UTERINE ARTERY DOPPLER IN HIGH-RISK PREGNANCIES

Document Reference No:	PTHB / MAT 090	
Version No:	1	
Issue Date:	December 2023	
Review Date:	December 2026	
Author:	DAU Midwife Sonographer	
Document Owner:	Head of Midwifery and Sexual Health	
Accountable Executive:	Executive Director of Nursing and Midwifery	
Approved By:	Women and Childrens Policies & procedures Governance Group	
Approval Date:	9th November 2023	
Document Type:	Guideline	Clinical
Scope:	PTHB / Maternity	

The latest approved version of this document is online.
If the review date has passed please contact the Author for advice.

Powys Teaching Health Board is the operational name of Powys Teaching Local Health Board
Bwrdd Iechyd Addysgu Powys yw enw gweithredol Bwrdd Iechyd Lleol Addysgu Powys

Version Control

Version	Summary of Changes/Amendments	Issue Date
1	Initial Issue	Dec 2023

ENGAGEMENT & CONSULTATION

Key Individuals/Groups Involved in Developing this Document

Role / Designation
Interim Head of Midwifery
Interim Assistant Head of Midwifery
Maternity Day Assessment Unit Team

Circulated to the following for Consultation

Date	Role / Designation
12/10/2023	Powys DAU Midwife Sonographers
12/10/2023	Interim Head of Midwifery and Sexual Health and Interim Assistant Head of Midwifery and Sexual Health
12/10/2023	Interim Assistant Head of Midwifery and Sexual Health
12/10/2023	Powys Midwifery Team
12/10/2023	Women and Children's guideline committee
12/10/2023	Safeguarding team
12/10/2023	Head of Radiology
12/10/2023	Ultrasound governance lead
12/10/2023	Link Obstetricians – commissioned services

Groups approved at

Date	Role / Designation
06/11/2023	Maternity Policies and Procedures Sub-Group
07/11/2023	Ultrasound Heads of service
09/11/2023	Women and Children's policies and Procedures group

Evidence Base
NICE (2023) NG235: Intrapartum care for healthy women and babies NICE (2021) Antenatal Care PTHB MAT 030 Midwifery Led Care Guidelines PTHB MAT 084 Small for gestational age (SGA) and fetal growth restricted babies – antenatal management-All Wales guidance. PTHB (2021) CDP002 Management of Medical Devices Equipment NHS England (2019) Saving babies lives, A care bundle for reducing perinatal mortality Version 2 NHS England (2023) Saving babies lives, A care bundle for reducing perinatal mortality Version 3

Kennedy AM, Woodward PJ. A radiologist's guide to the performance and interpretation of obstetric dopplers. Radiographics. May-June 2019;39:893-910

IMPACT ASSESSMENTS

Equality Impact Assessment Summary					
	No impact	**Adverse**	**Differential**	**Positive**	**Statement**
Age	x				***Improved access to local services. Reduced waiting times Equality in service provision for Powys women and families***
Disability	x				
Gender reassignment	x				
Pregnancy and Maternity				x	
Race	x				
Religion or Belief	x				
Sex	x				
Sexual Orientation	x				
Marriage and Civil Partnership	x				
Welsh Language	x				

Risk Assessment Summary
Have you identified any risks arising from the implementation of this policy / procedure / written control document? No risks identified
Have you identified any Information Governance issues arising from the implementation of this policy / procedure / written control document? No risks identified
Have you identified any training and / or resource implications as a result of implementing this? Additional theoretical and practical training for the Utad midwife sonographers in Powys

1 Policy Statement / Introduction

The uterine artery doppler (UtAD) scan is a screening test used to identify those babies that are at a greater risk of not growing to their full potential/growth restricted. The UtAD measures the blood flow through the uterine arteries, the vessels that supply blood to the uterus. The abnormal uterine artery Doppler pulsitivity index (PI) correlates with high resistance in the maternal arterial blood supply to the placental bed, secondary to poor trophoblast invasion and remodeling of the maternal spiral arteries. The resistance in the spiral arteries in early pregnancy is high but decreases as the pregnancy progresses. Persistent high resistance increases the chance of pre-eclampsia and intrauterine growth restriction (IUGR).

