Extremely Low Birth Weight (ELBW) Bundle of Care for Prevention of Intra Ventricular Haemorrhage (IVH)

Guideline Responsibilities and Authorisation

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Target Audience	Registered Nurses, NNPs, CNS, RMOs, SMOs

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Guideline Review History

Version	Updated by	Date Updated	Summary of Changes
1	Arun Nair, SMO NICU & Leanne Baker, NE NICU	August 2020	First version
1.1	Arun Nair	Dec 2020	Addition of Golden Hour Algorithm for ELBW Babies to Appendix A.

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1 Overview

1.1 Purpose

To reduce Intra Ventricular Haemorrhage (IVH) rates and other morbidities.

1.2 Scope

Waikato DHB staff working in Neonatal Intensive Care Unit (NICU) Delivery Suite and Delivery Theatres.

1.3 Patient / client group

Babies with BW <1000g and/or </= GA 28/40 Weeks

1.4 Definitions

BW	Birthweight
CNS	Clinical Nurse Specialist
CPAP	Continuous Positive Airway Pressure
CVAD	Central venous access device
D10%	Dextrose 10% solution
EBM	Expressed Breast Milk
ECHO	Echocardiogram
ELBW	Extremely Low birth Weight
ETT	Endotracheal Tube
FiO_2	Fraction of Inspired Oxygen
GA	Gestational Age
Glamorgan skin and pressure assessment	Risk assessment tool for skin and pressure injury
Golden hour management	Management in the first hour from birth
HFOV	High Frequency Oscillatory Ventilation
IVH	Intra Ventricular Haemorrhage
LISA	Less Invasive Surfactant Administration
MAP	Mean Airway Pressure

Modified NPASS	A tool used to assess pain and sedation in neonates. It has 5 assessment criteria: crying/irritability, behaviour/state, facial expression, extremities/tone and vital signs.
NNPs	Neonatal Nurse Practitioners
OIT	Oral Immune Therapy
PAL	Peripheral Arterial Line
pCO_2	Partial Pressure of Carbon Dioxide
PRN	pro re nata: as occasion arises
RMOs	Resident Medical Officers
SMOs	Senior Medical Officers
$TcpCO_2$	Trans Cutaneous pCO_2
TPN	Total Parenteral Nutrition
TTV	Targeted Tidal Volume
UAC	Umbilical arterial Catheter
UVC	Umbilical Venous Catheter

2 Clinical Management

2.1 Competency required

- Registered Nurse who has completed ventilator orientation and preferable for nurses with greater than 2 years ventilator experience or who have completed a neonatal intensive care course.
- Neonatal Nurse Practitioner (NNP) / Clinical Nurse Specialist (CNS) / Registered Medical Officer (RMO). All medical staff / NNP / CNS under the Supervision of the Senior Medical Officer (SMO).

2.2 Summary of Bundles

A. RESUSCITATION Bundle

B. CARE BUNDLE for the first 5 days in the NICU (Includes golden hour management)

2.3 Guideline

A. RESUSCITATION BUNDLE

A1 DELIVERY ROOM SET UP AND PREPARATION

- Check Resuscitation Package (refer to section A4).
- Assemble a Resuscitation team (minimum two experienced persons) (if time permits).
- Assign clear roles and brief all personnel prior to delivery.
- Ensure Resuscitation Team readiness: Confirm antenatal discussions, care plans and interventions, whether there has been a Neonatology consultation, check if appropriate doses of steroids and $MgSO4$ have been administered.
- Meet with the parents: Outline the resuscitation plan and address any concerns.

A2 SPECIAL CONSIDERATIONS FOR ELBW BABIES with BW ≤ 750g OR 23-24 Weeks

- Babies of these gestations are at the limits of viability.
- Each case needs to be individualised, according to the parent's wishes and the clinical condition.
- A decision of not to resuscitate is appropriate, if the parents have expressed this wish.
- If < 24 weeks with no antenatal steroids and impending birth at non tertiary hospital - Advise Comfort / Palliative Care.
- Clinical decisions to resuscitate should take into account antenatal steroid coverage, obvious sepsis, and congenital malformations.
- If resuscitation is started with mask and Neopuff ventilation, assess the response to resuscitation by the response of the heart rate in deciding whether to continue or stop after an adequate period of effective ventilation.
- It is usually inappropriate to provide chest compressions or medications at these gestations.
- It is usually appropriate to attempt full resuscitation at these gestations and beyond unless there any underlying congenital defect not compatible with long time survival.
- Refer to Waikato DHB NICU Guideline: Resuscitation of Marginally Viable Infants (ref: 5773).

