CLINICAL ALERT

Severe hypertension in pregnancy: Using dynamic checklists to save lives

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Severe hypertension is a major cause of morbidity and mortality. The South African *Saving Mothers* report (2011 - 2013) indicates that cerebral injury due to severe hypertension is resulting in avoidable maternal deaths. This demands that management of severe hypertension in pregnancy needs to be improved. A rapid-acting antihypertensive is recommended for the initial management of severe hypertension during pregnancy. A single dose of a rapid-acting agent may be ineffective, in which case incremental doses of the same medication or another antihypertensive may be required for adequate blood pressure control. To ensure that appropriate antihypertensives at the correct doses are administered, the use of a guideline in a dynamic checklist format is advocated and discussed in this article. It is envisaged that the use of dynamic checklists will be valuable to all healthcare professionals providing care during pregnancy and the puerperium.

S Afr Med J 2016;106(8):767-770. DOI:10.7196/SAMJ.2016.v106i8.10908

Hypertensive disorders of pregnancy (gestational hypertension, pre-eclampsia, eclampsia and chronic hypertension) are a major cause of maternal mortality in South Africa (SA) and worldwide. The most recent *Saving Mothers* report (2011 - 2013)[1] indicates that 14.8% of all maternal deaths were due to hypertensive disorders of pregnancy (HDP). This publication, which is the triennial report of the National Committee for Confidential Enquiries into Maternal Deaths (NCCEMD) in SA, also indicates that the final cause of death in >50% of hypertensive maternal mortality was probably associated with cerebral injury, particularly in cases of severe pre-eclampsia and eclampsia. In addition, the majority of deaths occurred in young women in their first pregnancies and a large proportion (>60%) were avoidable.[1]

Although severe HDP may cause other target organ damage such as renal impairment and pulmonary oedema, the authors have chosen to elaborate on cerebral injury, given the *Saving Mothers* report on the association between untreated severe hypertension and cerebral haemorrhage.[1] Moreover, in the authors' clinical experience and according to findings in recent reports, severe hypertension often precedes other cerebral manifestations such as blindness in pregnancy, stroke, altered mental state and the posterior reversible encephalopathy syndrome (PRES).[2-6]

PRES and severe hypertension in pregnancy

A known maternal cerebral complication of severe pre-eclampsia is PRES.[2] This syndrome is a clinico-neuroimaging entity and is hypothesised to be related to impaired cerebral blood flow autoregulation that leads to either over- or under-perfusion of the brain. On magnetic resonance imaging and computed tomography scans of the brain, oedema is seen mainly in the subcortical white matter and occasionally in the cortex of the occipital and parietal lobes.[3] Recently, Van Veen *et al.*[4] investigated cerebral blood flow autoregulation by measuring cerebral artery blood flow velocity using transcranial Doppler ultrasound and found impaired autoregulation in women with pre-eclampsia when compared with those who had gestational hypertension or normal pregnancies. There is therefore increasing evidence that impaired cerebral blood flow autoregulation plays a central pathological role in cerebral manifestations associated with pre-eclampsia/eclampsia syndrome.

Symptoms of PRES include persistent headache, nausea, vomiting, visual disturbances, confusion and seizures. These clinical signs are well known by obstetricians to herald seizures and other features of cerebral dysfunction. Eclampsia is reported to be one of the most important causes of PRES, and although most patients have severe hypertension, some have mildly elevated or even normal blood pressure (BP).[2,4]

It has been reported that PRES is reversible and that initiating early treatment of severe hypertension leads to cure, while delayed recognition of symptoms and cognisance of the need to lower high BP judiciously but immediately leads to cerebral injury.[2,3] The *Saving Mothers* report (2011 - 2013)[1] indicates that one of the avoidable health professional factors leading to maternal mortality is failure to institute appropriate and prompt management of severe systolic and diastolic hypertension in the ante-, intra- and postpartum periods.

