Waikato District Health Board

Guideline

Dilution of oral medication and osmolality management in Newborn Intensive Care Unit (NICU)

Guideline Responsibilities and Authorisation

Department Responsible for Guideline	NICU
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Document Owner Title	Clinical Director
Target Audience	Nurses, Nurse Practitioners, Clinical Nurse Specialist, Registrars and Senior Medical Officers
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Guideline Review History

Version	Updated by	Date Updated	Summary of Changes
1	Lee Carpenter Nurse Practitioner, Ivana Jovicic, Clinical Pharmacist and Joyce Mok ACNM	Oct 2019	First version

Dilution of oral medication and osmolality management in Newborn Intensive Care Unit (NICU)

1 Overview

1.1 Purpose

To provide guidance on how to reduce the number of hypertonic solutions administered to babies in NICU to minimize the potential risk of necrotising-enterocolitis (NEC).

1.2 Background

After birth, infant's gut is exposed to milk feeds (including Expressed Breast Milk and Human Milk Fortifier) with an osmolality of around 300-400 mOsm/kg.

Very low birth weight and low birth weight infants often require medication and additives for example multivitamins and electrolyte supplements. Administering these with milk feeds may markedly increase osmolality above the recommended limits. This high osmolality may be associated with delayed gastric emptying and studies from 1970s and 1980s have linked high osmolality solutions to increased incidence of NEC.

Although there is no clear evidence to show that hypertonic solutions cause direct damage of bowel mucosa, there is sufficient data to conclude that high osmolality associated with the addition of oral medications and electrolyte supplements to milk feeds, warrant concern.

To achieve the recommended osmolality of preterm oral solutions of <450 mOsm/kg, medication would need to be diluted according to their individual osmolality. This is deemed impractical and would potentially contribute to fluid overload hence the ratio of medication to water of 1:2 has been chosen. Use sterile water as diluent.

The American Academy of Paediatrics has recommended not exceeding an osmolality of 450 mOsm/kg for enteral feeds to minimise the risk of NEC

1.3 Scope

Waikato District Health (DHB) staff working in NICU

1.4 Patient group

Infants ≤32 up to 36/40 corrected age of gestation and/or weight less than 1500gm

1.5 Exceptions

All fat soluble vitamins (Vitamin A, D, E & K), nystatin and probiotics given orally are exempt from the need to dilute

1.6 Definitions

Osmolality	osmolality is the number of particles dissolved in water. This weight: relationship is defined as mOsm/kg. Note: Osmolality is different from osmolarity which describes a weight:volume relationship mOsm/L.
Hyperosmolarity	Hyperosmolar solutions are defined as solutions with an osmolality greater than that of serum (300mOsm/kg).
mOsm/kg	The number of milliosmoles (mOsm) of solute per kilogram of solvent (mosmol/kg or mOsm/kg)
EBM	Expressed breast milk
HMF	Human milk fortifier

2 Clinical Management

2.1 Competency required

- Registered Nurse with Waikato DHB generic IV certification
- Enrolled nurse with Waikato DHB generic IV certification and working under the direction and delegation of a registered nurse.

2.2 Guideline

- Draw up the prescribed dose of the oral medications.
- Dilute oral medication using sterile water for injection in the ratio of drug to water of 1:2, per medication (other than exceptions).
- Prepare immediately before administration.
- Consider spreading out the medications to one or two medication per feed time if practical.
- Diluted medication can be now given on an empty stomach or with feed if due.

2.3 Potential complications

- Potential for fluid overload
- Incorrect dilution
- Medication instability

3 Audit

3.1 Indicators

- All medication for infants in NICU is diluted at the correct ratio (according to this guideline)
- Accurate and up to date fluid balance documentation is evident for all infants in NICU
- All nurses administering medication are appropriately trained.

4 Evidence base

4.1 References

- AAP (1976). AAP Committee on Nutrition: Commentary of breast feeding and infant formulas including proposed standards for formulas. *Pediatrics*, 57,2, pp. 278-285.
- Chandran, S., Chua, M., Lin, W., Wong, J., Saffari, S., & Rajadurai, V. (2017). Medications that increase osmolality and compromise the safety of enteral feeding in preterm infants. *Neonatology*, (2017), 111 309-316.
- Ellis, Z-M. Tan, H., Embleton, N., Sangild, P., & Elburg, R. (2019). Milk feed osmolality and adverse events in newborn infants and animals: a systematic review. *Arch Dis Child Fetal Neonatal Ed*, 104, F333–F340.
- Chandran S et al (2019). Dilution guideline for high osmolality medications. *KK women's and Children Hospital Clinical Practice Guidelines.* Singapore.

4.2 Associated Waikato DHB Documents

- Waikato DHB NICU Drug Manual
- Waikato DHB NICU Medical Protocol: Necrotising Enterocolitis Care Bundle in Newborn Intensive Care Unit (NICU) (6171)
- Waikato DHB NICU Medical Protocol: Standardisation of enteral feeding in Newborn Intensive care Unit (NICU) (6172)