

Policy

A comparison of Australasian jurisdictional ambulance services' paramedic clinical practice guidelines series: Adult anaphylaxis

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Abstract

Introduction

This article forms part of a series that seeks to identify interjurisdictional differences in the scope of paramedic practice and, consequently, differences in patient treatment based on which jurisdiction a patient is geographically located within at the time of their complaint.

Methods

The current Clinical Practice Guidelines of each Australasian domestic jurisdictional ambulance service (JAS) were accessed during June 2020 and updated in August 2021. Content was extracted and verified by 18 paramedics or managers representing all 10 JASs.

Results

All JASs use intramuscular adrenaline as a first-line agent for adult anaphylaxis. Beyond this, significant differences exist in all treatments: five services provide nebulised adrenaline; 10 services provide adrenaline infusions (one requires doctor approval; one provides repeat boluses); six services provide nebulised salbutamol; two services provide salbutamol infusions (one requires doctor approval; one provides repeat boluses); five services provide nebulised ipratropium bromide; eight services provide corticosteroids (two restricted to intensive care paramedics (ICPs)); five services provide antihistamines for non-anaphylactic or post-anaphylactic reactions; four services provide glucagon (one requires doctor approval); magnesium is infused by ICPs in two services; 10 services allow unassisted intubation in anaphylactic arrest; one service allows ICPs to provide sedation-facilitated intubation or ketamine-only breathing intubation; eight services allow rapid sequence induction (two restricted to specialist roles).

Conclusion

The JASs in Australasia have each created unique treatment clinical practice guidelines that are heterogeneous in their treatments and scopes of practice. A review of the evidence underlying each intervention is appropriate to determining best practice.

Keywords:

anaphylaxis; Australasia; emergency medical technician; guideline; paramedic; scope of practice

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Introduction

Australia and New Zealand (Australasia) are serviced by 10 domestic jurisdictional ambulance services (JASs), each of which is sponsored by the corresponding state or territory government of their jurisdiction (in Australia) or their district health boards (in New Zealand). This article forms part of a series providing a comparison of current Australasian paramedic clinical practice guidelines (CPGs) for the treatment of common conditions. A comparison of the different JASs' paramedic CPGs is likely to be of benefit in identifying variations in practice, and consequently highlighting areas for consideration or review by each JAS. Additionally, as a summary of the current scope of practice of the profession in general, a review is likely to be of interest to paramedics not employed by a JAS, other external bodies such as healthcare services and educational institutions.

Methods

The methods are as outlined in the introductory article in this series (1). Clinical practice guidelines were accessed during June 2020, and content extracted by three registered paramedics. A copy of this paper was provided to each service for verification and optional feedback on 30 July 2020. Seven services formally verified the content – in six cases by a manager, and in one case by a paramedic. In addition, four paramedics employed by three of these services also informally verified content. Three services did not have capacity to formally review the paper. For each of these three services, a paramedic employed by the service informally verified content. Cumulatively, 18 paramedics or managers, including employees of all 10 JASs, provided verification of content. The contact was updated in August 2021 before publication.

Results

The overall results of the comparison of current Australasian paramedic clinical practice guidelines for the treatment of common conditions are presented in the introductory article in this series (1). The results of the comparison of CPGs as they specifically relate to adult anaphylaxis are shown in Tables 1 to 10 of this article. Although antihistamines are not directly used for anaphylaxis treatment by any JAS, they have been listed here to capture their use for post-anaphylactic symptoms in some services.

Discussion

All CPGs utilise intramuscular adrenaline as the first-line agent for anaphylaxis, and this forms the centerpiece of treatment in all services – in all guidelines, all other treatments are secondary to intramuscular adrenaline administration. Beyond this, treatments vary significantly between services.

Nebulised adrenaline is authorised for paramedics by five services, restricted to non-anaphylactic reactions in three,

and not authorised in two. Adrenaline infusions are authorised for ICPs by all 10 services, with one service allowing ICP administration only after direct medical approval. One service does not authorise infusions, instead allowing ICPs to deliver repeat boluses intravenously.

