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GLOBAL EXPERTS, LOCAL LEARNING



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Women's Heart Health

Heart disease in pregnancy: Intrapartum management and key to future events

Dra Ana Salvati ^{MTSAC}

Jefa Cardiología Clínica Modelo de Morón

Unidad Coronaria Hospital de Clínicas – Universidad de Buenos Aires

Delegada SAC Consejo de la Mujer SIAC - SSC





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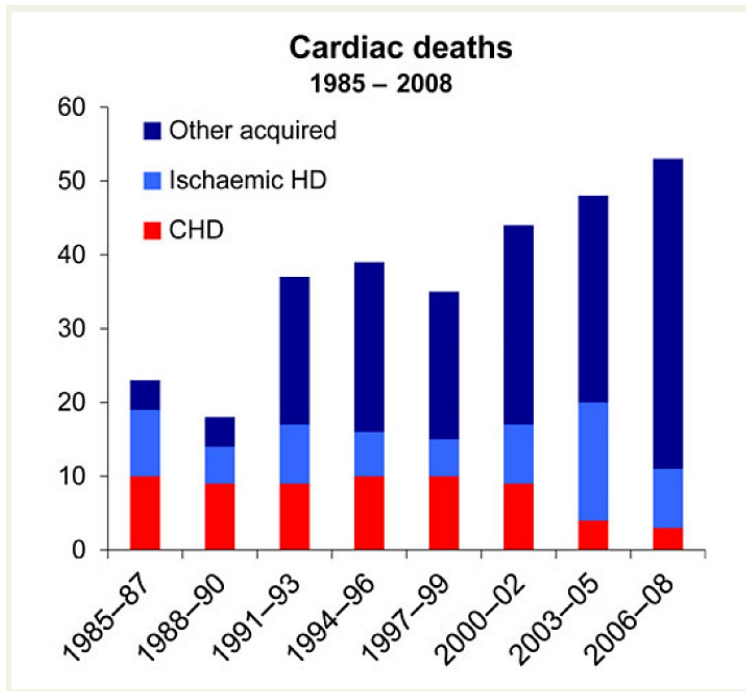
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Heart disease in pregnancy



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Maternal deaths related to cardiac disease in the UK,
stratified for underlying heart condition

