional Information section (g) Consult (h) Do not warm in a microwave (i) Do not administer if second stage is ongoing (j) ICP - "Intensive Care Flight Paramedic" only (k) This includes covering the patient with blankets, making the vehicle "as hot as possible", using heat pads, warming fluids, and not using foil blankets (l) Should be avoided where possible (m) On consult with receiving hospital (n) Paramedics to consult after two doses of Oxytocin (o) Not discussed within the postpartum haemorrhage CPG, however, is mentioned on normal birth CPG (p) Primary PPH within 3 hours only (q) ICP – 'Flight Intensive Care Paramedic' or 'High Acuity Response Unit Paramedic' only (r) Walking or standing is not recommended (s) Permissive hypotension; target verbal commands (t) Consult if >3 hours (u) ICP - "Retrieval Paramedic" only (v) Warm ambulance, remove wet clothing, provide blankets and foil (w) States "uterus cannot contract with placenta in situ… actions must be initiated to resolve these conditions"; these actions are not articulated within the document (x) Active management is contraindicated due to the risk of uterine inversion (y) If secondary PPH, on consult with receiving hospital (z) Birth or bleed <3 hours

Pathology

The causes of postpartum haemorrhage causes are commonly referred to as the 'Ts'.

Tone
- Uterine atony occurs when the myometrium fails to clamp the spiral arteries (which have no musculature of their own), leading to uncontrolled maternal haemorrhage within the uterus. This is most commonly cause by desensitivity to maternal oxytocin, a full maternal bladder impeding contraction, and uterine distension, among others.

Trauma
- Lacerations to the birthing canal or peritoneum can result from birth. Caesarean incision dehiscence or uterine artery pseudoaneurysm may be the cause in the case of secondary postpartum haemorrhage.

Tissue
- Retained placental tissue (including accreta) or products of conception, microbial infection causing endometritis, or gestational trophoblastic disease may all impede subinvolution.

Thrombin
- Rarely, haemorrhage may occur due to a congenital coagulopathy or, for some cohorts, anticoagulants or antiplatelets provided post-Caesarean.

Treatment rationale

Fundal massage
- Fundal massage is a technique to manually stimulate the myometrium and encourage involution.

Maternal bladder empty
- Micturition can reduce pressure on the wall of the uterus by the maternal bladder, which may interfere with involution.

Breastfeeding infant
- Breastfeeding can stimulate endogenous oxytocin release; oxytocin is a uterotonic and can stimulate involution.

Manual compression techniques
- External aortic compression is possible via a closed fist pinching the abdominal aorta shut against the vertebrae, reducing haemorrhagic loss.
- Bimanual compression applies direct pressure to the uterine haemorrhage site by inserting a closed fist into the anterior vaginal fornix and pressing this against an external hand on the abdominal wall.

Oxytocin
- Oxytocin is an endogenous hormone that can be supplied exogenously as a uterotonic, stimulating involution.

Ergometrine
- Ergometrine is a uterotonic that additionally has alpha adrenergic, dopaminergic, and serotonergic properties.

CPG = Clinical practice guideline ECP = Extended care paramedic ICP = Intensive care paramedic IM = Intramuscular IV = Intravenous JAS = Jurisdictional ambulance service PPH = Postpartum haemorrhage

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Differences in Adult Return of Spontaneous Circulation Treatment

Paramedic | Intensive Care | Extended Care | Specialist

Method

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Jurisdiction (Service)	Targets					Pharmacology						Interventions					Other
	RR (/min)	BP (mmHg)	Sp02 (%)	EtC02 (mmHg)	Temperature (°C)	Adrenaline	Metaraminol	Fluids	Glucose	Airway sedation	Amiodarone	Airway insertion	Pacing	Continue compressions	pPCI referral and / or thrombolysis	Orogastric tube	
Aus. Capital Territory (ACTAS)	8-10 (a, b)	>100 (c)	94-98 (d)	35-40	(e, f)	ICP (g)		✓	✓ (h)	(i)	(i)	✓ (j)	ICP (g)		✓	(i)	
New South Wales (NSWA)	6-8 (a, b)	>100 (k)	>94	35-45	(l)	ICP		✓ (m)	✓	ICP (n)	(i)	✓ (o)	(i)	✓ (p)	✓	(i)	
New Zealand (SJNZ)	(a)	>120	94-97	35-45	(q)	ICP (r)	ICP	✓	(i)	ICP	(i)	✓	(i)		✓		Post Arrest Checklist completed prior to transport RSI Unit requested if GCS <10
New Zealand (WFA)	(a)	>120	94-97	35-45	(q)	ICP (r)	ICP	✓	(i)	ICP	(i)	✓	(i)		✓		Post Arrest Checklist completed prior to transport RSI Unit requested if GCS <10
Northern Territory (SJNT)	(a)	>100	>94	30-40		ICP		✓ <20 ml/kg	(i)	(i)		ICP ETT	(i)			(i)	
Queensland (QAS)	8-12 (a, b)	>100	>94	30-40		ICP	(i)	✓	(i)	(i)		✓	(i)		✓	(i)	Position appropriately
South Australia (SAAS)	10-12 (a)	>100	94-98	<45 (s)	(e)	ICP	(i)	✓	✓ (h)	(i)	ICP	(i)	(i)		✓	✓	Rapid transport Raise head to 30 degrees
Tasmania (AT)		>90				ICP		ICP (t)	(i)	(i)		(i)	(i)			(i)	No specific CPG – included in Medical Cardiac Arrest CPG Transport rapidly
Victoria (AV)		>100		30-40		ICP		ICP <20 ml/kg (t)	(i)	(i)	ICP (u)	ICP RSI	(i)		✓	(i)	Paramedics may use fentanyl & ketamine for combative patients
Western Australia (SJWA)	(a)	>100	94-98	(v)	(f)	✓	(i)	✓	✓	(i)	(i)	(i)	(i)		✓	(i)	Do not rush (w)

(a) Avoid hyperventilation (b) Titrate respiratory rate with EtC02 and Sp02 (c) Consider posturing, fluids, and adrenaline to correct (d) 100% 02 not required (e) Aim for normal range (f) Avoid shivering (g) Pacing preferred over adrenaline (h) Avoid hyperglycaemia (i) Available and discussed on other CPGs; not explicitly discussed on ROSC CPG (j) If ongoing ALOC (k) Consider adrenaline (l) Avoid hyperthermia (m) If post-anaphylactic arrest, give additional boluses (n) Morphine and midazolam combined preferred; if no IV line, give IM ketamine (o) CPG states both insertion or removal may be required; clinician discretion (p) Continue if indicated (q) No active warming; cover with a single sheet only (r) If metaraminol not effective (s) If >45 mmHg, increase ventilatory rate to drop EtC02 by 1 mmHg/min until in normal range (t) Fluid available to all officers, however, is coloured as per ICP on ROSC section of CPG (u) Do not administer unless breakthrough ventricular fibrillation / tachycardia (v) Do not try and correct for the first few minutes (w) Consider naloxone if arrest precipitated by opioid overdose

ALOC = Altered level of consciousness BP = Blood pressure CPG = Clinical practice guideline ECP = Extended care paramedic EtC02 = End tidal carbon dioxide ETT = Endotracheal intubation GCS = Glasgow coma scale ICP = Intensive care paramedic IM = Intramuscular IV = Intravenous JAS = Jurisdictional ambulance service pPCI = Primary percutaneous coronary intervention RR = Ventilatory rate ROSC = Return of spontaneous circulation RSI = Rapid sequence induction Sp02 = Peripheral oxyhaemoglobin saturation

Produced by: Matt Wilkinson-Stokes, Marc Colbeck, Sonja Maria. Contact: matt.wilkinson-stokes@outlook.com

