CAPE HEART INSTITUTE
Global Medicine

ESC
European Society of Cardiology

2025 ESC Guidelines for the management of cardiovascular disease and pregnancy

An Approach to Most Frequent CVD in Pregnancy & Multi-disciplinary Care

Prof Karen Sliwa, MD, PhD, FESC, FACC
Director: Cape Heart Institute
Department of Medicine & Cardiology,
Faculty of Health Sciences,
University of Cape Town, South Africa

Outline:

- General Approach
- Hypertension & Adverse Pregnancy Outcome
- Cardiomyopathies
- Valvular Heart Disease
- Approach to chest pain

ESC European Society of Cardiology
European Heart Journal (2025) 00, 1–107
https://doi.org/10.1093/eurheartj/ehaf193

ESC GUIDELINES

2025 ESC Guidelines for the management of cardiovascular disease and pregnancy

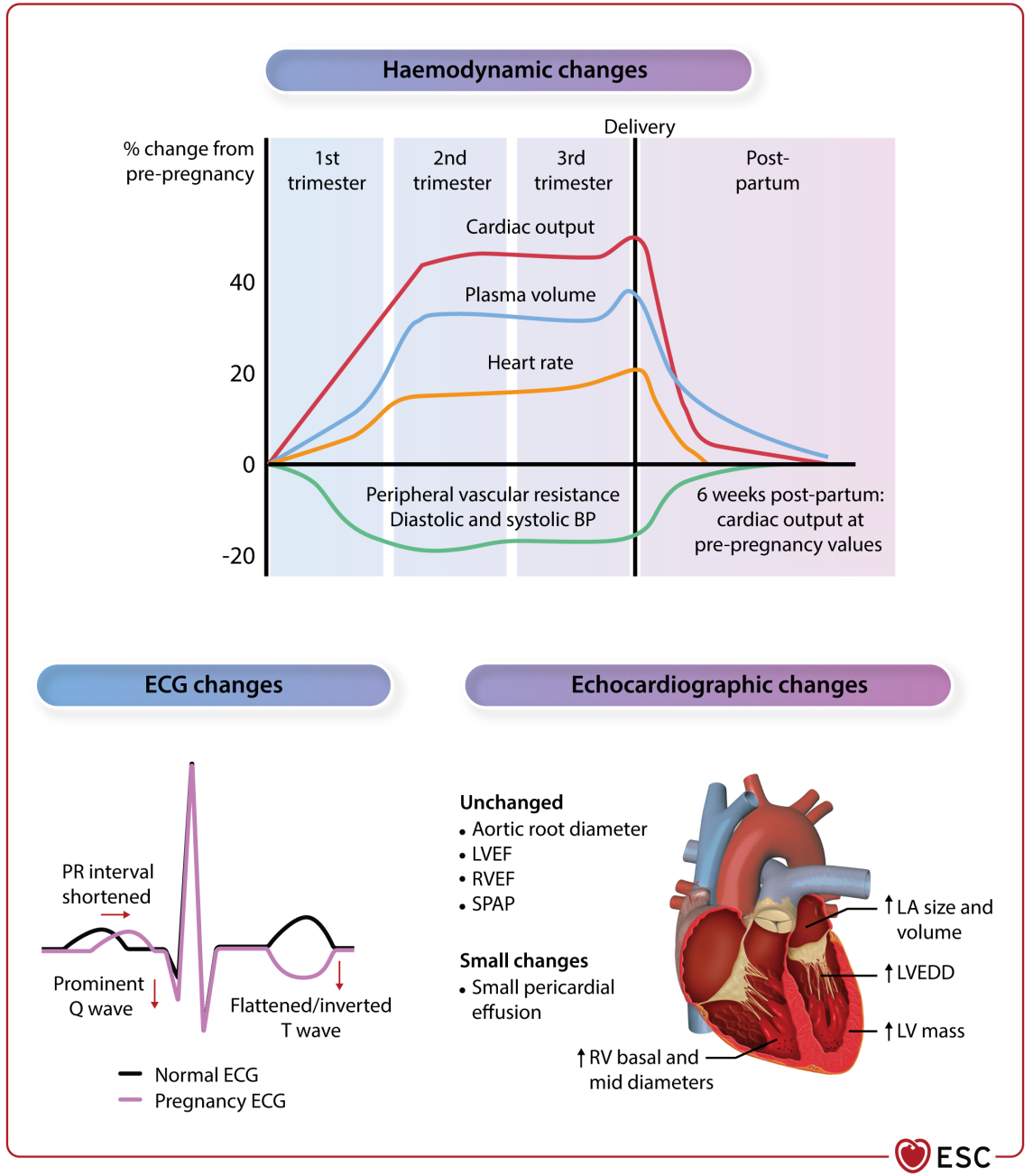
Developed by the task force on the management of cardiovascular disease and pregnancy of the European Society of Cardiology (ESC)

Endorsed by the European Society of Gynecology (ESG)

Authors/Task Force Members: Julie De Backer *†, (Chairperson) (Belgium), Kristina H. Haugaa *†, (Chairperson) (Norway), Nina Eide Hasselberg ‡, (Task Force Co-ordinator) (Norway), Michèle de Hosson ‡, (Task Force Co-ordinator) (Belgium), Margarita Brida (Croatia), Silvia Castelletti (Italy), Matthew Cauldwell (United Kingdom), Elisabetta Cerbai (Italy), Lia Crotti (Italy), Natasja M.S. de Groot (Netherlands), Mette-Elise Estensen (Norway), Eva S. Goossens (Belgium), Bernhard Haring (Germany), Donata Kurpas (Poland), Carmel M. McEniery (United Kingdom), Sanne A.E. Peters (Netherlands), Amina Rakisheva (Kazakhstan), Antonia Sambola (Spain), Oliver Schlager (Austria), Florian S. Schoenhoff (Switzerland), Tommaso Simoncini [1] (Italy), Françoise Steinbach (France), Isabella Sudano (Switzerland), Lorna Swan (United Kingdom), Anne Marie Valente (United States of America), and ESC Scientific Document Group

Document Reviewers: Werner Budts, (CPG Review Co-ordinator) (Belgium), Karen Sliwa, (CPG Review Co-ordinator) (South Africa), Marianna Adamo (Italy), Elena Arbelo (Spain), Eloisa Arbustini (Italy), Giuseppe Boriani (Italy), Antonio Brucato (Italy), Sergio Buccheri (Sweden), Alessandra Bura Riviere (France), Pavel Calda[1] (Czech Republic), G.-Andrei Dan (Romania), Konstantinos Dimopoulos (United Kingdom), Alexandra Frogoudaki (Greece), Estelle Gandjbakhch (France), Eva Gerdts (Norway), Sofie A Gevaert (Belgium), Bruna Gigante (Sweden), Bettina Heidecker (Germany), Borja Ibanez (Spain), Stefan James (Sweden), Mark Johnson (United Kingdom), Peter Jüni (United Kingdom), Jolanda Kluin (Netherlands), Lars Køber (Denmark), Konstantinos C. Koskinas (Switzerland), Greg Lip (United Kingdom), Emma F. Magavern (United Kingdom), John William McEvoy (Ireland), Borislava Mihaylova (United Kingdom), Richard Mindham (United Kingdom), Inge Moelgaard (Denmark), Philip Moons (Belgium), Jens Cosedis Nielsen (Denmark), Ntobeko A. B. Ntusi (South Africa), Agnes A. Pasquet (Belgium), Tatjana Potpara (Serbia), Eva Prescott (Denmark), Bianca Rocca (Italy), Jolien Roos-Hesselink (Netherlands), Xavier Rosselló (Spain), Anna Sannino (Germany), Felix Tanner (Switzerland), Ulf Landmesser (Germany), Ilonca Vaartjes (Netherlands), Christiaan Vrints (Belgium), Katja Zeppenfeld (Netherlands), and Dayenne Zwaagman (Netherlands)

Physiology of haemodynamic changes and changes in electrocardiogram and echocardiography during and post pregnancy