Saving babies lives (Version 2) recommends UtAD for assessment of fetal wellbeing with the aim of identifying babies that are at increased risk of being SGA/FFR. The screening is recommended to be performed on women that are considered at higher risk:

- Medical history: chronic kidney disease; essential hypertension; autoimmune disease and cyanotic congenital heart disease
- Obstetric history: Previous FGR; Hypertension in a previous pregnancy; previous stillbirth; previous SGA.
- Current pregnancy: Low PAPP A; echogenic bowel; significant bleeding, EFW $<10^{th}$ centile.

The All Wales Maternity and Neonatal network Fetal growth guideline (2021) has simplified the above criteria into 4 categories below:

- Previous hypertension disorder (including pre-eclampsia) requiring birth before 34 weeks gestation.
- Previous stillbirth with an EFW below the 10^{th} centile in the absence of any congenital fetal abnormality or infective etiology.
- Previous SGA or FGR baby weighing $<3^{rd}$ centile for gestational age in the absence of congenital or infective etiology.
- Hypertensive disease in current pregnancy requiring treatment with medication before 20 weeks gestation.

Doppler assessment (the mean value of three separate spectral traces) of both the right and left uterine arteries should be obtained, measured, evaluated, and stored. A PI value above the 95^{th} centile, and/or notching is abnormal and requires further closer monitoring of fetal growth throughout pregnancy.

Antenatal screening Wales (ANSW) have stated that the UtAD is not part of the anomaly scan and should be considered separately.
All Wales guidance as outlined in MAT 084 recommends that the UtAD is undertaken between 20+0 to 23+0 weeks gestation.

Powys will therefore undertake the UtAD as part of an additional scan (separate to the anomaly scan), between 20+0 and 23+0 weeks gestation in line with the All Wales guidance.

2 Objective

- To assist the midwives/midwife sonographers in identifying those pregnant women requiring additional surveillance (i.e. UtAD).
- To provide a robust care pathway for the midwife sonographers
- To assist sonographers/midwife sonographers in undertaking the UtAD in a singleton pregnancy; identifying an abnormal UtAD measurement and to provide a clear management plan for ongoing assessment in line with MAT 084- All Wales guidance - small for gestational age (SGA) and fetal growth restricted babies -antenatal management.

3 Definitions

- **PTHB** – Powys Teaching Health Board
- **DGH –** District General Hospital
- **DAU –** Day Assessment Unit
- **HoM –** Head of Midwifery
- **AHOM –** Assistant Head of Midwifery
- **PHR –** Pregnancy handheld records
- **UtAD –** Uterine artery Doppler
- **UtAD PI –** Uterine artery Doppler Pulsitivity Index
- **PI –** Pulsitivity Index
- **SDVP –** Single deepest vertical pool
- **CGC –** Customized growth chart
- **ANSW –** Antenatal Screening Wales

