National Clinical Guideline Centre

IV fluids in children

Intravenous fluid therapy in children and young people in hospital

Appendix J

December 2015

Commissioned by the National Institute for Health and Care Excellence











Disclaimer

Healthcare professionals are expected to take NICE clinical guidelines fully into account when exercising their clinical judgement. However, the guidance does not override the responsibility of healthcare professionals to make decisions appropriate to the circumstances of each patient, in consultation with the patient and/or their guardian or carer.

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Funding

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None

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None

J.1.2.2 Point-of-care versus laboratory testing

Figure 1: Mortality: Point of care versus laboratory testing

	Point of	Care	Labora	tory		Risk Ratio			Risk	Ratio		
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% CI	<u> </u>		M-H, Fix	ed, 95% CI		
Singer 2014	5	80	16	80	100.0%	0.31 [0.12, 0.81]	_					
Total (95% CI)		80		80	100.0%	0.31 [0.12, 0.81]	_					
Total events	5		16									
Heterogeneity: Not ap	plicable						0.1	0.2	0.5	1 2		10
Test for overall effect:	Z = 2.39 (F	P = 0.02					0.1			Favours Lab	oratory	10

J.1.2.3 Assessing dehydration and hypovolaemia

J.2 IV fluid therapy for fluid resuscitation

J.2.1 Fluid type for fluid resuscitation

J.2.1.1 Sepsis

J.2.1.1.1 Colloids versus crystalloids

J.2.1.1.1.1 Dextran 6% versus Ringer's lactate solution

Figure 2: Mortality: Dengue shock syndrome patients

	Dextran	6%	Ringer's la	actate		Peto Odds Ratio		Peto Oc	lds Ratio	
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% Cl	l	Peto, Fix	ed, 95% CI	
Dung, 1999	0	12	0	13		Not estimable				
Ngo, 2001	0	55	0	55		Not estimable				
Wills, 2005	0	126	0	128		Not estimable				
Total (95% CI)		193		196		Not estimable				
Total events	0		0							
Heterogeneity: Not ap	plicable						0.01	0.1	+ +	100
Test for overall effect:	Not applica	able					0.01 Fav	0.1 ours Dextran 6%	1 10 Favours Ringe	100 er's lactate

Figure 3: Decrease in pulse at 1 or 2 hours (beats per minute): Dengue shock syndrome patients

	D	extran		Ringe	er's lact	tate		Mean Difference	Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% C	IV, Fixed, 95% CI
Ngo, 2001	14.9	9.9	55	13.2	9.2	13	80.6%	1.70 [-3.94, 7.34]	
Dung, 1999	20.4	16.59	12	11.7	12.21	13	19.4%	8.70 [-2.80, 20.20]	 •
Total (95% CI)			67			26	100.0%	3.06 [-2.01, 8.13]	•
Heterogeneity: Chi ² = Test for overall effect:		,	, ,	I ² = 13%	6				Favours Ringer's lactate Favours dextran 6%

J.2.1.1.1.2 Gelatin versus 0.9% sodium chloride

Figure 4: Mortality: Sepsis patients

	Gelat	in	0.9% sodium c	hloride		Risk Ratio	Risk Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% C	CI M-H, Fixed, 95% CI
Upadhyay, 2005	9	29	9	31	100.0%	1.07 [0.49, 2.32]	-
Total (95% CI)		29		31	100.0%	1.07 [0.49, 2.32]	•
Total events	9		9				
Heterogeneity: Not ap Test for overall effect:	•	P = 0.8	7)				0.01 0.1 1 10 100 Favours gelatin Favours 0.9% sodium

Figure 5: Haemodynamically stable at 6 hours: Sepsis patients

	Gelati	in	0.9% sodium c	hloride		Risk Ratio			Risk Ratio		
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% C	I	M-H	Fixed, 95	% CI	
Upadhyay, 2005	19	29	22	30	100.0%	0.89 [0.64, 1.26]					
Total (95% CI)		29		30	100.0%	0.89 [0.64, 1.26]			•		
Total events	19		22								
Heterogeneity: Not app	plicable						0.01	0.1	+	10	100
Test for overall effect:	Z = 0.65 (F	= 0.5	2)			Eove		/ codium of	olor Foyo	ura galatin	

