

Risk assessment in obstetrics

“Every minute, somewhere in the world a woman dies in pregnancy or child birth.”

Introduction

The major goal of obstetric care is to ensure the birth of a healthy baby with minimal risk to the mother. Therefore determining which interventions are most likely to improve patient safety is an important global health issue. The Oxford English Dictionary defines risk as: ‘hazard, chance of bad consequences, loss.’

Risk assessment is the process where:

- Hazards are identified
- The risk associated with that hazard is analysed
- Appropriate ways to eliminate or control the hazard are determined.²

Obstetric risk assessment involves the identification of problem areas associated with the mother, fetus and organisation of service.

Maternal risk assessment

Pre-conceptual

Maternal risk assessment should begin pre-conceptually. Optimising maternal health prior to conception is important for improving pregnancy outcome. The evidence is especially strong for medical conditions such as diabetes.³ Hyperglycemia is the most important cause of adverse fetal risk in pregnancy. Normalising blood glucose levels before and in early pregnancy can reduce the risk of miscarriage and congenital malformations to that of non-diabetic women.⁴

Women who are known epileptics should be counselled about the risks of increased seizure frequency in pregnancy and the potential effects of seizures and anticonvulsant medication on pregnancy outcome. These women should be placed on anticonvulsant mono-therapy with the lowest effective dose to prevent seizures and considered for alteration or withdrawal of the anticonvulsant treatment prior to conception. Folic acid supplementation should be initiated at least 1 month prior to conception.

All women should have their body mass index (BMI) calculated at the pre-conceptual visit. Women with BMIs >26kg/m² should be counselled about risk to their own health and the further effect on pregnancy. These women should be offered behavioural strategies to reduce calorie intake and increase physical activity.

The pre-conceptual visit also allows the mother to be

screened for toxins such as alcohol, cigarettes and recreational drugs. Tobacco use in pregnancy has been associated with adverse outcomes such as miscarriage, prematurity and low-birth weight while a spectrum of birth defects ranging from subtle growth restriction to the fetal alcohol syndrome is associated with alcohol use in pregnancy. Evidence – based guidelines have been developed for the identification and intervention for with women who engage in excessive drinking and/or smoking.⁵ A systematic review of 12 studies has found good evidence for the effectiveness of behavioural interventions in reducing alcohol consumption at 6 and 12 months.⁶

This is also the ideal opportunity for any medication to be stopped (e.g. valproate and isotretinoin) or changed to one that is safer for the fetus (heparin for warfarin).

Prenatal

The prenatal visit should take place before 10 weeks of gestation. A complete history and examination will reveal the patient’s risk profile and allow for preventative measures to be instituted.

Women with a prior history of pre-eclampsia have a 7% risk of developing pre-eclampsia in the present pregnancy.⁷ This risk is further increased if the patient has pre-existing hypertension, renal disease or antiphospholipid syndrome. In low-risk patients, first trimester screening using maternal factors, uterine artery doppler, blood pressure and pregnancy - associated plasma protein - A (PAPP-A) is useful to predict preeclampsia.⁷ First trimester metabolomic detection for predicting early and late onset preeclampsia has recently been described.⁸ A model consisting of maternal demographics and multiple metabolites showed a 76.7% sensitivity and 100% specificity for pre-eclampsia detection. Once a patient at risk of developing pre-eclampsia is identified, prophylactic measures to reduce this risk may be prescribed. Low-dose aspirin will reduce ones risk by 15% while in women with a low baseline calcium intake: the risk reduction may be up to 80%.

Risk factors for thromboembolism should also be determined at this visit. Several authoritative bodies have prescribed guidelines for thromboprophylaxis and an individual risk assessment should be done early in pregnancy for women with a history of previous thromboembolism.

Obstetric emergencies

Three important causes of maternal mortality globally are embolism, haemorrhage and pregnancy-related hypertension. Quick identification of these and other emergencies and a rapid coordinated response are important for ensuring favourable outcomes.