Differences in Adult Seizure Treatment

Paramedic | Intensive Care | Extended Care | Specialist

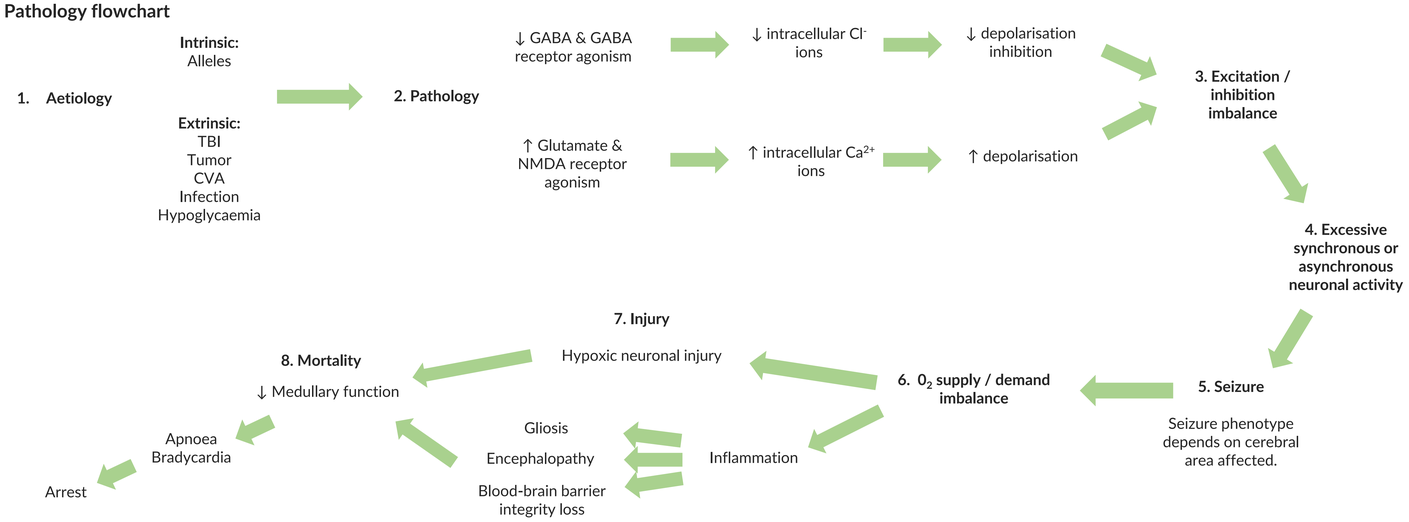
Method

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Jurisdiction (Service)	Pharmacology						Intervention	
	Benzodiazepine			Electrolyte	Anticonvulsant			
	Midazolam (intramuscular)	Midazolam (intranasal)	Midazolam (intravenous)	Magnesium Sulphate (intravenous)	Valproate (intravenous)	Levetiracetam (infusion)	Phlebotomy	RSI / DSI
Aus. Capital Territory (ACTAS)	✓		ICP	✓ (b)				ICP
New South Wales (NSWA)	✓		✓					
New Zealand (SJNZ)	✓	(a)	✓	ICP (b, c)	✓			ICP
New Zealand (WFA)	✓	(a)	✓	ICP (b, c)	✓			ICP
Northern Territory (SJNT)	✓		✓	ICP (b)		ICP		ICP
Queensland (QAS)	✓	✓	✓	ICP (b)		ICP		Specialist (d)
South Australia (SAAS)	✓		ICP			ICP		Specialist (e, f)
Tasmania (AT)	✓		ICP	ICP (b)				
Victoria (AV)	✓		ICP					ICP
Western Australia (SJWA)	✓		✓				✓	ICP

(a) Not carried, but authorised to administer patient's own medication via this route if available (b) Indicated for eclampsia only (c) Consultation required (d) ICP – "High Acuity Response Unit" only (e) ICP – "Retrievalist Flight Paramedic: only (f) Medical consultation required

Pathology flowchart



Treatment rationale

Midazolam
- Benzodiazepine that binds to an allosteric site on $GABA_A$ receptors, increasing the conductance of chloride anions when the ligand binds to the active site.
- The increase in intracellular negative ions hyperpolarises the cell, leading to action potential inhibition and termination of excessive neuronal activity.
- $GABA_A$ receptors are increasingly internalised within the neuron with ongoing seizure duration, and delay in administration of benzodiazepines may ultimately lead to reduced efficacy.

Magnesium Sulphate
- The second-most populous cation in the intracellular space – increasing extracellular magnesium raises the negative membrane potential, leading to action potential inhibition.
- Magnesium has multiple uses in pre-hospital medicine, including as an antidysrhythmic, anticonvulsant (especially prophylactically in pre-eclampsia), bronchodilator, vasodilator, and is under investigation for use in headache.

Valproate
- Mechanism of action includes increasing cerebral GABA concentrations (inhibiting action potentials) and blockading voltage-gated sodium-potassium channels (decreasing depolarisation likelihood).

Levetiracetam
- Mechanism of action is unknown – it does not blockade channels in the same manner that valproate does, and any GABA effects are believed to be mild – however, it has been shown to bind to SV2A, a protein in the axon terminal that facilitates calcium-induced exocytosis of neurotransmitters.
- Inhibition of calcium may underly the anticonvulsant properties it has.
- A recent, large-scale systematic review and meta-analysis found that levetiracetam had similar efficacy, lower adverse effects, and better cost-effectiveness than valproate, lorazepam, and phenytoin for status epilepticus.

Ca = Calcium cation Cl = Chloride anion CPG = Clinical practice guideline CVA = Cerebrovascular accident DSI = Delayed sequence intubation ECP = Extended care paramedic GABA = Gamma-aminobutyric acid ICP = Intensive care paramedic JAS = Jurisdictional ambulance service NMDA = N-methyl-D-aspartate RSI = Rapid sequence induction TBI = Traumatic brain injury

Produced by: Matt Wilkinson-Stokes, Alana Toso, Natasha St John, Marc Colbeck, Sonja Maria. Contact: matt.wilkinson-stokes@outlook.com

Differences in Adult Sepsis Treatment

Paramedic | Intensive Care | Extended Care | Specialist

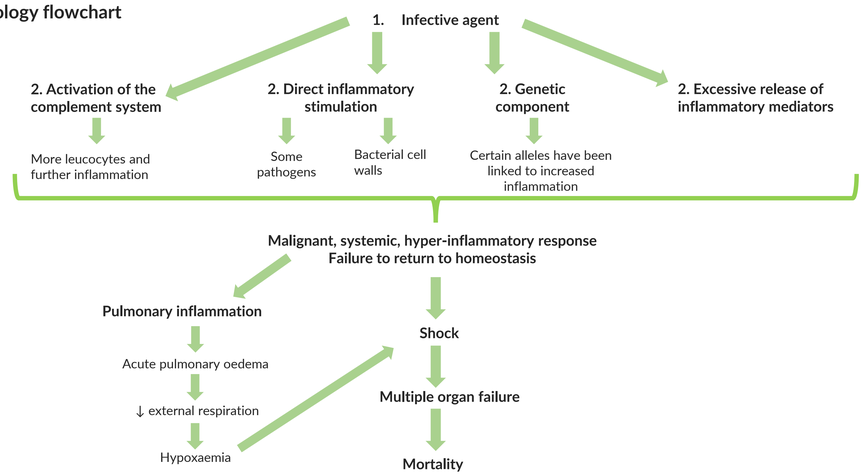
Method

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Jurisdiction (Service)	Pharmacology											Intervention				
	Antibiotic				Antipyretic	Corticosteroid	Fluids		Vasopressor / inotrope (infusion)			Phlebotomy	Lactate Measurement	Endotracheal intubation		
	Ceftriaxone	Benzylpenicillin	Amoxicillin & clavulanic acid	Gentamicin	Paracetamol	Dexamethasone	Sodium chloride 0.9%	Sodium lactate	Adrenaline	Noradrenaline	Metaraminol			Unassisted (arrest)	KOBI & IFS	DSI & RSI
Aus. Capital Territory (ACTAS)	✓ (a)						✓ (b)		ICP				✓	ICP	ICP	ICP
New South Wales (NSWA)		✓ (a)			✓ (c)			✓				✓ (o)		ICP		
New Zealand (SJNZ)	✓ (a)		✓ (d)	✓ (d, e)			✓ (f)		ICP (g)		ICP (h)			ICP		ICP
New Zealand (WFA)	✓ (a)		✓ (d)	✓ (d, e)			✓ (f)		ICP (g)		ICP (h)			ICP		ICP
Northern Territory (SJNT)	✓ (a)				✓		✓	✓	ICP	ICP				ICP		ICP
Queensland (QAS)	✓ (a or k, p)				✓		✓		ICP	Specialist (i)	Specialist (j)			ICP		Specialist (j)
South Australia (SAAS)		✓ (a)					✓ (h)		ICP	Specialist (n)	Specialist (n)			ICP		Specialist (n)
Tasmania (AT)	✓ (a or k, q)					✓ (k, p)	✓ (h)		ICP					ICP		
Victoria (AV)	✓ (a or k, p or r)						✓		ICP	Specialist (m)		✓ (r)		ICP		ICP
Western Australia (SJWA)							✓			ICP	ICP	✓		✓		ICP

a) Meningococcal septicaemia only b) Target SBP 90 mmHg c) Indicated if febrile d) Indicated for soft tissue, joint, chest infection d) Indicated for urinary, abdominal, or unknown source of infection f) Indicated during signs of hypovolaemia g) Indicated if unresponsive to metaraminol or if additionally bradycardic h) Target a SBP 100 mmHg i) ICP – Critical Care Flight Paramedic with medical approval only j) ICP – High Acuity Response Unit only k) Transport time over 60 minutes l) Available for non-meningococcal sepsis with medical approval m) ICP – Mobile Intensive Care Ambulance Flight Paramedic only n) ICP – Retrievalist Flight Paramedic under medical consult only o) Additional training required p) Medical consult required q) 'Prolonged' transport time r) PASS Trial (ACTRN12618000199213) participants only

