

INTRAVENOUS FLUID MANAGEMENT - CHW

PRACTICE GUIDELINE[®]

DOCUMENT SUMMARY/KEY POINTS

- Common Intravenous Fluid Types come in 1L bags (except for neonates).
- Common Intravenous Fluid Types (outside neonatal period) are:
 - **Maintenance:**
0.9% sodium chloride + 5% glucose +/- 20mmol/L potassium chloride
 - **Rehydration/ Replacement:**
0.9% sodium chloride + 5% glucose +/- 20mmol/L potassium chloride
 - **Resuscitation:**
0.9% sodium chloride with **NO** glucose
 - **OR (if specialist directed)** Hartmann's, or non-crystalloid e.g. albumin
- For **Neonates less than one month corrected age** use 500mL bags (or less) (*these guidelines not for use in Grace Centre for Newborn Care*):
 - **Maintenance:**
0.45% sodium chloride + 10% glucose +/- 10mmol/500mL bag potassium chloride,
 - **Rehydration/Replacement:**
0.45% sodium chloride + 10% glucose +/- 10mmol/500mL bag potassium chloride
 - **Resuscitation:**
0.9% sodium chloride with **NO** glucose

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1 st March 2015	Review Period: 3 years
Team Leader:	Staff Specialist	Area/Dept: Emergency Department CHW

CHANGE SUMMARY

- Updated following release of NSW Ministry of Health document number GL2014_009 "[Standards for Paediatric Intravenous Fluids: NSW Health](#)"¹
- Changes to fluid type for maintenance fluids as a result of new evidence in the literature relating to paediatric intravenous fluid management
- Recommendations relating to the rate and type of fluids used in neonatal patients has been added (for neonates in Emergency Department or general wards NOT Grace Centre for Newborn Care)
- References to administration of IV medications removed. This information can now be found in the [CHW Medication Management and Handling Practice Guideline](#).

READ ACKNOWLEDGEMENT

- Training/Assessment required:
 - All registered nurses
 - All enrolled nurses (medication accredited)
- The following are required to read and acknowledge they understand the contents of this guideline:
 - All medical staff
 - All clinical Department Heads
 - All clinical staff prescribing or administering IV fluids.

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

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Introduction

Increasing evidence in the literature demonstrates the risk of hyponatraemia in paediatric patients when using hypotonic solutions for rehydration/replacement therapy^{2,3} but also, more recently, for maintenance therapy as well.^{4,5,6} Much of this evidence has emerged since the NSW Kids and Families released its publication "Standards for Paediatric Intravenous Fluids" in June 2014.

In February 2015, NSW Kids and Families reconvened the paediatric fluids expert panel to discuss plans to release a second edition of the document to ensure the guidelines reflect this new evidence. Due to CHW clinician representation on this panel, CHW has been able to anticipate and incorporate these changes into this updated version of the CHW "Intravenous Fluid Management Practice Guideline". The second edition of the NSW Kids and Families - Standards for Paediatric Intravenous Fluids is expected to be published in the second half of 2015.

Exclusions

1. The following policies are NOT included within the scope of this document:
 - i. SCHN Intravenous Cannulation and Venepuncture Procedure.
 - ii. Parenteral Nutrition – CHW Practice Guideline.
 - iii. SCHN Central Venous Access Device Practice Guideline.
 - iv. Transfusion of Blood and Blood Components – CHW Policy.
2. Medication information and specific advice on management of IV medication is not included within the scope of this document.
3. Intraosseus needle insertion and management is not included in this document.
4. Arterial or umbilical line management is not included in this document.

1 Administration of Intravenous Fluids

All staff administering intravenous fluids must be accredited to do so. Refer to the [CHW Medication Management and Handling Practice Guideline](#) for further information⁷.

In accordance with NSW Health Policy directive, [Children and Adolescents - Guidelines for Care in Acute Care Settings PD2010_034](#), Section 3.3.10: "Paediatric infusions sets with an inline burette must be used for all children requiring intravenous therapy. An infusion pump should be used in all children".⁸

Peripheral intravenous infusion sets used for the administration of parenteral fluids must be changed every 96 hours⁹, however if the intravenous infusion set has been broken into or disconnected it must be replaced.

The following documentation must be included within the clinical record:

- Date and time intravenous infusion set changed
- Date and time intravenous infusion set due to be changed
- Position of intravenous cannula (e.g. right cubital fossa)

Cannula site checks are required every hour when a continuous IV infusion is being administered– confirmation of site check is made by the staff member initialling on the Paediatric Fluid Balance Chart (in the "sign" column - SMR120.005) or the Oncology flowchart (M66B).