4.0 Responsibilities

4.1 Head of Midwifery and Sexual Health

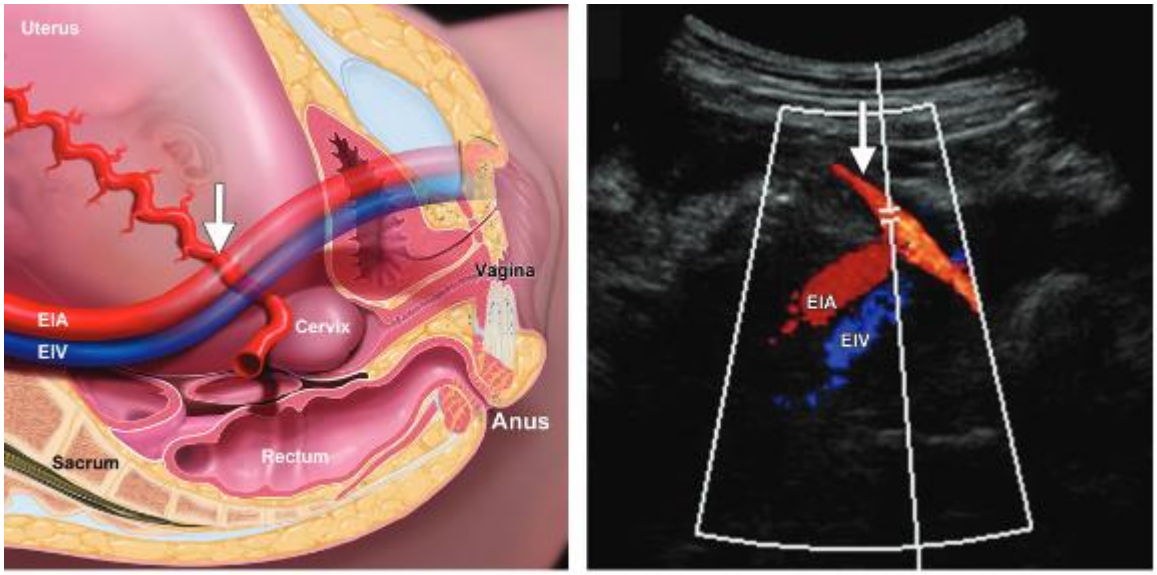
The Head of Midwifery must:

- Ensure that robust procedures are in place in order that PTHB can discharge its organisational responsibilities in the provision of safe services to the Powys population of

	pregnant women. • Ensure that all staff have read and understood the guideline • Ensure overall implementation of the guidance. • Ensure all staff have access to current Powys policies and guidelines. • Arrange regular review to ensure DAU staff/sonographers comply with the requirements of the service. • Follow up on audit and performance reports as required and provide assurances to the Directorate.
	4.2 Assistant Head of Midwifery and Sexual Health The Assistant Head of Midwifery must: • Ensuring dissemination of this document to all relevant staff. • Ensuring training compliance. Ensuring competence of carrying out the UtAD is reviewed as part of the appraisal process. • Ensure maintenance and Servicing of equipment is in place. • To oversee compliance with training and service development. • To provide leadership and support. • Be accountable for DAU service provision. • Overseeing and dealing with the service, provision, developments and issues. • Liaise with surrounding health boards regarding referrals and pathways.
	4.3 Women and Children's Risk and Governance Lead The women and children's risk and governance lead has responsibility for: • Monitoring review of incidents in relation to content of this document.
	4.4 Women and children's clinical Governance Ultrasound Lead The Governance ultrasound Lead must: • Provide support for the midwife sonographers during the implementation and roll out phase. • To determine the requirements for competency • Ensure competency of the sonographers in undertaking UtAD • Report to the Head of midwifery any themes and trends in DATIX submissions regarding UtAD • Investigate any incidents involving the Uterine artery Doppler
	4.5 DAU Midwives The DAU Midwives /midwife sonographers have responsibility for:

	• The sonographer must hold a post graduate certificate/diploma in medical Ultrasound for Obstetrics and trained at a recognized and CASE accredited course. • The Sonographer must be familiar with the content of this guideline. • Undertake theoretical and practical training on UtAD • Ensure dissemination of this document to all relevant staff • DATIX faulty equipment and inform Assistant HoM • Working to the requirements of their role and within their sphere of practice. • After the dating scan, the DAU midwife will identify those pregnant clients who qualify for UtAD based on the inclusion criteria highlighted below (section 5.1). • Ensure referral to consultant led care for review of the need for Low dose aspirin (if not already prescribed – see appendix 3). • DAU midwives will be required to counsel and consent women for the UtAD screening following the dating/anomaly scan • Where an abnormal uterine artery doppler has been identified, the DAU midwife must document this in the client's management plan in the PHR and communicate findings of the abnormal UtAD with the named midwife and DGH (of the client's choice) using the letter template in Appendix 4. This will provide a clear management plan for ongoing assessment in line with MAT 084. • An image of the 'M mode' of the fetal heart and the SDVP will be stored at the UtAD ultrasound scan. • Undertake a record keeping audit as part of clinical supervision
	4.6 Maternity Support Workers The maternity support workers must: • Make the UtAD scan appointment within the correct time frame in line with this guidance. • Provide overall support to the DAU midwife sonographers.
5 Performing a UtAD	
	5.1 UtAD eligibility (in line with All Wales guidance – MAT 084) • Previous hypertensive disorder (including pre-eclampsia) requiring birth before 34 weeks. • Previous stillbirth with and EFW less <10th centile in the absence of any congenital abnormality of infective etiology • Previous SGA or FGR baby weighing <3rd centile for gestational age in the absence of congenital or infective etiology

