



Hypertension In Pregnancy:

Measuring the Risk

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Hypertension pathologies complicate 5% to 10% of pregnancies and are associated with significant maternal and perinatal complications. The blood pressure (BP) levels measured during pregnancy will influence the diagnosis, type of followup, therapeutic approaches (e.g., rest, work stoppage, hospitalization), and time of childbirth.

Home blood pressure monitoring

For many, home blood pressure monitoring (HBPM) has been used for patients in their followup and treatment phases. The principle is simple: patients measure their BP repeatedly with a portable manometer at different times throughout the day. It is important to give patients specific instructions on:

- the technique,
- the BP-measuring timetable, and
- the logging of results.

In addition, it may prove advantageous to give advice on how to respond to a BP reading that is

too high or too low and on how to adjust medication accordingly.

Table 1 outlines the main advantages HBPM has over BP measured at the doctor's office. Generally speaking, HBPM is considered reliable.

HBPM's principal limitation lies in the inaccuracy of its readings (owing either to the manometer or the user). Nevertheless, accuracy can be improved by using devices validated in accordance with the protocols of the British Hypertension Society or the Association for the Advancement of Medical Instrumentation, and by provid-

ing patients with an annual update on proper use. While using automated devices with a memory also improves accuracy, such devices are more expensive.

Although self-BP measurement creates considerable anxiety in some patients, studies have shown mean HBPM readings are lower than BP taken at the doctor's office.¹⁻⁴ A diagnosis of hypertension is indicated when the HBPM mean exceeds 135/85 mmHg.³

An HBPM reading is also

Table 1

Advantages of HBPM

- The ability to obtain repeated readings over a longer timeframe
- The flexibility of the BP-measuring timetable
- The absence of a medical environment

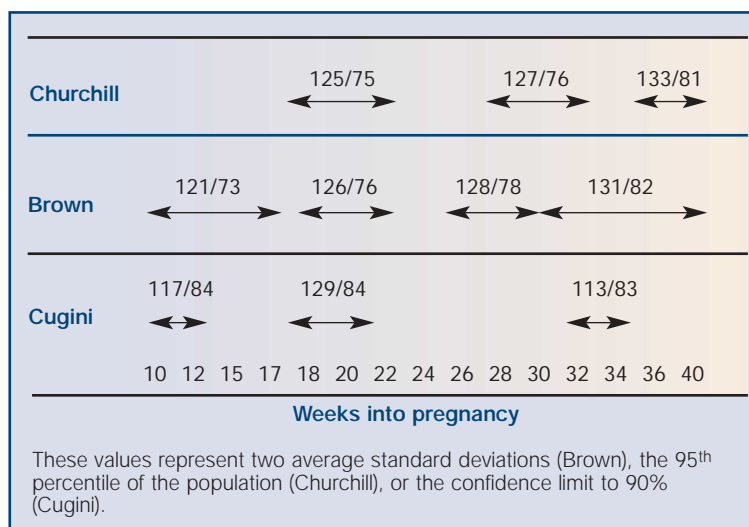


Figure 1. Reference values for daily ABPM blood pressures (mmHg) in pregnancy.



superior to a doctor's office BP measurement for predicting cardiovascular morbidity and mortality. The impact of HBPM use on improving hypertension monitoring is mitigated, but definitely positive when this technique is used following the instructions for adjusting antihypertensive medication.

diminished. Where an adequate teaching program exists, home blood-pressure readings by pregnant women are reliable.

The usefulness of HBPM during pregnancy has been studied in a general population among women presenting with pre-existing hypertension and women exhibiting gestational

device's memory and analyzed by software that calculates, among other things, the mean diurnal, nocturnal, and daily BPs. In order to obtain accurate measurements, subjects must be alerted to certain precautions and advised not to alter their daily activities.

In allowing for multiple BP readings during the patient's regular activities, ABPM lends itself for use in:

- diagnosing whitecoat hypertension,
- verifying the efficacy of antihypertensive treatment, and
- objectifying the presence of nocturnal hypotension and hypertension.

