Neonatal Clinical Resources

MATERNITY

Christchurch Women’s Hospital

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Ref.2403289

Approved by: Clinical Director Neonatal

July 2020
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NEWBORN RESUSCITATION ALGORITHMS

Term (≥ 37 weeks)

CALL for HELP at any time

- Birth
  - Breathing or crying
  - Good muscle tone
- Yes
  - Dry
  - Warm – skin/skin
  - Observe colour and breathing
- No
  - Dry and provide warmth
  - Assess breathing, heart rate, colour and tone
- Yes
  - Cyanosis but breathing well with good heart rate
  - Consider CPAP
- No
  - Check head position
  - Give positive pressure ventilation in air: 5 inflation breaths then ventilation breaths for 30 seconds
- Meeting criteria for PPV – no regular respiratory effort, gasping or HR < 100
  - Assess chest movement and heart rate response
  - Attach oximeter to right hand or wrist and then turn on

1 minute

Continuously reassess – at least every 60 seconds

- HR > 100 bpm
  - Breathing regularly
- HR > 80 but < 100 bpm
  - Apnoeic or irregular respiration
- HR < 80 bpm
  - Centrally blue or white
  - Apnoeic or gasping

If respiratory distress give CPAP in air

Increase oxygen by 10-20% every 30 seconds to meet target saturations

Continue IPPV and increase oxygen by 10-20% every 30 seconds to meet target sats

If chest movement inadequate, check seal and position, increase PIP, consider intubation

If HR < 80 bpm start chest compressions at 3:1 with lung inflation – oxygen to 100%

Reduce oxygen by 10-20% every 30 seconds to meet target saturation

TARGET SpO2
- 1 min: 60-70%
- 2 min: 65-85%
- 3 min: 70-90%
- 4 min: 75-90%
- 5 min: 80-90%
- 10 min: 85-90%

Authorized by Clinical Director Neonatal Services
Ref.237134 July 2016
Preterm (< 37 weeks)

CALL for HELP at any time

If < 28 weeks a consultant should be present

1 minute

Meeting criteria for PPV – inadequate respiratory effort, apnoea, gasping or HR < 100

YES

- Check head position
- Give positive pressure ventilation in 30% oxygen: 5 inflation breaths and then ventilation breaths for 30 seconds
- Assess chest movement and heart rate response
- Attach oximeter to right hand or wrist and then turn on
- If infant < 28 weeks consider intubation to give surfactant

NO

Assess breathing, heart rate, colour and tone

Continuously reassess – at least every 60 seconds

- HR > 100 bpm
- Breathing regularly
- If respiratory distress or cyanosis give CPAP in 30% oxygen
- Alter oxygen by 10-20% every 30 seconds to meet target saturations

- HR > 60 but < 100 bpm
- Apnoeic or irregular respiration
- Continue IPPV and alter oxygen by 10-20% every 30 seconds to meet target sats
- Consider intubation

- HR < 60 bpm
- Centrally blue or white
- Apnoeic or gasping
- If chest movement is inadequate, check seal and position, increase PIP, consider intubation
- If HR < 60 bpm start chest compressions at 3:1 with lung inflation – oxygen to 100%
- If no improvement intubate, give adrenaline via ETT, site UVC, UVC adrenaline, consider volume expansion

TARGET SpO2

1 min 60-70%
2 min 65-85%
3 min 70-90%
4 min 75-90%
5 min 80-90%
10 min 85-90%

Reduce oxygen by 10-20% every 30 seconds to meet target saturation
NEWBORN ASSESSMENT AND DOCUMENTATION

Newborn Observation Chart and Newborn Early Warning Score (NEWS)

- Newborn observations are part of the 0-2 hour and 24 hour newborn assessments completed in the majority of babies by their LMC. We recommend these are documented on the Newborn Observation Chart (C280106 Ref.6676) to provide a single view of clinical information and assist in recognising trends which may indicate a baby's condition has deviated from the norm.

- Early warning scores are now part of the standard of care for the Canterbury Health System which is the purpose of the introduction of NEWS as a component of the Newborn Observation Chart. Early warning scores aim to augment clinical decision making in detecting early the deteriorating baby/patient and accessing higher levels of care earlier to improve outcomes.

- For some newborns, there are impacts from antenatal risk factors, in-utero growth and intrapartum events that increase the risk for term and near term newborns to show signs of compromise. The gestation group of babies 35-41+ weeks are mostly cared for on postnatal wards from birth. 8-9% of term infants 37 weeks or more are admitted to the neonatal unit but they account for 50-55% of the admissions to NICU's.

- Audit has shown that the babies who transfer from a secondary care facility to a primary facility before 6 hours of age have been identified as a higher potential for retrieval if they have been exposed to sepsis risk, meconium or fetal distress and are included in the NEWS risk factor group.

Rationale for Newborn Observations

The key risk factors for newborns needing higher levels of observation and care include:

- Late preterm infants: born at 35 and 36 weeks gestation
  Transition and metabolic adaptation are compromised. They are at higher risk of temperature instability and hypoglycaemia. They are more likely to have poor feeding. Approximately 65-70% are admitted to NICU for part or all of their postnatal stay.

- Babies with risk factors for sepsis at any gestation
  Those at highest risk for postnatal sepsis include: prolonged rupture of membranes before delivery, maternal fever or signs of infection, Group B Strep status, and previous infant with Group B Strep sepsis. Signs and symptoms usually develop in the first 24 hrs. Intrapartum antibiotics reduce the risk when ≥2 doses are given.

- Babies at risk for hypoglycaemia – including babies who are small for gestation age:
  weight < 9th%, babies born to mothers with diabetes, those babies large for dates > 98th%
  Blood sugar < 2.6mmol/L on repeated occasions is associated with adverse neurodevelopmental outcome. High risk groups are identified for early detection. Includes maternal diabetes especially if poorly controlled and requiring insulin. SGA infants are at increased risk of hypoglycaemia, altered post-natal adaptation, including impaired thermoregulation and polycythaemia which further increases the risk of hypoglycaemia.

- Babies who experience fetal distress / intrapartum compromise (including cord lactate > 5.8)
  These babies are at increased risk of respiratory distress, impaired transition and hypoglycaemia.

- Babies exposed to meconium (all thick or particulate meconium, or thin meconium where the 5 minute Apgar score is 8 or less, or needed resuscitation/IPPV/CPAP for more than 5 minutes.)
  Meconium aspiration is more common with thick or particulate meconium (16-19% develop respiratory distress) or where the 5 min Apgar was < 9 and resuscitation needed. Symptoms often occur in first 6 hrs.

- Babies whose mother had opioids during labour
  Increases risk of respiratory depression

- In utero growth restriction
  Identified as asymmetric growth percentiles for weight (more than 2 percentile lines below length percentile). Important when associated with other risks, eg. meconium and fetal distress. These babies appear wasted and have little subcutaneous tissue.

- Babies of mothers on beta blockers
  Associated with hypoglycaemia and SGA
Document gestation, birth weight and weight centile (calculated on WHO chart)

Saturation recording only for babies at risk or if concerns. Record actual saturation result in relevant range box.

Blood glucose recordings only for babies at risk (see reverse of chart) or if concerns. Record actual result in relevant range box. For hypoglycaemia guideline see “When to Use NEWS” on reverse.

Place a tick (✓) in the box which represents the baby’s condition.
**COMPLETE RISK ASSESSMENT BELOW FOR ALL BABIES**

<table>
<thead>
<tr>
<th>RISK</th>
<th>OBSERVATION REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mark with a ✓ all boxes that apply</td>
<td></td>
</tr>
<tr>
<td>All babies</td>
<td>Identify any area of risk and all boxes that apply</td>
</tr>
</tbody>
</table>

**NOTE:** prior to transfer (to a primary unit before 24 hours) a baby with risk factors must have a repeat NEWS of 0

<table>
<thead>
<tr>
<th>RISK</th>
<th>MINIMUM REQUIRED NEWS OBSERVATIONS</th>
<th>OXYGEN SATS MONITORING</th>
<th>BLOOD GLUCOSE MONITORING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(respiratory rate, work of breathing, heart rate, temperature, behaviour, feeding)</td>
<td>To be performed on either foot until stable</td>
<td>Perform if signs or symptoms hypoglycaemia apparent</td>
</tr>
<tr>
<td>Intrapartum IV/IM opioid analgesia or general anaesthesia</td>
<td>At 1 and 4 hours post birth</td>
<td></td>
<td></td>
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<tr>
<td>Maternal GBS/PROM with or without intrapartum antibiotics, or other sepsis risk (suspected or clinical chorioamnionitis, maternal temperature greater than 38°C, previous GBS baby)</td>
<td>At 1 and 4 hours post birth, if birth less than 4 hours post intrapartum antibiotics, stay for 6 hours</td>
<td></td>
<td>Perform if signs or symptoms hypoglycaemia apparent</td>
</tr>
<tr>
<td>Meconium exposure: all thick, OR thin, only if agaer less than 9 at 5 minutes or resus needed</td>
<td>4 hours for 24 hours</td>
<td></td>
<td></td>
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<tr>
<td>Severe intrapartum fetal compromise, eg. one or all of: pH less than 7.1, IPPV greater than 5 mins or resus greater than 10 mins, agaer less than 7</td>
<td>At 1, 4, 24 hours post birth</td>
<td></td>
<td></td>
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<tr>
<td>Less than 37+4 weeks</td>
<td>3 hours before feeds until a total of 3 consecutive results are 2.6 mmol/L or above</td>
<td></td>
<td></td>
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<tr>
<td>Below 9th centile weight on growth chart</td>
<td>At 1, 4, 24 hours post birth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Above 85th centile weight on growth chart</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Maternal diabetes (infant of)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe intrapartum fetal compromise, eg. one or all of: pH less than 7.1, IPPV greater than 5 mins or resus greater than 10 mins, agaer less than 7</td>
<td>At 1 and 4 hours with NEWS observations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small or large babies are better identified using a growth centiles rather than weight cut-offs such as &lt; 2.5 or &gt; 4.5 kg</td>
<td>Greater than 3 mmol/L, not for transfer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other risks/concerns eg limited antenatal care, feeding concern</td>
<td>Other:</td>
<td></td>
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**Instrumental birth – vacuum and/or forceps, including forceps during caesarean section (risk for Subgaleal Haemorrhage)**

**Any of the following:**
- Total vacuum extraction time less than 20 minutes
- Up to 3 pulls
- No or 1 cup detachment
- Attempted instrumental birth

**Any of the following:**
- Total vacuum extraction time more than 20 minutes
- More than 3 pulls
- 2 or more cup detachments
- Agaer < 7 @ 5 mins
- At clinician’s request

**Observations required:**
- NEWS, frequency: __________________________
- O2 sat, frequency: __________________________

**Record escalation of care communication and outcomes in clinical notes**

**MODIFICATIONS** (completed by Neonatal team only)

<table>
<thead>
<tr>
<th>Vital signs observation</th>
<th>Accepted values and modified NEWS</th>
<th>Date and time</th>
<th>Duration</th>
<th>Initial/sumame/contact details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reason:</td>
<td></td>
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**Newborn Early Warning Score (NEWS) – ESCALATION PATHWAY**

1. Repeat in 1 hour, if unchanged notify person in-charge, eg. ACMM, and discuss with Registrar/CNS-ANP/NP
2. Reassess feeding as per feeding chart and discuss with snr MW, if no improvement escalate to Registrar/CNS-ANP/NP
3. Requires immediate review by Registrar/CNS-ANP → Consider emergency call to Neonatal Team (CW 777)

Ref: 2403289
Approved by: Clinical Director Neonatal
July 2020
Newborn Assessment 0-2 hours

- Two New Zealand documents provide guidance on the initial newborn examination in the first 2 hours
  - The Well Child Tamariki Ora schedule 2015
  - Consensus statement of the NZCOM and MOH 2012 on Observation of the Mother and Baby immediately after birth.

- It is the LMC’s responsibility to ensure that the 0-2 hour check is completed and documented on the QMR0044 form including any variances to be considered. If there is no documentation it is assumed to not have been done.

- The newborn assessment undertaken between 0-2 hours is detailed in the Tamariki Ora Well Child schedule. Cardio respiratory stability and transition from intrapartum physiology forms a component of this assessment which includes:
  - respiratory rate (counting for a full minute)
  - breathing effort
  - heart rate
  - central colour and perfusion
  - temperature
  - Inspection review for major anomalies such as cleft palate, anal atresia, syndromes forms another assessment component

- The NZCOM Statement identifies that ongoing assessment of the baby includes, but is not limited to reviewing:
  - colour, heart rate, respiratory rate, temperature, airway integrity and overall condition
  - tone and activity
  - ability to breastfeed
  - It also addresses the importance of observation during the initial skin to skin period.

- After birth the baby needs their risk category to be reviewed and documented. This will dictate when they require NEWS observations and if oxygen saturations and blood glucose monitoring are also required. Refer to document C280106.

- Canterbury has a high transfer rate to complete postnatal care in a primary birthing facility. Documentation of suitability for safe transfer will be enhanced by utilising the observation record chart for the 0-2 examination measures and undertaking a NEWS assessment before transfer.

- We propose that the respiratory rate and effort, heart rate and colour and temperature are recorded on the Newborn Observation Chart for all babies as a standard of care, to document these in one place and in sufficient detail.

Newborn Assessment 24-48 hours

- A full newborn examination should take place in the first 48 hours – usually from 24 hours age

- This check should occur in the presence of the mother so a history can be obtained and any concerns addressed

- Involves reviewing the maternal notes to check blood and scan results and taking a history from the mother to check for any concerns in pregnancy, family history of newborn problems (heart, hips, kidney diseases)

- Documentation for babies at CWH:
  - Second column on the back of the QMR0044.
  - Page 42 of the Well Child Book should also be filled in to show it has been done.
  - MMPO have a Baby Summary page – if LMC uses this a photocopy should be put in CDHB notes
  - If the QMR 0044 is used the LMC can take a copy for her records.

- Registrars and CNS/ANP to measure oxygen saturations on all babies when doing the full newborn check

- Midwives will check oxygen saturations on selected babies as documented in the NEWS
  - 1 and 4 hrs: intrapartum opioid analgesia, severe fetal distress
  - 1 and 4 hrs and prior to transfer: sepsis risk, meconium exposure
  - 12-24 hrs age: < 37 weeks, < 9n% weight, > 98n% weight or infants of diabetic mothers

- Saturations to be checked on either foot until they are stable and should be ≥ 95%. If they are < 95% recheck sats on the right hand and then if still <95% refer to the Neonatal Team to assess and investigate for a cardiorespiratory cause for lower saturations.
Handy Examination Hints

Top to toe examination
- Often best to listen to the heart before they are undressed and crying
- Have the ophthalmoscope on and at the ready at all times so that if the baby opens their eyes you can easily check the red reflex – impossible to do once they are crying
- Leave the hips until the end as it often makes the babies cry, you need them to be not crying to do the hip exam!

Head
- Size and shape
- Cephalhaematoma or caput
- Fontanelle – size and feel
- Facial features – any dysmorphism
- Ears – not low set or malformed
- Nose – patent nostrils
- Eyes – red reflex, pupil shape normal

Abdomen
- Shape
- Distension
- Umbilical cord healthy
- No umbilical hernia
- Any masses
- Femoral pulses – can be hard to feel, be persistent, easier when baby is quiet
- Testes – descended, undescended, hydrocoele
- Presence of inguinal hernia – rare at newborn exam

Trunk
- Shape
- Spacing of nipples
- Respiratory distress
- Back
- Spine
- Skin intact
- Any pits or tufts of skin over the spine

Back
- Spine
- Skin intact
- Any pits or tufts of skin over the spine

Other
- Tone
- Moro reflex
- Cry
- Irritable/Lethargic

Limbs
- All present and correct
- Correct number digits
- Polydactyly, syndactyly
- Palmar creases
- Talipes
- Hips – dislocatable or dislocated

Trunk

Another newborn check should also occur in the first week as described in the Tamariki Ora schedule. This is the responsibility of the LMC. We recommend a second check on Day 4 / 5 and the baby is reweighed at this time.

If weight loss is > 7 % review feeding, if > 10% assess clinically and consult with Neonatal (if inpatient) and Paediatrics (Children’s Acute Assessment Unit if discharged), if > 12.5% urgent referral to CAA.

Responsibility for the Newborn Assessment

Checks that are the responsibility of the Midwife
- NVD
- Uncomplicated instrumental deliveries
- Caesarean sections (all categories) where the Newborn Observations are normal and there are no additional concerns
- Babies of mothers with diabetes – refer for Neonatal input if there are blood sugar issues as per the guideline
- Breech deliveries – Neonatal team to be consulted if there are concerns about unstable hips for a second opinion and to ensure the hip referral forms are completed but the Neonatal team do not need to complete the full examination and this can be done by the midwife prior
- Babies briefly in NICU for < 4 hours who have normal Newborn Observations
• LMC’s are responsible for ensuring that the initial and 24 hour check are completed.
• If a midwife is not confident with performing this examination they should seek support from their midwifery colleagues or Neonatal Service ward Reg/CNS who can do the assessment with them.
• They can also seek further training from the midwifery educator at a convenient time.