Pathology flowchart



Treatment rationale

Ceftriaxone, benzylpenicillin, amoxicillin, gentamicin
- Bactericidal antibiotics that function by inhibiting the creation of bacterial cell walls, ultimately leading to bacterial disintegration during attempted replication
- (Gentamicin is commonly considered bactericidal, and functions by inhibiting protein 30S synthesis; the exact effects of this are unconfirmed)

Paracetamol
- Mechanism of action is fundamentally unknown; however, it is believed to function selectively in the central nervous system antagonising cyclooxygenase (COX) enzymes by reducing their active form, as well as potentially having action on the serotonergic, cannabinoid, nitric oxide, and opioid pathways

Dexamethasone
- Agonises glucocorticoid or mineralocorticoid receptors respectively, inducing a wide range of changes including reducing inflammation and immunosuppression.

Adrenaline
- Alpha-1 agonism causes peripheral vasoconstriction, improving central organ perfusion.
- Alpha-2 agonism decreases insulin secretion and increases glucagon, raising serum glucose.
- Beta-1 agonism causes positive inotropy, chronotropy, dromotropy, lusitropy, and bathmotropy, improving cardiac output and systemic perfusion.
- Beta-2 agonism induces bronchodilation, offsetting obstructive gas trapping and improving tidal volume.
- Beta-3 agonism triggers lipolysis, raising serum glucose.
- Stabilises mast cells, reducing degranulation and release of inflammatory mediators.

Noradrenaline
- Noradrenaline preferentially agonises alpha-1 receptors with a lesser amount of beta-1 receptor agonism, leading primarily to increased vasoconstriction with a lesser increase in cardiac output; however, the increase in mean arterial pressure from increased systemic vascular resistance generally leads to reflex bradycardia that offsets positive chronotropy

Metaraminol
- Direct effect at alpha adrenoreceptors; however, it also causes both vesicle exocytosis of noradrenaline, and also is a competitive agonist for alpha receptors with noradrenaline – both of these mechanisms lead to increased free noradrenaline, in turn causing some indirect beta effects

Phlebotomy
- Prior to the administration of broad-spectrum antibiotics may allow determination of the underlying pathogen for empiric antimicrobial therapy, and has the added benefits of providing a snapshot of the patient's condition prior to intervention and aid in identifying patient trends.

Lactate
- By-produce of anaerobic metabolism, and may be used to indicate inadequate perfusion; lactate increases proportionally to mortality, with a serum level above 4 mmol/L indicative of poor prognosis. Lactate may also be increased by adrenaline administration

Fluids
- Increases circulating volume to supplement perfusion, at the risk of acidosis, decreased temperature, dilutional anaemia, increased afterload, and hydrostatic pressure causing fluid shift (such as pulmonary oedema)

CPG = Clinical practice guideline DSI = Delayed sequence intubation ECP – Extended care paramedic ICP = Intensive care paramedic IFS = Intubation facilitated by sedation IV = Intravenous JAS = Jurisdictional ambulance service KOBI = Ketamine-only breathing intubation MDI = Metered dose inhaler PASS = Paramedic Antibiotics for Severe Sepsis RSI = Rapid sequence induction SBP = Systolic blood pressure

Produced by: Matt Wilkinson-Stokes, Elena Ryan, Michael Williams, Maddison Spencer, Marc Colbeck, Sonja Maria. Contact: matt.wilkinson-stokes@outlook.com

Differences in Shoulder Dystocia Treatment

Paramedic | Intensive Care | Extended Care | Specialist

Method

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Jurisdiction (Service)	**External manoeuvres**			**Internal manoeuvres**				**Order of moves**
	McRoberts'	Rubin's I	Gaskin's	Rubin's II	Wood's Screw	Reverse Wood's Screw	Sweeping posterior foetal arm	
Aus. Capital Territory (ACTAS)	✓ (a)	✓ (a, b, c)	✓ (b)	✓	✓	✓	✓	McRoberts Rubin I Gaskins Rubin II Woods Screw Reverse Woods Screw Posterior foetal arm
New South Wales (NSWA)	✓ (d)	✓ (b, d)	✓ (d)					McRoberts or Gaskins Rubin I
New Zealand (SJNZ)	✓ (b)	✓ (b)	✓ (b)				✓	McRoberts Rubin I Posterior foetal arm Gaskins
New Zealand (WFA)	✓ (b)	✓ (b)	✓ (b)				✓	McRoberts Rubin I Posterior foetal arm Gaskins
Northern Territory (SJNT)	✓ (d)	✓ (d)	✓					McRoberts Rubin I Gaskins
Queensland (QAS)	✓ (d, e)	✓ (d, e)	✓ (d, e)	✓ (d, e)	✓ (d, e)	✓ (d, e)	✓ (d, e, f)	McRoberts Rubin I Gaskins Internal moves in any order
South Australia (SAAS)	No CPG							
Tasmania (AT)	No CPG							
Victoria (AV)	✓	✓ (b)	✓					McRoberts Rubin I Gaskins
Western Australia (SJWA)	✓	✓	✓ (g)					McRoberts Rubin I Gaskins

(a) Attempt for 60 seconds maximum (b) This term is not used in the CPG, however, the description is consistent with this move (c) With lateral pressure (d) Attempt for 30 seconds maximum (e) Repeat after other moves if unsuccessful (f) Running start position recommended (g) Referred to as the Reverse McRoberts position; however, the description is consistent with the Gaskin move

Treatment rationale

All moves aim to directly or indirectly dislodge the anterior shoulder from the symphysis pubis by increasing the functional size of the pelvis, rotating the foetus into the wider pelvic oblique angle (rather than the narrower anterior-posterior diameter of the pelvic ring), and decreasing foetal bisacromial diameter. Neonatal asphyxia can occur if the foetal is not birthed promptly.

McRoberts'
- Mother on back, abducting knees towards chest, increasing pelvic inlet size by reducing lordosis and potentially dislodging the foetal anterior shoulder.

Rubin's I
- While in the McRoberts position adding suprapubic pressure, either constant or rocking, to dislodge the the foetal anterior shoulder.

Gaskin's
- Mother repositioned on all fours, with or without one leg lunging; the act of rotating may dislodge the foetal shoulder, gravity may allow the posterior shoulder to be birthed, or the lunge increasing pelvic inlet diameter may dislodge the obstructed foetal shoulder.

Rubin's II
- Inserting part of a clinician hand to apply direct pressure to the posterior of the foetal anterior shoulder, pushing it forwards (towards the foetal chest) to dislodge the the foetal anterior shoulder from the symphysis pubis into the wider oblique pelvic ring angle.

Wood's Screw
- While performing the Rubin II inserting part of a second clinician hand to apply direct pressure to the foetal posterior shoulder, providing greater traction.

Reverse Wood's Screw
- The reverse of the Wood's Screw; applying two clinician hands to rotate the foetal shoulders in the opposite direction.

Foetal arm
- Inserting part of a clinician hand to flex a foetal arm towards the foetal chest and to sweep it over the foetal head, pressuring the foetal shoulder under the symphysis pubis.