	• Hypertensive disease in current pregnancy requiring treatment with anti-hypertensive medication in pregnancy before 20 weeks of gestation. The UtAD will be undertaken in Powys in singleton pregnancies only. Twin pregnancies will be referred to a DGH of their choice following the dating scan and the UtAD undertaken at the DGH if appropriate. **5.2 Timing of the Uterine artery doppler** All Wales guidance (MAT 084) recommends the UtAD is undertaken between 20+0 days to 23+0 weeks gestation. (At a later gestation - Normalization of the uterine artery flow velocity does not abolish risk of SGA). Powys will undertake the UtAD as part of an additional scan (separate to the anomaly scan) between 20+0 and 23+0 weeks gestation in line with the All Wales guidance.
	5.3 Method Place the transducer in the lower lateral quadrant of the abdomen, medial to the anterior superior iliac spine (ASIS). Angle the probe medially. Use colour flow doppler to identify the uterine artery doppler. This courses anteriorly and crosses the external iliac vessels. Reduce the gate to 2.0mm if necessary. Place the curser 1cm downstream of the cross over and apply power wave.



a. b.

Figure 2: (a) Anatomical drawing of the uterine artery crossing over the external iliac vessels. (b) Ultrasound image showing Colour flow Doppler and the Power wave applied to the UtAD, 1 cm downstream of the crossover. The angle of insonation should be about 30 degrees.

5.4 Results

Three readings should be undertaken on each side and a mean result obtained and reported.

A normal UtAD result = mean UtAD PI <95th centile for gestational age.

An abnormal UtAD result = mean UtAD PI >95th centile for gestational age.

5.5 Ongoing management in line with MAT 084 – Small for gestational age and fetal growth restricted babies – antenatal management -All Wales guidance

If **Normal** Uterine artery Doppler (Pulsitivity Index <95th centile)

- Serial growth scan from 28 weeks 0 days every 3-4 weeks until birth and will include calculation of the EFW (plotted on the customized growth chart), measurements of the

	amniotic fluid (AF) using the SDVP and Umbilical artery doppler. If **Abnormal** Uterine artery Doppler (Pulsitivity Index >95th centile – see appendix 1) and or notching • Serial growth scans (EFW; SDVP; umbilical artery Doppler starting from 24 weeks at intervals of 3 weeks. The EFW should be plotted on the CGC. **If only one UtAD is obtained, then the PI from this will be used. If the UtAD is unable to be obtained on either side, the abnormal UtAd pathway will be followed.** **External Health Board Referral:** • Referrals (of Powys clients) with a singleton pregnancy from an external DGH where a UtAD is required, must be sent from a midwife or obstetrician via the DAU generic email.
	5.6 Equipment (inc. Maintenance and Servicing) • The scan machines are to be checked as part of the annual PAT and calibration testing service. • The scan machine should be included as part of the 'Management of Medical Devices Equipment' on a 6 monthly basis by a person with experience of medical devices. • The scan machine must be checked prior to use for any damage and any concerns reported to a line manager and via the DATIX system. • To ensure accuracy, a servicing and calibration contract will be ongoing. • Replacement of the scan machines will be reviewed by the senior management team every 5 years as part of the Medical Device and Point of Care Testing review.
	5.7 Documentation and Storage of images **Documentation:** • Rational for the UtAD should be documented in the maternal handheld pregnancy notes and included as part of the management plan .