Checks that are the responsibility of the Neonatal Team
• Antenatal consultation with the Neonatal Team
• Preterm delivery < 37 weeks
• Congenital abnormality
• An LMC or core midwife can request a review by the Neonatal Team at any time if they have any concerns such as respiratory distress, abnormal exam findings, unstable hips, murmur or antenatal anomalies that need follow-up
• Babies admitted to NICU for > 4 hours.
• Babies admitted to NICU for < 4 hours should be reviewed by the NICU Team but the full baby check may be able to be done by the LMC if there are no ongoing concerns.
• Babies born to mothers with complex mental health issues where it has been identified antenatally by the Mothers and Babies team that Neonatal review would be beneficial.

NICU Team Prioritisation of Neonatal Reviews on Postnatal Ward
• When covering the postnatal ward print off a patient list in the morning from Floview.
• The babies that need a check have a flag in the NICU section on Floview.
• Make contact with the maternity co-ordinator (pager 5128) and/or maternity discharge facilitator (pager 5034) on arrival on the ward to discuss prioritisation of workload.
• There is a handover book that sits beside the patient board on Level 5 and is a place to document any babies that need further review or tests followed up.
• It is imperative to use this as a way of communication to maintain continuity of care as there are a number of staff covering the postnatal ward during the week and weekends.
• Midwives or GP’s may contact the postnatal staff member for assistance with organising follow-up hip scan, renal scans and prophylactic antibiotics if the baby was not born at Christchurch Women’s. It is easier for us to arrange the tests and this ensures they will get appropriate follow-up if needed.
• Before referring babies to consultants in other specialties we prefer that you discuss the abnormality you have found with the neonatal paediatrician on call or on service. Referrals to clinics or for investigations should always take place in the context of a full discussion with the parent(s) and notification of the GP and/or LMC.
• Electronically sign off the results of all babies reviewed by the Neonatal Team on the postnatal wards on a daily basis and at discharge.

Process to Contact the Neonatal Team

MOH Referral guidelines (2012) identify reasons for referral

At Christchurch Women’s Hospital
• If an LMC OR core midwife identifies a problem with a baby at any time referral to the Neonatal Team can be requested. Pager 5039 (0830-1630 week days), Pager 5019 (after 1630 or at the weekend).
• Problems may include: any cardiorespiratory symptoms
  any abnormality found on the 0-2 and full newborn check
  abnormal hip, heart and eye examination
  anomalies detected in pregnancy where neonatal review is required, eg.
  cardiac, renal, ventriculomegaly, other
  babies who are being screened for at risk for hypoglycaemia who have a blood sugar < 2.6 mmol/L

At Primary Units and St Georges
• LMC’s can refer to Private Paediatricians if available. If this is not an option and there are concerns then a call to the Neonatal Team is appropriate to determine the next steps.
• If the newborn has an **acute** problem then a call to the NICU ACNM via the hospital operator on Pager 5088 or 027 702 1652 should occur promptly as the first point of contact

**If a baby requires follow-up in clinic then there are two options**

• **Paediatric Outpatients** with a specific Paediatrician who has been involved in the patients care and the Neonatal Team will arrange this follow-up.

• **CWH Outpatients** monthly neonatal clinic with rotating Paediatrician cover.
   To arrange this call the Paediatrician on service for NICU to discuss the clinical situation. If it is appropriate for the CWH clinic then a written referral is required and should be faxed to 3644883 (85883 internal). The referral will be received and the baby booked into the next available clinic

**Transfers**

The Neonatal Team is often asked to check that a baby is well enough for transfer either to home or a primary birthing facility. For this to occur the following needs to be clarified:

The initial check has been completed and documented by the LMC or midwife

• The baby has had a normal temperature (36.5 – 37.5) recorded between 1-4 hours of age

• The baby has fed well on one occasion as this is a good sign of wellness

• The baby has been reviewed to ensure that the cardiorespiratory status is stable and the baby has transitioned normally

Remember that babies 37 weeks and 9-25% may need longer before transfer.

• **Prior to transfer to a primary unit before 24 hours of age a baby with risk factors must have a repeat NEWS of 0**

**Babies who CAN Transfer LESS THAN 6hrs age if NEWS = 0**

• Vaginal delivery with no risk factors

• Non-complex instrumental birth (see definition on Newborn Observation chart)

• Intrapartum analgesia

• Maternal GBS/PROM/Sepsis risk and antibiotics given > 4hrs before birth

**Babies who CAN Transfer FROM 6 hrs age if NEWS = 0**

• Maternal GBS/PROM/Sepsis risk and no antibiotics or antibiotics given < 4hrs before birth (with 4 hourly observations to continue until 24 hours of age)

• Thick meconium, or thin meconium with Apgars at 5 minutes < 9 (with 4 hourly observations to continue until 24 hours of age)

• Weight > 98th% with no maternal diabetes require 3 normal blood sugars before transfer

• Maternal GDM diet controlled require 3 normal blood sugars before transfer

**Babies who CAN Transfer FROM 24 hrs age if NEWS = 0**

• Intrapartum fetal compromise (to stay one day even if the lactate normalises at 3-4 hours) If there is a request to transfer or discharge prior to 24 hours then the whole clinical picture needs to be reviewed with the Neonatal team

• Type 1 Diabetics or poorly control Maternal GDM must also have had 3 normal blood sugars

• Clinical chorioamnionitis

• Maternal GA (baby may be ready prior to 24 hours so this indication is maternally driven)

• High risk instrumental category – time > 20 minutes, more than 3 pulls, 2 or more cup detachments, Apgar<7 at 5 minutes.

**Babies who CAN Transfer from Day 3 if NEWS = 0**

• <9th % for weight and ≥ 37 weeks gestation

**Babies who CAN Transfer from Day 4 if NEWS = 0**

• Premature babies <37 weeks gestation
Transfers from NICU to the Postnatal Ward

This is a guideline and there needs to be an element of flexibility around:
- the acuity of the Delivery Suite, NICU and Postnatal on a daily basis
- the individual clinical situation
- the best situation for the baby and family to avoid separation wherever possible

Communication
- ISBAR form to be completed by NICU staff and to document the expected management on the postnatal ward including the requirement for observations or length of antibiotic course
- NICU staff to contact Postnatal Ward Clinical Coordinator to discuss the potential transfer
- Baby’s NICU red notes folder to transfer to the postnatal ward with the baby and to be returned to NICU after discharge

General
- Maintaining temp 36.5-37.5 in a cot
- If a baby is < 2.3 kg they will be admitted to NICU at birth, however, if the baby is stable as per the criteria below then discuss on day 3 if the baby can transfer to the postnatal ward to be with the mother. Rare to transfer a baby back to postnatal ward if < 2.2 regardless of performance
- Infants who are now well can complete their antibiotic course on the postnatal ward
- Observations will be required 4 hourly for 24 hours if the baby had been on CPAP or oxygen or is on antibiotics. The need for these to be continued past 24 hours to be discussed with the Neonatal team.

Respiratory
- Not requiring oxygen
- Respiratory rate < 60/min
- If respiratory rate is 60-70/min but effortless and not impacting on feeding and needing no specific NICU treatment transfer should still be considered
- NEWS score of 1 for respiratory rate 60-70/min can be an accepted variation that needs to be documented in the ISBAR handover and maternity multi-care pathway to highlight that the respiratory rate has been recognised and will be reviewed daily.
- Babies who receive CPAP in delivery suite but this is stopped on or shortly after admission should return to their mothers as soon as possible
- Babies who have short term CPAP/oxygen for 1-2 hours and then have transitioned well
  - 2-4 hours of sats monitoring in NICU off respiratory support
  - maintaining sats ≥ 95% in air
- Babies who required CPAP/oxygen for >2hours
  - at least 6 hours of sats monitoring after coming off respiratory support
  - maintaining sats ≥ 95% in air

Feeds and Blood Sugars
- Babies who have short term CPAP < 2 hours should have one breastfeed prior to transfer but this may not always be able to occur in NICU depending on the mothers mobility postpartum
- If the baby was on iv fluids/NG feeds these need to have been halved or stopped for at least 6 hours prior to transfer and the baby to have fed twice with 2 pre-feed sugars > 2.6 mmol/L
- If top ups are required then a specific feeding plan should be documented prior to transfer

Discharge Letter Criteria
- Discharge letters are required for the following babies on the postnatal ward:
  - Admission to NICU for > 4 hours prior to transfer to the postnatal ward
  - Received antibiotics
  - Requirement for Vitamin D and/or Iron after discharge (ie. < 37 weeks or < 2500 g)
  - Referrals to other specialties have been made, ie. ENT, Paediatric Surgeons, Plastics, Orthopaedics
  - Outpatient investigations have been made (excluding routine hip and renal scans)
  - If any clinic follow-up appointments are necessary
• If the baby has been referred to the NICU Team they must be discussed with them prior to discharge. This ensures the necessary paperwork and follow up is arranged appropriately

• Copies should go to the GP, LMC, Parents and other specialties involved in the care of the infant – this should be arranged by the postnatal ward admin staff

• If a baby needs follow-up to be arranged then bring a copy of the discharge letter to the NICU Ward Clerks who can facilitate the follow-up appointment. They are used to this process as opposed to the postnatal ward staff

HYPOGLYCAEMIA OF THE NEWBORN ON THE POSTNATAL WARD

Click here
**INFANTS < 37 WEEKS OR WEIGHT < 9TH%**

- Approximately 40% of babies born at 35 weeks and 70% of babies born at 36 weeks gestation remain on the postnatal ward (CWH audit 2013) and do not require admission to the neonatal unit.
- These preterm or low birth weight (LBW) babies are at higher risk of issues with temperature control, jaundice, establishing feeding, maintaining blood sugars and gaining weight.
- Parents should be informed of the unique characteristics of their preterm or LBW baby. For example, these babies may not wake spontaneously, may not feed effectively and may lack stamina to take adequate feeds.
- Consequently closer scrutiny of breastfeeding and protection of lactation by hand expressing and/or electric breast pumping is required to ensure lactation keeps pace with baby’s caloric intake.

**These babies require:**

- Daily review, whilst inpatient, by the Neonatal Team.
- Neonatal team will perform the 24 hour baby check and document on Newborn Record (QMR0044).
- Standard NEWS observations at 1, 4, 12, 24 hours as well as oxygen saturations once within 12-24hrs and blood sugar monitoring 3 hourly initially.
- First blood sugar to be checked pre-feed 3-4 hours after birth (combine with lactate if required), subsequent sugars to be checked pre-feed until there are 3 consecutive readings ≥ 2.6 mmol/L.
- Referral and review by the Lactation Consultant team to formulate a feeding plan which will include cue based feeding with no longer than 3 hours between feeds with top-ups of expressed breast milk (EBM) as available or donor breast milk (pasteurised or unpasteurised if applicable) or infant formula.
- Monitoring input and output that are consistent with postpartum age with clear documentation on Infant Feeding Record (Ref.2400431).
- Weigh on day 3 is preferable.
- Clearance by the Neonatal Team prior to discharge/transfer.
- Recommend that these babies all stay at CWH until after their weight on day 3.
- Ensure that feeding plan is in place.
- On day 3 consideration can be made to the mother and baby’s readiness for discharge or transfer after reviewing the whole clinical situation with the following options available:
  1. Stay at CWH for 4 days – mandatory if < 37 weeks at birth.
  2. Require ongoing oversight but this could occur at a Birthing Unit from day 3.
  3. Be ready to be discharged home (least preferred option) but would need a weight prior to discharge on day 3 to ensure that this is a safe decision.
- It is recommended that Vitamin D supplementation (from birth) if < 37 weeks or < 2500 g until 12 months age.
- Iron to start from 4 weeks of age if they are breastfed and < 37 weeks or < 2500 g birth weight. This is recommended to continue until 12 months age.
- Babies needing Vitamin D and Iron should get a prescription before discharge from the Neonatal Team.
- A discharge letter will be written after final review.

**ALTERNATIVES TO BREAST MILK**

**Pasteurised Donor Breast milk**

- The Neonatal Unit has a Human Milk Bank of pasteurised donor milk. This is available for use for all babies admitted to NICU when supply is high and limited to risk criteria when supply fluctuates.
- The availability of pasteurised donor milk extended to the maternity ward in late 2017 when the NICU has surplus milk. This supply is not guaranteed.
- There is a priority order for use of pasteurised donor milk on maternity depending on availability and this is communicated from the Milk Bank Manager to the Lactation Consultants/Nurse Manager on maternity.
- If the baby meets criteria for PDM then this can be offered if the mother’s plan is to exclusively breastfeed to 6 months of age and is committed to actively work on her lactation.
- Consent can be obtained by Maternity staff who have had the necessary training.
- [Pasteurised Donor Milk Prescribing/Dispensing Process](Ref.238988)
- [Recipient of Pasteurised Human Donor Milk Consent](Ref.238990)
Unpasteurised Donor Breast Milk

- In some situations a parent requests the use of donor breast milk from a breast feeding woman other than the biological mother of the infant.
- Donor breast milk is an alternative to formula where mothers are unable to provide their own milk due to maternal infection or illness, medication or low milk supply.
- Currently a Human Milk Bank of pasteurised donor breast milk exists within the CDHB but does not have the capacity to offer pasteurisation of milk for all babies outside the neonatal unit but when supply is available and the baby meets criteria then pasteurised donor milk may be available to use.
- Unpasteurised breast milk is not given to infants in the Neonatal Unit
- Where a parent or guardian requests the use of donor breast milk outside of the neonatal unit it must be explained to both the donor and recipient that the milk is not pasteurised. Informed consent for the donation and receipt of the donor milk must be obtained and recorded.
- For the use of unpasteurised donor breast milk link on CDHB premises please refer to the policy link here: Unpasteurised Donor Breast Milk (Ref.6668).

Formula

- Come parents will choose to formula feed their baby from birth
- Supplementation of a breastfed baby with infant formula is only recommended:
  - when the BSL is below the accepted threshold of 2.6 mmol AND when hypoglycaemia is unresponsive to breastfeeding with EBM top-ups AFTER treatment with Dextrose Gel.
  - Or when the baby is dehydrated or had significant weight loss and there is insufficient breast milk/donor milk
- Acceptable medical reasons for supplementation are outlined in the New Zealand BFHI documents, available from this link: Baby friendly part 2 pp. 23-24).
## ASSESSMENT OF HYDRATION

### Sign of Adequate Hydration

| Output of urine | Colour: pale straw or colourless │ Odour: non offensive |
|-----------------|---------------------------------|----------------------|
| Frequency:      | minimum of six per day (if no other fluids given) from day 4 | Volume: soaked nappy |
| Urates in the nappy beyond day 5 warrant a feeding and weight assessment |

<table>
<thead>
<tr>
<th>Feeding frequency</th>
<th>8-12 per 24 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>This depends on the age baby and individuality</td>
<td></td>
</tr>
</tbody>
</table>

| Behaviour | The baby settles well after most feeds and is generally contented. Most babies have a normal 'unsettled' period, often in the early evening – but frequently between 10pm and 4am – this will settle with time |

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Good skin colour and perfusion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bright eyes</td>
</tr>
<tr>
<td></td>
<td>Alert and responsive</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bowel motions</th>
<th>Changing stool by day 4. If not present then the feeding and weight need assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Breast milk bowel motion regularly by day 7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight</th>
<th>Regains birth weight by 10-14 days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gains 140 - 170 g per week, this may slow after the first month</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reference</th>
<th>Lauwers J. and Swisher, A (2005) Counselling the Nursing Mother (A Lactation Consultants guide)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mohrbacher, N (2010) Breastfeeding Answers</td>
</tr>
</tbody>
</table>

### Normal Pattern of Wetting/Soiling Nappies in Neonates

How to Know My Breastfed Baby is Getting Enough to Eat_2406229.docx (Ref.2406229) 

### Supplementary Feeding Volumes

<table>
<thead>
<tr>
<th>Age</th>
<th>Volume of Top-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-24 hours</td>
<td>2-10 mL per feed</td>
</tr>
<tr>
<td>24-48 hours</td>
<td>5-15 mL per feed</td>
</tr>
<tr>
<td>48-72 hours</td>
<td>15-30 mL per feed</td>
</tr>
<tr>
<td>72-96 hours</td>
<td>30-60 mL per feed</td>
</tr>
</tbody>
</table>

Feeding Red Flags

If any consecutive breastfeeds are A-D do a full set of newborn observations and consider recording feeding concerns in NOC/NEWS (Ref:6676)

Red flags that would trigger a score for feeding concerns include a baby who:

- Is lethargic and too sleepy to feed
- Not had a first feed in the first hour, followed by no feed in the first 4 hours.
- Has an initial first feed, then not waking for a feed within the next 6 hours
- Regular feeding for 12-24 hours is then not interested for 6 hours. When a baby stops feeding after previously doing well, this can be a sign of early onset sepsis (within the first 48 hours), severe hypoglycaemia, and in rare circumstances intra-abdominal problems
- Has hypothermia, which may also increase the risk of hypoglycaemia
- Babies with risk factors identified, who are not feeding well, have more potential to show early signs of infection or develop hypoglycaemia

If there are feeding concerns, then a blood glucose check may be warranted.

Consider the impact of maternal factors – eg; the reason for induction was poor growth at 37/38 weeks. Plus factors that delay lactation.

It is useful additional information recommended to plot the babies birthweight on a customised antenatal GROW chart in the mother’s notes, if available.

