

Appendix

This appendix was part of the submitted manuscript and has been peer reviewed. It is posted as supplied by the authors. Gelbart B, Schlapbach L, Ganeshalingham A, Ganu S, Erickson S, Oberender F, Hoq M, Williams G, George S, Festa M; on behalf of the Paediatric Study Group of the Australian and New Zealand Intensive Care Society. Fluid bolus therapy in critically ill children: a survey of practice among paediatric intensive care doctors in Australia and New Zealand. Crit Care Resusc 2018; 20: 00-000.

Section 1

Fluid Bolus Therapy in Children

Dear Colleagues,

On behalf of the ANZICS – Paediatric Study Group I invite you to participate in a survey on fluid bolus therapy (FBT). The aim is to try and understand what constitutes a fluid bolus, how do you assess the response and what response you expect.

FBT can be defined as a volume of fluid administered rapidly for the purposes of improving the circulation. As intensive care doctors you prescribe and administer this therapy frequently and have experience in assessing its impact. This is a short voluntary practice survey of FBT in the paediatric intensive care unit. It should take 10-12 minutes to complete.

The survey is in several parts. The first asks you about your current role and years of experience. The second asks you to identify the fluids, volume and rate of administration that constitutes fluid bolus therapy in your own current practice. The third asks you how you measure responses and identify the minimum change in specific haemodynamic and biochemical variables that you believe constitutes a response to FBT. Lastly some specific common scenarios will be presented. These questions should be completed as if the decision has been made to give the bolus already.

This project has been approved by the Royal Children's Hospital Human Research Ethics Committee (Approval No. 35267A). Your participation is voluntary and your responses will remain anonymous and accessible only by the primary investigator. Only aggregated findings will be published or presented in peer-reviewed critical care journals.

This area is a topical area of research in both paediatric and adult intensive care. Your responses will greatly enhance our understanding of current practice. If you have any questions you can contact me directly by phone or email.

Thanks again for participating

Ben Gelbart and Marino Festa

* 1. Please indicate your current qualification. Only chose 1.

- 1. Post FCICM Paediatric
- 2. Post FCICM Adult
- 3. FCICM trainee Choose this if you are a dual FCICM trainee
- 4. FRACP trainee
- 5. FANZCA trainee
- 6. FACEM trainee
- 7. Non Australian or New Zealand trainee

* 2. Your job title is

- 1. Consultant
- 2. Fellow
- 3. Registrar
- 4. Resident

* 3. Which one of the following describes your workplace

- 1. PICU
- 2. Predominantly Adult intensive care unit

* 4. Please indicate the years of paediatric ICU experience you have

- 1. <2 years
- 2. 2-5 years
- 3. 6-10 years
- 4. 11-20 years
- 5. greater than 20

* 5. Please rate how often you use these fluid types for fluid bolus (FB) resuscitation.

1 = never

2 = uncommonly (less than 30% of the time)

3 = sometimes (30-60% of the time)

4 = frequently (60-90% of the time)

5 = almost always (greater than 90% of the time)

CSL = Compound Sodium Lactate RL = Ringer's Lactate

	Never	Uncommonly	Sometimes	Frequently	Almost Always
Normal saline 0.9%	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plasmalyte	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hypertonic Saline 3%	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hartmann's Solution, CSL or RL	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4% Albumin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20% Albumin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dextran	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gelofusine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hydroxyethyl Starch	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 9. How do you rate the utility of changes in the following individual biochemical markers in assessing response to a fluid bolus?

1 = very poor

2 = poor

3 = acceptable

4 = good

5 = very good

6 = no experience with this parameter

	very poor	poor	acceptable	good	very good	no experience with this
Serum lactate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serum creatinine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Central venous saturations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Base excess	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 10. Please identify the minimum change in specific haemodynamic variables that you believe constitutes a response to fluid bolus therapy.

Consider the following scenario

A 3-year-old 15kg child is admitted to the PICU with presumed septic shock. He has had a total of 30ml/kg of 0.9% saline as a fluid bolus in the emergency department. He has some ongoing signs of shock and you wish to prescribe a fluid bolus. He has tachycardia with a heart rate of 160 bpm and a mean blood pressure of 48mmHg. He has passed 6ml of urine in the last hour. You decide to prescribe a fluid bolus.

What would constitute a clinically significant response for heart rate?

- A decrease in heart rate of 1-5%
- A decrease in heart rate of 6-10%
- A decrease in heart rate of 11-15%
- A decrease in heart rate of >15%
- I don't expect a change in this parameter

* 11. What would constitute a clinically significant response for blood pressure?

- An increase in mean arterial pressure of 1 to 5 %
- An increase in mean arterial pressure of 6 to 10 %
- An increase in mean arterial pressure of 11 to 15 %
- An increase in mean arterial pressure of >15 %
- I don't expect a change in this parameter

* 12. What would constitute a clinically significant response for urine output?

