

Potassium Replacement - NICU - Neonatal Full Clinical Guideline

Ref. No: CH PH N 22 Version 5

POTASSIUM REPLACEMENT

INDICATION: to prevent or to correct potassium depletion

NB: where possible, address the underlying cause initially, before giving potassium.

ROUTE: Oral or intravenous. Oral route should be used where possible – note that the IV injection may be given orally.

DOSAGE:

A. Hypokalaemia – prophylaxis

Orally or by IV infusion: 0.5-2mmol/kg/day, dose dependent on the deficit or daily maintenance requirements.

For oral administration give 0.5–1 mmol/kg **twice daily** using potassium chloride syrup, 1mmol in 1ml. Total daily dose may alternatively be given in 2-4 divided doses. Dose to be adjusted according to plasma-potassium concentration. Give with feeds to minimise gastric irritation where possible.

B. Hypokalaemia – treatment

(NB: Plasma potassium level <3.5 mmol/L or below normal level defined by local laboratory)

Alkalosis and the administration of insulin can drive extracellular potassium into the cells, making the plasma level a poor marker of whole body depletion. True depletion requiring replacement is quite rare. Over treatment can easily cause hyperkalaemia.

Correction of true body deficit should be slowly over 1-2 days, as a continuous IV infusion at a rate not exceeding **0.2mmol/kg/hour** (*i.e.* max 4.8mmol/kg/day). Check the serum potassium every 2-3 hours where possible.

Higher concentrations of potassium chloride may be given in fluid-restricted babies (up to 40 mmol/500 ml) or faster infusion rates (up to 0.5 mmol/kg in an hour, repeated as necessary) may be given in severe symptomatic hypokalaemia if renal function is adequate, but require a **central line** for administration.

N.B. Concentrations up to a maximum of 0.5 mmol/ml or even 1mmol/ml are used in some centres in **exceptional circumstances**. A central line and continuous ECG monitoring would be essential in such a case.

PREPARATIONS *see appendix 1 for alternative preparations available.

a. Oral use – use Potassium Chloride syrup sugar free, 1mmol in 1ml

- Prescribe as **mmols**
- The total daily dose of potassium should be divided between 2 to 4 doses

b. Intravenous use – calculation of the dose to be infused in 24 hours

1. Calculate the total mmols of potassium that requires replacing in 24 hours (a).
2. Calculate the total volume (mls) of fluid allowance available for the potassium i.e. the volume of simple fluid being administered in 24 hours (b) - (*in fluid restricted patients remember to take into account boluses/flushes/other infusions not available for potassium delivery*).
3. Calculate the total number of mmols potassium to be added to a 500ml bag as follows:
$$\frac{a \times 500}{b} = \text{mmol in 500ml}$$

Example:

Baby's weight is 1.79 kg, requires 2 mmol/kg/day, total fluid allowance is 120ml/kg/day. Baby is receiving a total of 15 ml fluid as antibiotics and flushes.

- a. Total mmols of potassium required in 24 hours is $(1.79 \times 2) = 3.58$ mmols.
- b. Total fluid available is $(120 \times 1.79) = 215$ mls, minus 15 ml (other drugs etc.) = 200ml
- c. Total mmol of potassium to be added to a 500 ml bag is $3.58/200 \times 500 = 8.95$ mmols
In this case a premade bag containing 10mmol potassium chloride would be appropriate.

IMPORTANT SAFETY INFORMATION:

Potassium overdose can be fatal and may occur following inappropriate preparation or administration techniques. Ready-mixed infusion solutions containing potassium should be used whenever possible as they are more quickly available, are terminally sterilised to minimise risk of contamination and there is less risk of potassium 'layering' in the bag resulting in overdose. See appendix 1 for bags available premade as stock on the unit or from pharmacy.

Exceptionally, if potassium chloride concentrate is used for preparing an infusion, the infusion solution should be **thoroughly mixed**.

Maximum concentration for peripheral IV administration is 20mmol in 500ml. Concentrations greater than this may be given via a central line but the maximum rate must still be observed (see above). Discuss with a consultant.

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N.B. Concentrations up to a maximum of 0.5 mmol/ml or even 1mmol/ml are used in some centres in **exceptional circumstances**. A central line and continuous ECG monitoring would be essential in such a case.

MONITORING:

- Regular monitoring of urea, electrolytes and blood gases.
- Use the neonatal VIP score tool to monitor for early signs of thrombophlebitis.
- If hypokalaemia is not responding well to replacement potassium, consider checking magnesium level.
- ECG monitoring should be carried out when giving more concentrated potassium solutions.
- Caution in renal impairment, close monitoring required - high risk of hyperkalaemia.
Avoid in severe renal impairment.

