Using Technology to Support Maternity Care

Home Blood Pressure and Urinalysis Monitoring

INFORMATION FOR MIDWIVES, OBSTETRICIANS and ALLIED HEALTHCARE WORKERS.

DOCUMENT CONTROL SHEET

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1.0 WHY IS HOME BLOOD PRESSURE MONITORING FOR PREGNANT WOMEN BEING ROLLED OUT ACROSS SCOTLAND?

Raised blood pressure (BP) affects approximately 10% of pregnancies worldwide; almost half of these women develop pre-eclampsia. Globally, around 15% of maternal mortality is due to pre-eclampsia so early detection and prevention are paramount.

The COVID-19 pandemic has required the NHS to urgently consider self-monitoring of BP at home by pregnant women in order to safely reduce the number of face-to-face consultations for pregnant and postnatal women.

Self-monitoring of BP at home by pregnant women can either be used to replace measurement of blood pressure by a healthcare professional on the day of a scheduled clinic (i.e. intermittently) or can be done routinely and more frequently by pregnant women (e.g. daily or weekly) in addition to usual care.

Service evaluations have been carried out examining its use and the results of trialling this intervention in over 2,400 normotensive women and 600 hypertensive women are expected later in 2020. No concerns have been raised to date over safety (RCOG – Self Monitoring of Blood Pressure in Pregnancy, March 2020).

Self-monitoring of blood pressure by pregnant women allows for multiple measurements providing a better estimate of the underlying blood pressure than intermittent clinic measurements. Self-monitoring in pregnancy could improve the detection and subsequent management of gestational hypertensive disorders including pre-eclampsia, while also increasing convenience, empowering and engaging women in their own care and adherence to medication.

Self-monitoring is easy to accomplish and is now commonplace in adults with hypertension outside of pregnancy.

2.0 WHICH WOMEN ARE ELIGIBLE FOR HOME BLOOD PRESSURE MONITORING?

Self-monitoring of blood pressure by pregnant women is going to be rolled out in phases to high-risk women.

Home monitoring will be initially targeted to women at high-risk of hypertensive complications or who are 'shielded' because of serious underlying medical conditions (Group 1). Units will subsequently roll this out to women identified at increased risk of hypertensive complications (Group 2). Subject to ongoing availability of monitors and successful roll-out of home monitoring to women in Groups 1 and 2, Units may wish to extend roll-out to women in Group 3.

Home blood pressure monitoring should NOT replace any appointment where a woman is receiving clinical review for her underlying medical condition (e.g. for

respiratory review of cystic fibrosis or cardiac review of underlying cardiac condition) or where fetal assessment is required as part of the clinical review.

GROUP 1:
Women identified as at 'high risk' of hypertensive complication including:

- Chronic hypertension
- Current gestational hypertension (Pregnancy Induced Hypertension, PIH)
- Current pre-eclampsia

Women who have been advised to 'shield' because of underlying serious underlying medical conditions including:

- Cystic fibrosis
- Solid organ transplant
- Cardiac conditions

GROUP 2
Women identified as at 'Increased risk' of developing pre-eclampsia, including those with:

- Hypertensive disease during a previous pregnancy
- Chronic Kidney disease
- Autoimmune disease (e.g. systemic lupus erythematosus/antiphospholipid syndrome)

GROUP 3

- Type 1 or Type 2 Diabetes
- Multiple pregnancy

3.0 WHAT ARE THE ELIGIBILITY CRITERIA?

All women being considered for home blood pressure monitoring **must** fulfil the following clinical inclusion and exclusion criteria:

Inclusion criteria

- Systolic BP range ≤150 mmHg
- Diastolic BP range ≤100 mmHg
- Proteinuria ≤ 1+ on urine dipstick
- Normal full blood count, liver and renal function blood tests as baseline and when new proteinuria present

Exclusion criteria

- Maternal age <16 years at booking.
- Systolic BP >150 mmHg
- Diastolic BP >100 mmHg
- Proteinuria ≥ 2+ on urine dipstick
- Symptoms of headaches, visual symptoms, epigastric pain
- Significant mental health concerns
- Women who are not capable of giving informed consent
- Women who are not able to operate home blood pressure equipment
- Fetal growth restriction

Eligibility should be considered on an individual basis for each woman, and in context of other pregnancy care guidance.

Eligibility assumes that if local appointments and recording of results use systems (e.g. Near Me, BadgerNet, Florence), professionals will discuss whether the woman has sufficient digital literacy, data/internet and devices to participate. Where appropriate, they will make sure alternative support with these issues can be secured. Please note, Near Me has functionality for people on different sites to join the appointment, including interpreters.

