

Using Technology to Support Maternity Care

Home Blood Pressure and Urinalysis Monitoring

INFORMATION FOR MIDWIVES, OBSTETRICIANS and
ALLIED HEALTHCARE WORKERS.



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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.

Initially, the COVID-19 pandemic 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. However, offering women informed choices about where and how to monitor their blood pressure and urine during pregnancy has demonstrated sustainable benefits for both women and clinicians which extend beyond context of the pandemic.

Self-monitoring of BP at home by pregnant women can either 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.

SAFETY AND ACCURACY

The paper, *Home blood pressure monitoring in the antenatal and postpartum period: A systematic review meta-analysis* (Kalafat et al, 2019) trialled this intervention in over 2,400 normotensive women and 600 hypertensive women and found that “No differences were observed for maternal, fetal or neonatal adverse outcomes”. It also reported association between home blood pressure monitoring and reduced risk of induction, prenatal hospital admissions and diagnosis of Pre-eclampsia.

In March 2020, the Royal College of Obstetricians and Gynaecologists issued [information for healthcare professionals](#) which stated “no concerns have been raised to date over safety”. Home urine testing and blood pressure monitoring have been shown to be acceptable and reassuring for women and no less accurate than when completed by a clinician.

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. It 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 rolled out in phases initially targeted to women at high-risk of hypertensive complications or ‘shielded’ because of serious

underlying medical conditions (Group 1), then to women identified as being 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 and other pregnant women.

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?

Eligibility should be considered on an individual basis for each woman, and in context of other pregnancy care guidance. Subject to availability of monitors and clinical judgement of her antenatal care team, this may include any woman.

The Royal College of Obstetrics & Gynaecology's now archived [Guidance on self-monitoring in pregnancy](#) suggested the following exclusion parameters, which has been echoed in other research, e.g. H Perry et al's [Home blood-pressure monitoring in a hypertensive pregnant population](#):

Exclusion criteria

- Maternal age <16 years at booking.
- Systolic BP >150 mmHg
- Diastolic BP >100 mmHg
- Proteinuria ≥2+ on urine dipstick

- Abnormal blood count, liver and renal function blood tests as baseline and when new proteinuria present
- 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 assumes that if local appointments and recording of results use systems (e.g. NHS Near Me, BadgerNet), 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: NHS Near Me has functionality for people on different sites to join the appointment, including interpreters.

Support with implementing NHS Near Me and Remote Health monitoring is available from your local Technology Enabled Care (TEC) project team. Please include them in your planning groups. To find out how to contact your local TEC lead, please email NSS.TEC@nhs.scot for details.

[Guidance](#) on using NHS Near Me to support pregnancy care and a [Maternity Care and NHS Near Me leaflet](#) can be found at <https://perinatalnetwork.scot/families/>

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, 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). 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 some women will be invited to have a brief telephone interview to discuss their experiences of using home monitoring. If they would be willing to take part, complete the Consent to Contact form (Appendix 8). Completed 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 list represents general guidance and may not be comprehensive.

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 and self-monitor for proteinuria and glycosuria ([patient information leaflet](#)).

5a. Blood Pressure

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 her to take her blood pressure by herself twice, at least one minute apart, to demonstrate understanding.

Reassure that while the patient information leaflet provides clinical parameters which would usually be considered 'normal' or 'high' readings, the ranges which are 'normal' for each woman will be unique to her.

Write or type on the Patient Information leaflet, in the space provided, the ranges specific to her and expected frequency of monitoring. For example, she may be required to monitor on the morning of any scheduled clinic, phone or NHS Near Me appointment and in addition to usual care (e.g. once a week, three times a week etc).

5b Proteinuria and glycosuria

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.

6. If local arrangements are for women to report their results using a system (e.g. BadgerNet), 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).

7. If local arrangements are for some appointments to include use of NHS Near Me, also give the woman a print or digital copy of the [Maternity Care and NHS Near Me leaflet](#)

Professional [Guidance](#) on using NHS Near Me to support pregnancy care can be found at <https://perinatalnetwork.scot/guidance/maternity-guidance/>

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.
9. **Please advise the woman it is vital that they follow the written instructions and ensure she understands who to contact if she is concerned about a reading. Suggested interpretation of blood pressure testing and urinalysis is included in Appendix 4; however, individualisation of care remains the cornerstone of safe management.**
10. If a woman requires additional investigations / appointments (e.g. growth scan, PIGF-based testing, obstetric clinic follow-up etc), arrange as per local guidelines.