Most cases of eclampsia or maternal death resulting from acute gestational hypertension occur within the 7-day period following a pre-natal visit.

HBPM and pregnancy

While the HBPM technique for pregnant women is similar to that used outside pregnancy, the choice of manometer takes on even more importance for the former, as not all devices on the market are validated for pregnant women. Furthermore, while some oscillometric devices are validated for normotensive pregnant women, their reliability for hypertensive pregnant women appears to be

hypertension. Ross-McGill and colleagues have observed that among normotensive women with no obstetrical complications, HBPM can reduce the number of antenatal visits from 7.4 to 4.5 between 30 and 41 weeks into the pregnancy.⁵

Ambulatory BP monitoring

The purpose of ambulatory BP monitoring (ABPM) is to repeatedly measure BP (day and night) over a 24- or 48-hour period using a portable manometer. The device is generally programmed to measure BP every 30 minutes during the day and every 60 minutes during the night. The data are stored in the

Generally, ABPM readings are lower than those obtained in the doctor's office—hypertension is considered when either the mean of the diurnal BPs exceeds 140/90 mmHg, or if the mean of the daily BPs exceeds 135/85 mmHg—and are superior in predicting hypertensive cardiovascular complications.

ABPM and pregnancy

ABPM use has confirmed a progressive increase in BP during the second half of pregnancy and allows for objectifying a nocturnal drop in BP. The difference between diurnal and nocturnal BPs exists throughout the pregnancy.

A number of BP reference

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thresholds, obtained by ABPM, have been published concerning various stages of pregnancy (Figure 1).⁹⁻¹⁴

Other than with regards to knowledge of pregnancy-specific physiologic phenomena, the usefulness of ABPM has been studied from four angles:

- diagnosing whitecoat hypertension,
- predicting the development of gestational hypertension,
- restricted fetal growth, and
- certain complications related to gestational hypertension.

Diagnosing whitecoat hypertension

Diagnosing whitecoat hypertension in pregnant women is important because it is associated with a lower risk of proteinuria, restricted growth, and premature delivery, compared to gestational hypertension. In contrast, the risk of a C-section is high if the diagnosis is unknown. The ABPM-established whitecoat hypertension rate, among pregnant women presenting with a BP > 140/90 mmHg in office, is approximately 30%.

Targeting gestational hypertension

During the first half of pregnancy, different studies have noted

Table 2

Sensitivity and specificity values of daily APBM BP in predicting gestational hypertension in low-risk populations.

Author	Stage of pregnancy (week)	APBM threshold (mmHg)	Sensitivity (%)	Specificity (%)
Kyle n=128	18	MBP > 80	65	51
	28	MBP > 80	88	42
	28	DBP > 75	35	90
Higgins n=1,048	18-24	DBP > 71	20	97
Hermida n=113	< 12	SBP > 108	85	84
		DBP > 64	64	> 85
	13-24	SBP > 108	85	87
		DBP > 63	68	> 85
24	SBP > 112	90	85	
	DBP > 66	82	> 90	
Brown n=164	18-30	SBP > 115	77	69

n: Sample size
DBP: Diastolic BP
MBP: Mean BP
SBP: Systolic BP

the ABPM BPs are higher among women who will later present with gestational hypertension.^{6,9-13} However, this difference is small and the discrimination thresholds are difficult to establish. Tables 2 and 3 present a number of ABPM BP thresholds for predicting gestational hypertension in both low and high risk groups.⁹⁻¹⁴ These data suggest that ABPM is of moderate value in predicting gestational hypertension. However, its value may be enhanced by using the hyperbaric index.

Restricted fetal growth/further complications

Other authors have studied the value of ABPM in predicting acute arterial hypertension, proteinuria, restricted growth, and prematurity in women presenting with a BP of 140/90 mmHg in a medical environment (Table 4).^{15,16} The level of sensitivity and specificity of different ABPM BP thresholds are generally comparable to those measured in a medical environment.