Figure 6: Haemodynamically stable at 12 hours: Sepsis patients

	Gelat	in	0.9% sodium o	chloride		Risk Ratio	Ris	sk Ratio	
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% CI	M-H, F	ixed, 95% CI	
Upadhyay, 2005	21	26	23	29	100.0%	1.02 [0.78, 1.33]			
Total (95% CI)		26		29	100.0%	1.02 [0.78, 1.33]		♦	
Total events	21		23						
Heterogeneity: Not ap Test for overall effect:		o = 0.8	9)			Favo	0.01 0.1 urs 0.9% sodium chlo	1 10 r Favours gelatin	100

Figure 7: Mortality: Dengue shock syndrome patients

	Gelat	in	0.9% sodium o	chloride		Peto Odds Ratio		Pete	o Odds I	Ratio	
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% Cl		Peto,	Fixed, 9	95% CI	
Dung, 1999	0	13	0	12		Not estimable					
Ngo, 2001	0	56	0	56		Not estimable					
Total (95% CI)		69		68		Not estimable					
Total events	0		0								
Heterogeneity: Not app	plicable						0.01	0.1	+	10	100
Test for overall effect:	Not applic	able						avours Gel	atin Fa	vours Sodiu	

Figure 8: Decrease in pulse at 1 or 2 hours (beats per minute): Dengue shock syndrome patients

	(Gelatin		0.9% so	dium chl	oride		Mean Difference		Mean Diff	ference	
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% C	I	IV, Fixed,	, 95% CI	
Dung, 1999	11.6	18.48	13	12.3	19.26	12	6.1%	-0.70 [-15.52, 14.12]			_	
Ngo, 2001	18.5	11.3	56	13.5	8.9	56	93.9%	5.00 [1.23, 8.77]				
Total (95% CI)			69			68	100.0%	4.65 [1.00, 8.31]		(•	
Heterogeneity: Chi ² = Test for overall effect:	,	,	,,	² = 0%				Favo	-100 -50 ours 0.9% sodiu	um chlor	50 Favours gelati	100

J.2.1.1.1.3 Dextran versus 0.9% sodium chloride

Figure 9: Mortality: Dengue shock syndrome patients

	Dextrar	ı 6%	0.9% sodiun	n chlor		Peto Odds Ratio		Peto Oc	lds Ratio	
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% CI		Peto, Fix	ed, 95% CI	
Dung, 1999	0	12	0	12		Not estimable				
Ngo, 2001	0	55	0	56		Not estimable				
Total (95% CI)		67		68		Not estimable				
Total events	0		0							
Heterogeneity: Not ap	plicable						0.01	0.1	1 10	100
Test for overall effect:	Not applica	able					0.01	Favours dextran		

Figure 10: Decrease in pulse rate at 2 hours (beats per minute): Dengue shock syndrome patients

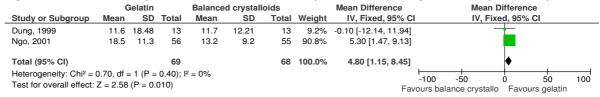
	De	xtran 6	%	0.9% so	dium chlo	oride		Mean Difference	Mean	Differen	ce	
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% CI	IV, Fi	xed, 95%	CI	
Dung, 1999	20.4	16.59	12	12.3	19.26	12	5.6%	8.10 [-6.28, 22.48]		_		
Ngo, 2001	14.9	9.9	55	13.5	8.9	56	94.4%	1.40 [-2.10, 4.90]				
Total (95% CI)			67			68	100.0%	1.78 [-1.63, 5.18]		•		
Heterogeneity: Chi ² = Test for overall effect:	,	,	, ,	2 = 0%				Favo	-100 -50 ours 0.9% sodium chlo	0 or Favo	50 urs dextran	100

