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Risk stratification and hierarchy of antenatal care

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Cardiac disease is the leading cause of maternal death in the UK. The triennial maternal mortality reports have repeatedly highlighted failure to recognise the level of risk as a major contributing factor to the deaths of these women. Once the level of risk has been recognised, services then need to be organised in a way that supports the needs of the highest risk women, but avoids unnecessary intervention for women at lower risk. Risk scoring systems and lesion-specific indicators may help predict maternal and neonatal outcomes. Care can then be planned accordingly, to optimise the outcome for the woman and her baby.

Introduction

Cardiac disease is the leading cause of maternal death in the UK. The triennial maternal mortality reports have repeatedly highlighted failure to recognise the level of risk as a major contributing factor to the deaths of women undergoing childbirth [1,2].

Risk stratification is important as it can provide women with information preconceptually, allowing them to make an informed choice about whether or not to embark on pregnancy. In early pregnancy,

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this same information may enable them to opt for a termination of pregnancy if they feel that the risks involved in continuing with the pregnancy are unacceptable. Risk stratification enables antenatal care to be organised so that women are cared for in the most appropriate place, with the mode and timing of delivery planned appropriately. For women with lower risk cardiac problems, appropriate risk stratification can avoid inappropriate intervention and enables their care to be provided by their local team closer to home. Women with higher risk cardiac disease can be transferred to tertiary centres with the facilities and expertise to care for them appropriately.

What risks are we predicting?

Women with heart disease are prone to maternal cardiac, obstetric, and neonatal complications, and are frequently concerned about the risks to their baby; their partners and family, however, are often more concerned about the risks to the woman herself.

A systematic review of the literature relating to women with congenital heart disease showed that cardiac complications occurred in about 11% of women [3]. Women with a Fontan circulation, transposition of the great arteries, or an atrioventricular septal defect, were particularly prone to cardiac arrhythmias. Those with cyanotic congenital heart disease, pulmonary atresia with a ventriculoseptal defect, or Eisenmenger syndrome, were most at risk of developing heart failure. There seems to be a modest increase in the incidence of preeclampsia and thromboembolic disease in women with cardiac disease. From an obstetric perspective, preterm delivery increases (16%), which is partly due to an increased incidence of spontaneous preterm labour or preterm rupture of membranes, and partly iatrogenic in origin [3]. This was particularly evident in those women with more complex, cyanotic congenital heart lesions, or both. Overall, the risk of perinatal mortality was increased four-fold, with the greatest risk in women with Eisenmenger syndrome.

Chronic heart disease is also associated with an increased risk of small-for-gestational age fetuses, perinatal mortality, and post-neonatal death [4]. A study from Washington state showed that, when women with chronic heart disease were compared with control women, there were an extra 62 small for gestational age babies per 1000 births. The risk of stillbirth, perinatal death, and postneonatal death was also increased. Although it was suggested that this could be due to higher rates of smoking, diabetes, and hypertension in women with chronic heart disease, this did not seem to fully explain the increase. The investigators also showed a progressive rise over an 18-year period in the numbers of women with chronic heart disease who became pregnant.

In some cardiac diseases, the fetus is at increased risk of being affected by the same condition. Clinical geneticists are ideally placed to provide women with information about these risks and their long-term implications. For some conditions, the pathological changes may not manifest in the child until later in life (e.g. Marfan's syndrome). For other conditions incomplete penetrance of the gene may occur and, although the gene may be inherited, there may not be any phenotypic manifestation. An example of this would be the q22 deletion associated with Di George syndrome, where there is a 50% chance of passing on the gene, but a significant proportion (>25%) of fetuses with the gene will not have congenital heart disease [5]. For some conditions, prenatal diagnostic testing may be technically possible, but detailed discussion is needed to determine whether it would be appropriate and ethical.

Prediction of risk in women with heart disease in pregnancy

In this section, we initially discuss systems that have been developed to predict the overall risk of adverse maternal cardiac or neonatal outcomes. We then discuss prediction of risk in specific cardiac conditions.

Table 1
New York Heart Association Classification.

Class I	Uncompromised – no limitation to physical activity
Class II	Slight limitation of physical activity
Class III	Marked limitation of physical activity
Class IV	Severely compromised at rest