A. RESUSCITATION BUNDLE

Continued...

A3 RESPIRATORY CARE in Delivery Suite/Theatre/NICU

- If the baby is spontaneously breathing offer CPAP as the initial mode of respiratory support.
- For Intubations:
- Ideally 2 clinicians to be present (intubation by experienced NP / CNS / medical personnel only).
- Treatment thresholds for Surfactant: (pre-warm e.g. Surfactant vial to body temp)
  - For babies with GA </= 26/40 - FiO2 > 0.3 and for babies with GA >26/40 - FiO2 > 0.4
  - Curosurf Dose: 200mg/kg (2.5 ml/kg) for initial dose, followed by 100mg/kg (1.25 ml/kg) for additional doses.
- If the baby is on CPAP: Consider LISA technique (and positioning, wrapping and holding baby to reduce the stress).
- If the baby is intubated: Avoid ETT disconnection for surfactant administration; use an ETT adapter if it is available, change to in-line suction adaptor some hours later after the surfactant is given.
- Secure ETT prior to transfer to NICU.

A4 RESUSCITATION PACKAGE

In addition to routine equipment / procedures for the management of high risk infant, resuscitation and stabilisation of babies with < 1Kg (expected) BW or < 26 weeks gestation includes:

- Inform consultant: Ensure at least two pairs of experienced hands, ideally an SMO plus assistants.
- Request the NICU ACNM / shift co-ordinator or a senior nurse to accompany initial medical / NNP responder.
- Curosurf™ – 200mg/kg (2.5 ml/kg) first dose followed by 100mg/kg (1.25ml/kg) for subsequent doses.
- Size 5 feeding tube for administration of surfactant, clean scissors.
- Sterile plastic wrap e.g. NeoWrap™ or plastic bag, placed on resuscitaire to pre-warm (if using plastic bag pre-cut right hand bottom corner).
- Pre-warmed radiant warmer bed to transport infant maintaining temperature through transfer to NICU).
- Check Laryngoscope and blades sizes 00/0.
- 2.0, 2.5 & 3.0 ET tube with stylet inserted as required.
- Pedicap™
- Pre-cut tapes of appropriate sizes for oral and nasal fixation of ET tubes.
- ECG leads / pads.
- Delegate tasks, so everyone knows their responsibility at delivery including documentation.

A. RESUSCITATION BUNDLE

Continued…

A4.1 Resuscitation Reminders in DS/OT

ENSURE DELAYED CORD CLAMPING AT DELIVERY

- Cord clamping delayed for 1 minute (unless needing urgent resuscitation).
- Baby needs to have head up and feet down while waiting, making sure that the baby is below or at level with the placenta (advise obstetric team).
- Seek advice to collect sample for Placental histology.
- **Avoid prolonged sustained inflations (>3 Seconds) as a part of resuscitation in these group of babies.**
- Plastic wrap (do not attempt to dry the baby).
- SpO2 monitor and probe to the right wrist.
- ECG leads / pads for placement under the baby.
- Cord blood sampling: Arterial and Venous, pH and lactate.
- Ensure room temp is warm (ideally 24-26 degree C) and all linen used is pre-warmed.
- Elevate head end of the bed to approximately 30 degrees.
- Vitamin K injection (<1500g, 0.5mg, ≥1500g 1mg) – (Refer Vitamin K (Phytomenadione) for Neonates drug guideline (Ref. 2980)).
- Avoid weight check and other measurements in Delivery Suite / Theatre.
- Positioning to keep the head in the midline, **avoid undue lifting or turning of head at all times.**
- **Transfer the baby to NICU on CPAP or IPPV, only after stabilisation in the Delivery Suite/Theatre. Allow for dad or designated member of the family to accompany the baby to NICU.**

A4.2 Preparation for admission in NICU (simultaneously by another team)

- Ensure Omnibed™ is pre-prepared for infant (can use it for the next 72 hours).
- Humidity to be adjusted to 85-95%.
- Loose rolls for easy access or removal when placing lines and for doing x-ray.
- Weigh the infant using Omnibed™ scale - level bed slowly prior to weigh, elevate bed slowly immediately after weighing. If no Omnibed™ available ensure alternate scales zeroed and ready.
- Measuring tape opened and positioned for head circumference and length.
- Check and lower the volume of alarms on monitors and ventilators as low as is clinically safe.
- Prepare the necessary line set up, CPAP circuits, prongs and medications (caffeine and prophylactic antibiotics) ready for administration before TPN is connected. Consider infusing D10% via UVC/ peripheral line if present, if any delay in commencement of TPN is anticipated.