Immediate treatment of severe hypertension in pregnancy

Standardised clinical protocols for the management of severe pre-eclampsia and eclampsia have been shown to reduce complications associated with this hypertensive disorder.[7-9] In pregnancy, acute-onset severe hypertension that is accurately measured using standard techniques and persistent for ≥15 minutes is regarded as a hypertensive emergency.[7-9] If not adequately treated, severe hypertension can cause cerebral injury. A systolic BP of ≥160 mmHg is included in the definition of severe hypertension in pregnancy. Severe diastolic hypertension of ≥110 mmHg is also regarded as a hypertensive emergency.[7-10] Pregnant women with acute-onset, severe systolic and/or diastolic BPs in the ante-, intra-, or immediate

postpartum periods therefore warrant antihypertensive treatment. The goal should be to lower high BP levels to a range of 140 - 150/90 - 100 mmHg in order to prevent repeated prolonged exposure of the patient to severe systolic hypertension with subsequent loss of cerebral vasculature autoregulation.[10]

Some case scenarios and the '5 Rs' in severe hypertension in pregnancy

If health professionals are aware that severe hypertension in pregnancy may result in cerebral injury, what should they do when they are faced with such clinical situations in an SA setting?

Health professionals must be aware of the **5 Rs:**

1. **Recognition** that acute-onset severe hypertension (≥160 mmHg systolic or ≥110 mmHg diastolic BP) in pregnant women is a MAJOR ALERT
2. **Responding** by notifying a specialist or seeking advice from the most appropriate health professional
3. **Responsibility:** taking responsibility to initiate early antihypertensive therapy and provide close monitoring until the patient is stabilised
4. **Reviewing** the clinical situation once high BP is stabilised
5. **Realising** that effective high BP control is merely a surrogate marker of maternal and neonatal outcome; components such as fetal assessment, prevention of seizures (eclampsia), expeditious delivery and post-delivery care must therefore be considered.[1-10]

Case scenarios

Health professionals may be faced with women with acute-onset severe hypertension in varying clinical scenarios. These include:

- In the antenatal period. When hypertension occurs in this setting, the patient should be admitted to hospital immediately and the high BP should be stabilised before delivery, even in urgent situations.[1] Lowering of the high BP should occur in a high-care area, or a dedicated bed selected for this purpose.
- If transfer from a district health facility to a regional/tertiary centre is required, the high BP should be stabilised and other measures such as the administration of magnesium (in cases of severe pre-eclampsia and/or eclampsia) started before transfer. Monitoring must continue while awaiting an ambulance for the transfer.
- When the diagnosis of acute-onset severe pre-eclampsia is made in an office setting, available emergency treatment should be initiated and the patient expeditiously sent to a regional/tertiary hospital for treatment and further management.
- If any hospitalised patient with pre-eclampsia has either a systolic BP of 160 mmHg or a diastolic BP of 110 mmHg, the automatic response should be initiating a rapid-acting antihypertensive agent such as nifedipine 10 mg orally, labetalol 20 mg intravenously (IV) or hydralazine 5 - 10 mg IV.[9,10]
- Induction of anaesthesia and intubation. In a setting in which the patient may require endotracheal intubation in a labour ward (high-care bed), an operating theatre or an intensive care unit, it should be recognised that endotracheal intubation increases the BP and should therefore not be undertaken without prior measures to prevent or minimise the hypertensive response to intubation.
- Acute-onset severe hypertension in the postpartum period. Onset may occur for the first time after delivery, or it may be superimposed on women with chronic hypertension, gestational hypertension and those with mild to moderate pre-eclampsia. In women with such diagnoses, long-acting antihypertensive therapy must therefore be maintained after delivery and not stopped abruptly. In the clinical setting of postpartum acute-onset severe hypertension, the same treatment, viz. rapid-acting antihypertensive agents, must be used to stabilise systolic and/or diastolic hypertension.

