National Clinical Guideline Centre

Draft for consultation

IV fluids in children

Intravenous fluid therapy in children and young people in hospital

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Appendix J

May 2015

Draft for consultation

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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Contents

Appendix J: Forest plots

J.1 Assessment and monitoring

J.1.1 Methods of assessing IV fluid requirements

J.1.1.1 Body weight versus body surface area

None

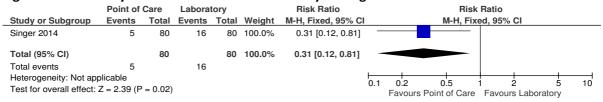
J.1.2 Methods of calculating IV fluid requirements

J.1.2.1 Measurement and documentation

None

J.1.2.2 Point of care versus laboratory testing

Figure 1: Mortality: Point of care versus laboratory testing



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

| | Dextran | | | 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 Fovo | ura galatin | |

Figure 6: Haemodynamically stable at 12 hours: Sepsis patients

| Gelatin | | | 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 | | | | |
|---|------|---------|-------|-------------------|----------|-------|--------|-----------------------|-----------------------------|------------|----------------------|-----|
| 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

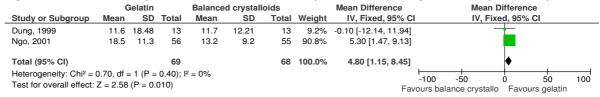
| | Dextran 6% 0.9% sodium | | | | | oride | | Mean Difference | Mean | Differen | ce | |
|--|------------------------|-------|-------|--------|-------|-------|--------|---------------------|-----------------------------------|--------------|-------------------|-----|
| Study or Subgroup | Mean | SD | 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 D | ifference | | |
|--|------|--------|-------|----------------------|---------|-------|--------|----------------------|-----|---------------------|--------------|--------------------------------|-------------|
| 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 | Albun | nin | | 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 | Albun | nin | | Peto Odds Ratio | | Peto Od | 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 | 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

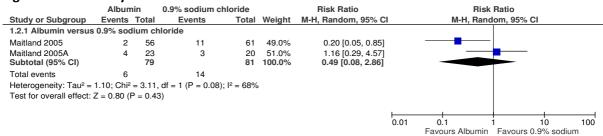


Figure 19: Pulmonary oedema

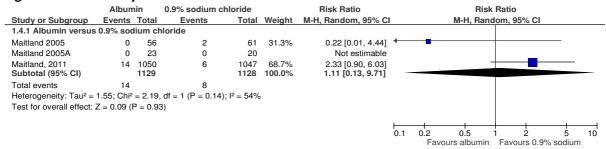


Figure 20: Neurological deterioration

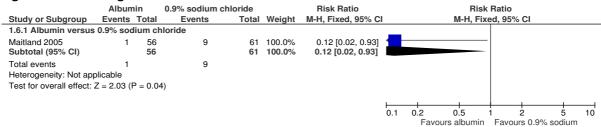


Figure 21: Neurological sequelae

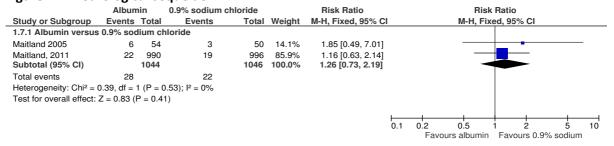
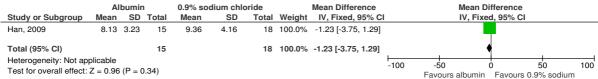


Figure 22: Length of hospital stay



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 | actate | Hypertonic S | Saline | | Risk Ratio | | Ris | sk Ratio | | | |
|--------------------------|----------------------|------------|-----------------|-------------|--------|---------------------|--------------|------------------------------------|--------------|---------------------|-------------|-------------------|
| Study or Subgroup | Events | Total | Events | Total | Weight | M-H, Random, 95% CI | | M-H, Ra | ndom, 95% | CI | | |
| 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 ; $Chi^2 = 2$ | 2.70, df = | 3 (P = 0.44); I | $l^2 = 0\%$ | | Ę. | 0.4 | 1 1 | | + | <u>+</u> | |
| Test for overall effect: | Z = 0.56 (P = | 0.58) | | | | (| 0.1 | 0.2 0.5 Favours Ringers Lactate | 1 Favours | 2 S Hypertonic S | 5 Saline | 10 |

