Local Guideline

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

NSW GOVERNMENT Health
Hunter New England Local Health District

Postnatal Steroid use in neonates for prevention or treatment of 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

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Keywords	Diuretics, Chronic Lung Disease, CLD, preterm, JHCH, NICU,
Document registration number	JHCH_NICU_12.14
Replaces existing document?	No

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 patient's health record.
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Date authorised	26th June 2018
This document contains advice on therapeutics	Yes Approval gained from Local Quality Use of Medicines Committee on 21st June 2018
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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 steroid administration to infants with CLD are prevented, identified and managed.

The risks are:

- *Hyperglycaemia*
- *Hypertension*
- *Increased risk of infection*

The risks are minimised by:

- *Clinicians having knowledge of clinical side effects/complications of steroids*
- *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
BPD	Bronchopulmonary Dysplasia
CLD	Chronic Lung Disease
CP	Cerebral Palsy
CPAP	Continuous Positive Airways Pressure
ETT	Endotracheal Tube
IC	Inhaled corticosteroids
IVH	Intraventricular Haemorrhage
NEC	Necrotising Enterocolitis
PDA	Patent Ductus Arteriosus
PMA	Post-menstrual Age
PPROM	Prolonged Premature Rupture of Membranes
PVL	Periventricular Leukomalacia
ROP	Retinopathy of Prematurity
RSS	Respiratory Severity Score

GUIDELINE

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

Introduction

Chronic lung disease (CLD) results from the effects of ventilator support on a structurally and functionally immature lung. Chorioamnionitis and an inflammatory cascade have also been implicated in the pathogenesis of CLD, but their precise role is uncertain. CLD is characterised primarily by prolonged need for ventilatory support, O2 requirements, need for home oxygen and readmission with respiratory illness in the first year of life. CLD was in the past defined as oxygen requirements beyond 28 days with abnormal xray[1]. However, a more meaningful definition in the current era is respiratory support (supplemental oxygen or CPAP in air) beyond 36 weeks post-conceptual age[2], which will be used in this document.

The pathological condition of bronchopulmonary dysplasia (BPD) is frequently used interchangeably with CLD. Pathologists can recognize changes in the lungs of infants soon after birth including airway epithelial necrosis and squamous metaplasia, organisation of hyaline membranes, and fibroblastic proliferation in the lung interstitium. This leads to eventual lung fibrosis and emphysematous changes[3].

Early Postnatal steroids (<8 days)

2017 Cochrane review[4] of RCTs had 32 studies from 1972 to 2016, the majority starting the course at <72 hours of age. 13 of these studies had follow up data. Studies used both hydrocortisone and dexamethasone. Most of the beneficial and harmful effects have been described with postnatal use of dexamethasone. Hydrocortisone is associated with reduced rates of Patent Ductus Arteriosus (PDA), mortality and combined mortality and CLD but an increased occurrence of intestinal perforation. Hydrocortisone has not been associated with long term problems; however, studies are limited with small numbers.

Benefits of early postnatal steroids:

- Improved rates of extubation
- Reduced BPD
- Reduced BPD or death
- Lower rate of PDA
- Lower rates of Retinopathy of prematurity (ROP)

No significant effect on:

- Mortality
- Infection rates
- Pulmonary air leaks
- Severe intraventricular haemorrhage (IVH)
- Necrotising enterocolitis (NEC)
- Periventricular leukomalacia (PVL) - early
- Pulmonary Haemorrhage – early
- Major neurosensory disability

Adverse effects:

- Gastrointestinal bleeding
- Intestinal perforation
- Increased risk of: hyperglycaemia, glycosuria, hypertension, hypertrophic cardiomyopathy, growth failure, cerebral palsy (CP) or abnormal neurological exam

The benefits afforded by steroids at this early stage are judged to be outweighed by the side effects and are not recommended by this unit.

Late postnatal Steroids (>7 days)

There were 21 RCTs in the 2017 Cochrane review[5], with all but one using dexamethasone.

Benefits:

- Reduced neonatal mortality at 28 days
- Reductions in failure to extubate
- Reduced incidence of BPD at 28 days of age and 36 weeks PMA
- Reduced need for later rescue steroids
- Decreased need for home oxygen
- Reduced death or BPD at 28 days and 36 weeks
- Trend towards decrease in severe IVH

No significant effect on:

- NEC
- Combined rate of death or CP
- Major neurosensory disability
- Combined rate of death or major neurosensory disability

Adverse Effects:

- Trend toward increased risk of infection and GI bleeding
- Short term hyperglycaemia, glycosuria and hypertension increased
- Increase in severe ROP but no increase in blindness
- Trend towards an increase in CP or abnormal neuro exam (offset by trend in opposite direction of death before late follow up)

More recent reviews have suggested that by targeting those babies that have a high risk of CLD, the use of postnatal steroids may improve the rate of death and CP[6].