- The results of the UtAD should be documented on the day admission page and the management page updated if the UtAD shows an **abnormal** result with a plan for ongoing care. In line with MAT 084.

- The DAU midwife is responsible for notifying the named midwife and the DGH (of the client's choice) of the abnormal UtAD and ongoing plan by email using the templated letter (Appendix 4).

Storage:

- All scans must be reported on the RADIS system using the relevant template and the ultrasound images will be stored on the PACS system to allow adequate monitoring, audit data and image review.

5.8 Training Compliance

There is currently no specified number of UtAD that need to be undertaken to ascertain competence or to maintain competency. There is also no set governance standards for this aspect of obstetric scanning. Powys will therefore ensure that:

- All midwife sonographers who currently undertake the ANSW anomaly scan have received training in UtAD.
- Competency will be assessed in house by the ultrasound governance lead.
- Annual assessment of competence through PADR/CPD evaluation.

6 Monitoring Compliance, Audit & Review

Audit of the compliance will be through record keeping audits and DATIX and case reviews in response to any adverse incidents. Training compliance will be assessed as part of an individual's PADR review.

Auditing of images will be completed by the Ultrasound Governance Lead.

Interesting cases involving a UtAD will be discussed as part of the DAU clinical cases review/clinical supervision held bi-monthly with the DAU team.

This document will be reviewed every three years or earlier should audit results or changes to legislation / practice within PTHB indicate otherwise.

7. Related Guidance

- MAT 084 **–** Small for gestational age (SGA) and fetal growth restricted babies – antenatal management – All Wales Guidance. Including management of unexpected SGA following birth in Powys.

- MAT 072 – Aspirin in pregnancy guideline

8. References / Bibliography

NHS England (2019) Saving babies lives, A care bundle for reducing perinatal mortality Version 2
NHS England (2023) Saving babies lives, A care bundle for reducing perinatal mortality Version 3
Gomez, O (2008). Reference ranges for uterine artery mean pulsitivity index at 11-41 weeks of gestation. Ultrasound obstetrics gynaecol,32:128-132. Published online 6th May 2008.
Kennedy AM, Woodward PJ. A radiologists guide to the performance and interpretation of obstetric dopplers. Radiographics. May-June 2019;39:893-910.
Royal college of Obstetricians and Gynaecologists (RCOG). The investigation and management of the small for gestational age infant. Green Top Guideline No.31. second edition 2014.
All Wales Maternity and Neonatal Network Guidelines – Small for gestational age and fetal growth restricted babies- antenatal management. 2021

Appendix 1: suggested example of reference tables for Doppler of umbilical Artery, middle cerebral artery & uterine artery and cerebroplacental ratio

	Umbilical Artery PI °		MCA PI °		Cerebroplacental Ratio (CPR) °		Mean Uterine Artery PI	
	>95th percentile is abnormal		<5th percentile is abnormal		CPR = MCA PI/UA PI <5th percentile is abnormal		Mean PI=(RT PI + Lt PI/2) >95th percentile is abnormal	
Gestation Weeks	50th percentile	95th percentile	50th percentile	5th percentile	50th percentile	5th percentile	50th percentile	95th percentile
18							1.20	1.79
19	1.25	1.63					1.15	1.70
20	1.22	1.59					1.10	1.61
21	1.19	1.55					1.05	1.54
22	1.17	1.52					1.00	1.47
23	1.14	1.48					0.96	1.41
24	1.12	1.47	1.86	1.38	1.74	1.16	0.93	1.35
25	1.09	1.44	1.94	1.44	1.85	1,24	0.89	1.30
26	1.06	1.41	2.01	1.50	1.95	1.32	0.86	1.25
27	1.03	1.38	2,06	1.55	2.05	1.40	024	1.21
28	LOD	1.35	2.11	1.58	2.14	1.47	0.81	1.17
29	0.98	1.32	2.15	1.61	2.21	1.53	0.79	1.13
30	0.95	1.29	2.16	1.62	2.28	1.58	0.77	1.10
31	0.93	1.27	2.16	1.62	2.32	1.62	0.75	1.06
32	0.90	1.25	2.14	1.61	2.35	1.64	0.73	1.04
33		1.22	2.10	1.58	2.36	1.65	0.71	1.01
34	0.86	1.20	2.04	133	2.35	1.63	0.70	0.99
35	0.84	1.18	136	1.47	2.32	1.60	0.69	0.97
36	0.82	1.16	1.86	1.39	2.27	1.55	0.68	0.95
37	0.80	1.14	1.75	1.30	2.19	1.48	0.67	0.94
38	0.78	1.12	1.63	1.20	2.09	1.40	0.66	0.92
39	0.76	1.10	1.49	1.10	1.97	1.29	0.65	0.91
40	0.75	1.09	1.29	1.02	1.80	1.24	0.65	0.90