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Postpartum haemorrhage

Risk factors for postpartum haemorrhage include multiparity, uterine distension from multiple gestations, polyhydramnios, macrosomia and prolonged labour. Use of active management of the third stage of labour has been shown to significantly reduce the risk of postpartum haemorrhage (RR 0.38, 95%CI 0.32-0.46).⁹ Management should be aggressive and involves delivery of the placenta, establishing intravenous access, identifying the cause of bleeding, uterotonic agents, transfusion, uterine packing, haemostatic sutures (B - Lynch), vessel ligation and hysterectomy.

Pre-eclampsia and eclampsia

Emergencies associated with hypertension in pregnancy account for 12% of maternal deaths worldwide.¹⁰ This is mainly due to eclampsia and unexplained coma. Predicting which patient is at risk of eclampsia is difficult: but adequate blood pressure control and delivery if the blood pressure is not controlled will reduce the risk of intracranial bleeds. Magnesium sulphate will reduce the risk of eclamptic fits by more than half.¹¹ Management of an eclamptic fit includes establishing an airway and oxygenation and administration of magnesium sulphate.

Embolism

Pulmonary embolism is a leading cause of death in the developed world. In pregnancy, prevention of death requires a high index of suspicion followed by a timely and accurate diagnostic approach. The American Thoracic Society recommends imaging evaluation for patients with the following clinical symptoms: shortness of breath, pleuritic chest pain, hypoxemia, tachycardia, hemoptysis, syncope cough and unexplained hypotension.¹²

Fetal risk assessment

Fetal medicine is a subspeciality in obstetrics that focuses on high-risk pregnancies and the role includes ultrasound for fetal assessment and diagnosis of anomalies, invasive prenatal diagnosis and management of pregnancies complicated by maternal medical disorders, multiple pregnancies and the antenatal management of extreme prematurity.

First trimester screening

Fetal aneuploidies are a major cause of perinatal mortality and childhood morbidity.¹³ First trimester screening identifies pregnancies at risk thus enabling patients to receive counselling and appropriate diagnostic testing. Screening using nuchal translucency thickness measurement, maternal serum beta-HCG and PAPP-A as well as additional markers such as fetal nasal bone measurement, ductus venosus doppler and tricuspid regurgitation detects 95% of foetuses with trisomy 21 with a 2.5% false positive rate.¹⁴ Trisomy 13 and 18 are also associated with an increased nuchal thickness and a low beta-HCG and PAPP-A values. Nuchal translucency may also be used to screen for fetal aneuploidy in twin pregnancies while in monochorionic twin pregnancies a discordant nuchal measurement may predict the development of early twin-to-twin transfusion syndrome.

Second trimester fetal anomaly scan

A detailed fetal scan done between 20-23 weeks of gestation serves as a screening tool for fetal structural malformations. In an Australian cohort involving 12 169 patients, the sensitivity of detection rate was 72.8% for patients allocated to routine ultrasound screening.¹⁵

Preventing preterm birth

Recent evidence has shown that both cervical cerclage and vaginal micronized progesterone reduces the risk of preterm birth in a specific group of women at very high risk, that would be defined by all 3 of the following:

- A current singleton pregnancy
- A history of spontaneous preterm birth in a prior pregnancy
- A cervical length of <25mm in the current pregnancy.

Untreated these patients have a 15-20% risk of preterm birth before 28 weeks, 25-30% risk before 32 weeks and a 50-60% risk before 37 weeks.¹⁵

Trials comparing cerclage with no cerclage, showed that cerclage resulted in significant reductions in the following¹⁶:

- Recurrent preterm birth before 35 weeks, relative risk (RR) 0.70
- Perinatal mortality, RR 0.65
- Composite neonatal morbidity, RR 0.60.

The use of vaginal progesterone in patients with the same 3 risk factors resulted in reductions in¹⁷:

- Recurrent preterm birth before 33 weeks, RR 0.54
- Composite neonatal morbidity and mortality, RR 0.41

Fetal anemia

The most important causes of fetal anemia include alloimmune antibodies, fetal infection including parvovirus B19 and fetomaternal haemorrhage. The middle cerebral artery (MCA) peak systolic flow measurement is a screening tool to detect fetal anemia. The MCA peak systolic velocity has a sensitivity of 88%, specificity of 82% and accuracy of 85% (95% CI 79-90%) for the detection of fetal anemia.¹⁸ This non-invasive method is used for both detection and monitoring of fetal anemia.