4.0 What is the Pathway for implementation in a hospital

In advance of implementation, all NHS-owned blood pressure monitoring devices should be acceptance tested, noted on a medical equipment records system and allocated an asset number. Devices should be labelled with the asset number, name of issuing NHS Board and contact details for the maternity unit. Staff issuing or using medical devices should first undertake relevant training in adverse incident reporting, per local requirements and process.

1. Arrange for a woman to attend face to face appointment in maternity assessment unit or antenatal clinic. Ask her to bring her mobile phone with her to the appointment. All NHS-issued monitors are validated for pregnancy. If she owns her own device, ask her to bring it to the appointment so the obstetrician can check it is suitable for use in pregnancy.

2. Provide antenatal or postnatal check as usual. Assess eligibility to participate in self-monitoring of blood pressure and urinalysis. Ensure contact details are up to date on the hospital electronic system (home, mobile phone, number, and email).

3. Provide an NHS device and an appropriately sized cuff (check upper arm measurement). In some cases, proxy measures may be taken from the forearm. Complete a blood pressure monitor loan form with the woman, ensuring the asset is appropriately labelled and tracked and informed consent is given (Appendix 1).

   3a. If care is being provided in one of the three evaluation sites (NHS Lothian, NHS Lanarkshire & NHS Highland) explain that a small number of women will be invited to have a brief telephone interview to discuss their experiences of using home BP monitoring. Ask if they would be willing to take part and if so, complete the Consent to Contact form (Appendix 8). Consent to contact forms should be collected by the clinical midwife lead in each site.

4. If a woman has brought her own blood pressure monitor to the appointment, validate it as suitable for pregnancy and puerperium. The following are pregnancy-validated monitors:

   • Omron Evolv (HEM-7600T-E)
   • Omron HEM-9210T
   • Omron M3 Comfort (HEM-7134-E)

- Omron M6 Comfort (HEM-7321-E)
- Omron M7 Intelli IT (HEM-7322T-E)
- Microlife BP 3BTO-A Omron MIT
- Omron M7 (HEM-780-E)
- Dinamap ProCare 400
- Welch Allyn Vital Signs

This represents general guidance – individual units are encouraged to adapt according to local resources.

Please note: some BP monitors routinely stocked by some Boards are suitable for use with larger cuffs, but are not validated for pregnancy. These should not be issued.

Upper-arm cuffs should not be used to take forearm measurements as there is not enough evidence this approach can give consistent readings.

Velcro cuffs should be cleaned according to local decontamination processes.

5. Give written instructions on how to take a blood pressure reading (patient information leaflet) and signpost the link to the short video: British Heart Foundation - How to take your own blood pressure. Use teach-back to show the woman how to take her own blood pressure, write down and interpret her results. Ask the woman to take her blood pressure by herself twice, at least one minute apart, to demonstrate understanding (patient information leaflet).

6. Give written instructions on how to self-monitor for proteinuria and glycosuria (patient information leaflet). As above, use teach-back to ensure the woman understands how to use the test and where and how to record her results. 'Glycosuria detected by routine antenatal testing Be aware that glycosuria of 2+ or above on 1 occasion or of 1+ or above on 2 or more occasions detected by reagent strip testing during routine antenatal care may indicate undiagnosed gestational diabetes. If this is observed, consider further testing to exclude gestational diabetes.'

7. Give written instructions on expected frequency of blood pressure monitoring and urinalysis, making clear whether this will be done in place of usual care (e.g. on the morning of a scheduled telephone/ virtual clinic appointment) or in addition to usual care (e.g. once a week, three times a week etc).

8. Unless local arrangements are in place, make clear home-readings will not be reviewed by a healthcare professional remotely unless it is before a pre-organised clinic appointment or virtual contact. However, ensure she understands who to contact if she is concerned about a reading.

9. If a woman requires additional investigations / appointments (e.g. growth scan, PIGF-based testing, obstetric clinic follow-up etc), arrange as per local guidelines.

10. If local arrangements are for women to report their results using a system (e.g. BadgerNet or Florence), ensure this is set up and she is able to log-in before she leaves the clinic. Use teach-back to show her where and how to record her results. Ask her to demonstrate that she is able to do this, preferably using her own mobile phone or tablet. Alternatively, or in addition, provide a paper blood pressure recording diary and show her how to use it (Appendix 2)

    An overview of home blood pressure monitoring is illustrated in Appendix 3.