References:

Acharya 8, et al. Reference ranges for serial measurements of blood velocity and pulsatility Index at the inn-abdominal portion, and fetal and placental ends of umbilical artery. Ultrasound Obstet Gynecol 2005: 26162-169.

° Ebbing. C., Rasmussen, S., 8 Kiserud. T. Middle cerebral artery blood flow velocities and pulsatility index and the cerebroplacental pulsatd?,

ratio: longitudinal reference ranges and terms for serial measurements. Ultrasound Obstet Gynecol, 2007. 30(3): p. 287-96.

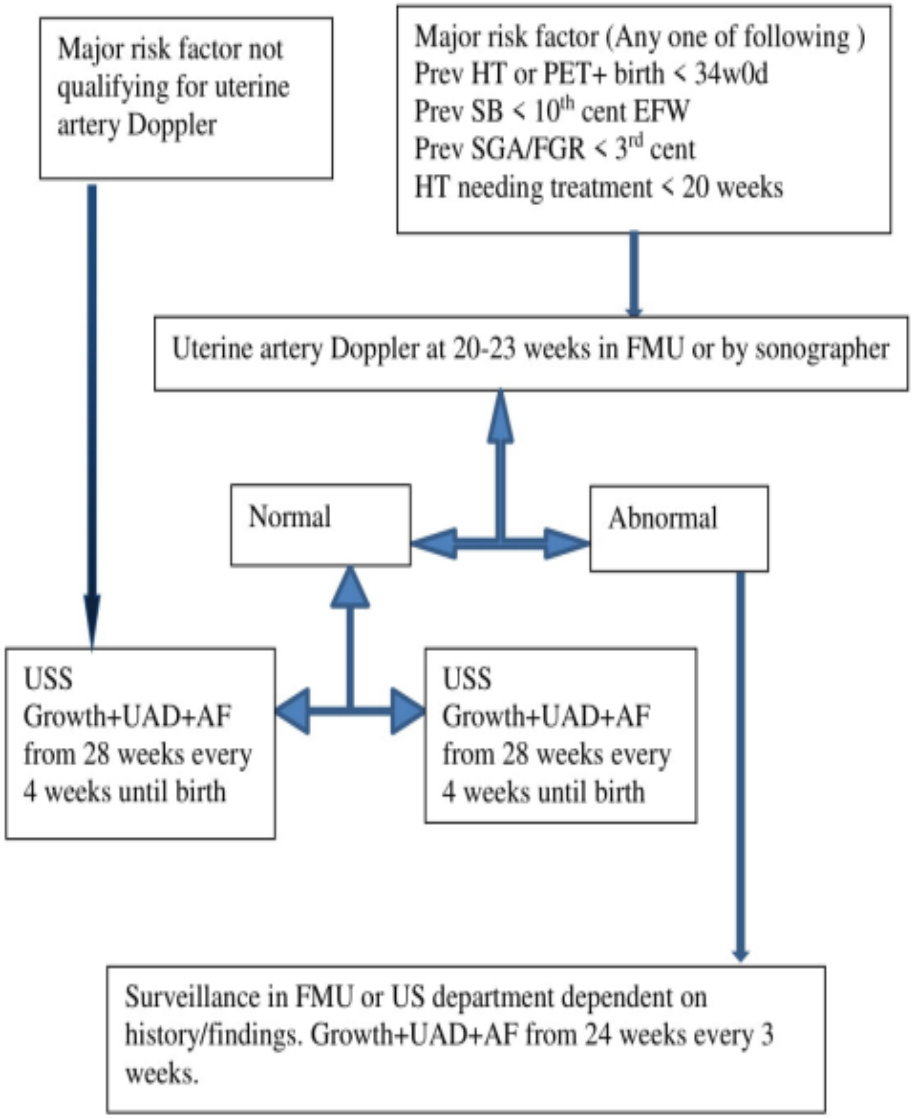
Baschat AA, Gembruth U. The cerebroplacental Doppler ratio revisited, Ultrasound Obstet Gynecol 2003; 21:124-127.