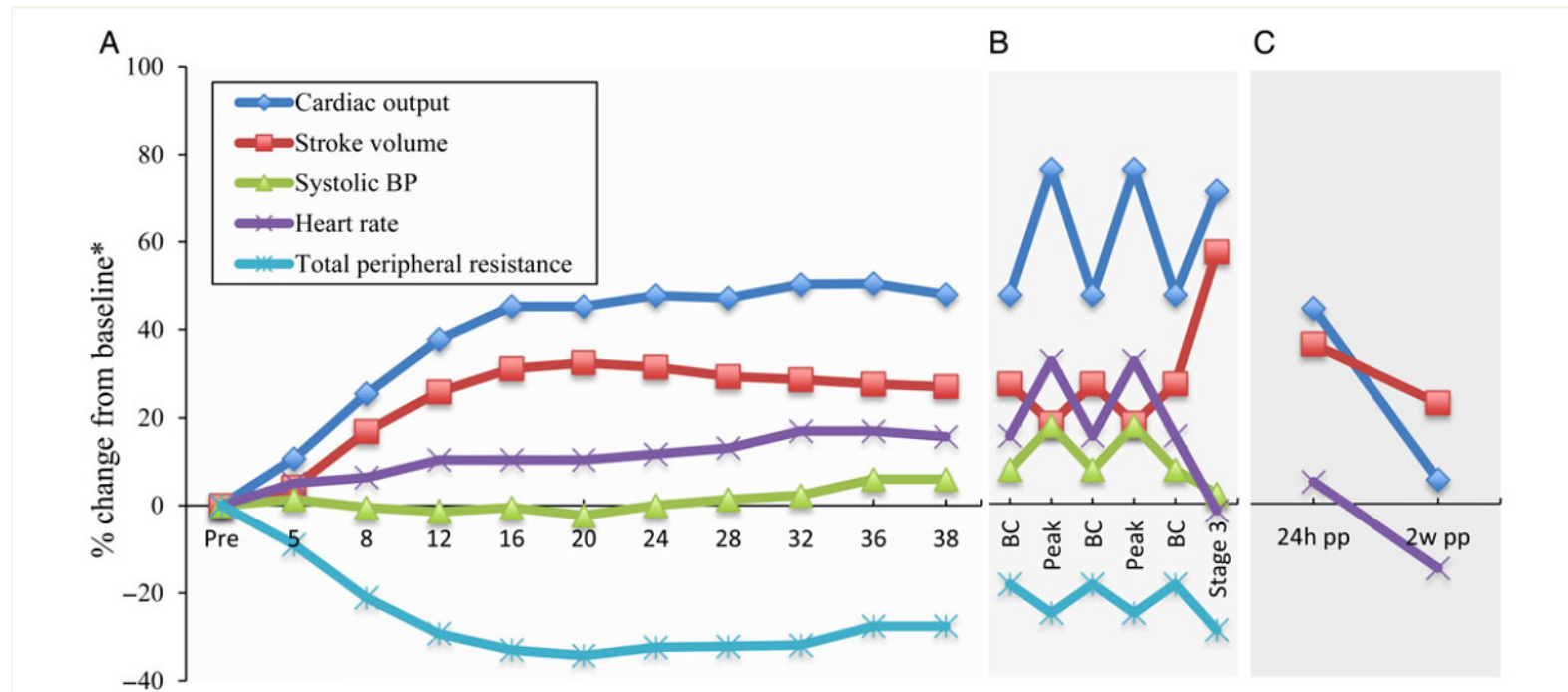
- Approximately 9/10.000 deliveries occur in women with congenital heart disease
- Risks associated with pregnancy in women with congenital heart disease affect both the mother and her fetus
- In women with CHD, the risks of pregnancy are related to the severity of the heart disease
- Successful operation before gestation is pivotal in reducing maternal and fetal risks
- The risks of pregnancy after congenital cardiac surgery are determined chiefly by the presence, type, and degree of cardiac and vascular residua and sequelae.

Modified from Cantwell , BJOG 2011

Haemodynamic changes during pregnancy, peripartum, and postpartum



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(A) Pregnancy (weeks of gestation). (B) Peripartum, BC, between contractions; Peak, at the peak of contraction; Stage 3, at the time of uterine contraction. (C) Postpartum. 24 h pp, 24 h postpartum; 2w pp, 2 weeks postpartum.

Modified from: Adams et al.

Modified from Robson et al.

Risk Scores



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ZAHARA score

- ☐ Mechanical heart valve (4.25 points)
- ☐ Severe left heart obstruction (mean pressure gradient >50 mmHg or aortic valve area <1.0 cm²) (2.50 points)
- ☐ History of arrhythmias (1.50 points)
- ☐ History of cardiac medication use before pregnancy (1.50 points)
- ☐ History of cyanotic heart disease (uncorrected or corrected) (1.00 points)
- ☐ Moderate-to-severe pulmonary or systemic atrioventricular valve regurgitation (0.75)
- ☐ Symptomatic heart failure before pregnancy (NYHA class ≥II) (0.75 points)

Risk: 0 to 0.5 : 2.9 %; 0.51 to 1.50 :7.5%; 1.51 to 2.50: 17.5%; 2.51 to 3.50, 43.1 %; and ≥3.51, 70.0 %

CARPREG risk score

- ☐ Poor functional class (NYHA class III or IV) or cyanosis
- ☐ Previous cardiovascular events including heart failure, a transient ischemic attack, stroke, or arrhythmia
- ☐ Left heart obstruction (mitral valve area of <2 cm², aortic valve area of <1.5 cm², or peak left ventricular outflow gradient >30 mmHg).
- ☐ Left ventricular systolic dysfunction (ejection fraction <40 percent)