Role of Pregnancy Heart Team in pregnancy pathway

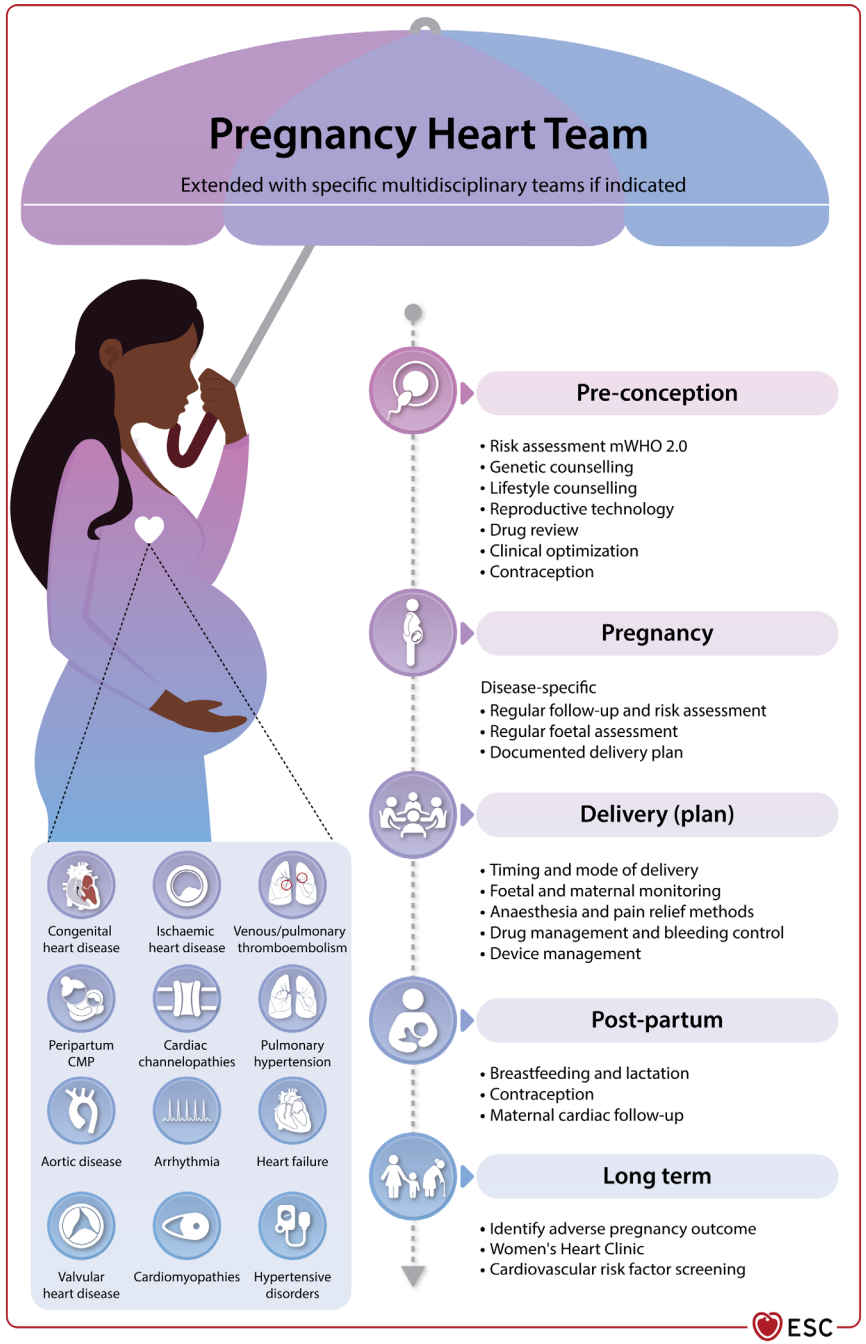


Figure 1
ESC Guidelines CVD Pregnancy 2025

Composition of the core and expanded case-based Pregnancy Heart Team

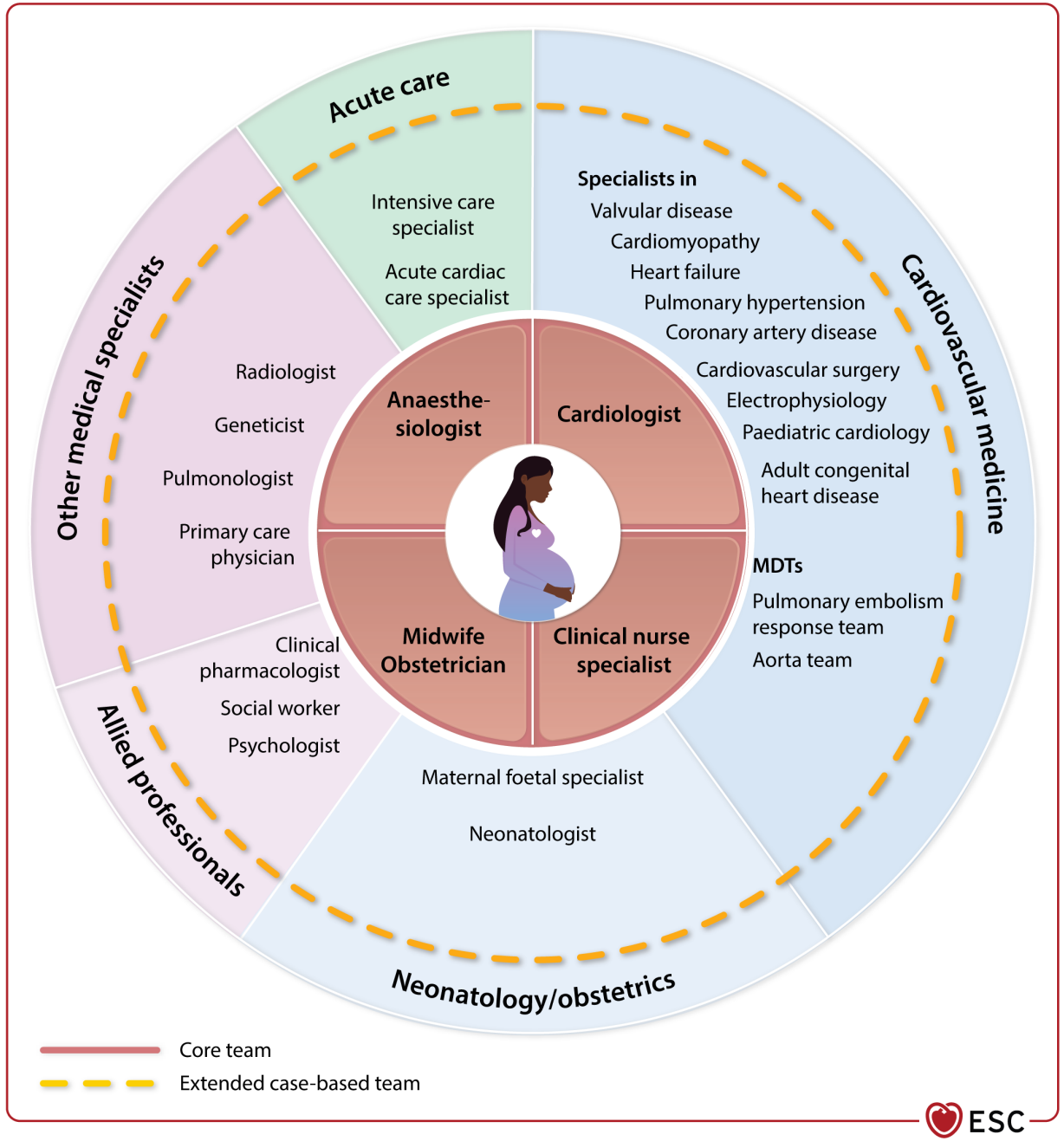


Figure 3
ESC Guidelines CVD Pregnancy 2025

Pre-conception counselling and genetic aspects

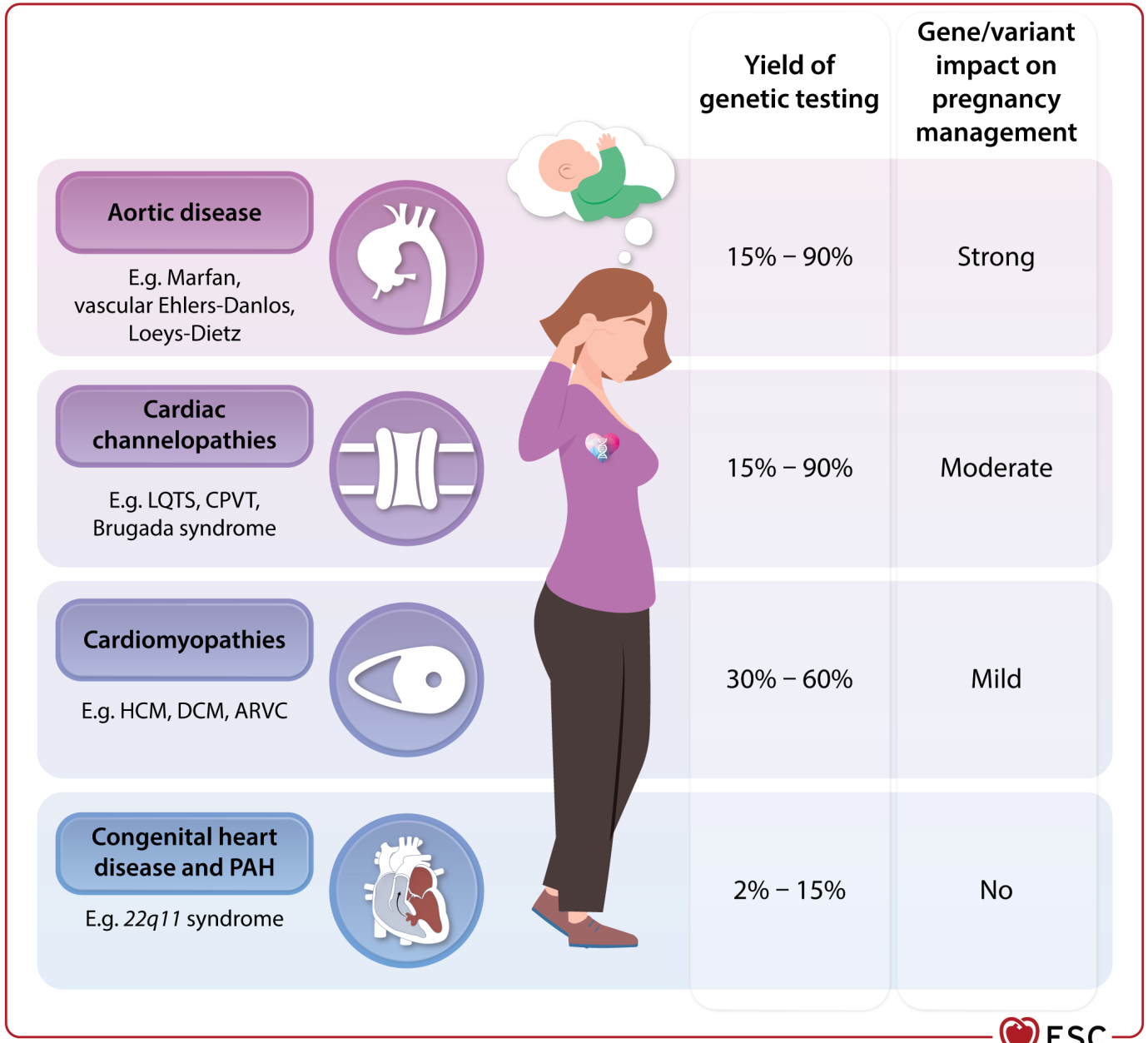
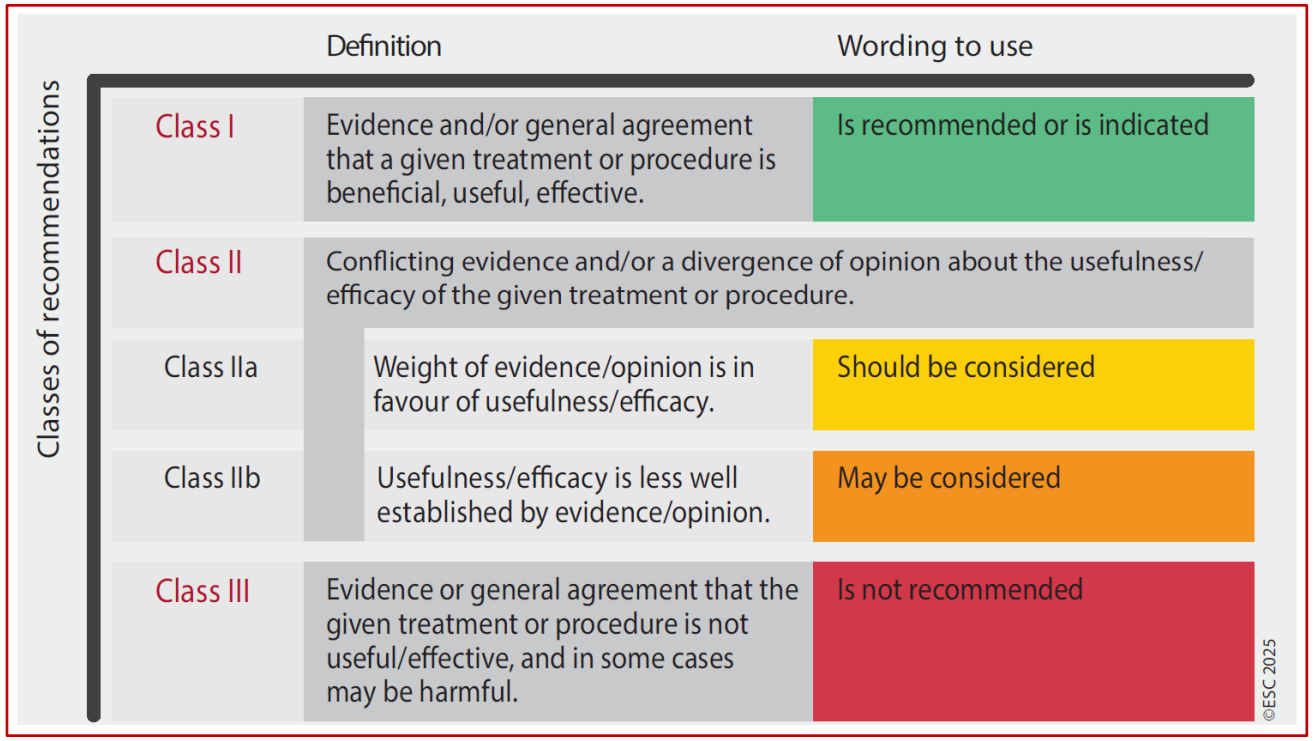