Intra-uterine growth restriction (IUGR)

Intra-uterine growth restriction is associated with increased perinatal mortality. Timely diagnosis and appropriate monitoring is used to optimise the timing of delivery. Doppler measurement of the fetal umbilical artery, ductus venosus waveform and middle cerebral artery waveforms are used to determine placental function and fetal well-being. A Cochrane review of the use of umbilical artery doppler compared with no doppler ultrasound in 18 trials with 10 000 high risk patients showed a 29% decrease in perinatal mortality, with a risk ratio of 0.71 (95% CI 0.53-0.98).¹⁹

An absent or reverse ductus venosus a-waveform is a strong predictor of fetal acidaemia and perinatal death.²⁰ A meta-analysis of 18 studies reported that abnormal ductus venosus waveform on doppler ultrasound predicted adverse perinatal outcome with a pooled positive

likelihood ratio of 3.15 (95% CI 2.19 – 4.54) and negative likelihood ratio of 0.49 (95% CI 0.40-0.59).²⁰ An absent or reversed a-wave in the ductus venosus for more than 7 days predicts stillbirth, irrespective of gestational age.²¹

Organisation of service

Patient safety is also dependent on the rate of preventable adverse events. Death from medical errors presents a significant burden to the health-care system. The 2008-2010 Saving Mothers Report found that 23.2% of maternal deaths were preventable.²² Gluck reports 5 categories of solutions to reduce “error” in the healthcare system.²³

These are:

1. Provide leadership
2. Respect human limitations
3. Develop effective team function
4. Create a learning environment
5. Anticipate the unexpected.

Provide leadership

Patient safety should begin in the boardroom of our hospitals. Leaders have the responsibility of providing necessary resources within their sphere so that providers have the training and tools to deliver effective and safe care.

Respect human limits

Work processes should be standardised as this increases efficiencies, reduces reliance on memory and reduces the risk of error.²⁴ Standard protocols should be developed to deal with common scenarios –for example, post hysterectomy or postpartum instructions - and these can still be flexible to allow for individual variations.

The effect of sleep deprivation on human performance is well known. The level of impairment associated with 24 hour sleep deprivation results in the same cognitive impairment as being legally drunk.²⁵ The American Accreditation Council for Graduate Medical Education has limited resident work hours to improve patient safety.²⁶ This has resulted in a reduction of all types of serious medical errors, but most especially diagnostic errors.²⁷

Develop effective team function

Communication problems are an important cause of preventable adverse outcomes in medicine. Miscommunication can occur at 2 levels: between health-care providers and between health-care provider and the patient. Transfer of information from one health-care provider to another is prone to error. This process is often unstructured, incomplete and sometimes interrupts other activities. Several techniques have been developed to improve communication. One such technique is SBAR: situation, back-ground, assessment and recommendation. Verbal communications between providers should be acknowledged and repeated.

Create a learning environment

Simulators are fast becoming a popular form of training in the medical field. Simulators have the advantage of training for uncommon and unpredictable events in a controlled environment without endangering patients. Although there

is growing enthusiasm for this type of learning, the long-term efficacy still needs to be validated.²⁸

Anticipate the unexpected

Medical systems need safety nets so that when problems arise they may be recognised and treated before the patient is harmed. Up to 70% of patients experience significant respiratory compromise up to 8 hours prior to cardiopulmonary arrest.²⁹ Healthcare workers should be trained to respond appropriately to certain triggers such as deterioration of vital signs, mental status or altered blood gas. Once a problem is recognised, protocols should be followed so that a diagnosis is made and treatment can be implemented timeously.

Conclusion

Obstetric risk assessment should not be a single evaluation; instead this is a series of assessments and interventions throughout pregnancy and the postpartum period. These assessments are also applied by different practitioners in the healthcare system. The ultimate aim is for the individual components to collectively result in a safe and successful pregnancy outcome.

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