Some babies who run into difficulty have asymmetric growth and their birth weight plots at 9-25th centile, so are not initially in a NEWS risk group

Risk Factors for Excessive Weight Loss and Dehydration

- Preterm <37 weeks gestation
- Twins
- Small for gestational age
- Intrauterine growth restriction
- Prolonged labour
- Perinatal sepsis
- Jaundice
- Congenital abnormalities or syndromes
- Structural/anatomical abnormalities of the jaw and mouth
- Babies of primigravid mothers at risk of delayed/inadequate lactation (eg: history of infertility, polycystic ovary disease)
- Significant maternal antepartum haemorrhage or postpartum haemorrhage
- Severe maternal illness including maternal mental health
- History of breast surgery involving periareolar incision

Note that multiple risk factors increase the likelihood of excessive weight loss

Signs of Dehydration

- Dry skin and mucous membranes with poor skin turgor (this is a late sign and may be missed).
- Weak cry, lethargy
- Scant urinary output – urates present if ≥5 days old. Note urine output may continue due to the poor concentrating ability of the kidneys in the first few days after birth. **Just because urine is being produced does not mean the baby is hydrated**
- Urine may be concentrated, reduced frequency, and not at every feed.
- Depressed fontanelle – may be a late sign of dehydration.
• Apathetic feeding at the breast, including falling asleep at the breast, difficult to waken.

> Weight loss of greater than 10% on day 3-5 may be accompanied by hyponatraemic dehydration, therefore paediatric assessment and a blood test to check electrolytes are considered a minimum medical requirement.

• Lethargic, underfed babies will require adequate calorie intake and hydration before they will feed well. Assessment of feeding dyad and early detection of problems with appropriate interventions are key in preventing significant problems.

• Observe and document at least one breastfeed in clinical notes in each 8 hour period during the hospital stay. Assessment of urinary output and stooling patterns appropriate to age of infant should also be documented.

• Dehydration is associated with apathetic feeding and weight loss.

• Dehydration can occur due to baby not receiving an adequate amount of his mother’s milk. Jaundice may also be evident. If it is identified during observation of feeding that milk transfer is inadequate but mother has an adequate supply then mothers should be assisted to express and supplement baby with their own breast milk.

### Management of Babies with Excessive Weight Loss

#### 7-10% Weight Loss
- Observe a full breastfeed
- Ensure effective positioning and attachment
- Observe for effective suckling pattern, observe for milk transfer and use breast compressions throughout the feed
- Ensure minimum of 8 feeds in 24 hours
- Skin contact to encourage breastfeeding
- Observe for change in frequency / amount of urine and stools
- If top-ups are felt to be needed consider half tops ups (15-30mls)
- Reweigh after 24 hours
  - If weight increasing, continue to monitor closely and provide support
  - If no weight gain or further loss refer to the next section below

#### 10-12.5% Weight Loss
- Follow the plan above
- Refer to Lactation consultant and Neonatal Team
- Express breastmilk after each feed and offer to baby
- Feed according to feeding cues with no longer than 3 hours between feeds
- Offer full top-ups (30-60mls) after each feed
- Consider breast milk substitute if inadequate EBM
- **Reweigh after 24 hours**
  - If weight increasing, continue to monitor closely and wean top ups as able
  - If no weight gain or further loss will need NICU admission

#### >12.5% Weight loss
- Refer to NICU for admission and management
**JAUNDICE**

**Red Flags for Jaundice**

The following situations are where babies need bilirubin levels to be taken:

- Known maternal blood group sensitisation with antibodies detected, e.g. Rhesus isoimmunisation, ABO incompatibility, other antibodies
- Family history of significant jaundice, e.g. due to blood group incompatibilities, hereditary spherocytosis, G6PD deficiency in males
- Preterm infants
- Any baby with visible jaundice in the first 24 hours
- Birth trauma, e.g. bruising, cephalhaematoma
- Polycythaemia
- Poor feeding and dehydration
- Sepsis
- HIE or other causes of acidosis
- Low albumin levels
- Dark pigmented skin (unable to assess jaundice levels visually)
- Ethnicity – increase risk in Asians, Mediterranean, African, Middle Eastern due to skin colour and risk of G6PD

If hyperbilirubinaemia, requires treatment with phototherapy then a full assessment of breastfeeding is required including baby's level of alertness, ability to transfer milk, urinary output and stooling patterns.

- If there is evidence of insufficient milk transfer then mothers should be supported to express and supplement their infant with EBM following a breastfeed.
- If feeding is inadequate and mother unable to supplement baby with her EBM then it may be necessary for the baby to be supplemented with Infant formula.
- Supplementing baby with infant formula or intravenous fluids has been shown to decrease the rate of exchange transfusion and reduce the time under phototherapy.9
- Close observation and assessment of breastfeeding and appropriate supplementation must be undertaken to optimize breastfeeding outcomes.

**Investigation of Jaundice**

**Jaundice in the first 24 hours**

- Full blood count, film and reticulocyte count
- Group and Coombs, cross match
- Maternal group
- CRP, albumin
- Urine cultures and blood culture if unwell
- LP if indicated

**Jaundice requiring phototherapy on day 3-5 in a term baby with no obvious cause**

- Full blood count, film and reticulocyte count
- Group and Coombs
- CRP, NEON
- Blood culture if clinically indicated
- Make sure Guthrie card has been sent and check results with the National Testing Centre
- Consider G6PD deficiency screen if male infant of African, Mediterranean, Middle Eastern or Asian ancestry
- Review current weight versus birthweight and feeding history
Phototherapy Charts

- These are to be used as a guide for when to start phototherapy or consider an exchange transfusion.
- There are up to 3 lines per chart – a level for considering an exchange transfusion, a level for standard phototherapy and a level for babies ≥ 35 weeks with haemolytic disease (ie. positive DAT).
- Completing all the parts of the phototherapy chart ensures that at a glance all the information is present to make decisions on starting or stopping treatment.
- The phototherapy lines are indications to start phototherapy and do not guide when to stop phototherapy. This decision is made taking into account the risk factors for jaundice, the rate of rise or fall of the bilirubin, the number of lights the baby is on and how far below the treatment line the bilirubin is.
- It is best to have the bilirubin significantly under the treatment line before stopping lights or the baby may rebound quickly back on to lights. There is no need to have 2 results below the line if the result is well below the line, ie. > 50 umol/L under.
- Keep in mind that there is no good specific evidence as to what constitutes a dangerous bilirubin level in a particular baby, so it is impossible to come up with sound, evidence based rules. Clinical judgement will be required. If in any doubt discuss with the neonatal consultant.

How to use phototherapy charts

- Ensure you have the correct chart for gestation – 35-37 weeks gestation or ≥ 38 weeks gestation.
- It is important to ensure the correct phototherapy chart is used as the treatment levels vary according to the infant’s gestation.
- Fill in the top box with date and time of birth, maternal blood group, evidence of antibodies or haemolysis.
- When deciding if there are risk factors refer to the back of the phototherapy page under red flags and then indicate if these are present yes or no in the top box and list the red flags.
- Careful thought about the aetiology of the jaundice and appropriate investigation is usually at least as important as phototherapy, and may lead to identification of another specific therapy.
- In the right hand column ensure the date, time and result of the TcB and/or SBR are recorded and plot on the graph (each square is 2 hours).
- Record number of lights or bilibed in the box – number of lights. This is important to help assess the response to treatment.
Physiologic Jaundice

“Physiologic” jaundice does not need phototherapy, but frequent feeds (preferably breast feeds) should be encouraged. There is good evidence that the frequency of breast feeding is as, or more important than the exact volume the baby receives. Infants with physiologic jaundice will be:

- Healthy term infant, weight loss < 10% birth weight
- No blood group “set up” for haemolysis
- Rate of rise less than 8 µmol/hour, ie. not visible in 1st 36 hours
- Normal ‘Guthrie’ screen
- Peak less < 300 µmol/L

Bilirubinometer

GLM0058 Transcutaneous Bilirubin (TcB) Monitoring for Babies in Maternity Ward

Bilirubin Blood Samples

- When taking blood for an SBR the phototherapy lights should be turned off and recommenced once the blood sample has been obtained.
- The SBR should be sent to the CDHB laboratories for processing.
- The blood sample should be sent immediately and does not need to be protected from light.
- The SBR can also be checked on the NICU blood gas analyser

Phototherapy on the Maternity Ward

General Principles

- Care of Infants Requiring Phototherapy complete document from NICU can be read here – Care of Infants Requiring Phototherapy (PPN48)
- Explain the need for phototherapy to the family and why minimal handling is required to ensure that the baby receives sufficient phototherapy to manage their jaundice.
- Ensure the Neonatal team are aware that a baby needs to or has started phototherapy
- As much skin needs to be exposed as possible to treat the jaundice.
- Skin needs to be clean, dry and oil free.
• Eye shades are required for most phototherapy devices.

• Bilirubin levels should be monitored according to treatment threshold, gestation, age and NICU team direction. Record levels on age appropriate phototherapy chart for gestation.

The NICU team will decide when phototherapy can stop

• Temperature needs to be checked within 30 minutes of starting phototherapy after 1 hour and then 3-4 hourly if stable.
• Infants in an incubator should have 4 hourly observations including HR, RR, temperature
• Monitor hydration. Ensure feeding plan is in place, including top ups if required. Consider Lactation Consultant input.

Bilibed

Prepare the bed
• Hospital cot with the mattress removed
• Bilibed not to be used in an incubator
• BiliBed (Medela) - place inside the cot

Care of the infant
• Undress the infant – leave nappy on
• Eye protection is not required for the Medela BiliBed
• Place infant inside BiliBed in the supine position, arms into sleeves. Zip into position and fasten Velcro strap under chin.

NeoBlue – Neocosy

Prepare the cot/incubator
• Hospital cot with the mattress removed
• Can also be used in an incubator with temp < 30 degrees
• Air vents are not to be covered or placed against obstructions

Care of the infant
• Undress the infant – leave nappy on
• Place eye protection
• Place infant on Neocosy in the supine position and cover with a blanket to keep warm

Bilisoft

Prepare the cot/incubator
• Hospital cot on top of the mattress
• Can also be used inside an incubator
• The grey box to be on a flat surface on a trolley and not

In the cot or incubator
• Plug the fibreoptic cable into the box
• Insert fibreoptic pad into the bilisoft cover
• The side labelled “this side facing patient” should be against the padded side of the cover
Care of the infant
- Place the infant on the padded side of the cover and cover with blankets to keep warm
- Place eye protection if there is visible light from the Bilisoft but if they are swaddled with no light escaping then eye protection is not needed
- The baby can be held with the Bilisoft in place whilst breastfeeding

Neo Blue Phototherapy

Prepare the incubator
- Initially commence temperature at 30 degrees.
- This may be adjusted until adequate infant temperature is maintained (see incubator guideline)
- Towels and linen may be used to provide a nest, however must not cover the skin (see incubator guideline)

Care of the infant
- Undress the infant but keep the nappy on
- Place infant in supine position.
- Always use eye protection

Light positioning
- Place the light directly on top of the incubator. The effect is best the closer to the baby.
- The rubber feet on the lights enable secure positioning and allow air flow between the light and incubator
- Use the red light to give central positioning of the infant under the lights. This will maximise skin coverage
- Press the switch to High which provides the equivalent of 1 light
- Adjust according to medical advice
- Ensure drapes are down to protect the parent’s eyes.
Incubator Use

Incubator Use Maternity

1. Prepare the incubator
   - For cold infants start temperature at 34 degrees.
   - For infants receiving phototherapy commence temperature at 30 degrees.
   - Ensure the incubator is on air mode only.
   - Position incubator away from direct sunlight and draughts.
   - Do not open the door to cool the incubator down or if incubator alarms, the incubator will self-adjust.

   NOTE: Ensure the incubator is plugged in and pre warmed at all times.

2. Care of Infant
   - Axilla temperature should be maintained between 36.5 – 37.5 degrees.
   - Ensure infant is naked apart from a nappy.
   - Position infant in the supine position. Nests maybe used by utilising linen to secure and form boundaries to settle, ensuring the infants face is clear at all times. Prone position maybe used to optimise oxygenation and lower energy expenditure in grunting infants, however infants in this position must be given extra supervision.
   - Access the infant through portholes if possible as this will limit heat loss from the incubator.
   - Ensure the parents are aware of the access points to provide comfort and cares.

   NOTE: Ensure the fan in the incubator is not obstructed by linen.
   No equipment is to be placed on top of the incubator.

3. Monitoring
   - An axilla temperature should be checked initially prior to being placed in the incubator.
   - Repeat temperature in 30 minutes, then hourly, thereafter 4 hourly or as condition dictates.
   - Incubator temperature should be adjusted by no more than 0.5 degrees until adequate thermoregulation is restored and maintained.
   - Infants that are unable to maintain their body temperature may need BSL’s and further investigation. Please seek medical advice.
NEONATAL SEPSIS AND CONGENITAL INFECTIONS

Thorough handwashing, before and after every contact with every baby is by far the most important method of preventing nosocomial infections.

Risk Factors for Early Neonatal Sepsis

- prolonged rupture of membranes ≥24hrs (increasing risk after 18 hours)
- maternal illness, pyrexia >38.0 C (but any elevation >37.5 C increases risk), WBC > 15, raised CRP > 10, suspected chorioamnionitis
- pathogens (e.g. GBS, E. coli) present in maternal urine or high vaginal swab
- prematurity < 37 weeks
- fetal distress, tachycardia >160bpm or need for resuscitation
- twin gestation

Although none of these risk factors alone has particularly good positive predictive value for sepsis, the more that are present, the lower the threshold should be to investigate and treat the baby for even minor clinical signs. In all sepsis, early diagnosis is vital.

Commencing antibiotics based on good clinical judgement will always be supported.

Risk factors may be an indication for investigation but are not in themselves an indication for antibiotics if the baby is born at term and is clinically well.

The decision process needs to balance the potential for unnecessary treatment of uninfected babies with delaying antibiotic treatment in infected babies.

Initial therapy is often commenced on the basis of clinical suspicion, since life-threatening infection can become established extremely quickly.

Early Onset Sepsis (EOS)

- This is most often perinatally acquired, but nosocomial possible.
- ANZNN definition is the first 48 hours
- *Group B streptococcus* (GBS), *E coli K1*, *Streptococci* and Gram negative organisms are common causes
- *Listeria monocytogenes* can also occur in a sporadic or epidemic pattern.
- The EOS rate in VLBW infants in a study by Ting et al. 2019, was 1 in 56 with risk factors, whereas when no risk factors are present was 1 in 204.

Clinical Features / Signs and Symptoms of Sepsis

- All newborn infants with early respiratory distress (tachypnoea, grunting, increased work of breathing, nasal flare) should be assessed for risk of EOS (GBS, E. Coli, other) and should be investigated.
- Where grunting is intermittent / and maybe described as “singing” they are not for transfer out from CWH OR if in primary maternity unit may need transfer into CWH.
- Use the sepsis calculator and flow chart to assist with blood tests. A Capillary Blood Gas may be helpful if there are no cord lactates.
- Temperature instability - hypothermia and hyperthermia are often due to issues with environmental temperature, but a body temp. of < 36°C or > 37.5°C for greater than 1 hour (if appropriate manoeuvres have been undertaken to correct environmental temperature) is possible sepsis and warrants clinical review and investigations
- Previously healthy baby who becomes too sleepy/lethargic to feed, no feed in 6 hours.
- Listlessness, lethargy, pallor, mottling and irritability
- New or increased respiratory distress – tachypnoea, increased WOB, grunting, increase in oxygen requirement
- Jaundice if it develops unusually rapidly
- Abdominal distension or bilious vomiting or nasogastric aspirate suggesting ileus
- Apnoea, especially new onset or increased frequency or severity
Management of the Asymptomatic Baby at Risk of Sepsis ≥ 37 weeks

Clinical Chorioamnionitis

Observations at 1 hr, 4 hrs and 4 hrly for 24 hrs

Not for transfer to a birthing unit or discharge home until after 24 hrs

Neonatal review prior to transfer/discharge

PROM GBS + Intrapartum Ab < 4hr

Observations at 1 hr, 4 hrs and 4 hrly for 24 hrs

May transfer to a birthing unit after 6 hrs
Not to discharge home until after 24 hrs age

Midwife review prior to transfer

PROM GBS + Intrapartum Ab ≥ 4 hr

Observations 1 hr, 4 hrs and 4 hrly for 24 hrs

May transfer to a birthing unit any time with midwife review prior to transfer

May transfer home any time with LMC taking over the review of sepsis risk

Not for transfer to a birthing unit or discharge home until after 24 hrs

Neonatal review prior to transfer/discharge
Management of the Asymptomatic Baby at Risk of Sepsis 35-36 Weeks

Clinical Chorioamnionitis or PROM, GBS + Intrapartum Ab <4hr or ≥ 4hr

Observations at 1hr, 4hrs and 4 hourly for 24 hrs

Not for transfer to a birthing unit or discharge home

Neonatal review daily and prior to discharge which may be up to 4 days due to prematurity

If symptoms develop the neonatal team needs to be consulted to examine and investigate the baby for sepsis

