ESC Guidelines 2011 for the management of cardiovascular diseases during pregnancy

Chairperson

Vera Regitz-Zagrosek
Charite Universitaetsmedizin Berlin,
Institute for Gender in Medicine,
Berlin, Germany

European Heart Journal 2011, doi: 10.1093/eurheatj/ehr218

www.escardio.org/guidelines

EUROPEAN SOCIETY OF CARDIOLOGY®

European Heart Journal
doi:10.1093/eurheartj/ehr218

ESC Guidelines on the management of cardiovascular diseases during pregnancy

The Task Force on the Management of Cardiovascular Diseases during Pregnancy of the European Society of Cardiology (ESC)

Endorsed by the European Society of Gynecology (ESG), the Association for European Paediatric Cardiology (AEPC), and the German Society for Gender Medicine (DGesGM).

Authors/Task Force Members Vera Regitz-Zagrosek (Chairperson) (Germany)*, Carina Blomstrom Lundqvist (Sweden), Claudio Borghi (Italy), Renata Cifkova (Czech Republic), Rafael Ferreira (Portugal), Jean-Michel Foidart† (Belgium), J. Simon R. Gibbs (UK), Christa Gohlke-Baerwolf (Germany), Bulent Gorenek (Turkey), Bernard Iung (France), Mike Kirby (UK), Angela H. E. M. Maas (The Netherlands), Joao Morais (Portugal), Petros Nihoyannopoulos (UK), Petronella G. Pieper (The Netherlands), Patrizia Presbitero (Italy), Jolien W. Roos-Hesselink (The Netherlands), Maria Schaufelberger (Sweden), Ute Seeland (Germany), Lucia Torracca (Italy).

ESC Committee for Practice Guidelines (CPG): Jeroen Bax (CPG Chairperson) (The Netherlands), Angelo Auricchio (Switzerland), Helmut Baumgartner (Germany), Claudio Ceconi (Italy), Veronica Dean (France), Christi Deaton (UK), Robert Fagard (Belgium), Christian Funck-Brentano (France), David Hasdai (Israel), Arno Hoes (The Netherlands), Juhani Knuuti (Finland), Philippe Kolh (Belgium), Theresa McDonagh (UK), Cyril Moulin (France), Don Poldermans (The Netherlands), Bogdan A. Popescu (Romania), Zeljko Reiner (Croatia), Udo Sechtem (Germany), Per Anton Sirnes (Norway), Adam Torbicki (Poland), Alec Vahanian (France), Stephan Windecker (Switzerland).

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Part I
Background

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Population of Europe of Childbearing Age

EU population 2008
499 million total*

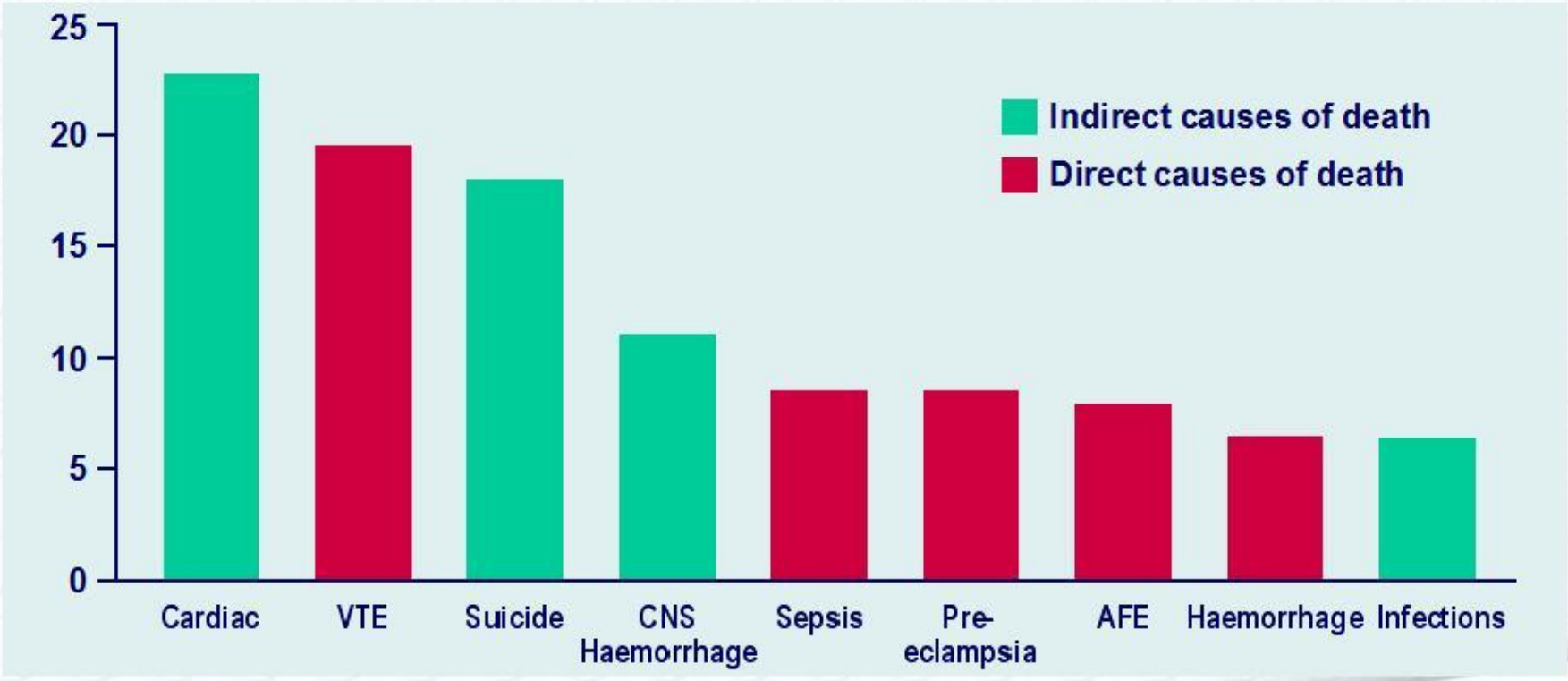
- 105 million women in childbearing age (15-45 years).
- 5 million live births.
- 1% of pregnancies are complicated by heart disease.**