J.2.1.1.1.4 Gelatin versus Ringer's lactate solution (balanced crystalloids)

Figure 11: Mortality: Dengue shock syndrome patients

	Gelat	in	Balanced crys	stalloids		Peto Odds Ratio		Peto Od	lds Ratio		
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% CI		Peto, Fix	ed, 95% CI		
Dung, 1999	0	13	0	13		Not estimable					
Ngo, 2001	0	56	0	55		Not estimable					
Total (95% CI)		69		68		Not estimable					
Total events	0		0								
Heterogeneity: Not app	olicable						0.01	0.1		0	100
Test for overall effect:	Not applic	able					0.01	Favours gelatin	Favours b	-	

Figure 12: Decrease in pulse at 1 or 2 hours (beats per minute): Dengue shock syndrome patients



J.2.1.1.1.5 Dextran versus gelatin – sepsis patients

Figure 13: Mortality

	Dextra	an	Gelat	in		Risk Ratio		Risk	Ratio		
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% CI	I.	/I-H, Fixe	ed, 95% CI		
Dung 1999	0	12	0	13		Not estimable					
Ngo 2001	0	53	0	56		Not estimable					
Total (95% CI)		65		69		Not estimable					
Total events	0		0								
Heterogeneity: Not app	olicable					<u> </u>	1 00	+!	<u> </u>	<u> </u>	
Test for overall effect:	Not applic	able				0.	-	0.5 1 Dextran	Favours Ge	latin	10

Figure 14: Cardiovascular compromise (change in heart rate)

	D	extran		(Gelatin			Mean Difference		Mean Difference			
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% CI		IV, Fixe	d, 95% CI		
Dung 1999	20.4	16.59	12	11.6	18.46	13	4.8%	8.80 [-4.94, 22.54]	_	-			
Ngo 2001	11.5	3.3	53	18.3	11.3	56	95.2%	-6.80 [-9.89, -3.71]					
Total (95% CI)			65			69	100.0%	-6.05 [-9.06, -3.03]					
Heterogeneity: Chi ² = Test for overall effect:	,	,	,,	I ² = 79%	6				-10	-5 vours Gelatin	0 Favours	- I 5 Dextran	10

J.2.1.1.2 Colloids versus albumin

J.2.1.1.2.1 Colloids versus albumin – sepsis patients

Figure 15: Mortality

0	•						
	Collo	id	Albumin			Risk Ratio	Risk Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% Cl	M-H, Fixed, 95% CI
Akech 2006	7	44	1	44	100.0%	7.00 [0.90, 54.55]	—
Total (95% CI)		44		44	100.0%	7.00 [0.90, 54.55]	
Total events	7		1				
Heterogeneity: Not appress for overall effect:		P = 0.0	6)				0.1 0.2 0.5 1 2 5 10 Favours Colloid Favours Albumin

Figure 16: Neurological compromise

	Collo	id	Albumin Peto Odds Ratio Peto Odds Ratio						ds Ratio	
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% CI		Peto, Fixe	ed, 95% CI	
Akech 2006	1	44	3	37	100.0%	0.29 [0.04, 2.18]				
Total (95% CI)		44		37	100.0%	0.29 [0.04, 2.18]				
Total events	1		3							
Heterogeneity: Not app Test for overall effect:		P = 0.2	3)				0.01	0.1 Favours Colloid	1 10 Favours Albur	100

J.2.1.1.3 Albumin versus crystalloids

J.2.1.1.3.1 Albumin versus 0.9% sodium chloride (crystalloids)

Figure 17: Mortality at 28 days

	Albumin	0.9% sodium chloride			Risk Ratio	Risk Ratio
Study or Subgroup	Events To	tal Events	Total	Weight	M-H, Fixed, 95% CI	M-H, Fixed, 95% CI
Maitland, 2011	137 10	63 135	1063	100.0%	1.01 [0.81, 1.27]	•
Total (95% CI)	10	63	1063	100.0%	1.01 [0.81, 1.27]	♦
Total events	137	135				
Heterogeneity: Not ap Test for overall effect:	•	0.90)				0.01 0.1 1 10 100 Favours albumin Favours 0.9% sodium