Record on NOC chart C280106
Management of the Symptomatic Baby at Risk of Sepsis

Follow Sepsis Flow Chart
• It is recommended to also use the Sepsis Calculator in babies from 34 weeks. https://neonatalesepsiscalculator.kaiserpermanente.org/ (validated for babies ≥ 34 wks).
• An app is available – EOS Calculator
• There are 3 Clinical Categories for risk stratification – clinical illness, equivocal presentation and well appearing
• Divided into 3 pathways – treat empirically, observe and evaluate, and continue observation.
• Use 0.4/100 for the incidence of EOS
• You need to know the highest maternal temp in labour (use 37.0 if unknown) GBS status and duration of AN antibiotics
• If in doubt check with SMO

Considerations
• Antibiotics for infants with sepsis can be lifesaving
• Overuse of empirical antibiotics can facilitate antibiotic resistance and prolonged use is associated with adverse outcomes.
• No antibiotic treatment is not the same as no care
• Prolonged antibiotic courses without a positive microbiology should be exception rather than the rule
• Culture media with antimicrobial neutralization properties enhance the reliability of blood cultures when the mother has received intrapartum antibiotics
• Antibiotic use has been linked to disruptions in the microbiome and is postulated to have a critical role in development of significant neonatal morbidities eg CLD, NEC, ROP & PVL, along with asthma, inflammatory bowel disease and childhood obesity

Investigations
There is no test with perfect sensitivity or specificity so the clinical scenario needs to be taken into account along with the blood test findings to decide if sepsis is present

Usual first line investigations are
• FBC and Blood Culture
• CXR
• CRP at 6hrs

FBC
• Total WBC < 5 and neutropenia < 1
• Immature/Total neutrophil ratio* > 0.25 on day 1, > 0.20 from day 5
  *This is immature neutrophils, (ie. bands + myelocytes + metamyelocytes) divided by the total of immature neutrophils plus the mature neutrophils.
• Toxic granulation, vacuolisation or Dohle bodies present on the film.
• Thrombocytopenia < 100 – think about Candida

CRP
• An acute phase reactant synthesised within 6-8 hours in response to tissue injury
• Non-infectious processes can also elevate the CRP ie: PROM, perinatal asphyxia, IVH, pneumothoraces, meconium, infarction, trauma, immunisation
• Levels peak at 24-48 hours
• A normal CRP at the start of an illness or at birth lacks the sensitivity to rule out sepsis but if taken at > 6hrs the sensitivity improves to > 90%
• A level of < 10mg/L is considered normal and has a negative predictive value of 99% for infection

Blood culture
• 1ml of blood is required for an adequate blood culture - smaller volumes may miss bacteraemia
• A negative blood culture result can be due to lack of infection, inadequate sample size or intrapartum maternal antibiotics

CXR
• AP & Lateral views for first X-ray.
• If concern re pneumothorax a AP shoot through will verify an anterior pneumothorax
Urine
• A urine should be taken in the evaluation of early onset sepsis for GBS antigen which indicates systemic GBS infection (not a GBS urine infection)
• Microscopy and culture is not required as the likelihood of a UTI is extremely low (although for late onset sepsis a UTI should be considered in the differential)
• A bag urine may be sufficient but if there has been known chorioamnionitis or PROM then the baby’s skin may be colonised so a bladder puncture or catheter sample will be more appropriate to exclude a positive result from skin contamination
• If a bag urine returns a positive result for GBS antigen it should be discussed with the consultant as to whether a bladder puncture is required
• If antibiotics have been stopped after 24-48hrs and bag urine collection has been unsuccessful then it can be omitted

Gastric Aspirate and Surface Swabs
• These have limited value and are not required routinely as the result only indicates colonisation
• Gastric aspirates should be done for admissions of extremely preterm infants (<28wks) with a high index of suspicion of infection (e.g. chorioamnionitis).

Lumbar Puncture
• This should be considered in a baby with a positive blood culture and in those babies with a negative blood culture but have significant blood changes or clinical signs that make meningitis a possibility
• Should be discussed with the Consultant
• This procedure is undertaken on NICU.

Neonatal Antibiotics
• The first choice antibiotics for suspected or proven sepsis presenting at birth or within 48 hours and admitted to NICU are:
  − Amoxycillin (50-100 mg/kg/dose, q12 hours, iv push). High dose if suspected meningitis or severe sepsis
  − Gentamicin (iv infusion based on locally devised extended interval dosing)
• The first choice antibiotics for suspected or proven sepsis presenting at birth or within 48 hours and remaining on the postnatal ward with no requirement for NICU admission are:
  − Amoxycillin (50 mg/kg/dose, q12 hours, iv push)
  − Cefotaxime (50 mg/kg/dose, q12 hours, iv push)
  − (Gentamicin is currently not given on the postnatal ward as it is an infusion with levels required. However, discuss with the SMO if there are clinical factors that dictate gentamicin to be more appropriate)
• For babies who start their antibiotic course in NICU and are transferred to the ward:
  − Amoxycillin
  − Change Gentamicin to Cefotaxime only if a 5 day course is required - this needs to be charted to start at the time that the next gentamicin dose was due (60 hours)
  − These babies are reviewed daily on ward. Discuss with SMO covering room 5/6/7 is preferred contact.
• The preference is that babies on the postnatal ward have their iv line sited on the postnatal ward.
• Options to consider are using the Obstetric CCO or Clinical Support Nurse (NICU) when available to help hold and tape.
• If it is necessary to bring the baby down to NICU for an iv line then call the NICU ACNM to coordinate where this is best to be done given NICU workloads. The intention then would be for the iv line to be placed and the baby returned to the postnatal ward for antibiotic administration
• If blood cultures are negative, symptoms resolve, CRP and white count normal, stop Abs at 24 hours or by 48 hrs
• If blood cultures are negative but the CRP remains elevated or there are persisting changes on CXR a 5 day course of antibiotics may be required but this decision will be by the Neonatal SMO
• A baby on IV antibiotics must be reviewed daily. If results are normal, stopping antibiotics at 24-36 hours is good clinical practice.
• If antibiotic duration required has been determined to be > 48 hours, but the baby is now well and CRP has normalised < 10, an SMO review can alter the original duration.
• If sepsis is proven (Blood culture positive) continue for 7-10 days, or longer as indicated for particular organisms or sites.
• Babies with proven or suspected UTI or renal tract anomalies should receive oral cotrimoxazole (use amoxicillin if the baby is jaundiced and change to cotrimoxazole after 5-7 days when the jaundice has settled)

Intramuscular Antibiotics

• Ideally antibiotics are given iv however there will be situations when an iv line cannot be sited and the clinical situation will need to be discussed with the consultant
• The usual antibiotics that can be given im are amoxicillin and cefotaxime and these can be drawn up with 1% lignocaine to help with the pain after injection
• Due to the potential four-fold error in drawing up the more concentrated gentamicin (80 mg/2 mL) for im injection versus our usual 10 mg/mL concentration a decision has been made not to give gentamicin im

First Dose of Antibiotic

• Baby with **signs of sepsis** and unable to site a peripheral iv line
  - Insert a UVC on NICU
• Baby with **risk factors** for sepsis but is **well** and unable to site a peripheral line
  - D/W SMO to see if a UVC is felt to be necessary to give antibiotics , or
  - D/W SMO to see if antibiotics are required or if taking FBC, CRP, blood culture and observation are appropriate, or,
  - Give IM cefotaxime 250mg/ml made up with 1% lignocaine as the sole antibiotic with Gram negative and GBS cover (do not give amoxicillin as well to avoid the baby receiving 2 im injections) and review the route of administration prior to the next dose

Subsequent Dose of Antibiotic

• Baby with **signs of sepsis**, peripheral iv has tissued after receiving at least 1dose of amoxicillin and gentamicin
  - Insert a UVC, or,
  - Give IM amoxicillin 250 mg/mL made up with 1% lignocaine as the sole antibiotic, as initial gentamicin dose will be providing coverage for 60 hours and review the amoxicillin route of administration prior to the next dose
• Baby with **risk factors** for sepsis but is **well** and peripheral iv has tissued after receiving at least 1 dose of amoxicillin and gentamicin
  - D/W SMO to see if antibiotics are still required or if taking FBC, CRP, blood culture and observation are appropriate, or,
  - Give IM amoxicillin 250 mg/mL made up with 1% lignocaine as the sole antibiotic, as initial gentamicin dose will be providing coverage for 60 hours and review the amoxicillin route of administration prior to the next dose

Sticky Eyes

• The commonest cause of a sticky eye is a blocked tear duct
• If the eyes are sticky and the conjunctiva are red and swollen, send an urgent gram stain and appropriate swab for culture to exclude gonococcal ophthalmitis (call microbiology).
• A chlamydia swab should also be taken and sent for immunofluorescence
• Chlamydia swabs (special pink swabs) are kept in the fridge in Level 3, or may need to be requested from the laboratory. A vigorous scraping of the conjunctiva should be undertaken, prior to the baby being commenced on treatment. If the immunofluorescence is positive, commence systemic erythromycin.
• A routine bacterial culture should also be sent. Routine treatment for purulent eye discharge is chloramphenicol eye drops, one drop each eye four times a day for one week. Fusidic acid is an alternative
Staphylococcal Infections

*Staphylococcus aureus* skin colonization

- Some babies may be colonized by *Staph. aureus* in the first 24 hours, but, only 30% of infants in one study were found to be colonized by bacteria at 6 days of age.
- Staph. colonization does not always correlate directly with incidence of infection presumably because of variable virulence of the organisms and host resistance.
- Male infants appear to have higher infection rates of bacterial infection compared to females.
- The sites most commonly colonised by *Staph. aureus* are the umbilicus, skin flexures and the nares.

*Staphylococcus aureus* superficial infections

- **Omphalitis**: erythema and/or induration with purulent discharge from the umbilical stump, due to gram+ve / gram-ve/ anaerobic organisms
- **Paronychia**: inflammation of the nail bed
- **Pustulosis**: localised collections of vesicopustules on an erythematous base in an otherwise asymptomatic baby. Gram stain will show Gram-positive cocci and abundant neutrophils, and culture will confirm *Staph. aureus*.

Treatment for *Staphylococcus. aureus* skin infections

- Any systemic sign of infection take blood cultures and give systemic iv antibiotics (flucloxacillin and add in gentamicin if severe)
- Any Staphylococcal infection in a preterm infant < 35 weeks
  - blood cultures and systemic iv antibiotics: iv for minimum 24-48 hours, after which oral antibiotics to complete a 5 day course if the baby remains well
- Isolated Staphylococcal skin pustules in a well baby > 35/40
  - consider chlorhexidine body wash and repeat at 24 hours if improved
  - start oral flucloxacillin if not improved within 24 hours and treat for 5 days
- Isolated Staphylococcal superficial omphalitis
  - oral flucloxacillin for 5 days
  - consider adding topical treatment with alcohol wipes as well
- Those with open, purulent sites may need contact precautions in addition to universal precautions.

Chlorhexidine wash protocol

- Wet the baby's body, face, eyes and ears with warm water.
- Spread 1% chlorhexidine white obstetric cream over the whole body except the eyes. All creases, the perianal area, periumbilical area, axillae and the neck folds should be treated.
- Massage the chlorhexidine cream gently into the scalp.
- Leave the cream in contact with the skin for 60 seconds or more.
- Wash all of the cream off gently or sponge off with warm water.
- If chlorhexidine cream accidentally gets into the eyes, gently rinse with a liberal amount of warm water only.
- An in vitro study showed that an increasing duration of exposure of *Staphylococcus aureus* to chlorhexidine 0.5% solution from 15 to 30 and 60 seconds reduced the colony count by 37%, 77% and 93% respectively.
- Single application

Staphylococcal Scalded Skin Syndrome

This condition is characterised by red blistering skin which is caused by the release of two exotoxins (epidermic toxins A and B) from toxigenic strains of *Staphylococcus aureus*. Neonates are particularly at risk due to the lack of specific immunity to the toxins and an immature renal clearance system. Outbreaks in Neonatal units may be due to a staphylococcal carrier in the staff. When a baby is thought to have staphylococcal scalded skin syndrome the management will include:

- Admit baby to NICU
- Specimen (skin swab) to be sent to the Institute of Environmental Science and Research (ESR) along with a detailed history to determine whether the *Staphylococcus aureus* is a toxigenic strain.
- Place the infant into contact isolation until the results are available (1-2 weeks)
- IV antibiotics – flucloxacillin +/- gentamicin
• When the infant is being bathed they should be washed with 1% chlorhexidine obstetric cream (as above) until discharge. This is aimed at suppressing the organism on the affected infant and reduces the likelihood of transmission to other infants in the unit.

• Consider contact tracing of staff

• Strict hand hygiene is the key to prevention and further transmission.

Congenital Infections

The presentation of these diseases is rarely specific and maternal infections antenatally are often asymptomatic or only mildly symptomatic. Therefore consider congenital infections in infants who have:

• IUGR, Purpura, jaundice, chronic rash, anaemia, seizures, cerebral calcification, hepatosplenomegaly, chorioretinitis, microphthalmia, pneumonitis, cataract

The investigation and treatment of these diseases is complicated and should be done in consultation with the neonatal consultant and the Paediatric infectious disease consultant Tony Walls. At discharge discuss the follow up needs of infants with congenital infection with the consultant. Most will need developmental follow up and many will need hearing and ophthalmological assessments.

### HERPES SIMPLEX

(updated from 2013 National Guidelines)

(CDHB Labs no longer processes surface swab cultures and only uses PCR)

<table>
<thead>
<tr>
<th>Symptoms and risk</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Only 30% of mothers of infected infants have a history of symptomatic genital herpes so need to have an index of suspicion</td>
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</tr>
<tr>
<td>• 85% of disease is contracted during labour with only 10% being contracted postpartum</td>
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</tr>
<tr>
<td>• The risk of HSV infection in an infant born vaginally to a mother with a first episode of primary genital infection is 57% and so caesarean section is indicated</td>
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</tr>
<tr>
<td>• The risk from recurrent genital HSV is 3% as there is some protection from maternal Ab’s</td>
<td></td>
</tr>
<tr>
<td>• There are no absolute guidelines on how to deliver a mother with an active recurrent lesion, however, caesarean section should be offered but will not eradicate the risk of HSV transmission and is not an absolute indication (see flow charts).</td>
<td></td>
</tr>
<tr>
<td>• Scalp electrodes and instrumentation must be avoided if there is suspicion of active HSV There may be a history of contact with herpes simplex but most symptoms are non-specific, vesicular lesions (in 40% only), pustules, fever, seizures, encephalopathy, may present with liver disease</td>
<td></td>
</tr>
<tr>
<td>• Intratrauterine disease – IUGR, chorioretinitis, skin scarring, hydranencephaly</td>
<td></td>
</tr>
<tr>
<td>• Skin/Eye/Mouth – in 45%, good prognosis but readily disseminates if not treated</td>
<td></td>
</tr>
<tr>
<td>• Disseminated disease – in 25%, with mortality of 30% even if treated</td>
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</tr>
<tr>
<td>• CNS disease – in 30%, presents with encephalitis from day 5-21</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Investigation for mother</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Type specific serology testing but not often at the time as results are not immediate</td>
<td></td>
</tr>
<tr>
<td>• Vesicle fluid sent for HSV/VZV PCR</td>
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</tr>
<tr>
<td>• Acyclovir from 36 weeks may decrease the risk of recurrent lesions at term (if prior outbreak earlier in pregnancy) and decrease the need for a LSCS if there are no lesions present at the time of birth. Aciclovir in this setting does not eliminate viral shedding though</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Investigation for infant if: Suspected or confirmed primary HSV infection at birth or within 6 wks of birth</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Delivered by LSCS and membranes ruptured for less than 4 hours</td>
<td></td>
</tr>
<tr>
<td>– Surface swabs of oropharynx, conjunctiva, rectum for PCR 24-48hrs after birth</td>
<td></td>
</tr>
<tr>
<td>– If swabs are negative – no further treatment required</td>
<td></td>
</tr>
<tr>
<td>– If baby becomes symptomatic with CNS signs, disseminated disease or skin lesions at any time whilst the initial surface swab results are awaited the admit and investigate as below</td>
<td></td>
</tr>
<tr>
<td><strong>Symptomatic or positive surface swabs:</strong></td>
<td></td>
</tr>
<tr>
<td>• Take Blood (PCR and culture), CSF (PCR and culture) prior to starting iv aciclovir</td>
<td></td>
</tr>
<tr>
<td>• If there are any skins lesion scrape the base of the lesion and send for PCR</td>
<td></td>
</tr>
<tr>
<td>• Treat for a minimum of 5 days with aciclovir until Blood and CSF (PCR and culture) results remain negative</td>
<td></td>
</tr>
<tr>
<td>• Treat CNS/ disseminated disease for 21 days, treat for 14 days if skin/eye/mouth disease</td>
<td></td>
</tr>
<tr>
<td>• Delivered Vaginally or LSCS but membranes ruptured for more than 4 hours</td>
<td></td>
</tr>
<tr>
<td>– Surface swabs of oropharynx, conjunctiva, rectum for PCR immediately after birth</td>
<td></td>
</tr>
</tbody>
</table>
**HERPES SIMPLEX** (updated from 2013 National Guidelines) (CDHB Labs no longer processes surface swab cultures and only uses PCR)

- If there are any skin lesion scrape the base of the lesion and send for PCR
- Take Blood (PCR and Culture), CSF (PCR and Culture) prior to starting iv aciclovir
- Treat for a minimum of 5 days with aciclovir until Blood and CSF (PCR and Culture) results remain negative
- Treat CNS / disseminated disease for 21 days, treat for 14 days if skin/eye/mouth disease

**Investigation for infant if: Recurrent HSV infection**

- Vaginal delivery is appropriate even in the presence of recurrent lesions.
- Often a LSCS is offered, but, it does not eradicate the low risk of transmitting HSV
- Avoid scalp electrodes and instrumentation even if no lesions are present
- If there are lesions present at delivery or a history of recurrent lesions in this pregnancy then take surface swabs of oropharynx, conjunctiva, rectum for PCR 48hrs after birth and not before 24 hours
- As the risk of transmission is very low the baby can be discharged from CWH and the LMC can take the swabs and follow-up the PCR results

**Asymptomatic but positive surface swabs:**
- If any of the PCR surface swabs taken after 48 hrs age come back positive, in a well-baby, there are no current recommendations of what to do in this low risk population. The clinical history and risk factors need to be reviewed and the baby needs a clinical examination and repeat surface swabs taken. This is often best done with a referral to CAA if they are at home.

