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27 November 2020

[redacted]

I refer to your Official Information Request dated 12 November 2020 requesting the following information:

Could I please have the ADHB policies that were current as at 24/9/2019 in relation to:

- **Induction of labour**
- **Fetal heart rate monitoring**
- **Neonatal cooling treatment**
- **Maternal blood pressure monitoring during pregnancy**

Please find attached the following policies which relate to the categories outlined above:

- Induction of Labour
- Oxytocin for Induction and Augmentation of Labour
- Fetal Surveillance Policy
- Hypertension – Antenatal, Intrapartum and Postpartum
- Cooling Therapeutic Hypothermia in the Neonate - Starship Clinical Guidelines
- Rupture of Membranes in Pregnancy - Guideline

You are entitled to seek a review of the response by the Ombudsman under section 28(3) of the Official Information Act. Information about how to make a complaint is available at www.ombudsman.parliament.nz or freephone 0800 802 602.

Please note that this response, or an edited version of this response, may be published on the Auckland District Health Boards website.

Yours faithfully

Ailsa Claire, OBE
Chief Executive of Te Toka Tumai (Auckland District Health Board)

Induction of Labour (IOL)

Document Type	Guideline
Function	Clinical Practice
Directorate(s)	National Women's Health
Department(s) affected	Maternity
Applicable for which patients, clients or residents?	All maternity women
Applicable for which staff members?	All clinicians in maternity including access holder lead maternity carers (LMCs)
Key words (not part of title)	prostaglandin, Foley catheter, oxytocin, cervical ripening
Author – role only	Midwifery Educator
Owner (see ownership structure)	Service Clinical Director, Secondary Maternity
Edited by	Clinical Policy Advisor
Date first published	November 2005
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Unique Identifier	NMP200/SSM/061

Contents

1. Purpose of guideline

To provide guidance on the indications and timing for induction of labour (IOL); to guide clinicians to offer IOL when appropriate (ie where evidence shows that benefit to mother and/or baby outweighs the risk), and to avoid IOL when not appropriate, within Auckland District Health Board (Auckland DHB).

To describe the process of booking IOL (planned and urgent), which is the same for all practitioners.

To provide guidance on the effectiveness and safety of methods of cervical ripening and on clinical management of IOL.

To define the roles and responsibilities of practitioners looking after pregnant women at Auckland DHB undergoing IOL.

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2. Background

IOL rates have steadily increased over the last two decades. In 2013, one in three women who gave birth at Auckland DHB had their labour induced. Rate of IOL among standard primipara is one of the clinical maternity indicators identified by the NZ Ministry of Health, as part of its national quality and safety programme for maternity services.

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3. Definitions

The following terms are used within this document:

Acute or urgent IOL	The clinical risk indicates IOL should commence within 24-48 hours
BMI	Body mass index
CCM	Clinical Charge Midwife
CTG	Cardiotocography
DAU	Day Assessment Unit
EDD	Estimated due date
Hypertonus	Contraction lasting more than two minutes, or less than 60 seconds resting tone in between contractions
Induction of labour (IOL)	The artificial initiation of labour
L&BS	Labour and Birthing Suite
LMC	Lead Maternity Carer
LMP	Last menstrual period
PG	Prostaglandin
RCT	Randomized controlled trial
SMO	Senior Medical Officer
Tachysystole	More than 5 uterine contractions per 10 minute period
Uterine hyperstimulation	Tachysytole and/or hypertonus combined with fetal heart rate abnormalities
VBAC	Vaginal birth after caesarean
WAU	Women's Assessment Unit

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4. Reducing the risk of post-term IOL

a. Dating ultrasound scan

Gestation should be calculated using Naegele rule from the woman's LMP. If LMP is unsure or she has an irregular cycle, an ultrasound should be performed. Crown-rump length measurement is more accurate to estimate gestational age than mean sac diameter. Biparietal diameter may also be used. Ultrasound dating of pregnancy has been shown to reduce the need for post-term IOL compared to using LMP. If there is a discrepancy of more than 5 days between the EDD by LMP and by early (< 14 weeks) ultrasound scan, the scan EDD should be considered the best estimate; if 5 days or less, the EDD by LMP could be used. Once the EDD has been determined, it should not be changed. Ultrasound scans performed later in pregnancy are not as accurate for dating.

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b. Membrane sweeping

Membrane sweeping reduces the duration of pregnancy and increases the chance of spontaneous labour. Eight women would need to have membrane sweeping in order to prevent one formal post-term IOL. Each woman should be offered the option of membrane sweeping from 38 weeks, with the plan to perform membrane sweeping at 40 weeks. Recent evidence suggests that serial sweeping is no more effective than a single membrane sweeping. The woman should be informed to expect some discomfort during the procedure and some spotting afterwards.

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5. Indications and timing for elective/planned IOL

A woman who has an indication for elective IOL should be assessed by a specialist obstetrician, who should then make a management plan.

Midwives can use the post term virtual consultation (PTVC) pathway if specific criteria are met:

- A healthy woman, age < 40, and BMI < 35
- A healthy baby, normal customized estimated fetal weight, and normal fetal movements
- If previous caesarean, the woman has had formal consultation with specialist obstetrician, is clinically suitable for VBAC, and a care plan is documented in HealthWare
- The woman agrees to and understands that her LMC will undertake this virtual consultation, and has read and understands the "Induction of labour at Auckland City Hospital" information leaflet

Complete and fax a DD3073: Post term virtual consultation (PTVC) form, and relevant information such as ultrasound scans, to 630-9781. The SMO in Antenatal Clinic should contact the LMC with the date and time, by next business day, and should document a plan in HealthWare.

For a woman who does not meet the criteria for PTVC pathway, midwives should refer to Antenatal Clinic for a consultation well in advance. Complete and fax a CR3509: Maternity Secondary Referral form, and relevant information such as ultrasound scans, to 630-9781.

CR3509: Maternity Secondary Referral forms and DD3073: Post term virtual consultation (PTVC) forms can be found at the National Women's Health website under the Health Professionals tab (or see associated Auckland DHB documents section below).

The Auckland Consensus Guideline (Auckland DHB, Waitemata DHB and Counties Manukau DHB) provides evidence-based recommendations for possible indications and timing of IOL. Feedback was obtained from midwives and doctors at all three DHBs and from the NZ College of Midwives. The full guideline with references can be found at the National Women's Health website under the Health Professionals tab.

Below are summary statements from the guideline:

- A woman with an uncomplicated dichorionic/diamniotic twin pregnancy should be offered IOL at 37-38 weeks to reduce the risk of adverse neonatal outcome
- A woman with preeclampsia should be offered IOL at 37 weeks to improve maternal outcomes. A woman with hypertension no preeclampsia may be offered IOL from 37 weeks or expectant management (individualised)
- A woman with suspected small for gestational age fetus, and normal middle cerebral and uterine Doppler studies, should not be routinely offered IOL before 40 weeks. If these detailed Doppler studies have not been performed, IOL should be offered around 38 weeks

- A woman with gestational diabetes, a normally grown fetus, and good glucose control throughout pregnancy (irrespective of treatment type) should not be routinely offered IOL before 40 weeks
- A woman should be offered the option of IOL to reduce the maternal and neonatal risks associated with post-term pregnancy. IOL should be arranged around 41+5, but this can be individualised
- A woman ≥ 40 years old may be offered IOL at 40 weeks

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6. Indications and timing of urgent/acute IOL

Reasons for acute IOL include (but are not limited to):

- Pre-labour rupture of membranes (PROM)
- Reduced fetal movements
- Reduced liquor volume (ultrasound estimate of maximum liquor pool depth < 2 cm)
- Abnormal CTG or biophysical profile
- Prolonged latent phase
- Preeclampsia
- Suspected small for gestational age
- Intrauterine fetal demise
- Termination of pregnancy

A woman who has diagnosed pre-labour rupture of membranes from 37 weeks should be offered the option of IOL to reduce the risk of maternal and neonatal infection. A woman who does not meet clinical criteria for expectant management (see Rupture of Membranes in Pregnancy guideline) should be advised to have IOL. For a woman who chooses expectant management, IOL is appropriate approximately 24 hours after PROM. The woman should be provided with the "Pre-labour Rupture of Membranes" information leaflet to guide the discussion of risks and benefits of IOL vs. expectant management, and a plan documented.

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7. Antenatal fetal surveillance

Each woman should be counselled about monitoring daily fetal movements, and to report any reduction in movements to their LMC. The woman could be provided with the "Your baby's movements and what they mean" information leaflet.

For a woman with antenatal risk factors or fetal concerns that do not need IOL, additional surveillance can be arranged in the community, or through DAU. Further information about DAU can be found at the National Women's Health website under the Health Professionals tab.

Each woman should be informed that there is no high quality evidence that proves that additional fetal surveillance will reduce the risk of stillbirth.

To make an appointment in DAU, fax a referral form and ring DAU.

Those who may be offered additional surveillance include (but are not limited to):

- A woman aged 35 or more
- A woman with booking BMI of 35 or more
- A woman who conceived after IVF
- A woman with chronic or gestational hypertension
- A woman at 41+0 or more weeks' gestation

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8. Planning IOL

The decision to plan an IOL should be at the level of the specialist obstetrician.

Give the woman the "Induction of Labour at Auckland City Hospital" information leaflet (available on internet) and use this to guide discussion. The woman should be able to ask questions and make informed decisions about their care.

Discussion should include:

- Primary reason for induction and other factors
- Alternatives to IOL
- Risks and benefits of induction vs. expectant management
- Proposed method of IOL
- Realistic expectation of duration of IOL

After discussion with the woman and her partner/family/whānau, a clear management plan should be documented.

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9. Booking elective IOL (see also figure 1)

To book an elective IOL, the referring doctor has two options:

Option (i) Referring doctor to phone 021-400-983, 0730 - 1800 Monday through Friday. The midwife should complete a CR2251: Elective Induction of Labour (IOL) Booking Request Form and place it in the induction binder in DAU. The following information will be immediately required: EDD, named obstetrician responsible for decision to induce, primary reason for induction and other antenatal risks, method and location of induction.

Option (ii) Referring doctor to fax completed form to DAU anytime (09-307-8904). The next business day the DAU midwife should phone the LMC (and/or referring doctor if appropriate) with date and time, and ensure form is complete, especially who is starting the IOL. The LMC (or referring doctor) is responsible to inform the woman of the date and time.

There should be a total of five elective IOL slots per day. PG IOLs can be booked to start at 0730, 0930, 1030, 1200 or 1630 as per referring doctor. Balloon IOLs by preference should commence at 0730. ARM IOLs can be booked to start at any time. There is no limit to the number of each method of IOLs per day, as long as the total number of elective IOLs in both WAU and L&BS together is no more than five.

Important: Elective IOLs can be booked no more than 7 days in advance no matter the indication, LMC type, method, or location. Exception is for medical reasons (eg anticoagulation) or where coordinating in advance with other services is required (eg NICU, paeds surgery).

The booking form can be completed and faxed to DAU earlier than 7 days, but the date and time will not be scheduled until 7 days ahead. In this situation, the DAU midwife should ring or text the LMC (and/or referring doctor as appropriate) with the date and time.

Important: Ensure the woman is aware that date and time provided is a probable but not guaranteed booking, because of the potential need to make that time available to a woman of higher clinical priority for IOL or because of other service constraints eg staffing, or if a baby needs NICU and a NICU bed is not available.

The induction binder and the induction phone should be in DAU during DAU business hours. When DAU closes, the binder and phone should be handed to the WAU shift coordinator. At 1800 daily the ward clerk should add women having elective IOLs the next day to the expected arrivals on the Whiteboard, the binder should be locked in DAU, and the phone should be turned off.

The WAU flow coordinator should bring the induction binder to 0800 handover every day. The L&BS SMO should review the expected arrivals on the Whiteboard and the clinical details from the booking forms in the binder. The WAU flow coordinator should bring the binder back to WAU after handover; the ward clerk should place the booking forms for that day in the woman's clinical record. When the woman arrives, the ward clerk should start the IOL tab in

HealthWare. For IOLs starting on L&BS, the WAU flow coordinator can hand these booking forms to the ward clerk on L&BS prior to returning the binder to WAU.

Elective IOL booking forms can be completed in Microsoft Word, and can be found at the National Women's Health website under the Health Professionals tab. Paper copies can also be found in DAU, WAU and Antenatal clinic.

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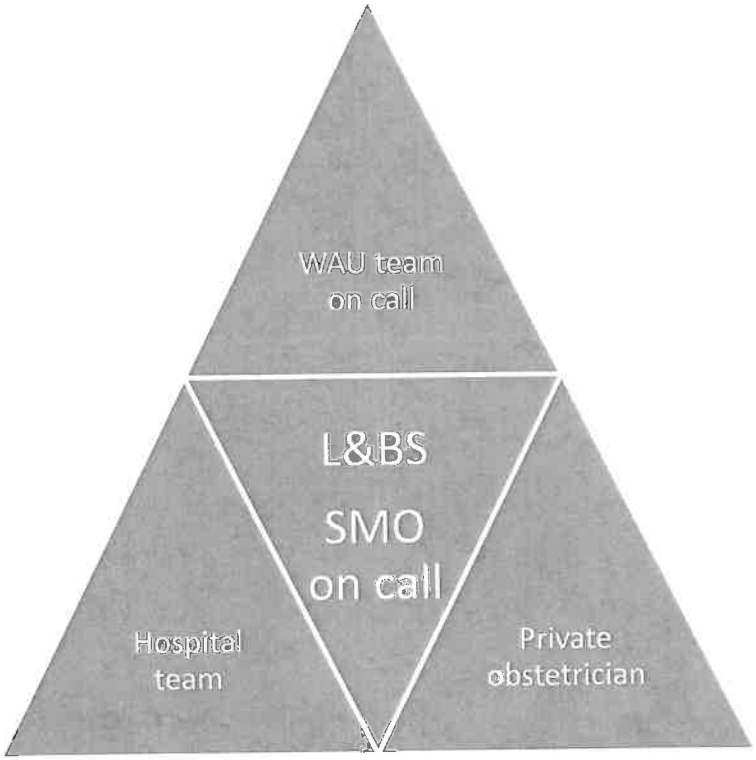
10. Booking acute IOL (within 24 - 48 hours) (see also figure 1)

To book an acute IOL (within 24 - 48 hours), the referring doctor should phone the L&BS SMO on call to discuss indication and timing. If they agree to add on an acute IOL, the referring doctor should complete a CR2252: Acute Induction of Labour (IOL) Bookings required within 48 hours form, and give it to the ward clerk on WAU or L&BS (or fax and ring ward clerk directly to ensure receipt).

If after 2200 hours, please ring the L&BS CCM instead of the L&BS SMO on call.

The ward clerk should add the woman to the expected arrivals on the Whiteboard, and should place the form in the woman's clinical record. The referring doctor is responsible to inform the woman where and when to come for her IOL. The WAU flow coordinator should bring a copy of the acute forms to the 0800 handover.



The Women's Health Service should try to accommodate a woman requiring IOL for intrauterine demise or termination of pregnancy at a date and time to suit her and her family/whānau.

Acute IOL booking forms can be completed in Microsoft Word, and can be found at the National Women's Health website under the Health Professionals tab. Paper copies can also be found in WAU.