Salbutamol by metered dose inhaler is authorised for paramedics in seven services, restricted to a specialist unit in one service, and not carried in two services. Nebulised salbutamol is authorised for paramedics by six services. The remaining four do not provide it for anaphylaxis. Salbutamol infusions are authorised for specialist paramedics by one only after direct medical approval. A second service does not authorise intravenous infusions, but does allow ICPs to deliver repeat boluses intravenously. Ipratropium bromide is authorised for paramedics in five services. The remaining five services do not use it for anaphylaxis.

For patients experiencing anaphylaxis, corticosteroids are authorised for paramedics in six services, for ICPs in two services, and are not available in the remaining two services. Three services have specific warnings stating that steroids have no role in the acute treatment of anaphylaxis. Antihistamines are authorised for paramedics for non-anaphylactic reactions in three services, for post-anaphylactic itch in two services, and is not available in the remaining five services. Three services have specific warnings stating that antihistamines have no role in the acute treatment of anaphylaxis.

Glucagon is authorised for paramedics in three services and authorised for paramedics after medical consultation in one more service. Magnesium is administered via infusion by ICPs in two services. Volume filler solutions are available in all services. Nine use sodium chloride 0.9%, with one service using sodium lactate. The doses and targets vary significantly, with weight-based doses ranging from 20 mL/kg to 60 mL/kg, bolus doses ranging from 250 mL to 1 L, and other services having full clinician discretion with no guide provided.

Endotracheal intubation unassisted (ie. without pharmacological assistance) is available to paramedics in one service and restricted to ICPs in the remaining nine services. Intubation facilitated by sedation or ketamine-only breathing intubation are authorised by one service. Rapid sequence induction or delayed sequence intubation are available to ICPs in six services, restricted to specialist ICPs in two services, and not available in two services.

Limitations

This paper is a descriptive analysis and comparison of a specific and discrete cluster of primary sources. This comparison does not review the peer-reviewed, published literature to determine current best practice in treatment, nor conduct causal comparisons or Grading of Recommendations Assessment, Development and Evaluation (GRADE) analysis. Consequently,

no CPG is inferred to be superior or inferior to any other, nor that the most common treatment is necessarily optimal. It is highly likely that differences between services will always be necessary due to regional variations in geography, demographics, and organisational budgets. The purpose of this review is to make the community aware of differences in the current scope of practice of Australasian paramedics and to present variations between the CPGs of the JASs that may warrant further investigation.

We have attempted to present data accurately by accessing current CPGs and by verifying content with paramedics from each service. However, due to the fluidity of these organisations, changes to the CPGs between data extraction and publication remain possible.

Each CPG is presented in a way that is unique to each JAS, and an experienced paramedic in that service may accurately infer implications from that presentation that an unfamiliar viewer could remain unaware of. We have attempted to correct for this by verifying our interpretation of the CPG with paramedics from each service and providing a copy of the completed paper to each JAS for review prior to submission for publication; however, some mistaken interpretation remains possible. Similarly, common cultural practices in a JAS that are understood but not explicitly stated in the CPG could result in different interpretations between unfamiliar and experienced users of that CPG. Finally, paramedics may not necessarily adhere to their guidelines; actual treatment may vary from that published here.

Conclusion

This article reviews and summarises the existing paramedic management for adult anaphylaxis provided by Australasian JASs. The different JASs in Australasia have each created unique CPGs for the treatment of anaphylaxis in adult patients. Although there is some degree of overlap, there remains significant variations in CPGs between the different JASs for all treatments except intramuscular adrenaline – with conflict regarding the use of anticholinergics, corticosteroids, antihistamines, glucagon, magnesium and endotracheal intubation.

It would be appropriate for further research to be undertaken comparing each of these interventions against best available evidence, and additionally for the guideline development groups of each service to liaise directly to compare the evidence informing their decisions.

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Competing interests

The authors declare no competing interests. Each author of this paper has completed the ICMJE conflict of interest statement.