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

11. 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
12. Inform the GP that the woman is undertaking home blood pressure monitoring (Appendix 5).
 13. Explain the arrangements to the woman for the return of the blood pressure monitor (local arrangements).
 14. 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 suitable for use with larger cuffs, 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:

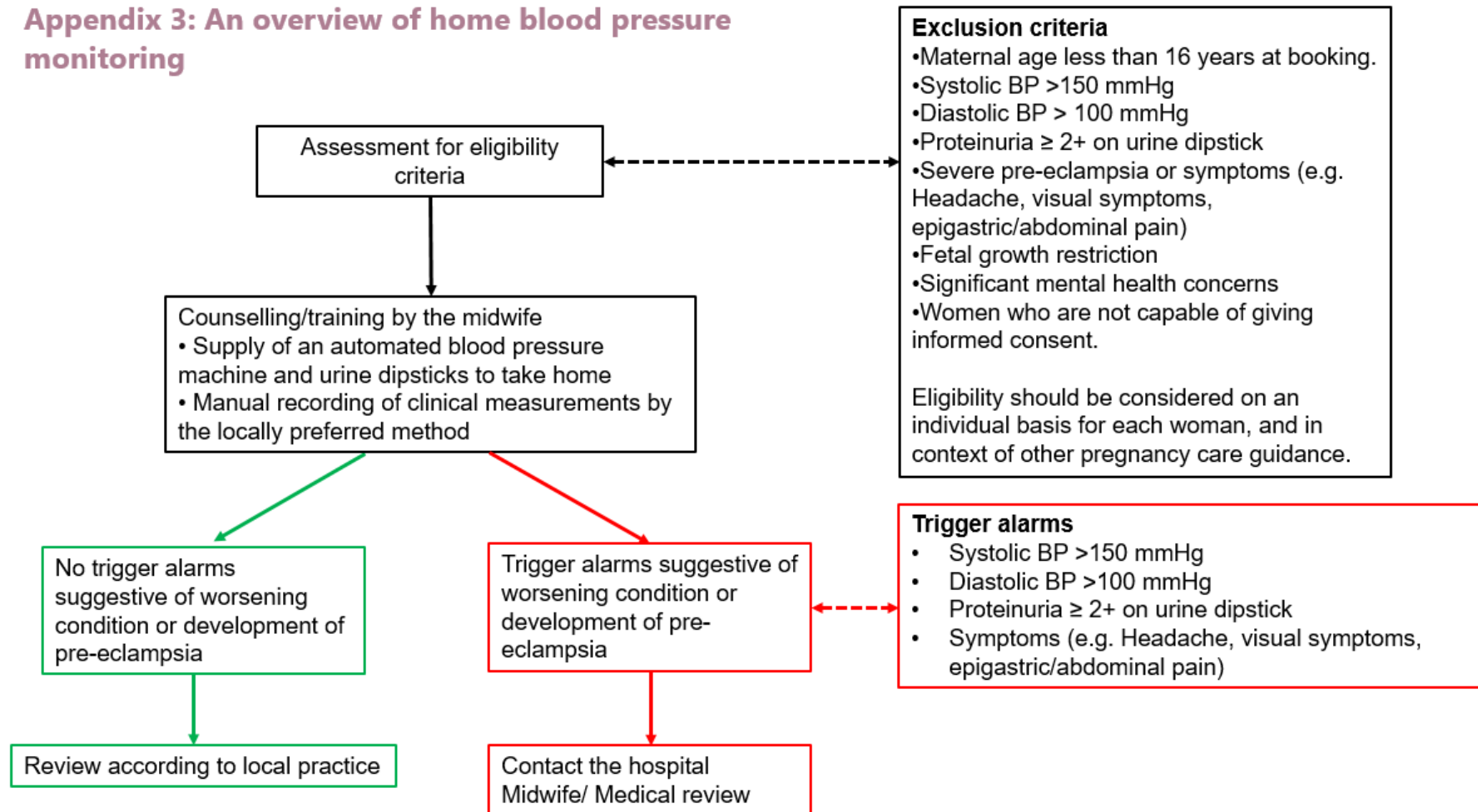
Staff signature (dated):

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 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 ≥ 100 mmHg	Arrange for same day hospital assessment. (aim for within 4 hrs)
New or pre-existing hypertension with proteinuria ($\geq 1+$ protein) after 20 weeks	Systolic ≥ 140 mmHg and/or diastolic ≥ 90 mmHg and/or new proteinuria $\geq 1+$	Arrange immediate review at day assessment Unit
New proteinuria without hypertension after 20 weeks (gestational proteinuria)	$\geq 1+$ Protein	Repeat urinalysis in community in 1 week. If $\geq 1+$ proteinuria persists, send PCR / MSSU and review following week If PCR negative<30mg/mmol continue with weekly assessment. If PCR(≥ 30 mg/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 ≤ 90 mmHg) 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 ≥ 90 mmHg) or proteinuria ($\geq 1+$)	Immediate review at Day Assessment Unit

Resources accessed in order to produce this guidance:

- <https://www.rcog.org.uk/globalassets/documents/guidelines/2020-03-30-self-monitoring-of-blood-pressure-in-pregnancy.pdf>
- 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

_____(Name and Unit)

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 shield 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:

Eligibility should be considered on an individual basis for each woman, and in context of other pregnancy care guidance. Subject to availability of monitors and clinical judgement of her antenatal care team, this may include any woman.