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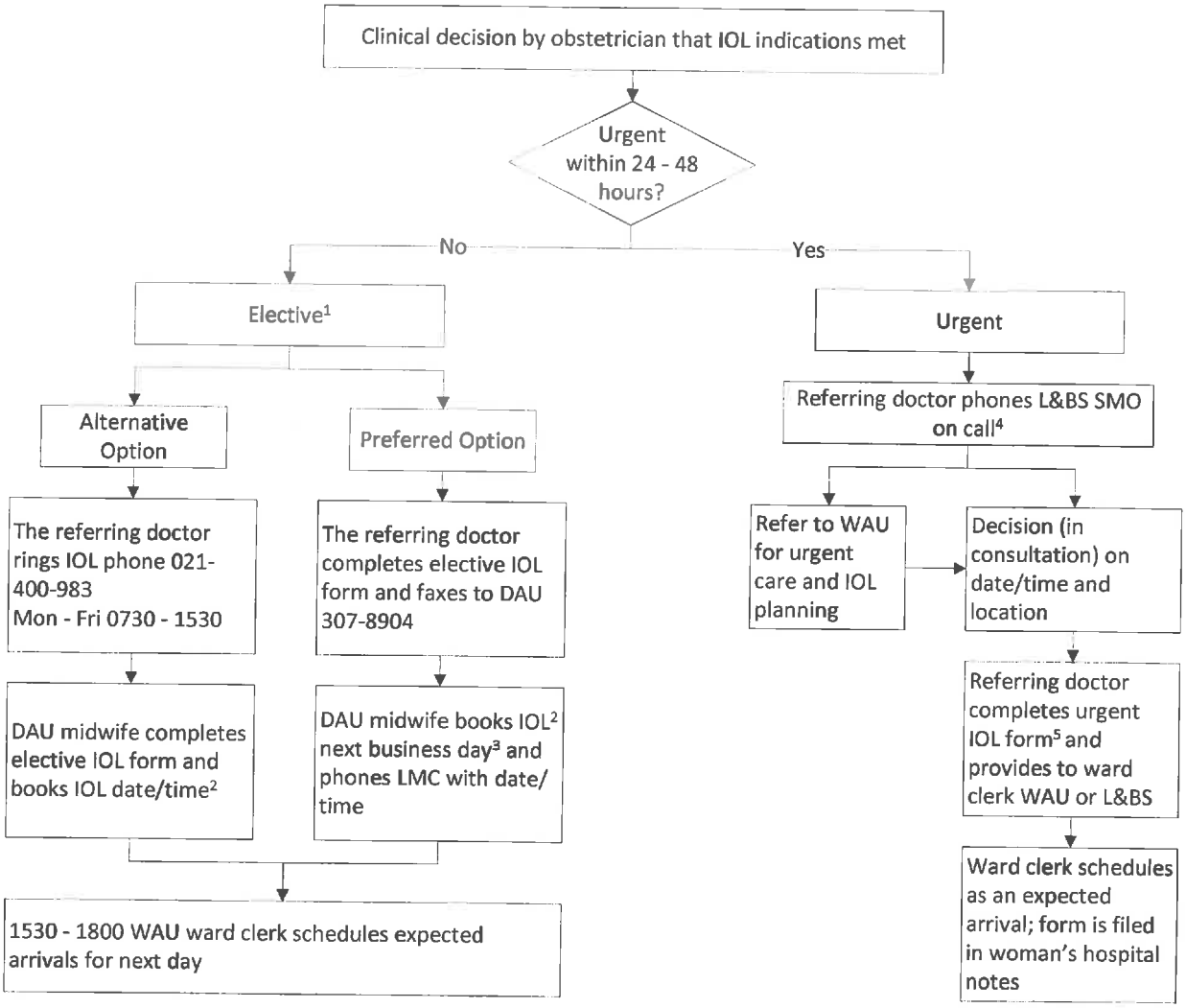
11.IOL booking



NOTES

[1] If requested date for IOL is > 7 days, then form will be filed in IOL binder (expected pocket). At 7 days, DAU midwife will book IOL and phone LMC with date/time

[2] To book IOL, DAU midwife uses booking schedule, selects date/time, and enters NHI into schedule; form is filed on appropriate day

[3] WAU flow coordinator can also book elective IOL from 1530 - 1800

[4] After 2200 phone L&BS CCM

[5] IOL booking forms on nationalwomenshealth.adhb.govt.nz website

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12. Clinical prioritisation

If WAU is on RED+, or if L&BS is on RED, then, as outlined in the Women's Health Escalation Plan the L&BS SMO on call should clinically prioritise all IOLs and discuss deferring the least urgent IOL(s) with the obstetrician who booked it. The L&BS SMO on call should notify the woman's LMC of the decision to defer, and document the decision in the woman's clinical record. The LMC should notify the woman of the new date/time.

If agreement cannot be reached between L&BS SMO on call and the booking obstetrician, the service clinical director, secondary maternity, should be asked to mediate.

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13. Roles and responsibilities of practitioners

The L&BS team on call should document the roles and responsibilities of the LMC, hospital midwife, and obstetrician after 3-way discussion with the woman and her family/whānau.

The LMC is encouraged to be present for the start of the IOL and to formally hand over midwifery care to the hospital midwife. The hospital midwife should communicate regularly with the LMC to discuss the woman's progress, and mutually agree to when midwifery care is handed back to the LMC.

The obstetrician may recommend that clinical responsibility be handed over to them (eg for Syntocinon augmentation). If this is agreed, following a 3-way discussion with the LMC and the woman and her family/whānau, then this should be documented in the woman's clinical record.

A handover sticker may be used to aid clear documentation in the woman's clinical record.

Refer to Auckland DHB policy on handover.

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14.Starting IOL in WAU or L&BS

If IOL is not on the Whiteboard as an expected arrival, then discussion between the LMC and L&BS SMO on call, and between L&BS team on call and CCM on L&BS, should occur prior to starting an IOL, regardless of indication, LMC type, location, method and acuity. If IOL is on the Whiteboard, the IOL can be started without further delay.

To start an IOL, the LMC should:

- Confirm the named obstetrician responsible for management of the IOL (can use Handover sticker)
- Confirm the primary indication for IOL
- Identify other antenatal risk factors
- Confirm EDD (by scan < 14 weeks if available, otherwise best estimate by LMP or later scan)
- Ensure most recent ultrasound does not show low lying placenta/placenta praevia or non-cephalic presentation
- Confirm the woman's informed consent to have IOL (see points above for discussion re IOL)
- Offer the "Induction of Labour at Auckland City Hospital" information leaflet
- Commence neonatal blue card by documenting above information and maternal blood results
- Perform assessment of
  - Maternal well-being (observations; urinalysis and blood tests only if indicated)
  - Fetal lie, presentation and engagement (abdominal palpation)
  - Fetal well-being (CTG)
- Document all of the above in a proper "admission note" or ask the medical team to do so – it is expected that every woman undergoing IOL has a complete and comprehensive note

If any concerns with any of the assessment, consult with the responsible obstetrician (if private), or L&BS team on call (if public). If no concerns, the IOL can be started without further delay.

The CTG at the start of the IOL should be documented in the woman's clinical record. CTG sticker may be used.

The Bishop Score (BS) at the start of the IOL should be documented in the woman's clinical record. BS sticker may be used.

SCORE	0	1	2
Position	Post	Mid	Ant
Consistency	Firm	Int	Soft
Length (cm)	3	1 - 2	< 1
Dilation	0	1 - 2	3
Station	-3	-2 - 1	0

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15. Management of IOL

A woman undergoing IOL and any woman with a planned IOL for that day should be reviewed at 0800 handover. Expected arrivals can be viewed on Whiteboard under "expected arrivals" tab, and the booking forms should be in the IOL binder.

It is expected that at all handovers, the L&BS registrar is knowledgeable about the primary indication for IOL and other antenatal risk factors, and about the management plan, for any woman having an IOL.

It is expected that every woman undergoing IOL be reviewed by the responsible obstetrician (if private) or L&BS SMO (if public) every day.

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16. Methods of cervical ripening

It is reasonable to offer either cervical ripening method for any indication for IOL.

A balloon IOL is recommended where maternal or fetal risks from tachysystole or hypertonus are increased; such as:

- Suspected SGA
- Oligohydramnios or decreased fetal movements
- Previous caesarean

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a) Prostaglandin E_2 (PGE_2, Dinoprostone) Vaginal Gel

A systematic review of 35 RCTs of 2 - 5 mg vaginal PGE_2 gel (vs. placebo) in women with an unfavourable cervix showed a significant improvement in Bishop score at 24 hours and a significant reduction in the need for oxytocin augmentation and in the incidence of meconium-stained liquor. PGE_2 gel was significantly associated with the complication of uterine hyperstimulation (RR 4.5). There was no difference in rate of vaginal birth within 24 hours or in caesarean rate.

Vaginal PGE_2 gel protocol

- Ensure CTG was performed and that fetal heart rate pattern is normal
- Ensure the woman's consent
- Site IV luer and send bloods for full blood count (FBC) and group and screen
- Position the woman comfortably on bed, perform vaginal examination, perform stretch and sweep if possible, and place gel in posterior fornix
- There is no need for a routine post-PGE_2 gel CTG in the absence of contractions
- The woman can then mobilize, eat and drink, shower and bathe
- Inform the woman of expected time of subsequent assessment
- Document abdominal palpation, BS (using sticker), CTG findings (using sticker), PGE_2 gel dose, and time of gel in the woman's clinical record (and on Whiteboard)

If the IOL process is occurring normally, routine fetal or maternal monitoring is unnecessary.

Vaginal PGE_2 gel recommended regimen

- PGE_2 gel should be formally prescribed on the standard medication chart.
- One dose of PGE_2 gel, followed by a second dose after 6 hours (minimum) if labour is not established. Starting Oxytocin should also be delayed by a minimum 6 hours after a dose of PGE_2 gel.
- More than two doses in 24 hours may be considered if there are no signs of uterine hyperstimulation and there has been a discussion with the responsible obstetrician (if private) or L&BS team on call (if public).
- Dose of 1mg or 2mg should be a clinical decision based on the woman's parity and BS. There is no good evidence to support a specific regimen of PGs in terms of starting dose or follow-up dose or total amount per 24 hours, regardless of parity.
- If after 24 hours labour is not established, the woman should be reviewed in person and examined by the responsible obstetrician (if private), or L&BS team on call (if public).

- At any point, if a woman has abnormal vaginal bleeding, painful regular contractions or spontaneous rupture of membranes, further maternal and fetal assessment should be performed. Routine monitoring is not necessary.

Maternal Complications/Possible adverse events:

Up to 5% of women undergoing PGE_2 IOL will experience uterine hyperstimulation. At any point, if there is uterine hyperstimulation, consult with the responsible obstetrician (if private), or L&BS team on call (if public). Place the woman in left lateral position and administer IV fluids. Refer to Auckland DHB Oxytocin guideline for options for acute tocolysis. Document findings and care plan in the woman's clinical record.

If there is uterine tachysytole or hypertonus, place the woman in left lateral position and administer IV fluids. Tocolysis is not usually required. Document findings and care plan in the woman's clinical record.

Some women will experience nausea, vomiting, diarrhoea, fever, and hypersensitivity reactions (e.g. anaphylactic reactions).

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b) Balloon catheter

A meta-analysis of 27 RCTs comparing outcomes after IOL with a Foley catheter balloon (vs. locally applied prostaglandins) showed a significant reduction in the complication of uterine hyperstimulation, no difference in caesarean rate, and no difference in time from start of IOL to birth.

Balloon catheter protocol

- Ensure CTG was performed and is normal
- Ensure the woman's consent
- Set up procedure room on WAU and ring responsible obstetrician (if private), or L&BS team on call (if public)
- Position the woman comfortably on bed in lithotomy position
- Perform sterile speculum exam (if difficult, can use larger size speculum, and/or condom to hold back vaginal walls), advance Foley balloon through cervix and *above* internal os, inflate balloon with 30 mL sterile saline then gently pull back until balloon abuts internal os (this also confirms correct placement) – attach spigot to end of catheterAuscultate FH
- Tape balloon to inner thigh on gentle tension while standing
- The woman can then mobilize, eat and drink, shower and bathe
- Inform the woman of expected time of subsequent assessment
- Document abdominal palpation, BS (using sticker), CTG findings (using sticker), and time of balloon in the woman's clinical record (and on Whiteboard)

Balloon recommended regimen:

The balloon should remain in situ for 24 hours. The woman could give a gentle tug every so often to see that it is still in correct place. After 24 hours, balloon can be deflated and removed. If BS > 5 then proceed to ARM (see below). If not, consider switching to PGs (see above).

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17. Artificial rupture of membranes (ARM)

Even if ARM is possible, there is research to suggest less postpartum haemorrhage and greater patient satisfaction with PG induction (compared to ARM plus IV syntocinon) in the setting of BS > 5.

ARM can occur on WAU if certain clinical criteria are met:

- Longitudinal lie, cephalic presentation, and stable presenting part (at least 1/5 descended)
- Cervix dilated less than 4 cm
- Not grand multip and no history of precipitous labour

The rationale for these criteria is to reduce risk of cord prolapse and of precipitous birth on WAU.

ARM protocol

- Ensure CTG was performed and is normal
- Ensure the woman's consent
- Site IV luer and send bloods for full blood count (FBC) and group and screen
- Perform vaginal examination, perform ARM and check amount and colour of liquor
- Position the woman comfortably on bed and perform CTG
- The woman can then mobilize, eat and drink, shower and bathe
- Inform the woman of expected time of transfer to L&BS
- Document abdominal palpation, BS (using sticker), CTG findings (using sticker), and time of ARM in the woman's clinical record (and on Whiteboard)

Maternal and fetal monitoring can be individualized. A woman can remain on WAU until she establishes in labour.

If there is minimal liquor or it is meconium- or blood-stained, consider further maternal and fetal assessment and transfer to L&BS.

If the CTG is abnormal, perform a sterile speculum exam to exclude cord prolapse or imminent birth.

The CCM L&BS should communicate regularly with the WAU midwives to arrange the transfer of a woman to L&BS.

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18. Oxytocin (Syntocinon)

Refer to Auckland DHB Oxytocin guideline.

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19.Supporting evidence

- Auckland Consensus Guideline on Induction of Labour 2014. Wise M, McDougall J, Wotton J, Ansell L, Belgrave S, Farmer E, Wadsworth S
- Boulvain M, Stan CM, Irion O. Membrane sweeping for induction of labour. *Cochrane Database of Systematic Reviews* 2005, Issue 1
- Guidelines for Consultation with Obstetric and Related Medical Services (Referral Guidelines). Ministry of Health; 2012
- Intrapartum Fetal Surveillance, 3rd edition. RANZCOG Clinical Guideline; 2014
- National Institute for Health and Clinical Excellence. Induction of labour. NICE Clinical Guideline 70; 2008
- Vaknin Z, Kurzweil Y, Sherman D. Foley catheter balloon vs locally applied prostaglandins for cervical ripening and labor induction: a systematic review and metaanalysis. *Am J Obstet Gynecol* 2010;doi:10.1016/j.ajog.2010.04.038

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20.Associated Auckland DHB documents

- Access Holders in Women's Health
- Informed Consent
- Intravenous Fluid Prescription - Adult
- Medications - Administration
- Medications - Allergies & Adverse Drug Reactions (ADRs) Identification, Documentation & Recording
- Medications - Intravenous & Infusions Administration
- Medications - Prescribing
- Nursing Led Handover
- Oxytocin (Syntocinon) for Induction & Augmentation of Labour
- Rupture of Membranes in Pregnancy
- Small for Gestational Age (SGA) over 34 weeks - Clinical Pathway
- Vaginal Birth After Caesarean (VBAC)
- Women's Health Escalation Plan

Auckland DHB clinical forms

- CR2251: Elective Induction of Labour (IOL) Booking Request Form
- CR2252: Acute Induction of Labour (IOL) Bookings required within 48 hours
- CR3509: Maternity Secondary Referral form
- DD3073: Post term virtual consultation (PTVC)

Patient information leaflets

- Induction of Labour (Auckland DHB)
- Term pre-labour rupture of membranes - Information for women at term (37 or more weeks) (Auckland DHB)
- Your Baby's Movements And What They Mean

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21.Disclaimer

No guideline can cover all variations required for specific circumstances. It is the responsibility of the health care practitioners using this Auckland DHB guideline to adapt it for safe use within their own institution, recognise the need for specialist help, and call for it without delay, when an individual patient falls outside of the boundaries of this guideline.

