INTRODUCTION AND HISTORICAL PERSPECTIVE

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Hypertensive disorders of pregnancy are one of the most common medical disorders of pregnancy, occurring in 12-22% of pregnancies.[1] These disorders are responsible for approximately 17% of maternal mortality in the United States.[2,3] The California Pregnancy-Associated Mortality Review (CA-PAMR)[3], found a similar incidence of maternal mortality related to preeclampsia and associated syndromes, such as severe preeclampsia, eclampsia and HELLP (**H**emolysis, **E**levated Liver enzymes, **L**ow **P**latelet Count) from 2002-2004. The California Pregnancy Associated Mortality Review (CA-PAMR)[1], found a similar incidence of maternal mortality related to preeclampsia and associated syndromes from 2002-2004. In addition, hypertensive disorders are one of the leading contributors to premature birth leading to significant neonatal morbidity and mortality. Delivery of the fetus and placenta is an essential and critical component of the management of this disease. Induced premature delivery, placing the preterm newborn at significant risk, is often necessary to preserve the pregnant patient's health and life. The cost of preserving maternal health is a potential increase in the incidence of preterm delivery.

The association between preeclampsia and maternal mortality has been noted in the medical literature for over 150 years. Physicians in Great Britain and France identified the presence of albumin in the urine of pregnant women and edema as factors in the development of eclampsia in the mid-1800s. With the development of the sphygmomanometer in 1888, physicians recognized that elevated blood pressure was associated with eclampsia, leading to the triad of proteinuria, edema and hypertension being universally recognized as precursors to eclampsia. The term preeclampsia was introduced as a means to recognize the time period where delivery could potentially be used to prevent the progression to eclampsia. Organizational efforts to introduce prenatal care as an intervention to prevent and treat conditions of pregnancy that contributed to high maternal mortality rates largely addressed the identification and treatment of preeclampsia and eclampsia. The current pattern of prenatal care visits closely reflects the recommendations published by the Children's Bureau in 1924.[4]

Major emphasis has been placed on the prevention of eclamptic seizures, which are associated with a significant increase in both maternal and neonatal morbidity and mortality. The use of magnesium sulfate to prevent and treat seizures has been well accepted throughout the world as the standard of care.[5,6-8] The current standard of practice is to administer magnesium sulfate for seizure prophylaxis in patients with severe preeclampsia. Seizure prophylaxis for treatment of preeclampsia without severe features (mild) remains controversial.

Historically, less emphasis has been placed on the control of blood pressure to prevent stroke, and this aspect of management has recently been identified as a major gap in knowledge and application of proven therapeutic interventions. Treatment of systolic blood

pressure at levels of equal to or greater than 160, and/or diastolic blood pressure of equal to or greater than 105 has been emphasized by Martin et al.[9] However, the clinician may choose to institute therapy at lower levels of systolic and/or diastolic blood pressures. (Please refer to National Institute of Health and Clinical Excellence Guidelines).[2] The data from the CA-PAMR review from 2002-2004 confirmed the importance of this approach, as lack of timely therapeutic intervention at these levels of blood pressure was a consistent finding in patients dying of cerebrovascular accident (CVA) in the setting of preeclampsia/eclampsia.

There is little dispute that delivery of the fetus and placenta is the most important intervention in the treatment algorithm for preeclampsia/eclampsia. The aphorism that "delivery is the cure" is widely accepted in the obstetrical world, but it is clear that in many cases the multi-system pathology continues for a variable amount of time following delivery. There is greater recognition of the importance of continued evaluation in the postpartum period following delivery of the fetus and placenta, as serious clinical consequences persist for days and even weeks postpartum. These include severe levels of hypertension, onset of eclamptic seizures, and renal dysfunction. The onset of posterior reversible encephalopathy syndrome (PRES) is often diagnosed in the postpartum period. The initial two weeks postpartum seems to be a particularly vulnerable time for these complications, but reports of sequelae of preeclampsia have been reported up to six weeks postpartum.