Cont'd on page 86 →

Table 3

Sensitivity and specificity values of daily APBM BP in predicting gestational hypertension in high-risk populations

Author	Stage of pregnancy (weeks)	ABPM threshold (mmHg)	Sensitivity (%)	Specificity (%)
Benedetto n=1,041	20-25	SBP > 103	88	75
		DBP > 60	82	55
Hermida n=152	< 12	HBI > 15	93	> 98
	13-24	HBI > 15	97	> 98
	> 24	HBI > 15	99	> 98
Brown n=122	18-30	SBP > 119	60	61

n: Sample size
 DBP: Diastolic BP
 SBP: Systolic BP
 HBI: Hyperbaric Index (mmHg/hour)

Table 4

Prognostic value of ABPM in a hypertensive population

Author	ABPM threshold (mmHg)	Comparative group	Sensitivity (%)	Specificity (%)
Acute hypertension (160/110 mmHg)				
Penny	DBP > 85	DBP > 90	65 vs. 44	71 vs. 77
Bellomo	SBP > 125	SBP > 140	88 vs. 92	78 vs. 55
	or DBP > 74	or DBP > 90		
Proteinuria				
Penny	DBP > 85	DBP > 90	47 vs. 40	60 vs. 71
Peek	Diurnal DBP > 85	DBP > 90	79 vs. 69	57 vs. 41
Growth restriction				
Penny	DBP > 85	DBP > 90	56 vs. 39	60 vs. 70
Peek	Diurnal DBP > 85	DBP > 90	72 vs. 80	51 vs. 43
Prematurity				
Penny	DBP > 85	DBP > 90	55 vs. 92	68 vs. 75
Peek	Diurnal DBP > 85	DBP > 90	86 vs. 86	55 vs. 48

SBP: Systolic BP
 DBP: Diastolic BP

Breaking it down

BP drops in the early stage of pregnancy, reaches its lowest point between 20 and 24 weeks, and progressively rises thereafter. It is not unusual to see normal BPs in a woman presenting with pre-existing hypertension, especially before the 28th week. In order to establish an abnormality in a subject's BP readings, the readings must be compared with norms established in a population at the same stage of pregnancy. Such values are available for ABPM, but not for HBPM.

Among pregnancy-specific hypertensive pathologies, gestational hypertension is unquestionably the most worrisome complication for both mother and fetus. We do not have tools available that permit early identification of women who will go on to present with gestational hypertension. Furthermore, development of this complication can be fulminant: the majority of cases of eclampsia or maternal death resulting from acute gestational hypertension occur within the seven-day period following a pre-natal visit.¹⁷ HBPM and ABPM do not appear to be effective in predicting gestational hypertension.

The validity of oscillometric manometers in pregnancies complicated by hypertension is uncertain.

The HBPM likely permits close followup of women identified as being at high risk for



developing gestational hypertension or at risk of a rapid increase in BP. HBPM is to be used as part of a maternal-fetal monitoring program and resources must be made available if high BPs are measured. Aneroid sphygmomanometers are the best tool for the pregnant woman, as few automated manometers have been validated for gestational hypertension. It is worth noting some women may find these systems difficult to use and, in terms of reliability, the BP readings may be questionable because these specific devices have no memory.

For its part, ABPM allows for objectifying a number of physiologic phenomena in a normal pregnancy or one complicated by hypertension. However, the data concerning the usefulness of ABPM in predicting gestational hypertension and complications arising from this condition are inconclusive. It is unlikely ABPM use will replace the usual assessment of normal pregnancies, or those complicated by hypertension. CME

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Take-home message



- Although self-BP measurement creates anxiety in some patients, self-measurement readings are reliable and generally lower than BP taken at the doctor's office.
- The purpose of ABPM is to repeatedly measure BP over a 24- or 48-hour period using a portable manometer; ABPM readings are superior, to those taken in the doctor's office, in predicting hypertensive cardiovascular complications.

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