° Gomez 0, et al Reference ranges for uterine mean pulsatility index at 1141 weeks of gestation. Ultrasound Obstet Gynecol 2008; 32: 128-131

Appendix 2

Appendix 2 C: High Risk Pregnancies and Uterine artery Doppler (In FMU or US department)

(Abbreviations: AF DVP: amniotic fluid deepest vertical pool; CTG: cardiotocography; EFW: estimated fetal weight; FMU: Fetal Medicine Unit; HT: hypertension; PET: pre-eclampsia; UAD: umbilical artery Doppler)



Addressograph

Birth Centre

Date:

Dear Doctor,

I have seen.....today and identified the following risk factors for pre-eclampsia and fetal growth restriction in pregnancy:

Women at high risk are those with any of the following: (please circle those identified)	Women at moderate risk are those with two or more of the following risk factors: (please circle those identified)
• Hypertensive disease during a previous pregnancy • Chronic hypertension • Type 1 or type 2 diabetes • Chronic Kidney disease • Autoimmune disease such as systemic lupus erythematosus or antiphospholipid syndrome • Placental histology confirming placental dysfunction in a previous pregnancy	• First pregnancy • ≥ 40 years of age at booking • Pregnancy interval of more than 10 years • Body mass index (BMI) of 35kg/m^2 or more at first visit • Family history of pre-eclampsia in a first degree relative • Multiple pregnancy

In accordance with NICE guideline 133 (Hypertension in pregnancy: diagnosis and management) (2019) and NHS England's Saving Babies' Lives Care Bundle Version 2 (2019), treatment with aspirin is recommended from 12 weeks' gestation for women at high risk of pre-eclampsia and also for women with more than one moderate risk factor for pre-eclampsia.

Evidence from randomised controlled trials supports a 150mg daily dose of aspirin. Despite the evidence and recommendation aspirin does not have a UK marketing authorisation for this indication (*off-label use*), therefore aspirin for this indication must be prescribed (the prescriber should follow relevant professional guidance, taking full

responsibility for the decision. Informed consent should be obtained and documented).

I have discussed the national guidance and the benefits of aspirin treatment with the patient. I have also carried out a risk assessment and found no contraindications to treatment. I have therefore provided an initial 28-day supply of aspirin tablets, with directions to take 150mg daily (in accordance with PTHB PGD 0171). To ensure that treatment continues for the remainder of the pregnancy, I would be really grateful if you could provide repeat prescription for aspirin. The patient is aware that they will need to contact their practice in order to access further supplies.

Thank you for your support. If you have any questions please do not hesitate to contact a member of the midwifery team.
Yours sincerely

Powys Midwife

Appendix 4

GIG CYMRU NHS WALES | Bwrdd Iechyd Addysgu Powys Powys Teaching Health Board

Addressograph

Birth Centre/Day Assessment unit

Date:

Dear Consultant

I have seen ..... today and undertaken the Uterine Artery Doppler in line with the All-Wales fetal growth guideline (2023).

An **Abnormal Uterine artery Doppler** was identified on scan today.

In accordance with the All-Wales Fetal growth guideline, serial growth scans will be undertaken, starting from 24 weeks at intervals of 3 weeks until birth.

If any further information is required, please contact the Day assessment unit on .....

Kind regards

Powys Day Assessment Unit