CPG = Clinical practice guideline ECP = Extended care paramedic ICP = Intensive care paramedic JAS = Jurisdictional ambulance service

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Differences in CVA and TIA Treatment

Paramedic | Intensive Care | Extended Care | Specialist

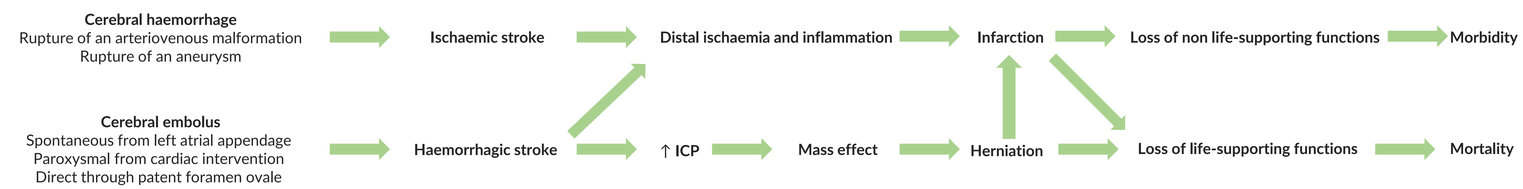
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Jurisdiction (Service)	Assessment tool	Pharmacology					Interventions												
		Fluids & SBP target (mmHg)	Is correcting hypoglycaemia explicitly discussed?	Antiemetic	Analgesia	Adrenaline	Positioning	IV Access: Indicated	IV Access: Target	ECG guidance	EtC02 target (mmHg)	Acute stroke referral: To mobile stroke ambulance	Acute stroke referral: To ED	Acute stroke referral: To neurologist	Acute stroke referral: To ECR unit	Time guidance: Thrombolysis	Time guidance: ECR	Time guidance: Travel time to stroke centre	Phlebotomy	Consider intubation
Aus. Capital Territory (ACTAS)	CRESST	✓ >100	✓ (a)		✓ (b)		For comfort	✓	1 x 18 g in unaffected arm	Report any episodes of AF	27-40		✓	✓	✓	<24 hours	<24 hours			ICP
New South Wales (NSWA)	FAST Hunter 8 mRS		✓	✓	✓			✓	1 x 18 g in R) ACF				✓		✓	<24 hours (c)	<24 hours (c)	<90 minutes		
New Zealand (SJNZ)	FAST PASTA LAMS Walking test Finger-Nose test		✓ (d)					✓					✓		✓	<4 hours	<6 hours (e)			
New Zealand (WFA)	FAST PASTA LAMS Walking test Finger-Nose test		✓ (d)					✓					✓		✓	<4 hours	<6 hours (e)			
Northern Territory (SJNT)	ROSIER		(f)	✓	✓ (g)			✓					✓							ICP
Queensland (QAS)	NIHSS-8 mRS	✓	(f)	✓	✓		45 degrees	✓	2 x any				✓	✓	✓	<9 hours	<24 hours	<24 hours (h)		
South Australia (SAAS)	ROSIER ACT		✓					✓	2 x 18 g				✓		✓	< 4 hours	<24 hours	<60 mins		
Tasmania (AT)	ACT FAST		(f)		✓ (g)			✓	1 x 18 g minimum				✓		✓	<6 hours	<24 hours	<60 mins		
Victoria (AV)	MASS ACT FAST	(i)	(f)	✓ (j)	✓ (g)	✓ (k)		✓	1 x 18 g	Report any episodes of AF		✓ (l)	✓		✓	<12 hours	<24 hours			ICP
Western Australia (SJWA)	FAST RACE							✓	ACF preferred				✓		✓	<9 hours			✓	

(a) Treat cautiously (b) Avoid if eligible for lysis (c) Currently undergoing a staged increase throughout the state from 4.5 hours up to 24 hours (d) Do not treat as stroke if hypoglycaemic (e) CPG notes that ECR is suitable up to 24 hours for some patients; however, it also only indicates acute ECR stroke referral hospitals for 6 hours from symptom onset (f) States to exclude mimics including hypoglycaemia, does not state to treat hypoglycaemia (g) Avoid due to potential impact on conscious state (h) <60 minutes for ECR centre referral (i) Post intubation SBP target 120-140 (j) Avoid prochlorperazine, preference ondansetron (k) If orolingual angioedema occurs post stroke thrombolysis, ICPs may administer autonomously; for paramedics consultation is required (l) The mobile stroke ambulance, which includes a CT scanner, may also be dispatched directly from a 000 call

Pathology flowchart



Treatment rationale

Thrombolysis
- Provision of a lysis drug, usually tissue plasminogen activator ("tPA"), that converts plasminogen into plasmin, allowing that plasmin to then cleave fibrin, degrading the fibrin matrix and causing fibrinolysis leading to thrombolysis.

Endovascular clot retrieval
- Mechanical removal of a thrombus via insertion of a cannula, usually in the femoral artery, and destruction and suction of the clot.

ACT = Arm-chat-tap test AF = Atrial fibrillation CPG = Clinical practice guideline CRESST = Canberra prehospital stroke screening tool CT = Computerised tomography ECP – Extended care paramedic ECR = Endovascular clot retrieval (also known as thrombectomy, percutaneous stroke intervention, and stroke clot retrieval) ED = Emergency department EtC02 = End tidal carbon dioxide FAST = Face arms speech time test ICP = Intensive care paramedic IV = Intravenous JAS = Jurisdictional ambulance service LAMS = Los Angeles motor scale MASS = Melbourne ambulance stroke screen tool mRS = Modified Rankin score NIHSS-8 = National institute of health stroke scale PASTA = Pre-hospital acute stroke triage and assessment RACE = Rapid arterial occlusion evaluation ROSIER = Recognition of stroke in the emergency room SBP = Systolic blood pressure

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Differences in Adult Narrow Complex Tachycardia Treatment

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Method

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Jurisdiction (Service)	Pharmacology			Interventions								
	Anti-dysrhythmics		Beta blocker	Valsalva			Phlebotomy	Synchronised cardioversion				
	Amiodarone	Adenosine	Metoprolol	Modified	Abdominal	Total attempts		Cardioversion	Sedation	First shock joules	Second shock joules	Third shock joules
Aus. Capital Territory (ACTAS)	ICP (a, b, c)	ICP (a, b, d)		✓		2						
New South Wales (NSWA)	ICP (f)			✓	✓	2		ICP (d, g, h)	Morphine and/or Midazolam	100	150	200
New Zealand (SJNZ)	ICP (j)	ICP (a, d, i)	ECP (t)	✓ (a)		2		✓ (a)	Ketamine (l)	200	200	
New Zealand (WFA)	ICP (j)	ICP (a, d, i)	ECP (t)	✓ (a)		2		✓ (a)	Ketamine (l)	200	200	
Northern Territory (SJNT)		ICP (k)		✓ (d)	✓ (d)	3		ICP (d)	Fentanyl and/or Midazolam	150	150	200 Anterior-posterior
Queensland (QAS)			Specialist (s, u)	✓ (l, m)		3		ICP (l, n)	Fentanyl and/or Morphine and/or Midazolam	100	150	200 Consider alternate placement
South Australia (SAAS)		ICP (m)	Specialist (s)	ICP (m)		No limit		ICP (n)	Fentanyl and/or Midazolam	100	150	
Tasmania (AT)		ICP (m, i)	Specialist (s)		✓ (m)	3		ICP (n or m/i/p)	Midazolam	100	200	(q)
Victoria (AV)		ICP (d, i)		✓ (d)	✓ (d)	3		ICP (n)	Midazolam and Fentanyl	150	150	200 Anterior-posterior
Western Australia (SJWA)	ICP (r/i or f)			✓		2	✓	ICP (n)	Ketamine and/or Midazolam and/or Fentanyl	75	100	Continue increasing by 25 Maximum 200

(a) If ventricular rate >150 (b) If symptomatic (c) Atrial fibrillation or flutter with cardiac output (d) Excluding atrial fibrillation or flutter (e) If ventricular rate >200, unconscious, pulseless (f) If refractory to cardioversion (g) Excluding sinus tachycardia (h) Excluding patients who are alert or verbal on AVPU scale (i) Valsalva ineffective (j) If ventricular rate >130 (k) Symptomatic AVRT or AVNRT only (l) Primary dysrhythmia (m) Stable (n) Unstable (o) Adenosine effective (p) Adenosine ineffective (q) Medical consult required (r) Atrial fibrillation only (s) ICP – "Flight Intensive Care Paramedic" or "Retrieval Paramedic" or "Flight Critical Care Paramedic" under consultation only (t) Asymptomatic atrial fibrillation (u) Where acute coronary syndrome is suspected (v) ICPs may administer autonomously, paramedics to consult; if consult unavailable, paramedics may administer autonomously

Types of narrow complex tachycardias

- Supraventricular tachycardia is a blanket term for any tachycardia originating above the atrioventricular node.
- This includes:
  - Sinus tachycardia,
  - Atrial tachycardia (unifocal or multifocal),
  - Sinoatrial nodal re-entrant tachycardia (SANRT),
  - Rapid atrial fibrillation,
  - Atrial flutter (Type 1 and Type 2),
  - Atrioventricular re-entrant tachycardia (AVRT, orthodromic or antidromic), including Wolff-Parkinson-White (WPW) syndrome,
  - Atrioventricular nodal re-entrant tachycardia (AVNRT), and
  - Junctional tachycardia.
- However, SVT may also include wide-complex tachycardias where conductional aberrancy is present; due to occasional complexity differentiating SVT with aberrancy from VT, the sign 'narrow-complex tachycardia' is often used to simply treatment.