*http://epp.eurostat.ec.europa.eu/portal/page/portal/population/data
**Report on Maternal Deaths in UK RCOG

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Major Causes of Maternal Death (UK 2003-2005)

Overall death rates per million maternities

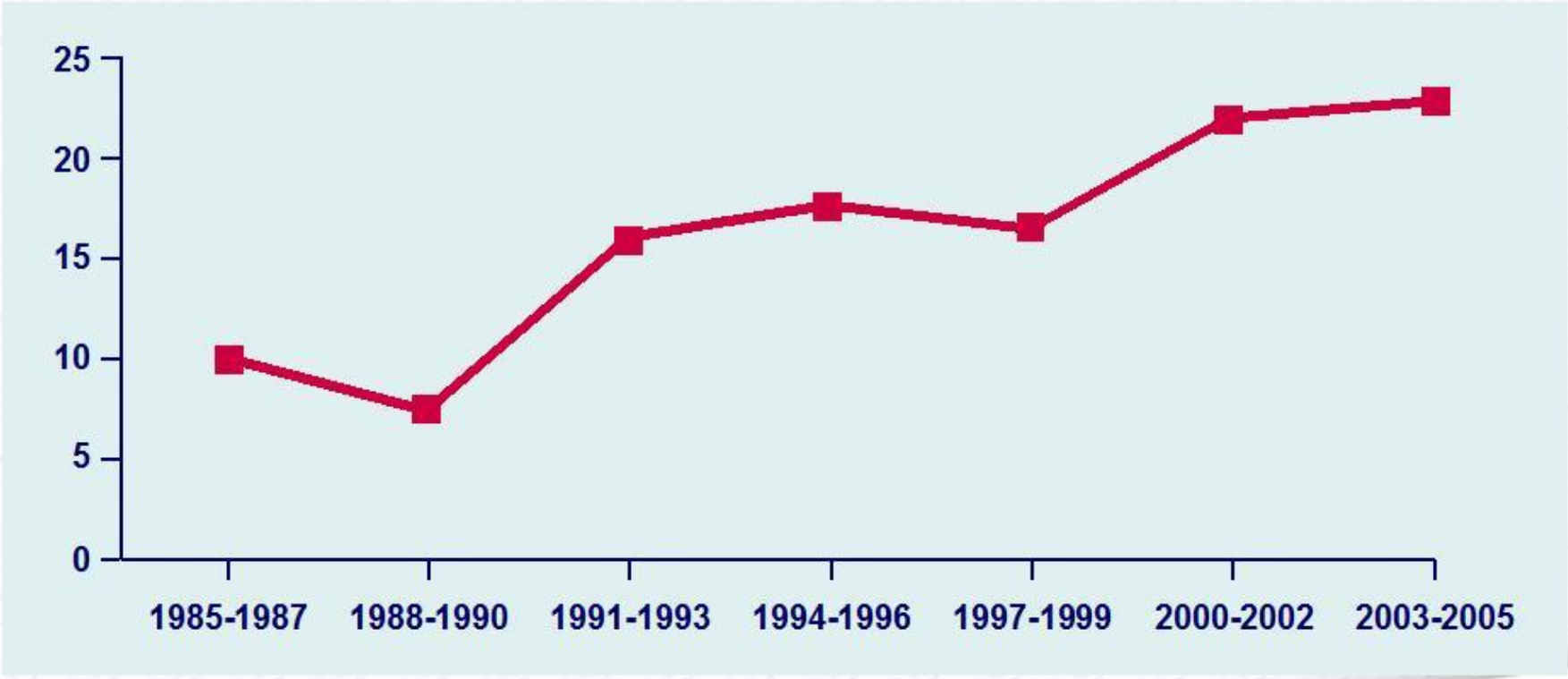


Roos-Hesselink Heart 2009;95:680-6

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Evolution of Maternal Mortality from Heart Disease in the UK

Cardiac



Roos-Hesselink et al. *Heart* 2009;95:680-6

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