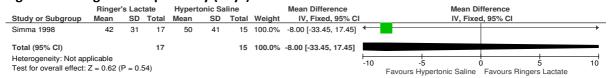
Figure 24: Cardiovascular compromise (incidence of ARDS)

| | Ringer's Lactate Hypertonic Saline | | | | | Peto Odds Ratio | Peto Odds 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 Lactate Hypertonic Saline | | | Saline | | Peto Odds Ratio | Peto Odds Ratio | | | | | | |
|---|------------------------------------|-------|--------|--------|--------|---------------------|-----------------|----------------|-------------------------|------------------|---|-----------------|---------------|
| Study or Subgroup | Events | Total | Events | Total | Weight | Peto, Fixed, 95% CI | | | Peto, Fix | ed, 95% Cl | l | | |
| 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 | 0.5 Ringer's Lactate | 1 2 Favours I | - - - - - - - - - - - - - - - - - - - | 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 sequalae

| | 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 | | Peto O | dds Ratio | |
|--|---------|----------|-------------|--------|--------|---------------------|------|---------------------------|-----------------------|----------------------|
| Study or Subgroup | Events | Total | Events | Total | Weight | Peto, Fixed, 95% CI | | Peto, Fix | xed, 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 app Test for overall effect: | | P = 0.33 | 3) | | | | 0.01 | 0.1 avours 0.9% saline | 1 1 Favours LR + 5 | 0 100 5% dextrose |

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% saline LR + 5% dextrose | | | | | ose | | Mean Difference | Mean Difference | | | nce | |
|---|------------------------------|------|---------|------|------|-------|--------|----------------------|-----------------|---------------------|------------------|---------------------|-----------------|
| 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% saline LR + 5% dextrose | | | Peto Odds Ratio | | Peto Oc | | | | | |
|--|------------------------------|-------|--------|-----------------|--------|---------------------|------|----------------------------|------------------|--------------------|-----|
| 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

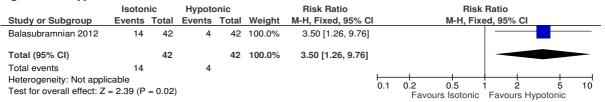
Figure 33: Hyponatraemia

| 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 | o | | |
| 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

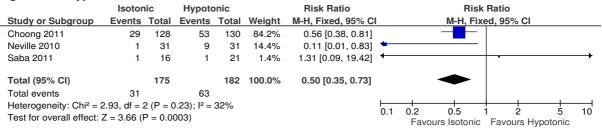


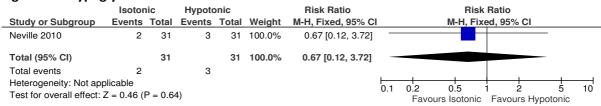
Figure 38: Severe hyponatraemia

| | 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

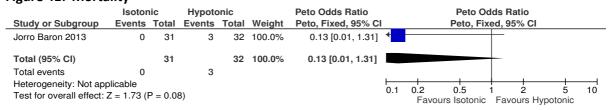


Figure 42: Length of PICU stay

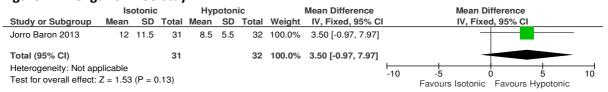


Figure 43: Hyponatraemia

| | 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

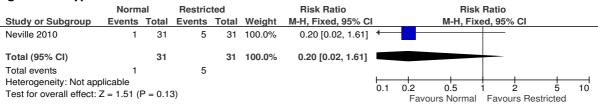


Figure 48: Hyponatraemia at 24 hours

| | 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

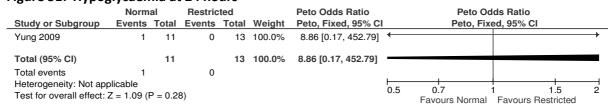
| | Norm | al | Restric | ted | | Peto Odds Ratio | Peto Odds Ratio |
|---|--------|---------|---------|-------|--------|---------------------|---|
| Study or Subgroup | Events | Total | Events | Total | Weight | Peto, Fixed, 95% CI | Peto, Fixed, 95% CI |
| Neville 2010 | 0 | 31 | 3 | 31 | 100.0% | 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

| | Norm | al | Restric | ted | | Peto Odds Ratio | | Peto Oc | lds Ratio | |
|--|--------|---------|---------|-------|--------|---------------------|-----|-----------------------|-----------------------------|---------------|
| Study or Subgroup | Events | Total | Events | Total | Weight | Peto, Fixed, 95% CI | | Peto, Fix | ed, 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 app Test for overall effect: | | P = 0.1 | 5) | | | | 0.5 | 0.7 Favours Normal | 1 1.5 Favours Restricted | 2 |

J.3.2.2 Normal versus restricted in a specialist unit

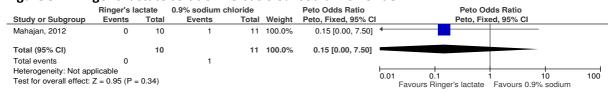
Figure 51: Hypoglycaemia at 24 hours



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