11. **Please advise the woman it is vital that they follow the written instructions and phone the hospital contact number if they develop raised blood pressure, new proteinuria, increasing proteinuria, or new symptoms. Suggested interpretation of blood pressure testing and urinalysis is included in Appendix 4**.

    Individualisation of care remains the cornerstone of safe management.

12. Book the next appointment with the woman and discuss whether this will be telephone (or other remote working) or face-to-face. Suggested follow-up will vary on a case by case basis but typical patterns will include:
    - essential hypertension – virtual follow-up monthly
    - pregnancy induced hypertension virtual follow-up 1-2 weekly
    - mild/ well pre-eclampsia- once a week virtual once a week face-to-face

13. Inform the GP that the woman is undertaking home blood pressure monitoring (Appendix 5).

14. Explain the arrangements to the woman for the return of the blood pressure monitor (local arrangements).

15. Once returned, wipe the blood pressure monitor and cuff thoroughly with a universal disinfectant wipe and allow to dry prior to storage or reissue – in line with manufacturer's instructions and covid-19-guidance-for-domiciliary-care.

    Please note: monitors not suitable for use with universal disinfectant wipes, such as Microlife monitors, must be restricted to single-use to comply with covid-19-guidance-for-domiciliary-care.

Appendices:

Appendix 1: Loan agreement (compulsory)
Appendix 2: Home blood pressure diary (optional)
Appendix 3: An overview of home blood pressure monitoring
Appendix 4: How to interpret home monitoring (advice for health care professionals)
Appendix 5: Sample GP/Primary MW letter
Appendix 6: Inclusion, Exclusion and Eligibility Criteria
Appendix 7: Clinical Pathway
Appendix 8: Consent to contact form for the evaluation
Appendix 9: Teach Back Questions

APPENDIX 1: Loan agreement template for hospitals

Loan and Data collection agreement for blood pressure monitor

Blood pressure monitor asset number: .....
(Essential for tracking if device malfunctions)

Cuff size:

Name:
Identifier number:
Address:

Declaration: (please initial all boxes)

☐ I accept responsibility for the above equipment and understand I have been asked to monitor my blood pressure through pregnancy and (if postnatally) after my baby is born.

☐ I understand how use the equipment and how to read and interpret my blood pressure readings, using the guidance provided.

☐ I agree to seek advice from the hypertension clinic if my blood pressure reading is out with the levels set within the guidance provided.

☐ I will return the blood pressure monitor as requested.

☐ If the blood pressure monitor stops working or becomes damaged, lost or stolen, I understand that I must report this to the Maternity Unit on the below number and that I am not responsible for the cost of replacement or repair.

☐ I give permission for my clinical data to be used to evaluate the home blood pressure monitoring service.

Name

Hospital number

Date of birth

Signature of agreement to conditions (dated):

Staff name:

Staff signature (dated):

Maternity team contact:
Telephone:

Please copy and give one copy to the woman, place one in notes (if paper based, or document in electronic record) and retain one copy in the Service folder. This should be available in the event of a safety recall.

Appendix 2: HOME BLOOD PRESSURE AND URINE TESTING DIARY

(for women where results reporting is not digital or where women prefer to also keep a paper diary)

Patient

Name:
Identifier number:
Address:

Target blood pressure: ...../ .....