Figure 18: Mortality at 8 hours

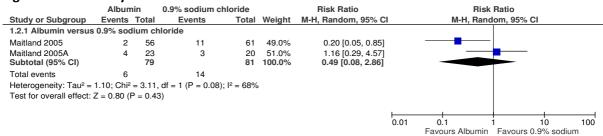


Figure 19: Pulmonary oedema

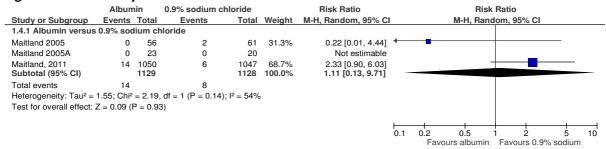


Figure 20: Neurological deterioration

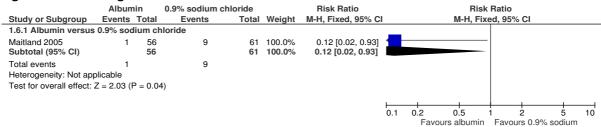


Figure 21: Neurological sequelae

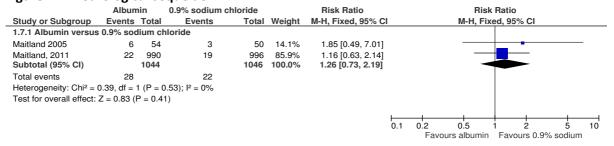
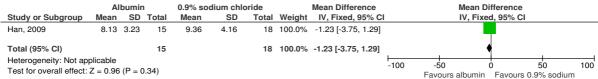


Figure 22: Length of hospital stay



J.2.1.1.3.2 Ringer's lactate solution versus hypertonic sodium chloride

Figure 23: Mortality (death at 3-15 days)

	Ringer's La	ctate	Hypertonic S	Saline		Risk Ratio			Risk	Ratio			
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI			M-H, Rand	dom, 95% C	1		
Belba 2009	5	55	5	55	63.0%	1.00 [0.31, 3.26]		_		-			
Bowser 1986	3	19	0	19	10.5%	7.00 [0.39, 126.92]							\longrightarrow
Caldwell 1979	1	17	2	20	16.5%	0.59 [0.06, 5.94]	\leftarrow					_	
Simma 1998	2	17	0	15	10.0%	4.44 [0.23, 85.83]					-		→
Total (95% CI)		108		109	100.0%	1.31 [0.51, 3.34]							
Total events	11		7										
Heterogeneity: Tau2 =	0.00 ; $Chi^2 = 2$.70, df =	3 (P = 0.44); I	$^{2} = 0\%$			-			! :		<u>+</u>	
Test for overall effect:	Z = 0.56 (P =	0.58)	, , , , ,				0.1	0.2 Favours F	0.5 ingers Lactate	Favours H	ypertonic S	5 Saline	10

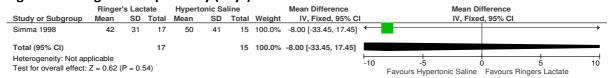
Figure 24: Cardiovascular compromise (incidence of ARDS)

	Ringer's La	actate	Hypertonic	Saline		Peto Odds Ratio			Peto Od	lds Ratio			
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% CI			Peto, Fix	ed, 95% C	I		
Simma 1998	4	17	0	15	100.0%	8.04 [1.02, 63.46]							+
Total (95% CI)		17		15	100.0%	8.04 [1.02, 63.46]							
Total events	4		0										
Heterogeneity: Not ap							0.1	0.2	0.5	1 2	<u> </u>		10
Test for overall effect:	Z = 1.98 (P =	0.05)					0.1		Ringer's Lactate	Favours I	- Hypertonic Sa	aline	10

Figure 25: Cardiovascular compromise (arrhythmia)

