Local Guideline

John Hunter Children's Hospital
CHILDREN, YOUNG PEOPLE AND FAMILIES

NSW GOVERNMENT Health
Hunter New England Local Health District

Diuretic use for babies with or developing Chronic Lung Disease (CLD) in NICU

Sites where Local Guideline applies	Neonatal Intensive Care Unit, JHCH
This Local Guideline applies to:	
1. Adults	No
2. Children up to 16 years	No
3. Neonates – less than 29 days	Yes
Target audience	Clinicians looking after babies with or developing Chronic Lung Disease
Description	Provides information to clinicians about when to consider diuretic use
National Standard	Standard 4: Medication Safety

Go to Guideline

Keywords	Diuretics, Chronic Lung Disease, CLD, preterm, NICU, JHCH
Document registration number	JHCH_NICU_12.15
Replaces existing document?	Yes

Related Legislation, Australian Standard, NSW Ministry of Health Policy Directive or Guideline, National Safety and Quality Health Service Standard (NSQHSS) and/or other, HNE Health Document, Professional Guideline, Code of Practice or Ethics:

- NSW health Policy Directive PD 2017_013 Infection Control and prevention Policy
- NSW Health Policy Directive PD2017_032 Clinical Procedure Safety
- Medication Safety in HNE Health PD2013_043:PCP31

Prerequisites (if required)	N/A
Local Guideline note	This document reflects what is currently regarded as safe and appropriate practice. The guideline section does not replace the need for the application of clinical judgment in respect to each individual patient but the procedure/s **require mandatory compliance**. If staff believe that the procedure/s should not apply in a particular clinical situation they must seek advice from their unit manager/delegate and document the variance in the patients' health record.
Position responsible for the Local Guideline and authorised by	Pat Marks. General Manager / Director of Nursing CYPFS
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Date authorised	26th June 2018
This document contains advice on therapeutics	Approval gained from Local Quality Use of Medicines Committee on 21st June 2018
Issue date	27th June 2018
Review date	27th June 2021

Note: Over time links in this document may cease working. Where this occurs please source the document in the PPG Directory at: http://ppg.hne.health.nsw.gov.au/

Purpose and risks

This local clinical procedure has been developed to provide instruction to the health clinician and to ensure that the risks of harm to the infant associated with administration of diuretics for CLD are prevented, identified and managed.

The risks are:

- *Electrolyte abnormalities*
- *Hearing loss*
- *Hypovolaemia and hypotension*

The risks are minimised by:

- *Clinicians having knowledge of diuretic side effects and complications*
- *Clinicians seeking assistance if caring for infants is outside their scope of practice*
- *Following the instructions set out in the clinical procedure*
- *Notification and management of the complications/ risks to the patient*

Risk Category*:* *Clinical Care & Patient Safety*

Glossary

Acronym or Term	Definition
CLD	Chronic Lung Disease
CXR	Chest X-ray
GA	Gestational age
IV	Intravenous
RAAS	Renin-angiotensin-aldosterone system
US	Ultrasound

Guideline

This Guideline does not replace the need for the application of clinical judgment in respect to each individual patient.

Why do we use diuretics in babies with or developing CLD?

Alveolar and interstitial lung oedema is present in the early stages of CLD. It has been postulated that diuretics could reduce this fluid load and help to improve pulmonary function. Epidemiological studies have shown that around 30% of babies <32 weeks get exposed to diuretics during their NICU stay[1].

What diuretics do we use?

1. **Furosemide** (frusemide), brand name-(Lasix): Loop diuretic that acts in the Loop of Henle (inhibits Na / K / 2Cl symporter), causing loss of sodium and potassium.
2. **Hydrochlorothiazide**: Acts on distal renal tubule (inhibits Na/Cl co-transport), causing sodium loss, though less marked sodium loss than Frusemide.
3. **Spironolactone:** Acts in collecting duct (inhibits Na/K exchange), causing sodium loss and potassium retention. Spironolactone also works as aldosterone antagonist on the RAAS system.

Evidence for diuretic use for babies with or developing CLD

There is limited evidence for the use of diuretics for babies with or developing CLD. Research that has been done is now many years old, has been short term, included few patients and was in a heterogeneous group of studies. The population of babies with chronic lung disease now is likely to represent a different group of babies to those that have been included in these studies. Available data has been analysed in a Cochrane review for each diuretic type separately; this information is summarised below.