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22. Corrections and amendments

The next scheduled review of this document is as per the document classification table (page 1). However, if the reader notices any errors or believes that the document should be reviewed ***before*** the scheduled date, they should contact the owner or the Clinical Policy Advisor without delay.

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Oxytocin for Induction and Augmentation of Labour

Unique Identifier	NMP200/SSM/014
Document Type	Clinical Guideline
Risk of non-compliance	may result in significant harm to the patient/DHB
Function	Clinical Practice, Patient Care
User Group(s) • Organisation(s) • Directorate(s) • Department(s) • Used for which patients? • Used by which staff? • Excluded	Auckland DHB only Auckland District Health Board Women's Health Maternity All Auckland DHB Maternity patients as indicated All Auckland DHB clinicians in maternity including access holder Lead Maternity Carers (LMCs)
Keywords	
Author	Midwifery Educator
Authorisation • Owner • Delegate / Issuer	 Service Clinical Director – Secondary Maternity Services Service Clinical Director – Secondary Maternity Services
Edited by	Clinical Policy Facilitator
First issued	Yet to be determined
This version issued	22 February 2019 - updated
Review frequency	3 yearly

Contents

1. Purpose of guideline

The purpose of this guideline is to ensure that the use of oxytocin is safe and effective within Auckland District Health Board (Auckland DHB).

2. Guideline management principles and goals

- Oxytocin for augmentation or induction of labour requires a formal consultation with the Labour & Birthing Suite (L&BS) team on call, LMC and the woman.
- Consent from the woman must be obtained and documented, including awareness of complication of uterine hyper-stimulation (see *Informed Consent Policy* in associated documents).
- Decision about ongoing clinical responsibility must be discussed with the woman and her LMC
- It is recommended that clinical responsibility be transferred to the L&BS team on call and a clinical responsibility handover sticker placed in clinical record.
- Oxytocin must be prescribed on the Auckland DHB Medication Chart by the L&BS team on call, including any changes to the standard guideline which must also be documented in the patient's clinical notes. See Table 1: Standard protocol for oxytocin infusion (see associated documents for *Medication - Prescribing policy*).
- In settings where oxytocin is to be used with caution (see Precautions), consultation with the obstetric consultant via the registrar is mandatory.
- Individualised management plan regarding pain relief and reassessments must be documented.
- Advise active management of third stage of labour.
- If oxytocin is started in second stage, it is advised that vaginal exams be performed by L&BS team on call, every hour, to ensure progress and plan for delivery.

3. Contraindications

- Known hypersensitivity to oxytocin.
- Hypertonic uterine contractions or fetal distress when delivery is not imminent.
- Any condition where spontaneous labour or vaginal delivery is contraindicated.
- Oxytocin must NOT be administered within 6 hours after administration of vaginal prostaglandin gel.

4. Precautions

- Women with previous uterine scar*.
- Multiparous women.
- Women in second stage labour.
- With high risk women i.e. cardiac or severe eclampsia.
- Women with known Long QT syndrome and women taking other medications known to prolong the QT interval.

- Severe renal impairment.
- Multiple pregnancy.
- HIV/Hepatitis B – oxytocin may be used with intact membranes in an effort to reduce vertical transmission. See Note 2 below. In the above settings, consultation with the obstetric consultant via the registrar is mandatory.

***Note**: If a trial of labour after caesarean is judged safe, then oxytocin may be used for either induction or augmentation if clinically appropriate.

Note 2: Amniotomy performed later, after the commencement of oxytocin, is associated with longer duration of labour, which can be mitigated by an oxytocin protocol using 30-minute increments. It may also reduce the risk of chorioamnionitis, and does not increase the risk of caesarean section (Mercer, McNanley, O'brien, Randal, & Sibai, 1995).

Note 3: Once an ARM has been performed, evidence is insufficient to make recommendations regarding timing of commencement of oxytocin (Howarth & Botha, 2001).

5. Adverse effects

- Uterine hyperstimulation with excessive doses of oxytocin.
- Water intoxication, associated with administration of high doses of oxytocin together with large amounts of electrolyte-free fluid over a prolonged time.
- Headache.
- Tachycardia, bradycardia.
- Nausea and vomiting.

6. Assessment

Maternal assessment

- Vital signs: temperature, pulse, blood pressure and respirations 4 hourly or more frequently if clinically indicated.
- Abdominal palpation for contractions and resting tone should be performed prior to, and after, increasing the dose: frequency, strength, duration.
- Vaginal examination: this should only be performed if the findings will affect the management.
- Monitor fluid balance as water intoxication may result from prolonged infusion combined with the slight anti-diuretic activity of oxytocin.

Fetal assessment

Continuous CTG.

Note: It is important to interpret the findings of maternal and fetal assessments, and document a plan of management.

7. Administration

Equipment

- Volumetric pump (Alaris)
- 10 units of oxytocin
- 500 mL 0.9% sodium chloride
- Mainline IV infusion of Plasma-Lyte

Preparation

- Add 10 units of oxytocin (to a 500 mL bag 0.9% sodium chloride).
- Label bag with signed "medication added" label.
- Document fluid volume and drug on the Fluid Balance Record.
- Invert bag several times to ensure mixing of the oxytocin in the diluent fluid.
- Connect the infusion to the side arm of the mainline of Plasma-Lyte.

Administration

- Commence the oxytocin infusion via the Alaris infusion pump (see Table 1: Standard protocol for oxytocin infusion)
- Increase the rate (see Table 1: Standard protocol for oxytocin infusion) until reaching goal of four contractions in 10 minutes, lasting 40 - 90 seconds each with at least 60 seconds resting tone in-between.
- Once 4 contractions in 10 minutes are achieved, maintain infusion rate. The infusion rate should be titrated as required to maintain four contractions in 10 minutes.
- Watch for uterine hyperstimulation, especially in second stage of labour.

Important considerations

- There is no need to stop infusion during procedures such as epidural insertion, consider decreasing rate if needed.
- In multiparous women, consider decreasing rate once labour is established.
- In women in second stage labour, rate and interval may be increased more frequently, with attendance and on instruction of an obstetric Registrar or SMO.
- In women with previous uterine scar, maximum dose to be advised by obstetric SMO.
- In the operating theatre for a trial of instrumental birth, the oxytocin infusion is administered by the attending midwife, guided by the attending O & G specialist.
- NOT to be given by subcutaneous, intramuscular or IV bolus injection.

Table 1: Standard protocol for oxytocin infusion

Millilitres per hour	Milliunits per minute	Time
6	2	0
12	4	30 minutes
18	6	60 minutes
24	8	90 minutes
36	12	120 minutes
48	16	150 minutes
60	20	180 minutes
72	24	210 minutes
84	28	240 minutes
96	32	270 minutes

8. Documentation

- Clinical record
- Partogram: record oxytocin rate in milliunits/minute (mu/min)
- CTG: add maternal observations and interventions on graph
- Medication chart (back page)

9. Management of uterine tachsystole, hypertonus and hyperstimulation

Definitions

Term	Definition
Uterine Tachysystole	• More than 5 contractions in 10 minutes with a normal fetal heart rate
Uterine Hypertonus	• Contractions lasting 2 minutes or more and/or • Less than 60 seconds resting tone in-between each contraction with a normal fetal heart rate
Uterine hyperstimulation	• Either of the above (tachysystole or hypertonus) when accompanied by an abnormal fetal heart rate

Management of tachsystole/hypertonus (normal CTG)

- Decrease the oxytocin infusion rate until contractions settle
- Reassess the need for oxytocin infusion
- Notify L&BS team on call

Management of hyperstimulation

- Inform CCM and call L&BS team on call (see associated documents)
- Stop/reduce oxytocin infusion
- Commence intrauterine resuscitation i.e. position woman in left lateral, increase fluids
- Consider acute tocolysis: terbutaline/glyceryl trinitrate (GTN)/nifedipine (see section 10)
- Consider fetal blood sampling (lactates)
- After review recommence oxytocin as per medical instructions (see associated documents for *Fetal Surveillance Policy*)

10. Options for acute tocolysis (emergency halting of contractions)

The available evidence supports the use of beta-adrenergic receptor agonists such as terbutaline to reduce uterine pressure and contractions during term labour. However the preferred choice of type of beta-agonists and the dosage remains unclear. Terbutaline has been shown to be superior to GTN to reduce uterine contractions in a randomised trial (Pullen et al., 2007). PHARMAC funds terbutaline under section 29. Given the limited evidence overall for acute tocolysis in term labour, and the potential side effect profile of each tocolytic, it is recommended that an individualised approach is taken. Therefore this guideline provides dosage regimes for all 3 tocolytics but recommends that terbulatine be used in the first instance if there are no contraindications.

Terbutaline regime

a) Contraindications include - history of cardiac disease; significant risk factors for myocardial ischaemia; pulmonary hypertension; eclampsia or severe pre-eclampsia
b) Use with caution - hypertension; mild to moderate pre-eclampsia; hyperthyroidism; hypokalaemia (particular risk with potassium-depleting diuretics); suspected cardiovascular disease (should be assessed by a cardiologist before initiating therapy); monitor blood pressure, pulse rate (should not exceed 140 beats per minute), ECG (discontinue treatment if signs of myocardial ischaemia develop), blood glucose and lactate concentrations, fluid and electrolyte status (avoid over-hydration-discontinue drug immediately and initiate diuretic therapy if pulmonary oedema occurs); diabetes—monitor blood glucose (risk of hyperglycaemia and ketoacidosis)
c) Administer 250 micrograms subcutaneously as a single dose

Glyceryl trinitrate (GTN) regime

a) GTN 400 microgram spray, administer one metered spray sublingually
b) Check blood pressure
c) Repeat further spray after 5 minutes if hyper-stimulation persists

Nifedipine regime

a) Check no contraindications to tocolysis (eg woman asthmatic, vaginal bleeding etc.)
b) Check blood pressure and pulse following each dose
c) Initial nifedipine dose: 2 x 5 mg sublingual (pierce capsule prior to administration)

d) 15 minutes after initial dose give further 2 x 5 mg nifedipine capsules sublingually if still hyper-stimulated
e) 30 minutes after initial dose give further 2 x 5 mg nifedipine capsules sublingually if still hyper-stimulated
f) 45 minutes after initial dose give further 2 x 5 mg nifedipine capsules sublingually if still hyper-stimulated

11. Third stage

Active management of the third stage is required for all women who have had oxytocin prescribed for induction or augmentation of labour (see associated documents - *Intrapartum Care – Normal Labour and Birth*).

12. Supporting evidence

- Burrows, E., Anderson, J.N. & Papacostas, K. (2001). What is best practice for Oxytocin infusion for induction of labour? *Medical Journal of Australia (MJA), 175*(6), 336-337.
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13. Associated Auckland DHB documents

- Fetal Surveillance Policy
- Group and Screen Requirements in Maternity
- Induction of Labour - RBP
- Informed Consent
- Intrapartum Care - Normal Labour & Birth
- Medications - Administration
- Medications - Intravenous and Infusions Administration
- Medications - Prescribing
- Postpartum Haemorrhage (PPH) Prevention and Management

14. Disclaimer

No guideline can cover all variations required for specific circumstances. It is the responsibility of the health care practitioners using this Auckland DHB guideline to adapt it for safe use within their own institution, recognise the need for specialist help, and call for it without delay, when an individual patient falls outside of the boundaries of this guideline.

15. Corrections and amendments

The next scheduled review of this document is as per the document classification table (page 1). However, if the reader notices any errors or believes that the document should be reviewed ***before*** the scheduled date, they should contact the owner or Document Control without delay.

Fetal Surveillance Policy

Document Type	Policy
Function	Clinical Practice, Patient Care
Directorate(s)	Auckland District Health Board (Auckland DHB) National Women's Health
Department(s) affected	Auckland DHB Maternity
Applicable for which patients, clients or residents?	All Auckland DHB maternity patients
Applicable for which staff members?	Clinicians in maternity including access holder lead maternity carers (LMCs)
Key words (not part of title)	CTG fetal heart monitoring
Author – role only	Midwifery Educator
Owner (see ownership structure)	Owner: Service Clinical Director - Secondary Maternity Issuer: Charge Midwives - DU and WAU
Edited by	Clinical Policy Facilitator
Date first published	20 February 2017
Date this version published	23 February 2017 – hyperlink correction
Review frequency	3 yearly
Unique Identifier	NMP200/SSM/096 - v01.01

Contents

1. Purpose of policy

To ensure certain elements of the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) Intrapartum Fetal Surveillance Clinical Guidelines are followed within Auckland DHB by all practitioners employed or with an access agreement.

2. Recognition of risk factors

If antenatal or intrapartum risk factors (listed in RANZCOG Clinical Guideline) are present, continuous Cardiotocography (CTG) in labour is recommended.

Fetal surveillance in labour, whether by intermittent auscultation or by electronic fetal monitoring, should be discussed with and recommended to all women. Any practitioner performing intermittent auscultation must be trained in the correct method of as per the RANZCOG guidelines (Recommendation 6)

3. Documentation of continuous CTG

A CTG sticker should be completed at least **every 60 minutes** and placed in the patient's clinical notes. The CTG should be reviewed by another midwife or doctor every two hours and the CTG sticker should be co-signed and placed in the patient's clinical notes, ("fresh eyes"). Doctor's reviewing the patient/CTG need to complete a CTG sticker as part of their documentation, regardless of the timing of when a sticker was last used.

4. Management of abnormal CTG

Identify any reversible cause and **initiate intrauterine resuscitation** by:

- Positioning the patient on her left side
- Stopping the oxytocin and/or starting tocolysis as needed
- Correcting low blood pressure
- Rehydrating with intravenous fluids

Escalate to a more experienced midwife or clinical charge midwife or consult with the Labour and Birthing Suite team on call.

Consider further fetal evaluation with scalp stimulation or scalp lactate.

Document the above actions in the patient's clinical notes.

5. Further fetal evaluation

If fetal scalp stimulation leads to acceleration in the fetal heart rate, regard this as a reassuring feature. Take this into account when reviewing the whole clinical picture. If fetal scalp lactate is undertaken, patient should be in a position that avoids inferior vena cava compression (eg left lateral position).

Contraindications to fetal scalp lactate are listed in the RANZCOG Clinical Guideline (Recommendation 13).

6. Management of fetal scalp lactate results

Lactate results	CTG	Action
Less than or equal to 4.0	CTG improves	No need to repeat
Less than or equal to 4.0	CTG remains abnormal	Repeat in 1-2 hours
4.1 – 4.7		Repeat in 30 minutes
4.8 – 5.7		Expedite birth
Over 5.7		Category 1 Caesarean Section

7. Umbilical cord lactates

Umbilical cord lactates should be taken where any of the following are present:

- Any labour where there has been concerns about fetal wellbeing
- Fetal scalp lactate performed during labour
- Assisted vaginal birth (ventouse and forceps)
- Emergency caesarean section
- Apgar < 4 at one minute
- Apgar < 7 at five minutes
- Small for gestational age babies
- Preterm babies
- Babies with fetal abnormalities

Cord lactates should be taken and processed within 10 minutes of cord clamping.

Results must be documented and signed for on the Newborn Record, the Lactate Record Sheet (whilst this is in use) and the clinical notes.

8. Management of umbilical cord lactate results

Lactate results	Action
Less than 6.0	Document results
6.0 or above	Send paired umbilical cord gases

9. Management of umbilical cord gas results

Umbilical cord gases can be analysed within one hour of birth if clamped immediately after delivery. Both umbilical cord arterial and venous gases should be analysed.