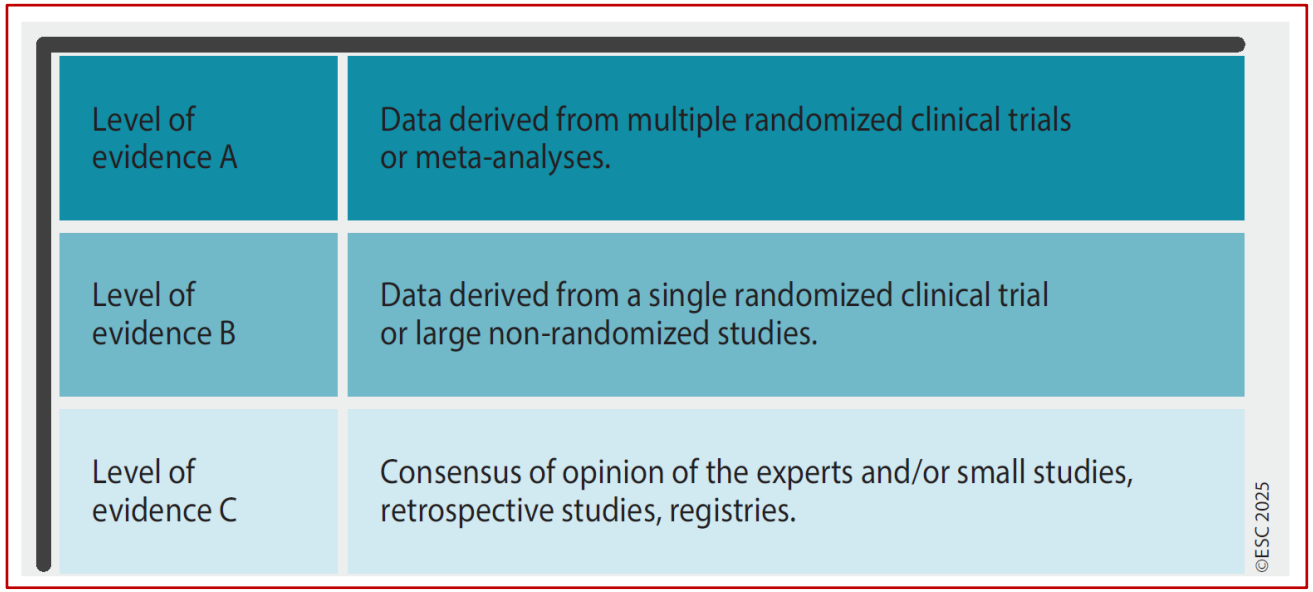
Figure 4
ESC Guidelines CVD Pregnancy 2025

Classes of recommendations



Classes of recommendations	Definition	Wording to use
Class I	Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective.	Is recommended or is indicated
Class II	Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure.	
Class IIa	Weight of evidence/opinion is in favour of usefulness/efficacy.	Should be considered
Class IIb	Usefulness/efficacy is less well established by evidence/opinion.	May be considered
Class III	Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.	Is not recommended

Levels of evidence



Level of evidence A	Data derived from multiple randomized clinical trials or meta-analyses.
Level of evidence B	Data derived from a single randomized clinical trial or large non-randomized studies.
Level of evidence C	Consensus of opinion of the experts and/or small studies, retrospective studies, registries.

Hypertensive Disorders of Pregnancy (HDP)

Leading cause of maternal mortality and morbidity

Affecting 5-10% of pregnancies worldwide

Preconception or <20 weeks gestation	≥20 weeks gestation		
Chronic hypertension Hypertension diagnosed before conception or before 20 weeks of gestation. **White coat hypertension** Office or clinic BP ≥140/90 mmHg, but home/ambulatory BP <135/85 mmHg. **Masked hypertension** Office or clinic BP <140/90 mmHg, but home/ambulatory BP ≥135/85 mmHg.	**Gestational hypertension** New-onset hypertension (≥140/90 mmHg) without proteinuria or organ/placental dysfunction.	**Preeclampsia (*de novo*):** Gestational hypertension plus ≥1 of the following signs of organ or uteroplacental dysfunction at ≥20 weeks' gestation: 1. Proteinuria (≥30 mg/mmol; 300 mg/d) 2. Other maternal signs of organ dysfunction: • neurological complications (e.g., eclampsia, altered mental status, blindness, stroke, clonus, severe headaches, or persistent visual scotomata) • Pulmonary oedema • Haematological complications (e.g. platelet count <150,000/µL, DIC, haemolysis • Acute kidney injury (creatinine ≥90 µmol/L or 1 mg/dL) • Liver Involvement (e.g. elevated transaminases: ALT or AST >40 IU/L, with or without right upper quadrant or epigastric pain) 3. Uteroplacental dysfunction (e.g. placental abruption, angiogenic imbalance, foetal growth restriction, abnormal umbilical artery Doppler waveform analysis, or intrauterine foetal death).	**Preeclampsia superimposed on chronic hypertension** Chronic hypertension with new-onset proteinuria and/or organ or uteroplacental dysfunction as described on the left column.

Multidisciplinary approach of adverse pregnancy outcomes

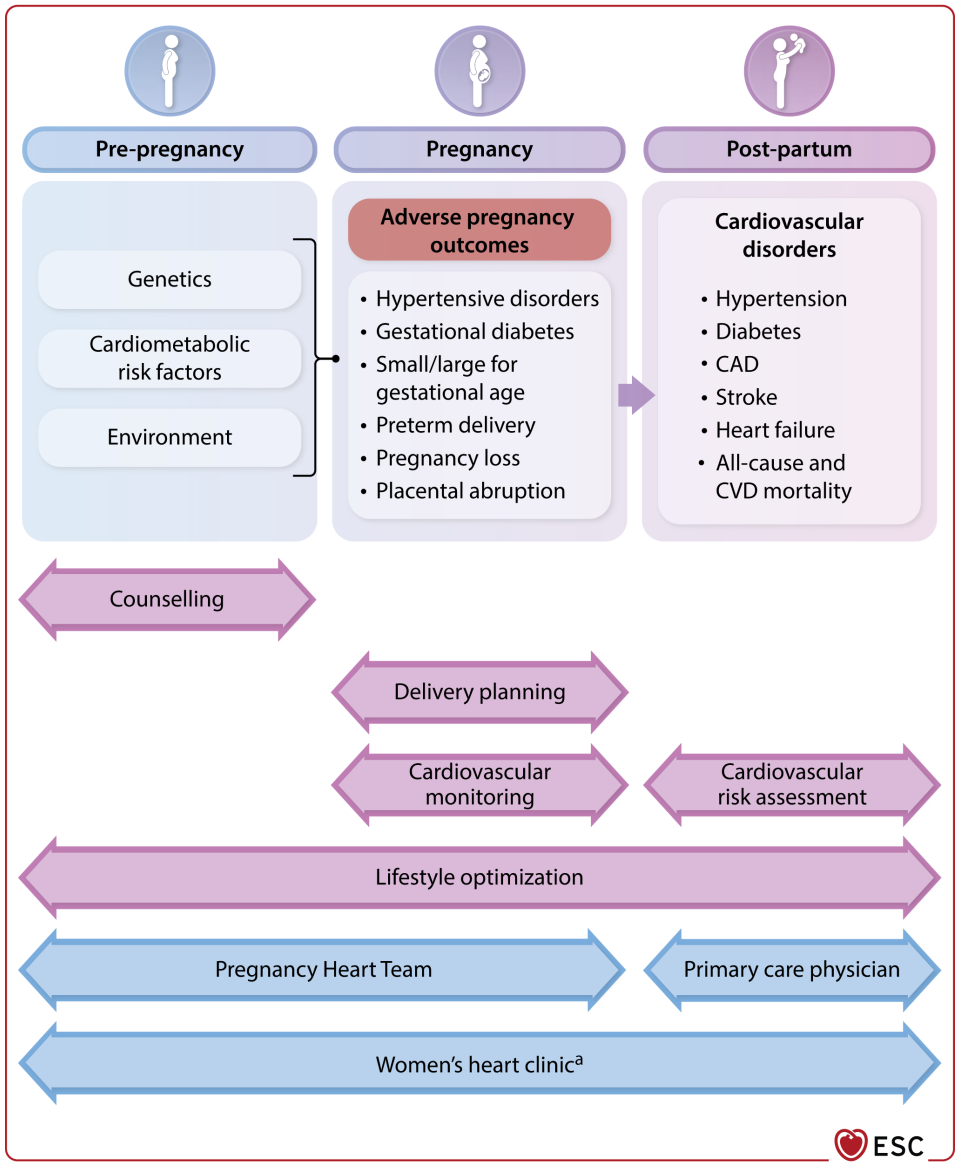


Figure 23
ESC Guidelines CVD Pregnancy 2025

Algorithm for the management of new-onset post-partum hypertension

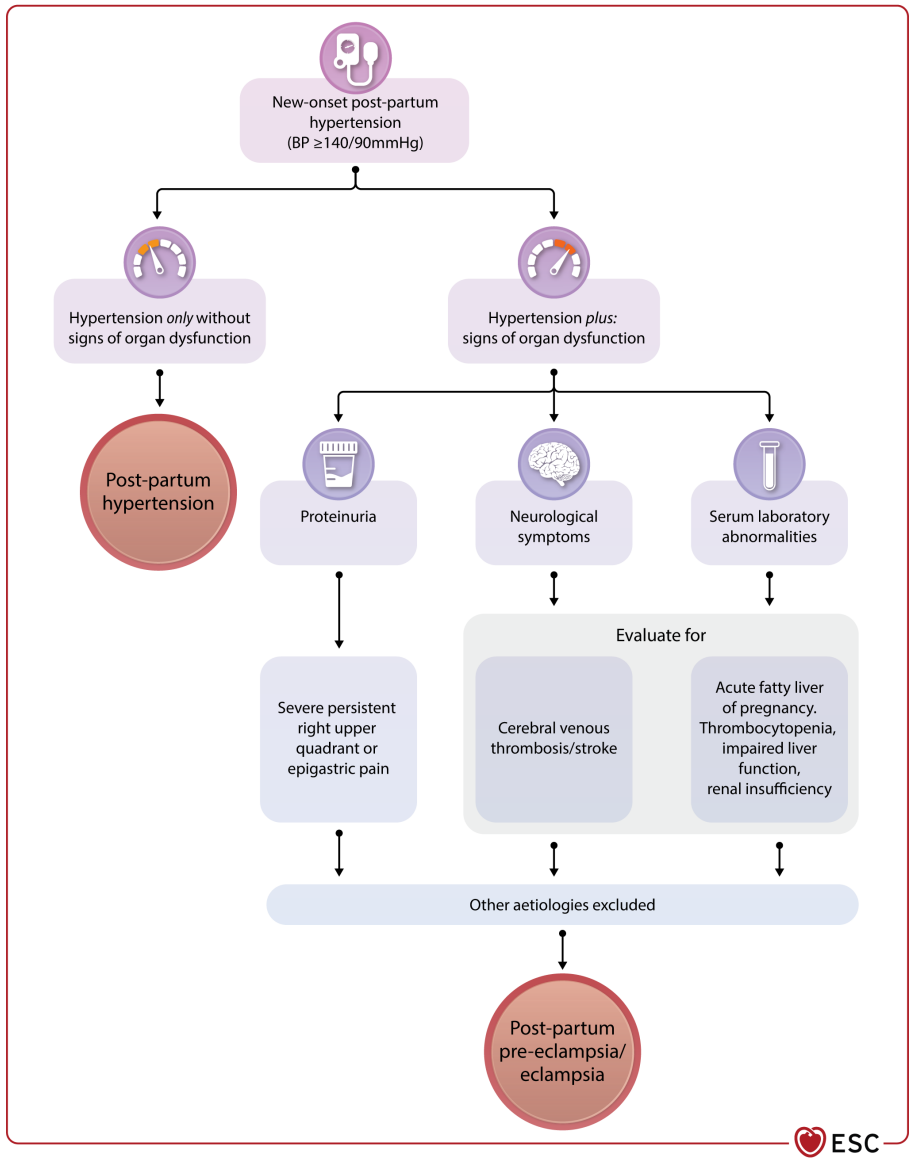


Figure 24
ESC Guidelines CVD Pregnancy 2025

New recommendations: **Long-term effects**

Recommendations	Class	Level
Section 13. ***Long-term effects of Adverse Pregnancy Outcomes (APO)***		
This is a **completely new section in the guidelines, reflecting the growing recognition of the importance of APOs.**		
It is recommended to undertake a cardiovascular risk assessment in women with APOs, to recognize and document APOs when CVD risk is evaluated in women, and to provide counselling on the **importance of healthy lifestyle** choices that optimize cardiovascular health.	**I**	**B**