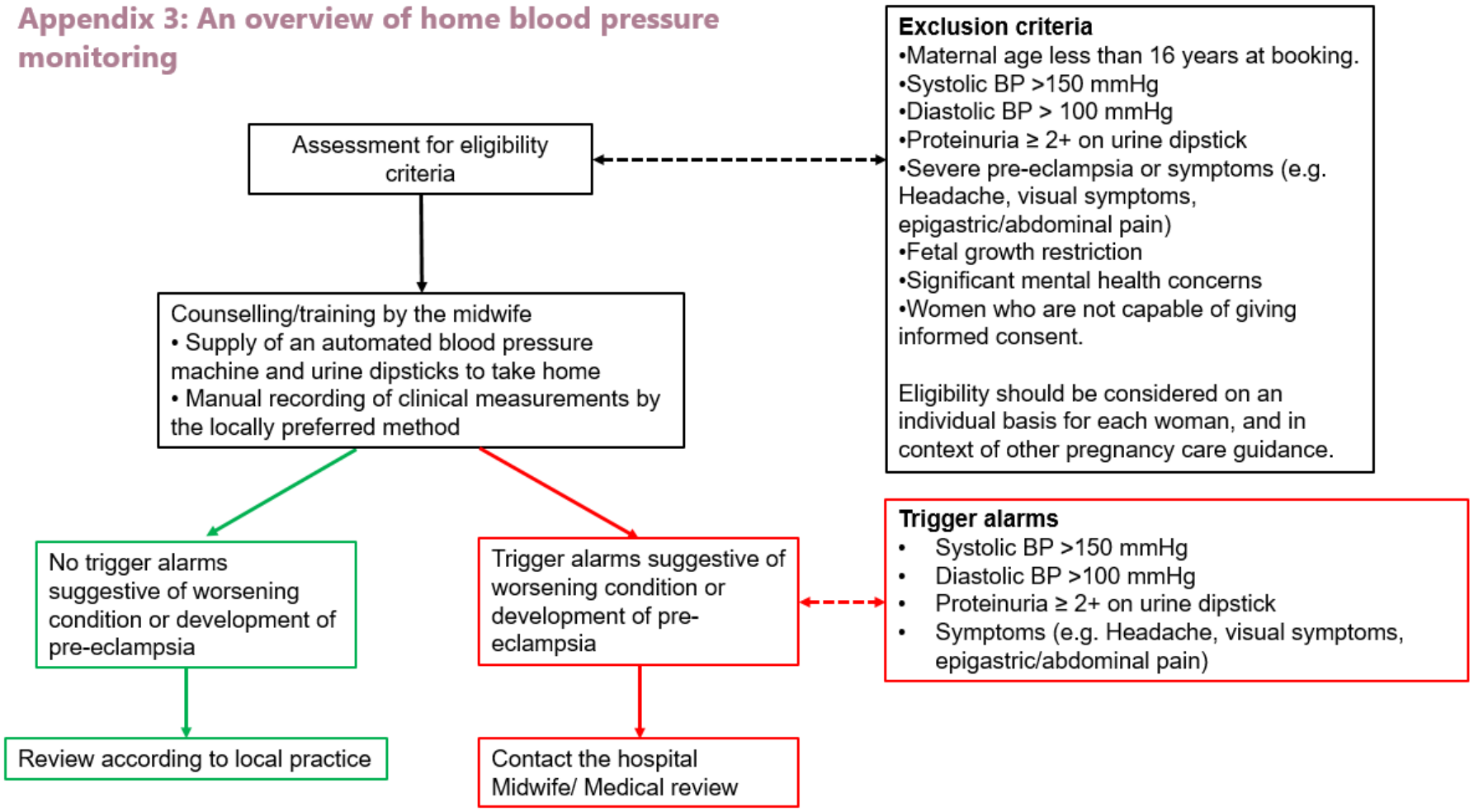
Arm used: Left ☐ Right ☐

Please monitor and record your blood pressure at home as you have been instructed. On each occasion take a minimum of 2 readings at least one minute apart. Please record the second of these readings. Sit on a chair with your back supported and both feet on the ground. Sit quietly for 5 minutes before beginning to check your blood pressure.

Use the table below to record your blood pressure and urine readings. The numbers you write down should be the same as appear on your screen or urine chart. Do not round the numbers up or down.

DATE	**TIME**	**SYSTOLIC BP** (top number)	**DIASTOLIC BP** (Middle number)	**Urine: Protein Reading**	**Urine: Glucose Reading**	**NOTES** (eg. Medication changes)
Eg. 06/03/20	0945	134	83			No medication

Appendix 3: An overview of home blood pressure monitoring



APPENDIX 4: How to Interpret Home Monitoring – Advice for Health Care Professionals