- Increase in urinary output of 0.5ml/kg/hour in the next hour
- Increase in urinary output of 0.6-1.0 mL/kg/hour in the next hour
- Increase in urinary output of >1.0 mL/kg/hour in the next hour
- I don't expect a change in this parameter

* 13. At 6 hours he is ventilated and a central venous line is placed in his right internal jugular vein. His ventilator pressures are a peak inspiratory pressure of 20cmH₂O and an end expiratory pressure of 5cm H₂O at a rate of 20 breaths per minute. His central venous pressure is 4 cmH₂O
What would constitute a clinically significant response for central venous pressure?

- An increase in CVP of 1mmHg
- An increase in CVP of 2 to 3mmHg
- An increase in CVP of 4 to 5mmHg
- An increase greater than 5mmHg
- I don't expect a change in this parameter

* 14. His central venous oxygen saturation (ScvO₂) is 55%.

What would constitute a clinically significant response for central venous oxygen saturation?

- An absolute increase in ScvO₂ of 0 to 2%
- An absolute increase in ScvO₂ of 3 to 5%
- An absolute increase in ScvO₂ of 6 to 8%
- An absolute increase in ScvO₂ of >8%
- I don't expect a change in this parameter

* 15. His first lactate is 4mmol/L.

What would constitute a clinically significant response for change in lactate?

- A decrease in blood lactate of 0 to 0.5 mmol/L
- A decrease in blood lactate of 0.6 to 1.0 mmol/L
- A decrease in blood lactate of 1.1 to 1.5 mmol/L
- A decrease in blood lactate of >1.5 mmol/L
- I don't expect a change in this parameter

* 20. SCENARIO 5. A 1- year-old child is admitted to hospital, is ventilated with acute lung injury and is hypotensive. You assess the child and decide to prescribe a fluid bolus. In this setting you preferentially prescribe:

PLEASE TICK 1 BOX ONLY FOR FLUID TYPE AND 1 BOX ONLY FOR VOLUME (MLS/KG)

	<5ml/kg	5ml/kg	10ml/kg	15ml/kg	20ml/kg	Other
Normal saline 0.9%	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plasmalyte	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hypertonic Saline 3%	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hartmann's Solution, CSL or RL	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4% Albumin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20% Albumin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dextran	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gelofusine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hydroxyethyl Starch	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
No preference	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't look after this group of patients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 21. In children with septic shock unresponsive to fluid bolus therapy, after what volume of initial fluid bolus resuscitation do you commence inotropic or vasoactive medication?

- 1. <20ml/kg
- 2. 21-40ml/kg
- 3. 41-60 ml/kg
- 4. > 60ml/kg
- 5. None of the above

* 22. Are you aware of the Mortality after Fluid Bolus in African Children with Severe Infection study (The FEAST study)?

- Yes
- No

* 23. Has this study changed the way you prescribe fluid boluses in sepsis?

- Yes
- No

Section 2

Table. Clinical scenarios

Scenario	Vignette
1	A 1-year-old has returned to the PICU 1 hour ago following repair of a large ventricular septal defect (VSD) and is hypotensive. (modified ultrafiltrate blood is not available and he is not bleeding significantly)
2	A previously well 1-year old child with community acquired sepsis is admitted to the PICU and is hypotensive
3	A 1-year-old child is admitted to hospital following a motor vehicle accident with suspected traumatic brain injury (TBI) and is hypotensive. His examination does not reveal any bleeding
4	A 1- year-old child is admitted to hospital following a motor vehicle accident with blunt abdominal trauma and is hypotensive. His examination does not reveal active bleeding
5	A 1- year-old child is admitted to hospital, is ventilated with acute lung injury and is hypotensive

Section 3

Table. Demographic characteristics of participants

	n = 106
Role n (%)	
Consultant	49(46)
Fellow	11(10)
Registrar	46(43)
Qualification n (%)	
FCICM paediatric	45(42)
FCICM adult	7(8)
CICM trainee	14(15)
RACP trainee	14(15)
ANZCA trainee	1(1)
ACEM trainee	5(5)
Non ANZ trainee	17(16)
Years of experience n (%)	
<2	32(30)
2-5	17(16)
6-10	22(20)
11-20	20(18)
>20	15(14)
Practice location n (%)	
PICU	101(95)
Predominant adult ICU	5(5)

FCICM Fellow of the college of Intensive Care Medicine, CICM College of Intensive Care Medicine, RACP Royal Australian College of Physicians, ANZCA Australian and New Zealand Intensive Care College of Anaesthesia, ACEM Australasian College of Emergency Medicine

Section 4

Preferred fluid composition for FBT for specific pathophysiological conditions

Clinical Scenario	Total	0.9% Saline n(%)	4% Albumin n(%)	Absolute Difference (95% CI)	P value
Post-operative cardiac surgery (VSD* repair)	98	35 (36)	63 (64)	32% (19%, 45%)	<0.001
Septic shock	95	68 (71)	27 (29)	42% (29%, 55%)	<0.001
Traumatic Brain injury	95	91 (96)	4 (4)	92% (86%, 97%)	<0.001
Blunt Abdominal Trauma	95	85 (89)	10 (11)	78% (70%, 88%)	<0.001
Acute Lung Injury	96	72 (75)	24 (25)	50% (38%, 62%)	<0.001

*VSD Ventricular Septal Defect