In general terms, healthcare professionals must provide close maternofetal monitoring during the stabilisation of acute-onset severe hypertension. Judicious fluid administration is recommended, especially in the oedematous pre-eclamptic patient with oliguria and laboratory signs of renal dysfunction. Fluid balance and signs of early pulmonary oedema must therefore be given careful attention. After initial BP stabilisation, close monitoring should be carried out and a maintenance dose of antihypertensive(s) given.

Over the past decade, the use of clinical protocols and dynamic checklists has become a standard approach to ensure patient safety and improve the care provided to mothers and their newborns.[11] The clinical management of severe acute-onset pregnancy hypertension lends itself to dynamic checklists.

First-line antihypertensive therapy for acute-onset severe hypertension

IV labetalol, IV dihydralazine and oral nifedipine are the commonly used antihypertensive agents. The contraindications to and compelling indications for the available rapid-acting agents must be considered when choosing a particular drug. Magnesium sulphate is not recommended as an antihypertensive agent, but remains the drug of choice for seizure prophylaxis in severe pre-eclampsia and for controlling seizures in eclampsia.[12] Nifedipine may be the more appropriate antihypertensive agent in a setting of primary healthcare clinics and midwifery obstetric units because it can be given orally.[13,14] Intravenous agents (labetalol or dihydralazine if available) are preferable if the patient is restless or semiconscious or in a hospital setting.

Fig. 1 outlines the steps for the use of rapid-acting antihypertensive agents for acute-onset severe hypertension during pregnancy and the postpartum period.

It should be noted that dihydralazine is not available in most provinces of SA. Oral nifedipine and/or labetalol should therefore be a 'stock item' for all hospitals providing healthcare for pregnant women. Both of these drugs are available in public sector hospitals in SA. The common contraindications of rapid-acting antihypertensive agents are shown in Table 1. All the agents listed may cause severe hypotension, but these events are rare. It is suggested that where possible fetal heart rate monitoring should be done at the same time as the lowering of very high BP.

Key points

- There is consensus that sustained severe hypertension in pregnancy should be lowered immediately in a controlled manner to reduce the risk of cerebral complications.
- A systolic BP of 160 mmHg is suggested as the most appropriate threshold for defining severe maternal hypertension.
- If threshold systolic BP levels are sustained or occur with a combination of symptoms suggesting maternal cerebral complications, immediate use of rapid-acting antihypertensive agents is essential.
- The goal of rapid-acting antihypertensive agents should be to achieve a BP of 140 - 150/90 - 100 mmHg.
- Use of dynamic checklists is essential for the management of acute-onset severe pregnancy hypertension.

Conclusion

Severe hypertension in pregnancy is an **emergency (major alert)** that requires immediate attention. An inappropriately managed severe