Cannula site description – e.g. patent, not inflamed or swollen etc. should be documented in the clinical record.

It is recommended that if any IV set is disconnected for bathing or showering purposes, the IV intravenous infusion set must be discarded and a new intravenous infusion set used.

All IV fluid bags must be changed every 24 hours.

1.1 Intermittent Line Changes

All intravenous infusion sets used for intermittent administration of intravenous fluids or medication **must be** discarded after each use when they are disconnected at the cannula site.

Consider using syringe pump driver to administer intermittent IV fluids/medication as the intravenous infusion set can be "capped", not requiring discarding of the line for 96 hours (see above).

1.2 Extravasation Monitoring and Management

Refer to the [NSW Health Safety Notice Extravasation of IV Fluids – Care of the cannula site in neonates and children](#)¹⁰ (SN:013/07) and the [CHW IV Extravasation Practice Guideline](#) for more information.

If any signs of extravasation are noted, stop the infusion immediately; notify treating medical team and [document in the clinical record](#).

1.3 Labelling of Fluid Bags and Lines

All containers (e.g. bags and syringes) for intravenous fluids and all conduits for the administration of fluid to a patient (e.g. IV administration lines, burettes) for administering intravenous fluids are to be labelled as per the NSW Health Policy Directive '[User Applied Labelling of Injectable Medicines, Fluids and Lines](#)' [PD2012_007]. Further information about labelling is available in the [National Recommendations for User-applied Labelling of Injectable Medicines, Fluids and Lines 2012](#).

2 Intravenous Fluid Management

Refer to the NSW Ministry of Health Guideline '[Standards for Paediatric Intravenous Fluids: NSW Health](#)' [GL2014_009]

When prescribing IV fluids, staff should consider:

- Does this child **need** to have fluids administered intravenously?
- Wherever possible replace fluids enterally to all children, even if sick.
- If oral fluids are not tolerated, consider fluid replacement via a nasogastric (or nasojejunal) tube.

IV fluids should be discontinued as soon as enteral options can be substituted. If both are used for a transitional period, remember to base calculations on total fluid intake.

2.1 Intravenous Fluid Monitoring

Whenever IV fluids are administered ensure accurate prescribing and regular monitoring.

Make sure that there are clear orders with respect to frequency and type of vital sign monitoring your patient requires and the upper and lower limits of the observations at which medical staff should be called to reassess the child.

All children on IV fluids should be weighed prior to commencement and all children (except those on TKVO) should be weighed again preferably 6-8 hours after the infusion is commenced and then at least daily.

All children on IV fluids (except TKVO) for acute conditions other than elective surgery, should have serum electrolytes and glucose checked before commencing the infusion, and again within 24 hours while IV therapy continues or sooner if clinically indicated. If IV therapy continues, serum electrolytes and glucose should be checked every 24-48 hours.

Pay particular attention if weight changes by more than 5%, if serum sodium is less than 135mmol/L or greater than 145mmol/L, or if serum sodium is rising or falling quickly.

2.2 Intravenous Fluid Types

NB: These guidelines may not be applicable to special patient groups e.g. patients with diabetic ketoacidosis or specialised fluids e.g. 3% sodium chloride. Consult with a senior Medical Officer before proceeding. Refer to relevant policy and/or Drug Therapy Guidelines for management.

Plasma-Lyte 148 (with and without glucose): while the emerging use of Plasma-Lyte 148 (with and without glucose) as a balanced salt solution for both resuscitation and maintenance is acknowledged, more evidence is required before it is recommended for routine use. In addition, Plasma-Lyte 148 is a relatively new product and its compatibility with most drugs is untested. Until further compatibility studies are completed, it is not feasible to consider Plasma-Lyte 148 as a routine maintenance fluid.

Hartmann's Solution: this is an isotonic balanced salt solution that may be used at the direction of a specialist, for example when there is concern about the development of hyperchloraemic acidosis from excessive use of 0.9% sodium chloride containing products. Hartmann's Solution is incompatible with many drugs (due to the calcium content) limiting its use as a routine maintenance fluid.

2.2.1 *Infants and Children (outside the neonatal period)*

Fluid types for common scenarios when serum electrolytes are not significantly abnormal, in patients greater than one month corrected age.

Maintenance:

- 0.9% (150mmol/L) sodium chloride and 5% glucose +/- 20mmol/L potassium chloride

Rehydration/Replacement:

- 0.9% (150mmol/L) sodium chloride + 5% glucose +/- 20mmol/L potassium chloride.