**Symptomatic:**
- If baby becomes symptomatic with CNS signs, disseminated disease or skin lesions at any time whilst the initial surface swab results are awaited then admit and investigate with Blood (PCR and culture), CSF (PCR and culture). If there are any skin lesion scrape the base of the lesion and send for PCR. Start on iv aciclovir and treat for a minimum of 5 days with aciclovir until Blood and CSF (PCR and Culture) results remain negative
- If the baby has confirmed infection then treat CNS / disseminated disease for 21 days and 14 days if skin/eye/mouth disease

**Isolation**
- Contact isolation required, especially if skin lesions present.
- Advise mother about the importance of handwashing if she has active lesions

**CYTOMEGALOVIRUS (CMV)**

**Symptoms**
- **Maternal symptoms:** asymptomatic and/or viral illness with atypical lymphocytes.
- **Fetal/Neonatal signs:** intracerebral calcifications, microcephaly, hydrocephaly, thrombocytopenia, haemolytic anaemia, ascites, hydrops and IUGR.
- Commonest congenital infection
- 15% of those born after primary infection of their mother will have sequelae.
- Infection and disability can occur regardless of timing in pregnancy but most severe will be primary infection in the first trimester
- 90% infants are asymptomatic at birth but are at risk of hearing impairment and learning disability

**Investigation for mother**
- Serology CMV IgG and IgM (if these are positive in the first 20 weeks gestation, the lab will do avidity testing - low avidity means infection < 3 months ago, high avidity means infection > 3 months ago) Repeat serology required in 2 weeks’ time from first testing, if booking bloods are unavailable.
- Consider PCR on amniotic fluid in antenatal period (won’t confirm that the fetus is infected though).
- Obstetric specialist input required.

**Investigation for infant**
- All infants need one urine sample for PCR taken after birth. Best transported fresh and chilled.
- The virus can be shed for up to 3 weeks so if diagnosis is delayed urine can still be collected up to 3 weeks of age
- Head ultrasound and ophthalmology review if CMV positive
- Universal hearing screening with aABR and review at 9 months and annually until 6 years if CMV positive
### CYTOMEGALOVIRUS (CMV)

**Management**
- Treatment of CMV positive babies is intensive (6 weeks of iv ganciclovir) and not routine care
- No clear evidence that it will improve outcomes
- Isolation not required but strict handwashing is important

### TOXOPLASMOsis

**Symptoms**

<table>
<thead>
<tr>
<th>Maternal symptoms</th>
<th>Fetal/Neonatal signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>sore throat, malaise, fever and lymphadenopathy</td>
<td>hydrocephalus, microcephaly, intracerebral calcifications, hepatosplenomegaly, lymphadenopathy, maculopapular rash, jaundice, thrombocytopenia, seizures, chorioretinitis. 85% of infected infants will appear normal at birth.</td>
</tr>
</tbody>
</table>

**Investigation for mother**
- Infection in first trimester is less likely to infect fetus (10%) but more likely to cause harm.
- Infection in second/third trimester more likely to infect fetus (30-50%) but with milder effects
- Toxoplasma IgG and IgM serology and lab will do IgG avidity testing if IgM serology is positive in the first 20 weeks gestation.
- High IgG avidity indicates infection >3mths ago, low IgG avidity indicates infection <3mth ago
- IgM can be detected 2 weeks after infection, peaks at 1 month and declines by 6 months
- IgG peaks 1-2 months after infection and remains lifelong
- PCR on amniotic fluid in antenatal period can confirm fetal infection
- Placental tissue sample sent for toxoplasma PCR (although most positive placenta samples are also detected by other tests)
- If toxoplasma infection is considered then treatment of the mother with pyrimethamine, sulphonamide and folinic acid may decrease the severity of the disease in the fetus.
- Serial ultrasounds are needed to monitor the pregnancy

**Investigation for infant**
- Serology toxoplasma IgM and a baseline IgG (only 75% of congenitally infected infants will produce detectable IgM)
- PCR on blood, urine, CSF
- Head ultrasound, ophthalmology review, universal hearing screening with aABR

**Management**
- Isolation is not needed
- Confirmed congenital infection
- Treat with pyrimethamine, sulfamethoxazole, folinic acid for 1 year
- IgG will still be present after 1 year and titres will rise
- Not confirmed congenital infection (likely maternal infection and no transfer)
- IgM should be negative
- IgG titres will fall over time (as they are the maternal antibodies)
- Transplacental IgG from mother’s infection should disappear by 6-12 months

### PARVOvirus

**Symptoms**

<table>
<thead>
<tr>
<th>Maternal symptoms</th>
<th>Fetal/Neonatal signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illness with rash, fever, myalgia, arthritis, +/- anaemia.</td>
<td>Anaemic or hydropic infant noted on ultrasound scan or known maternal seroconversion in antenatal period particularly between 10 – 20 weeks gestation. Risk of fetal demise is 2-6%.</td>
</tr>
</tbody>
</table>

**Investigation for mother**
- Serology for Parvovirus IgG, IgM (positive IgM indicates infection within past 2-4mths)
- Obstetric specialist input required.
- Consider USS, MCA Doppler velocity monitoring and fetal blood sampling if anaemia is suspected
- Tissue sample from placenta sent in sterile pottle with no saline.

**Investigation for infant**
- If hydropic infant or stillborn, send tissue sample from placenta as above, and this will be tested for Parvovirus PCR

**Management**
- No specific treatment available
- Contact isolation
### RUBELLA

**Symptoms**

| **Maternal symptoms:** | Routine antenatal screen at booking. Testing done after contact with rubella or symptoms of fever, erythema, lymphadenopathy or arthralgia. |

| **Fetal/Neonatal signs:** | Retinal pigmentation, cataracts, glaucoma, microcephaly, sensorineural deafness, pneumonitis, hepatosplenomegaly, thrombocytopenia, blueberry muffin lesions |

**Investigation for mother**

- Rubella IgM and IgG if there is a rubella contact and/or symptoms of rubella
- 85% chance of transmission to fetus if contract rubella in first 12 weeks of pregnancy
- Obstetric specialist input required

**Investigation for infant**

- Serology rubella IgM (note there can be false positives and negatives)
- Consider sending EDTA tube from cord or infant blood for rubella PCR
- Consider urine/CSF for rubella PCR
- Head ultrasound and ophthalmology review
- Universal hearing screening with aABR

**Management**

- No specific treatment
- Can be infectious for the first year of life after congenital rubella
- Contact isolation

### VARICELLA ZOSTER

**Symptoms**

| **Maternal symptoms:** | Chicken pox vesicles, pneumonia. Contact with chicken pox later in pregnancy carries a risk for the infant – living with a person in the same household or face to face contact for > 5 minutes are considered risk factors. |

| **Fetal/Neonatal signs:** | Infection in the first trimester can cause congenital varicella syndrome in 1-2% – limb hypoplasia, skin scarring, eye and CNS anomalies |

**Investigation and management for mother**

- If vesicles evident, swab the base of the vesicle and send for VZV/HSV PCR
- If previous history of Chicken pox is unknown – request urgent VZV IgG serology (IgM is unreliable)

**Treatment for exposure in seronegative women:**

- If mother is seronegative and she presents within 4 days from chicken pox contact, mother should get ZIG to attempt to prevent infection developing.
- If consultation is greater than 4 days from chicken pox contact, no ZIG is required.
- Oral aciclovir is given in the 2nd half of pregnancy, in the immuno-compromised, in a smoker or a woman with underlying lung disease.

**Treatment of women with active chicken pox:**

- If seen within 24 hrs, mother to get oral aciclovir.
- If seen after 24 hrs, no aciclovir.
- If seen after 24 hrs and is considered high risk and at risk of complications, mother to get IV aciclovir.
- If mother develops chicken pox 5 days prior to 2 days after birth, infant should receive ZIG.

**Management of infant**

- If maternal chickenpox onset is 5 days prior to delivery or develops within 2 days of birth, infant to have ZIG
- If maternal chickenpox onset is greater than 7 days prior to delivery, no ZIG necessary
- Healthy term infants exposed to chicken pox outside these timeframes in a mother who has not had chicken pox do not need ZIG but should seek medical review if any lesions occur as there is a risk of severe disease that may need treatment.

**Treatment for infant:**

- In an infant who develops chickenpox and is very preterm, has respiratory disease and or severe chicken pox disease, this infant to have IV aciclovir administered.
- ZIG to be given if the neonate is preterm and there is no maternal history of chicken pox
- ZIG to be given if <28wks or <1000gm regardless of maternal chicken pox status
- Isolate (contact and airborne precautions) if the baby has active lesions until they crust over
- Infants with embryopathy at birth do no need isolation
**ENTEROVIRUS**

| Symptoms | Maternal symptoms: Fever, encephalitis, myositis, Hand Foot and Mouth disease.  
<table>
<thead>
<tr>
<th></th>
<th>Fetal/Neonatal Signs: Nonspecific but can include apnea, sepsis, meningitis, hepatitis</th>
</tr>
</thead>
</table>
| Investigations for infant | • Call Microbiologist to discuss appropriate testing required.  
|                              | • Samples can be sent for PCR or culture  
|                              | • Nasopharynx/throat/rectal swabs may be done after discussion with microbiology  
|                              | • If doing an LP send the CSF for PCR |
| Management | No specific treatment |
There has been a rapid rise in syphilis cases among women in recent years with a corresponding increase in cases of congenital syphilis. Incorrect or delayed management or inadequate follow up can result in increased morbidity.

There should be information in the antenatal folder regarding women that are known to have syphilis.

**Definitions**

Acquired syphilis can be divided into **primary** (ulcer or chancre stage), **secondary** (systemic dissemination), **early latent** (within 2 years of acquisition with no symptoms), **late latent** (> 2 years since acquisition with no symptoms) and **tertiary** syphilis (symptomatic late syphilis e.g. gummas, cardiovascular and neurological involvement).

The risk of congenital syphilis is very high during the first 4 years after acquisition of syphilis and is negligible after 8 years of infection.

**Maternal and Antenatal Risk factors**

The risk of congenital infection for untreated pregnant women is 100% for primary syphilis and secondary syphilis, 80% for early latent and 10% for late latent syphilis.

The risk of congenital syphilis in women treated during pregnancy is between 1-2%.

**Antenatal Scans**

Ultrasound signs of congenital syphilis in the fetus include hepatomegaly, placentomegaly, polyhydramnios, ascites and elevated middle cerebral artery peak systolic velocity. Less frequent findings include bowel dilatation and long bone abnormalities. Abnormal ultrasound finding prior to treatment is associated with treatment failure and delivery of a neonate with congenital syphilis.

**Understanding Investigations**

<table>
<thead>
<tr>
<th>EIA</th>
<th>TPPA</th>
<th>RPR</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactive</td>
<td>Reactive</td>
<td>Reactive</td>
<td>Confirmed syphilis infection</td>
</tr>
<tr>
<td>Reactive</td>
<td>Reactive</td>
<td>Non-reactive</td>
<td>Evidence of past treated syphilis or latent infection OR very early infection.</td>
</tr>
<tr>
<td>Reactive</td>
<td>Non-reactive</td>
<td>Reactive</td>
<td>Biological false positive OR very early infection Repeat in 2 weeks</td>
</tr>
<tr>
<td>Reactive</td>
<td>Non-reactive</td>
<td>Non-reactive</td>
<td>Possible early primary, latent or false-positive, retest in one month</td>
</tr>
<tr>
<td>Non-reactive</td>
<td>Not tested</td>
<td>Not tested</td>
<td>No evidence of syphilis, or too early, retest in one month if strong suspicion based on clinical evidence.</td>
</tr>
</tbody>
</table>

A decrease of RPR titres after treatment from 1:16 to 1:4 is indicative of adequate treatment. Conversely for example, a rise in RPR titres after treatment from 1:2 to 1:8 is indicative of re-infection or treatment failure.

**Symptoms**

Babies born to all women treated for syphilis in current pregnancy require evaluation at birth.

The newborn infant should be examined for the following clinical features:

- IUGR / Unexplained enlarged placenta.
- Hepatomegaly/splenomegaly
- Necrotising funisitis – inflammation of the umbilical cord
- Fever / Jaundice.
- Non immune hydrops fetalis (NB: check for parvovirus).
- Generalised lymphadenopathy.
- Snuffles, haemorrhagic rhinitis.
- Bullous lesions, palmar/plantar rash, mucous patches.
- Condylomata lata.
<table>
<thead>
<tr>
<th><strong>Investigations that may suggest diagnosis</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Osteochondritis/periostitis.</td>
</tr>
<tr>
<td>• CNS signs, elevated cell count or protein in CSF and no other cause found</td>
</tr>
<tr>
<td>• Haemolytic anaemia, DIC, thrombocytopenia.</td>
</tr>
<tr>
<td>• Pneumonitis, Nephrotic syndrome.</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Investigation for infant</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The interpretation of syphilis serology in neonates requires specialist input as no single test can be used to diagnose congenital syphilis. Passive transfer of maternal antibodies makes interpretation of neonate serology more complex</td>
</tr>
<tr>
<td>• Paired venous blood samples: RPR serology paired with mother</td>
</tr>
<tr>
<td>o Send a neonatal venous blood sample for syphilis serology: request serum treponemal EIA, RPR, treponemal IgM (available through select laboratories in NZ). Take blood from the neonate, not the umbilical cord.</td>
</tr>
<tr>
<td>Send a maternal venous blood sample for serum RPR at the time of delivery if no result available within the past 4 weeks from the same lab</td>
</tr>
<tr>
<td>• Send further tests as clinically indicated below</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Management</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>See below</td>
</tr>
<tr>
<td>Category</td>
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<tr>
<td>--------------------------------------</td>
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</table>
| **Proven, or highly probable congenital syphilis** | Abnormal physical examination consistent with congenital syphilis OR A serum RPR titre fourfold high than the mother's titre on 2 occasions (e.g. mother's RPR 1:4, infants 1:16) or infant IgM positive OR T. pallidum PCR assay of lesions or body fluids reactive | • CSF analysis (VDRL, cell count, protein)  
• FBC, EUC, LFT  
• Long-bone X-Rays  
• Other tests if needed:  
  - Chest X Ray  
  - Neuroimaging  
• Ophthalmologic examination  
• Formal audiologic examination  
• Examination  
• Placental histology and syphilis PCR | Benzylpenicillin 50,000U (30mg)/kg/dose IV every 12 hours during the first 7 days of life  
**AND**  
every 8 hours thereafter for a total of 10 days * | 1) Paediatric review at 6wks, 3mths, 5-6 mths and 12-18 mths of life.  
2) RPR expected to be negative at 6 months  
3) If congenital neurosyphilis diagnosed at birth- repeat CSF analysis every 6 months until normal parameters  
4) If infant RPR increasing or not decreasing may need repeat LP / retreatment |
| **Asymptomatic possible congenital syphilis** | Normal clinical examination AND serum RPR equal to or less than fourfold the maternal titre AND ONE OF THE FOLLOWING  
Mother not treated, inadequately treated or no documentation of treatment OR Mother treated with a non-penicillin regimen OR Mother received recommended treatment <4 weeks before delivery | • CSF analysis (VDRL, cell count, protein)  
• FBC, EUC, LFT  
• Long-bone X-Rays  
• Placental histology and syphilis PCR | Benzylpenicillin 50,000U (30mg)/kg/dose IV every 12 hours during the first 7 days of life  
**AND**  
every 8 hours thereafter for a total of 10 days *  
Note: For some infants where CSF examination and other investigations normal and where follow up can be assured, then benzathine benzylpenicillin tetrahydrate 50,000U/kg IM as a single dose may be used after discussion with Paediatric ID specialist # | 1) Paediatric review at 6wks, 3mths, 5-6 and 12-18 mths of life with repeat RPR  
2) RPR expected to be negative at 6 months  
3) If congenital neurosyphilis diagnosed at birth- repeat CSF analysis every 6 months until normal |
### Congenital Syphilis Less Likely

| Normal infant examination | None needed | Repeat serology at 6 weeks, 3 and 6 months  
<table>
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<tbody>
<tr>
<td><strong>AND</strong></td>
<td></td>
<td><strong>OR</strong></td>
</tr>
</tbody>
</table>
| Serum RPR titre equal to or less than fourfold the maternal titre | Repeat serology at 6 weeks, 3 and 6 months  
| **AND**                  |             | If any concern regarding follow up or lack of required maternal testing then **GIVE** benzathine benzylpenicillin tetrahydrate 50,000U/kg IM as a single dose # |
| Mother treated appropriately during pregnancy for stage of infection and treatment was administered > 4 weeks before delivery | Repeat serology at 6 weeks, 3 and 6 months  
| **AND**                  |             | If any concern regarding follow up or lack of required maternal testing then **GIVE** benzathine benzylpenicillin tetrahydrate 50,000U/kg IM as a single dose # |
| Mother has no evidence of reinfection or relapse | Repeat serology at 6 weeks, 3 and 6 months  
| **AND**                  |             | If any concern regarding follow up or lack of required maternal testing then **GIVE** benzathine benzylpenicillin tetrahydrate 50,000U/kg IM as a single dose # |