Treatment rationale

Valsalva manoeuvre
- A vagal move that briefly increases intrathoracic pressure, decreasing venous return and increasing systematic vascular resistance. On release of the intrathoracic pressure, blood pressure reduces, and reflex tachycardia occurs. The increase in cardiac output triggers a compensatory reflex bradycardia, potentially terminating certain supraventricular tachydysrhythmias.

Amiodarone
- An anti-dysrhythmic working in all Vaughan-Williams classes, most importantly in prolonging the sinoatrial, atrioventricular, and ventricular repolarisation periods, and in slowing conduction in the sinoatrial and atrioventricular nodes.

Adenosine
- An anti-dysrhythmic prolonging duration of the cardiac cycle, potentially terminating certain re-entrant tachydysrhythmias.

Cardioversion
- Cardioversion provides an electrical current, timed to occur during the R wave to avoid R on T precipitating ventricular fibrillation.

AVNRT = Atrioventricular nodal re-entrant tachycardia AVPU = Alert verbal painful unresponsive AVRT = Atrioventricular re-entrant tachycardia CPG = Clinical practice guideline ECP = Extended care paramedic ICP = Intensive care paramedic JAS = Jurisdictional ambulance service SANT = Sinoatrial nodal re-entrant tachycardia WPW = Wolff-Parkinson-White

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Differences in Adult Wide Complex Tachycardia Treatment

Paramedic | Intensive Care | Extended Care | Specialist

Method

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Jurisdiction (Service)	Treatment of SVT with aberrancy within the CPG	Pharmacology					Interventions					
		Anti-dysrhythmics				Perfusion support	Phlebotomy	Synchronised cardioversion				
		Amiodarone	Lignocaine	Magnesium sulphate for Torsades	Sodium Bicarbonate for overdose or hyperkalaemia	Fluids (a)		Cardioversion	Sedation	First shock joules	Second shock joules	Third shock joules
Aus. Capital Territory (ACTAS)	Paramedics expected to differentiate Separate SVT CPG	ICP (b)	ICP (c)	ICP	ICP (d)	✓ (e)						
New South Wales (NSWA)	Paramedics not expected to differentiate Any wide complex rhythm other than VT or Torsades must be transported without treatment	ICP (b, f, g)	ICP (f, h)		ICP (i, j)			ICP (k, m or n)	Morphine and/or Midazolam	100	150	200
New Zealand (SJNZ)	Paramedics expected to differentiate Treat undifferentiated wide complex >150 bpm as VT if unsure Separate CPGs for SVT and for AF/Flutter	ICP (o, p)		(q)	ICP (i)	✓ (r)		✓ (s)	Ketamine (v)	200	200	
New Zealand (WFA)	Paramedics expected to differentiate Treat undifferentiated wide complex, rate >150, as VT if unsure Separate CPGs for SVT and for AF/Flutter	ICP (o, p)		(q)	ICP (i)	✓ (r)		✓ (s)	Ketamine (v)	200	200	
Northern Territory (SJNT)	Paramedics not expected to differentiate If uncertain, treat regular wide complex tachycardia as VT Single Tachycardia CPG	ICP (b, p, t, w)	ICP (c)	✓	ICP (i, v)			ICP (b, u)	Fentanyl and/or Midazolam	150	150	200 Anterior-posterior
Queensland (QAS)	Paramedics not expected to differentiate Separate CPGs for NCT and WCT	ICP (b, t)		ICP	ICP (d, v)			ICP (u)	Fentanyl and/or Morphine and/or Midazolam	100	150	200 Consider alternate placement
South Australia (SAAS)	Paramedics not expected to differentiate Separate CPGs for SVT and VT	ICP (t)						ICP (u)	Fentanyl and/or Midazolam	100	150	
Tasmania (AT)	Paramedics not expected to differentiate Single Tachycardia CPG, unique CPG for accelerated idioventricular Treat all wide complex tachycardias as VT	ICP (t, p, or x)		ICP (y)	ICP (i, v)			ICP (m, u)	Midazolam	100	200	
Victoria (AV)	Paramedics not expected to differentiate Separate CPGs for NCT and WCT	ICP (t, p, or x)			ICP (i)			ICP (m, u)	Midazolam and Fentanyl	150	150	200 Anterior-posterior
Western Australia (SJWA)	Paramedics not expected to differentiate Separate 'unstable tachycardia' and SVT CPGs	ICP			ICP (v)		✓	ICP (z)	Ketamine and/or Midazolam and/or Fentanyl	125	150	Continue increasing by 25 Maximum 200

(a) Only listed if specifically mentioned in the main CPG (b) Ventricular tachycardia (c) If amiodarone contraindicated (d) For wide QRS due to overdose on cardioactive medications (tricyclic antidepressants, beta blockers, or digoxin) (e) Hypotensive and not in left ventricular failure, with Torsades or unresponsive (f) Alert or verbal (g) Contraindicated for Torsades (h) Indicated for Torsades (i) Wide QRS due to tricyclic antidepressant overdose (j) Shock, coma, or seizure (k) Pain or unresponsive and rate >160 (l) ICPs may administer autonomously, paramedics to consult; if consult unavailable, paramedics may administer autonomously (m) If unsuccessful, treat with amiodarone (n) If unsuccessful, treat with lignocaine (Torsades) (o) If not severely compromised (p) Contraindicated for tricyclic antidepressant overdose (q) A note on the CPG states that magnesium may have a role in the treatment of Torsades, and to Consult (r) 2-3 litres indicated for a tricyclic antidepressant overdose (s) If severely compromised (t) Stable (u) Unstable (v) Indicated for wide QRS due to hyperkalaemia (w) Contraindicated for wide QRS due to hyperkalaemia (x) If cardioversion unsuccessful (y) If unstable, cardiovert (z) Joule details not on CPG; provided by paramedic

AF = Atrial fibrillation CPG = Clinical practice guideline ECG = Electrocardiograph ECP = Extended care paramedic ICP = Intensive care paramedic SVT = Supraventricular tachycardia NCT = Narrow complex tachycardia VT = Ventricular tachycardia WCT = Wide complex tachycardia

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Differences in Adult Traumatic Brain Injury Treatment

Paramedic | Intensive Care | Extended Care | Specialist

Method

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Jurisdiction (Service)	Pharmacology												Intervention						
	Ventilatory support		Circulatory support				Agitation management						Non transport guidance for minor head wound	Positioning	ICP* monitoring +/- CSF drainage	Airway and intubation			
	Oxygenation and target Sp02	EtC02 monitoring and target	Fluids and target blood pressure	Are pressors indicated?	Hypertonic saline 7.5%	Are blood products indicated?	Midazolam	Droperidol	Olanzapine	Opioids	Ketamine	Preferred TBI sedative (if discussed)				Preferred airway adjunct (if discussed)	Unassisted	KOBI, IFS	RSI
Aus. Capital Territory (ACTAS)	✓ ≥94%	✓ 35-40	✓ >100 systolic				ICP	✓ (a)			✓ (b)			✓ "By perfusion or comfort"			(c, d)	(c, d)	(c, d)
New South Wales (NSWA)	✓ 95-98%		✓ ≥100 systolic				ICP (e)	✓			ICP	Ketamine	✓	✓ 30 degrees			(c)		
New Zealand (SJNZ)	✓ SFM at 6 L/m (f)	✓ 30-35	✓ >120 systolic	ICP (g)		(c)	✓	✓	✓		ICP	Ketamine	✓			(i)	ICP (j)		ICP (k)
New Zealand (WFA)	✓ SFM at 6 L/m (f)	✓ 30-35	✓ >120 systolic	ICP (g)		(c)	✓	✓	✓		ICP	Ketamine	✓			(i)	ICP (j)		ICP (k, v)
Northern Territory (SJNT)	✓ 100% (l)	✓ (l)	✓ 85-90 MAP	ICP (m)		(c)	(n)			✓	ICP	Opioids Ketamine		✓ 30 degrees		(o)	(c)		ICP
Queensland (QAS)	✓ 92-96%	✓ 35-40	✓ 100-120 systolic	(c)	Specialist (p, q)	(c)	ICP					Midazolam		✓ 30 degrees		OPA / NPA (i)	ICP (r)		Specialist (q)
South Australia (SAAS)	✓ >94%	✓ 30-35 (h)	✓ ≥110 systolic ≥ 90 MAP	(c)	Specialist (x)	(c)	ICP					Midazolam		✓ 30 degrees	Specialist (x, y)		(c)		(c)
Tasmania (AT)	✓ >95%	✓ 35-40	✓ >100 systolic			(c)					(s)	(t)				NPA SGA (i)	ICP (u)		
Victoria (AV)	✓ >95%	✓ 30-35	✓ >120 systolic	(t)		ICP >120 systolic	(s)			✓	✓	Opioids Ketamine				NPA (o) RSI SGA			ICP (k)
Western Australia (SJWA)	✓ >90		✓ >90	(c)	ICP	(c)					✓	Ketamine		✓ 30 degrees (w)		(i)	(c)		ICP