Umbilical cord gas result	Action
pH less than 7.0 OR base excess less than or equal to -12 mmol/L	**Call paediatric registrar 2nd on call for review**
pH 7.0 – 7.15 OR base excess -11 to -7 mmol/L OR umbilical cord gas result not available and cord lactate greater than or equal to 6.0 mmol/L	**Monitor baby for signs of neonatal encephalopathy (hypotonia, poor feeding, lethargy, weak or absent suck/gag or moro reflex, seizures)** **Call paediatrician if any concerns**
pH above 7.15 AND base excess above -7 mmol/L	**Document results**

10. Associated Auckland DHB documents

- Intrapartum Care – Normal Labour and Birth
- Oxytocin (Syntocinon) for Induction & Augmentation of Labour
- Caesarean Section (CS) - Pre, Peri & Post-Op Care

11. Supporting Evidence

- RANZCOG. (2014). Intrapartum Fetal Surveillance Clinical Guideline – Third Edition.

12. Disclaimer

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Hypertension - Antenatal, Intrapartum and Postpartum

Unique Identifier	NMP200/SSM/074 – v06.00
Document Type	Clinical Guideline
Risk of non-compliance	may result in significant harm to the patient/DHB
Function	Clinical Practice, Patient Care
User Group(s) • Organisation(s) • Directorate(s) • Department(s) • Used for which patients? • Used by which staff? • Excluded	Auckland DHB only Auckland District Health Board Women's Health Maternity All patients in Maternity All clinicians in Maternity
Keywords	Pre-eclampsia
Author	Maternal Fetal Medicine Consultant
Authorisation • Owner • Delegate / Issuer	 Service Clinical Director – Secondary Maternity Services Service Clinical Director – Secondary Maternity Services
Edited by	Clinical Policy Facilitator
First issued	September 2008
This version issued	18 April 2019 - updated
Review frequency	3 yearly

Contents

1. Purpose of guideline

This guideline describes evidence-based care for women with hypertension and pre-eclampsia in pregnancy for clinicians within Auckland District Health Board (Auckland DHB).

2. Guideline management principles and goals

All Hypertensive Disorders of Pregnancy (HDP) affect 5 - 10% of all pregnancies. Pre-eclampsia complicates 3 - 8% of pregnancies in New Zealand (4 - 5% of nulliparous women, 2 - 3% of low risk multiparas and up to 20% in women with Major Risk Factors (MRF) (MOH, 2018).

A priority of antenatal care in the second half of pregnancy is to detect the development of pre-eclampsia. When pre-eclampsia develops, delivery of the baby and placenta is the only cure. Management is aimed at timing delivery to prevent maternal complications whilst minimising fetal morbidity and mortality from prematurity and associated intrauterine growth restriction.

3. Definitions/symbols

SBP = systolic blood pressure
DBP = diastolic blood pressure
PCR = protein creatinine ratio
MFM = maternal fetal medicine
MRF = major risk factor
± plus or minus
≥ greater than, or equal to

Hypertension: SBP ≥ 140 mmHg **OR** DBP ≥ 90 mmHg measured on two or more consecutive occasions at least 4 hours apart or one measurement SBP ≥ 160 **OR** DBP ≥ 110 mmHg (Cluver *et al.,* 2017 and MOH, 2018).

Women with an incremental increase from baseline booking BP of SBP ≥ 30 mmHg and/or DBP ≥ 15 mmHg, do not meet the criteria of defined hypertension, however, such women should be monitored more closely (MOH, 2018).

Chronic/pre-existing hypertension: Hypertension confirmed pre-conception or prior to 20 weeks of gestation with or without a known cause - measured on two or more consecutive occasions at least four hours apart (MOH, 2018).

Severe hypertension: SBP ≥ 160mmHg **OR** DBP ≥ 110 mmHg on one occasion at any time (MOH, 2018).

Gestational hypertension: New onset hypertension after 20 weeks' gestation (in a woman who was normotensive before 20 weeks of gestation) (Cluver *et al,* 2017) when:

- SBP ≥ 140 mmHg **OR** DBP ≥ 90 mmHg (MOH,2018)
- Without any of the abnormalities that define pre-eclampsia (MOH,2018)
- Followed by return of blood pressure within three months postpartum (MOH,2018)

Proteinuria: Spot urine PCR ≥ 30 mg/mmol or ≥ 2+ on dipstick testing subsequently confirmed by a spot urine protein/creatinine (PCR) ratio ≥ 30 mg/mmol. Once diagnostic proteinuria has been detected, there is no established role for serial testing (MOH, 2018).

Proteinuria is not essential for a pre-eclampsia diagnosis (MOH, 2018).

Pre-eclampsia

The new onset of hypertension after 20 weeks of gestation (in a woman who was normotensive before 20 weeks gestation) or superimposed on pre-existing hypertension **and** the coexistence of **one or more** of the following new onset conditions (MOH, 2018).

- **Renal involvement** (MOH, 2018):
  - Proteinuria – Spot urine PCR ≥ 30 mg/mmol or ≥ 2+ on dipstick testing subsequently confirmed by a spot urine protein/creatinine (PCR) ratio ≥ 30 mg/mmol.
  - Serum or plasma creatinine > 90 µmol/L
  - Oliguria - urine output < 80mL/4 hours

- **Haematological involvement** (MOH, 2018):
  - Thrombocytopenia (platelet count below 100 x 10^9/L)
  - Haemolysis
  - Disseminated intravascular coagulation

- **Liver involvement** (MOH, 2018):
  - Elevated serum transaminases (AST & ALT) - at least twice the upper limit of normal range ± right upper quadrant or epigastric abdominal pain (may be referred to upper back).
  - **Note:** normal ranges are: ALT 0-30 u/L and AST 10-50 u/L

- **Neurological complications (examples commonly include)** (MOH, 2018)**:**
  - Seizure (eclampsia)
  - Hyper-reflexia when accompanied by clonus
  - Severe headache
  - Persistent visual disturbances (altered mental status, photopsia, persistent visual scotomata, cortical blindness, retinal vasospasm)

- **Stroke**

- **Uteroplacental dysfunction** (MOH, 2018):
  - Fetal growth restriction
  - Placental abruption

Severe pre-eclampsia (MOH, 2018):

- SBP ≥ 160 mmHg **OR** DBP ≥ 110 mmHg on one occasion at any time.
- **Thrombocytopenia** (platelet count below 100 x 10^9/L)
- **Impaired liver function not responding to treatment** and:
  - Not accounted for by alternative diagnosis
  - AST & ALT at least twice the upper limit of normal range ±
  - Right upper quadrant or epigastric abdominal pain (may be referred to upper back)
- **Progressive renal insufficiency**:
  - Serum or plasma creatinine > 90 µmol/L or
  - Doubling of serum creatinine in the absence of other renal disease
  - Oliguria, urine output <80 mL/4 hours
- **Pulmonary oedema**
- **New onset of headaches and visual disturbances**

Unstable pre-eclampsia

Women with pre-eclampsia who have worsening pre-eclampsia blood results and severe hypertension not controlled by antihypertensive medication. Also known as fulminating pre-eclampsia (MOH, 2018).

HELLP syndrome

A variant of severe pre-eclampsia (elements include **H**aemolysis, **E**levated **L**iver enzymes and **L**ow **P**latelet count). In a woman with pre-eclampsia, the presence of any of the following is an indicator of HELLP:

- Maternal platelet count of less than 100 x 10^9/L
- Elevated transaminases (elevated blood concentrations of liver enzymes to twice normal concentration)
- Microangiopathic haemolytic anaemia with red cell fragments on blood film

Eclampsia

New onset of seizures in association with pre-eclampsia. It is a severe manifestation of pre-eclampsia and can occur before, during or after birth. It can be the presenting feature of pre-eclampsia in some women (MOH, 2018).

4. Summary table - management

Problem	Recommended Action
Background hypertension or previous PET	• Review cause and effect • Refer MFM if severe hypertension or previous early onset pre-eclampsia ≤ 30 weeks • Consider prophylaxis with aspirin/calcium • Coordinate more frequent antenatal reviews • Regular fetal growth assessment (monthly if uncomplicated, more frequently if additional clinical concerns)
Antenatal Hypertension	• Review cause and effect • Consider treatment if SBP ≥ 140 mmHg – 160 mmHg OR DBP ≥ 95mmHg – 100 mmHg consistently • Discuss case with obstetric senior clinical staff member (Obstetrician +/- Physician) and MFM as appropriate (especially if ≤ 30 weeks)
Hypertension in Labour	• Review cause and effect • Treat if SBP ≥ 160 mmHg OR DBP ≥ 100 mmHg on two occasions, 15 minutes apart • See Hypertension in Labour - Management for recommended medications • Consider use of epidural to reduce pain associated hypertension • Consider use of magnesium sulfate (see Associated documents section below for guideline) • Discuss with obstetric senior clinical staff member (Obstetrician +/- Physician) and MFM as appropriate (especially if ≤ 30 weeks)
Post natal hypertension	• Review cause and effect • Treat if SBP ≥ 160 mmHg and or DBP ≥ 100 mmHg consistently • Treat if SBP ≥ 170 mmHg, DBP ≥ 110 mmHg consistently • Discuss case with senior clinical staff member and MFM if additional concerns
Eclampsia	• Use ABCD for immediate resuscitation • Blood pressure (BP) control primary importance if severe • Magnesium sulfate to prevent further eclamptic seizures • See Associated documents section below for magnesium sulfate guideline • Seek advice, support and High Dependency Unit (HDU/maternity complex care setting) care (see below) • Recommended total fluid rate = 80 mL/hour

5. Pre-pregnancy and early pregnancy care

Hypertension arising before pregnancy or detected in the first 20 weeks of pregnancy implies long-standing or chronic hypertension (MOH, 2018). The majority of these women have essential hypertension with no underlying renal or adrenal cause however should be referred for medical opinion early in pregnancy. Very rarely pre-eclampsia may present before 20 weeks often in the context of an abnormal fetus/baby or severe maternal disease and usually with abnormal indices of utero placental circulation (Parrott *et al.*, 2017).

5.1 Management of chronic hypertension

Other causes of chronic hypertension should always be considered (e.g. renal disease, phaeochromocytoma, Cushing's syndrome, Conn's syndrome or coarctation of aorta) (Lowe *et al.*, 2014).

Hypertension should ideally be controlled *before* conception. Specific consideration should be given to the choice of anti-hypertensive in women who may become pregnant. For those women with complicated pre-existing hypertension (including those on more than one antihypertensive agent), we would recommend preconception referral for obstetric physician review and discussion.

It seems reasonable for non-pregnant women already on ACE inhibitors to continue treatment, especially in those on treatment for specific indications (i.e. diabetic nephropathy). However, they should be provided with specific instructions to discuss switching to an alternative antihypertensive with her specialist when pregnancy is anticipated (see Table 3), or to stop treatment and attend for medical review as soon as pregnancy is suspected (MOH, 2018).

ACE inhibitors are contraindicated in pregnancy as their use in the second and third trimesters have been associated with oligohydramnios, renal failure, bony malformations and prolonged hypotension (MOH, 2018).

5.2 Prediction and prevention of pre-eclampsia

5.2.1 Prediction

As part of a comprehensive health assessment at booking, all women should be reviewed for the risk factors for pre-eclampsia (Table 1). This will help to appropriately identify the most at-risk women. Women who have a major risk factor (MRF) have an approximate 20% risk of developing pre-eclampsia and should be considered as high risk (MOH, 2018).

Table 1: Increased risk of developing pre-eclampsia if a woman has pre-existing risk factors (MOH, 2018):

Pre-existing Risk Factor	Relative risk/Odds Ratio[95% CI	Notes
Antiphospholipid antibody/SLE	9.72 [4.34,21.75]	MRF
Previous history of pre-eclampsia	7.19 [5.85,8.83]	MRF
ART (oocyte donation)	4.34 [3.10, 6.06]	MRF
Renal disease	4.07 [2.17, 7.66]	MRF
Chronic hypertension	3.60 [2.0, 6.6]	MRF

Pre-existing Risk Factor	Relative risk/Odds Ratio[95% CI	Notes
Previous history of HELLP	3.70 [0.9, 16.1]	MRF
Pre-existing diabetes	3.56 [2.54,4.99]	MRF
Genetic ancestry African Indian Māori Pacific	 2.97 [1.98, 4.4] 2.66 [1.29, 5.48] 1.51 [1.16, 1.96] 1.21 [0.99, 4.57]	
Nulliparity	2.91 [1.28, 6.61]	
Multiple pregnancy	2.93 [2.04, 4.21]	
Family history of pre-eclampsia (father of baby)	2.10 [1.0, 4.3]	
Change in partner	2.50 [1.8, 3.5]	
Elevated BMI > 35 (early pre-pregnancy)	2.47 [1.66, 3.67]	
Maternal age ≥ 40 (multiparous)	1.96 [1.34, 2.87]	
Maternal age ≥ 40 (primiparous)	1.68 [1.23, 2.29]	
Pregnancy interval >10 years	1.83 [1.72, 1.94]	
ART (sperm donation)	2.50 [1.8, 3.5]	
Diastolic BP ≥ 80 mmHg at booking	1.38 [1.01, 1.87]	
Any ART	1.17 [1.10-1.24]	

Low dose aspirin (LDA)

Prophylactic LDA use in pregnancy should be considered in women with an increased risk of pre-eclampsia. Low Dose Aspirin (LDA) of 100mg taken in the evening or at bedtime is indicated in women at high-risk of developing pre-eclampsia (MOH, 2018, Ayala *et al.*, 2013, Meher *et al.*, 2017).

Timing of aspirin: Evidence demonstrates LDA commencement between 12-16 weeks has a significant risk reduction for pre-eclampsia (MOH, 2018, Roberge *et al.*, 2017, Tong *et al.*, 2017). LDA demonstrates a 17% risk reduction in pre-eclampsia, 8% reduction in the risk of pre-term birth and 10% reduction of SGA (MOH, 2018).

Discontinuation of aspirin: There is limited evidence to guide practice in regards to the optimal gestation to discontinue aspirin, however the use of LDA in many studies is until 36 weeks (Roberge *et al.*, 2017).

A recent meta-analysis is reassuring that there is no increased risk of abruption or antepartum haemorrhage with LDA started before 16 weeks and at a dose of at least 100mg daily, however gestation at discontinuation was not reported (Roberge *et al.*, 2017).

If a woman presents for review > 16 weeks ("late booker" for example)

Although the optimal timing throughout literature is for commencement of aspirin between 12-16 weeks, there is evidence suggesting that there are benefits of commencing aspirin > 16 weeks (Meher *et al*, 2017; Tong *et al.*, 2017).

Note: There is some evidence that the optimal effectiveness of LDA occurs if taken at night (Ayala et al., 2013).

Calcium

Calcium supplementation in conjunction with dietary advice* should be offered to women at high risk of pre-eclampsia to achieve 1g elemental calcium per day (MOH, 2018).

Calcium carbonate 1.25g contains 500 mg of elemental calcium - two tablets daily are necessary to provide the recommended amount of elemental calcium.

Timing of calcium: Ideally commencing from booking until birth.

***Dietary advice/practical advice (MoH 2006):**

- Pregnant women should eat at least three servings of calcium-rich foods such as milk, cheese and yoghurt every day to ensure an adequate intake of calcium.
- Women who avoid milk and milk products need to maintain adequate intakes by eating non-dairy sources of calcium, such as calcium-fortified soy milk, canned fish (with bones), nuts, green leafy vegetables, dried fruit, tofu, and wholegrain breads and cereals.

6. What to do before developing an antenatal care plan

Identify the presence of any MRF (refer to Table 1) that predispose women in a given pregnancy to pre-eclampsia.

7. What to do after the risk assessment

Offer women a referral before 20 weeks for specialist input to their antenatal care plan if they have one of the MRF (refer to Table 1).

7.1 Doppler studies

Where possible, women with a major risk factor (MRF) for pre-eclampsia should have uterine artery Doppler studies performed at their 20-week anatomy scan. The result of this assessment can be used to plan the schedule for serial growth assessment (MOH, 2018).