Risk: 0 points 4% ; 1 point: 26 %; ≥2 points: 62%



Modified WHO Classification of Maternal Cardiovascular Risk



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WHO Pregnancy Risk Category	Risk Description	Maternal Risk Factors
I	No detectable increase in maternal mortality and no/mild increase in morbidity risk	• Uncomplicated small/mild pulmonary stenosis, PDA, mitral valve prolapse • Successfully repaired simple lesions (ASD, VSD, PDA, anomalous pulmonary venous drainage) • Atrial or ventricular ectopic beats, isolated
II	Small increase in maternal mortality and moderate increase in morbidity risk	If otherwise well and uncomplicated: • Unoperated ASD, VSD • Repaired TOF • Most arrhythmias
II - III	Moderate increase in maternal mortality morbidity risk	Mild LV impairment • Hypertrophic cardiomyopathy • Native or tissue valvular disease (not considered risk category I or IV) • Marfan syndrome without aortic dilation • Aortic dilation <45 mm in bicuspid aortic valve aortopathy



Modified WHO Classification of Maternal Cardiovascular Risk



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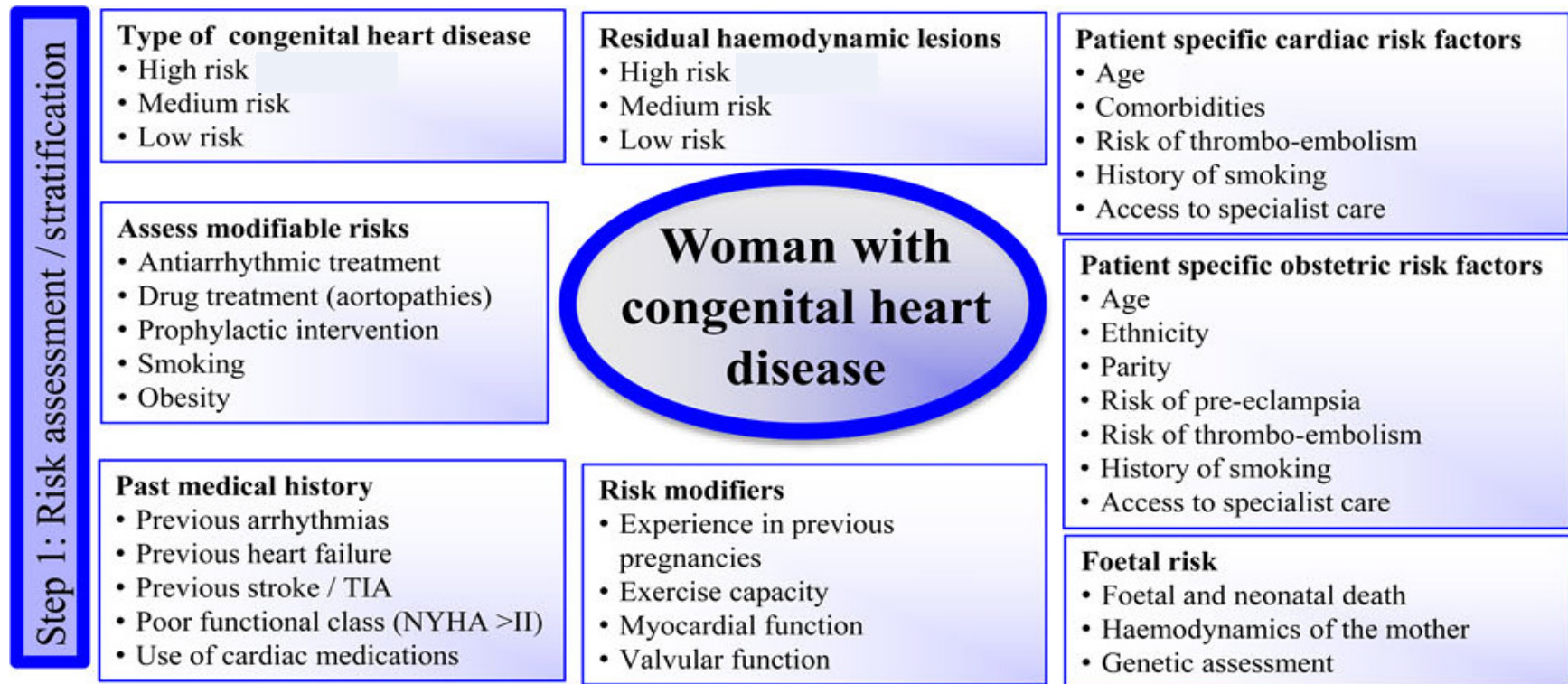
WHO Pregnancy Risk Category	Risk Description	Maternal Risk Factors
III	Significantly increased maternal mortality or severe morbidity risk. Expert counseling required. In the event of pregnancy, intensive specialist cardiac and obstetric monitoring needed throughout pregnancy, childbirth, and the puerperium	• Mechanical valve • Systemic RV • Fontan circulation • Cyanotic heart disease (unrepaired) • Other complex CHD • Aortic dilation 40–45 mm in Marfan syndrome • Aortic dilation 45–50 mm in bicuspid aortic valve aortopathy
IV	Extremely high maternal mortality or severe morbidity risk. Pregnancy is contraindicated. In the event of pregnancy, termination should be discussed. If pregnancy continues, care should follow class III recommendations.	• Pulmonary arterial hypertension (of any cause) • Severe systemic ventricular dysfunction (LV ejection fraction <30%, NYHA class III-IV) • Previous peripartum cardiomyopathy with any residual impairment of LV function • Severe mitral stenosis, severe symptomatic aortic stenosis • Aortic dilation >45 mm in Marfan syndrome • Aortic dilation >50 mm in bicuspid aortic valve aortopathy • Native severe coarctation