B. CARE BUNDLE for the first 5 days in the NICU (Includes golden hour management)

IT IS PREFERABLE FOR THESE BABIES TO BE CARED FOR BY NURSING STAFF WITH GREATER THAN 2 YEARS VENTILATOR EXPERIENCE OR WHO HAVE COMPLETED A NEONATAL INTENSIVE CARE COURSE.

IT IS NOT APPROPRIATE TO USE THESE BABIES FOR ORIENTATION PURPOSES DURING THE FIRST WEEK OF LIFE

B1 ENVIRONMENT - includes bed position / weighing

- Admit all babies with BW </= 1000g into a pre-warmed Giraffe Omnibed™ bed with humidification on at 85-95%.
- Use Omnibed™ with set Comfort Zone in order to optimise bed settings for infant weight and gestation.
- Elevate head end of the bed to maximum allowed on the Omnibed™ (up to 30 degrees).
- If bed needs to be levelled for any reason - be slow and steady.
- Consider "Deep nesting" of infant to promote neurodevelopmental stability.
- **Use of incubator scales - no routine weights for the first 5 days after birth.** Use the birth weight (BW) unless otherwise indicated by clinical status.
- If weight check or for any other procedure lifting is required - MUST be done as a 2 person process (see below) ensure minimal linen change for the first 5 days (no routine linen changes).
- For X-ray - level the bed and use incubator x-ray tray whenever possible.
- Minimize noise and light levels in the room - use Giraffe incubator drape if available but ensure visibility of the baby at all times.
- Take particular care to prevent temperature loss during procedures like UVC, UAC line placements and Intubations. Make sure that the temperature probes are attached to the skin and the servo is turned on.
- Use air curtain when accessing the incubator portholes or opening the side door to avoid heat loss.
- Refer to Waikato DHB NICU Nursing Procedure: Temperature Control of infants in NICU (ref: 1476) for management of temperature.

B. CARE BUNDLE for the first 5 days in the NICU (Includes golden hour management)

Continued.....

B2 MONITORING

Temperature - measure baby's temperature as soon as possible on arrival prior to procedures as normo-thermia is one of the parameters for outcome measures.

BP/Vital sign monitoring Blood pressure MUST be obtained as soon as the baby is clinically stable.

When UAC is present:

- If arterial line is present, avoid chest or limb leads - heart rate may be obtained from arterial pulses.
- Do not use chest or limb leads - heart rate may be obtained from arterial pulses.
- Do not use manual BP unless clinically unstable and correlation is required.
- Any flushing / withdrawal needs to be slow and steady (minimum 30 seconds each step).
- Ensure umbilical lines are well secured - if duoderm or bridging is required for active infant - ensure minimal surface area of duoderm in contact with skin.
- Minimise blood sampling as possible - consider using 0.15ml arterial sample for blood gas.

When no UAC is present

- Use only limb leads for cardio respiratory monitoring.
- If clinically stable, cuff BP 1-4 hourly only as clinically indicated (re-site cuff 4 hourly).

Non-Invasive Monitoring

- Peripheral temperature sensor is best on the hand or wrist secured with sticky foam or a small piece of silicone tape - change location 4-6hrly.
- Skin temperature probe to be placed on non-bony area (i.e. abdomen) secure with silicone tape and then reflective heart cover - silicone tape is repositionable and safe on immature skin.
- PCO2 monitoring by blood gases (ensure PCO2 is within normal range 4.6 – 6.2 kPa), consider use of TcPCO2 if there is no UAC.

B. CARE BUNDLE for the first 5 days in the NICU (Includes golden hour management)

Continued…..

