



Royal College of
Obstetricians &
Gynaecologists

Self-monitoring of blood pressure in pregnancy

Information for healthcare professionals

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I. Introduction

The COVID-19 pandemic has required the NHS to urgently consider blood pressure (BP) self-monitoring in order to reduce face to face consultations for pregnant and postnatal women, whilst maintaining adequate safety for the woman and her baby.

BP self-monitoring in pregnancy can either be used to replace BP measurements on the day of a scheduled clinic (i.e. intermittently) or can be done routinely and more frequently (e.g. daily or weekly) in addition to usual care.

Service evaluations have been carried out examining 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. BP self-monitoring is already done informally by many pregnant women with chronic hypertension, based on their care outside of pregnancy.

I.1 Scope

This guidance covers pregnant women who currently require blood pressure monitoring (at varying frequencies) throughout the antenatal and postnatal period, during the period of COVID-19 pandemic. For women with chronic hypertension, gestational hypertension or pre-eclampsia, more frequent BP monitoring is required, over and above standard antenatal care. Other groups of women may also require increased frequency if they have additional risk factors or are developing pregnancy hypertension. The aim of BP self-monitoring is to reduce face-to-face consultations while maintaining a level of safety.

2. Women for whom self-monitoring of blood pressure in pregnancy should be considered

2.1 Inclusion criteria

There are three groups of women to whom providers may wish to offer BP self-monitoring, summarised in Table 1 below. Inclusion should be prioritised in accordance with clinical need, and in consideration of the

availability of blood pressure monitors (BPMs) that are validated for home use in pregnancy (see 3.2). In view of availability of appropriate monitors and timescales for the COVID-19 response, providers considering BP self-monitoring should prioritise roll-out to Group 1 as a minimum.

To ensure sufficient national supply and equitable access to suitable BPMs across England for use by women for the next 3 months, NHS England and NHS Improvement has procured 16,000 monitors nationally for use with women with hypertension in Group 1. These are available to NHS maternity providers free of charge. For more information, see Section 3.3.

Trusts can roll out more widely to women in Groups 2 and 3 where the woman has an appropriate monitor, or where the trust can ensure supply above those procured nationally by NHS England and NHS Improvement.

Group	Description	Illustrative prevalence
1 - Currently hypertensive women (Priority)	Women with chronic hypertension, gestational hypertension or pre-eclampsia.	c.10%
2 - Normotensive women considered at higher risk of pregnancy hypertension by NICE guidelines	<p>Women with one of the following risk factors:</p> <ul style="list-style-type: none"> - hypertensive disease during a previous pregnancy - chronic kidney disease - autoimmune disease (e.g. systemic lupus erythematosus or antiphospholipid syndrome) - type 1 or type 2 diabetes <p>Women with two of the following risk factors:</p> <ul style="list-style-type: none"> - first pregnancy - age 40 years or older - pregnancy interval of more than 10 years - body mass index (BMI) of 35 kg/m² or more - family history of pre-eclampsia - multi-fetal pregnancy 	

3 – Normotensive women	All other normotensive pregnant women as part of standard antenatal care (including those who may need to self-isolate for a period).	
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2.2 Exclusion criteria

BP self monitoring should not be offered or continued for women who require admission under local trust guidelines (e.g. severe hypertension, pre-eclampsia with adverse features).

3. Guidelines for implementation of home blood pressure monitoring

There are four components to implementation:

- i. Pathway for implementation in a hospital NHS Trust or Board (3.1)
- ii. Provision of a validated blood pressure monitor (3.2)
- iii. Provision of information for a pregnant woman (3.3)
- iv. Optional use of a BP monitoring app (for use with a smartphone) or via text messaging (3.4)

3.1 Pathway for implementation in a hospital NHS Trust or Board

1. Arrange for a woman to attend face to face appointment in maternity assessment unit or antenatal clinic and check eligibility for self-monitoring of blood pressure. Provide antenatal (or postnatal) check as usual. A hospital NHS Trust or Board may choose to make alternative arrangements to provide a blood pressure monitor and information (e.g. by arranging remote pick-up). Women may already own their own validated monitor (which can be used).
2. Ensure that women's contact details are up to date on hospital electronic system (home, mobile phone number, email) and update these as necessary.
3. Provide a woman with a semi-automated or automated home blood pressure monitor, validated for use in pregnancy and pre-eclampsia (Appendix 2), and an appropriately sized cuff (check upper arm measurement). Label the blood pressure monitor with name of the hospital NHS Trust or Board, and

appropriate contact details for the maternity unit. Complete a blood pressure monitor loan form with the woman (Appendix 2)