Inhaled Corticosteroids (IC)

When comparing inhaled corticosteroids given at >7days to systemic corticosteroids there was no benefit [7,8]. More recently when comparing IC to placebo for prevention or treatment of CLD there has been significant reduction in CLD at 36 weeks PMA (NNT = 14) and a reduction in the use of systemic steroids[9]. Numbers and long-term data are limited.

Indications for steroids

After consideration of the above evidence, therapeutic oral corticosteroids should be offered to babies who fit the following criteria after consultation with the parents, with the aim of improving mortality and reducing the risk and severity of CLD.

Consider giving **early postnatal** steroids:

- For preterm infants (<32 weeks at birth) at 7-14 days of postnatal age AND
- Ventilated or on CPAP with a Respiratory Severity Score **(RSS) of > 2.4**

Respiratory Severity Score[10]
= Mean Airway Pressure (ventilated) or PEEP (CPAP) X Fraction of Inspired Oxygen
For example:

RSS	MAP/PEEP	FiO_2
1.26	6	0.21
1.68	8	0.21
2.4	8	0.3
3.2	8	0.4
3.0	10	0.3
4.0	8	0.5
5	10	0.5

Consider other concomitant factors such as:

- Prolonged premature rupture of membranes (PPROM),
- Chorioamnionitis
- Inadequate antenatal steroids
- Carbon dioxide (CO_2) retention (PCO_2 consistently >70mmHg).
- Male Sex/ severe IUGR

Exclude other possible causes of respiratory deterioration including:

- Infection
- PDA
- Collapse/consolidation/air leaks

- **If the neonate is deemed to require steroids, the appropriate course should be commenced by day 15**
- **If there is concurrent infection steroids can be commenced 48 hours after adequate antibiotic coverage after consultation with the Neonatologist**

Dosage: Dexamethasone[11]:

If RSS >2.4 to 3.2 consider lower dose regimen (same as the DART trial schedule) (0.89 mg/kg/course)

- 0.075 mg/kg/dose 12 hourly for 3 days
- 0.05 mg/kg/dose 12 hourly for 3 days
- 0.025 mg/kg/dose 12 hourly for 2 days
- 0.01 mg/kg/dose 12 hourly for 2 days

→ Reassess after 3 days, if no or little response commence high dose protocol. (Total of 4.05mg/kg/course)

If RSS > 3.2 consider high dose protocol (3.6 mg/kg/course)

- 0.25 mg/kg/dose 12 hourly for 3 days then,
- 0.15 mg/kg/dose 12 hourly for 3 days then,
- 0.1 mg/kg/dose 12 hourly for 3 days then,
- 0.05 mg/kg/dose 12 hourly for 3 days then,
- 0.025 mg/kg/dose 12 hourly for 6 days then cease.

Side Effects

- Hypertension: This occurs quite commonly and usually resolves once steroids are ceased. It is unclear whether there are any benefits to treating it unless persistent.
- Hyperglycemia: Glycosuria occurred only in infants treated with dexamethasone. If values repeatedly exceed 12mmol/L, an insulin infusion may be required.
- Gastrointestinal perforation or bleeding: NBM, clinical assessment/resuscitation, radiograph, bloods (also check coagulation profile)
- Myocardial hypertrophy: Consider if a murmur appears in association with a respiratory deterioration in a baby on steroids. Following the change to lower dose courses, this is now rarely seen.
- Infection: There is an increased risk of infection. The risk may be reduced if care is taken to exclude sepsis prior to starting steroids, or covering sepsis with antibiotics if time doesn't permit.
- Any of these side effects **may** be an indication to stop the steroids early. **This should be done in consultation with the Staff Specialist on call.**

References

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9. Shinwell ES, Portnov I, Meerpohl JJ, et al. Inhaled Corticosteroids for Bronchopulmonary Dysplasia: A Meta-analysis. *Pediatrics.* 2016;138(6):e20162511
10. Iyer NP, Mhanna MJ. Non-Invasively Derived Respiratory Severity Score and Oxygenation Index in Ventilated Newborn Infants. Pediatr Pulmonol. 2013; 48:364–369.
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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 and audit

1. Approved clinical guideline will be uploaded to the PPG and communication of updated ‘Postnatal Steroids 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

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Approved NICU Operational, Planning & Management Committee 06/06/18
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