#### Management of Babies Born to Hepatitis B, C and HIV Positive Mothers

- Wear gloves when handling the baby until they have been bathed
- Bath the baby in warm water only to remove any maternal secretions
- Clean the skin with an aqueous chlorhexidine (alcohol-free) swab prior to giving im Vitamin K
- Hep B positive mothers – baby to receive Hep B immunoglobulin and vaccination as soon as possible (see immunisation section)

#### Congenital Syphilis Less Likely

- Normal infant examination AND
- Serum RPR titre equal to or less than fourfold the maternal titre AND
- Mother treated appropriately during pregnancy for stage of infection and treatment was administered > 4 weeks before delivery AND
- Mother has no evidence of reinfection or relapse

#### Syphilis Serology

1) Repeat syphilis serology at 3 months – if all negative – discharge
2) If syphilis serology reactive then repeat at 3 monthly intervals until negative
3) RPR is expected to be non-reactive at 6 months - any passive cross over of treponemal antibodies will be negative by 15 months of life.
**ORTHOPAEDICS**

## Developmental Dysplasia of the Hips

**Risk factors for developmental dysplasia of the hips (DDH)**

- Breech or transverse lie in the 3rd trimester
- First degree relative with history of DDH
- Severe oligohydramnios of long duration
  - These infants should have a hip ultrasound at 6 weeks after their due date regardless of a normal hip examination (scans done before 6 weeks are hard to interpret due to immaturity and need to be repeated so details such as the EDD are crucial to get the correct timing of the scan)
- The form includes information for the parents to understand why the scan is being requested and the follow-up required if the scan is abnormal
- Give the other copies of the form for the GP and LMC to the Neonatal ward clerk to distribute
- Details such as EDD, phone number and GP name are essential on the US request form
- All results are reviewed by the Orthopaedic DDH coordinator so ensure all referrals have Team DDH CDHB as the Responsible Clinician
- Borderline results involve arranging a repeat hip US in 6 weeks
- Abnormal results are referred on to Orthopaedics for a clinic review within 4 weeks

## Abnormal Hip Examination

Hips that are dislocated or dislocatable or there is a major risk factor such as neural tube defect or arthrogryposis

- Discuss the clinical findings with the neonatologist on service who may also examine the baby
- After discussion with the neonatologist refer to orthopaedics by completing the referral form (saved in the common folder in G:drive as “DDH Referral Form” and emailing a scanned copy of the form to the DDH Coordinator at ddh@cdhb.health.nz. And the NICU secretary nicuadmin@cdhb.health.nz to upload on to HCS.  
  - The Coordinator can also be contacted on 021951261 if you have any questions
  - There is no need to phone the on-call Orthopaedic Registrar and no need to order an ultrasound as orthopaedics will arrange that after assessing the baby.
- The referral will be reviewed and booked within 3 days and an appointment made within 2 weeks

## LMC Orthopaedic Referrals

- For babies that are inpatients at CWH please ask the Neonatal team to arrange referrals for screening hip ultrasounds or referrals to Orthopaedics for abnormal hip examinations
- For babies not at CWH the LMC should contact the DDH team directly by email: ddh@cdhb.health.nz or ph: 021 951 261 if a baby needs hip dysplasia screening or has an abnormal hip examination

## Talipes

**Positional talipes**

- The foot can be brought into normal anatomical alignment when manipulated
- No need for Orthopaedic review but notify the Neonatal Physio (pager 5119 or referral in pigeon hole) who will review the baby on the ward or contact the family by phone to discuss exercises to perform.

**Talipes calcaneovalgus**

- The foot is pressed against the front of the shin is of no significance and needs no treatment.
**Talipes equinovarus**

- The foot is inverted, supinated and adducted distal to the talus
- Many babies are born with a minor degree of positional talipes equinovarus in which full ankle movements are possible and in these cases no treatment is necessary.
- Fixed talipes can be detected on antenatal scans and an antenatal referral may have gone to the Orthopaedic Paediatric Physio who should have met with the family to discuss the treatment after birth
- Babies on the postnatal ward with fixed talipes should be referred to the Orthopaedic team by completing a yellow consult sheet (Fax 80806). Please include on this the Mothers NHI as the team may have met the family antenatally. A senior Orthopaedic Nurse will either visit the family in hospital or arrange to see them as an outpatient within 2 weeks to discuss the treatment required. **There is no need to call the on-call Registrar.**
- Babies in NICU with fixed talipes should have a yellow consult sheet faxed to the Orthopaedic team when the baby approaches term (if born prematurely) as casting will not be done prior to this as it is not developmentally supportive.
- Treatment involves casting from about 2 weeks of age in term babies or around term corrected age in preterm babies. The casts are changed every week for about 6 weeks and then they proceed to a tenotomy and a further 4 weeks of casting before starting to wear John Mitchell boots and bars.

**Erbs Palsy**

- This is caused by injury to the brachial plexus often after a difficult delivery
- Typically the arm is held limply by the side, medially rotated and the hand in a “waiters tip” position
- Flexion at the elbow is diminished
- Look for associated clavicular and humeral fractures and Horner’s syndrome (ptosis, small pupil)
- Refer to Neonatal Physio (page 5119 or place a referral in her pigeon hole in NICU) who will review on the ward if available and at 2 weeks of age. If the palsy has not recovered then they will refer to the Child Development Service for ongoing follow-up and management

**Other Orthopaedic Issues**

- Occasionally other orthopaedic issues occur that need to be discussed with the Orthopaedic team, eg. fractured humerus or femur, dislocated joints, congenital skeletal abnormalities.
- If they are non-acute then a consult sheet to Orthopaedic Outpatients is all that is required. This will be reviewed by the Orthopaedic Paediatric Physio in the first instance who will liaise with the available Paediatric Orthopaedic Surgeon and a time will be arranged to review the baby
- If it is acute and within work hours then complete a yellow consult sheet and contact Jan Armstrong (Charge Nurse) on phone 80812 or mobile 0276890189 and she will liaise with the Paediatric Orthopaedic Surgeon available and arrange for the baby to be seen. Faxes can be sent to 8086 (int) or 03 3640806 (ext) or emailed to orthopaedics@cdhb.health.nz
- If it is an acute issue that is out of hours then call the Acute Orthopaedic Registrar on 027 222 2723 as the first point of contact
**ANTENATAL RENAL**

**Management of Fetal Renal Tract Dilation: Antenatal v1.0 Feb 2017 ANFRD Chart**

### First US Assessment
- **16-28 weeks**
  - Visible dilation in the first trimester is always abnormal
  - AP RPD < 4mm
  - +/- central calyceal dilation (no peripheral dilation)
  - No additional findings
- **>28 weeks**
  - AP RPD 4mm to < 7mm
  - +/- central calyceal dilation (no peripheral dilation)
  - No additional findings
  - AP RPD 7mm to < 10mm
  - +/- central calyceal dilation (no peripheral dilation)
  - No additional findings
  - AP RPD 10mm to < 20 mm
  - +/- central calyceal dilation (no peripheral dilation)
  - No additional findings
  - AP RPD 20 mm to < 24 mm
  - +/- central calyceal dilation (no peripheral dilation)
  - No additional findings
  - AP RPD 24 mm to < 27 mm
  - PLUS any one or more of:
    - Peripheral calyceal dilation
    - Abnormal parenchymal thickness
    - Abnormal parenchymal appearance
    - Dilated ureters
    - Abnormal bladder wall or ureteroceles
    - Unexplained oligohydramnios
  - Dilled duplex or anomalous kidneys, cystic kidney disease or other abnormal parenchyma without dilation

### Follow-up US Assessment
- **NORMAL**
  - No follow up

### Reassess using same criteria as First US Assessment
- **28 weeks**
  - Repeat US at or near 32 weeks. Repeat is not needed if dilation was first detected after 28 weeks.

### A1 - LOW RISK
- Maternal and Neonatal GP registration
- Initial Postnatal Ultrasound: 6 weeks No antibiotics.

### A2 - INTERMEDIATE RISK
- Maternal and Neonatal GP registration
- Initial Postnatal Ultrasound: Day 7 if >13mm L-L bilateral and All at 6 weeks (1-3 months).

### A3 - HIGH RISK
- Maternal and Neonatal GP registration
- Consider antenatal paediatric specialist services referral
- Minimum Postnatal Ultrasound: US at day 7 as determined by FAAC AND US and MCU at 6 weeks with A0’s Additional US within 24-48 hours if suspected bladder outlet obstruction, oligohydramnios, abnormal parenchyma or worrying clinical presentation such as poor urine output. Clinical assessment drives urgency. Consider catheter placement if US delayed or concern about bladder outflow obstruction.

---

*or appropriate local equivalent
Management of Fetal Renal Tract Dilatation: Postnatal v1.0 Feb 2017

First US Assessment
Timing as per the Antenatal Pathway. ALL scans will be reviewed under the virtual clinic process. Letter to GP will be sent.
Scans performed before 7 days of age may falsely underestimate dilatation and should be repeated after 7 days

N
AP RPD < 10mm
+/− central calyceal dilatation (no peripheral dilatation)
No additional findings

P1
AP RPD 10 to < 15mm
+/− central calyceal dilatation (no peripheral dilatation)
No additional findings

P2
AP RPD = 15mm
+/− central calyceal dilatation (no peripheral dilatation)
No additional findings

P2
AP RPD < 15mm
With peripheral calyceal dilatation and/or dilated ureters
No additional findings

P3
AP RPD > 15mm
With peripheral calyceal dilatation and/or dilated ureters

P3
Any AP RPD
PLUS Any one or more of:
Abnormal parenchymal thickness
Abnormal parenchymal appearance
Abnormal bladder wall or ureteroceles
Anomalous kidneys, cystic kidney disease, symptomatic child or urinary tract infections

All children with abnormal renal scans require registration with a GP

NORMAL
Normal scan after 1 month age:
EXIT PROTOCOL: No further follow-up

P1
LOW RISK: Virtual Clinic review, and letter to GP.
Low risk US after 1 month age:
Needs repeat US and assessment at 6-12 months of age. Review at GU clinic

P2
INTERMEDIATE RISK
Virtual clinic review D7 scan reviewed (see P3)

P3
HIGH RISK
Needs urgent specialist input
Abnormal D7 scans reviewed at NICU grey meeting with Paediatric Surgeons. Confirm 6 week tests ordered.

EXIT PROTOCOL
Referral or other management as appropriate

US assessment at 12 months
Use same criteria as first US assessment

If normal at 12 months then EXIT PROTOCOL
No further follow up

If remains P1 at 12 months of age then EXIT PROTOCOL
No further follow up

If P2 or P3 at 12 months then follow appropriate pathway.
Review at GU clinic will be arranged.

1. Follow up at GU clinic will be arranged.
2. Repeat US 1–3 months
At discretion of responsible clinician, consider:
Prophylactic antibiotics – Radiology prescribe if VUR identified
MCU if bilaterally dilated ureters or calyces
(Nmag or DTPA after 3 months age if suspicion of obstruction)

1. Urgent referral to local Specialist Paediatric Service. Tests at 6 weeks reviewed by Virtual clinic and FU arranged at monthly GU clinic.
2. Repeat US / other tests as determined by specialist
At discretion of responsible clinician, consider:
Catheter placement if concern about bladder outlet obstruction
Prophylactic antibiotics (Continue if grade 3 or more VUR)
MCU for assessment of reflux or bladder outlet obstruction
Nmag or DTPA after 3 months age if suspicion of obstruction

CDHB annotated in blue
May 2017

Ref.2403289 Approved by: Clinical Director Neonatal
July 2020
Other Renal Issues

The flowcharts above only relate to antenatal renal dilatation, however, there are other antenatal renal anomalies that need follow up:

- Single kidney and Unilateral Multicystic dysplastic kidney:
  - MCU and US at 6 weeks
  - Antibiotics for 2 nights prior to MCU
  - Virtual clinic FU
- Horseshoe kidney, Duplex kidney, Pelvic kidney - without dilatation or dilatation <7mm:
  - US at 6 weeks
  - No antibiotics
  - Virtual clinic FU
- Family History of High grade VUR in parent or siblings, ie. first degree relatives:
  - Parents should be made aware that despite normal antenatal ultrasound findings the infant is at increased risk of VUR and investigation are recommended.
  - Incidence of VUR is 20-40% if a sibling is affected and 40-60% in offspring of mothers with VUR.
  - Over the years the level of VUR at 6 weeks age when the postnatal renal US was normal is usually grade 3 or less and the need for other than US monitoring has not been required in the majority of cases.
  - US only if no antenatal dilatation and no antibiotics are needed, however after discussion, acknowledge that the family may request an MCU due to their previous experience
  - US and MCU if antenatal dilatation > 7mm, regardless of peripheral calyceal involvement and give antibiotics

Antibiotic prophylaxis

- If an MCU is done < 7 days age give a dose of iv gentamicin prior to the MCU
- Prophylactic oral antibiotics can start from day 5
- Firstline choice is cotrimoxazole (0.25 mL/kg/dose at night) and to continue until the MCU result is known
- If the baby is jaundiced then use amoxicillin 50 mg nocte for a maximum of 2 weeks and then change to cotrimoxazole otherwise resistant organisms are more likely
- Who should start prophylactic antibiotics by 5 days of age
  - Babies booked for an MCU should be recommended antibiotics.
  - As noted above a single kidney or unilateral MCDK needs antibiotics just for the 2 nights prior to the MCU
  - Renal pelvis dilatation ≥ 7 mm with additional findings (A3 group) and MCU planned.
  - Renal pelvis dilatation ≥ 7 mm without additional findings due to family history and MCU planned
  - Pattern on antenatal scans highly suggestive of VUR eg fluctuating renal pelvis and ureter seen whatever the renal pelvis dilatation measurement is
  - Family history of VUR with early UTI history in other family members and normal antenatal scans - some parents will prefer antibiotics from day 5 depending on their experience. Signs and symptoms of UTI are variable and subtle.
  - Parents are sometimes reluctant for their baby to be on antibiotics – they should be advised depending on the severity of the antenatal findings. If at the mild end of the spectrum commencing 2 nights before the MCU is adequate.

Documentation

- Generic letter to be completed: Health Connect South – Add New Document – New Referral Document – Neonatal Specialty – Document type to get the correct template (Renal or Renal Family History) which explains the process to parents, LMC, GP
- The copy for the Antenatal Renal Virtual Clinic (Paediatric Outpatients) to be given to the NICU ward clerk.
- The US and MCU are ordered electronically. The SMO for the investigations would say R SINCLAIR so that the results go to the appropriate person to act upon
- The requests must have the Maternal NHI written in free text for the Radiologists to be able to view the antenatal scans at the time of the postnatal investigations
LMC Renal Referrals

- LMC’s should contact the ward registrar or CNS-ANP on pager 5039 during working hours to arrange the necessary investigations and arrange prophylactic antibiotics if required
- Copies of the antenatal ultrasound will need to be faxed to 3644883 or 85883 internal if they are not available on Health Connect South
- Virtual clinic follow up is by Dr Sinclair after the investigations at 6-8 weeks.

CARDIOLOGY

Murmurs

- The following recommendations are based on the fact that the majority babies will have an audible murmur (often quite transiently) sometime in the first 24 hours, caused by closure of the ductus arteriosus or other circulatory changes related to the perinatal transition.
- The murmur of normal ductal closure in a well term infant is typically a systolic murmur with blowing or "whooshing" quality. It can be reasonably loud but should never be accompanied by a precordial lift or thrill, abnormal peripheral pulses, cyanosis. It is usually short, as opposed to the holosystolic or machinery murmur of a persistent patent ductus arteriosus in an older baby, presumably because the pulmonary vascular pressures are still relatively high. With experience, you will get used to these innocent murmurs and will distinguish them from murmurs that sound more pathological in origin.
- However, it is also important to recognise that several of the most serious congenital heart defects that present in the first week of life can be associated with soft or insignificant sounding murmurs. Thus, in excluding serious congenital heart disease, the rest of the cardiovascular examination is just as important as auscultating the heart.
- If the baby is well and has a normal examination, and is less than 24 hours old, re-examine in 24 hours.