The preeclampsia task force was charged with developing a toolkit to address the clinical spectrum of this serious disorder and develop systematic and evidence-based approaches to management of this disease. Maternal mortality is the unfortunate outcome of this disease in a considerable number of cases, but the morbidity and long-term effect on patients' lives are significant, underreported, and underappreciated.[10,11]

Data from the CA-PAMR and other state and international reports have emphasized the high rate of preventability of morbidity and mortality in 50-70% of cases of hypertensive disorders of pregnancy.[4,10,12,13] The CA-PAMR analysis of maternal deaths from 2002-2004 revealed that all of maternal deaths related to preeclampsia had at least 'some' chance of being altered by adherence to systematic, evidence-based and well-published algorithms for management of this disease. Almost half (48%) had a 'good to strong' chance to alter the outcome. The Quality Improvement Opportunities (QIOs) identified through CA-PAMR reinforced the international data suggesting increased preventability

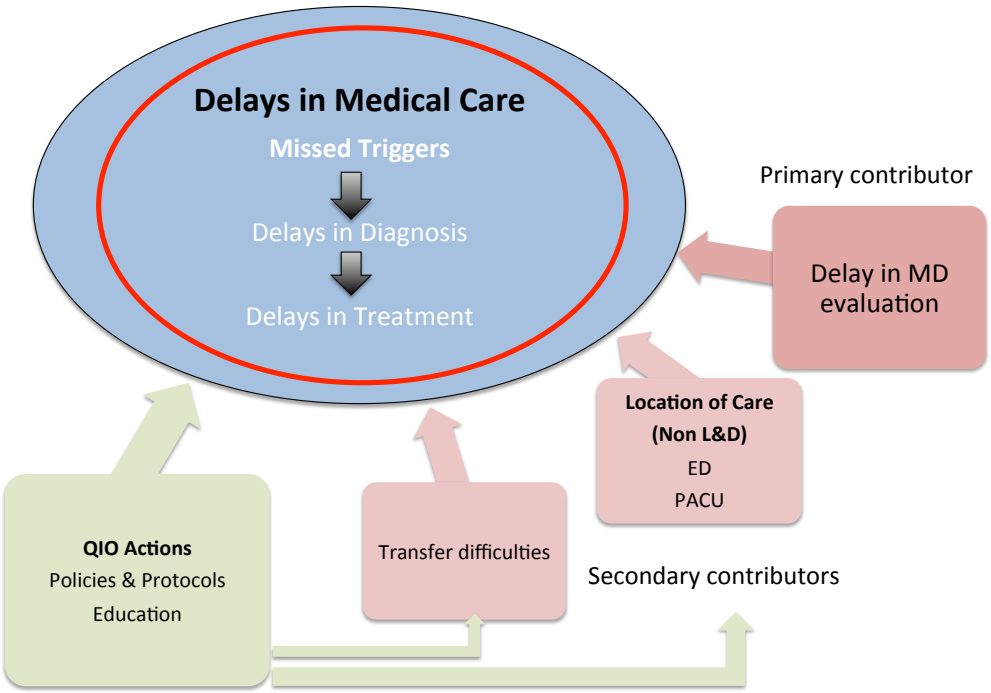

Figure 1: Major Themes in QIOs among Preeclampsia Deaths, CA-PAMR 2002-2004

of mortality by following straightforward management approaches. The 3-Delay (3D) Model was developed in under-resourced countries to address the significant incidence of maternal mortality in those countries and is validated by current data. The "3 Delays" are: 1) delay in deciding to seek care, 2) delay in reaching care in time, and 3) delay in receiving adequate treatment.[14] Unfortunately, these same delays are often present in our own state and country as reflected in Figure 1.

This toolkit has been developed to be applicable at all levels of hospitals that deliver care to pregnant women and newborn infants. The toolkit algorithms are straightforward and focus on critical action. They are flexible for use by a wide variety of practitioners who are likely to encounter women with hypertensive disorders of pregnancy including family practitioners, emergency department personnel, midwives, obstetricians, perinatologists, nursing staff, and labor and delivery staff. The focus of the toolkit is on the continuum of care from the prenatal period through delivery and postpartum.