Resuscitation:

- 0.9% (150mmol/L) sodium chloride with **no glucose**
- Alternatives (if specialist directed)
 - Hartmann's; or
 - Non-crystalloid, e.g. albumin
 - Plasma-Lyte 148 (without glucose)

2.2.2 Neonates less than one month corrected age

In neonates 500mL bags (or less) should be used. For neonates in Grace Centre for Newborn Care, please see local guidelines. For all other neonates (e.g. in the Emergency Department or the general wards), use the following:

Maintenance:

- 0.45% (38mmol/500mL) sodium chloride + 10% glucose +/- 10mmol/500mL bag potassium chloride
- Alternatives (if specialist directed)
 - 0.22% sodium chloride + 10% glucose +/- 10mmol/500mL bag potassium chloride

Rehydration/Replacement:

- 0.45% (38mmol/500mL) sodium chloride + 10% glucose +/- 10mmol/500mL bag potassium chloride

Resuscitation:

- 0.9% (75mmol/500mL) sodium chloride with **no glucose**

2.3 Intravenous Fluid Volumes

Remember to clinically review the patient to assess fluid status, it is vital to always monitor the **Total Fluid Intake** (oral, intravenous and drug/blood infusion volumes) not just intravenously ordered volumes.

- When calculating fluid volumes for neonatal patients less than 2 weeks of age, use birth weight if admission weight is *less than* birth weight.

IF IN DOUBT OR THE PATIENT IS NOT IMPROVING ALWAYS SEEK EARLY ADVICE FROM A MORE SENIOR MEDICAL OFFICER.

2.3.1 Resuscitation

For infants and children (outside the neonatal period)

- 20 mL/kg as a bolus given as rapidly as possible.
(This may be repeated if inadequate improvement)

For neonates (up to one month corrected age)

- 10-20 mL/kg as a bolus given as rapidly as possible.
(This may be repeated if inadequate improvement)

2.3.2 Rehydration/Replacement

For ALL patients (neonates, infants and children)

- To calculate the approximate deficit in mL, use the following formula:

$$(\text{Weight [kg]} \times \% \text{ clinical dehydration} \times 10 \text{ mL})$$

Divide this calculated volume by 24 to get the hourly rate of infusion.

- Use the table below to estimate the % dehydration.

Description of Dehydration	Dehydration (% of body weight)	Signs and Symptoms
No clinical sign of dehydration		Reduced urine output Thirsty No physical signs
Mild	3%	Reduced urine output Thirsty Dry mucous membranes Mild tachycardia
Moderate	5%	Dry mucous membranes Tachycardia Abnormal respiratory pattern Lethargy Reduced skin turgor Sunken eyes
Severe	10%	Above signs + Poor perfusion: Mottled, cool limbs/Slow capillary refill/Altered consciousness Shock: Thready peripheral pulses with marked tachycardia & other signs of poor perfusion stated above

Special circumstance: Gastroenteritis

Oral then nasogastric rehydration are the usual first and second line methods for rehydrating a child with gastroenteritis. However, when IV rehydration is being used for this purpose, standard rehydration over 24 hours may be used as above. Alternatively, rapid IV rehydration may be considered if:

- Child is > 6 months of age and
- Diarrhoea is present and
- Serum Na >130 & <149mmol/L and
- Child not severely dehydrated or shocked and
- Child has normal level of consciousness and
- Child has no medical condition making them at risk of fluid overload

Rapid rehydration is not a resuscitation bolus.

Rapid IV rehydration should not be used if the child has already received rapid NG rehydration

Rapid IV rehydration should not be used for any other conditions apart from gastroenteritis.

The same fluid should be used for rapid IV rehydration as for standard rehydration (i.e. 0.9% sodium chloride + 5% glucose). It is given at a rate of 10mL/kg/hr for 4 hrs then ceased.

For more detail please see NSW Ministry of Health Guideline '[Children and Infants with Gastroenteritis - Acute Management](#)' [PD2010_009]¹¹.

2.3.3 Maintenance

For infants and children (outside the neonatal period)

- Total Maintenance Fluid Volume for 24hrs:
 - 100mL/kg for first 10kg of patient's weight +
 - 50mL/kg for second 10kg of patient's weight +
 - 20mL/kg for every kg of patient's weight thereafter
- Total Maintenance fluid volume may also be calculated using the 4,2,1 Rule, that is:
 - 4mL/kg/hr for first 10kg of patient's weight +
 - 2mL/kg/hr for next 10kg of patient's weight +
 - 1mL/kg/hr for every kg of patient's weight thereafter

Up to a maximum of 2500mL/day of **maintenance fluids** - Resuscitation and/or Rehydration/Replacement Fluid is in addition to this volume.