Examine the baby daily up to day 4 or until the baby is discharged. If the murmur is still present on day 4 or at discharge:

- Perform pre (right wrist) and post ductal oxygen saturations (feet) prior to discharge. The oxygen saturation should be read once a satisfactory trace has been obtained (for at least 6 minutes)
- Infants in whom the oxygen saturation is < 95% on either of the recordings or where there is a significant difference (≥ 3%) between the two readings should have an echo performed prior to discharge
- Infants in whom the oxygen saturation is < 90% or in whom there is clinical concern should be seen by the neonatal registrar/CNS-ANP and admitted to the NICU
- Infants in whom the oxygen saturation is ≥ 95% on both of the recordings should be booked in to the Echocardiogram clinic on a Wed afternoon in CWH Radiology.
- Order the echo by electronic radiology request on Health Connect South. Consultants will triage and arrange a Wed appointment within 1-2 weeks
- If an echo is requested by the Consultant to be performed by the echo technicians from cardiology, complete an Echo request form and fax (81449)
- Perform CXR, ECG, 4 limb BP if baby unwell or echo indicates a significant shunt.
ENT

Ear Deformities
- Deformational ear anomalies occur in 1:100 live births.
- Early external splintage may reduce long term deformity and the need for later surgical correction.
- Neonates with simple deformational ear anomalies should be referred to the plastics registrar (8922) for consideration of simple splintage and a time will be made to apply ear moulding in Plastics Outpatients.
- This splintage is best applied in the first week of life and can be applied without anaesthetic.
- Follow up will be by Mr Chris Porter in an elective clinic 2-3 weeks later.
- Splintage may be required for 3-6 weeks.
- The equipment will be available in plastics outpatients for application (solder wire + silicone/paediatric feeding tube + steristrips).

BEFORE

AFTER

Cleft Lip and Palate

Cleft Palate and/or Lip
- May need admission but management on the postnatal ward is encouraged.
- All babies to be discussed with the SMO on service who will also need to approve readiness for discharge.
- To stay in hospital until feeding is established or a discharge feeding plan is made. This will take at least 4 days.
- Encourage breast feeding or time at the breast, but breast milk feeding via a “pigeon” or “Haberman” specialised feeding system is often used.
- Referrals needed (also see flow sheet below):
  - Cleft Nurse – works part-time but can act on referrals promptly. May have met the family antenatally.
  - Plastic Surgeon – will visit family on maternity or NICU if requested, otherwise will see in clinic after discharge.
  - Speech language therapist - will assess and provide appropriate specialised bottles. All babies need to be seen by SLT prior to discharge.
  - Lactation consultant – may have met family antenatally, involve early.
- There is a parent information booklet (The Blue Book) available to be given to the family.
- A Child Disability Allowance form should be completed before discharge if the palate is involved and registration for the National Travel scheme and carer support if appropriate.

Pierre Robin Sequence
- Pierre Robin syndrome is characterised by micrognathia (small jaw), retrognathia (posterior displacement of the chin), glossoptosis (the tongue falls backwards) and u shaped cleft soft palate.
- The severity of the syndrome, which presents in the neonatal period with upper airway obstruction and feeding difficulties, varies widely.
- Upper airway obstruction presents at, or shortly after birth as a result of retrognathia and subsequent posterior position of the tongue. The airway can be managed in a number of ways from postural nursing with the infant prone, nasopharyngeal airway to tracheostomy.
- Admit to the NICU for saturation monitoring if there is any suspicion of airway compromise.
- Referral pattern as per cleft palate pathway but may also need ENT review.
- Consider investigation/follow-up for other features of (autosomal dominant) Stickler syndrome, especially if there is a positive family history of Robin sequence or eye abnormalities, usually with geneticist referral.
• Babies that benefit from nasopharyngeal airway will have had full assessment, including a sleep study, prior to NP airway insertion. The decision will be made by Consultants with consultation with parents.
• Consider need for cardio-respiratory monitoring at home.
• See Procedures section for instruction on how to insert a nasopharyngeal airway.

Cleft Lip and Palate Pathway

At Birth
Initial Assessment of airway by Neonatal Team

Admit to Postnatal Ward and assess airway and feeding
Admit to NICU if babies has retrognathia and a cleft palate (Pierre Robin) or babies with colour changes or significant feeding difficulties.

Notify Neonatal SMO of all births.
Bronwyn Dixon provides all outpatient follow-up

Neonatal Outreach
Will home visit all cases irrespective of the need for NICU admission

Neonatal Team are responsible for the issue of Child Disability Allowance Form at discharge if applicable

Cleft Coordinator
Harriette Van der Zee
pager: 7038
phone: 81974
(can leave message)
fax: 80246

Speech Language Therapist
pager: 8270
phone: 80710
fax: 80107
For management of feeding and feeding equipment

Lactation Consultant
pager: 5040
phone: 85521
For management of feeding and feeding equipment

Plastic Surgeon
Kirk Williams
mobile: 0211091386
phone: 80157
fax: 81587
Assesses lip and palate

Orthodontics
fax: 80246
Referral made by Plastics or Cleft Coordinator if needed
For strapping of the lip, or, obturator (plate)
**MATERNAL THYROID DISEASE**

- Maternal stimulating or inhibiting thyroid antibodies may cross the placenta and transiently affect the baby.
- Occasionally some of these infants will need treatment in the neonatal period.
- When there are more than two generations affected by thyrotoxicosis or more than one first degree relative consider the even rarer autosomally dominantly inherited activating mutations of the TSH receptor. This is important as the neonatal thyrotoxicosis is more persistent.
- Any symptomatic baby needs a medical review.
- Note that the Guthrie will only detect hypothyroidism.

**Maternal Hypothyroidism secondary to ectopic thyroid or thyroid aplasia**

- There is only a slightly increased risk in the neonate and a Guthrie card test should suffice.

**Maternal Graves Disease**

- In mothers with a history of Graves disease will have circulating thyroid stimulating antibodies which can cause a transient hyperthyroid state in the neonate that may require treatment.
- This can occur even if the mother has been rendered hypothyroid by surgery or radioiodine treatment.
- Both carbimazole and propylthiouracil cross into breast milk but do not appear to affect the neonate if maternal doses are less than 15 mg per day of carbimazole and less than 150 mg per day for PTU.
- Although rare neonatal thyrotoxicosis is associated with a high mortality.
- The incidence of Grave’s is estimated to be about 0.2% and only 1-10% of infants will subsequently be affected. The highest risk is in those whose mothers are receiving antithyroid treatment at the time of delivery.

**Maternal Hashimoto’s**

- In mothers with Hashimoto’s thyroiditis there may be circulating stimulating or inhibiting antibodies that may transiently affect the neonate.

**Investigations**

- The optimum timing of thyroid function tests in the newborn is debatable.
- We know that there is a natural physiological surge in TSH and subsequently T4 at about 30 minutes post-delivery. The TSH falls over the next 5 days with the T4 gradually declining over the next 2 weeks.
- Babies at high risk of (mothers with active Grave’s in pregnancy, known maternal thyroid antibodies on blood tests, or family history of activating mutations of TSH receptor) or with symptoms of hyperthyroidism (tachycardic, weight loss, loose stools, increased temperature/hot, jittery/hyperactive) should have thyroid function tests done at 2 days, in conjunction with the Guthrie (or earlier if symptomatic) and repeated at 1 week with close observation for symptoms.
- Babies at low but some risk of hyperthyroidism (past history of Grave’s disease or Hashimoto’s thyroiditis) or hypothyroidism (Hashimoto’s thyroiditis) should have thyroid function tests checked at 5-7 days and parents advised of symptoms of thyroid disease.
- Babies at low risk (mothers with an ectopic or aplastic thyroid, or on thyroxine replacement with no antibodies) should simply have a Guthrie done.
- Babies whose mothers are on thyroxine but have no thyroid antibodies only need a Guthrie.
- TFT’s (TSH, T4, T3) are done in the biochemistry lab at Canterbury Health Labs – fill one green tube to the top line and this can be done by the midwife by heelprick along with the Guthrie test if needed.

**Process**

- LMC identifies in pregnancy that the baby will need screening blood tests after birth.
- LMC is responsible for ensuring the blood form is completed and their name on the form to check the result.
- LMC to ensure the bloods are taken (if on day 2 then combine with the Guthrie and if in CWH then to be discussed with core staff about who will take the blood).
- LMC is the primary person responsible for checking the result. If the results are normal then no more action is needed. If the results are abnormal then that is the time to contact the Neonatal team on 5039 (weekdays) or 5019 (weekends) for help in interpreting the result.
BABIES OF MOTHERS WITH MENTAL ILLNESS

General considerations
- Mental illness combined with the stress of post-partum period may impair a mother’s ability to comprehend or retain information and make decisions.
- Communicate with compassion and document clearly. Consider written information and ideally have a support person present when conveying complex or distressing information about their baby.
- Involve the father in discussions about the care of his infant however be mindful that there may be complex relationship issues, as well as legal and confidentiality issues.
- Babies of mothers with mental illness are more likely to have exposure to smoking, alcohol and substance misuse, poverty, social adversity and family violence so there may be care and protection considerations.
- Mothers with mental illness may struggle to bond with their infant and care should support the mother-infant relationship and minimise periods of separation.
- Encourage breastfeeding if no contraindications but support formula feeding or mixed feeding if it is the mother’s informed decision or best way to protect maternal/infant wellbeing. Lack of sleep is a common precipitating factor for a relapse of severe psychiatric illness.

Birth care plans for women with complex needs
- Women living with complex mental illness will have a complex needs birth plan (usually completed by 34 weeks gestation). A copy is placed in a confidential folder in the locked Neonatal ACNM office and should be consulted if her infant needs neonatal assessment.
- A FloView notification and a psychosocial support plan sticker on the front sheet of a woman’s notes alerts practitioners that the woman has a complex needs birth plan.

Poor Neonatal Adaptation and Neonatal Abstinence/Withdrawal
- Poor Neonatal Adaptation is a collection of symptoms seen in up to a third of neonates exposed to psychotropic medications in-utero, mainly SSRIs. Whether the symptoms relate to side effects of the medication or a withdrawal phenomenon is not clear.
- Symptoms include tremors, irritability, lethargy, hyper/hypotonia, poor feeding, tachypnoea, temperature instability, nasal congestion, hypoglycaemia, vomiting and diarrhoea.
- In the majority of infants, symptoms are mild and self-resolve, usually by 72 hours.
- Never assume infant irritability/lethargy/poor feeding/jitteriness is solely due to maternal medications. They could be signs that an infant is seriously medically unwell and the infant must be assessed and investigated appropriately. “Effects of maternal medications” is a diagnosis of exclusion.
- Supportive care should include an explanation of the infant’s symptoms to the mother, support for feeding, swaddling/skin to skin cuddles and pacifier use for settling.
- Neonatal Abstinence/withdrawal phenomena are seen with benzodiazepines and opiate exposure.
- Benzodiazepines and opiate withdrawal can begin 2-3 days after delivery so a longer observation time is necessary. Finnegan/NAS scoring is only validated for opiate withdrawal and is required for opiate withdrawal in term infants who are usually admitted to Neonatal Unit for observation and management.

Babies Exposed to Lithium
- In utero lithium is transferred freely to fetus across the placenta.
- Lithium has a narrow therapeutic index (therapeutic levels in adults 0.4-1.2mEq/L) and requires close monitoring to avoid toxicity (seen in adults at levels > 1.2mEq/L, no data on infants).
- Lithium can potentiate the effects of muscle relaxants.
- Lithium levels can fluctuate during pregnancy and at the time of birth.
- Babies exposed to lithium in-utero may be at increased risk of Ebstein’s anomaly or other cardiac defects (first trimester exposure) and should have had a detailed fetal anomaly scan.
- Some infants exposed to lithium may be hypotonic and require initial breathing support after birth and the neonatal team should be present at the birth.
- Some infants exposed to lithium may experience a prolonged ‘floppy baby syndrome’ associated with lethargy, poor sucking, tachypnoea, tachycardia, respiratory distress, cyanosis and hypotonia. The neonatal team should do the 24hr check including a pulse oximetry check.
- Babies whose mothers are on lithium at the time of delivery are at risk of lithium toxicity in the immediate postpartum if mother’s levels are high or if they become dehydrated. Extra monitoring and support with feeding may be needed to prevent dehydration and reduce risk of lithium toxicity.
• A **cord blood lithium level** should be taken on all recently exposed infants and reviewed by neonatal team. There are no current recommendations to guide interpretation. Below is a table of suggested actions. However regardless of blood lithium level, **any baby who is showing signs suggestive of lithium toxicity** (lethargy, hypotonia, poor feeding) should be **reviewed by neonatal team and will likely need admission**.

<table>
<thead>
<tr>
<th>Lithium level (&lt;0.6)</th>
<th>Lithium level 0.6-1.2</th>
<th>Lithium level &gt;1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>- support demand feeding</td>
<td>- ensure adequate hydration</td>
<td>- consider admission to neonatal unit for cardiorespiratory monitoring</td>
</tr>
<tr>
<td>- do not allow baby to go &gt; 4 hours without a feed</td>
<td>- support feeding</td>
<td>- support hydration</td>
</tr>
<tr>
<td>- do not allow baby to go &gt; 3 hours without a feed</td>
<td>- monitor lithium levels</td>
<td>- monitor lithium levels</td>
</tr>
<tr>
<td>- ensure adequate hydration</td>
<td>- check renal function</td>
<td>- check renal and thyroid function</td>
</tr>
</tbody>
</table>

• As lithium can affect **thyroid function** it is important to ensure all exposed infants have their newborn screening test.

• **Breastfeeding is not recommended** for women on lithium as lithium is excreted into breast milk in variable amounts (up to 42%) and there is a risk of neonatal toxicity, particularly if the baby is unwell or premature. There is also a paucity of data on long term outcomes however there is currently no data to suggest lithium affects neurodevelopment long term. It may be acceptable for babies to have a first feed of colostrum to aid establishment of the intestinal microbiome. Beyond that donor human milk or formula milk is advised.

• If a mother decides to **breastfeed on lithium** the risks and uncertainties need to be carefully explained to the mother, and there needs to be **careful clinical oversight** by Mothers & Babies Team with **infant blood monitoring** (blood tests on day 2, 7, 14 and then 3 monthly for lithium level, renal and thyroid function). Additional testing should be done if baby becomes unwell or if maternal levels are high or if maternal dose is increased (allow 5 days before testing for steady state drug level to be reached). If baby stops breastfeeding or is predominantly formula milk fed then this monitoring is not needed. It is important to emphasise that this monitoring does not guarantee the infant will not suffer adverse effects.

**KEY POINTS**
1. Neonatal team to attend delivery of all babies of mothers on lithium
2. Cord blood to be taken for lithium level in all exposed infants (neonatal team to review result)
3. Close observation of baby after birth with feeding support to avoid dehydration
4. Neonatal team to do 24 hour check (including pulse oximetry check due to increased risk of cardiac defects).
4. Breastfeeding not recommended. If mother chooses to do so blood test monitoring of baby required.

Additional Resources:

New Zealand Formulary ([www.nzf.org.nz](http://www.nzf.org.nz))
Medsafe ([www.medsafe.govt.nz](http://www.medsafe.govt.nz))
Bumps ([www.medicinesinpregnancy.org](http://www.medicinesinpregnancy.org))
MotherToBaby ([www.mothertobaby.org](http://www.mothertobaby.org))

You can also contact the Mothers and Babies Service Liaison Paediatrician for advice and the Hospital Drug Information Service. There is also a Health Pathways Guideline.
**SURGICAL**

**Urogenital**

**Undescended Testes**
- Most undescended testes are evident at birth.
- Descent is unlikely to occur beyond 3 months post-term
- Newborn testes are not retractile

**Action:**
- If undescended testis suspected, refer to paediatric surgery/paediatric urology at 3 months post-term
- Inform the GP and tell the parents that an operation is likely to be necessary if the testis is confirmed to be undescended

**Hypospadias**
- Presents as a bent penis (chordee), with an incomplete foreskin (dorsal hood) and a urethral meatus in an abnormal position (proximal to where it should be)
- Check that the testes are descended and that the scrotum is not bifid (this may indicate a DSD (intersex) problem

**Action:**
- Refer to the paediatric surgeon/urologist to be seen at 3 months
- Neonatal circumcision contraindicated
- If the abnormality is severe, obtain a renal USS.

**Hydroceles**
- Hydroceles need no treatment unless they persist

**Action:**
- Examine to be certain there is no inguinal hernia
- If hydrocele alone, reassure parents that these almost always resolve spontaneously,
- Refer to paediatric surgeon if there is diagnostic uncertainty or advise the parents that their GP can refer if they persist beyond 2 years of life

**Inguinal Hernias**
- Usually appear as an intermittent lump at the external ring in the groin
- Always needs surgical correction

**Action:**
- Paediatric surgical referral before discharge.

**Bilious Vomiting**
- Bilious vomiting is a sign of intra-abdominal pathology and must be taken seriously.
- It could be the first sign of malrotation with volvulus even if the abdomen is not distended and this is a surgical emergency
- Bilious aspirates can occur in the preterm infant on nasogastric feeds with feed intolerance, but, this is completely different from the term baby with bilious vomiting
- Usually babies with bilious vomiting will be on the postnatal ward

**Management**
- Consider the diagnosis of malrotation with volvulus
- Take an accurate history of feeds and vomiting
- View the colour of the vomit if possible
- Examine the baby for abdominal distension, abdominal tenderness and groin lumps
- Check the blood sugar (if they are obstructed they may not be absorbing enough milk to maintain blood sugars)
• AXR - if abnormal admit the baby to NICU
• If no other definite cause for the bile stained vomiting contact the Paediatric Surgeons, make the baby NBM and start iv fluids and antibiotics (amoxicillin and gentamicin)
• The Surgeons may request upper GI contrast studies to confirm the diagnosis
• If there is a clinical picture of peritonitis surgery will be required after the contrast study.