Multi-disciplinary and multi-step risk assessment



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Multi-disciplinary and multi-step risk assessment



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Step 2: Risk estimation

Maternal risks

Manageable risks

- Transient functional deterioration
- Arrhythmias
- Transient heart failure
- Bleeding / thrombo-embolism

Catastrophic / irreversible events

- Death
- Stroke
- Irreversible heart failure

Pregnancy risk/ risk of pregnancy

Foetal risks

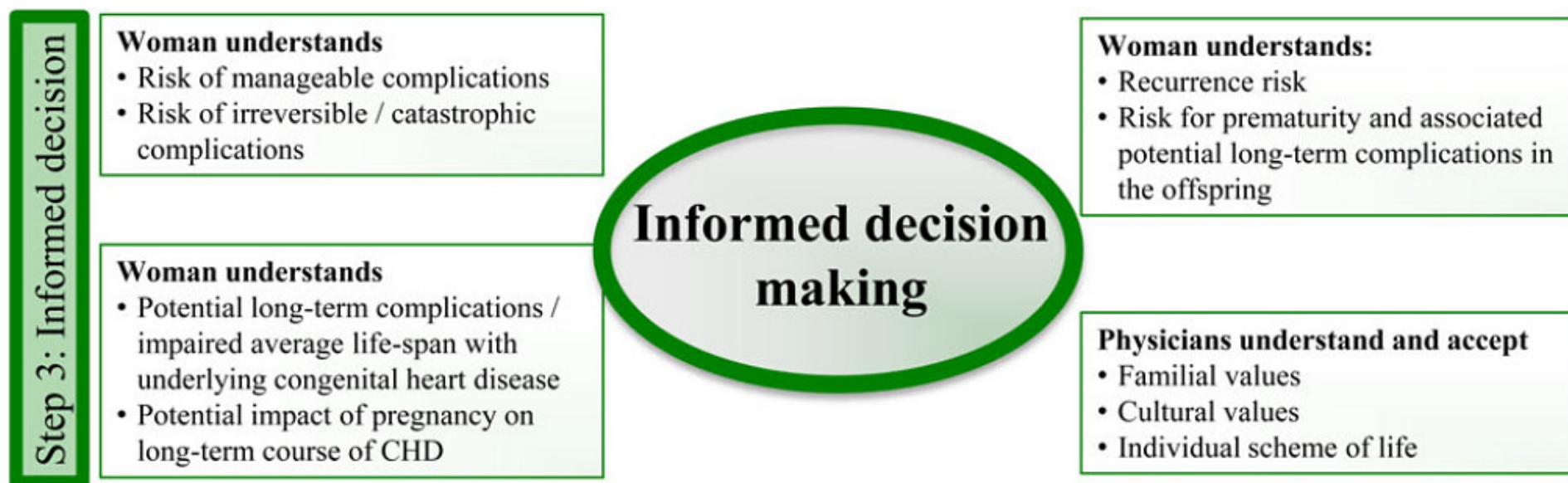
- Small for gestational age
- Prematurity
- Recurrence risk
- Embryo- and foeto-pathy (medication)