(a) Recommended for a SAT score of 1-2 (b) Recommended for a SAT score of 2-3; ICP backup must be requested if administered (c) Available, but not explicitly discussed on the TBI CPG (d) This skill is available to ICPs, however, its is solely indicated for airway compromise (e) If maximum dosage of ketamine or droperidol reached (f) Regardless of Sp02 this is recommended routinely; dosage may be titrated per clinician judgement (g) If systolic blood pressure <120 mmHg (h) May be unreliable (i) No explicit preference; CPG does state that NPAs are not contraindicated, and that clinicians should be mindful of the potential for a base of skull fracture (j) If GCS3 and airway compromise (k) If GCS<10 (l) Be aware that this may be deranged (m) Use with caution (n) Avoid unless seizing (o) Avoid unless necessary due to pharyngeal reflex risk (p) ICP – "Flight Critical Care Paramedic" (q) ICP – "High Acuity Response Unit" (r) Not to be undertaken unless all other methods of securing the airway have failed (s) Contraindicated (t) Consultation required (u) For GCS 3-4, to be facilitated using a SGA (v) If airway compromise (w) Contraindicated if hypovolaemic (x) ICP – "Retrieval Paramedic" only, under medical consultation (y) Maintenance only, where the intervention is pre-established

CPG = Clinical practice guideline CSF = Cerebrospinal fluid ECP = Extended care paramedic EtC02 = End tidal carbon dioxide GCS = Glasgow coma scale ICP = Intensive care paramedic ICP* = Intracranial pressure IFS = Intubation facilitated by sedation JAS = Jurisdictional ambulance service KOBI = Ketamine only breathing intubation MAP = Mean arterial pressure NPA = Nasopharyngeal airway OPA = Oropharyngeal airway RSI = Rapid sequence induction SAT = Sedation assessment tool SFM = Simple face mask SGA = Supraglottic airway Sp02 = Peripheral oxygen saturation TBI = Traumatic brain injury

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Adult Medical Cardiac Arrest Specific Circumstances

Paramedic | Intensive Care | Extended Care | Specialist

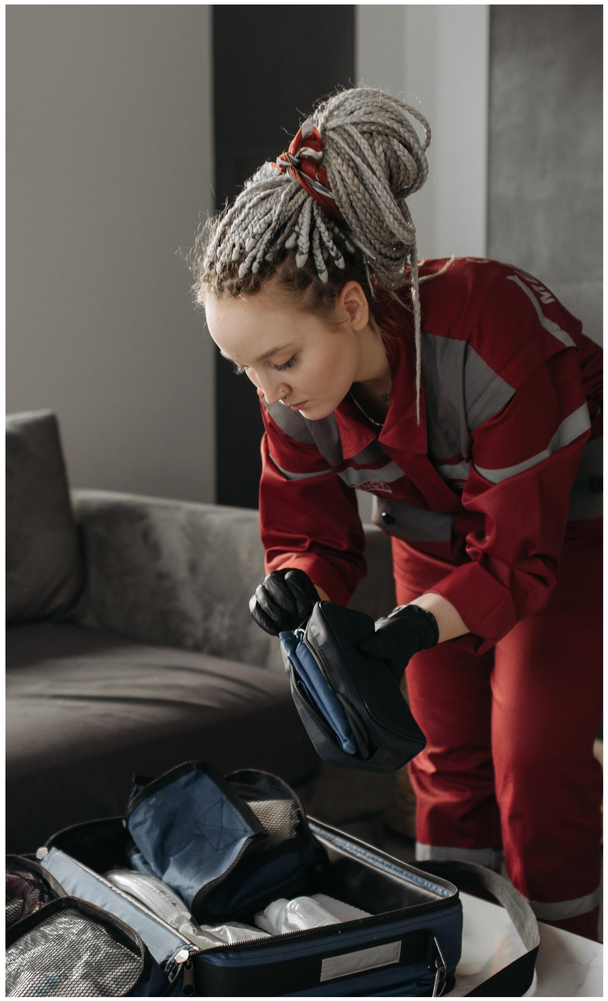
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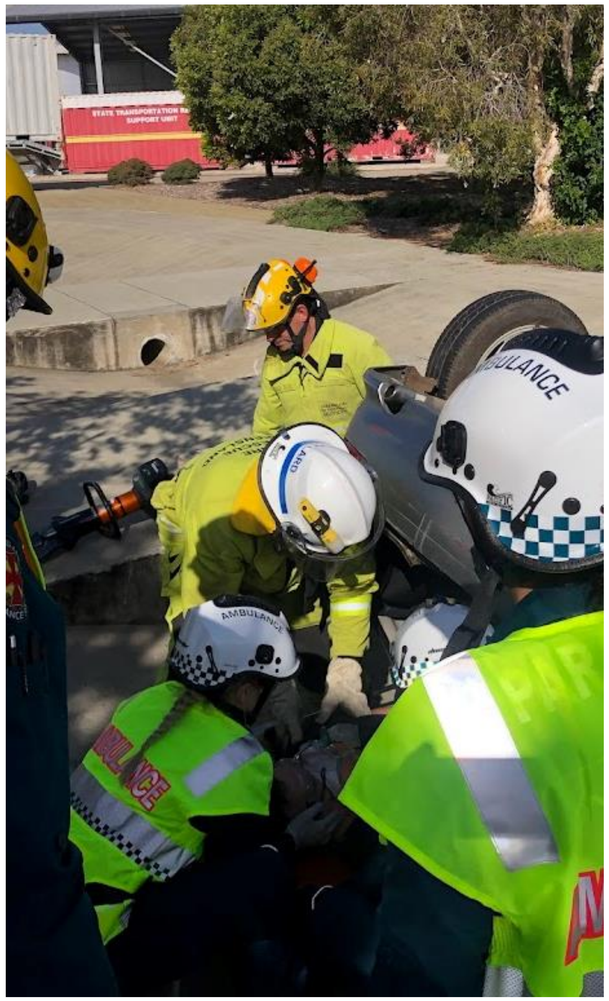
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Jurisdiction (Service)	Anaphylaxis	Arrest witnessed by paramedics	Asthma	COPD	CPRIC	Decompression Illness	Drowning	Hyperkalaemia	Hypoglycaemia	Hypothermia	Mechanical External Chest Compression Device	Obesity	Opiate Overdose	Pacemaker	Pregnancy	Sudden Unexpected Death in Infancy	Pre-existing tracheostomy	Tricyclic Antidepressant Overdose	Ventricular Assist Device
Aus. Capital Territory (ACTAS)	✓	✓						✓		✓								ICP	
New South Wales (NSWA)					✓			✓			✓					✓			✓
New Zealand (SJNZ)	✓	✓	✓		ICP		✓			✓	✓	✓	✓	✓	✓	✓		✓	
New Zealand (WFA)	✓	✓	✓		ICP		✓			✓	✓	✓	✓	✓	✓	✓		✓	
Northern Territory (SJNT)					ICP			ICP	✓	✓	ICP				✓			ICP	
Queensland (QAS)		✓	✓	✓	ICP	✓		ICP		✓	ICP	✓		✓	✓	✓	✓		
South Australia (SAAS)			✓		ICP			ICP		✓	✓	✓			✓				
Tasmania (AT)								ICP		✓								ICP	
Victoria (AV)			✓		✓			ICP	✓	✓	✓				✓			ICP	
Western Australia (SJWA)									✓	✓	✓				✓				