	Ringer's La	actate	Hypertonic	Saline		Peto Odds Ratio			Peto Oc	lds Ratio			
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% CI			Peto, Fix	ed, 95% CI			
Simma 1998	3	17	0	15	100.0%	7.48 [0.72, 78.00]							\rightarrow
Total (95% CI)		17		15	100.0%	7.48 [0.72, 78.00]							
Total events	3		0										
Heterogeneity: Not ap Test for overall effect:		0.09)					0.1	0.2 Favours F	0.5 Ringer's Lactate	1 2 Favours H	lypertonic Sa	l 5 aline	10

Figure 26: Length of hospital stay (days)



J.2.2 Volume and rate of administration for fluid resuscitation

J.3 IV fluid therapy for routine maintenance

J.3.1 Fluid type for routine maintenance

J.3.1.1 Additional glucose

Figure 27: Ringer's lactate solution versus Ringer's lactate solution + 5% dextrose: Neurological sequelae

	Lactated Rin	nger's	LR + 5% de	xtrose		Risk Ratio	Risk Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% CI	I M-H, Fixed, 95% CI
Nicholson, 1992	1	19	3	17	100.0%	0.30 [0.03, 2.60]	
Total (95% CI)		19		17	100.0%	0.30 [0.03, 2.60]	
Total events Heterogeneity: Not ap	1 plicable		3				
Test for overall effect:	•	0.27)					0.01 0.1 1 10 100 Favours Lactated Ringer's Favours LR + 5% dextrose

Figure 28: 0.9% sodium chloride versus Ringer's lactate solution + 5% dextrose: Mortality

	0.9% sa	line	LR + 5% de:	xtrose				Peto Odds Ratio			
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% CI		Peto, Fix	red, 95% CI		
Bell, 1993	0	16	1	17	100.0%	0.14 [0.00, 7.25]	←		_		
Total (95% CI)		16		17	100.0%	0.14 [0.00, 7.25]					
Total events	0		1								
Heterogeneity: Not ap Test for overall effect:		P = 0.33	3)				0.01	0.1 Favours 0.9% saline	•	10 5% dext	100 rose

Figure 29: 0.9% sodium chloride versus Ringer's lactate solution + 5% dextrose: Cardiorespiratory



Figure 30: 0.9% sodium chloride versus Ringer's lactate solution + 5% dextrose: Mean days in ICU

	0.99	% salir	ne	LR + 5	% dexti	ose		Mean Difference		Mean I	Difference		
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% CI		IV, Fix	ed, 95% CI		
Bell, 1993	3.06	1.95	16	6.31	6.55	17	100.0%	-3.25 [-6.51, 0.01]					
Total (95% CI)			16			17	100.0%	-3.25 [-6.51, 0.01]			•		
Heterogeneity: Not ap Test for overall effect:	•	(P = 0	0.05)						-100	-50 Favours 0.9% saline	0 Favours LI	50 R + 5% dexti	100 rose

Figure 31: 0.9% sodium chloride versus Ringer's lactate solution + 5% dextrose: Mean days to discharge in hospital

	0.9%	0.9% saline LR + 5% dextrose				ose		Mean Difference		Mean Difference			
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% CI		I	V, Fixed, 959	6 CI	
Bell, 1993	7.6	2.1	16	11.7	2.93	17	100.0%	-4.10 [-5.83, -2.37]					
Total (95% CI)			16			17	100.0%	-4.10 [-5.83, -2.37]			•		
Heterogeneity: Not ap Test for overall effect:		(P <	0.00001	1)					-100	-50 Favours 0.9%	0 saline Favo	50 ours LR+ 5% c	100 dextrose

Figure 32: 0.9% sodium chloride versus Ringer's lactate solution + 5% dextrose: Hypoglycaemia

	0.9% sa	line	LR + 5% dex	xtrose		Peto Odds Ratio		Peto Oc	lds Ratio		
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% CI		Peto, Fix	ed, 95% CI		
Bell, 1993	0	16	0	17		Not estimable					
Total (95% CI)		16		17		Not estimable					
Total events	0		0								
Heterogeneity: Not app Test for overall effect:		able					0.01	0.1 Favours 0.9% sodium	1 Favours I F	10 R+5% dextros	100