Recommendations:
Long-term effects of adverse pregnancy outcomes

Recommendations	Class	Level
It is recommended to undertake a **cardiovascular risk assessment in women with APOs, to recognize and document APOs when CVD risk is evaluated in women**, and to provide counselling on the importance of healthy lifestyle choices that optimize cardiovascular health.	I	B
In women with **persistent post-partum hypertension beyond 6 weeks to 3 months post-partum, initiation of antihypertensive therapy** with reference to lactating status is recommended following current guidelines.	I	B
In cases where adoption of **healthy lifestyle choices alone is inadequate to control post-partum glucose levels, initiation of pharmacotherapy following current guidelines is recommended.**	I	C
It is recommended that women with a **history of GDM undergo a formal oGTT 6–12 weeks post-partum with a repeat assessment at 6–12 months and regular annual follow-up visits to screen for diabetes**.	I	C

APO: Adverse Pregnancy Outcome; **GDM:** Gestational Diabetes

Algorithm for the management of adverse pregnancy outcomes

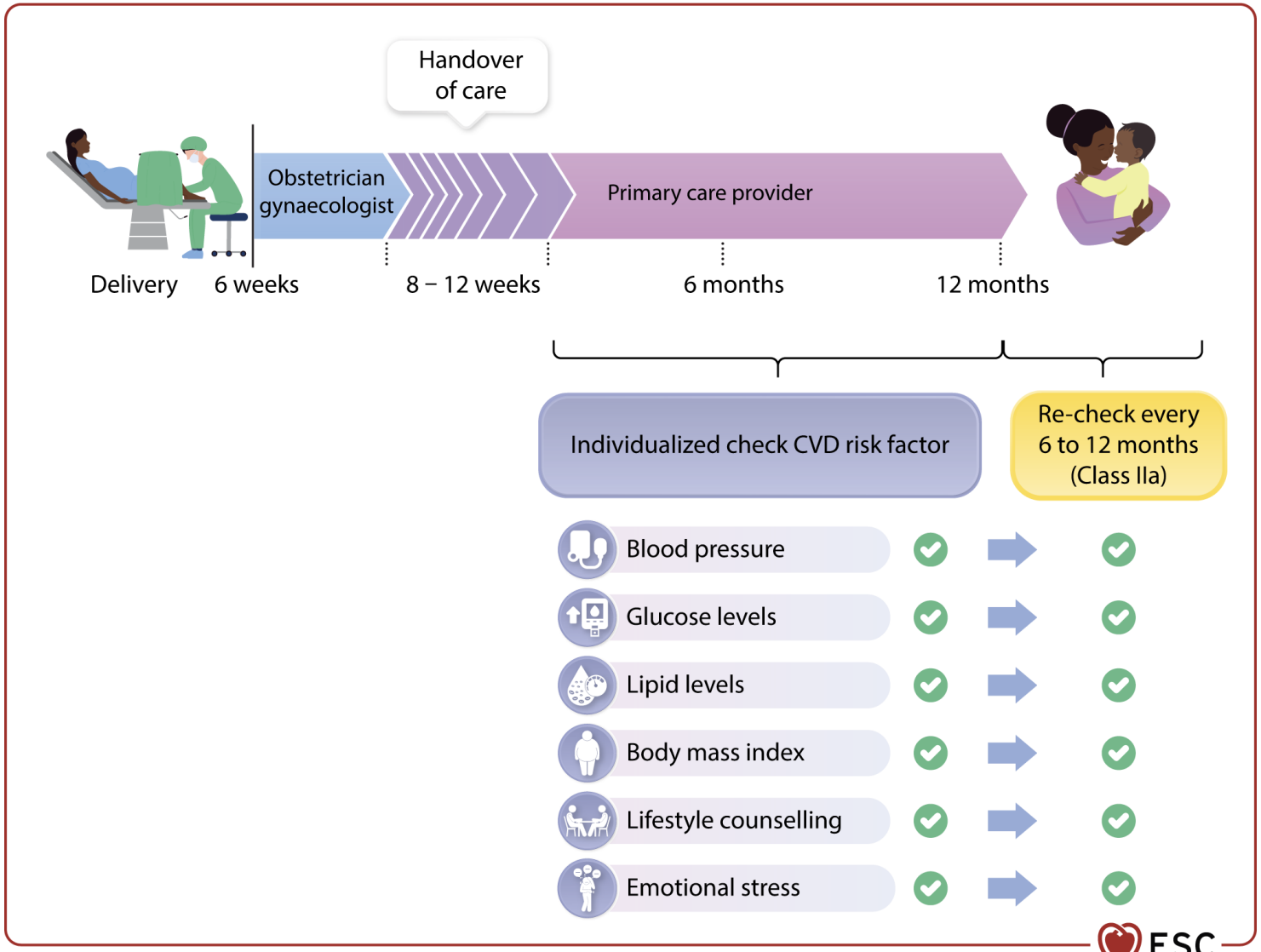


Figure 25
ESC Guidelines CVD Pregnancy 2025

Outline:

- General Approach
- Hypertension & Adverse Pregnancy Outcome
- Cardiomyopathies
- Valvular Heart Disease
- Approach to chest pain

***Summary of new recommendations*: Peripartum cardiomyopathy**

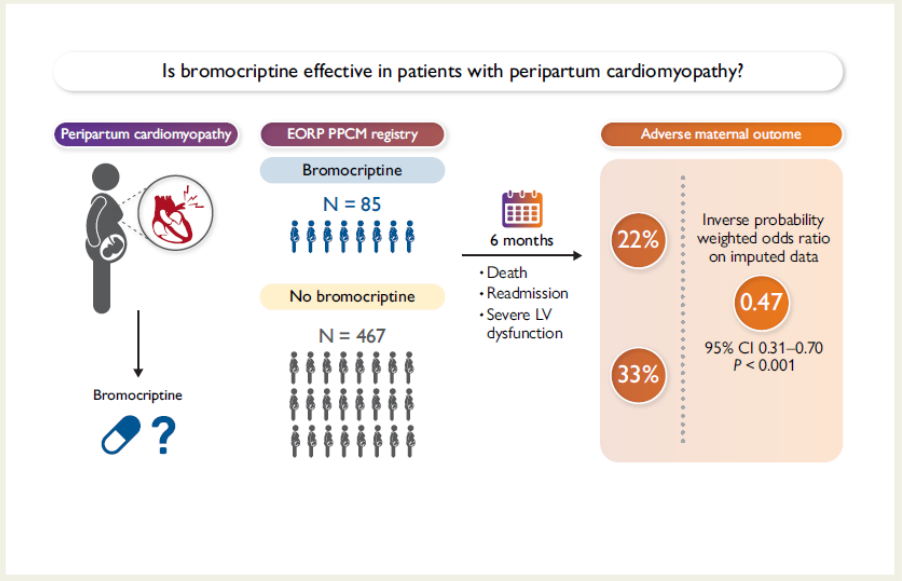
Recommendations	Class	Level
Section 7. Peripartum cardiomyopathy		
We have provided a separate section on PPCM in these guidelines.		
Genetic counselling and testing should be considered in women with PPCM.	**IIa**	**C**
When a reversible course of HF is assumed, treatment in accordance with HF guidelines should be considered for at least 12 months after complete LV recovery (normalization of LV volumes and EF).	**IIa**	**C**

New Evidence 2025 leading to adaptations of guidelines Peripartum cardiomyopathy

Key Question
Is bromocriptine treatment associated with improved maternal outcomes in patients with peripartum cardiomyopathy (PPCM)?

Key Finding
In women with PPCM, bromocriptine treatment was associated with better maternal outcomes, as compared to standard-of-care group. This benefit was primarily driven by fewer patients with severe LV dysfunction after 6 months. Furthermore, no differences in thromboembolic events were observed between the two groups.

Take Home Message
In women with PPCM, bromocriptine treatment in addition to standard-of-care is associated with better maternal outcomes.



The association between bromocriptine treatment and maternal outcome in patients with peripartum cardiomyopathy. CI, confidence interval; LV, left ventricular.

Keywords Peripartum cardiomyopathy • Bromocriptine • Pregnancy • Heart failure

ESC European Society of Cardiology
European Heart Journal (2024) **00**, 1–11
https://doi.org/10.1093/eurheartj/ehae559

FASTTRACK – CLINICAL RESEARCH
Heart failure and cardiomyopathies

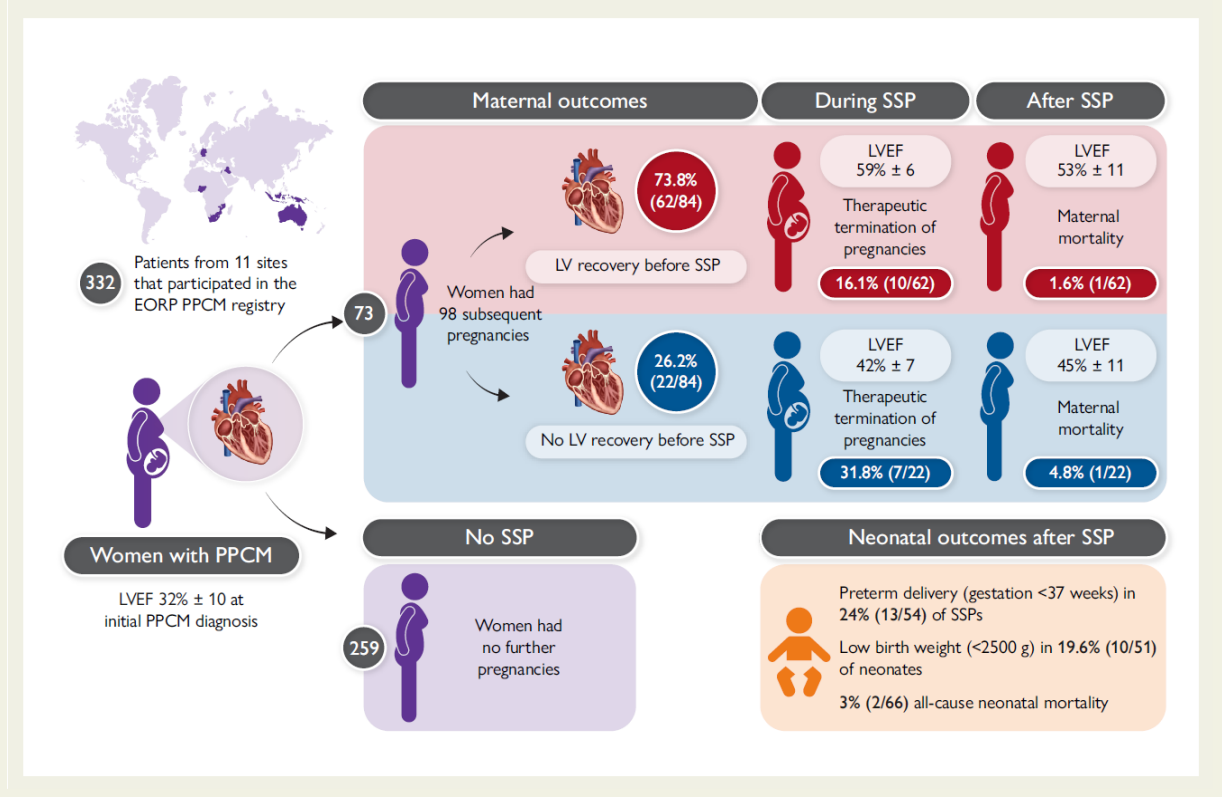
Bromocriptine treatment and outcomes in peripartum cardiomyopathy: the EORP PPCM registry

Peter van der Meer [1,*], Bart Johan van Essen[1], Charle Viljoen[2,3], Michael Böhm[4], Alice Jackson[5], Denise Hilfiker-Kleiner[6], Julian Hoevelmann [2,4], Alexandre Mebazaa[7,8], Hasan Ali Farhan [9], Sorel Goland [10,11], Wouter Ouwerkerk[12], Mark C. Petrie [5], Petar M. Seferović[13,14], Jasper Tromp [15,16,17], Karen Sliwa [18,†], and Johann Bauersachs [19,†]