ADVERSE EFFECTS:

- Hyperkalaemia
- Solutions more concentrated than 20mmol in 500ml cause thrombophlebitis and pain at the injection site. Extravasation can cause tissue necrosis.
- Rapid IV administration may cause arrhythmias including heart block and cardiac arrest.
- With oral use: abdominal cramps; diarrhoea; gastrointestinal disorders; nausea; vomiting

COMPATIBILITIES:

See separate y –site compatibility chart

REFERENCES:

British National Formulary for Children accessed via new.medicinescomplete.com on 15/01/20
Medusa, accessed through trust intranet, on 15/01/20
Evelina London, Paediatric Formulary, accessed via cms.ubqo.com/public/d2595446-ce3c-47ff-9dcc-63167d9f4b80 on 15/01/20
Bedside Clinical Guidelines Partnership, Staffordshire, Shropshire and Black Country Neonatal Operational Delivery Network and Southern West Midlands Neonatal Operational Delivery Network, Hypokalaemia, accessed on 15/01/20
Newborn Services Clinical Guideline, available online:
www.adhb.govt.nz/newborn/Guidelines/Nutrition/Electrolytes.html, accessed on 15/01/20
Subramaniam B. Electrolytes Maintenance Requirements Guideline NIC ME 01. Derby Hospitals NHS Foundation Trust, Version 3, 2018
Handbook on Injectable Drugs accessed via new.medicinescomplete.com accessed on 15/01/20

Appendix 1:

Oral preparations: (to be ordered on a patient named basis from pharmacy)

Kay-Cee-L® 7.5%w/v (liquid) containing 1mmol each of potassium and chloride in 1ml.

Slow K (slow release tablets) each tablet contains potassium chloride 600mg, providing 8mmol each of potassium and chloride per tablet.

Sando-K® (soluble tablets) each tablet contains potassium bicarbonate 12mmol and chloride 8mmol.

The following IV fluids are kept as stock on NICU:

| | | | Volume (mL) |
|-----------------------|-----------------------|------------------|-------------|
| Sodium Chloride 0.45% | | | 500mL |
| Sodium Chloride 0.9% | | | 500mL |
| Sodium Chloride 0.18% | Glucose 4% | Potassium 10mmol | 500mL |
| Glucose 5% | | | 50mL |
| Glucose 5% | | | 500mL |
| Glucose 12.5% | | | 250mL |
| Glucose 10% | | | 500mL |
| Glucose 10% | Sodium Chloride 0.18% | | 500mL |
| Glucose 20% | | | 500mL |

The following potassium containing IV fluids are kept within Pharmacy as pre-made bags:

| | | | | Special* |
|-----------------------|-------------|------------------|-------|----------|
| Sodium Chloride 0.9% | | Potassium 10mmol | 500mL | |
| Sodium Chloride 0.9% | | Potassium 40mmol | 500mL | |
| Sodium Chloride 0.9% | | Potassium 20mmol | 500mL | |
| Sodium Chloride 0.9% | Glucose 5% | Potassium 10mmol | 500mL | ✓ |
| Sodium Chloride 0.9% | Glucose 5% | Potassium 20mmol | 500mL | ✓ |
| Sodium Chloride 0.45% | Glucose 5% | Potassium 10mmol | 500mL | |
| Sodium Chloride 0.45% | Glucose 5% | Potassium 20mmol | 500mL | ✓ |
| Sodium Chloride 0.45% | Glucose 10% | Potassium 10mmol | 500mL | ✓ |
| Sodium Chloride 0.9% | Glucose 5% | Potassium 10mmol | 500mL | ✓ |
| Sodium Chloride 0.9% | Glucose 5% | Potassium 20mmol | 500mL | ✓ |
| Sodium Chloride 0.18% | Glucose 4% | Potassium 10mmol | 500mL | |
| Sodium Chloride 0.18% | Glucose 4% | Potassium 20mmol | 500mL | |
| Sodium Chloride 0.9% | Glucose 10% | Potassium 20mmol | 500mL | ✓ |
| Glucose 5% | | Potassium 20mmol | 500mL | |
| Glucose 10% | | Potassium 10mmol | 500mL | |

*The se infusi

ons are prepared under a “Specials Licence” – it is a legal requirement to record details of

all patients receiving such infusions, therefore they require ordering on a named patient basis from pharmacy. The prescriber must also be informed of the fact that this infusion is prepared under a “Specials Licence” – the Paediatric Directorate have already approved this preparation for use.

If none of the above are appropriate contact pharmacy with the infant’s weight, potassium requirement and available daily fluid volume for an individual bag to be prepared.

Documentation Control

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|--|----------------------|-------------------------|--|--------------------|
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| Version / Amendment History | Version | Date | Author | Reason |
| | 1 | April 2005 | Julie Vanes Directorate Pharmacist | Original Guideline |
| | 2 | March 2011 | Lisa Taylor Senior Pharmacist Paediatrics | Review Due |
| | 3 | August 2014 | Aleli Akani Rotational Specialist Pharmacist | Review Due |
| | 4 | September 2019 | Kevin Inglesant Lead Paediatric Pharmacist | Review due |
| | 5 | September 2020 | Harriet Hughes Advanced Pharmacist, Women's & Children's | |
| Consultation with: Rachel Cook – Clinical Nurse Educator, Shaun Edwards – Neonatal Matron | | | | |
| Intended Recipients: Medical and nursing staff on NICU | | | | |
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| Distribution and Location of Guideline: Within the manual entitled "Directorate of Children's Services Clinical and Operational Policies and Guidelines." Located in all areas within the Children's Hospital Pharmacy | | | | |
| Key contact: Senior pharmacist, Paediatrics – bleep 2268 | | | | |

| DIVISIONAL AUTHORISATION | |
|--|------------|
| GROUP | DATE |
| Nigel Ruggins | 12/02/2021 |
| Sharon Conroy - Advanced pharmacist - children's | 22/09/2020 |
| Clinical Director – Paediatric BU | 23/02/2021 |
| Divisional Clinical Governance Committee – Integrated care | 23/02/2021 |