J.3.1.2 Isotonic versus hypotonic solution for routine maintenance in children aged 48 hours to 28 days

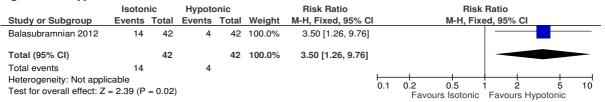
Figure 33: Hyponatraemia

Study or Subgroup Even Balasubramnian 2012 Total (95% CI)	ts Tota 3 4	I Events	Total	Weight	M-H. Fixed, 95% CI					
	3 4			110.9	W-n, rixea, 95% Ci		M-H, Fix	ed, 95%	CI	
Total (95% CI)		2 18	42	100.0%	0.17 [0.05, 0.52]	←				
	4	2	42	100.0%	0.17 [0.05, 0.52]					
Total events	3	18								
Heterogeneity: Not applicable Test for overall effect: Z = 3.07	(D. 0.0	02)				0.1	.2 0.5 Favours Isotonic	1 2	5 s Hypotonic	10

Figure 34: Severe hyponatraemia

	Isotor	nic	Hypoto	onic		Peto Odds Ratio		Peto Od	lds Ratio	
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% CI		Peto, Fix	ed, 95% CI	
Balasubramnian 2012	0	42	2	42	100.0%	0.13 [0.01, 2.15]	←			→
Total (95% CI)		42		42	100.0%	0.13 [0.01, 2.15]				
Total events	0		2						_	
Heterogeneity: Not appl Test for overall effect: Z		= 0.15))				0.5	0.7 Favours Isotonic	1 1.5	2

Figure 35: Hypernatraemia



J.3.1.3 Isotonic versus hypotonic solution for routine maintenance in children aged 28 days to 16 years

Figure 36: Mortality

0	•												
	Isotor	nic	Hypoto	onic		Peto Odds Ratio			Peto C	Odds Rati	О		
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% CI			Peto, Fi	ixed, 95%	CI		
Kannan 2010	1	58	0	56	100.0%	7.14 [0.14, 359.98]							\rightarrow
Total (95% CI)		58		56	100.0%	7.14 [0.14, 359.98]							
Total events	1		0										
Heterogeneity: Not approximately Test for overall effect:		P = 0.3	3)				0.1	0.2 Favou	0.5 irs Isotonio	1 :	l 2 rs Hypoto	5 onic	10

Figure 37: Hyponatraemia

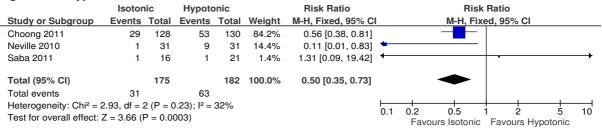


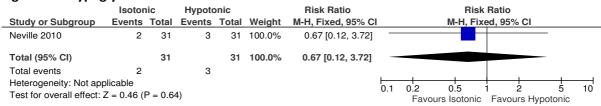
Figure 38: Severe hyponatraemia

	Isotor	nic	Hypoto	onic		Peto Odds Ratio	Peto Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% CI	Peto, Fixed, 95% CI
Choong 2011	1	128	8	130	51.1%	0.20 [0.05, 0.77]	
Kannan 2010	1	58	8	56	48.9%	0.18 [0.05, 0.70]	←
Neville 2010	0	31	0	31		Not estimable	
Saba 2011	0	16	0	21		Not estimable	
Total (95% CI)		233		238	100.0%	0.19 [0.07, 0.50]	
Total events	2		16				
Heterogeneity: Chi2 = 0	0.02, df =	1 (P = 0	0.90); I ² =	0%			0.1 0.2 0.5 1 2 5 10
Test for overall effect:	Z = 3.41 (I	P = 0.00	007)				0.1 0.2 0.5 1 2 5 10 Favours Isotonic Favours Hypotonic