4. Give written instructions on how to take a blood pressure reading (Appendix 3). Ask the woman to take her blood pressure twice, at least one minute apart and write the second blood pressure down, or send the second reading via a text message or smart phone app.
5. Give written instructions on expected frequency of blood pressure monitoring, making it 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 or three times a week).
6. Give written instructions (rainbow coloured chart) about interpreting blood pressure readings (Appendix 1), and check that she understands who to contact with an abnormal reading.
7. If a woman requires additional investigations (e.g. growth scan, PIGF-based testing), arrange these as indicated. If a woman is asked to self-monitor urine for proteinuria, arrange this.
8. If you are using an app or text-based system (attached document: App-based systems for pregnancy blood pressure monitoring), set this up, check that she is able to log in before leaving the hospital and ask her to demonstrate sending a blood pressure reading. Make it clear whether the readings will be reviewed by a healthcare professional remotely whilst she is at home or not. For many maternity units, the usual option would be that blood pressure readings would not be reviewed routinely and that responsibility for acting on high blood pressure readings sits with the woman.
9. Confirm next appointment with the woman, and whether this will be telephone (or other remote working) or face-to-face. Ask the woman to call her midwife or the maternity unit as she would normally if she has any concerns about herself or her baby or if she thinks that she needs medical attention.
10. Explain arrangements to the woman for return of the blood pressure monitor; either at the time of coming in for birth, or at a time postnatally if a woman needs postnatal blood pressure monitoring. Options for returning a blood pressure monitor may include handing it back to hospital staff, returning it to a community midwifery hub or posting it in a freepost envelope.

11. Once returned, wipe the blood pressure monitor thoroughly with a cleaning wipe, and check that all components are correct (e.g. cuff, connector, batteries).
12. Consider how to record details of blood pressure monitor loans and associated uptake and outcomes as a service evaluation

3.2 Validated blood pressure monitors in pregnancy

A list of validated blood pressure monitors is maintained on the STRIDE BP website, an international scientific non-profit organization operating in affiliation with the European Society of Hypertension, the International Society of Hypertension and the World Hypertension League.

<https://stridebp.org/bp-monitors>

Blood pressure monitors should be validated for use in pregnancy, in pregnancy hypertension and pre-eclampsia, or be considered to have full equivalency with a device that is validated (see 'Criteria for equivalent blood pressure measurement function of new devices compared to previously validated ones' on <https://www.stridebp.org/about-us/principles-for-device-listing>.)

The following information is taken from the STRIDE BP website:¹

Preferred devices: are upper-arm cuff devices with at least one STRIDE BP approved validation study published within the last 10 years. Preferred devices for home use should also allow automated storage of multiple readings, or mobile phone, PC or internet link connectivity enabling data transfer.

Validated devices: have passed established validation procedures that have been checked and approved by the STRIDE BP Scientific Advisory Board.

Devices for Home blood pressure monitoring

Preferred devices

- Andon iHealth Track
- Microlife 3AS1-2
- Microlife WatchBP Home
- Microlife WatchBP Home A

¹ <https://stridebp.org/bp-monitors> (information current as at 27 March 2020)

- 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)

Validated devices

- Microlife BP 3BTO-A Omron MIT
- Omron M7 (HEM-780-E)

Devices for Office / Clinic blood pressure measurement (for information only)

Preferred devices:

- Dinamap ProCare 400

Validated devices:

- Welch Allyn Vital Signs

3.3 National offer of appropriate BPMs for currently hypertensive (Group I) women

To ensure sufficient national supply and equitable access to suitable BPMs across England for the next 3 months, NHS England and NHS Improvement has procured 16,000 appropriate monitors nationally for use with Group I women.

These will be available to NHS maternity providers free of charge. To request a delivery of these monitors, please complete the request template in [Annex A](#) and submit it to england.maternitybpm@nhs.net for approval and fulfillment.

National supply has been modelled on the illustrative prevalence of Group I women over a 3 month period. Therefore, a justification will be required from any providers requiring more than 2.5% of annual deliveries. For more information, please email england.maternitybpm@nhs.net.

3.4 Provision of information for a pregnant woman

Appropriate explanation and information should be given. Templates of an appropriate loan form and instructions for pregnant women are provided in Appendix 2.

3.5 App-based systems for pregnancy blood pressure monitoring

A range of apps are available that can support the recording of readings taken when self-monitoring, and the sharing of these data with clinicians. The following information is shown, but provides no indication of whether the app or telemonitoring system has MHRA approval, or CE-marking, or has undergone appropriate testing. It provides no guarantee that the app system is currently available for external use currently.

Maternity units should be aware of the difference between a class I and a class II app, and of the implications for use in self-monitoring of blood pressure in pregnancy. A Data Protection Impact Assessment will need to be completed and submitted to your hospital Trust before use (see <https://www.nhs.uk/key-information-and-tools/information-governance-guidance> for further advice). App providers listed below may be able to provide a generic DIPA assessment template to help providers submit these quickly.

The apps are listed in alphabetical order:

BPm-Health: <https://www.sensynehealth.com/bpm-health>

Contact: info@sensynehealth.com

Florence: <http://www.simple.uk.net/home/videos/flo-and-pih-kim-hinshaw>

Contact: phil.oconnell@simple.uk.net

Hampton: <https://help.k2ms.com/portal/kb/hampton-blood-pressure-monitoring>

Contact: <https://www.k2ms.com/k2-hampton-contact-form.aspx>

This document was prepared by Professor Lucy Chappell, King's College London, who declares no conflicts of interest. The document was rapidly reviewed by Dr Lucy Mackillop, Oxford University Hospitals NHS Trust; Professor Asma Khalil, St George's University Hospital; Dr Kim Hinshaw, City Hospitals Sunderland NHS Foundation Trust; Dr Sophia Stone, Western Sussex Hospitals NHS Foundation Trust.