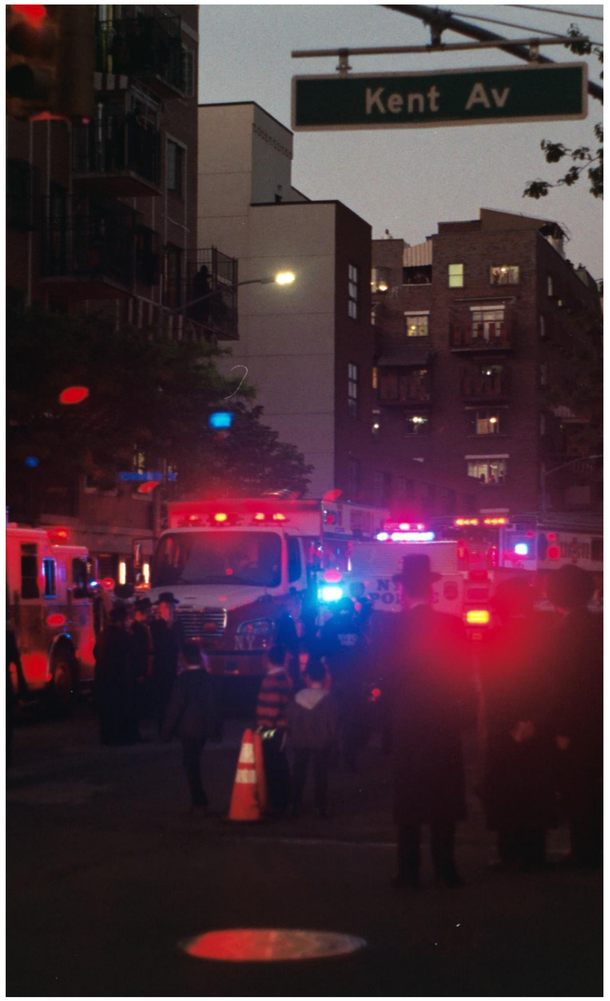
COPD = Chronic obstructive pulmonary disease CPG = Clinical practice guideline CPRIC = CPR induced consciousness ECP = Extended care paramedic ICP = Intensive care paramedic JAS = Jurisdictional ambulance service

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AMBULANCE




Kent Av

THE SUMMARY

An incomplete list of some of the interesting differences among the 10 JASs

Acute Behavioural Disturbance

- 6 different sedatives are used, with Droperidol being used by paramedics of all services
- 7 services use oral sedatives for compliant patients (set to be introduced in an 8th)
- 3 services have Ketamine is used by paramedics, with it restricted to ICPs in a further 6 services
- 3 services explicitly authorise RSI & DSI
- 7 services use one of two different tools to guide sedation decisions; 3 instead use clinician judgement
- 6 different terms are used

Acute Coronary Syndrome

- 7 services provide Tenecteplase; in 1 case, it is limited to ICPs
- 5 services have a preferred opioid (Fentanyl)
- 5 services provide Clopidogrel; in 1 case, it is limited to ICPs
- 1 service has paramedics provide Ticagrelor
- 1 service has paramedics provide Tirofiban
- 5 services provide Enoxaparin; in 1 case, it is limited to ICPs
- 8 services provide Heparin; in 2 cases, it is limited to ICPs
- 2 services have paramedics provide beta blockers, and it is limited to specialists in 1 service
- 4 services have paramedics provide GTN transdermally, and by infusion in 4 services (in 3 by ICPs, and in 1 by specialists)

Acute Pulmonary Oedema

- 4 services have paramedics provide GTN transdermally, and by infusion in 4 services (in 3 by ICPs, and in 1 by specialists)
- 4 services have ICPs provide diuretics, and it is limited to specialists in 1 service
- 3 services provide opioids for anxiolysis
- 3 services provide bronchodilators
- 6 services have paramedics provide CPAP, limited to ICPs in a further 3 services
- 4 services have paramedics provide PEEP, limited to ICPs in a further 2 services

Analgesia

- JASs in Australasia are heavily focused on systemic agents, with limited use of local anaesthesia for neural blockade
- Although not presented in the posters, the team noticed that there is little consistency in the dosages: the two New Zealand services give Paracetamol doses 150% that of other JASs (also the case with Ibuprofen); ACTAS, AT and SJWA have a weekly maximum for Methoxyflurane that is absent in other JASs; and in QAS, the maximum dose for intranasal Fentanyl is equal to or lower than the loading dose in ACTAS, SJNZ, WFA, NSWA, SAAS, and AV
- AT and ACTAS use weight-based dosing for opioids, while other services primarily rely on an age cut-off
- Ibuprofen, Aspirin, Parecoxib, Tramadol, Codeine, and Oxycodone are each used in a minority of services
- The use of rapid and delayed induction and intubation for humanitarian reasons (i.e. intractable pain, rather than neuroprotection or securing the airway) is explicitly allowed in a minority of services
- There is an equal split between services that allow paramedics to administer Ketamine, and those that restrict it to ICPs

Anaphylaxis

- All services provide IM Adrenaline, and all have ICPs providing Adrenaline infusions
- 8 additionally provide nebulised Adrenaline
- 8 services provided Salbutamol; in 2, it is also available to ICPs or specialists intravenously
- 5 services provide Ipratropium Bromide
- 6 services provide steroids; 1 of these is restricted to ICPs
- 5 services have paramedics provide Glucagon (for inotropy)
- 2 services have ICPs providing Magnesium



Asthma

- All services provide Salbutamol, Ipratropium Bromide, and IM Adrenaline
- 2 services provide intravenous Salbutamol (1 by ICP, 1 by specialists)
- 8 services provide steroids: in 7 cases by paramedics, in 3 cases by ICPs, and in 2 cases by ECPs
- 6 services have ICPs provide Magnesium, it is restricted to specialists in 1 service
- 3 services have paramedics measure PEFR, and ECPs measure it in 1 service
- 1 service has paramedics provide CPAP, limited to ICPs in 2 services
- 2 services provide ICPs with BiPAP
- 4 services provide paramedics with PEEP, restricted to ICPs in 1 service
- 2 services have paramedics perform expiratory chest squeezes
- 2 services have paramedics wait for an apnoeic exhalatory period before commencing compressions if cardiac arrest occurs

Autonomic Dysreflexia

- Treatment variously starts at a SBP >150, 160, 170, 180, or a relative rise of 20 above normal
- 2 services provide GTN infusions
- 2 services provide beta blockers
- 1 service limits SL GTN to ICPs
- 3 services provide transdermal GTN: 2 by paramedics, 1 by ICPs
- The dosage for GTN ranges from 300 mcg to 800 mcg
- 3 services say transport may not be required; 6 require mandatory transport

Bradycardia

- 1 service recommends paramedics provide fluids; in 1 service, this is limited to ICPs
- 9 services have ICPs providing Adrenaline
- 2 services have paramedics providing Atropine; this is limited to ICPs in 8 services
- 2 services have Isoprenaline provided by specialists
- 1 service has Dobutamine and Dopamine provided by specialists
- All services have ICPs provide transcutaneous pacing; transvenous management is provided by specialists in 2 services

Breech

- 2 services do not have guidelines for managing a breech birth
- 3 services state that some breech presentations much be transported without any paramedic intervention, regardless of the progress of the birth
- 1 service allows paramedics to birth all breech presentations; 4 allows paramedics to only birth frank or complete breeches; 1 allows paramedics to only birth frank breeches
- 8 services allow Methoxyflurane
- 4 contraindicate opioids; 1 recommends morphine as the first-line analgesic; 1 contraindicates morphine but precautions fentanyl; 2 precaution all opioids
- Preferred maternal positioning ranges from squatting/standing (5 services), lithotomy (4 services), all fours (3 services), to Sim's (3 services, when avoiding birth)
- 4 services allow paramedics to manually reposition are compressed cord
- 3 allow paramedics to rotate the foetus to be back uppermost if not already in that position
- 5 assist birth of the legs
- 5 perform Løvset's manoeuvre; 2 sweep the arms (if a full Løvset's is not required)
- 6 perform the modified Mauriceau-Smellie-Veit manoeuvre

Chronic Obstructive Pulmonary Disease

- 3 services allow ECPs to administer either IV or PO antibiotics
- 3 services assess PEFR to guide decision-making
- 4 services provided CPAP; 2 services provided BiPAP
- 6 services provided PEEP, with 3 limiting it to ICPs
- 1 service prefers nebulisation with air over oxygen; another has a time limit of 6 minutes for nebulisation
- 1 service provides intravenous Salbutamol
- 1 service allows intramuscular Adrenaline for severe bronchospasm; 3 allow intravenous
- 9 services provide some form of corticosteroid; 3 services offer a choice for either ECPs or ICPs; 1 service limits administration to ICPs
- 1 service provides manual chest pressure during exhalation