B3 TESTS AND PROCEDURES

UAC/UVC Placements - limit attempts to within one hour if possible, or retry later when more stable: (To be attempted by the most experienced NNP/ Registrar/SMO on the shift)

- Careful measurement and calculation of insertion depth in order to avoid later re-adjustment.
- Arterial line sampling technique - slow and steady. Refer to Waikato DHB NICU Nursing Procedures: Arterial Line: Catheterisation and Set Up Umbilical and Peripheral Arterial catheter in NICU (Ref:1637) and Arterial lines in Neonates – sampling, nursing management and removal (Ref: 1638)
- Glucose monitoring with blood gases via the UAC, if it is present.
- Lumbar puncture should be avoided until after 72 hours if possible.
- If infant requires an invasive procedure (PAL, chest tube, CVAD) consider Fentanyl bolus prior to procedure.
- Consider blood transfusion as per Waikato DHB NICU Medical Procedure: Blood transfusion: Threshold for top up in Newborn Intensive Care Unit (Ref:1645).
- **Routine head ultrasounds** should be deferred until 72 hours unless there are specific decision making concerns - will require 2 people to retain positioning as required to complete the test.
- Consider point of care ECHO to assess haemodynamic significance.
- **Participation in research and Studies** - as consented by the medical team, Careful consideration of blood tests requested in order to avoid iatrogenic anaemia.

B4 RESPIRATORY SUPPORT

- CPAP via prong / mask – cycle 4-6 hourly: Initial settings- 6cm/6L flow (Clean the ears gently before putting on CPAP hat.
- Do not remove /replace CPAP hat if possible - ensure hat is not too tight (should be able to insert the pinky finger tip under rim of hat - check forehead / ears during cares for pressure area and positioning.
- If intubated connect to ventilator as soon as possible once intubated (minimise Neopuff and bagging).
- If ventilated: initial settings - TTV: Inspiratory volume 4-6mls/kg, max pressures 25/5, MAP 8 (consider HFOV if needing higher setting).
- Aim for blood gas pH > 7.25.
- No routine suctioning - if suctioning is clinically indicated, provide comfort measures before, during and after the procedure.
- Avoid changing ETT for first 72h if at all possible (even if oral ETT).

B. CARE BUNDLE for the first 5 days in the NICU (Includes golden hour management)

Continued…..

B5 MEDICATIONS

Refer NICU Drug guidelines

- Caffeine loading dose as soon as practical, if possible before starting TPN. Refer to the Caffeine Citrate for neonates drug guideline (Ref. 0591).
- Antibiotics within 1st hour unless known that mother has had a recent dose of Intrapartum Antibiotic Prophylaxis.
- Hydrocortisone low dose for babies with GA < 28 weeks. Refer to the Hydrocortisone for neonates drug guideline (Ref. 2928).
- Vitamin K IM if not already given at birth.
- Probiotics

B. CARE BUNDLE for the first 5 days in the NICU (Includes golden hour management)

Continued.....

B6 HANDLING AND POSITIONING *(ensure minimal handling at all times)*

Cue based cares wherever possible:

- Keep head and body in line at all times (ears, shoulder and hips should be in a straight line).
- Deep nesting to be used to facilitate positioning and musculoskeletal development.
- Use rolls or positioning devices as appropriate to keep the head and neck in line with the body.
- Neck rolls (folded not rolled) for CPAP babies - in ventilated babies, only as indicated (not routinely required) - neck supports must not exert direct pressure on neck during lateral positioning.
- No prone positioning for 5 days even if no umbilical lines are present.
- Nurse infant in lateral or supine midline position only - reposition 4-6hrly as indicated, ¼ to ½ turns only, if baby is stable.
- Skin to skin or kangaroo cuddles should not be offered during the first 5 days of life and while umbilical lines in place except if the baby is for palliative care.
- **Two person handling and repositioning for**:
- Any repositioning which involves movement of the head
  - Weighing or linen change (if indicated - refer above).
  - Transfer to other incubator or radiant warmer (if indicated).
  - Removal of polyethylene occlusive plastic wrap following completion of procedures/lines etc. (as per Waikato DHB NICU Nursing procedure: Admission to Level 3 Intensive Care Nursery in NICU Ref: 4571).
- Head Circumference - initial measurement to be performed after admission - gently slide the tape under to minimise lifting the head off the bed.
- **Assessments** (healthcare team) must be kept to a minimum
  - Group all assessments (medical / surgical / nursing / physio) as possible.
  - ALL examinations should be focused and brief.
- **Nappy care** - lift from the hips and slide under (do not lift legs).
- **Fontanelle checks** - No routine assessments or head massage at least for five days.
- **Skin care** - complete Glamorgan skin and pressure area assessment form within 8hours of admission then with handling / cares 2-4 hourly/PRN - back assessment: observe during lateral position) use paraffin gauze on the vulnerable areas PRN at risk of break down.

