

CARDIOVASCULAR DISEASE IN PREGNANCY

Relevant Guidelines

ESC 2025 guidelines on pregnancy

2025 ESC Guidelines for the management of cardiovascular disease and pregnancy. *Eur Heart J*. 2025.

ESC 2022 Guidelines on cardio-oncology

2022 ESC Guidelines on cardio-oncology developed in collaboration with the European Hematology Association (EHA), the European Society for Therapeutic Radiology and Oncology (ESTRO) and the International Cardio-Oncology Society (IC-OS). *Eur Heart J*. 2022.

Relevant Scientific Statements and Position Papers

AHA 2020 Statement on Pregnancy

Cardiovascular Considerations in Caring for Pregnant Patients: A Scientific Statement From the American Heart Association. *Circulation*. 2020;141:e884-e903.

AHA 2021 Statement on Pregnancy

Adverse Pregnancy Outcomes and Cardiovascular Disease Risk: Unique Opportunities for Cardiovascular Disease Prevention in Women: A Scientific Statement From the American Heart Association. *Circulation*. 2021

HRS 2023 consensus statement on arrhythmias during pregnancy

2023 HRS expert consensus statement on the management of arrhythmias during pregnancy. *Heart Rhythm*. 2023;20:e175-e264.

AHA 2024 Statement on Cardiovascular Disease Risk After Adverse Pregnancy Outcomes

Opportunities in the Postpartum Period to Reduce Cardiovascular Disease Risk After Adverse Pregnancy Outcomes: A Scientific Statement From the American Heart Association. *Circulation*. 2024;149:e330-e346.

CARDIOVASCULAR DISEASE IN PREGNANCY

Overview

Pregnancy is associated by an increase in blood volume (50%), cardiac output, and heart rate combined with a decrease in systemic vascular resistance (Figure 1).¹⁻⁴ Pregnancy in women with heart disease in general is associated with increased risks of maternal mortality and cardiovascular, obstetric, and foetal complications.^{3,5} Until 2010, maternal mortality and/or heart failure increased. Thereafter, these rates declined, especially in emerging countries, despite increasing numbers of high-risk patients (ROPAC registry).⁶ Cardiovascular disease is the leading cause of pregnancy-related mortality in the US and has gradually increased over time (from 7.2 to 17.2 deaths per 100 000 live births from 1987–2015).⁷

Risk factors (before pregnancy) have been estimated by the CARPEG II score (heart disease in general), and the ZAHARA and Kahairy et al studies (congenital heart disease) (Figure 2).⁸⁻¹¹ The modified WHO classification is provided in Table 1 and calculated risk in Figure 3.

In general they are:

- LVEF < 40%
- NYHA > II or cyanosis
- Mechanical valve
- Left heart obstruction (mitral valve area < 2 cm², aortic valve area < 1.5 cm² with gradient > 30 mm Hg).
- Prior cardiac event or arrhythmia and use of cardiac medication
- Systemic or pulmonary AV valve regurgitation

The most prevalent cardiac complications during pregnancy are arrhythmias, heart failure and hypertensive complications.^{5,12} Spontaneous coronary dissection is the most common cause of pregnancy-associated myocardial infarction.¹³ It is rare but potentially lethal. A history of hypertension is associated with CAD earlier in life and with a future risk for myocardial infarction with both obstructive and nonobstructive coronary arteries.¹⁴ In general, individuals with adverse pregnancy outcomes also have an increased incidence of cardiovascular disease risk factors after delivery.¹⁵

Neonatal complications increase with:

- Poor functional class or cyanosis
- Left heart obstruction
- Anticoagulation
- Smoking

- Mechanical valve replacement
- Multiple gestations

Arrhythmias are among the most common complications in pregnancy.¹⁶ The most common arrhythmias seen in pregnant patients are generally benign, including sinus arrhythmia, supraventricular tachycardia, and premature beats. Atrial fibrillation is increasingly becoming a common newly diagnosed arrhythmia.¹⁷ Supine orthostatic hypotension and syncope may be due to inferior cava compression by the gravid uterus in late pregnancy in supine position. Left lateral decubitus position obviates the symptoms. Sinus tachycardia and atrial extrasystoles do not need specific treatment.¹⁷ Monitoring and treatment of hypokalaemia and hypomagnesaemia is recommended in pregnant women with primary arrhythmia syndromes suffering from hyperemesis (ESC 2025 GL on pregnancy, I C).¹⁸

Women experiencing common pregnancy complications, such as gestational **diabetes mellitus**, **preeclampsia** and other hypertensive disorders, intrauterine growth restriction, and preterm delivery are at increased risk of cardiovascular disease.¹⁹ These complications are prevalent (36%), and provide an opportunity for early identification of women at increased risk of cardiovascular disease later in life. Glycosuria and hemoglobin decline are also newly discovered markers of pregnancy cardiovascular complications.²⁰ Women with **congenital or acquired heart disease** may also be at increased risk or unable to tolerate pregnancy.²¹ Pregnant persons with rheumatoid arthritis had higher risk of preeclampsia, peripartum cardiomyopathy, arrhythmias, acute kidney injury, and venous thromboembolism during delivery hospitalizations.²² Maternal mortality after **cardiac surgery** during pregnancy does not seem to be influenced by trimester. Foetal mortality reported after maternal cardiac surgery is high (27%), especially in the first and second trimesters. CS performed prior to cardiac surgery seems independently associated with improved foetal outcome and might therefore be advised in case of a viable foetus.²³ Risks are also discussed in relevant chapters.^{18,24}

The diagnosis of **cancer** during pregnancy is uncommon (1 in every 1000 pregnant women is diagnosed with cancer), with breast cancer, melanoma, and cervical cancer being the most frequent diagnoses.²⁵ Chemotherapy is generally not applied during the first trimester due to the high risk of foetal congenital abnormalities (up to 20%) and cytotoxic chemotherapies have different risk profiles during the second or third trimesters. Furthermore, chemotherapy administration is usually not given beyond week 34 of gestation to provide a 3-week window between the last cycle and delivery.²⁵

The ESC general recommendations for care are presented in Figures 4-7 and Tables 2-5. Recommendations on anticoagulation are provided in Table 6 and Figure 7, and for drugs in general in Figure 8 and Appendixes 3 and 5. Recommendations for cancer are provided in Tables 7-9, and Figure 9. The AHA has produced specific recommendations on

the management of pregnancy in patients with ACHD.²⁶ Recommendations for specific disorders are presented in the relevant chapters. Detailed comments and recommendations on drug use during pregnancy and breastfeeding have also been provided by AHA 2017 detailed recommendations (see Appendix 3). The HRS has also published an expert consensus statement on the management of arrhythmias during pregnancy in 2023.¹⁷ Specific recommendations are presented in Appendix 5. The management of adverse pregnancy outcomes is presented in Table 10 and Figures 10 and 11.

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