Condition	Results of home monitoring	Proposed Actions
New PIH or Ess HT without proteinuria (<1+ protein) No symptoms	BP under control i.e. <140/90	Consider: Monthly review in Ess. HT without proteinuria (< 1+ protein) 1-2 weekly review in PIH with <1+ protein USS for fetal growth as per hospital practice.
	Systolic ≥ 140 and <150mmHg and / or diastolic blood pressure ≥ 90 and <100mmHg on 2 readings 5 mins apart	Recheck blood pressure in 30 mins and contact day assessment unit Start or increase antihypertensive medication with repeat monitoring within 24-48 hours.
	Systolic ≥150 mmHg/ Diastolic ≥100mmHg	Arrange for same day hospital assessment. (aim for within 4 hrs)
New or pre-existing hypertension with proteinuria (≥1+ protein) after 20 weeks	Systolic ≥140mmHg and/or diastolic ≥90 mmHg and/or new proteinuria ≥1+	Arrange immediate review at day assessment Unit
New proteinuria without hypertension after 20 weeks (gestational proteinuria)	≥1+ Protein	Repeat urinalysis in community in 1 week. If ≥1+ proteinuria persists, send PCR / MSSU and review following week If PCR negative <30mg/mmol continue with weekly assessment. If PCR(>/=30mg/mmol) is raised, day assessment unit review within a week
	2+ Protein	Send PCR and refer for hospital assessment within 48 hours
Maternal Symptoms	Headache, epigastric pain and or visual disturbances without hypertension (systolic ≤140 mmHg and/or diastolic ≤90mmHg) with or without proteinuria	Depending on severity /nature of symptoms consider referral for same day hospital assessment OR reduce interval before next community antenatal assessment
	Headache, epigastric pain and or visual disturbances with hypertension (systolic ≥140 mmHg and/or diastolic ≥90mmHg) or proteinuria (≥1+)	Immediate review at Day Assessment Unit

Resources accessed in order to produce this guidance:

1. https://www.rcog.org.uk/globalassets/documents/guidelines/2020-03-30-self-monitoring-of-blood-pressure-in-pregnancy.pdf
2. https://www.health.org.uk/sites/default/files/16.%20St%20George's_HaMpton_v2.pdf

APPENDIX 5: GP letter / Primary MW

Useful contacts:
……– Day Assessment Unit
…… – Specialist Midwife

Date:

Dear Doctor,

Re:

Name:
Identifier number:
Address:

The above patient has been

☐ Commenced Home Blood pressure monitoring during pregnancy with support from the day care unit. (OmronM4 Intellii - _____ Asset number – Essential for device safety) Device has been loaned to her for the duration of pregnancy and postnatal period.

☐ Advised to take Aspirin at 150mg at night from 12 weeks until delivery/ ____ weeks gestation. (Contra indications would include severe asthma, stomach ulcers or known allergy to aspirin)

☐ Discharged from hospital follow-up on _____ medication. I would be grateful if you could review her in [insert number] weeks.

Kind regards

____Hospital

Appendix 6: Inclusion, Exclusion and Eligibility Criteria

Women with conditions described in Group 1 and Group 2 (a phased approach may be considered). This should not replace any appointments where the patient is receiving clinical review for her underlying medical condition (e.g. for respiratory review of cystic fibrosis or cardiac review of underlying cardiac condition) or where fetal assessment is required as part of the clinical review. [1]

Group 1
'Women identified as 'high risk 'of hypertensive complication including:

- **Chronic Hypertension**
- **Current Gestational Hypertension (Pregnancy Induced Hypertension, PIH)**
- **Current Pre- eclampsia**

Women who have been advised to shied because of serious underlying medical conditions:

- **Cystic Fibrosis**
- **Solid organ transplant**
- **Cardiac conditions**

. **Group 2**
'Increased risk' of developing Pre-eclampsia

- **Hypertensive disease during a previous pregnancy**
- **Chronic Kidney disease**
- **Autoimmune disease (eg SLE/ Antiphospholipid syndrome)**

Group 3

- **Type 1/ Type 2 Diabetes**
- **Multiple pregnancy**

Eligibility Criteria:

All women who are to be considered for home blood pressure monitoring must fulfil the following clinical inclusion and exclusion criteria:

Box 4: Inclusion criteria
•Systolic BP range ≤150 mmHg
•Diastolic BP range ≤100 mmHg
•Proteinuria ≤ 1+ on urine dipstick
•Normal full blood count, liver and renal function blood tests as baseline and when new proteinuria present

Eligibility should be considered on an individual basis for each woman, and in context of other pregnancy care guidance.

Box 5: Exclusion criteria
•Maternal age less than 16 years at booking.
•Systolic BP >150 mmHg
•Diastolic BP > 100 mmHg
•Proteinuria ≥ 2+ on urine dipstick
•Severe pre-eclampsia
•Symptoms of headaches, visual symptoms, epigastric pain.
•Fetal growth restriction
•Significant mental health concerns may not be suitable.
•Women who are not capable of giving consent.

Eligibility should be considered on an individual basis for each woman, and in context of other pregnancy care guidance.

[1] Amended from - HaMpton (Innovating for improvement – Elaine Sheehan and Professor Asma Khalid, St Georges Hospital, 2017)

Appendix 7: Clinical Pathway

Woman identified as meeting criteria (box 1 ,2) for remote monitoring at referral, booking or during antenatal or postatal period.