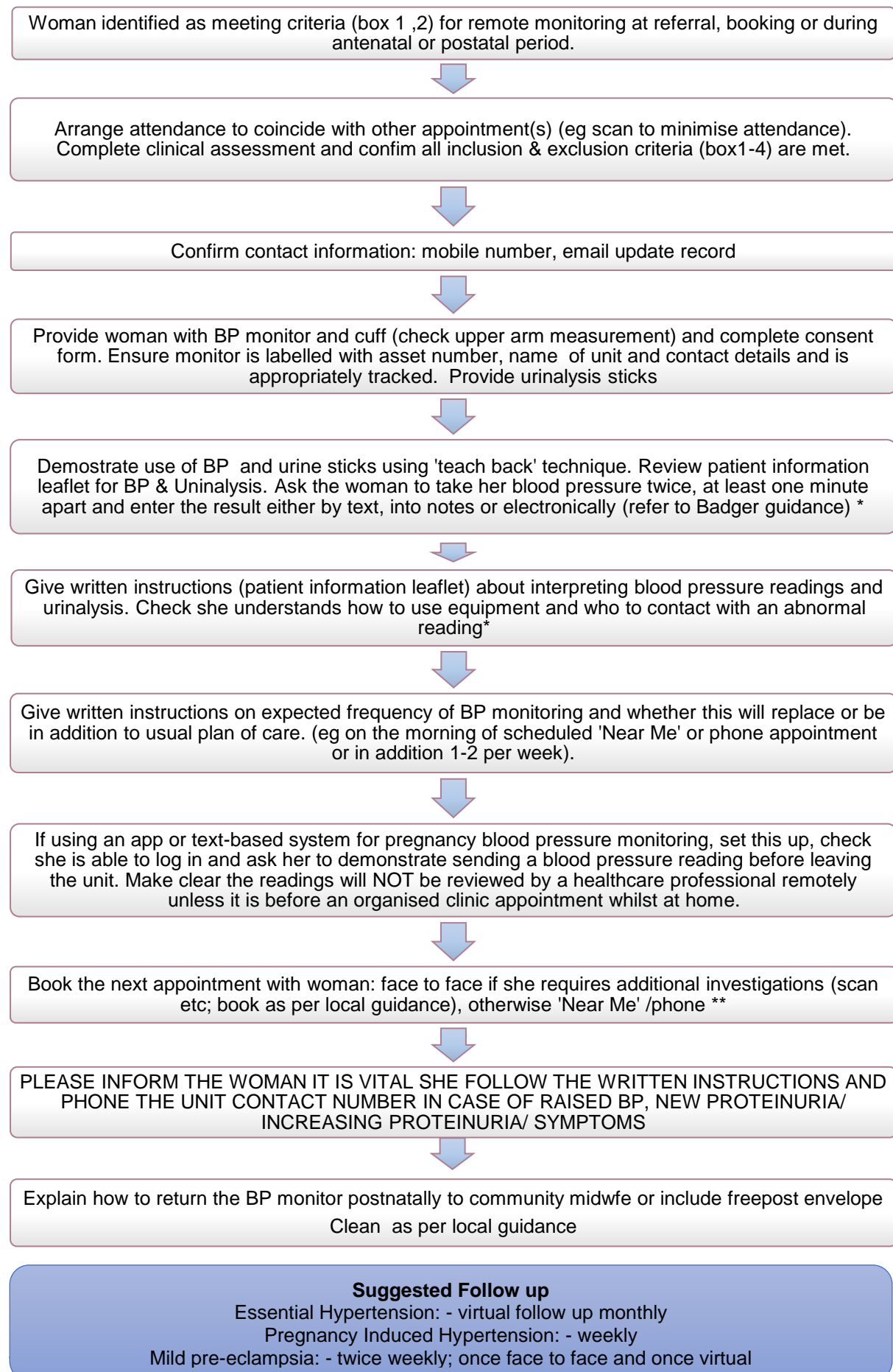
The Royal College of Obstetrics & Gynaecology's [Guidance on self-monitoring in pregnancy](#) suggests the following exclusion parameters:

Box 4: Exclusion criteria

- Maternal age less than 16 years at booking.
- Systolic BP >150 mmHg
- Diastolic BP > 100 mmHg
- Proteinuria \geq 2+ on urine dipstick
- Abnormal blood count, liver and renal function blood tests as baseline and when new proteinuria present
- 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.

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

Appendix 7: Clinical Pathway



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. BadgerNet 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 BadgerNet 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