Figure 39: Hypernatraemia

	Isotor	ic	Hypoto	onic		Risk Ratio	Risk Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% C	I M-H, Fixed, 95% CI
Choong 2011	4	128	5	130	62.5%	0.81 [0.22, 2.96]	
Kannan 2010	2	58	2	56	25.7%	0.97 [0.14, 6.62]	
Neville 2010	1	31	0	31	6.3%	3.00 [0.13, 70.92]	-
Saba 2011	1	16	0	21	5.5%	3.88 [0.17, 89.46]	-
Total (95% CI)		233		238	100.0%	1.16 [0.46, 2.93]	
Total events	8		7				
Heterogeneity: Chi ² =	1.24, df = 3	3(P = 0)).74); I ² =	0%			
Test for overall effect:	Z = 0.31 (I	P = 0.70	6)				0.01 0.1 1 10 100 Favours Isotonic Favours Hypotonic

Figure 40: Hypoglycaemia



J.3.1.4 Isotonic versus hypotonic solution for routine maintenance in children within a specialist unit

Figure 41: Mortality

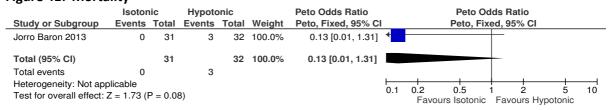


Figure 42: Length of PICU stay

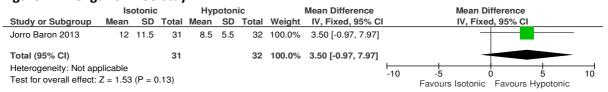


Figure 43: Hyponatraemia

	Isotor	nic	Hypote	onic		Risk Ratio			R	isk Ra	ıtio		
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% CI			M-H, I	Fixed.	95% CI	<u> </u>	
Coulthard 2012	0	39	7	40	29.7%	0.07 [0.00, 1.16]	←			+			
Jorro Baron 2013	4	31	5	32	19.8%	0.83 [0.24, 2.79]				-		_	
Montanana 2008	3	59	13	63	50.5%	0.25 [0.07, 0.82]	←			-			
Total (95% CI)		129		135	100.0%	0.31 [0.14, 0.67]							
Total events	7		25										
Heterogeneity: Chi2 =	3.74, df =	2 (P = 0	0.15); I ² =	46%				0.2		+		<u></u>	10
Test for overall effect:	Z = 2.96 (P = 0.0	03)				0.1		0.5 ırs Isotor	nic F	avours l	5 Hypotonic	

Figure 44: Severe hyponatraemia

	Isotor	nic	Hypoto	onic		Peto Odds Ratio	Peto Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% CI	Peto, Fixed, 95% CI
Coulthard 2012	0	39	1	40	20.2%	0.14 [0.00, 7.00]	-
Jorro Baron 2013	0	31	1	32	20.2%	0.14 [0.00, 7.04]	•
Montanana 2008	0	59	3	63	59.6%	0.14 [0.01, 1.37]	—
Total (95% CI)		129		135	100.0%	0.14 [0.02, 0.81]	
Total events	0		5				
Heterogeneity: Chi2 =	0.00, df = 3	2 (P = 1	1.00); I ² =	0%			
Test for overall effect:	Z = 2.19 (P = 0.0	3)				0.1 0.2 0.5 1 2 5 10 Favours Isotonic Favours Hypotonic

Figure 45: Hypernatraemia

•							
	Isotor	nic	Hypote	onic		Peto Odds Ratio	Peto Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% CI	Peto, Fixed, 95% CI
Coulthard 2012	0	39	0	40		Not estimable	
Jorro Baron 2013	1	31	2	32	59.4%	0.52 [0.05, 5.18]	←
Montanana 2008	1	59	1	63	40.6%	1.07 [0.07, 17.31]	•
Total (95% CI)		129		135	100.0%	0.70 [0.12, 4.10]	
Total events	2		3				
Heterogeneity: Chi2 =	0.15, df =	1 (P = 0	0.70); I ² =	0%			
Test for overall effect:	Z = 0.40 (1	P = 0.6	9)				0.1 0.2 0.5 1 2 5 10 Favours Isotonic Favours Hypotonic