Arrange attendance to coincide with other appointment(s) (eg scan to minimise attendance). Complete clinical assessment and confim all inclusion & exclusion criteria (box1-4) are met.

Confirm contact information: mobile number, email update record

Provide woman with BP monitor and cuff (check upper arm measurement) and complete consent form. Ensure monitor is labelled with asset number, name of unit and contact details and is appropriately tracked. Provide urinalysis sticks

Demostrate use of BP and urine sticks using 'teach back' technique. Review patient information leaflet for BP & Uninalysis. Ask the woman to take her blood pressure twice, at least one minute apart and enter the result either by text, into notes or electronically (refer to Florence or Badger guidance) *

Give written instructions (patient information leaflet) about interpreting blood pressure readings and urinalysis. Check she understands how to use equipment and who to contact with an abnormal reading*

Give written instructions on expected frequency of BP monitoring and whether this will replace or be in addition to usual plan of care. (eg on the morning of scheduled 'Near Me' or phone appointment or in addition 1-2 per week).

If using an app or text-based system for pregnancy blood pressure monitoring, set this up, check she is able to log in and ask her to demonstrate sending a blood pressure reading before leaving the unit. Make clear the readings will NOT be reviewed by a healthcare professional remotely unless it is before an organised clinic appointment whilst at home.

Book the next appointment with woman: face to face if she requires additional investigations (scan etc; book as per local guidance), otherwise 'Near Me' /phone **

PLEASE INFORM THE WOMAN IT IS VITAL SHE FOLLOW THE WRITTEN INSTRUCTIONS AND PHONE THE UNIT CONTACT NUMBER IN CASE OF RAISED BP, NEW PROTEINURIA/ INCREASING PROTEINURIA/ SYMPTOMS

Explain how to return the BP monitor postnatally to community midwfe or include freepost envelope

Clean as per local guidance

Suggested Follow up

Essential Hypertension: - virtual follow up monthly

Pregnancy Induced Hypertension: - weekly

Mild pre-eclampsia: - twice weekly; once face to face and once virtual

Appendix 8: Home Blood Pressure (BP) Monitoring in Pregnancy Study

CONSENT TO CONTACT FORM

The Scottish Government is supporting NHS boards across Scotland to implementation BP self-monitoring in pregnant women who are either shielded or at increased risk of complications of high blood pressure of pregnancy during the current COVID-19 pandemic. A small number of women will be invited to take part in a short telephone interview with a researcher to find out how they are getting on with home BP monitoring. This will help us to improve the service to women.

As you are being given a home BP monitor we would like you to consider agreeing to take part in an interview. You do not have to agree to take part and this will not affect your care. We are not asking you to decide now.

We are asking you to give permission for us to pass your contact details and some information about you, to a researcher from University of Stirling. They will keep your information confidential. They may then send you more information about the interviews and contact you by telephone or email to answer any questions and invite you to take part.

What will happen if I take part?
You will be contacted to arrange a convenient date and time for the interview, which will be a one-to-one conversation with a member of the research team by telephone. It is anticipated that your interview will last about 20 minutes, although this will depend on how much you have to say. The questions will all be about how you are getting on with your BP monitor. You can stop the interview at any time.

☐ I give permission for the information below to be passed to the researcher at University of Stirling

☐ I consent to be contacted about a possible telephone interview.

Name

Gestation

Age

Parity (number of pregnancies)

Address

Post code

Email:

Telephone:

Signature:

Staff Name

Date:

Staff signature:

Please pass all consent to contact forms to the Lead Midwife for home BP monitoring in your maternity unit. University of Stirling will contact the Lead Midwife to arrange secure collection of the completed forms prior to commencing the research.

APPENDIX 9: Teach Back Questions (for use with women eligible for home blood pressure monitoring and urinalysis)

Teach back questions

(Please adapt to suit local processes and protocols)

Q Can you tell me what will alert you to take your BP readings?
A e.g. Florence on my phone

Q What position should you be in to take BP readings?
A Sitting, with arm resting in front, at heart level

Q Can you tell me the order in which you should record the numbers?
A Sys then Dias

Q What urine should you not test?
A First urine of the day

Q How long should you wait after dipping the stick in urine to read the result?
A 60 seconds

Q How should you record your urine result?
A PROT 0 / 1 / 2

Q Who should you contact if Florence says your reading is not normal?
A DBU or triage number

Document understanding e.g in Badger notes

Scan consent form and loan agreement form into notes