[1]Department of Cardiology, University of Groningen, University Medical Centre Groningen, Groningen, The Netherlands; [2]Cape Heart Institute, Faculty of Health Sciences, University of Cape Town, Cape Town, South Africa; [3]Division of Cardiology, Department of Medicine, Groote Schuur Hospital, Faculty of Health Sciences, University of Cape Town, Cape Town, South Africa; [4]Department of Internal Medicine III-Cardiology, Angiology, and Internist Intensive Medicine, Saarland University Hospital, Homburg, Saar, Germany; [5]British Heart Foundation Cardiovascular Research Centre, University of Glasgow, Glasgow, UK; [6]Philipps-Universität Marburg, Medical Faculty, Marburg, Germany; [7]Paris Cité University, French National Institute of Health and Medical Research (INSERM) Cardiovascular MArkers in Stress Conditions (MASCOT), Paris, France; [8]Department of Anesthesiology and Critical Care, Saint Louis Lariboisière Hospitals, Public Assistance Hospital of Paris, Paris, France; [9]Iraqi Board for Medical Specialisations, University of Baghdad, College of Medicine, Baghdad, Iraq; [10]Kaplan Medical Center, The Heart Institute, Rehovot, Israel; [11]Israel Hadassah Medical School, Hebrew University, Jerusalem, Israel; [12]Amsterdam UMC, University of Amsterdam, Amsterdam Infection and Immunity Institute, Amsterdam, The Netherlands; [13]Faculty of Medicine, University Medical Center, Belgrade, Serbia; [14]Serbian Academy of Sciences and Arts, Medical Faculty University of Belgrade, Belgrade, Serbia; [15]Saw Swee Hock School of Public Health & The National University Health System, Singapore, Singapore; [16]Duke-NUS Medical School, Singapore, Singapore; [17]National Heart Centre Singapore, Singapore, Singapore; [18]Cape Heart Institute, Faculty of Health Sciences, Department of Medicine and Cardiology, University of Cape Town, Cape Town, South Africa; and [19]Department of Cardiology and Angiology, Hannover Medical School, Hannover, Germany

Received 15 July 2024; revised 7 August 2024; accepted 15 August 2024

New Evidence 2025 leading to adaptations of guidelines: PPCM and subsequent pregnancy



ESC European Society of Cardiology
European Heart Journal (2025) **00**, 1–10
https://doi.org/10.1093/eurheartj/ehaf006
CLINICAL RESEARCH
Heart failure and cardiomyopathies

Pregnancies in women after peri-partum cardiomyopathy: the global European Society of Cardiology EuroObservational Research Programme Peri-Partum Cardiomyopathy Registry

Karen Sliwa [1,*†], Alice Jackson[2,†], Charle Viljoen[1], Albertino Damasceno [3], Irina Mbanze[3], Hassan Al Farhan[4,5], Israa Fadhil Yaseen[4,5], Amam Mbakwem[6], Triwedya Indra Dewi[7], Zofia Dzielinska[8], Timur Abdullaev[9], Sorel Goland [10], Denise Hilfiker-Kleiner[11], Julia Hahnle[1], Carmen Basic [12], Alexandra Frogoudaki[13], Petar Seferovic[14], Peter van der Meer[15], Mark C. Petrie [2], and Johann Bauersachs[16]; on behalf of the EuroObservational Research Programme in conjunction with the Heart Failure Association of the European Society of Cardiology Committee on Peripartum Cardiomyopathies

[1]Cape Heart Institute, Department of Cardiology and Medicine, Faculty of Health Sciences, University of Cape Town, 4th floor Chris Barnard Building, Observatory, Cape Town 7925, South Africa; [2]School of Cardiovascular and Metabolic Health, University of Glasgow, Glasgow, UK; [3]Faculty of Medicine, Eduardo Mondlane University, Maputo, Mozambique; [4]Iraqi Board for Medical Specializations, Scientific Council of Cardiology, College of Medicine, University of Baghdad, Baghdad Heart Center, Baghdad, Iraq; [5]Baghdad Teaching Hospital, Department of Medicine and Cardiology, Medical City, Baghdad, Iraq; [6]Department of Cardiology, College of Medicine and Lagos University Teaching Hospital, Lagos, Nigeria; [7]Department of Cardiology and Vascular Medicine, Faculty of Medicine, Bandung Hasan Sadikin General Hospital, Bandung, Indonesia; [8]Cardinal Wyszynski National Institute of Cardiology, Medical University of Warsaw, Warsaw, Poland; [9]Specialized Scientific Medical Centre, Department of Medicine and Cardiology, Tashkent, Uzbekistan; [10]Heart Institute, Department of Cardiology, Kaplan Medical Centre, Rehovot, Hebrew University, Jerusalem, Israel; [11]Faculty of Medicine, Philipps University Marburg, Marburg, Germany; [12]Institute of Medicine, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden; [13]Atticon University Hospital, Department of Cardiology, Chaidari, Greece; [14]Department of Cardiology, University of Belgrade Faculty of Medicine, Belgrade, Serbia; [15]University Medical Centre Groningen, Department of Cardiology, Groningen, Netherlands; and [16]Department of Cardiology and Angiology, Hannover Medical School, Hannover, Germany

Summary of new recommendations: Peripartum cardiomyopathy

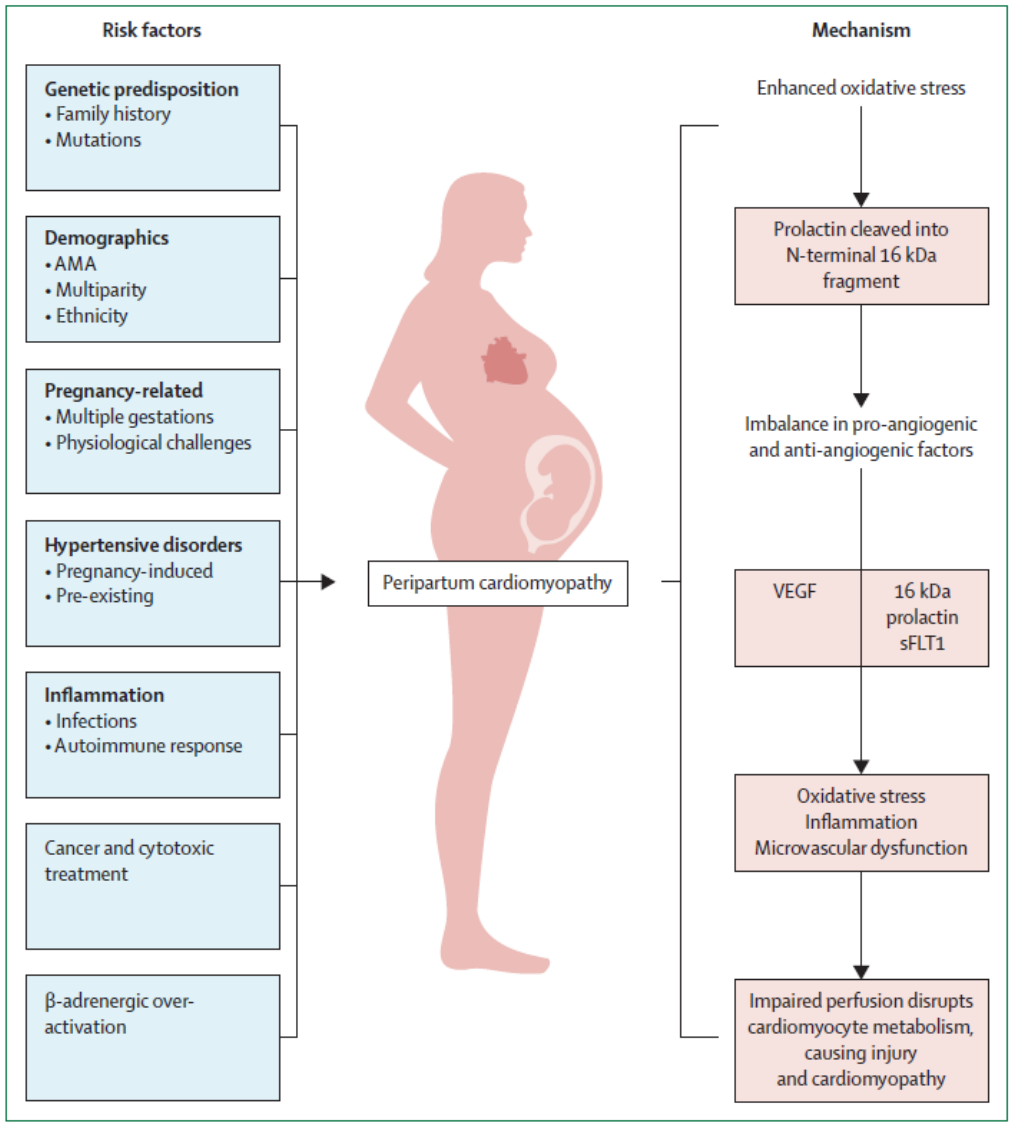
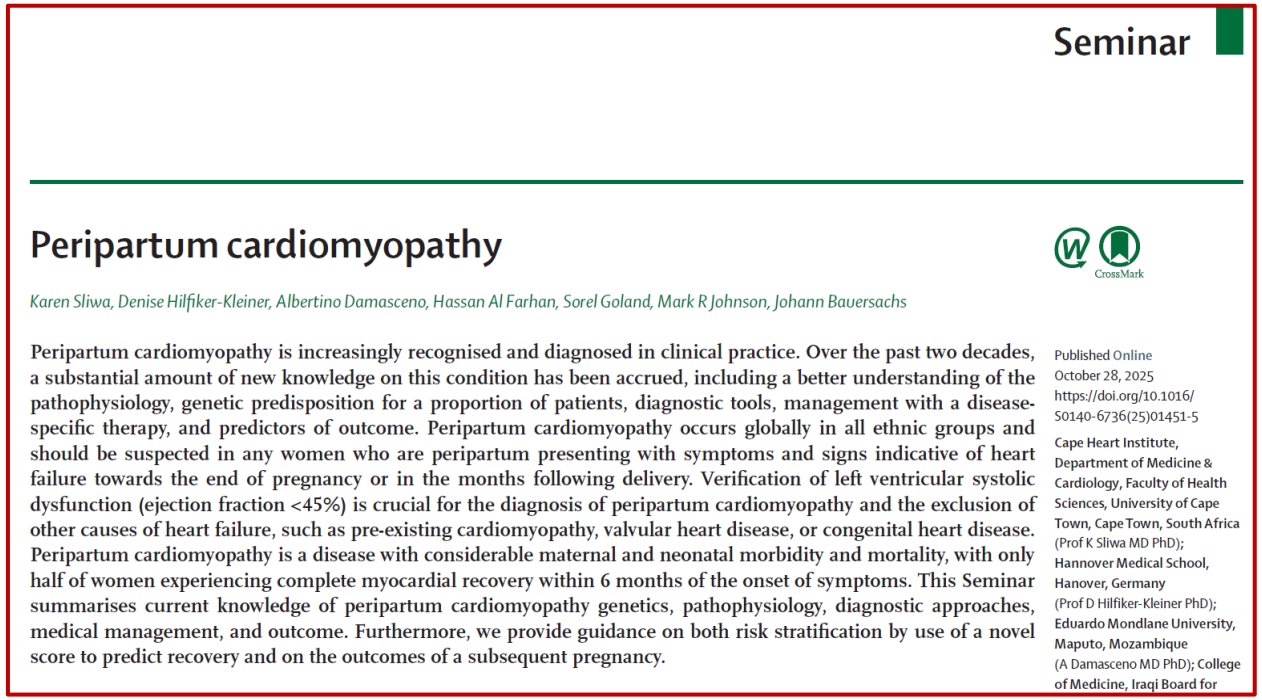


Figure 2: **Multiple hit model**
AMA=advanced maternal age. sFLT1=soluble fms-like tyrosine kinase-1. VEGF=vascular endothelial growth factor.