Reference

1. Wilkinson-Stokes M, Maria S, Colbeck M. A comparison of Australasian jurisdictional ambulance services' clinical practice guidelines series: an introduction. *Australasian Journal of Paramedicine* 2021;18. doi.org/10.33151/ajp.18.914

Table 1. Summary of the scope of practice for Australasian paramedics working in jurisdictional ambulance services

JAS	Year relevant guideline within the 2021 CPGs was last updated	Pharmacology																Intervention		
		Adrenergic						Anticholinergic		Corticosteroid			Antihistamine		Inotrope	Electrolyte	Isotonic, acidic volume filler			
		Adrenaline (intramuscular)	Adrenaline (nebulised)	Adrenaline (infusion)	Salbutamol (MDI)	Salbutamol (nebulised)	Salbutamol (infusion)	Ipratropium Bromide (MDI)	Ipratropium Bromide (nebulised)	Hydrocortisone	Dexamethasone	Prednisolone	Fexofenadine	Loratadine	Glucagon	Magnesium	Sodium chloride 0.9%	Sodium lactate (Ringer's lactate, Hartmann's solution)	Endotracheal intubation (ETT) unassisted	ETT – KOB & IFS
Australian Capital Territory (ACTAS)	2016	✓		ICP	✓			✓								✓		ICP		ICP
New South Wales (NSWA)	2020	✓	✓	ICP	Restricted (1)	✓			✓ (2)			(3)		✓ (4)		✓		ICP		
New Zealand (SJNZ)	2019	✓	(3)	ICP							✓ (5)		✓ (5)			✓		ICP		ICP
New Zealand (WFA)	2019	✓	(3)	ICP							✓ (5)		✓ (5)			✓		ICP		ICP
Northern Territory (SJNT)	2013	✓	(3)	ICP (7)	✓ (8)	(3)		✓		✓						✓		ICP	ICP	ICP
Queensland (QAS)	2021	✓	✓	ICP (9)	✓ (9,10)	✓ (9,10)	Restricted (11,12)		(13)	ICP (9,10)			(5)	✓ (9,14)		✓		ICP		Restricted (15)
South Australia (SAAS)	2020	✓	✓	ICP	✓	✓		✓	✓	ICP		✓	(3)		ICP	✓		ICP		Restricted (16)
Tasmania (AT)	2018	✓	✓	ICP	✓	✓	ICP (7)		✓		ICP			✓ (12)	ICP	✓		ICP		
Victoria (AV)	2020	✓	✓	ICP	✓	✓		(6)	✓		✓				✓	✓		ICP		ICP
Western Australia (SJWA)	2017	✓		ICP (12)	✓	✓										✓		✓		ICP

DSI = Delayed sequence intubation IFS = Intubation facilitated by sedation KOB = Ketamine-only breathing intubation MDI = Metered dose inhaler RSI = Rapid sequence induction

(1) Special Operations Team paramedic only, where nebulised salbutamol is unavailable (2) Only if wheeze persists after administration of salbutamol (3) Indicated for non-anaphylactic reactions or non-life-threatening symptoms (4) In patients on beta blockers who are hypotensive after sodium lactate (5) Indicated for post-anaphylactic itch/rash (6) Not currently carried, however approved for use if available (7) Not a true infusion; repeated intravenous boluses unavailable (8) Introduced during SARS-CoV2 pandemic (9) Indicated for patients refractory to three IM adrenaline injections (10) Indicated for unresolved wheeze (11) Flight Paramedic only (12) Medical consultation required (13) Not listed on the Anaphylaxis CPG; however, indicated on the relevant drug protocol for bronchospasm (14) Indicated for ongoing hypotension / shock (15) ICP - High Acuity Response Unit only (16) ICP – Retrievalist Flight Paramedic only under medical consultation

Table 2. Number of JASs providing each treatment (10 services total)

Treatment	Paramedic	ICP	Restricted	Not used
Adrenaline (intramuscular)	10			
Adrenaline (nebulised)	5			5
Adrenaline (infusion)		10		
Salbutamol (MDI)	7		1	2
Salbutamol (nebulised)	6			4
Salbutamol (infusion)		1	1	8
Ipratropium bromide (MDI)	2			8
Ipratropium bromide (nebulised)	5			5
Corticosteroid	6	2		2
Antihistamine	2			8
Glucagon	4			6
Magnesium		2		8
Endotracheal unassisted	1	9		
Endotracheal facilitated		1		9
Endotracheal RSI		6	2	2