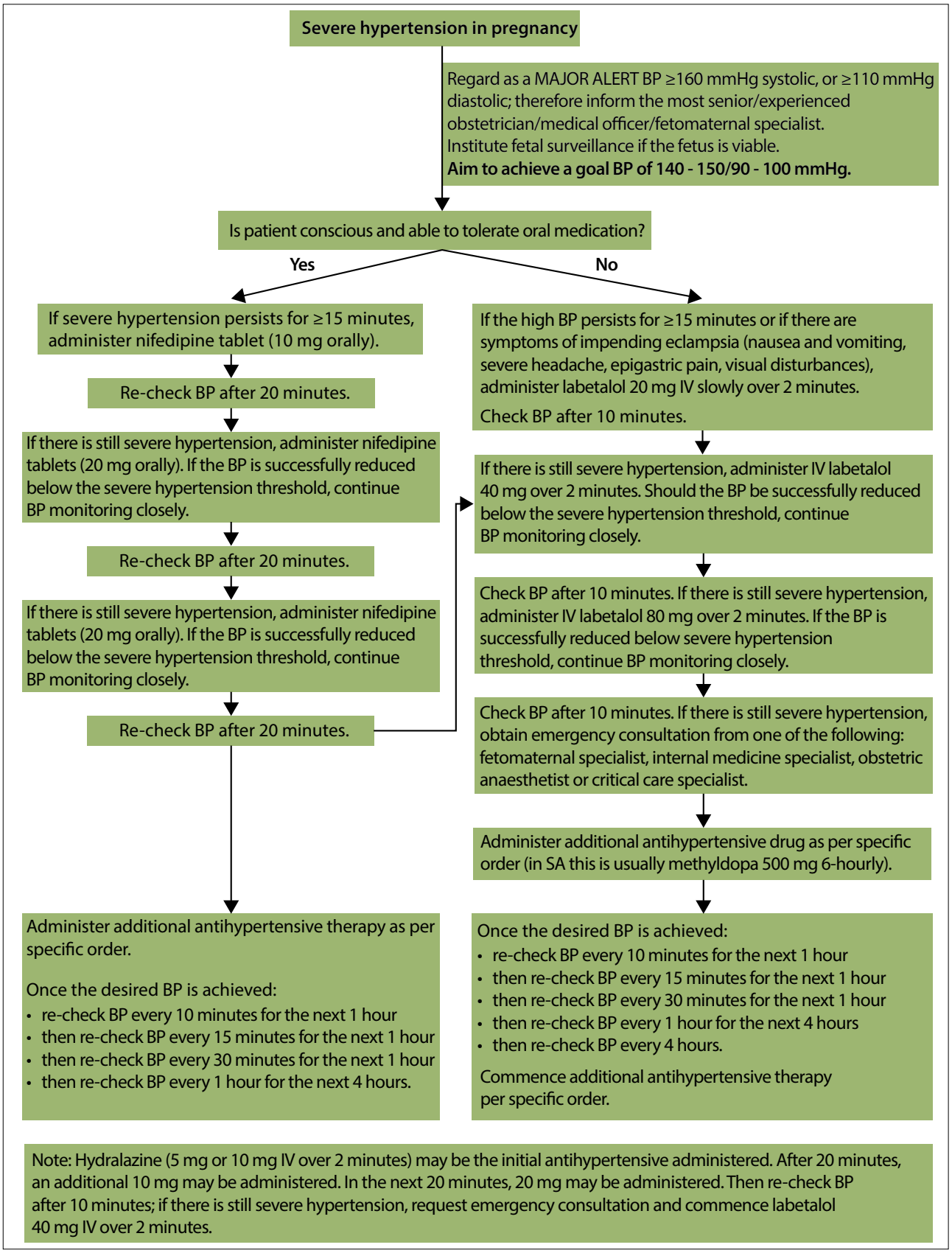


Fig. 1. Algorithm for the initial control of BP in severe hypertension in pregnancy.

hypertensive condition may result in cerebral haemorrhage. Timely action to reduce sustained systolic hypertension judiciously by means of a rapid-acting antihypertensive drug will reduce maternal and neonatal mortality and morbidity.

Table 1. Common contraindications of the rapid-acting antihypertensive agents

	Cautions	Contraindications
Nifedipine	Hypertrophic obstructive cardiomyopathy, aortic stenosis. The capsules cause a reflex increase in sympathetic tone which should be avoided in women with increased myocardial oxygen demands, e.g. fixed valvular obstruction.	Unstable angina, congestive heart failure, myocardial infarction
Labetalol	Controlled heart failure, hepatic disorder. Best avoided in women with asthma. Parenteral labetalol may cause neonatal bradycardia, but is not a major problem in clinical practice.	Heart failure with symptoms, 2nd and 3rd degree atrioventricular block, severe bronchospasm, asthma, sinus bradycardia
Hydralazine	Renal or hepatic impairment, porphyria, angina. It causes a reflex increase in sympathetic tone and should therefore be avoided for women in whom increased myocardial oxygen demands could be dangerous, e.g. coronary artery disease, mitral stenosis.	Systemic lupus erythematosus, aortic stenosis, tachycardia, hypertrophic obstructive cardiomyopathy

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Accepted 13 April 2016.