B. CARE BUNDLE for the first 5 days in the NICU (Includes golden hour management)

Continued…..

B7 MANAGEMENT OF PAIN AND DISCOMFORT

- Monitor pain and sedation scores using Modified NPASS; manage pain/sedation scores using Waikato DHB NICU Nursing Guideline: Neonatal pain and sedation: Assessment and nursing management in NICU (Ref: 1684).
- Pain scoring should be ordered on daily fluid and management chart.
- Minimal handling and / or cluster cares as tolerated to allow rest periods - must be individualised based on infant condition and tolerance of stimulation.
- Gentle handling always.
- Provide non-pharmacologic and / or pharmacologic measures to reduce pain for all stressful and/or painful procedures.
- Avoid Midazolam, if possible.

B8 LIGHTING & VISUAL STIMULATION

- Minimise light levels where appropriate. Protect infant’s eyes from bright light during cares.
- Reduce exposure to light in incubators by using a drape. Provide eye protection for infants receiving phototherapy, shield light from infants in adjacent incubators / cots.
- Visual toys and pictures are not appropriate for this gestational group. Ensure toys and pictures are not placed within direct visual space.

B9 SOUND AND HEARING

- Minimise environmental noise.
- Be aware of sound / noise levels in NICU (talk softly at the bedside).
- Observe **NICU quiet times** (1330hrs-1430hrs) - no disturbance unless for emergency / resuscitation.
- Attend to alarms promptly and set alarm volume as low as is clinically safe.
- Decrease volume / tone of telephone ring and no radios in rooms.
- Close incubator doors quietly. Do not tap or bang on incubator.
- Discourage the use of the top of the incubator as a writing surface and or storage area.
- Ensure CPAP and ventilator tubing is regularly cleared of water condensation.
- Audio tapes are not recommended for this gestational group.

B. CARE BUNDLE for the first 5 days in the NICU (Includes golden hour management)

Continued…..

B10 NUTRITION

- Encourage hand to mouth contact.
- No pacifier unless sucking cues evident.
- Use fresh not frozen EBM for mouth care. Refer to Waikato DHB NICU Medical Procedure: Oral Immune Therapy in NICU (Ref: 6169).
- Trophic feeds with EBM if available from Day 1.
- Start Probiotics - either with adequate amounts of EBM or - if EBM unavailable - sterile water may be used to mix probiotic.
- Commence D10% while waiting on line confirmation to maintain blood glucose - change to D10%, Sterile Water, Preterm Starter solution and Preterm Lipid once CVAD is in correct position - fluid changes as prescribed.
- Advance oral feeds as tolerated.

B11 SMELL AND TASTE

- Commence Oral Immune Therapy as soon as EBM available - parents may familiarise their infant with the smell of breast milk by using milk soaked gauze prior to available OIT.
- Discard used gauze immediately after use.

3 Audit

3.1 Indicators

Yearly IVH Outcome Data.

3.2 Tools

ELBW Database.

4 Evidence base

4.1 Bibliography

- NICU IVH bundle for all infants below 30 weeks GA. Mt Sinai Hospital, Toronto: Promoting Brain Health. (Nov 2016) https://www.mountsinai.on.ca
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4.2 Associated Waikato DHB Documents

- Lippincott Procedures - Developmental support, Neonatal
- Waikato DHB NICU Medical Procedure: Blood transfusion: Threshold for top up in Newborn Intensive Care Unit (Ref:1645)
- Waikato DHB NICU Medical Procedure: Oral Immune Therapy in NICU (Ref: 6169)
- Waikato DHB NICU Medical Guideline: Resuscitation of Marginally Viable Infants (ref: 5773)
- Waikato DHB NICU Nursing Procedure: Admission to Level 3 Intensive Care Nursery in NICU Ref: 4571)
- Waikato DHB NICU Nursing Procedure: Arterial Line: Catheterisation and Set Up Umbilical and Peripheral Arterial catheter in NICU (Ref:1637)
- Waikato DHB NICU Nursing Procedure: Arterial Lines in Neonates – Sampling, Nursing Management and Removal (Ref: 1638)
- Waikato DHB NICU Nursing Guideline: Neonatal pain and sedation: Assessment and nursing management in NICU (Ref: 1684)
- Waikato DHB NICU Nursing Procedure: Temperature Control of infants in NICU (ref: 1476)

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Appendix A: Golden Hour Algorithm for ELBW Babies