CLINICAL PEARLS

Compiled by the Preeclampsia Task Force

ACUTE TREATMENT:

- Antihypertensive medications administered within 1 hour and ideally as soon as possible upon arrival at a healthcare facility for blood pressures of 160 systolic, and/or 105-110 diastolic or greater is a critical initial step in decreasing morbidity and mortality.

- Magnesium sulfate therapy for seizure prophylaxis should be administered to any patients with:
  - Severe preeclampsia with subjective neurological symptoms such as headache or blurry vision or right upper quadrant or epigastric abdominal pain AND
  - Should be considered in patients with preeclampsia without severe features (mild).

- Magnesium sulfate is the approved initial therapy for an eclamptic seizure.

- Algorithms for acute treatment of severe hypertension and eclampsia should be readily available or preferably posted in all labor and delivery units.

- Early post-discharge follow-up should be the norm for all patients diagnosed with preeclampsia/eclampsia. The Task Force recommends that follow-up occur within 3-7 days if blood pressure medication was used during the labor and delivery or postpartum and within 7-14 days if the diagnosis of preeclampsia was made but no medication was used. Current ACOG guidelines recommend for women in whom gestational hypertension, preeclampsia, or superimposed preeclampsia is diagnosed, that BP be monitored in the hospital or that equivalent outpatient surveillance be performed for at least 72 hours postpartum and again 7-10 days after delivery or earlier in women with symptoms.[15]

- Postpartum patients presenting with hypertension, preeclampsia or eclampsia to the Emergency Department should be either assessed by or admitted to an obstetrical service. If they are treated in the Emergency Department and discharged, adequate follow-up must be arranged with an obstetrical provider.

- All institutions should consider preparing a severe preeclampsia/eclampsia box of medications and supplies needed for the treatment of preeclampsia (see Appendix, S, pg. 124) that includes at a minimum the following: Magnesium sulfate (including tubing, syringes and needles), labetalol, hydralazine and calcium gluconate. Additional medications such as second-line antihypertensives should be institution specific.

- Treatment of hypertension in the patient with chronic cocaine/amphetamine abuse may cause an exaggerated decrease in blood pressure. Hypotension may be difficult to treat due to altered vasopressor response and depleted endogenous catecholamine stores. Unexpected, severe hypotension may also occur after regional anesthesia or general anesthesia.

PATIENT ASSESSMENT:

- A high index of suspicion for hypertensive disorders of pregnancy and the syndrome of preeclampsia/eclampsia is required when encountering pregnant women with evidence of NEW ONSET hypertension and/or proteinuria.

- Preeclampsia is typically a disease of the late third trimester; however, earlier onset of preeclampsia prior to 34 weeks is often more severe and may have an atypical presentation. This diagnosis should be considered in any patient with new onset symptoms and signs of hypertension and/or proteinuria.

- Patients presenting with vague symptoms such as headache, abdominal pain, shortness of breath, “I just don’t feel right,” or generalized swelling should be evaluated for atypical presentations of preeclampsia or “severe features.”

- Forty percent of patients with new onset hypertension or new onset proteinuria will develop preeclampsia.[16]

- Patients presenting with preeclampsia, severe preeclampsia or eclampsia to centers with limited resources to care for either the infant or mother should be stabilized and transferred to a center that has the capacity to care for expected complications of either the mother or infant.

PROVIDER and PATIENT EDUCATION:

- Healthcare professionals often tend to minimize signs and symptoms and therefore, may miss an opportunity to alter outcome.

- Use of patient education strategies, targeted to the educational level of the patients will increase patient awareness of signs and symptoms of preeclampsia.

- The importance of adequate prenatal care and access to obstetrical services should be emphasized for all socio-economic groups.

- Use of preeclampsia specific checklists, team training and communication strategies, and implementation of a continuous process improvement strategy may reduce the morbidity associated with hypertensive disorders of pregnancy.

- The patient should be counseled that hypertensive disorders during pregnancy may predict future cardiovascular risk.

- There is no clinically validated screening strategy to predict the development of preeclampsia at this time.

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