Seminar

Peripartum cardiomyopathy

Karen Sliwa, Denise Hilfiker-Kleiner, Albertino Damasceno, Hassan Al Farhan, Sorel Goland, Mark R Johnson, Johann Bauersachs

Peripartum cardiomyopathy is increasingly recognised and diagnosed in clinical practice. Over the past two decades, a substantial amount of new knowledge on this condition has been accrued, including a better understanding of the pathophysiology, genetic predisposition for a proportion of patients, diagnostic tools, management with a disease-specific therapy, and predictors of outcome. Peripartum cardiomyopathy occurs globally in all ethnic groups and should be suspected in any women who are peripartum presenting with symptoms and signs indicative of heart failure towards the end of pregnancy or in the months following delivery. Verification of left ventricular systolic dysfunction (ejection fraction <45%) is crucial for the diagnosis of peripartum cardiomyopathy and the exclusion of other causes of heart failure, such as pre-existing cardiomyopathy, valvular heart disease, or congenital heart disease. Peripartum cardiomyopathy is a disease with considerable maternal and neonatal morbidity and mortality, with only half of women experiencing complete myocardial recovery within 6 months of the onset of symptoms. This Seminar summarises current knowledge of peripartum cardiomyopathy genetics, pathophysiology, diagnostic approaches, medical management, and outcome. Furthermore, we provide guidance on both risk stratification by use of a novel score to predict recovery and on the outcomes of a subsequent pregnancy.

Published Online
October 28, 2025
https://doi.org/10.1016/
S0140-6736(25)01451-5

Cape Heart Institute, Department of Medicine & Cardiology, Faculty of Health Sciences, University of Cape Town, Cape Town, South Africa (Prof K Sliwa MD PhD); Hannover Medical School, Hanover, Germany (Prof D Hilfiker-Kleiner PhD); Eduardo Mondlane University, Maputo, Mozambique (A Damasceno MD PhD); College of Medicine, Iraqi Board for

Sliwa et al, The Lancet. 2025
https://doi.org/10.1016/S0140-6736(25)01451-5

Risk factors and management of peripartum cardiomyopathy

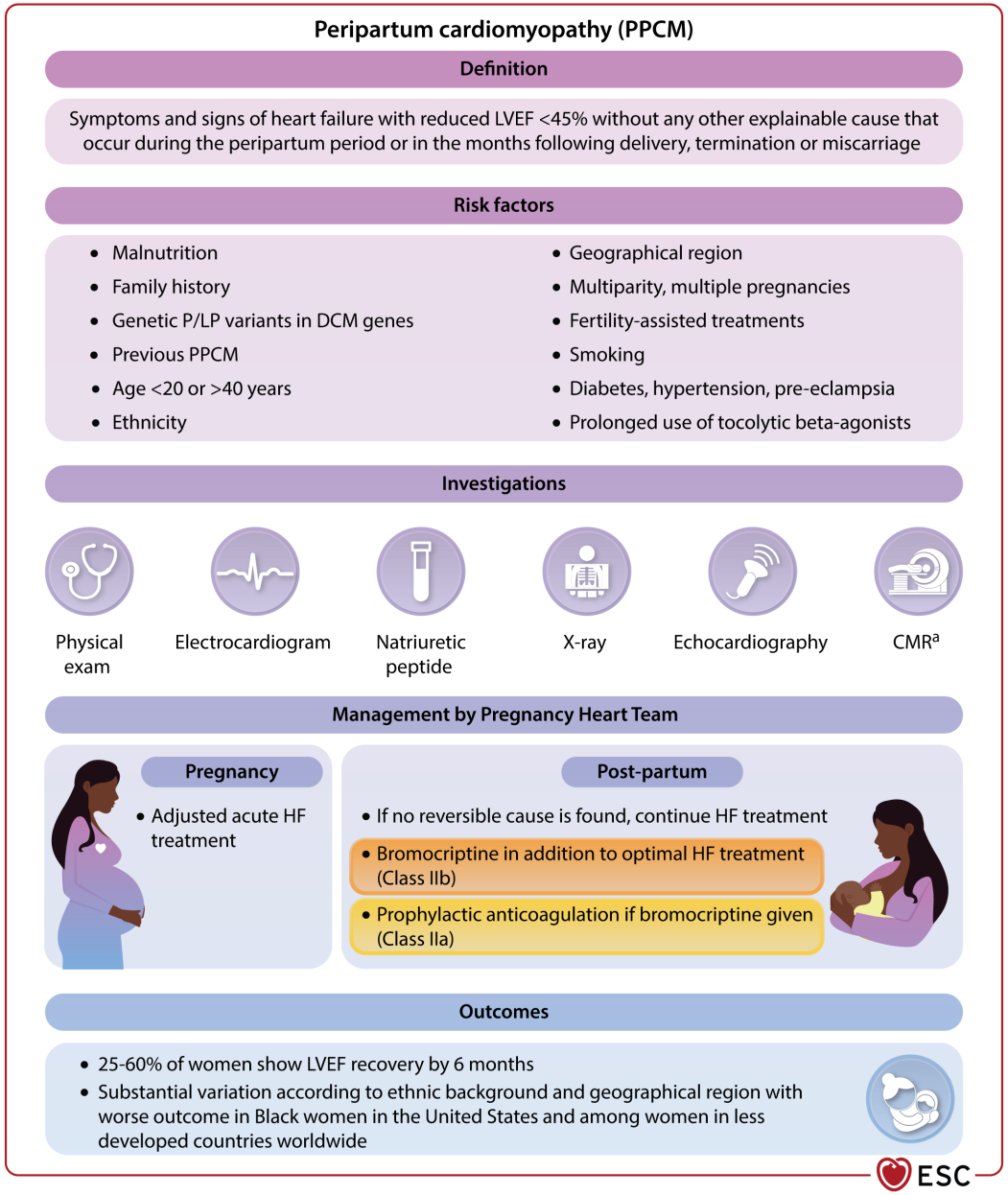


Figure 7
ESC Guidelines CVD Pregnancy 2025

Modified WHO 2.0 classification of maternal CV risk: PPCM & PPCM subsequent pregnancy

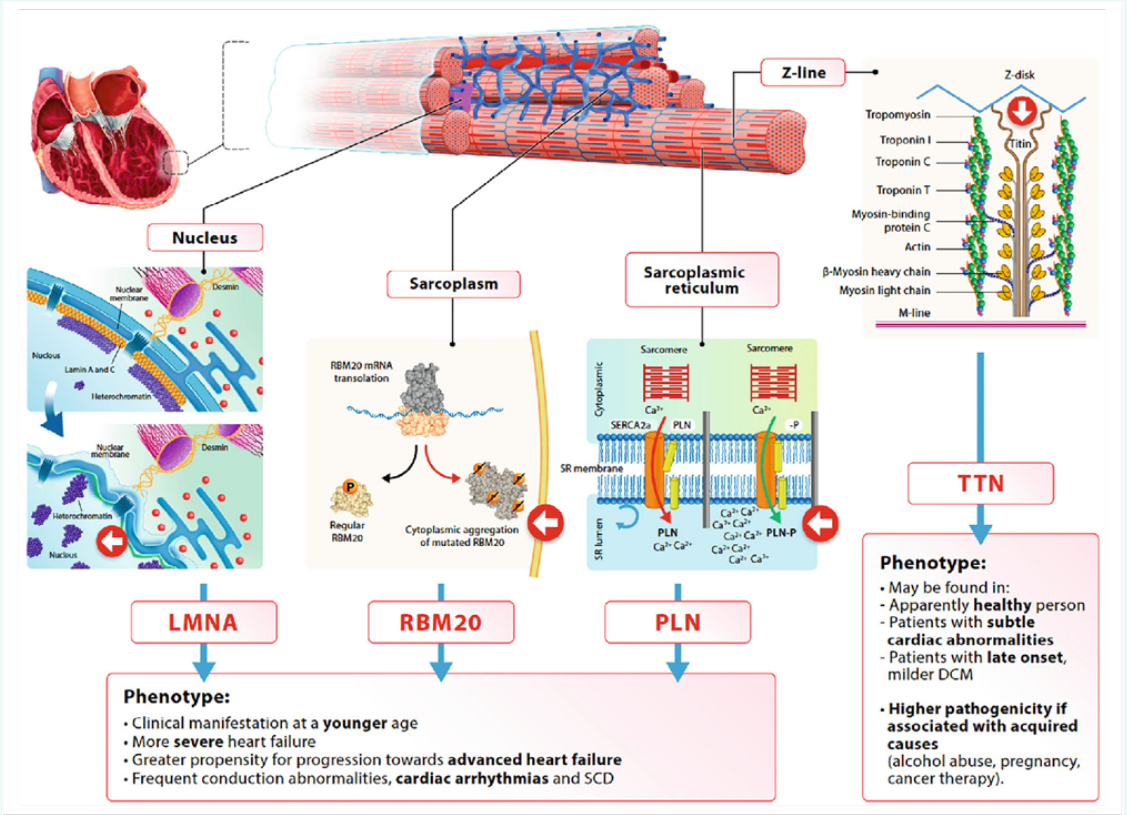
mWHO 2.0 I	mWHO 2.0 II	mWHO 2.0 II–III	mWHO 2.0 III	mWHO 2.0 IV
Ventricular (dys)function + pulmonary hypertension				
		PPCM: Mild left ventricular impairment: EF >45%	**PPCM:** Moderate left ventricular impairment: EF 30%–45% **Previous PPCM** with not more than mild residual left ventricular impairment	**PPCM:** Severe left ventricular impairment: EF <30% or NYHA class III/IV **Previous PPCM** with more than mild left ventricular impairment

PPCM: Peripartum Cardiomyopathy

Recommendations: Peripartum Cardiomyopathy

Recommendations	Class	Level
Counselling for women with PPCM about the risk of recurrence during a subsequent pregnancy and about contraception is recommended in all cases, even after recovery of LV function (LVEF >50%).	I	C
Adding at least prophylactic LMWH treatment to bromocriptine treatment in women with PPCM should be considered.	IIa	C
Genetic counselling and testing should be considered in women with PPCM.	IIa	C
When a reversible course of HF is assumed, **treatment in accordance with HF guidelines should be considered for at least 12 months after complete LV recovery (normalization of LV volumes and EF).**	IIa	C
Bromocriptine treatment may be considered in addition to optimal HF treatment to enhance recovery of LV function in women with PPCM.	IIb	B
The use of a WCD may be considered in women with PPCM and LVEF <35%.	IIb	C

Cardiomyopathy & Pregnancy: Individualized risk-stratification and management



Genotype – phenotype associations of genetic variants in cardiomyopathies:

LMNA (Lamin A/C mutations): abnormalities within different cellular signalling pathways; frequency: 5%; association with skeletal muscle dystrophy, **atrial fibrillation, conduction abnormalities and ventricular arrhythmias.**

RBM20 (Ribonucleic acid Binding Motif 20) mutations: perturbation in post-transcriptional pre-mRNA processing; frequency: 2%; **association with conduction abnormalities, ventricular arrhythmias, and early progressive cardiomyopathy.**

PLN (phospholamban mutations): cellular Ca^{2+} dysregulation, contractile & metabolic dysfunction; frequency: 2%; association with **low voltage electrocardiogram and ventricular arrhythmias.**

TTN (titin truncating mutations): increased non-sense mRNA decay, activation of rapamycin (mTOR) complex signalling pathway, mitochondrial dysfunction, **increased interstitial fibrosis; frequency: 25%; variable genotype – phenotype associations.**

