

Abstract:

Regular blood pressure checks are crucial to the early detection of pre-eclampsia and are associated with better maternal and neonatal outcomes. Hypertension can develop between antenatal visits however and complications may progress rapidly. Having women monitor their own blood pressure at home could be an effective way of overcoming this problem, providing a cost-effective means of improving outcomes and empowering women in their care. Further evidence is needed however to ensure that the practice is implemented safely and favourably for both women and health care professionals.

Key Sentences:

Early detection of hypertension in pregnancy leads to better outcomes for women and babies.

Self-monitoring of blood pressure in pregnancy may improve the early detection and control of hypertension.

Having women monitor their blood pressure at home empowers them to engage in their own care and reinforces the woman centred model of practice.

Self-monitoring of blood pressure could reduce the need for extra antenatal clinic appointments.

Introduction

Pre-eclampsia screening is one of the cornerstones of antenatal care. Early recognition of the disorder is linked to improved maternal and neonatal outcomes and this relies primarily upon regular monitoring of blood pressure. Traditionally this responsibility has rested largely with midwives however there is evidence to suggest that the practice of home blood pressure monitoring is becoming increasingly popular with pregnant women – either through their own initiative or on the advice of their health care providers. With its potential to empower women and provide a cost-effective means of improving early detection of pre-eclampsia, self-monitoring of blood pressure (SMBP) offers exciting possibilities - particularly when combined with advances in technology, such

as smart phone Apps. Preliminary research suggests that the addition of SMBP to antenatal care offers potential benefit. However, more robust evidence is needed to guide the practice and ensure that home readings are accurate and acted on appropriately in a way that is acceptable to pregnant women. In short, the research needs to keep abreast of evolving practice.

The Importance of Monitoring Blood Pressure in Pregnancy

Hypertensive disorders in pregnancy have long been recognised as a leading cause of maternal and infant morbidity and mortality (Duley, 2009). Raised blood pressure affects approximately 10% of pregnancies worldwide, and a high proportion of affected women develop pre-eclampsia. Globally, around 14% of maternal mortality is due to pre-eclampsia (Say *et al*, 2014).

The UK has seen a decline in mortality related to pre-eclampsia (MBRRACE, 2016) however inadequate management of blood pressure was highlighted as a key factor in the 2005-2008 Confidential Enquiries into Maternal Deaths and there is still room for improvements in care. Early diagnosis of pre-eclampsia is associated with better outcomes and midwives play a key role in monitoring for the disorder. The current schedule of antenatal care is essentially designed with this in mind, however early detection can still be a challenge.

Pre-eclampsia is an unpredictable disease. It is possible for women to develop pre-eclampsia and be normotensive (Cowan, Redman and Walker, 2017) however blood pressure remains the most important indicator for the disorder and is a key diagnostic sign. This is why blood pressure - along with proteinuria - is checked at every antenatal appointment. Hypertension can develop between antenatal visits however, leading some women to slip through the screening net. Having women who are at higher risk of developing pre-eclampsia monitor their own blood pressure at home may offer a solution.

Self-monitoring of blood pressure (SMBP) has been used with good effect in the general population for some time now (Baral-Grant *et al*, 2012) and it would appear that the practice is increasingly

common amongst pregnant women (Magee et al, 2007; Dehaek et al, 2010, ACOG, 2013). St George's hospital in London for example encourage SMBP in women with gestational hypertension and have developed a smartphone App in which the women can document their readings (The Health Foundation, 2017).

Despite its burgeoning popularity there is a lack of robust evidence to show that SMBP in pregnancy is beneficial and to guide its use. Pregnancy related hypertension is a different disease process to that of the general population presenting unique challenges in terms of surveillance and management. Guidelines on the use of SMBP in pregnancy need to be based on pregnancy specific research. And while the evidence available suggests that the potential benefits of its use are significant (Denolle et al, 2005; Rey, Pilon and Boudreault, 2007; Lo et al, 2002) the validity of these studies is limited by their short duration, small sample numbers and in some cases the use of monitors which are not validated for pregnancy. Further research is needed before any reliable conclusions can be drawn on the potential benefits and possible drawbacks associated with SMBP in pregnancy.

Potential Benefits of Self-Monitoring of Blood Pressure in Pregnancy

SMBP in pregnancy could help to detect hypertension earlier by identifying significant increases in blood pressure as they occur. Self-monitoring could also give a more accurate picture of blood pressure fluctuations that wouldn't be evident from clinic readings alone. Blood pressure can be labile - particularly in the earlier stages of pre-eclampsia - and clinic measurements may not reflect the true patterns. Self-monitoring also has the potential to detect "masked hypertension" - where clinic readings are normal but home readings are raised (Pickering, Eguchi and Kario, 2007) and "White Coat Syndrome" - where the blood pressure is high in clinic but otherwise normal (Pickering et al, 1998)

SMBP provides women with an opportunity to be more actively involved in their care - an important aspect of the "women centred" model underpinning midwifery practice (NICE, 2008; RCM, 2014).

Within a wider context it is recognised that greater patient involvement improves health outcomes, satisfaction with care, knowledge and understanding of health status and adherence to treatment while also bringing about significant reductions in costs (Department of Health (DOH) 2010). SMBP offers similar potential to pregnant women.