Impact of pregnancy on long-term outcome of congenital heart disease

Multi-disciplinary and multi-step risk assessment



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Multi-disciplinary and multi-step risk assessment



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Step 4: Management planning

Decision to embark on pregnancy

- Obstetric precautions
- Vaccinations updated?
- Folic acid prophylaxis
- Medication that is contraindicated in pregnancy?
- Information concerning potential risk of assisted reproductive technology
- Follow-up plan

Patient education!

Decision to avoid risks of pregnancy

- Offer access to appropriate contraception
- Offer information concerning safe termination of undesired pregnancy
- Offer information about adoption / surrogate pregnancies

Patient education!

Cardiac complications



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- ☐ Congestive heart failure, including pulmonary edema (12.3%)
- ☐ Cardiac arrhythmias (6%)
- ☐ Thromboembolism (1.9%)
- ☐ Angina (1.4%)
- ☐ Hypoxemia (0.7%)
- ☐ Infective endocarditis (0.5%)
- ☐ Maternal mortality rate (2.7%)
- ☐ Stillbirth and spontaneous abortion (7.7%)

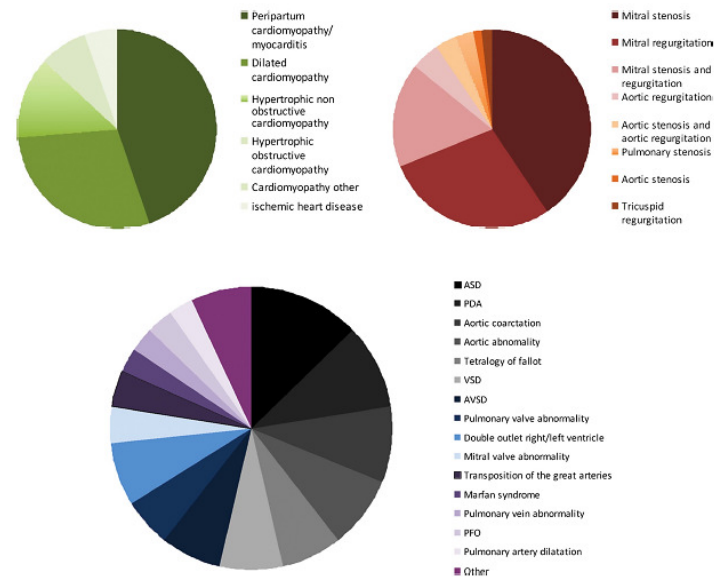


Predictors of heart failure in pregnancy



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- ☐ Cardiomyopathy
- ☐ NYHA class ≥ 3
- ☐ WHO ≥ 3
- ☐ Pre-pregnancy HF
- ☐ Pulmonary hypertension
- ☐ Pre-eclampsia