Modified WHO 2.0 classification of maternal CV risk: Cardiomyopathies

mWHO 2.0 I	mWHO 2.0 II	mWHO 2.0 II–III	mWHO 2.0 III	mWHO 2.0 IV
Cardiomyopathy				
HCM: genotype-positive + phenotype-negative		Low-risk ARVC: genotype-positive + no or mild phenotype HCM without complications DCM/NDLVC with normal or mild left ventricular impairment: EF >45%	ARVC with moderate/severe disease HCM with arrhythmic and/or moderate haemodynamic complications DCM/NDLVC with moderate left ventricular impairment: EF 30%–45%	DCM/NDLVC with severe left ventricular impairment: EF <30% or NYHA class III/IV HCM with symptomatic severe outflow tract obstruction: ≥50 mmHg HCM with severely symptomatic LV dysfunction (EF <50%)

ARVC: Arrhythmogenic Right Ventricular Cardiomyopathy; **DCM:** Dilated Cardiomyopathy; **NDLVC:** Non-Dilated Cardiomyopathy ; **HCM:** Hypertrophic Cardiomyopathy

Recommendations: Cardiomyopathies

Recommendations	Class	Level
Clinical cardiological surveillance (ECG, echocardiogram, and Holter ECG monitoring) is recommended during pregnancy in women with CMPs, depending on individual risk.	I	C
Vaginal delivery is recommended in most women with CMPs, unless there are obstetric indications for caesarean section, severe HF (EF <30% and/or NYHA class III/IV), uncontrolled arrhythmias, or severe outflow obstruction (≥50 mmHg) in women with HCM, or in women presenting in labour on VKAs.	I	C
Continuation of beta-blockers should be considered during pregnancy in women with CMPs, with close follow-up of foetal growth.	IIa	C
Dilated cardiomyopathy		
In women with **DCM and worsening of EF during pregnancy, counselling on the risk of recurrence during a subsequent pregnancy is recommended in all cases, even after recovery of LV function.**	I	C

Recommendations: Cardiomyopathies

Recommendations	Class	Level
Arrhythmogenic right ventricular cardiomyopathy		
Flecainide, in addition to beta-blockers, should be considered as the antiarrhythmic drug of choice in pregnant women with ARVC.	IIa	C
Sotalol may be considered as an antiarrhythmic drug in pregnant women with ARVC, with careful evaluation of QTc and while monitoring for foetal bradycardia and foetal growth and neonate hypoglycaemia.	IIb	C
Hypertrophic cardiomyopathy		
It is recommended to use the same risk stratification protocol for ventricular arrhythmias in pregnant women with HCM as for non-pregnant women with HCM.	I	C
It is recommended to start beta-blockers in women with HCM who develop symptoms due to outflow tract obstruction or arrhythmia during pregnancy.	I	C
It is recommended that women with HCM with symptomatic LV dysfunction (EF <50%) and or severe LVOTO (≥50 mmHg) wishing to become pregnant are counselled by the Pregnancy Heart Team regarding the high risk of pregnancy-related adverse events.	I	C

Outline:

- General Approach
- Hypertension & Adverse Pregnancy Outcome
- Cardiomyopathies
- Valvular Heart Disease
- Approach to chest pain

Valvular heart disease and pregnancy

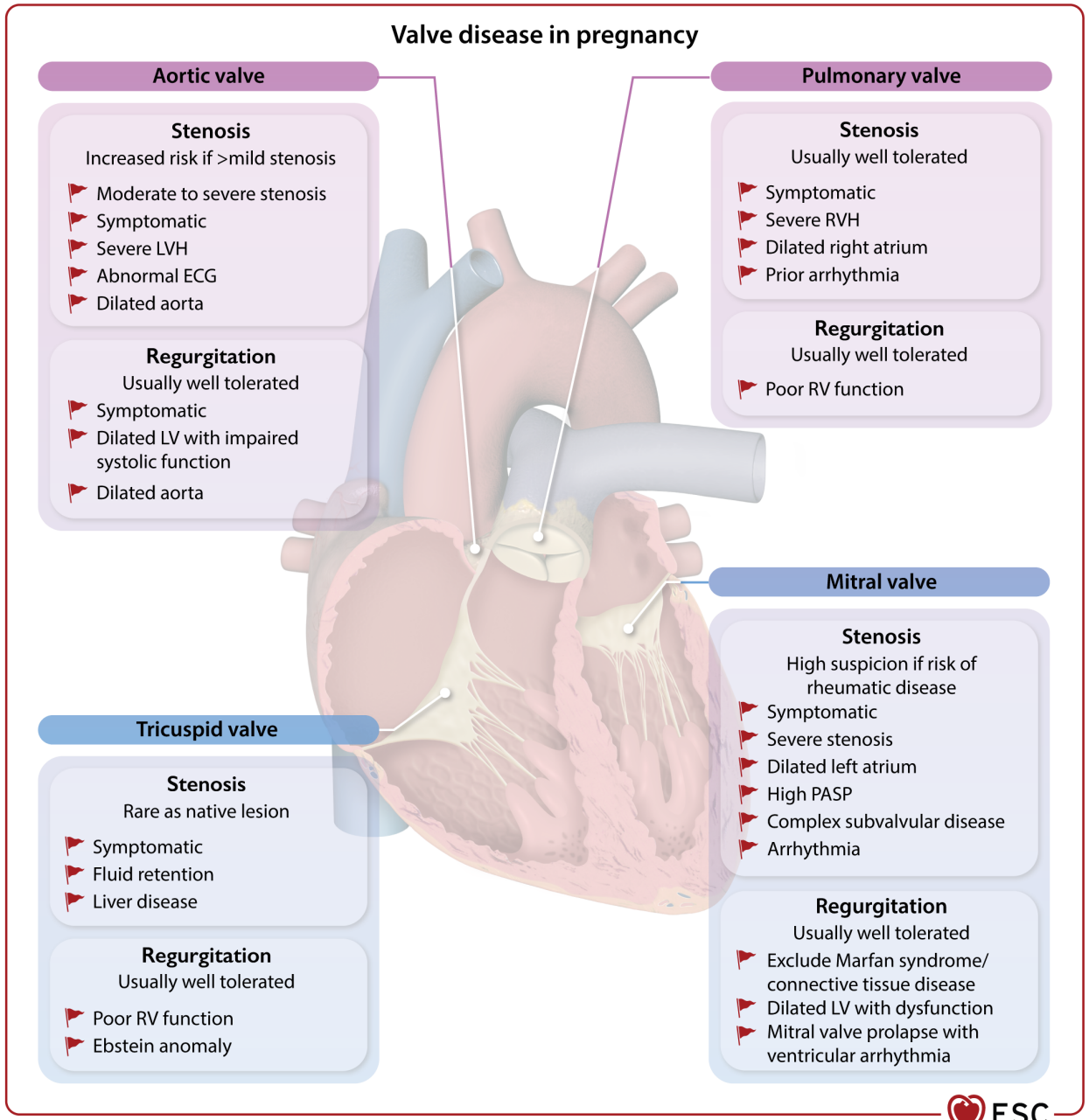


Figure 20
ESC Guidelines CVD Pregnancy 2025

Modified WHO 2.0 classification of maternal CV risk: **Valvular disease**

mWHO 2.0 I	mWHO 2.0 II	mWHO 2.0 II–III	mWHO 2.0 III	mWHO 2.0 IV
Valvular heart disease				
mild pulmonary stenosis mitral valve prolapse without significant regurgitation		mild mitral stenosis, moderate aortic stenosis moderate valvular regurgitation	Uncomplicated mechanical valve with stable well controlled INRs. moderate mitral stenosis severe asymptomatic aortic stenosis severe left-sided valvular regurgitation	severe mitral stenosis severe symptomatic aortic stenosis

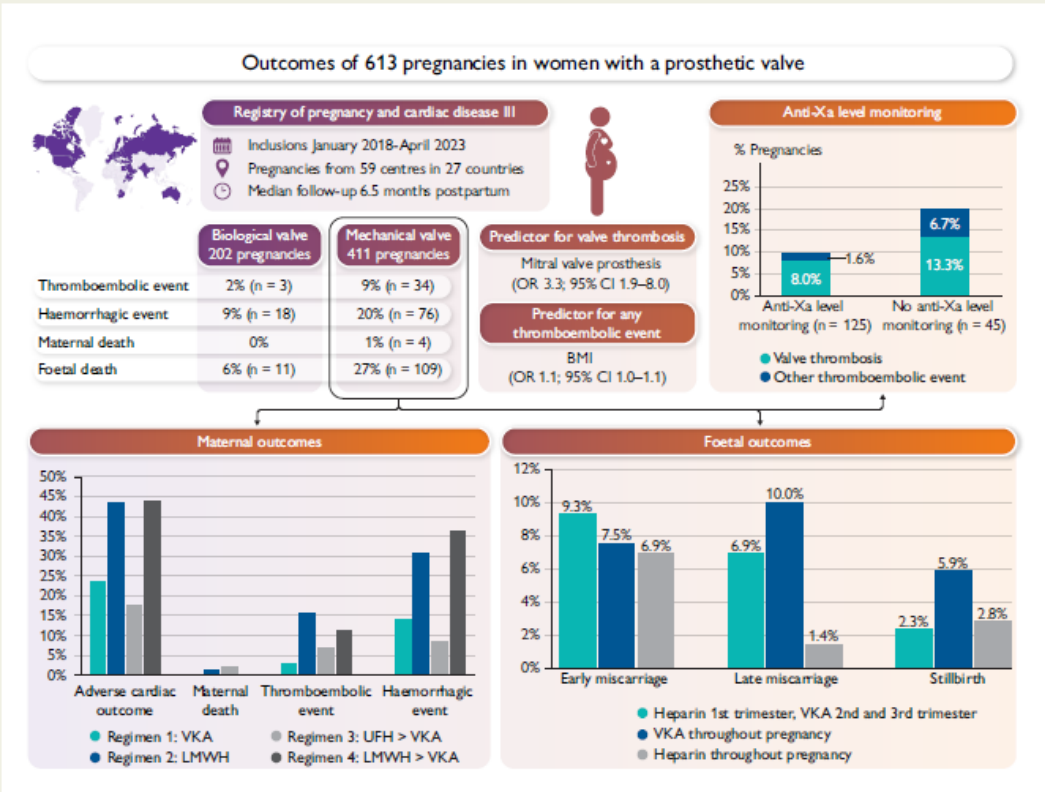
New Evidence 2025 leading to adaptations of guidelines: Prosthetic valves I

Pregnancy with a prosthetic heart valve, thrombosis, and bleeding: the ESC EORP Registry of Pregnancy and Cardiac disease III

Johanna A. van der Zande [1,2], Karishma P. Ramlakhan [1,2], Karen Sliwa [3], Justin P. Gnanaraj[4], Hasan Al Farhan[5], Isabelle Malhamé [6], Catherine M. Otto[7], Roman Vasallo Peraza[8], Ariane Marelli [9], Aldo P. Maggioni[10], Jerome M. J. Cornette[2], Mark R. Johnson[11], Jolien W. Roos-Hesselink [1,*], and Roger Hall[12]; on behalf of the ROPAC investigators[†]

[1]Department of Cardiology, Erasmus MC, University Medical Center Rotterdam, Room RG-435, PO Box 2040, 3000 CA Rotterdam, The Netherlands; [2]Department of Obstetrics and Fetal Medicine, Erasmus MC – Sophia Children's Hospital, University Medical Center Rotterdam, Rotterdam, The Netherlands; [3]Department of Cardiology, Faculty of Health Sciences, Cape Heart Institute, University of Cape Town, Cape Town, South Africa; [4]Institute of Cardiology, Madras Medical College, Chennai, India; [5]Iraqi Board for Medical Specializations, College of Medicine, University of Baghdad, Baghdad Heart Center, Baghdad, Iraq; [6]Department of Medicine, McGill University Health Centre, Montreal, QC, Canada; [7]Division of Cardiology, Department of Medicine, University of Washington School of Medicine, Seattle, WA, USA; [8]Department of Cardiology, Institute of Cardiology and Cardiovascular Surgery, Havana, Cuba; [9]Department of Experimental Medicine, McGill University Health Center, Montreal, QC, Canada; [10]Department of Cardiology, ANMCO Research Center, Florence, Italy; [11]Department of Obstetric Medicine, Imperial College London, Kensington, London, UK; and [12]Department of Cardiology, University of East Anglia, Norwich, UK