7.2 Severe or atypical disease

For advice on the management of women with a history of particularly severe or atypical disease, contact the MFM consultant or an obstetric physician. Women with a history of severe pre-eclampsia (complicated or leading to delivery before 32 weeks) should be referred to MFM consultant care in the first trimester and have at least fortnightly BP and urine checks after 20 weeks. Each woman engaged in MFM clinic should be informed verbally and given written information about the symptoms and signs of pre-eclampsia and the reasons why BP and urine are checked.

8. General antenatal care

8.1 Patient information

Each woman should be informed verbally and given written information by her lead maternity carer (LMC) at booking about the symptoms and signs of pre-eclampsia and the reasons why BP and urine are checked at each visit.

8.2 Maternal fetal medicine referral

Please see associated documents for referral

8.3 Taking the blood pressure

It is recommended that automated blood pressure values should be compared with conventional sphygmomanometery at admission or at the beginning of treatment.

8.4 Day Assessment Unit (DAU)

Referral to the DAU for further assessment and investigation should be considered when there is a suspected hypertensive disorder of pregnancy, and there is a need for visits outside the weekly clinic setting. DAU is open 5 days a week and is established for women to improve continuity of care, improve psychological wellbeing, reduce disruption to family life and reduce inpatient stays. This model of care has been proven to be successful and safe and may improve outcomes for the woman. When referring to DAU please use the referral form in the clinical areas and ensure a member of the clinical team has been identified who is contactable and will be responsible for the care on DAU.

8.5 Admission - Day Assessment Unit

Please see the Associated documents.

8.6 Inpatient admission

Criteria for recommending inpatient admission for assessment include:

- Symptoms of headaches, visual disturbance or epigastric pain
- Proteinuria (PCR ≥ 30 mg/mmol on a spot urine sample or ≥ 2+ on dipstick testing confirmed by a PCR) with hypertension
- SBP ≥ 160 mmHg and or DBP > 100 mmHg
- Abnormal blood results:
  - Falling or low platelets < 150 x 10^9/L, raised creatinine (abnormal if > 90 µmol/L)
  - Raised ALT, AST (at least twice the upper limit of normal range ± right upper quadrant or epigastric abdominal pain. **Note:** normal ranges are: ALT 0-30 u/L and AST 10-50 u/L)
- Antepartum haemorrhage
- Reduced fetal movements
- Uterine activity

8.7 Outpatient care

Women with pre-eclampsia should be managed as inpatients. Consideration should be given to re-assessing thromboembolic risk when admitted for in-patient care. Thromboembolic stockings (TEDs) are strongly recommended and low molecular weight heparin (LMWH) should also be considered. Some women at lower risk may be suited to outpatient care and care should be individualised in consultation with a Senior Medical Officer (SMO) (obstetrics or obstetric medicine).

8.8 Bed rest

For mild hypertension in pregnancy, bed rest in a home or hospital setting has not been shown to be beneficial and may be harmful, potentially increasing the risk of venous thromboembolism.

Delivery should be in a secondary or tertiary unit

8.9 Severe hypertension detected outside of hospital setting

Women detected with severe pre-eclampsia or with severe hypertension outside the hospital setting require urgent admission to hospital (accompanied by a doctor or midwife) (MOH, 2018). It is important to discuss the admission with the SMO on-call for obstetrics and obstetric medicine.

9. Antenatal management of chronic hypertension

Normal BP profile in pregnancy

BP decreases in normal pregnancy, reaching its lowest at 20 weeks before rising to pre-pregnant levels or slightly higher at term. Similar changes are often seen in chronic hypertension and therefore anti-hypertensive therapy may need to be reduced or discontinued in early pregnancy.

Threshold for treatment

Anti-hypertensive therapy for mild chronic hypertension decreases the incidence of severe hypertension, but the impact on perinatal outcomes is unclear.

- Anti-hypertensive drugs may be initiated or increased when the BP is consistently above:
  SBP ≥ 140mmHg –160 mmHg and or **DBP ≥ 95 mmHg-100 mmHg**

- Treatment targets should be individualised. However, in general treatment target recommendations are (Lowe *et al.,* 2014, MOH, 2018):
  SBP 130 mmHg -150 mmHg and **DBP 90mm Hg – 100 mmHg**

Medications

A number of drugs have demonstrated efficacy and safety. Treatment options are the same as those used for treating gestational hypertension, which include labetalol, sustained-release nifedipine and methyldopa (Lowe *et al.,* 2014, MOH, 2018) - see Table 3.

ACE inhibitors, diuretics and atenolol should be avoided during pregnancy due to their associated fetal side-effects (MOH, 2018). If conception occurs whilst on ACE inhibitors, diuretics or atenolol, anti-hypertensive therapy should be medically reviewed as soon as possible. Methlydopa is usually recommended in pregnancy and it has a sound pregnancy safety history (MOH, 2018).

Discussion with MFM/obstetric physician, including consideration of a MFM clinic review is usually indicated.

Super-imposed pre-eclampsia

Women with chronic hypertension are at increased risk of super-imposed pre-eclampsia and require careful assessment if there is an apparent rise in BP or the development of proteinuria (MOH, 2018).

10. Antenatal monitoring and assessment for pre-eclampsia

Several points to emphasise:

- Pre-eclampsia is a multisystem disease, where each end organ (e.g. blood vessels, kidney, CNS, liver, clotting system and placenta) may be affected to a greater or lesser extent. Careful assessment of each end organ is essential for optimal management.
- Severe pre-eclampsia and eclampsia are life-threatening conditions; the labour and birthing suite (LBS) registrar on call should always inform and involve SMO on-call (+/- obstetric physician) and the anaesthetist. A management plan should be made and written in the patient's clinical record. The duty paediatrician should also be informed if preterm delivery is expected.
- Pre-eclampsia progresses at different rates in different cases; occasionally the rate of progress can be remarkably rapid. Eclampsia rarely occurs without premonitory symptoms (e.g. severe headache, visual disturbance, epigastric pain) and symptoms should always be taken seriously.
- Hypertension is a treatable manifestation of pre-eclampsia. Reducing high blood pressure will not alter the underlying progression of the disease although in the short term it may reduce the risk of eclampsia and a cerebrovascular accident.
- The LBS registrar on call must be informed if any woman has SBP ≥ 160 mmHg OR DBP ≥ 110 mmHg, which has not fallen below these levels on rechecking 20 minutes later (MOH, 2018).

  Note: a BP within the parameters of SBP ≥ 160 mmHg OR DBP ≥ 110 mmHg will activate a Maternity Early Warning Score (MEWS) escalation pathway requiring a Team Registrar review within 20 minutes and a PaR (Patient at Risk) team review within 30 minutes. A SBP ≥ 200 mmHg will activate a 777 code (obstetric emergency and adult code Red and SMO input from obstetrics and obstetric medicine).
- The LBS registrar on call will be responsible for instituting appropriate antihypertensive treatment, with supervision from the relevant SMO (see Acute Management of Hypertension below).

Women whose condition is difficult to control, or who may have renal or hepatic involvement should be discussed urgently with the on-call SMO for obstetrics and obstetric medicine.

Forty percent (40%) of eclamptic seizures occur after delivery thus, post-natal vigilance is essential, although the disease will resolve spontaneously in all but a few cases.

Note: Eclampsia can occasionally occur in the absence of hypertension or proteinuria.

10.1 Assessment, physical signs and monitoring

These should be documented in the patient's clinical record. The development of hepatic tenderness, hyperreflexia ± clonus, breathing difficulties, abdominal pain, antepartum haemorrhage or altered fetal movements are an indication for urgent senior physician review.

Daily assessment of maternal and fetal condition is required at registrar level or above to determine that conservative management, rather than delivery, is safe and can be continued.

Assessment should include systematic review for symptoms and signs that indicate severe pre-eclampsia including:

- Persistent severe hypertension (SBP ≥ 160 mmHg **OR** DBP ≥ 110 mmHg)
- Oliguria less than 80 mL/4 hours
- Oliguria less than 500 mL/24 hours
- Serum creatinine > 90 µmol/L
- Signs of neurological involvement (persistent headache, visual disturbance, hyperreflexia with clonus)
- Pulmonary oedema
- Liver dysfunction (abdominal pain with abnormal LFTs)
- Haematological involvement (thrombocytopenia < 100 x 10^9/L or falling platelets, disseminated intravascular coagulopathy (DIC)
- Assessment should also include systematic review of the fetus including:
  - Fetal wellbeing (movements, cardiotocography (CTG), ultrasound and Doppler assessments)
  - Signs of placental abruption (vaginal bleeding, uterine contractions or irritability, abdominal discomfort or pain)

10.2 Maternal monitoring (refer to Table 2)

Recommended standards for inpatient maternal monitoring include (MOH, 2018):

- 4-6 hourly BP (except overnight when an interval of 8 hours is acceptable, provided the BP is < 160/100 mmHg on retiring)
- Twice weekly full blood count (including haemoglobin, platelet count), creatinine, liver function tests (albumin, ALT and AST)
- Coagulation studies should be performed if falling platelets (< 100 x 10^9/L) or abnormal liver tests or concern about possible placental abruption
- Laboratory investigations should be repeated more often if there are concerns about either the maternal or fetal condition

Fluid balance

Women with pre-eclampsia are generally hypovolaemic but their tissues are fluid overloaded. Specific attention should be paid to fluid balance, which should be closely monitored if there are concerns about rapidly accumulating oedema, rapidly increasing proteinuria, reduced urine output or rising creatinine.

10.3 Fetal assessment

As a minimum, include fortnightly:

- Growth measurements
- Amniotic fluid volume estimates
- Umbilical artery Doppler studies

More frequent ultrasound assessment including Doppler studies may be required especially in severe or complicated disease progression.

Umbilical artery Doppler

The frequency of umbilical artery doppler studies and liquor volume assessment may need to be increased if either are abnormal or in the presence of intrauterine growth restriction (IUGR) (abdominal circumference (AC) < 10% or estimated fetal weight (EFW) < 10% on customised charts or reduced growth rate). Consider discussion with MFM if there are additional concerns.

Cardiotocography (CTG) monitoring

Inpatient daily CTGs are recommended for all fetuses considered viable and not usually indicated before 25 weeks. The timing of 'viability' at early gestations can be very complex and should ideally involve a multidisciplinary approach and include careful discussion with the parents by the obstetric and neonatology team. You may wish to consult with the MFM team for guidance.

Neonatal Review

Referral for expert neonatal opinion should always be considered, and is critical when imminent pre-term birth is likely. Ideally, referral would be made at a consultant/specialist level. The on-call neonatal specialist can be contacted via switchboard.

10.4 Table 2 – Summary table: Monitoring for women with hypertensive disorders (adapted from MOH, 2018)

Treatment of Hypertension in Pregnancy Summary						
Pre-existing/chronic	**Gestational hypertension**	**Pre-eclampsia with expectant management (hospital inpatient)**	**Severe unstable pre-eclampsia/ eclampsia (MCCA like setting)**	**Magnesium sulfate monitoring (MCCA like setting)**	**Intrapartum pre-clampsia/ eclampsia**	**Postpartum**
BP Monitoring						
Consider more frequent **blood pressure measurements and appointments** than normal if for pregnant women who have any of the risk factors and unstable pre-eclampsia; individualise the decision to the woman	Blood pressure 1-2 times/week	4-6 hourly blood pressure (except overnight when an interval of 8 hours may be acceptable at discretion of parent team if <150/90 mmHg on retiring)	One-on-one care **Blood pressure** at least hourly, respiratory rate, oxygen saturation	One-on-one care **Blood pressure** every 5 minutes during loading dose then hourly during maintenance dose	**Blood pressure** at least hourly	4-6 hourly blood pressure (except overnight when an interval of 8 hours is acceptable while inpatient) After discharge, **blood pressure** daily for first 7 days, then weekly up to 6 weeks postpartum

Pre-existing/chronic	Gestational hypertension	Pre-eclampsia with expectant management (hospital inpatient)	Severe unstable pre-eclampsia/ eclampsia (MCCA like setting)	Magnesium sulfate monitoring (MCCA like setting)	Intrapartum pre-eclampsia/ eclampsia	Postpartum
Testing						
Identify risk factors	**Urinalysis testing for proteinuria** at least weekly[a] Pre-eclampsia bloods if sudden increase in BP or new proteinuria Pre-eclampsia bloods = full blood count (including haemoglobin, platelet count), creatinine, electrolytes, liver function tests (albumin, ALT and AST), urate	Twice weekly **pre-eclampsia bloods** Perform **coagulation studies** if liver tests are abnormal or you have concerns about possible placental abruption Repeat **laboratory investigations** more often if you have concerns about the condition of either mother or fetus	At least daily **pre-eclampsia bloods** Perform **coagulation studies** if liver tests are abnormal or you have concerns about possible placental abruption Repeat **laboratory investigations** more often if you have concerns about the condition of either mother or fetus	At least daily **pre-eclampsia bloods** Perform **coagulation studies** if liver tests are abnormal or you have concerns about possible placental abruption Repeat **laboratory investigations** more often if you have concerns about the condition of either mother or fetus Consider magnesium levels as per guideline	Pre-eclampsia bloods at start of IOL, on admission to L+BS, then as advised by the obstetric or anaesthetic team FBC should be taken within 6 hours of epidural insertion and removal, and an APTT + PT if platelet count <100 x10^9/L	Monitor for **all signs** of pre-eclampsia **(including pre-eclampsia bloods)** returning to normal but beware of postpartum deterioration and eclampsia

a. Urinalysis by dipstick followed by spot urine PCR if ≥2+ proteinuria. Once significant proteinuria has been detected, there is no established role for serial testing.

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Pre-existing/chronic	Gestational hypertension	Pre-eclampsia with expectant management (hospital inpatient)	Severe unstable pre-eclampsia/ eclampsia (MCCA like setting)	Magnesium sulfate monitoring (MCCA like setting)	Intrapartum pre-eclampsia/ eclampsia	Postpartum
Fetal Assessment						
Ongoing fetal assessment[b] for growth. If IUGR detected follow the SGA pathway	Fetal assessment at time of diagnosis. Do not repeat USS in <2 weeks, unless fetal indications[b] Changes in fetal movements, other signs/symptoms of pre-eclampsia. Woman advised to assess daily and her maternity carers assess when they see her	**Cardiotocography (CTG)** daily once 26 weeks gestation if inpatient. Decision for CTG at 24-25^{+6} gestation requires full discussion with obstetric and neonatal teams regarding resuscitation attempts	**Cardiotocography (CTG)** daily	Continuous **cardiotocography**	Continuous **cardiotocography**	N/A

b. Fetal assessment with ultrasound for early dating and fetal growth at the time of diagnosis, and repeat if suspected growth restriction on clinical assessment by LMC. Umbilical artery velocimetry and cardiotocography only if fetal growth restriction or distress is suspected. C. Educate the woman around the need to contact her LMC urgently if she experiences symptoms of pre-eclampsia/eclampsia or any changes in fetal movements. ALT = alanine aminotransferase, AST = aspartate aminotransferase, BP = blood pressure, IUGR = intrauterine growth restriction, SGS = small for gestational age, Sp02 = peripheral capillary oxygen saturation, USS = ultrasound scan

Pre-existing/chronic	Gestational hypertension	Pre-eclampsia with expectant management (hospital inpatient)	Severe unstable pre-eclampsia/ eclampsia (MCCA like setting)	Magnesium sulfate monitoring (MCCA like setting)	Intrapartum pre-eclampsia/ eclampsia	Postpartum
Fluid Balance						
			Fluid restriction 80-85 mL/hour total fluid for severe pre-eclampsia **Fluid balance chart**	**Fluid restriction** 80-85 mL/hour total fluid for severe pre-eclampsia **Fluid balance chart**	**Fluid restriction** (replace loss at birth and then 80-85mL/hour total fluid for severe pre-eclampsia. This may require **Fluid balance chart**	

Pre-existing/chronic	Gestational hypertension	Pre-eclampsia with expectant management (hospital inpatient)	Severe unstable pre-eclampsia/ eclampsia (MCCA like setting)	Magnesium sulfate monitoring (MCCA like setting)	Intrapartum pre-eclampsia/ eclampsia	Postpartum
Special Considerations						
		Symptoms of labour (presence of contractions, rupture of membranes, abdominal pain, bleeding) **Symptoms of severe pre-eclampsia** (headache, visual changes, shortness of breath, epigastric pain, retrosternal pressure/pain, nausea, vomiting, hyperreflexia)	**Symptoms of labour** (presence of contractions, rupture of membranes, abdominal pain, bleeding)	Toxicity Monitoring **Respiratory rate/Sp02** hourly **Patella reflexes** hourly **Urine output** (>100mL per 4 hour epoch)		If magnesium sulfate started ante/intrapartum, continue 24 – 48 hours. Recommend women who have had pre-eclampsia **stay in secondary or tertiary facility** for at least 72 hours postpartum. Base the decision for discharge timing on the individual woman and on whether satisfactory monitoring and follow-up care arrangements have been made

11. Antenatal therapy in pre-eclampsia and hypertension

Disease progression
It should be stressed that anti-hypertensive therapy **does not prevent** the progression of the underlying disease process and close maternal and fetal surveillance should be continued.