Foreign Body Airway Obstruction

- 2 services attempt to push an obstruction past the carina to ventilate a single bronchus
- While 8 services provide cricothyrotomy, 1 allows paramedics to perform it, 6 ICPs, and 1 restricts it to specialists
- 1 service provides transtracheal ventilation
- The Heimlich has been completely removed from all services

Hyperkalaemia

- 4 services have a specific medical hyperkalaemia CPG (distinct from crush / other aetiologies)
- 5 services have ICPs provide Sodium Bicarbonate
- 5 services have ICPs provide Calcium (as Gluconate or Chloride)
- 2 services have paramedics provide large dose Salbutamol, and it is limited to ICPs in 1 more

Palliation

- Hydromorphone, Oxycodone, Haloperidol, Clonazepam, Metoclopramide, Levomepromazine, and IV Paracetamol are used by ECPs
- 2 services allow ECPs to place SC lines; another 2 allow paramedics to use existing SC lines
- 2 services allow ECPs to troubleshoot existing syringe drivers
- 2 services recommend avoiding Potentially uncomfortable vital signs including blood pressure
- 1 service uses antiemetic acupressure





Post-Partum Haemorrhage

- 2 services provide Adrenaline infusion for suspected amniotic fluid embolism
- 3 services provide bimanual compression
- 1 service contraindicates active third stage management; 4 services indicate it, with 1 limiting management to ICPs
- 9 services provide fundal massage
- 6 services empty the maternal bladder
- 5 services encourage breastfeeding
- 5 services provide external aortic compression
- 5 services have a single PPH CPG, 1 has distinct Primary and Secondary PPH CPGs, and 4 only have a Primary PPH CPG
- 6 services provide Oxytocin; 3 allow ICPs to provide an infusion; 1 service prefers Ergometrine
- 6 services provide Tranexamic Acid; 1 restricts this to ICPs
- 4 service provide blood products

Return of Spontaneous Circulation

- 1 service states 'not to rush', while another recommends 'rapid transport'
- 1 service has a specific ROSC checklist for completion prior to transport
- 3 services explicitly discuss RSI post ROSC
- Blood pressure targets range from >90 to >120 mmHg
- Ventilation guides range from 6 to 12 per minute

Stroke

- 13 different tools are used to identify and triage CVAs
- All services pre-notify the ED of a code stroke; 2 others additionally notify the on-call neurologist, while 9 perform direct ECR referrals
- Time ranges for thrombolysis referrals range from 4 hours to 24 hours
- Time ranges for ECR referrals range from 6 hours to 24 hours
- 1 service has an EtC02 target; 1 has a SBP target; 1 performs phlebotomy
- 3 services explicitly consider intubation
- 1 service provides Adrenaline if orolingual angioedema occurs post stroke thrombolysis
- 1 service has a mobile stroke unit

Tachycardia – Wide Complex

- 7 services provide cardioversion - 2 allow paramedics to perform this
- Cardioversion joules vary from initially 100 to 200, a maximum of 2 attempts to 4, and 3 services use alternate electrode placement
- 3 services provide Lignocaine
- 4 services provide Magnesium Sulphate for Torsades: in 1 by paramedics, in 3 by ICPs
- 3 services expect that paramedics differentiate SVT with aberrancy from VT
- 1 service has a unique CPG for accelerated idioventricular
- 1 service provides phlebotomy

Traumatic Brain Injury

- First line sedatives for agitation vary between benzodiazepines (2 services), opioids (2 services), and Ketamine (4 services), with 2 services providing no preference
- 1 service contraindicates Midazolam; another contraindicates Ketamine
- 3 services allow paramedics to administer Ketamine; 4 restrict it to ICPs
- Oxygen is provided regardless of Sp02 in 3 services; the remaining 5 aim to avoid hyperoxia
- Systolic blood pressure targets vary between >90, >100, >110, and >120, with 2 services using MAP instead of SBP
- 5 services discuss the safety of NPAs during base of skull fracture, with differing conclusions reached
- 1 service explicitly authorises blood produces; 7 more have them available but do not discuss them on the CPG
- 5 services recommend placing a patient at 30 degrees
- 3 services provide Hypertonic Saline: in 2 cases by specialists, and in 1 by ICPs

THE SHIFT EXTENSION

P A R A M E D I C P U B L I S H I N G

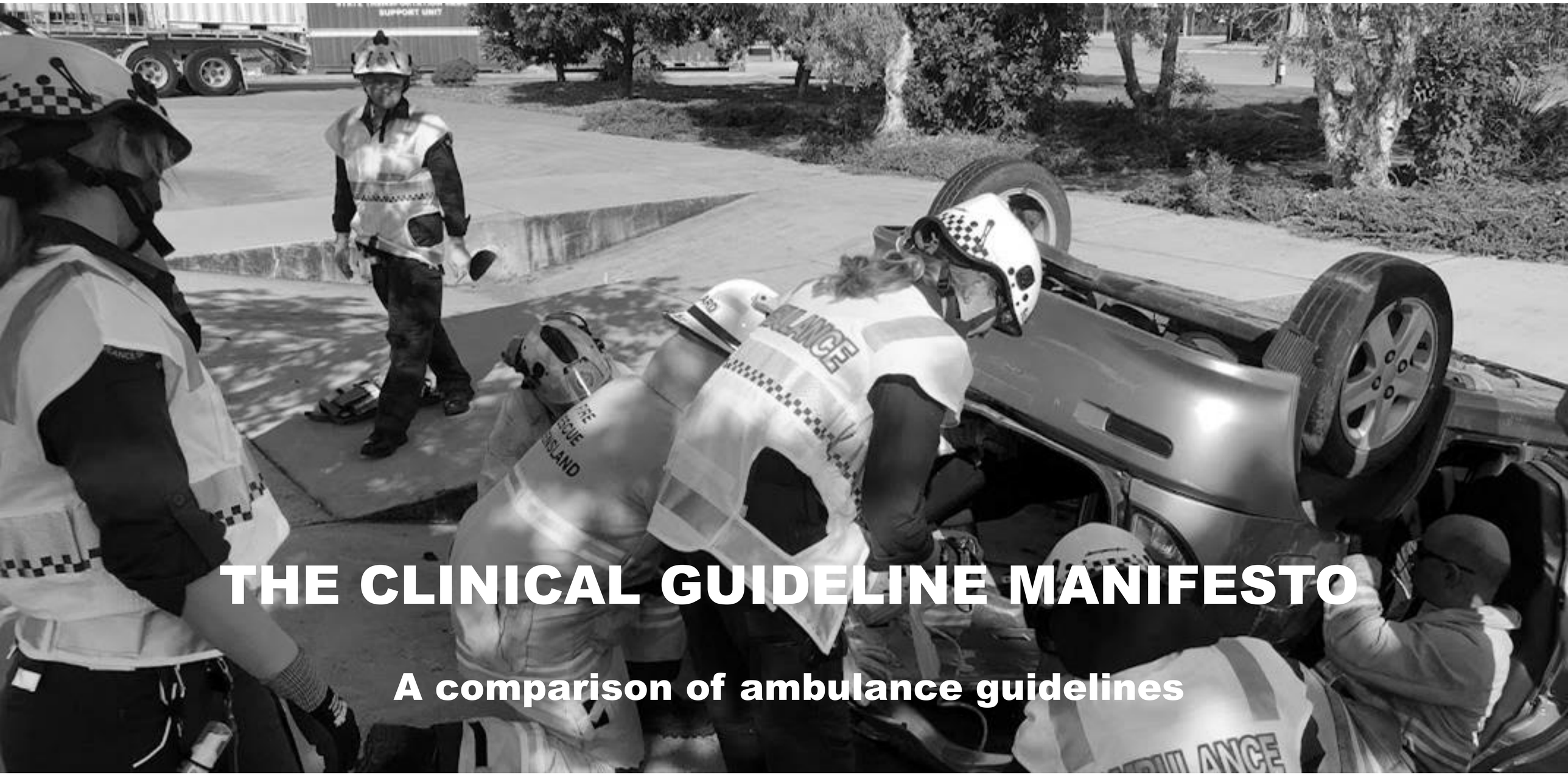
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