**Bowel Obstruction**

A variety of conditions may present with similar signs and symptoms. Antenatal scans, history and careful examination should help in establishing a diagnosis. The higher the obstruction the earlier the vomiting with less marked abdominal distension. The lower the obstruction the later the vomiting and more marked the distension

**Presentation**

- Abdominal distension
- Tenderness or pain on examination of the abdomen
- Vomiting – often bilious
- Delayed passage of meconium or failure to pass meconium within 48-72 hours
- Maternal history of polyhydramnios may indicate a high obstruction

**Ovarian Cysts**

Ovarian cysts diagnosed antenatally

- The vast majority of these are benign follicular cysts and if they contain solid elements consider the possibility of a cystic teratoma
- Cystic masses containing solid elements or symptomatic ovarian cysts should be surgically removed and histology performed
- Septated or debris filled cysts usually mean that the ovary is already dead from torsion and ischaemia and these frequently disappear on follow up ultrasound scans
- All suspected ovarian cysts should be referred to the Paediatric Surgeons
- An early postnatal scan should be arranged – discuss timing with the surgeons and arrange follow-up in the surgical clinic after the scan
**ANTENATAL ULTRASOUND ABNORMALITIES**

- Borderline cerebral ventriculomegaly (ventricles 10-15 mm)
  - Head circumference and careful physical exam
  - Ventricle/s ≥ 13.1 mm – postnatal head US in all babies
  - Ventricle/s 10-13.0 mm – postnatal head US only if this is the advice from the Fetal Anomaly Committee, otherwise treat as normal
  - Head US as an inpatient has the benefits of rapid resolution of any parental concerns as the majority of these scans will be normal.
  - If the head US is done as an outpatient then arrange for the parents to receive the results – either by phone contact or review in CWH Wed clinic after the scan
- Choroid plexus separation
  - Physical exam including head circumference
  - Head US only if ventriculomegaly or structural abnormality (especially of corpus callosum) on later antenatal scan
- Choroid Plexus cyst(s) - Physical exam, if no abnormality, no investigation required
- Agenesis of the corpus callosum (CC) / absent cavum septum Pellucidum (CSP)

  **Isolated partial or complete agenesis of CC +/- absent CSP:**
  - Antenatal: Fetal MRI AND microarray
  - Postnatal:
    - Monitor blood glucose until 48 hours old, if < 2.6 mmol/L send hypoglycaemia panel immediately
    - Pituitary workup at 48 hours of age: T4, TSH, FSH, LH (inpatient)
    - Ophthalmology review (outpatient)
    - MRI if not obtained antenatally, microarray if not obtained antenatally

  **Isolated absent CSP after 20 wks GA:**
  - Antenatal: Fetal MRI, consider genetics only if additional anomalies found
  - Postnatal:
    - Monitor blood glucose for 48 hours, if < 2.6 mmol/L send hypoglycaemia panel immediately
    - Pituitary workup: At 48 hours of age, send T4, TSH, FSH, LH (inpatient)
    - Ophthalmology review (outpatient)
    - MRI if not obtained antenatally
- Fetal cardiac echogenic focus - Physical exam, if no abnormality, no investigation
- Abdominal calcifications
  - Physical exam, if no abnormality, may need no investigation.
  - Consider TORCH screen if not done antenatally.
  - Make sure Guthrie card is done after 48 hours protein feeds
- Borderline cerebral ventriculomegaly (ventricles 10-15 mm)
  - Head circumference and careful physical exam
  - Ventricle/s > 10mm – postnatal head US if this is the advice from the Fetal Anomaly Committee
  - Head US as an inpatient has the benefits of rapid resolution of any parental concerns as the majority of these scans will be normal.
  - If the head US is done as an outpatient then arrange for the parents to receive the results – either by phone contact or review in CWH Wed clinic after the scan
- Choroid plexus separation
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  - Head US only if ventriculomegaly or structural abnormality (especially of corpus callosum) on later antenatal scan
- Choroid Plexus cyst(s)
  - Physical exam, if no abnormality, no investigation required
- Fetal cardiac echogenic focus
  - Physical exam, if no abnormality, no investigation
• Antenatal diagnosis aortic arch hypoplasia
  - These cases have had a potential arch abnormality detected on antenatal scans
  - A referral will have gone to Cardiology Auckland with the scans being reviewed and a plan made that it is appropriate to deliver in Christchurch
  - Any fetus with a significant and likely duct dependent arch narrowing will have a plan made to deliver in Auckland. However, the arch and PDA are dynamic structures so it is not always possible in borderline/mild cases to determine antenatally which cases will end up having a clinically significant arch narrowing that needs cardiology input soon after birth or prostaglandin to maintain systemic blood supply and which will have normal anatomy after birth.

Management
• Paediatric attendance at delivery is not required for this indication alone
• Keep baby with their mother on the postnatal ward if well and expect admission for a minimum of 3 days as monitoring and scans are required
• Daily Neonatal Team review and Neonatal Team to do the 24 hour baby check and to include pre and post ductal saturations at this time
• Monitor with newborn observations at 1, 4, 12 hours and then 12 hourly (including saturations) until the heart ultrasound is performed
• Lactate measurement 12 hourly until the heart ultrasound is done
• Heart ultrasound to be performed by NICU consultant day 2-3 or earlier if unwell
• The baby needs to remain an inpatient until the PDA closes and the aortic arch has been confirmed on scan as patent
• These babies often need a repeat scan at 6-8 weeks so discuss with Dr Alex Binfield (Paediatrician) regarding the requirement of this prior to the baby being discharged

Abdominal calcifications
  – Physical exam, if no abnormality, may need no investigation.
  – Consider TORCH screen if not done antenatally.
  – Make sure Guthrie card is done after 48 hours protein feeds

★ IMMUNISATION

Maternal Hepatitis B Carrier (HBsAg positive)
• The risk of mother passing the virus to her baby during delivery is high, and if not infected at birth, the baby remains at risk of hepatitis B infection from mother during the first five years.
• Although the baby's infection may be mild or even asymptomatic, chronic hepatitis occurs in up to 90% of infants who acquire the virus at birth.
• Thus, infection early in life results in a much higher risk of chronic hepatitis than in adulthood.
• Chronic hepatitis puts the baby, later in life, at high risk of transmitting the virus to others such as sexual partners and offspring, and of death from chronic liver disease or hepatocellular carcinoma.
• Recognition and counselling of mothers who are hepatitis B carriers should begin early in antenatal care.
• All pregnant women should be screened.
• Pacific Islanders, Africans, Asians and New Zealand Maori are high risk groups for chronic Hepatitis B carriage (this is presumed to be mostly due to perinatal acquisition).
• Carriage is also more common in people who have occupational or social exposure to human blood.

Management
• Wearing disposable gloves (to protect yourself) when handling the baby at birth and until they are bathed
• Early bathing of the baby to remove maternal blood and body fluids in warm water only
• Before any im injections the skin is to be cleaned with an aqueous chlorhexidine (alcohol-free) swab
• As soon as possible after birth, the infant should receive Hepatitis B Immunoglobulin (HBIG) 0.5 mL and Hepatitis B vaccine 1 mL IM at separate sites (see drug profiles)
• Vaccine and HBIG are likely to be fully effective when given up to 12 hours after birth, and will protect some infants even when given after that, but there is no advantage in delay.
• If the father or a household contact has Hepatitis B it is appropriate for the baby to receive the Hep B vaccination at birth but immunoglobulin is only indicated to prevent transmission from the mother during birth.
• The baby will need subsequent hepatitis B immunisations as per the National Immunisation Schedule.
• Infants of HBsAg positive mothers should be tested for HBsAg and antibodies to HBsAg one and three months after completion of the vaccine series. This will identify those few infants who have become chronically infected despite immunisation and will aid in their long term medical management. It will also identify infants who lack antibody and who should receive further doses of vaccine.
• If mother's HBsAg status is unknown at the time of delivery, maternal blood should be sent for testing.
• However, prophylaxis needs to begin immediately to be effective, so if she belongs to a high risk group, you should follow the protocol above for infants whose mothers are known to be positive without waiting for the results.
• If the mother proves to be negative the usual hepatitis B vaccine can be given at 6 weeks, 3 months and 5 months, and the serology testing after completion of the vaccine schedule can be omitted.
• We advise immunisation against Hepatitis B for all health care workers who are at risk of exposure to blood or bodily fluids. We also advise obtaining serologic proof that immunity has developed.

**BCG Vaccine**

• High rates of TB exist in New Zealand among population groups from Asia, Africa and the Pacific, particularly in recent immigrants.
• The role of vaccination is to protect individuals at high risk of exposure.
• BCG immunisation was introduced for neonates in 1976 and is highly efficacious in preventing extra pulmonary disease.
• The LMC needs to assess the risk of TB in pregnancy and plan for vaccination after birth.
• In babies admitted to the Neonatal Nursery the Neonatal Staff also have the responsibility of considering eligibility for BCG vaccine.
• Preterm delivery or being of low birth weight are not contraindications to vaccination but babies should wait until they are > 34 weeks before being vaccinated in order to ensure an adequate response.
• Families should be referred to the Vaccination Clinic at CWH by phoning the Public Health Nurses at Burwood Hospital on 99777 (internal) or 383 6863 (external) and faxing a request over 383 6878.

**Neonatal BCG Eligibility Criteria**

• Living with a person with current TB or a past history of TB.
• Living with one or more people who within the last 5 years lived for a period of ≥ 6 months in countries with a rate of TB ≥ 40 per 100,000.
• During their first 5 years they will live for ≥ 3 months in a country with a rate ≥ 40 per 100,000 and are likely to be exposed to those with TB.

**Areas with rates of TB ≥ 40 per 100,000:**
Africa, South America, Russia, India, China (not Hong Kong), South East Asia (not Singapore), Pacific (not Cook Islands, Fiji, Niue, Samoa, Tokelau, Tonga)
Haemorrhagic disease affects one in 2-400 babies who are not given vitamin K prophylaxis. Recommendations are:

- All infants should have vitamin K prophylaxis (2 mg/0.2 mL)
- Vitamin K given either as a **single IM injection or as repeated oral** doses is safe and effective in preventing haemorrhagic disease of the newborn in **well** newborns.
- Parents should be free to choose, either an injection or oral doses for their child.
- Oral vitamin K is given as 2 mg at birth with the first feed.
- For breastfed infants repeat doses (2 mg) should be given at 5 days (at the time of the Guthrie test) and at 6 weeks (with the first immunisation).
- IM vitamin K is given as a single injection of 1 mg (0.1 mL) at birth (< 1500 g 0.5 mg = 0.05 mL).
- **IM vitamin K is the strongly recommended route for high risk infants** (prematurity, birth asphyxia, traumatic deliveries, known hepatic disease, or any illness that will delay feeding, eg. most NICU admissions)
- Maternal phenytoin, primidone, methsuximide or phenobarbitone therapy is an indication for the mother to be given vitamin K (10 mg IM vitamin K) 24 hours before delivery then the baby should have 1 mg IM vitamin K at birth then again 24 hours later.
- Usually maternal warfarin therapy is stopped well before delivery because it crosses the placenta and can cause severe neonatal haemorrhagic disease. Occasionally, it cannot be stopped for maternal reasons. In these circumstances, the baby will need immediate and usually repeated doses of vitamin K, as well as measurement of PT and PTT and fresh frozen plasma on standby.
INVESTIGATIONS

Tubes for Lab Tests

- Intranet/Divisions/Canterbury Health Lab/Testing information will provide you with the blood volume and tube required for all tests done at Canterbury Health Labs
- Green tube = Lithium heparinised
- Pink tube = EDTA
- Red tube = Plain tube

<table>
<thead>
<tr>
<th>BLOOD TEST</th>
<th>VOLUME</th>
<th>TUBE</th>
<th>COMMENTS</th>
<th>LAB</th>
<th>TESTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromosomes</td>
<td>0.6 mL</td>
<td>Green</td>
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<td>Mon-Fri</td>
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<td>Daily</td>
</tr>
<tr>
<td>JAUN screen</td>
<td>0.6 mL</td>
<td>Green</td>
<td></td>
<td>80397</td>
<td>Daily</td>
</tr>
<tr>
<td>NEON</td>
<td>0.6 mL</td>
<td>Green</td>
<td></td>
<td>80397</td>
<td>Daily</td>
</tr>
<tr>
<td>TSH/T4 Endo Lab</td>
<td>1.2 mL</td>
<td>Pink</td>
<td></td>
<td>80848</td>
<td>Mon-Fri</td>
</tr>
<tr>
<td>TSH/T4 at Biochem</td>
<td>0.6 mL</td>
<td>Green</td>
<td></td>
<td>80397</td>
<td>Daily</td>
</tr>
</tbody>
</table>

It is not necessary to cover the blood tube with tin foil when sending for bilirubin test
**Swabs – Identification guide**

<table>
<thead>
<tr>
<th>Swab Type</th>
<th>Description</th>
<th>Media</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacterial Swabs</td>
<td>Phone Microbiology: ext 80350</td>
<td>CERVICAL SWABS / BACTERIAL SWABS (as above) for Mycoplasma/Ureaplasma</td>
</tr>
<tr>
<td>Chlamydia Multi- Collect Kits</td>
<td>Phone Serology: ext 80418 (A/H 80350)</td>
<td>All Chlamydia PCR Swabs Use for Chlamydia Testing:</td>
</tr>
<tr>
<td></td>
<td>Multi-Collect Transport Tubes</td>
<td>- Genital</td>
</tr>
<tr>
<td>Herpes Group PCR Swabs including VZ</td>
<td>Phone Virology: ext 80356 (A/H 80350)</td>
<td>- Eyes</td>
</tr>
<tr>
<td></td>
<td>Black top (Plain, plastic shaft, Dacon tip)</td>
<td>Enterovirus PCR: throat swab</td>
</tr>
<tr>
<td>Respiratory Viruses</td>
<td>Nasopharyngeal swab in Viral Transport Media. Phone Microbiology: ext 80350</td>
<td>Mycoplasma PCR: throat swab</td>
</tr>
<tr>
<td></td>
<td>Adult and Paediatric</td>
<td></td>
</tr>
<tr>
<td>Bordetella pertussis PCR</td>
<td>Nasopharyngeal swab &gt;&gt; place back in collection tube</td>
<td>No Transport Media</td>
</tr>
<tr>
<td></td>
<td>Adult and Paediatric</td>
<td></td>
</tr>
<tr>
<td>Measles PCR</td>
<td>Nasopharyngeal swab in Viral Transport Media</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adult and Paediatric</td>
<td></td>
</tr>
<tr>
<td>Oral Swabs for Measles PCR and Serology</td>
<td>For patients under 5 years only</td>
<td>No Transport Media</td>
</tr>
</tbody>
</table>

Authorised by: Microbiology, Canterbury Health Laboratories, CDHB  
Date: April 2013
Capillary Blood Sampling

Ensure the parents understand the reason for the blood test.

- Assemble equipment required
- Wash hands
- Warm the site if required using heel warmer
- Give infant sucrose as per the drug protocol
- Disinfect the site using an alcohol free chlorhexidine 2% solution and allow to air dry
- Select site of the puncture – medial or lateral portion of the heel, plantar surface. Punctures should never be made on posterior curvature of the heel below Achilles tendon where bone is closest to skin or on arch of the foot. Do not puncture over previous site.

- Wear gloves and use universal precautions when taking blood
- Use an automated lancet with a depth of incision ≤ 2.0 mm to puncture the heel. Wipe off first drop of blood with sterile gauze. Collect drops of blood into appropriate tube. Do not scrape blood from the heel area.
- Apply gauze to puncture site and apply pressure until bleeding stops.
- Discard lancet into sharps container

Newborn Metabolic Screen

- Capillary blood sample as above
- Refer to Maternity Guidelines Newborn Screening Guidelines for collection on to test card

Care of IV Luer on the Maternity Ward

Once the IV luer has been inserted and secured it will have a splint in situ to minimise the possibility of it becoming dislodged. This should be left unbandedged in order for it to be seen and checked.

- The IV luer will be taped in such a way that the site of insertion is visible under the tegaderm dressing. Where the cannula ends will be visible to allow easy detection of any swelling/redness of the site.
- A PALL filter will be attached to the end of the luer with a smart site on either side of the filter line.
- The smart site is to be swabbed with a 70% alcohol swab prior to administration of the medication. Medications will be given via the smart site at the end of the connection, thus going through the filter
- A sodium chloride 0.9% flush of 1 mil will be charted on the Drug Treatment chart (QMR0004) to be given 6 hourly as a slow push to ensure the luer is patent. The luer is to be checked for patency before the administration of any medication through the cannula
- The site of the luer should be observed at a minimum of 3 hourly by a midwife or registered nurse and the parents instructed to notify the midwife/nurse if they notice anything they are concerned about
- Notify the NICU team if any concerns regarding the IV luer.

IV Luer Insertion on the Maternity Ward

IV insertion should be undertaken on the maternity ward whenever possible. Assistance with this procedure will be required from the maternity ward staff. Their responsibility with this procedure is to:

- Ensure sucrose is available and administer it to the baby as per the protocol
- Contain and hold the infant for the procedure
- Assist with securing the IV luer under the guidance of the NICU Team
- Provide ongoing care of the IV luer (as per care of the IV luer on the maternity ward)