ROPAC Registry Ruys TPE, et al. Heart 2014

Heart failure: timing and outcomes



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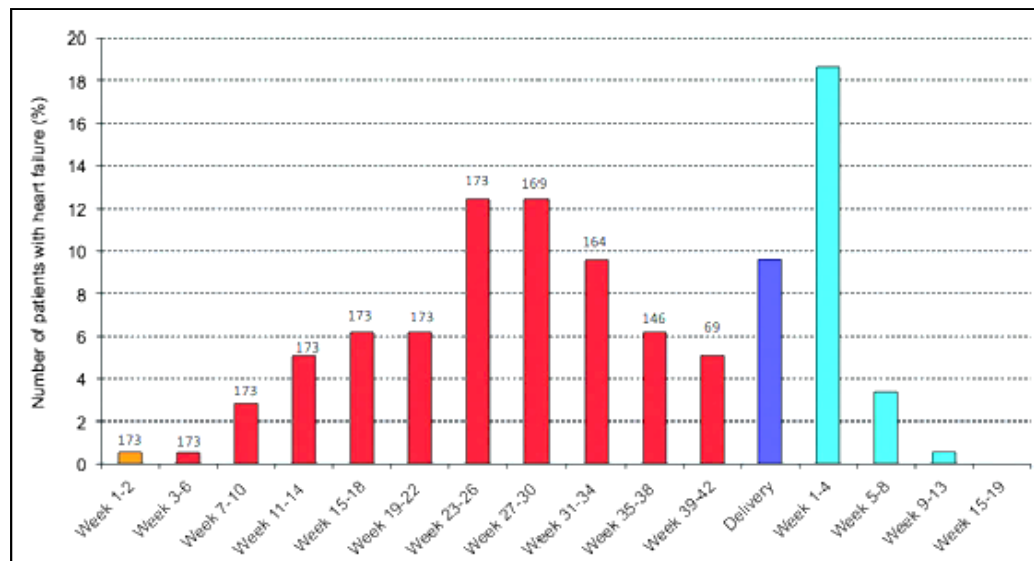


Table 4 Other complications during pregnancy and fetal outcome in patients with and without HF

	Total group n=1321	Patients with HF (n=173)	Patients without HF (n=1148)	p Value
Maternal mortality (%)	1	4.8	0.5	<0.001
Cardiac (%)				
Atrial fibrillation	0.9	1.2	0.9	0.71
Ventricular arrhythmias	2	2.9	1.8	0.35
Thromboembolic events	0.5	1.2	0.3	0.14
Endocarditis	0.2	1.2	0.1	0.006
Bleeding complications postpartum	4.9	4.6	5	0.85
Obstetric (%)				
Intra uterine growth retardation	5.8	13	4.6	<0.001
Pregnancy induced hypertension	2.4	2.9	2.4	0.67
(Pre-)edampsia	3.3	12	1.9	<0.001
Bleeding complications during pregnancy	1.6	2.9	1.4	0.14

ROPAC Registry Ruys TPE, et al. Heart 2014

Arrhythmias



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Recurrence rates during pregnancy in women with a history of previous arrhythmia

- ☐ Supraventricular tachycardia: 50%
- ☐ Paroxysmal AF/AF: 52%
- ☐ Ventricular tachycardia: 27%
- ☐ Adverse fetal events (20%) occurred more commonly in women who developed antepartum arrhythmias (RR 3.4, 95% CI 1.0 to 11.0, $p = 0.045$)

Candice K; Am J Cardiol. 2006;97:1206



Pulmonary hypertension



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- ❑ Maternal mortality : Death may be attributed to arrhythmias, RV failure, or hemorrhage
 - Eisenmenger syndrome: 36%
 - Primary pulmonary hypertension: 30%
 - Secondary pulmonary hypertension: 56%
- ❑ Spontaneous abortion: 40% to 50%
- ❑ Neonatal mortality: 13%
- ❑ The preponderance of complications occurs at term and during the first postpartum week.
- ❑ Termination of pregnancy and sterilization should always be offered to such patients
- ❑ The vasodilation associated with pregnancy will increase the degree of right to left shunting in patients with Eisenmenger syndrome, resulting in worsening of maternal cyanosis with poor fetal outcome



Labour and delivery



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- ☐ Vaginal delivery is always preferred over cesarean section

Conditions in which is caesarean section is preferred

- ☐ Women with an ascending aorta diameter >45 mm
- ☐ Pre-term labour while on oral anti-coagulation
- ☐ Women with severe aortic stenosis experiencing symptoms during pregnancy (preferably general anaesthesia and endotracheal intubation)
- ☐ Severe heart failure





Conclusion

- ❑ Women who have survived congenital heart disease into adulthood often have a strong desire to become pregnant.
- ❑ Optimum care of these potentially complicated pregnancies can only be achieved by a combined approach by cardiologists and obstetricians in specialist centers with an understanding of the obstetric and cardiac complications that can arise.



Multi-disciplinary team



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