Table 3. Adrenaline for anaphylaxis CPG comparison

Australian Capital Territory (ACTAS)	Intramuscular	500 mcg, repeat PRN, max 1.5 mg
	Nebulised	Not indicated for adults
	Infusion	2 mcg/min, titrated to response
New South Wales (NSWA)	Intramuscular	500 mcg, repeat at 5 minutes, no maximum
	Nebulised	5 mg, repeat at 30 minutes, no maximum
	Infusion	5 mcg/min, titrated to response
New Zealand (SJNZ, WFA)	Intramuscular	500 mcg, repeat at 5 minutes if deteriorating (10 minutes if not improving), no maximum
	Nebulised	Not indicated
	Infusion	8 mcg/min, titrated to response
Northern Territory (SJNT)	Intramuscular	500 mcg, repeat at 5 minutes, no maximum
	Nebulised	5 mg, single dose only
	Intravenous	20-50 mcg, repeat at 1 minute, no maximum
Queensland (QAS)	Intramuscular	500 mcg, repeat at 5 minutes, no maximum
	Nebulised	5 mg, single dose only
	Infusion	20-50 mcg bolus, then 10-50 mcg/min
South Australia (SAAS)	Intramuscular	10 mcg/kg up to 500 mcg, repeat at 5 minutes, no maximum
	Nebulised	5 mg, single dose only
	Infusion	5-20 mcg/min
Tasmania (AT)	Intramuscular	500 mcg, repeat at 5 minutes, no maximum
	Nebulised	5 mg, single dose only
	Infusion	10 mcg/min, titrated to response
Victoria (AV)	Intramuscular	500 mcg, repeat at 5 minutes, no maximum
	Nebulised	5 mg, consult for repeat
	Infusion	10 mcg/min, titrated to response, no maximum
Western Australia (SJWA)	Intramuscular	500 mcg, repeat at 5 minutes, no maximum (300 mcg if pregnant)
	Nebulised	Not indicated
	Infusion	Consultation required

Table 4. Salbutamol for anaphylaxis CPG comparison

Australian Capital Territory (ACTAS)	MDI	1.2 mg, repeat at 20 min, no maximum
	Nebulised	Not carried
	Infusion	Not carried
New South Wales (NSWA)	MDI	1.2 mg, repeat PRN, no maximum
	Nebulised	5 mg, repeat PRN, no maximum
	Infusion	Route not allowed
New Zealand (SJNZ, WFA)	MDI	Not carried
	Nebulised	Not indicated
	Infusion	Route not allowed
Northern Territory (SJNT)	MDI	Introduced for SARS-CoV2, protocol not available
	Nebulised	5 mg, repeat PRN, no maximum
	Infusion	Route not allowed
Queensland (QAS)	MDI	1.2 mg, repeat at 10 min, no maximum
	Nebulised	5 mg, repeat PRN, no maximum
	Infusion	5 mcg/min, increased by 2.5 mcg/min every 3-5 min
South Australia (SAAS)	MDI	1.2 mg, repeat PRN, no maximum
	Nebulised	5-15 mg, repeat PRN, no maximum
	Infusion	Route not allowed
Tasmania (AT)	MDI	600 mcg, repeat at 5 min, no maximum
	Nebulised	10 mg, repeat 5 mg at 5 min, no maximum
	Intravenous	250 mcg, repeat at 15 min, no maximum
Victoria (AV)	MDI	400 mcg - 1.2 mg, repeat at 20 min, no maximum
	Nebulised	5 mg, repeat at 20 min, no maximum
	Infusion	Route not allowed
Western Australia (SJWA)	MDI	400 mcg, repeat at 4 min, no maximum
	Nebulised	5-10 mg, repeat PRN, no maximum
	Infusion	Route not allowed

MDI = metered dose inhaler

Table 5. Ipratropium bromide for anaphylaxis CPG comparison

Australian Capital Territory (ACTAS)	MDI	168 mcg, repeat once at 20 min
	Nebulised	Not carried
Northern Territory (SJNT)	MDI	Not carried
	Nebulised	500 mcg, single dose only
Queensland (QAS)	MDI	Not carried
	Nebulised	500 mcg, repeat at 20 min, maximum 1.5 mg
South Australia (SAAS)	MDI	168 mcg, single dose only
	Nebulised	500 mcg, repeat at 20 min, maximum 1.5 mg
Tasmania (AT)	MDI	168 mcg, repeat at 20 min, maximum 504 mcg
	Nebulised	500 mcg, single dose only
Victoria (AV)	MDI	168 mcg*, single dose only
	Nebulised	500 mcg, single dose only
New South Wales (NSWA) New Zealand (SJNZ, WFA) Western Australia (SJWA)	Not indicated	