1. Furosemide (frusemide)

- In preterm infants < 3 weeks of age developing CLD frusemide was not shown to have consistent effects[2].
- > 3 weeks of age single IV doses transiently improve lung mechanics and chronic use (enteral or IV) improves oxygenation and lung mechanics (up to 8 days studied).
- No evidence for benefit on need for ventilatory support, survival or long-term outcome.

2. Hydrochlorothiazide and spironolactone

- In infants > 3 weeks of age, chronic administration of thiazide and spironolactone improves lung compliance at 4 weeks of treatment and reduces need for furosemide[3].
- Single study looked at using thiazide-spironolactone combination compared with thiazide alone showed no difference in oxygen requirement, pulmonary mechanics or need for electrolyte supplementation.

Potential Side Effects of diuretics

- Electrolyte abnormalities such as hyponatremia, hypokalemia and hypomagnesemia can occur. Spironolactone is potassium sparing, whereas furosemide causes potassium loss.
- Thrombocytopenia
- Hypovolemia and hypotension
- Hypercalcuria which can cause potential nephrocalcinosis
- Phosphaturia can occur increasing risk of metabolic bone disease
- Hearing loss (furosemide)

When should we consider diuretics in babies with or developing CLD

Postnatal age <14 days

- GA at birth <32 weeks
- Aim:
    - Improving pulmonary mechanics & oxygen need
- Indication:
    - US or CXR evidence of fluid overload

Postnatal age ≥ 14 days

- GA at birth <32 weeks
- Aim:
    - improving pulmonary mechanics in the short term
    - aid to wean off HHFNC or CPAP at 34 wks CGA
- Indication:
    - Respiratory Quotient > 2.4 (MAP x FiO_2)
    - Ultrasound evidence of volume overload

- If using loop diuretics suggest up to a **maximum 3 doses IV or PO course** (given increasing risk of nephrocalcinosis with increased exposure).
- If using hydrochlorothiazide and spironolactone suggest review at 2 weeks then cessation if no change in oxygen need or respiratory stability.
- Cessation should be earlier if side effects unable to be managed e.g. electrolyte abnormalities such as severe hyponatremia not amenable to sodium supplementation. Course may be extended to 4 weeks if diuretics thought to have been clinically useful with no significant side effects and need for diuretics still present (e.g. ongoing high oxygen need >40%).

References

1. Laughon MM, Chantala K, Aliaga S, Herring AH, Hornik CP, Hughes R, Clark RH, Smith PB. Diuretic exposure in premature infants from 1997–2011. *Am J Perinatol*. 2015 January; 32(1): 49–56.
2. Stewart A, Brion LP. Intravenous or enteral loop diuretics for preterm infants with or developing chronic lung disease. *Cochrane Database of Systematic Reviews* 2011, Issue 9.
3. Stewart A, Brion LP, Ambrosio-Perez I. Diuretics acting on the distal renal tubule for preterm infants with (or developing) chronic lung disease. *Cochrane Database of Systematic Reviews* 2011, Issue 9.

Staff Preparation

It is mandatory for staff to follow relevant: “Five moments of hand hygiene”, infection control, moving safely/safe manual handling, documentation practices and to use HAIDET for patient/carer communication: **H**and hygiene **A**cknowledge, **I**ntroduce, **D**uration, **E**xplanation, **T**hank you or closing comment.

Implementation, monitoring compliance

1. Approved clinical guideline will be uploaded to the PPG and communication of updated ‘Diuretic use for babies with or developing CLD in NICU’ clinical guideline to NICU staff will be via email and message on the HUB.
2. Incident investigations associated with this Guideline and Procedure will include a review of process.
3. The Guideline and Procedure will be amended in line with the recommendations.
4. The person or leadership team who has approved the Guideline and Procedure is responsible for ensuring timely and effective review of the Guideline and Procedure.
5. Evaluation will include a review of the most current evidence as well as a consideration of the experience of Neonatal staff at JHCH in the implementation of the Guideline and Procedure.

FEEDBACK

Any feedback on this document should be sent to the Contact Officer listed on the front page.

Reviewers

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Approved

NICU Operational, Planning & Management Committee 06/06/18
JHCH CQ&PCC 26/06/18