Received 2 October 2024; revised 26 November 2024; accepted 31 March 2025



New Evidence 2025 leading to adaptations of guidelines: Prosthetic valves II

Table 6 Baseline characteristics and outcomes of pregnancies in women with a prosthetic valve from low- or middle-income countries and high-income countries

	Mechanical valve				Biological valve			
	Total ($n = 411$)[a]	LMIC ($n = 332$)	HIC ($n = 79$)	*P*-value[b]	Total ($n = 202$)	LMIC ($n = 77$)	HIC ($n = 125$)	*P*-value[b]
Pre-pregnancy baseline characteristics								
Age, years, mean ± SD	29.9 ± 5.9	29.3 ± 5.9	31.8 ± 5.6	**<001**	32.0 ± 5.6	31.2 ± 6.3	32.6 ± 5.0	.081
Nulliparity	141 (34.3)	103 (31.0)	38 (48.1)	**.005**	70 (35.4)	28 (37.8)	42 (33.9)	.645
Chronic hypertension	18 (4.4)	9 (2.7)	9 (11.4)	**.003**	6 (3.0)	3 (3.9)	3 (2.4)	.677
SEF < 40%	12 (3.1)	10 (3.2)	2 (2.6)	1.000	3 (1.5)	0 (0)	3 (2.4)	.287
NYHA class > II	14 (3.6)	12 (3.8)	2 (2.6)	1.000	2 (1.0)	1 (1.3)	1 (.8)	1.000
Prosthetic valve details								
Age at first valve replacement, years, mean ± SD	19.4 ± 7.8	20.1 ± 7.1	17.1 ± 9.5	**.005**	20.2 ± 9.6	21.1 ± 9.7	19.6 ± 9.5	.289
Time first valve replacement to current pregnancy, years, mean ± SD	10.5 ± 6.9	9.2 ± 5.2	14.8 ± 9.5	**<001**	11.7 ± 8.6	9.8 ± 7.8	12.9 ± 8.9	**.010**
Cause of underlying valvular disease								
Congenital	105 (25.5)	65 (19.5)	40 (50.6)	**<001**	139 (68.8)	36 (46.8)	103 (82.4)	**<001**
Rheumatic	244 (59.4)	223 (67.2)	21 (26.6)	**<001**	36 (17.8)	28 (36.4)	8 (6.4)	**<001**
Other/unknown	62 (15.1)	44 (13.3)	18 (22.8)	**.037**	27 (13.4)	13 (16.9)	14 (11.2)	.289
Anticoagulation regimen[c]				**<001**				
Regimen 1	120 (29.4)	109 (32.9)	11 (14.3)	**<001**				
Regimen 2	72 (17.6)	47 (14.2)	25 (32.5)	**<001**				
Regimen 3	137 (33.6)	136 (41.1)	1 (1.3)	**<001**				
Regimen 4	79 (19.4)	39 (11.8)	40 (51.9)	**<001**				
Maternal outcomes								
Adverse cardiac outcome	152 (25.9)	89 (23.1)	63 (31.5)	**.029**	37 (19.0)	16 (21.9)	21 (17.2)	.453
Maternal mortality	4 (1.0)	4 (1.2)	0 (0)	1.000	0 (0)			
Heart failure	23 (5.9)	15 (4.5)	8 (11.5)	**.029**	13 (7.1)	6 (9.0)	7 (6.0)	.552
Thromboembolic event	34 (8.6)	21 (6.6)	13 (16.5)	**.011**	3 (1.5)	1 (1.3)	2 (1.6)	1.000
Haemorrhagic event	94 (16.1)	47 (12.2)	47 (23.5)	**<001**	18 (9.2)	7 (9.6)	11 (9.0)	1.000

Continued

New Evidence 2025 leading to adaptations of guidelines: Prosthetic valves III

Table 4 Predictors of valve thrombosis during pregnancy in women with a mechanical valve

	Univariate model			Multivariate		
	Odds ratio	95% CI lower-upper limit	*P*-value	Odds ratio	95% CI lower-upper limit	*P*-value
Age	1.08	1.01–1.17	**.037**	1.05	.97–1.13	.235
BMI	1.05	.99–1.12	.113			
Nulliparity	1.40	.60–3.23	.436			
LMIC	.21	.09–.49	**<.001**	.28	.12–.68	**.005**
Current smoker	2.68	.31–23.20	.372			
Atrial fibrillation/flutter	3.81	1.01–14.37	**.048**	2.78	.73–10.56	.133
Signs of heart failure	1.68	.47–5.96	.421			
SEF < 40%	1.38	.17–11.14	.760			
Non-cardiac disease	2.45	.79–7.65	.123			
Cardiac medication before pregnancy	.40	.05–3.04	.375			
Congenital heart disease	.97	.37–2.51	.949			
Rheumatic heart disease	.56	.24–1.28	.169			
Mitral position	1.70	.71–4.08	.231	3.28	1.87–8.02	**.004**
Aortic position	.46	.15	.160	1.34	.51–3.48	.552
Malfunction of prosthetic valve before pregnancy	1.44	.17	.729			
Plan for anticoagulation level monitoring	.83	.28	.712			

Bold values denote statistical significance at $P < .05$ level. Logistic regression not possible for chronic hypertension, diabetes mellitus, renal disease, and NYHA class > II due to quasi separation.
BMI, body mass index; LMIC, low- or middle-income country; SEF, systemic ejection fraction.

Summary *-revised recommendations*: **Valvular disease**

2018 Guidelines	Class	Level	2025 Guidelines	Class	Level
Section 12. Recommendations for acquired heart disease and pregnancy					
Balloon aortic valvuloplasty should be considered during pregnancy in patients with severe aortic stenosis and severe symptoms.	**IIa**	**C**	In very selected symptomatic pregnant women with severe aortic stenosis not responding to medical therapy, non-surgical options such as balloon valvuloplasty or TAVI may be considered.	**IIb**	**C**
A bioprosthesis should be considered in young women contemplating pregnancy.	**IIa**	**C**	A bioprosthetic valve is recommended (over a mechanical valve) in young women contemplating pregnancy requiring a valve prosthesis.	**I**	**B**
During the second and third trimesters, LMWH with anti-factor Xa level monitoring and dose adjustment (see separate recommendations) may be considered in women who need a high dose of VKA after patient information and consent.	**IIb**	**C**	During the second and third trimesters until the 36th week, continuing VKAs should be considered in women with prosthetic heart valves at higher risk of thrombosis.	**IIa**	**C**

Outline:

- General Approach
- Hypertension & Adverse Pregnancy Outcome
- Cardiomyopathies
- Valvular Heart Disease
- Approach to chest pain

Management of chest pain during pregnancy and within 6 months post-partum

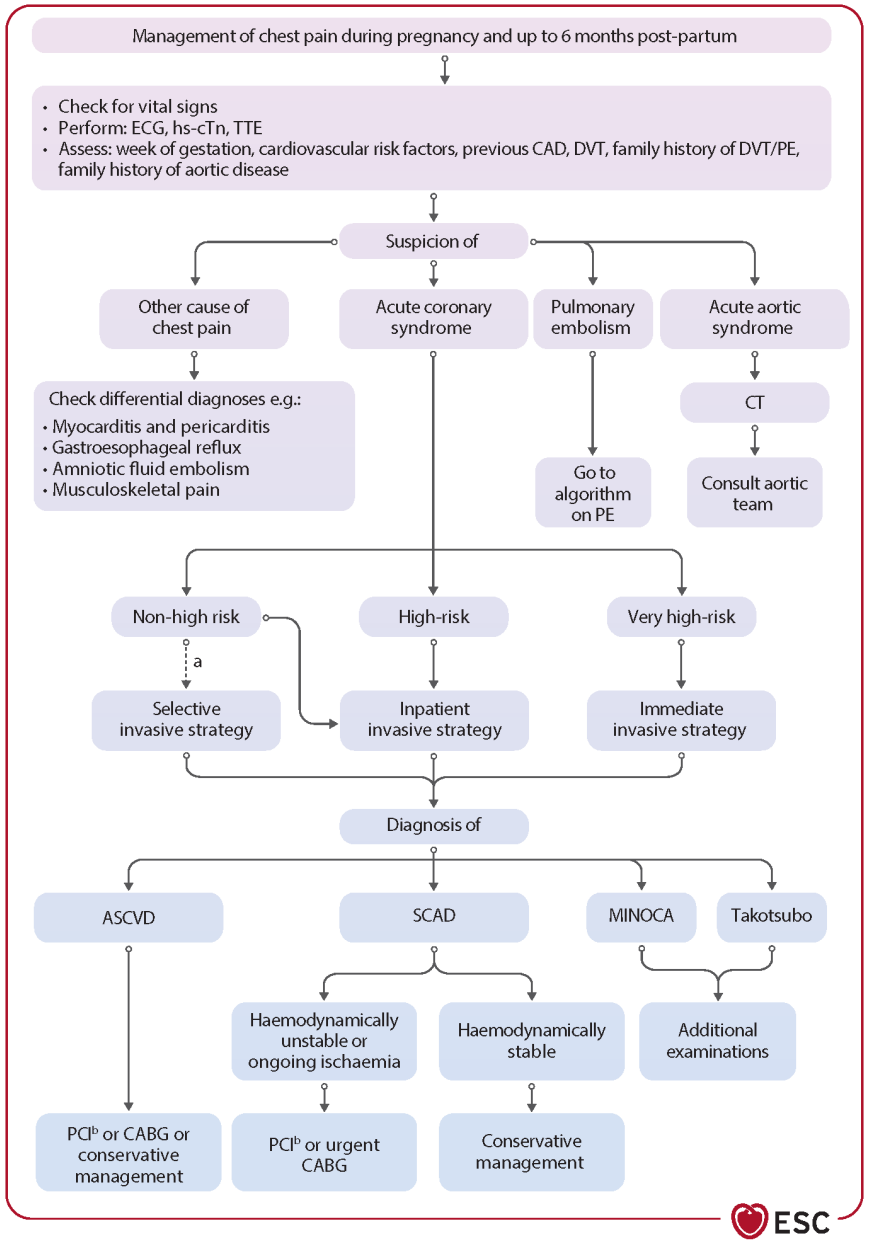


Figure 11
ESC Guidelines CVD Pregnancy 2025

SCAD: Spontaneous Coronary Artery Dissection
MINOCA: Myocardial Infarction without Obstructive CAD
ASCVD: Atherosclerotic Cardiovascular Disease

Recommendations for coronary artery disease and pregnancy

Recommendations	Class	Level
In pregnant women with chest pain, it is recommended to exclude life-threatening cardiovascular conditions, including PE, ACS (including SCAD), and acute aortic syndrome.	I	C
It is recommended to manage pregnant women with ACS in the same way as non-pregnant women, including diagnostic investigations and interventions.	I	C
Low-dose ASA is recommended as the antiplatelet treatment of choice during pregnancy and lactation when single antiplatelet treatment is indicated.	I	B
If DAPT is required, clopidogrel is recommended as the P2Y12 inhibitor of choice during pregnancy.	I	C
The duration of DAPT (aspirin and clopidogrel) in pregnant women undergoing coronary stent implantation is recommended to be the same as in non-pregnant women, with an individual approach considering ischaemic risk and delivery-related bleeding risks.	I	C
A vaginal delivery should be considered in most pregnant women with ACS		

Thank you

	@CapeHeartInstitute
	@CHI_UCT
	@CHI_UCT
	UCT Cape Heart Institute
	@uctcapeheartinstitute