Figure 46: Hypoglycaemia

	Isotor	nic	Hypoto	onic		Peto Odds Ratio			Peto C	Odds Ratio		
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% Cl			Peto, Fi	ixed, 95% CI		
Montanana 2008	1	59	0	63	100.0%	7.91 [0.16, 399.35]						—
Total (95% CI)		59		63	100.0%	7.91 [0.16, 399.35]						
Total events	1		0									
Heterogeneity: Not ap Test for overall effect:		P = 0.3	0)				0.1	0.2 Favou	0.5 urs Isotonio	1 2 Favours F	5 Typotonic	10

J.3.2 Rate of administration for routine maintenance

J.3.2.1 Isotonic crystalloid at normal rate versus restricted rate

Figure 47: Hyponatraemia at 8 hours

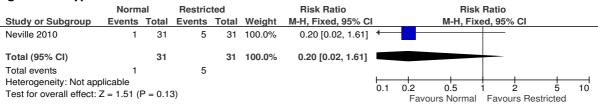


Figure 48: Hyponatraemia at 24 hours

	Norm	al	Restric	ted		Risk Ratio			Risk	Ratio		
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Fixed, 95% CI			M-H, Fix	ed, 95% CI		
Neville 2010	4	19	1	12	100.0%	2.53 [0.32, 19.99]						
Total (95% CI)		19		12	100.0%	2.53 [0.32, 19.99]						
Total events	4		1									
Heterogeneity: Not ap Test for overall effect:		P = 0.3	B)				0.1	0.2 Favo	0.5 ours Normal	1 2 Favours F	5 Restricted	10

Figure 49: Hypernatraemia at 8 hours

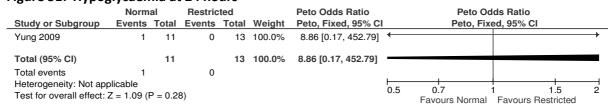
	Norm	al	Restric	ted		Peto Odds Ratio	Peto Odds Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% CI	Peto, Fixed, 95% CI
Neville 2010	0	31	3	31	100.0%	0.13 [0.01, 1.26]	1
Total (95% CI)		31		31	100.0%	0.13 [0.01, 1.26]	
Total events	0		3				
Heterogeneity: Not appropriate the Test for overall effect:		P = 0.0	8)				0.1 0.2 0.5 1 2 5 10 Favours Normal Favours Restricted

Figure 50: Hypoglycaemia at 24 hours

	Normal		Restricted			Peto Odds Ratio		Peto Odds Ratio		
Study or Subgroup	Events	Total	Events	Total	Weight	Peto, Fixed, 95% CI		Peto, Fix	Peto, Fixed, 95% CI	
Neville 2010	2	31	0	31	100.0%	7.64 [0.47, 124.98]	+			\rightarrow
Total (95% CI)		31		31	100.0%	7.64 [0.47, 124.98]				
Total events	2		0							
Heterogeneity: Not applicable Test for overall effect: $Z = 1.43$ ($P = 0.15$)							0.5	0.7 Favours Normal	1 1.5 Favours Restricted	2

J.3.2.2 Normal versus restricted in a specialist unit

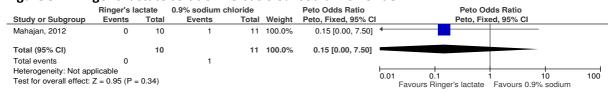
Figure 51: Hypoglycaemia at 24 hours



J.4 IV fluid therapy for replacement and redistribution

J.4.1 Ringer's lactate solution versus 0.9% sodium chloride

Figure 52: Ringer's lactate solution versus 0.9% sodium chloride



J.5 Managing hypernatraemia and hyponatraemia developing during IV fluid administration

J.5.1 Management of hypernatraemia

None

J.5.2 Management of hyponatraemia

J.6 Training and education of healthcare professionals for management of IV fluid therapy