Corticosteroids
Steroids should be considered for all women ≤ 34^{+6} weeks gestation. Refer to Auckland DHB guideline: *Antenatal Corticosteroids to Improve Neonatal Outcomes*.

Magnesium sulfate for fetal neuroprotection
Magnesium sulfate should be considered when a decision to deliver at less than 30 weeks gestation is made (MOH, 2018). Refer to Auckland DHB guideline: *Magnesium Sulfate for Pre-eclampsia and for Neuroprotection in Pre-term Births < 30^{+0} Weeks*

Anti-hypertensive therapy (refer to Table 3)

- Anti-hypertensive therapy should be considered if:
  SBP consistently ≥ 140mmHg –160 mmHg OR **DBP consistently ≥ 95mmHg – 100 mmHg** (MOH, 2018)
- Always give anti-hypertensive therapy if:
  SBP > 160 mmHg OR **DBP > 100 mmHg** at *any one time* (MOH, 2018)

Table 3 – Antihypertensive Treatment in Pregnancy
(adapted from MOH, 2018 and Lowe *et al*, 2014)

Drug	Dose	Action	Contra-indications	Practice Points
Methyldopa	250mg po TDS (up to 750mg po TDS)	Central	Depression	• Slow onset of action over 24 hours • Adverse Effects: dry mouth, sedation, depression, blurred vision • Withdrawal effects: rebound hypertension
Labetalol	100mg po BD (up to -400mg po Q8H)	ß-blocker (with mild α-vasodilator-effect)	Asthma, chronic airways limitation	• Adverse Effects: bradycardia, bronchospasm, headache, nausea, scalp tingling (which usually resolves within 24-48 hours)
Nifedipine (sustained release)	20mg po BD *or* 30-60mg po DAILY (Maximum 60mg/BD)	Calcium channel blocker	Aortic stenosis	• Can be added as 2nd line agent to labetalol or methyldopa • Sublingual nifedipine is not recommended in any instance for BP reduction • Immediate release formulation is not recommended for long-term treatment • Adverse Effects: severe headache, peripheral oedema, constipation

The medications in Table 3 have been listed in order of international experience and extent of published safety data). There is no clear evidence that one particular medicine is better than any other and evidence shows no significant differential effects (MOH, 2018). The choice of anti-hypertensive should depend on the experience and familiarity of the individual clinician and should include current knowledge of adverse maternal and fetal adverse effects (MOH, 2018).

The Auckland DHB supports the "Anti-BP's in Preeclampsia Study" which investigates the endothelial activation in an attempt to answer the questions as to which medication is better for treatment.

12. Timing of birth

The timing of birth will usually be decided by a specialist obstetric consultant. Pre-eclampsia on its own is not an indication for caesarean delivery.

Consideration should be given to the usual obstetric parameters of achieving safe vaginal birth within a reasonable time. Epidural analgesia for women with pre-eclampsia is generally recommended as long as there is no coagulopathy.

Note: stabilisation of the maternal condition first will lead to a safer birth by whatever route.

a) For non-severe hypertensive disorders (includes chronic hypertension, gestational hypertension and stable pre-eclampsia in the absence of severe features)

Maternal outcome is improved by planned birth; however, there may be benefit of avoiding birth prior to 37 weeks to improve neonatal outcomes (MOH, 2018).

b) Early onset and/or severe pre-eclampsia - less than 30 weeks gestation or pre-eclampsia complicated by disseminated intravascular coagulopathy (DIC), haemolysis, elevated liver enzymes & low platelet count (HELLP) or multisystem derangement.

The decision around timing of birth should be individualised. There may be benefit in avoiding birth before 34 weeks to improve neonatal outcomes (MOH, 2018).

A discussion with and referral to MFM/obstetric physician is strongly recommended.

All women with early onset severe pre-eclampsia or complicated disease should have careful postnatal follow up and review after hospital discharge. We recommend this should be by the obstetric physicians and/or MFM team. At this time, a plan should be made for any future pregnancies and recommended on-going general health follow-up.

c) Peri or pre-viability

Manage in consultation with MFM and neonatal team.

If indication for delivery presents, administer corticosteroids and if <30 weeks, magnesium sulfate protocol for fetal neuroprotection.

Refer to Auckland DHB guidelines (in Associated documents):

- *Antenatal Corticosteroids To Improve Neonatal Outcomes*
- *Magnesium Sulfate for Pre-eclampsia and for Neuroprotection in Pre-term Births < 30 Weeks*

d) For women with HELLP or eclampsia

Seizures

All cases of unexpected seizures in pregnant women should be assumed to be eclampsia until proven otherwise (need to exclude other acute neurological causes, e.g. subarachnoid haemorrhage).

The mother should be stabilised and transferred to the High Dependency Unit (HDU/maternity complex care setting).

Magnesium sulfate IV should be given for prevention of recurrent seizures (MOH, 2018).
See Associated documents for magnesium sulfate guideline.

Any gestational age: Recommend delivery after stabilising woman, administer corticosteroids (if $\leq 34^{+6}$) (MOH, 2018).

Eclamptic seizure is not an indication for immediate delivery.

13. Management in labour (refer to Table 2)

Investigations

- Full blood count (FBC)
- Coagulation screen - if platelets falling rapidly or (< 100 x 10^9/L or signs of haemolysis, and/or abnormal liver functions)
- Creatinine (abnormal if > 90 µmol/L)
- Serum ALT and AST

Threshold for treatment

Treatment should be individualised however, the previously discussed levels of BP are reasonable to use in labour (SBP 140 mmHg – 160mmHg OR DBP 95 mmHg – 100mmHg). Treatment options are outlined in section Acute Management of Hypertension.

Overall management

Early transfer to a tertiary centre is recommended for women with early onset or severe pre-eclampsia to avoid the adverse outcomes associated with the transfer of a critically ill mother or preterm neonate.

In severe hypertension (**SBP ≥ 160 mmHg** OR **DBP ≥ 110 mmHg**) anti-hypertensive therapy is urgently required to reduce the risk of maternal intracerebral haemorrhage (see Tables 4 and 5).

Senior clinicians should be involved directly in managing the mother and transfer to a HDU/maternity complex care setting, or an area with 1:1 midwifery or nursing care is strongly recommended. Fetal monitoring throughout is strongly recommended. However, the maternal condition must be stabilised before transfer.

Anaesthetic involvement

The senior anaesthetist on call for labour and birthing suite should be involved early in the management plan and process.

Fluid management and urinary output

Whilst pre-eclampsia, and especially severe pre-eclampsia, is a condition with reduced intravascular volume the associated endothelial dysfunction means that fluid typically leaks more quickly from the vascular space into surrounding tissue and compartments (dependent oedema, ascites, pulmonary oedema, pleural and pericardial effusions, cerebral oedema etc).

Because of this, it is essential that strict attention is paid to fluid balance. Usually these women are managed with the fluid restriction (typically 80 mL/hour) though limited fluid challenges may be indicated in exceptional circumstances.

Urinary output

This should be measured on an hourly basis however, it is reasonable to use a definition of oliguria of < 80 mL/4 hours before intervention is considered especially fluid challenges in the oedematous mother.

Mildly elevated serum creatinine is a reflection of the depleted intravascular volume and renal involvement. In nearly all cases, the apparent renal impairment will reverse completely after delivery as pre-eclampsia resolves.

Communication and follow up

Inform the Lead Maternity Carer (LMC) of any woman who has been admitted with severe pre-eclampsia before she is discharged. Postnatal follow-up should be arranged in the appropriate clinic, particularly for women with either early onset (less than 30 weeks) complicated pre-eclampsia or persistent hypertension. There should be a comprehensive discharge summary indicating the need for ongoing follow-up for long-term cardiovascular risk.

14. Acute management of Severe Hypertension (refer to Table 4 and Table 5)

If severe hypertension (**SBP ≥ 160 mmHg** or **DBP ≥ 110 mmHg**) exists for longer than 20 minutes, these women should have urgent medical review. It is recommended that the acute management of these women is directly supervised by a registrar or more senior clinician.

Note: *BP within the parameters of SBP ≥ 160 mmHg OR DBP ≥ 110 mmHg will activate a MEWS escalation pathway requiring a Team Registrar review within 20 minutes and a PaR (Patient at Risk) team review within 30 minutes. A SBP ≥ 200 mmHg will activate a 777 code (obstetric emergency and adult code Red and SMO input).*

Management should commence immediately on the ward pending transfer to HDU/maternity complex care setting. Consider magnesium sulfate administration (see guideline and associated document *Magnesium Sulfate for Pre-eclampsia and for Neuroprotection in Pre-Term Births < 30^{+0}Weeks)*

If severe hypertension is sustained for **more than 30 minutes** or **BP ≥ 160/110 mmHg at any time**, acute treatment is required (see Table 4 below) with the aim of lowering blood pressure to the following ranges (MOH, 2018):

- Diastolic BP: 80-100 mmHg
- Systolic BP: 130-150 mmHg

Table 4 - Acute blood pressure lowering for severe hypertension
(adapted from MOH, 2018 and Lowe *et al.*, 2014):

Drug	Dose	Route	Onset of Action	Practice Points
Nifedipine	10mg Repeat after 30-45 minutes if required Max 80 mg/day	Oral	30-45 minutes	• Use 5 mg immediate release capsules (NOT sublingual or sustained-release tablets) • Once target BP achieved, consider changing to slow-release tablets for long-term management
Labetalol	200 mg Repeat after 30 minutes if required	Oral	30 minutes	• Oral therapy can be given while obtaining IV access • Contraindicated in patients with history of steroid-dependent asthma or obstructive airways disease
	20mg Repeat with 40-80 mg every 5-10 minutes if required Max 300 mg/day	IV bolus (over 2 minutes)	5 minutes	
Hydralazine*	5-10 mg (5 mg if fetal compromise) Repeat every 20 minutes if required. Max 30mg/day	IV bolus (over 3-10 minutes)	20 minutes	• Effect on BP less predictable than with IV labetalol

* IV hydralazine has been associated with precipitous falls in BP, which may cause fetal distress by impairing placental perfusion. Consider whether a bolus of IV fluids is indicated before or when administering first dose (Lowe *et al.* 2014).

Persistent or refractory severe hypertension may require repeated doses of the above agents.
If blood pressure is not adequately controlled (e.g. after 4 bolus doses), a continuous infusion of labetalol or hydralazine may be required (Lowe *et al.*, 2014). See **Table 5** below.

Table 5 – Continuous IV infusion for refractory severe hypertension
(adapted from McClintock *et al.*, 2015 and Lowe *et al.*, 2014):

Drug	Dose	Practice Points
Labetalol	20 mg/hour Can be doubled every 30 minutes until target BP achieved (up to maximum of 160 mg/hour)	• Max cumulative dose 300 mg (including bolus doses) • Discontinue by weaning over 1-2 hours when BP is consistently <155/85 mmHg
Hydralazine	Initially: 200-300 micrograms/minute Rate reduce when adequate response achieved. Usual maintenance: 50 – 150 micrograms/minute	• If >100 mg/day is required, the patient's acetylator status should be evaluated (may provoke an SLE-like syndrome)

15. Anaesthesia and analgesia for women with pre-eclampsia and hypertension

All women with hypertensive disorder of pregnancy (HDP) should have a platelet count performed on admission to delivery suite.

Severe pre-eclampsia is not a contraindication to epidural analgesia providing the platelet count is > 100 x 10^9/L (within 6 hours of epidural insertion) (MOH, 2018).

If the platelet count is < 100 x 10^9/L a coagulation screen should be sent.

Hypovolemia is part of the pathophysiology of pre-eclampsia, and careful attention to fluid balance is mandatory, particularly with epidural analgesia.

Fluid pre-loading is not routinely recommended prior to epidural insertion (MOH, 2018).

In women with fulminating pre-eclampsia, the platelet count may drop rapidly and needs rechecking prior to insertion of an epidural.

Epidural analgesia is useful to reduce the hypertensive response to painful contractions and provides a means for rapid conversion to epidural anaesthesia suitable for surgery if required. Adequate control of blood pressure prior to operative intervention is essential for optimal maternal safety.

Adequate precautions to obtund the pressor response to laryngoscopy should be taken in the event of general anaesthesia being required (MOH, 2018).

16. Criteria for transfer to Department of Critical Care Medicine (DCCM)

- Persisting seizures
- BP remains uncontrolled despite appropriate doses of labetalol/nifedipine/hydralazine
- Pulmonary oedema requiring additional respiratory support
- Acute Kidney Injury (AKI) requiring hemofiltration
- Compromised myocardial function
- Neurological impairment requiring ventilation
- Other complicating co-morbidities

Women, who do not meet the above criteria, may still need to be transferred to DCCM if appropriate level of care is unable to be provided in the maternity setting.

We recommend early discussion with the relevant clinicians, including the Patient at Risk (PaR) team and the critical care team about the clinical condition of women who may need advanced resuscitation or possible transfer.

17. Postpartum management

17.1 Epidural removal

A platelet count should be checked prior to epidural removal (within 6 hours). If the platelet count is < 100 x 10^9/L a coagulation screen should be sent and the pain team should be consulted for a plan for removal.

17.2 Disease progress and treatment

In the immediate postpartum period women who have pre-eclampsia should continue to be monitored for disease resolution. Women who develop multisystem complications prior to delivery may deteriorate further in the first 48 - 72 hours post partum. Forty percent of eclampsia occurs post-partum.

There is a physiological rise in BP after delivery and treatment instigated before delivery should probably continue for a minimum of 3 - 4 days. In general, we recommend that women with hypertensive disorders in pregnancy (HDP) remain in hospital for at least 72 hours post partum for blood pressure monitoring (MOH, 2018).

17.3 Postpartum management of women with chronic hypertension and new Hypertension

In many women with chronic hypertension or superimposed pre-eclampsia, blood pressure is often unstable for one to two weeks after delivery. It may also be particularly high on the third to sixth day post-delivery, necessitating antihypertensive medication.

Hypertension may also arise *de novo* in the postpartum period in women who did not have hypertension in the antenatal period (MOH, 2018). This could be a non-specific phenomenon but may also be late onset pre-eclampsia or the unmasking of chronic hypertension. The relevant investigations for pre-eclampsia should be performed.

Evidence to guide optimum management of postpartum hypertension is limited, but therapy should generally be considered if:

- **SBP** is **persistently ≥ 150 mmHg** or
- **DBP** is **persistently ≥ 100 mmHg**

The agents mentioned earlier for managing hypertension in pregnancy (i.e. from Table 3) are compatible with breastfeeding, as are **ACE inhibitors** (e.g. enalapril and quinapril) (Lowe *et al.*, 2014, Newton *et al.*, 2015 and MOH, 2018).

