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Severe systolic hypertension and the search for safer motherhood

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ABSTRACT

Timely and appropriate response to severe hypertension during gestation is an important component of quality, safe care for pregnant or puerperal mothers regardless of causation. The reduction of severe maternal morbidity and maternal mortality in the hypertensive mother is clearly enhanced by the addition of standard protocols for provider response to severe hypertension, particularly severe systolic hypertension. The program developed in New York State via the Safe Motherhood Initiative promotes the implementation of unit-specific safety bundles, especially one that is focused upon a standardized approach to handling the obstetric emergency of severe hypertension usually associated with preeclampsia/eclampsia. The comprehensive preeclampsia/eclampsia safety bundle as summarized by Drs. Moroz and colleagues is reviewed especially from the perspective of its focus on the timely and specific responses for health care providers to make when severe hypertension is detected in the pregnant patient. Evidence-based guidance to practice considerations and clinical care of patients with preeclampsia/eclampsia is embedded within the program outlined for New York State by Moroz and her District II ACOG colleagues. There is a central focus on timely and appropriate antepartum/postpartum management of severe hypertension, a core concept to lessen maternal risk for cerebral hemorrhage. Ten considerations for further integration into the New York program are suggested. Beyond blood pressure control, there is a need for systematic review of interventions and outcomes over time, attention to possible future variations of the protocol for racial/ethnic patient groups at highest risk for maternal morbidity and mortality, and the identification of biomarker(s) that further specify and quantify risk to the maternal brain and other organ systems when severe hypertension develops. Safer motherhood will happen when evidence for best practice is integrated into systems of care for all patients.

Introduction

This year (2015) marks the 10th anniversary of the call first made by a group of investigators from the University of Mississippi Medical Center (UMMC) and published in the February 2005 issue of Obstetrics and Gynecology to call for an important paradigm change in obstetric practice—specifically to elevate the finding of *severe systolic hypertension* ≥160 mmHg in any pregnant patient for any reason to the status of a hypertensive emergency requiring immediate attention and prompt treatment by provider(s).[1]

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Based on the findings in 28 mothers who suffered a stroke and/or cerebral hemorrhage in association with preeclampsia/eclampsia/HELLP syndrome, the Mississippi investigators observed that while all but one patient in their series expressed *severe systolic* hypertension (≥160 mmHg) prior to hemorrhagic-arterial stroke, in contrast to what was expected only three (13%) of the patients in the series had evidence of *severe diastolic* hypertension (≥110 mmHg) in the hours preceding a stroke event. Only three patients had received pre-stroke antihypertensive medication, ostensibly because obstetric providers were withholding intervention pending evidence of severe diastolic hypertension, mean arterial pressures >125–130 mmHg, and/or sustained severe systolic hypertension exceeding readings of 170–180 mmHg.[2,3] The lack of immediate intervention with antihypertensive therapy once systolic blood pressure was ≥160 mmHg likely contributed to the deaths of 15 mothers who had cerebral bleeds (54%) and 10 others who survived cerebral bleeds but with significant residual neurological sequelae. Although patient numbers were small and validation was required by other investigators ideally with access to large and informative patient databases, the findings were hugely significant with regard to the implication for reducing maternal morbidity and mortality on a global basis if severe maternal hypertension could be rapidly interrupted regardless of cause. The finding that severe diastolic hypertension does not usually develop before stroke in most patients with preeclampsia required a paradigm shift away from the primacy of that parameter and toward a focus on severe systolic hypertension.[1]

Consistent with these findings in pregnant patients was the report one decade earlier in 1995 by Lindenstrom et al.[4] who used the Framingham data to determine that adult male and female (non-pregnant) patients in general have a risk of hemorrhagic stroke that correlates directly with the degree of *systolic* blood pressure elevation which is less related to, but not independent of, the diastolic blood pressure.

Protocols and health care systems

Obstetric colleagues in the UK/RCOG likely were the first country to take the next step and implement this change in paradigm with modification of obstetric practice on a large scale. Recognizing that severe hypertension can cause central nervous system injury, observing as a part of the Confidential inquiries that two-thirds of maternal deaths in the UK between 2003 and 2005 resulted from cerebral hemorrhage or infarction, and aware of the 2005 call for a paradigm change in practice with regard to obstetric control of severe systolic hypertension, the RCOG altered their obstetric care guidelines for maternity patients with preeclampsia/eclampsia/HELLP syndrome with the directive to rapidly intervene when severe systolic hypertension was detected. Data for the ensuing 2006–2008 years in the UK revealed significantly improved maternal mortality rates because of a reduction in cerebral and respiratory complications.[5] Similar changes to Canadian practice were reflected in their hypertension guidelines released both in 2008 and 2014.[6,7]

Even before ACOG revised its guidelines for preeclampsia practice in the United States to respond to this new paradigm, and while acting in his consultant leadership role with the Hospital Corporation of America, Dr. Steve Clark facilitated the introduction of checklist-based protocols in HCA hospitals beginning in 2007 which included the prompt recognition and treatment of in-hospital severe systolic hypertension. Between 2007 and 2012 a policy that involved blood pressure thresholds for prompt therapeutic intervention was instrumental in eliminating deaths from in-hospital intracranial hemorrhage and reducing overall deaths from preeclampsia from 15 to 3 in a total population of >1.2 million HCA-delivered women ($P = 0.02$).[8,9] Clark et al.[8,9] provided evidence that disease-specific protocols, similar to those espoused by UK/RCOG guidelines, can be beneficial and helpful to reduce maternal death because of hypertensive disease as well as postoperative pulmonary embolism. The prompt reduction within 15 min of any systolic blood pressure ≥160 or diastolic blood pressure ≥110 in a hospitalized patient with preeclampsia became the third of the "10 Clinical Diamonds" that Clark and Hankins recommended to clinicians to prevent maternal death.[10]

ACOG and severe hypertension

Based upon the mounting evidence for an integral role of severe systolic hypertension prevention in maternal morbidity and mortality reduction, ACOG's Committee on Obstetric Practice developed and released in December 2011 its Committee Opinion Number 514 entitled "Emergent Therapy for Acute-Onset, Severe Hypertension During Pregnancy and the Postpartum Period."[11] Importantly this Committee Opinion delineated "best practice" standardized order sets to enable individuals and institutions to have mechanisms in place to promptly administer either labetalol or hydralazine to treat severe intrapartum or postpartum hypertension. This Committee Opinion was recently updated to include oral nifedipine as a third therapeutic option.[12] The recently released ACOG Presidential Task Force Report on Hypertensive Disorders of Pregnancy continues within its recommendations and guidelines the same emphasis upon rapid recognition and response to acute-onset severe systolic hypertension for safer, better maternal outcomes, both during pregnancy and very importantly into the postpartum period.[13] More recently, the American Heart Association and American Stroke Association affirmed their support of the 160 mmHg threshold for treating severe systolic hypertension.[14] These guidelines continue postpartum since the prevalence of de novo postpartum hypertension or preeclampsia ranges between 0.3% and 27.5%.[15] Importantly and appropriately, Moroz et al. emphasize these recommendations and considerations in their hypertension bundle.

Maternal mortality and severe morbidity

A number of other developments in American obstetrics have occurred in parallel with, in support of and concurrent with the paradigm change in how practitioners should respond to severe systolic hypertension in their patients. Largely in response to Dr. William Callaghan and his CDC colleagues'