First-hand accounts from sufferers of pre-eclampsia consistently highlight a lack of information and control as a source of psychological trauma (Cowan, Redman & Walker, 2017). Self-monitoring may provide extra reassurance to women, especially if they've had pre-eclampsia in a previous pregnancy. It could also cut down on extra clinic appointments for those who require closer surveillance and be less burdensome for women having to juggle the demands of work and/or other children.

Taking a more active role in the screening of pre-eclampsia could provide women with a better understanding of the disorder and the significance of its signs and symptoms. The unpredictable and often asymptomatic nature of pre-eclampsia means that women can be unaware of its existence prior to the advanced stages. The more informed a woman is about pre-eclampsia the better the outcomes are likely to be for her and her baby (MBRRACE, 2016).

SMBP also has the potential to provide significant cost and time benefits by improving outcomes without placing additional strain on resources. Current guidelines advise that women who are at higher risk of developing pre-eclampsia be reviewed more frequently in clinic (APEC, 2004; NICE, 2010). However, the majority (65%) of these women never develop pre-eclampsia (Poon et al, 2010) making the benefit-cost ratio of this approach less than ideal. "Very frequent checks are likely to catch most cases, but at a cost for 'normal' mothers-to-be, caregivers and health systems.

Infrequent checks are less intrusive but will miss more cases". (Cowan, Redman & Walker, 2017).

Self-monitoring could be an effective means of ensuring that hypertension is identified in a timely way with fewer extra clinic visits.

Management of hypertensive disorders in pregnancy often involves treatment with medication, which is titrated according to the blood pressure. Optimal management therefore relies on accurate blood pressure measurements which self-monitoring could provide. This in turn could lead to better outcomes with lower associated health-care costs.

Advances in technology can play an important role in facilitating the empowerment of pregnant women through greater involvement in their care. Information about hypertension in pregnancy is more readily accessible, smart phones have opened up new avenues of communication and data collection and automated blood pressure machines are freely available to purchase. The need to develop new models of care which harness technological advances has been highlighted by the government (HM Government, 2014) yet compared to other sectors the health service has been slower on the uptake. According to National Information Board “In 2014 59% of all citizens in the UK have a smartphone and 84% of adults use the internet; however, when asked, only 2% of the population report any digitally enabled transaction with the NHS” (HM Government, 2014: 12).

Given the potential benefits of SMBP it is easy to see why the practice is becoming more common however it is important to weigh the merits against any possible drawbacks.

Potential Drawbacks of Self-Monitoring of Blood Pressure in Pregnancy

Rather than provide reassurance, it is possible that the process of self-monitoring could be anxiety provoking for some women, particularly if their blood pressure is elevated or the home readings differ significantly from those in clinic.

Supplying women with blood pressure monitors alone is also insufficient, it is crucial that women who are self-monitoring understand the appropriate action to take should their blood pressure start to rise. Hypertension doesn't always follow a predictable pattern and it can be a challenge for midwives to decide on the best course of action, particularly if the blood pressure is on the high end of normal or labile. The publication of the PRECOG community guidelines (APEC, 2004) provided

much needed clarity in this respect however it is questionable whether midwives would realistically have the time to tailor this information to each woman's needs. If they are going to be encouraged to check their own blood pressure then women need clear instructions on how to identify and respond to an abnormal reading and currently no official guidance exists.

It is possible that self-monitoring could lead to increased clinic or hospital visits without any measureable benefit as not all hypertensive women require treatment or intervention. Poor technique and the use of monitors which haven't been validated for pregnancy could also produce inaccurate readings (Magee et al, 2014).

Pre-eclampsia is an unpredictable disorder. Women can develop the disease while remaining normotensive and unremarkable home readings could provide false reassurance in such instances. Pre-eclampsia can also progress rapidly and a seemingly healthy woman can become dangerously unwell from it in a short space of time. Standard practice in the UK has traditionally been to admit women to hospital once a diagnosis of pre-eclampsia has been made (NICE, 2008) however anecdotal evidence suggests that women in the earlier stages of the disease are sometimes managed as outpatients. On the one hand, it could be argued that home monitoring makes outpatient management of pre-eclampsia safer through increased surveillance. On the other hand, it is possible that self-monitoring could encourage more obstetricians to defer admission to hospital which could have safety implications. Randomised controlled trials would have to be undertaken to evaluate this.

While the practice of SMBP appears to be gaining momentum robust evidence is required to ensure it is used safely and effectively.

Conclusion

Early detection of raised blood pressure remains the most effective tool for improving outcomes in women and infants affected by hypertensive disorders in pregnancy. Through self-monitoring

pregnant women could hold the key to improving early detection of hypertension. Drawing upon advances in technology SMBP has the potential to engage pregnant women in their care and meet their needs more effectively while also providing a cost-effective way of improving outcomes.

Improper use of SMBP in pregnancy carries risks however and it is important that both the women and their care providers have adequate guidance on how to implement it safely. The research underpinning SMBP in pregnancy is lacking and in the absence of evidence-based guidelines it is currently down to individual clinicians to decide how to integrate it in practice. As SMBP in pregnancy becomes more common, there is a pressing need for high quality evidence to inform a new model of care.

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