Methyldopa is usually avoided postpartum due to its effects on mood and association with depression (MOH, 2018). For women who were previously on treatment with methyldopa, a postnatal change to an oral long-acting beta blocker, calcium channel blocker or an ACE inhibitor is recommended (MOH, 2018).

17.4 Breastfeeding

In general, breastfeeding is strongly recommended in women with hypertension. Treatment with oral anti-hypertensive agents does not preclude breastfeeding. Treatment with ACE inhibitors appears safe during breastfeeding (Hale Drugs in Pregnancy and Lactation, Beardmore, 2008, Lowe *et al.*, 2014 and MOH, 2018).

17.5 Ongoing monitoring post discharge

Blood pressure should be monitored regularly after hospital discharge, ideally, daily for the first 7 days. Once the BP is **≤ 140/90 mmHg** anti-hypertensive therapy can be reduced as necessary by the GP.

A discharge summary/letter dictated by the registrar or SMO is mandatory. Advice about future pregnancies is also recommended. A copy of the discharge summary and the Standard Letter to Patient Re BP (Associated Documents) should be given to the woman. A six-week postnatal visit to the hospital should be arranged for women with hypertension. This only needs to be with the Obstetric Physician team if they have been involved antenatally with the care. It can otherwise be with the appropriate obstetric team.

Women with a history of hypertensive disorders in pregnancy should receive information on long-term risks of pre-eclampsia including cardiovascular disease and the importance of maintaining a healthy lifestyle.

Women with a history of pre-eclampsia should have a yearly assessment of blood pressure, lipids, blood glucose, thyroid function and BMI. Long-term risks appear to increase significantly 10 years after the initial hypertensive event. This timing should be taken into account when advising on on-going surveillance for these risks.

Women with a history of pre-eclampsia should also receive information on risks associated with subsequent pregnancies and have the opportunity to discuss contraceptive options.

17.6 Risk of developing long-term conditions for women who have had gestational hypertension or pre-eclampsia (MOH, 2018)

Future risk	Hypertensive disorder in index pregnancy	
	Gestational Hypertension*	Pre-eclampsia
	Relative risk (95%CI)	
Gestational hypertension in future pregnancy	3.4 (2.0-5.8)	6.3 (3.4-12.0)
Pre-eclampsia in future pregnancy	7.57 (2.31-24.78)	7.19 (5.85-8.83)
Chronic hypertension	3.39 (0.82-13.9)	3.13 (2.51-3.89)
Cardiovascular disease	1.66 (0.62-4.41)	1.76 (1.43-2.21)
Cerebrovascular disease	1.47 (1.05-2.0)	1.76 (1.43-2.21)
Venous thromboembolism	-	1.79 (1.37-2.33)
End-stage kidney disease	-	4.3 (3.3-5.6)

*More research is required around the long-term effects of gestational hypertension

18. Supporting evidence

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19. Associated documents

- Magnesium Sulfate for Preeclampsia and for Neuroprotection in Pre-Term Births <30 weeks
- Antenatal Corticosteroids to Improve Neonatal Outcomes
- Discharge letter to patient
- MFM referral letter

20. Disclaimer

No guideline can cover all variations required for specific circumstances. It is the responsibility of the health care practitioners using this Auckland DHB guideline to adapt it for safe use within their own institution, recognise the need for specialist help, and call for it without delay, when an individual patient falls outside of the boundaries of this guideline.

21. Corrections and amendments

The next scheduled review of this document is as per the document classification table (page 1). However, if the reader notices any errors or believes that the document should be reviewed ***before*** the scheduled date, they should contact the owner or Document Control without delay.

Starship Child Health | Newborn intensive care | Clinical Guideline

Cooling - therapeutic hypothermia in the neonate

Date last published: 25 July 2019

Cooling has been recognised as an effective intervention to decrease adverse neuro-developmental outcomes following perinatal asphyxia (hypoxic ischaemic encephalopathy HIE)

Overview

Cooling has been recognised as an effective intervention to decrease adverse neuro-developmental outcomes following perinatal asphyxia. There are no studies that have performed direct comparison between selective head cooling and whole body cooling and it is generally considered that both techniques provide neuroprotection.

Indications

For indications see NZCYCN Guideline on Neonatal Encephalopathy. Also quick link to Simplified Sarnat Criteria.

Application of Cooling

Care is taken to not overheat the infant prior to cooling.

- Infant should be nursed on a radiant heat table
- Turn off radiant heat source and allow to cool passively
- Umbilical venous and arterial lines should be inserted as venous access may not be easy to establish once the infant is cooled and frequent blood samples +/- invasive BP monitoring may be required
- Insert approved rectal probe to 5 cm
- Turn off radiant heat source and allow to cool passively
- Follow link to specific instructions for Criticool body cooling or selective head cooling set up and instructions.
- Cooling (core temperature between 33.0 and 34.0°C) normally continues for a period of 72 hours before careful rewarming. Infants with severe PPHN may require warming earlier.
- Infants are nil by mouth during their initial stabilisation and assessment. Consideration of starting trophic feeds (20ml/kg/day) during active cooling is at the discretion of the consultant and may depend on the availability of EBM.
- Infants do not need to be routinely intubated and ventilated during therapeutic cooling. This should be assessed on an individual case basis.
- Cold is a noxious stimulus. During cooling, patients may be kept comfortable on a morphine infusion. A loading bolus of 50 micrograms/kg/hr and infusion rate of 10 micrograms/kg/hr are recommended. Titrate as needed.

Set up and initiating whole body cooling

Initiating whole body cooling is the responsibility of the senior medical staff. Ideally ensure that the Criticool device is plugged into the red uninterrupted power supply (UPS)

1. Assemble the Criticool device according to Reference Guide
2. Ensure radiant heater is off & mattress either off or set at 33.5° C
3. **Before use, perform a System Calibration.**

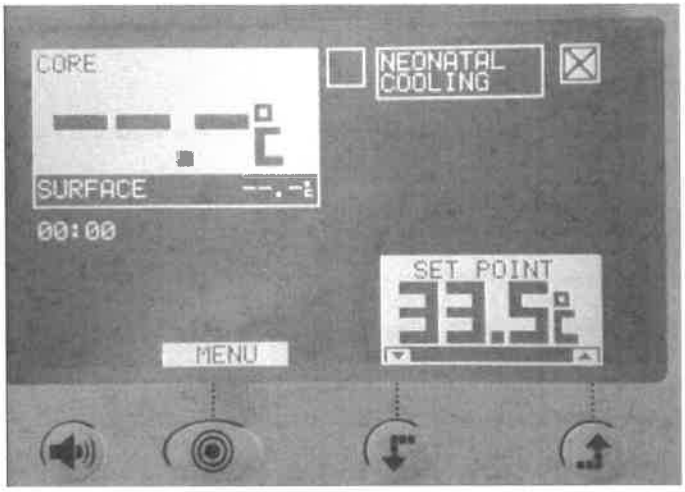
   Before performing system calibration test, check the reservoir is filled to between 1500ml and 2 litres with tap water. **Top up to max after calibration is complete.** Connect to power source and turn the system on (make sure the tubes and sensors are disconnected). The unit will perform a self test then automatically default to cooling operational mode.
4. **To perform a System Calibration:**

   Cooling mode is highlighted

   Press OK

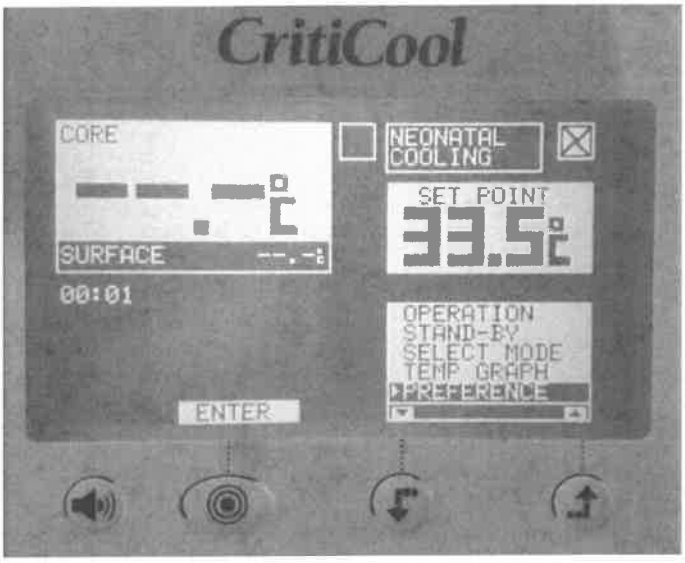
Check the default mode is set to NEONATAL and the temperature is 33.5° c.

Push MENU



Scroll down using arrows until PREFERENCE is highlighted

Press ENTER



System calibration should now be highlighted

Press the up arrow

Calibration will commence

Calibration takes about 10 minutes.

When the process is complete, a message appears on the screen "SYSTEM CALIBRATION COMPLETED".

Switch to operation mode and commence cooling **or** go to standby mode until ready to commence cooling.

Top up the water tank to the maximum allowable level.

5. Insert the approved rectal core temperature probe to 5cm, secure to inner thigh of infant and connect to the device. Position a skin temperature probe on the infant in an area outside of the garment (i.e. upper chest, arm or leg) and connect to the device.
6. Place the infant on the wrap. Connect water tubes to wrap and to the CritiCool unit - the wrap automatically fills up. Check all garment clamps are open and a clicking sound is heard. Ensure the baby has a nappy on (consider urinary catheterisation).
7. Monitor the garment closely while it fills. If it leaks, change it. Once the wrap has finished filling, wrap the infant in the garment, ensuring no folds, bends or areas of pressure that may interfere with the flow of water causing leaks or damage the infants' skin.
8. **Circulation is confirmed when the "flow icon" (top right of display) is turning.**
9. Ensure you have core and surface temperature readings - the infants' temperature should now be managed by the CritiCool.

Monitoring and Assessment

1. For the period of hypothermia all infants require the following monitoring and recording:

   - Continuous rectal temperature measuring

   - Continuous heart rate, respiratory rate, pulse oximetry

   - Invasive blood pressure monitoring, if possible

   - Recording of the real time core, skin and set temperature as displayed on the therapy control panel

   The heart rate may reduce during hypothermia so alarms must be adjusted accordingly

2. Continuous amplitude integrated electroencephalogram [BRAINZ] monitoring may be requested by the SMO and should be set up according to the NICU protocol.

3. General management of the infant is provided according to the routine clinical practice guidelines and protocols such as:

   - respiratory support

   - cardiovascular support

   - management of seizures

   - infection

   - fluid and electrolyte balance

4. Staff caring for the infant being cooled should contact the Level 3 Reg/NSANP if there are any problems reaching or maintaining a rectal temperature of between 33.5°c and 34° c throughout the 72 hour period of hypothermia.

Rewarming using the criticool device

Rewarming is initiated by the SMO. We use MANUAL rewarming with this device.

Manual Rewarming

1. Select NORMOTHERMIA on the control panel.

   The sun icon will replace the snow flake icon

   An alarm will sound alerting that the core temperature readout is too low - / acknowledge / select OK

2. The set point is increased by 0.1° c every 20 minutes: this ensures an overall increase in temperature of 0.3° c every 1 hour.

3. It will take approximately 10 hours to rewarm an infant

4. Seizure activity may be encountered during this phase.

5. When the core temperature reaches 36.5° c remove the garment. Turn the RHT on to baby mode to ensure the infant stays within the normothermic range.

6. Remove the rectal probe when the core temperature has reached 37°c

7. Once CritiCool disconnected from the infant, the system needs to be emptied.

   - Disconnect the wrap

   - Connect an emptying tube to the "water out" of the CritiCool and direct the tube into a container large enough for water collection.

   - Change the mode to empty

   - Wait for the water to empty from the system

   The CritiCool is now ready for storage until next procedure.

Follow up of baby after cooling completed

SeeNZCYCN Guideline on Neonatal Encephalopathy for more information about cooling and follow-up

Rupture of Membranes in Pregnancy

Document Type	Guideline
Function(s)	Clinical Service Delivery
Activity & Sub-Activity	Clinical Practice
Health Service Group (HSG)	Women's Health
Departments affected	Maternity
Staff affected	All clinicians in Maternity
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Contents

1. Purpose of guideline

This guideline establishes the expected management of women with rupture of membranes (ROM) to ensure the wellbeing and safety of both the woman and her unborn baby within Auckland District Health Board (ADHB).

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2. Guideline management principles

All women are to be seen by their Lead Maternity Carer (LMC) and referred to Women's Health as required.

The LMC is responsible for the initial assessment of the woman to confirm ROM, and the development of an individualised management plan that is clinically appropriate for each woman with confirmed ROM.

It should be ensured that the woman and her partner/whānau are fully aware of the clinical situation and verbal consent is obtained for the proposed management. There should be clear documentation of the counselling provided. The ADHB patient information leaflet "Pre-labour Rupture of Membranes" should be provided to the woman as a basis for discussion.

If the selection criteria are met, the woman should be given the options of induction of labour or expectant management (at home or in hospital). The team on call for Women's Assessment Unit (WAU) may be consulted at any time in WAU, and at that point the LMC, the team, and the woman are to agree together on a management plan which is to be documented in the woman's clinical record.

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3. Diagnosis of rupture of membranes (ROM)

On admission, the diagnosis of ROM must be established or excluded by:

a. Clinical examination

A sterile speculum examination should be offered to all women who present with obvious or suspected ROM. If obvious clear liquor is seen externally and the CTG is normal then a speculum examination may not be required. Consideration should be given as to whether the woman is in active labour or not before deciding on the need for any vaginal examination.

The woman should have been lying flat for at least 30 minutes prior to the speculum examination. The vulva is cleansed with sterile saline in the standard manner. It is not acceptable to omit cleansing. Antiseptic should not be used as it may interfere with bacteriological assessment and will render any subsequent vaginal discharge difficult to interpret. The speculum should not touch the cervix, although the cervical dilatation and the presence or absence of a prolapsed umbilical cord should be noted.

Until a definitive course of action is decided upon, a digital examination should not be performed, unless there is reason to exclude cord prolapse or malpresentation, or if delivery is considered imminent. If the diagnosis of ROM is in doubt, a repeat speculum examination after another period of lying down may be helpful.

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b. Ancillary tests

The use of nitrazine swabs (which indicate pH) does not provide more accurate diagnosis in isolation compared with visualising liquor passing through the cervix. Consideration may be given to using the newer immunoassay swabs (e.g. Amnisure and Amnioquick) if these are available. Care should be taken to read the enclosed instructions. There is some evidence that these tests, when used in conjunction with standard methods, can improve the accuracy of diagnosis.

An ultrasound examination may useful to assess fetal size, presentation and normality, and to assess liquor volume.

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4. Pre-labour ROM at term (term PROM)

This common obstetric complication is associated with hazards to both the baby and mother. Term PROM occurs in up to 10% of pregnancies. More than half of women with term PROM go into labour spontaneously within 24 hours, and about 70% within 48 hours.