Appendix I. Blood pressure thresholds for self-monitoring

Level	Blood pressure /mmHg	Action
High	SYS 150 or more OR DIA 100 or more	Your blood pressure is high. Sit quietly for 5 minutes then measure it again and note the reading. If your repeated reading is raised, please contact your maternity unit for review today (within 4 hours) and continue to monitor your BP daily. If your repeated SYS (systolic) reading is 160 or more, make sure that you make contact with a healthcare professional in this time.
Raised	SYS 140-149 OR DIA 90-99	Your blood pressure is raised. Sit quietly for 5 minutes then measure it again and note the reading. If your repeated reading is raised, please contact your maternity unit within 24 hours and continue to monitor your BP daily.
High Normal	SYS 135-139 OR DIA 85-89	Your blood pressure is normal but moving towards the raised threshold. Sit quietly for 5 minutes then measure it again and note the reading. If your repeat reading is still high end of normal, please monitor your blood pressure daily.
Normal	SYS 110-134 AND DIA 70-84	Your blood pressure is normal. Continue blood pressure monitoring and your current care.
Low	SYS 109 or less AND DIA 69 or less	If you are not taking blood pressure medication: Your blood pressure is normal. If you are feeling well this blood pressure does not need any further action. If you are taking blood pressure medication: Your blood pressure is low. Repeat once more in 5 minutes. If you repeat reading is still low, contact your maternity unit within 24 hours or within 4 hours if you feel unwell (e.g. dizzy or faint).

Appendix 2. Loan agreement template for hospitals

Loan agreement for blood pressure monitor



Blood pressure monitor number:

Cuff size:

Declaration:

I accept responsibility for the above equipment and understand I have been asked to monitor my blood pressure through pregnancy (and postnatally) after the baby is born. I will return the blood pressure monitor as requested. If the blood pressure monitor becomes damaged, lost or stolen, I understand that I must report this information to the Maternity Unit on the below number and that I am not responsible for the cost of replacement or repair.

Name	
Hospital number	
Date of birth	
Signature of agreement to conditions:	
Staff name:	
Staff signature:	
Date:	

Maternity team contact:

Telephone:

Please copy and give one copy to the woman and retain one copy.

Appendix 3 - Patient information

How to take your blood pressure at home using an upper arm monitor

- You will be asked to take either
 - On the morning of your clinic appointment if you have normal blood pressure
 - Once a week if you are at higher risk of getting high blood pressure
 - One to three times a week if you have high blood pressure.
- Check with your midwife or doctor how often they would like you to monitor your blood pressure.
- Always measure your blood pressure using the same arm (normally the left arm).
- Wear loose clothing with sleeves that roll up easily and do not feel tight when rolled up (you will need to fit the cuff onto your bare arm) or take your arm out of the clothing.
- Sit on a chair with your back supported and both feet flat on the floor. Rest for 5 minutes before beginning to take blood pressure readings.
- Slip the cuff onto your arm so that the air tube points towards your wrist. The yellow line on the cuff should be over the inside of your elbow.
- Adjust the bottom edge of the cuff so that it is about 2cm above the inside of the elbow joint.
- Tighten the cuff around the arm and secure using the Velcro.
- Rest your arm on a table or across your lap with your hand slightly open and the palm facing upward.
- Once the machine is set up and you have the cuff in the correct position, and you are ready to start, press the start button on the front of the machine to take a reading.
- Relax, do not move your arm muscles and do not talk until the measurement is completed.
- Each time you measure your blood pressure you will get two readings:
 - The top number (usually called SYS, short for systolic),
 - The bottom number of your blood pressure, (usually called DIA, short for diastolic)
 - You may also get the pulse displayed, usually called PUL
- Measure your blood pressure twice, at least one minute apart.
- Write down the second blood pressure reading (on your phone, in your maternity notes), or send it by text or smartphone app if you are using one of these systems.

DISCLAIMER: The Royal College of Obstetricians and Gynaecologists (RCOG) has produced this guidance as an aid to good clinical practice and clinical decision-making. This guidance is based on the best evidence available at the time of writing, and the guidance will be kept under regular review as new evidence emerges. This guidance is not intended to replace clinical diagnostics, procedures or treatment plans made by a clinician or other healthcare professional and RCOG accepts no liability for the use of its guidance in a clinical setting. Please be aware that the evidence base for COVID-19 and its impact on pregnancy and related healthcare services is developing rapidly and the latest data or best practice may not yet be incorporated into the current version of this document. RCOG recommends that any departures from local clinical protocols or guidelines should be fully documented in the patient's case notes at the time the relevant decision is taken.

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