MDI = Metered dose inhaler *Not carried, however authorised for use if available

Table 6. Corticosteroids for anaphylaxis CPG comparison

Australian Capital Territory (ACTAS)	Contraindicated: "Antihistamines and steroids have no role in treating anaphylaxis in the pre-hospital setting"	
New South Wales (NSWA)	IV, IM	Hydrocortisone 100 mg single dose only
New Zealand (SJNZ, WFA)	Contraindicated: "Antihistamines and steroids have no role in the acute treatment of anaphylaxis". Note: for prominent rash associated with anaphylaxis, provided all systemic signs of anaphylaxis have resolved, administer prednisolone 40 mg single dose only orally	
Northern Territory (SJNT) Tasmania (AT)	IV, IM	Dexamethasone 8 mg single dose only
Queensland (QAS)	IV, IM	Hydrocortisone 200 mg single dose only
South Australia (SAAS)	IV, IM	Hydrocortisone 250 mg single dose only
	Oral	Prednisolone 50 mg single dose only
Victoria (AV)	IV per oral	Dexamethasone 8 mg single dose only
Western Australia (SJWA)	Not indicated	

IV = intravenous, IM = intramuscular

Table 7. Antihistamines for anaphylaxis CPG comparison

Australian Capital Territory (ACTAS)	Contraindicated: "Antihistamines and steroids have no role in treating anaphylaxis in the pre-hospital setting"
New South Wales (NSWA)	Not indicated. For non-anaphylactic localised reactions, administer fexofenadine 180 mg single dose only orally
New Zealand (SJNZ, WFA)	Contraindicated: "Antihistamines and steroids have no role in the acute treatment of anaphylaxis". Note: for prominent itch associated with anaphylaxis, provided all systemic signs of anaphylaxis have resolved, administer loratadine 10 mg single dose only orally
Queensland (QAS)	Not indicated. Note: for non-anaphylactic urticaria, administer loratadine 10 mg single dose only orally
South Australia (SAAS)	Not indicated. For mild/moderate non-anaphylactic allergy only, administer fexofenadine 180 mg single dose only orally
Tasmania (AT) Victoria (AV) Northern Territory (SJNT) Western Australia (SJWA)	Not carried

Table 8. Glucagon for anaphylaxis comparison

New South Wales (NSWA)	IV	2 mg, single dose only
Queensland (QAS)	IV, IM	1 mg, single dose only
Tasmania (AT)	IV, IM	1-2 mg, single dose only
Victoria (AV)	IV, IM	1 mg, repeat once at 5 minutes
Tasmania (ACTAS) New Zealand (SJNZ, WFA) Northern Territory (SJNT) South Australia (SAA) Western Australia (SJWA)	Not indicated	

IV = intravenous, IM = intramuscular

Table 9. Magnesium for anaphylaxis comparison

South Australia (SAAS) Tasmania (AT)	Infusion	2.47 g, single dose only
Australian Capital Territory (ACTAS) New South Wales (NSWA) New Zealand (SJNZ, WFA) Northern Territory (SJNT) Queensland (QAS) Victoria (AV) Western Australia (SJWA)	Not indicated	

Table 10. Fluid administration for anaphylaxis comparison

Australian Capital Territory (ACTAS)	IV	250-500 mL, repeat PRN
New South Wales (NSWA)*	IV	20 mL/kg, repeat PRN, target SBP >90 mmHg
New Zealand (SJNZ, WFA)	IV	1 L, repeat PRN, no maximum
Northern Territory (SJNT)	IV	250-500 mL, repeat PRN, maximum 40 mL/kg
Queensland (QAS)	IV	PRN, no maximum
South Australia (SAAS)	IV	10 mL/kg, reassessed every 250 mL, repeat PRN, maximum 30 mL/kg (consult for further)
Tasmania (AT)	IV	20 mL/kg, repeat PRN, maximum 50 mL/kg
Victoria (AV)	IV	40 mL/kg, consult for further. If consult unavailable, 20 mL/kg
Western Australia (SJWA)	IV	250 mL, repeat PRN, maximum 2 L (small, elderly maximum 1 L)

*NSWA use sodium lactate, other services use sodium chloride IV = intravenous