The initial assessment is to be performed by the LMC either at the woman's home, the clinic, or in WAU (see Diagnosis). The following should be completed to ensure safety of a woman and her baby whilst experiencing Term PROM:

- Take history of ROM and general maternal and fetal wellbeing
- Record maternal temperature and pulse
- Abdominal palpation to confirm cephalic presentation and engaged presenting part
- CTG may be performed to assess fetal wellbeing and uterine activity (if no access to a CTG machine, intermittent auscultation and palpation for contractions is acceptable)
- DO NOT perform digital vaginal examination unless in established labour or immediately prior to commencing induction of labour (IOL)
- Sterile speculum examination to be performed with maternal consent. May not be necessary if obvious ROM. If any concern regarding occult cord prolapse then speculum examination must be done
- Vaginal and/or endocervix swabs are not routinely indicated
- Antepartum risk factors for GBS to be assessed (see algorithm)
- Ensure eligibility for expectant management (see next section)
- If woman meets the selection criteria for expectant management, provide information that allows an informed choice of expectant or active management, and ensure the woman and partner/whānau understand the risks and benefits of both options
- Give the woman the ADHB patient information leaflet "Pre-labour Rupture of Membranes; Information for women at term (37 or more weeks gestation)" and use this to guide discussion
- After diagnosis and discussion with the woman and her partner/family/whānau, a clear management plan should be documented

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a. Active management and antepartum risk factors for Group B Streptococcus (GBS) disease

For those women who have antepartum risk factors for GBS (see below), or who do not meet criteria for expectant management (see below), or who choose immediate induction of labour, please follow the guideline on Induction of Labour. Research indicates that although there is no contraindication to the use of prostaglandins for ripening of the cervix in women with Term PROM, there is less risk of chorioamnionitis and endometritis in women induced with IV oxytocin vs. vaginal PG.

Antepartum risk factors for GBS

- Previous baby with GBS infection
- + GBS low vaginal/perianal swab at 35-37 weeks
- + GBS urine culture anytime in current pregnancy

Note: GBS found on vaginal swab earlier in pregnancy is not necessarily an antepartum risk factor for GBS

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b. Expectant management at home

Women with Term PROM who meet the following criteria are eligible for expectant management at home:

- No antepartum risk factor for GBS (see above)
- Cephalic presentation and engaged
- Clear liquor
- Normal fetal movements
- Afebrile
- Not tachycardic (HR < 100 bpm)
- Has NOT had a digital vaginal examination
- Has home telephone
- Lives less than 40 minutes away
- Able to get transport to and from hospital easily

The Clinical Charge Midwife, L&BS (phone 24913), should be notified of the approximate timing of admission for IOL, which should be planned for 18 – 24 hours after ROM.

The ADHB patient information leaflet "Pre-labour Rupture of Membranes" should be given to the woman as it provides information on what to monitor and when to call the unit.

At home, 4 hourly monitoring of the following is required, and any concerns to be reported to the LMC:

- maternal temperature and pulse
- liquor
- fetal wellbeing

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c. Expectant management at hospital

Expectant management as an inpatient may be appropriate for those women who decline active management, but either choose to stay in hospital, or do not meet criteria for going home. In such cases there should be consultation with the team on call for WAU. The Clinical Charge Midwife, L&BS (phone 24913), should be notified of the approximate timing of IOL, which should be planned for 18 – 24hrs after ROM.

If the woman remains an inpatient she is to be transferred to an appropriate ward via the Duty Manager. The following observations should continue at 4 hourly intervals, and if any concerns to notify the team on call:

- maternal temperature and pulse
- observation of liquor
- Uterine activity
- FH auscultation

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d. Recommended intra-partum management to prevent early onset neonatal Group B Streptococcus (GBS) disease

- Intra-partum chemoprophylaxis must be given if there are any ante-partum or intra-partum risk factors for early onset neonatal GBS disease
  - Ante-partum risk factors – see above
  - Intra-partum risk factors – prolonged rupture of membranes of 18-24 hours or more
- Refer to GBS neonatal disease prevention guideline for advice re intra-partum antibiotics

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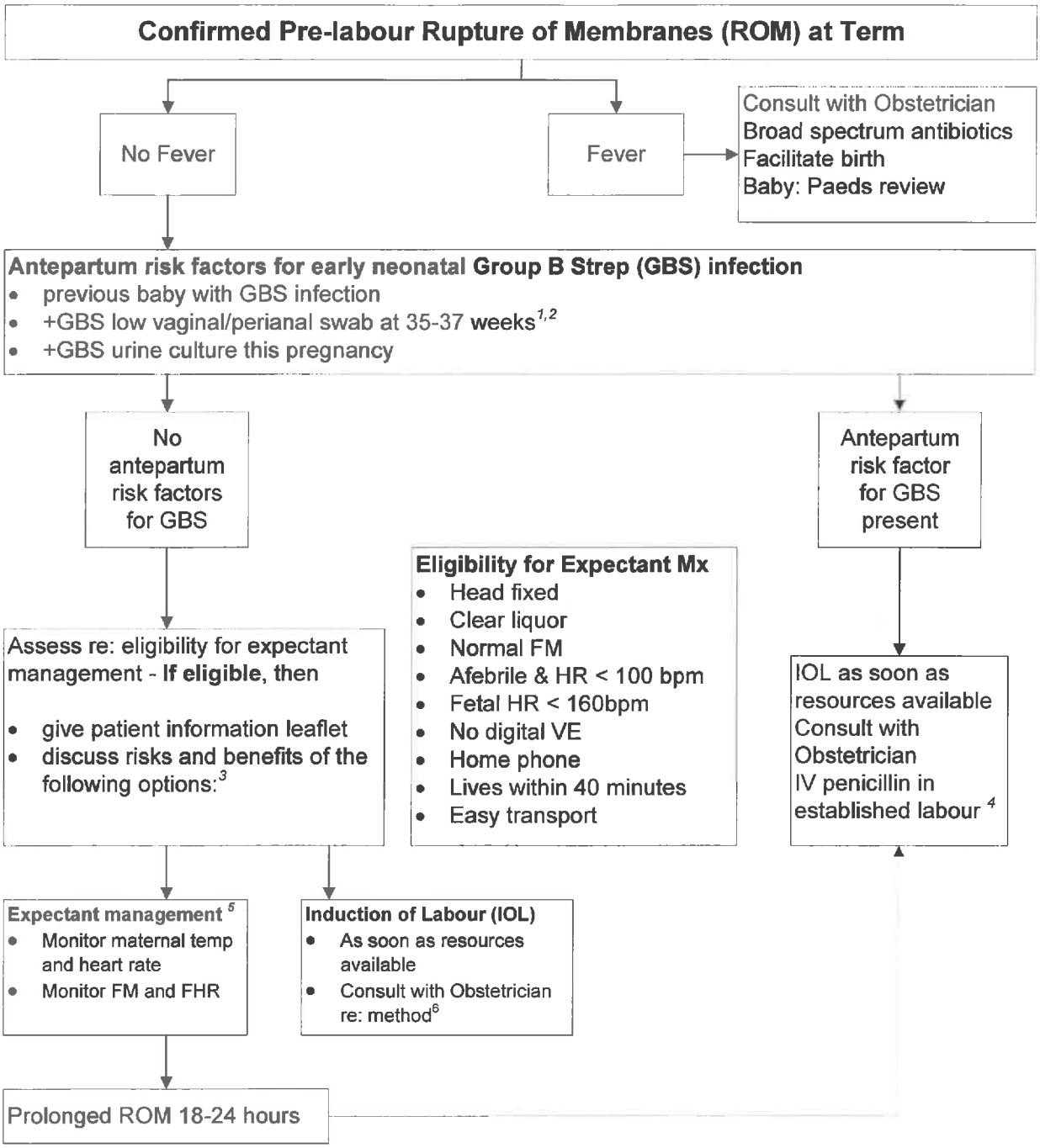
e. Algorithm



[1] *It is not NW policy to routinely screen for GBS in pregnancy*
[2] *GBS+ swab prior to 35 weeks is NOT predictive of current colonisation*
[3] *Evidence supports improved outcomes with early planned birth*
[4] *Penicillin should be started at least 4 hours prior to birth for neonatal protection*
[5] *All women managed expectantly should have their baby observed for 12 hours (temp and resps and information sheet)*
[6] *Evidence supports less risk of infection with IV Oxytocin rather than vaginal PG*

5. Preterm pre-labour ROM (PPROM)

This common obstetric complication is associated with hazards to both the baby and the mother. PPROM complicates up to 2-4% of pregnancies and is the cause of 30-40% of all spontaneous preterm births.

The risks of PPROM are:

- Neonatal prematurity and associated complications (death, respiratory distress syndrome, chronic lung disease, intraventricular haemorrhage, necrotising enterocolitis and retinopathy)
- Neonatal infection, particularly if the interval between PROM and delivery is prolonged
- Neonatal lung hypoplasia if PPROM occurs < 24 weeks, > 90% will suffer this complication if there is anhydramnios after PPROM before 18-20 weeks
- Maternal infection
- Caesarean section

The majority of women with PPROM go into labour spontaneously. There is an inverse relationship between gestational age at the time of ROM and onset of spontaneous labour. In women with PPROM near term, more than half laboured within 5 hours, and 95% within 28 hours. In women with PPROM < 26 weeks, more than half laboured within one week, and 22% remained undelivered four weeks later.

In general, the greatest risks to the fetus prior to 34 weeks gestation are the complications of prematurity. After 34 weeks the greatest risk to the fetus is infection.

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a. Initial management

An accurate diagnosis of rupture of the membranes is crucial to management. This can be difficult in PPROM at very early gestations (e.g. 24 weeks) as there is a lower liquor volume and women may not realise they are leaking liquor.

Digital examination should be avoided (unless there is a suspicion of cord presentation or prolapse) as it increases the risk of infection and does not provide more information than a speculum examination.

Low vaginal/rectal swabs should be taken in a single sweep with specific request for GBS culture. The presence of gram positive cocci on the initial Gram stain should not lead to a presumptive diagnosis of GBS – cultures must be awaited.

Swabs for Chlamydia trachomatis and Neisseria gonorrhoea should be considered in high-risk groups – see MOH guidelines July 2008.

It should be noted however, that lower genital tract swabs are overall, poor predictors of intrauterine infection in women with PPROM.

The presence of contractions is noted and signs of infection are sought. These include fever, maternal or fetal tachycardia, offensive or purulent discharge, vaginal bleeding (even if light) and uterine tenderness. If these signs are presented a consultant review is required and broad spectrum antibiotics may be indicated as well as consideration of expediting delivery.

An ultrasound examination is useful to assess fetal size, presentation and normality, as well as the liquor volume. Cardiotocography should be performed for at least 30 minutes to assess fetal well being and uterine activity when the fetus is viable. For fetuses under 28 weeks in this context the interpretation of the CTG can be difficult and advice should be sought from a Senior Obstetrician/MFM Specialist.

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b. Routine inpatient management

Initial management involves hospitalisation. The following tests should be individually tailored and repeated according to clinical indication. CTG; LVS; FBC; CRP and USS.

Antibiotics

Prospective randomised controlled trials of women with PPROM taking prophylactic antibiotics vs. placebo, have found a significant prolongation of pregnancy and a significant reduction in the incidence of chorioamnionitis, perinatal morbidity, neonatal sepsis, necrotising enterocolitis and respiratory distress syndrome in women taking antibiotics. Currently no one specific antibiotic regime appears to be superior to another, however regimes including amoxicillin-clavulanic acid appear to be inferior. We recommend Erythromycin 250mg orally four times per day for ten days.

Since preterm labour is a risk factor for early onset neonatal GBS disease, women should be given GBS chemoprophylaxis in labour as per protocol.

Tocolysis

There is no evidence to support the use of prophylactic tocolytics to improve neonatal outcome prior to the onset of contractions. However, if PPROM occurs before 34 weeks, consideration can be given to use of tocolysis to allow the administration of corticosteroids, providing there are no signs of sepsis (fever, maternal and/or fetal tachycardia, uterine tenderness and irritability, leucocytosis), antepartum haemorrhage or other contraindication to steroid use. This decision should be made in consultation with the L&BS or MFM consultant on call.

Amniocentesis

This may be useful when intra-amniotic infection is suspected. In this instance diagnosis is based upon an amniotic fluid glucose<1 mmol/L, a positive gram stain, or a positive amniotic fluid culture. In the future amniotic fluid cytokine levels may aid the diagnosis of infection.

Fetal surveillance as an inpatient

We recommend daily observation of fetal movement, daily CTG, weekly ultrasound scan for liquor volume, and fortnightly ultrasound scan for fetal growth.

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c. Outpatient management

Selection criteria

Women with PPROM who meet the following criteria may be considered eligible for expectant management at home:

- Cephalic presentation and engaged
- Clear liquor
- Normal fetal movements
- Afebrile
- Not tachycardic (HR < 100 bpm)
- Has NOT had a digital vaginal examination
- Likely to attend all follow-up, and report concerns promptly
- Has home telephone
- Lives less than 40 minutes away
- Able to get transport to and from hospital easily

Usual outpatient management is three times weekly assessment in Day Assessment Unit with review by the woman's team (NOT the WAU team on call). At each visit, the DAU midwife records fetal movement, maternal temperature and heart rate, and performs a CTG. The woman's team will then review the woman and adjust the plan as necessary. The woman's team is responsible to ensure that ultrasound scans for liquor volume are arranged weekly, and for fetal growth fortnightly.

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d. Delivery

Timing

In women who have PPROM prior to 34 weeks, in the absence of fetal or maternal compromise, traditional management has been to deliver at about 34 weeks. The rationale is that at this gestation, neonatal outcomes are very good and the risk of infection from remaining in utero may be greater than the risk of neonatal complications of prematurity. Alternatively, once they reach 34+0 they may be

eligible to enrol in the PPROMPT study. For more information contact the study coordinator.

Women with PPROM between 34+0 to 36+6 weeks may be eligible for the PPROMPT study. Women who participate will be randomized to induction of labour within 24 hours, or to expectant management. The primary hypothesis is that early planned delivery will be associated with less neonatal and maternal morbidity compared with expectant management. For more information contact the study coordinator.

In women with antepartum risk factors for GBS (see above), early planned delivery may be considered. GBS prophylaxis should be given in labour for all women in preterm labour, although consideration may be given to omitting this if there is a negative GBS LVS/rectal swab in the last 5 weeks. There is no evidence to guide practice regarding GBS prophylaxis prior to labour.

In women with evidence of sepsis, early planned delivery should be considered. Broad spectrum antibiotics should be started immediately.

Mode

In the absence of fetal or maternal compromise or other obstetric factors necessitating a caesarean, vaginal delivery is usually indicated.

Where there is evidence of fetal infection, unless delivery is imminent, caesarean section may be indicated, though at very early gestations with little liquor this may end up being a difficult classical caesarean section. Decision about mode of delivery should be individualized. In some cases at very early gestation (typically <26 weeks) the decision may be taken by the obstetrician and family not to perform a difficult caesarean section and allow 'nature to take its course'.

Cervix suture

If a cervical suture is present, there is an increased risk of sepsis. The suture should be removed as soon as possible. The consultant on call for DU should be consulted and ongoing care should be individualised.

Referral to Support Services

At borderline viability women should be offered counselling from a neonatologist.

Women should be referred to support services as required – e.g. social worker.

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6. Definitions

- Pre-labour ROM at term (Term PROM) = Rupture of the amniotic membranes prior to the onset of labour (at least one hour) at or beyond 37 weeks gestation.
- Pre-term pre-labour ROM (PPROM) = Rupture of the amniotic membranes prior to the onset of labour and before 37 weeks gestation.

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7. Supporting evidence

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8. Associated ADHB documents

Access Holders in Women's Health
Group B Streptococcal Neonatal Disease Prevention
Induction of Labour – RBP
Induction of Labour – Roles and Responsibilities
Informed Consent
Magnesium Sulphate for Pre-eclampsia and for Neuroprotection in Pre-Term Births <30 weeks
Patient information leaflet "Pre-labour Rupture of Membranes"
Patient information leaflet "Induction of Labour"
Referral – Maternal Fetal Medicine

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9. Disclaimer

No guideline can cover all variations required for specific circumstances. It is the responsibility of the health care practitioners using this ADHB guideline to adapt it for safe use within their own institution, recognise the need for specialist help, and call for it without delay, when an individual patient falls outside of the boundaries of this guideline.

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10. Corrections and amendments

The next scheduled review of this document is as per the document classification table (page 1). However, if the reader notices any errors or believes that the document should be reviewed ***before*** the scheduled date, they should contact the owner or the Clinical Policy Advisor without delay.

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