Both methods for calculating maintenance fluid requirements are described in the table below:

Weight	Method A: Daily IV requirements (mL/24hours)	Method B: Hourly IV requirements (mL/hour)
3-10kg	100mL/kg	4mL/kg
10-20kg	1000mL + (50mL/kg for each kg over 10kg)	40mL + (2mL/kg/hr for each kg over 10kg)
>20kg	1500mL + (20mL/kg for each kg over 20kg)	60mL + (1mL/kg/hr for each kg over 20kg)

Patients at Risk of Syndrome of inappropriate ADH secretion (SIADH)

In cases of CNS infection (encephalitis and meningitis) and acute lower respiratory infection (e.g. pneumonia, bronchiolitis) correct any immediate circulatory deficit as per resuscitation guidelines then continue with reduced Total Fluid Intake at approximately $\frac{1}{2}$ - $\frac{2}{3}$ maintenance because of the risk of SIADH and monitor closely.

Maintenance Intravenous Fluid Calculation based on Weight (for patients greater than one month corrected age)

Weight (kg)	Total Fluid Intake (based on 4/2/1 rule) mL/hr	Starting Total Fluid Intake for children with: Meningitis, Encephalitis, Bronchiolitis, Pneumonia once immediate circulation rectified	
		½ maintenance (mL/hr)	2/3 maintenance (mL/hr)
3	12	6	8
4	16	8	11
6	24	12	16
8	32	16	21
10	40	20	26
12	44	22	29
14	48	24	32
16	52	26	34
18	56	28	37
20	60	30	40
25	65	33	43
30	70	35	46
35	75	38	50
40	80	40	53
45	85	43	56
50	90	45	60
55	95	48	63
60 and above	100	50	66

For neonates (up to one month corrected age)

Age	Method A: Daily IV requirements (mL/24hours)	Method B: Hourly IV requirements (mL/hour)
Day 1 of life	60mL/kg	2.5mL/kg/hr
Day 2 of life	90mL/kg	3.75mL/kg/hr
Day 3-30 of life	120mL/kg	5mL/kg/hr

2.4 Intravenous Fluid Order Documentation

All IV fluids must be prescribed by a Medical Officer or Authorised Nurse Practitioner on the appropriate forms or systems (e.g. Critical Care Information System - CCIS). An IV fluid order is valid for 24 hours and a new order is to be prescribed every 24 hours. If the patient is clinically unstable, fluid orders may only be valid for 4-6 hours requiring medical review. A fluid order is only valid with the following criteria:

- Patient Identification documented (patients details handwritten in full or an addressograph with patients name written underneath – using blue or black ink)
- Weight of patient clearly documented
- Date and time of order
- Legible handwriting (not applicable for CCIS)
- Volume and rate in mL/hr documented
- Name of prescriber legible and signature to confirm order is recorded. Include the pager number if applicable.

Two (2) clinicians accredited to administer and/or check IV fluids must sign the fluid order (SMR120007) and document time started and finished.

3 Clinical Documentation

All patients with an intravenous cannula capped or infusing IV fluid are to have documentation notated in the clinical record for every shift (that is 2 or 3 times per day depending on routine shift times). For documentation requirements refer to SCHN [Intravenous Cannulation and Venepuncture Procedure](#).

4 Key Performance Indicators

Annual review of reported incidents as recorded in IIMS regarding the following:

- IV fluid administration
- IV fluid ordering
- Quality of clinical documentation

References

1. NSW Ministry of Health Guideline "Standards for Paediatric Intravenous Fluids: NSW Health" GL2014_009: http://www0.health.nsw.gov.au/policies/gl/2014/pdf/GL2014_009.pdf (accessed 17/02/15)
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6. Shamim A, AFZAL K, Manazie Ali S, Safety and Efficacy of Isotonic (0.9%) vs Hypotonic (0.18% Saline as Maintenance Intravenous Fluids in Children: A Randomised Controlled Trial, *Indian Pediatrics*, 2014, 51:969-974
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11. NSW Health Paediatric Clinical Practice Guidelines. Acute management of gastroenteritis in infants and children. PD2010_009: http://www.health.nsw.gov.au/policies/pd/2010/pdf/PD2010_009.pdf (accessed 25/11/14)

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