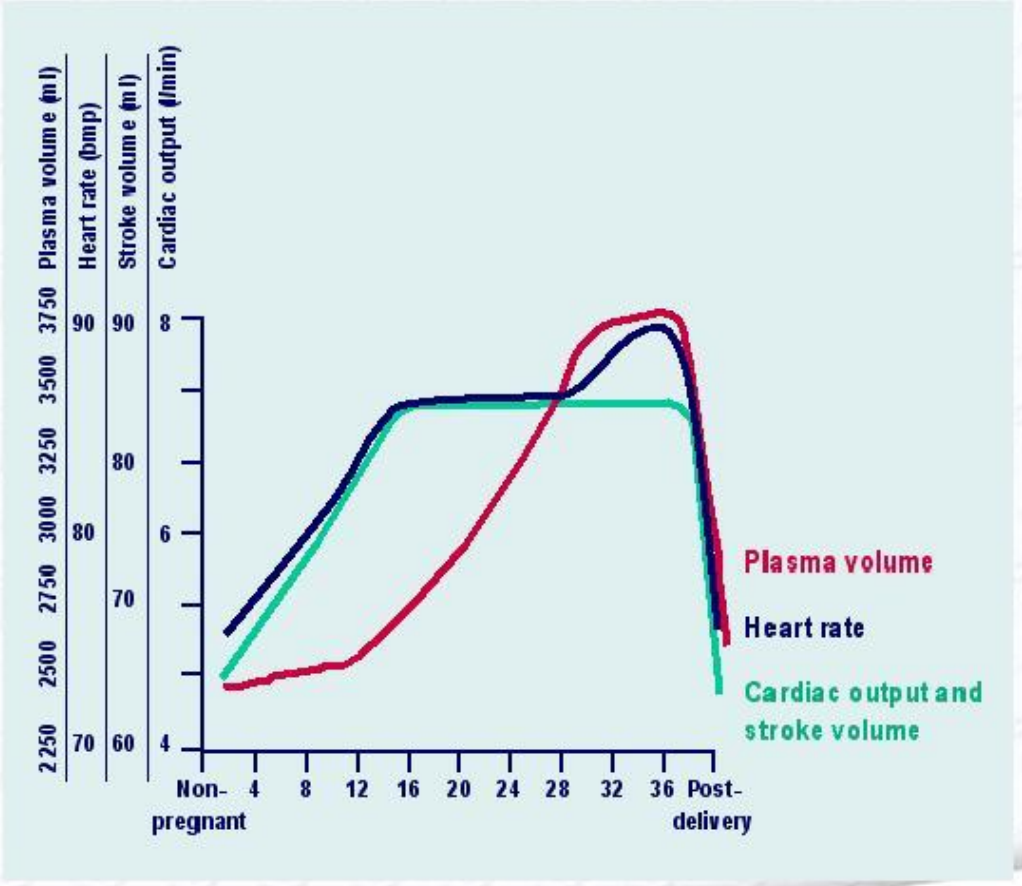
Aetiology of Cardiac Diseases in Pregnancy

Study	n	Rheumatic	Cong.	Other	Mortality	Morbidity
Siu 2001, 2002, Canada	562	Acquir. VD14 - 22%	74%	12%	1%	13%
Lesniak Sobelga 2004, Poland	259	62% Rheum 20% MVP		18% VR	0%	15%
Madazli 2010,Turkey	144	88% Rheum	12%	-	0%	6% - 66%

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Haemodynamic Changes During Pregnancy

- ↑ blood volume ≈ 50%.
- ↑ cardiac output 30-50% maximum between, 5th and 8th months.
- ↓ systolic and diastolic blood pressure.
- ↓ systemic arterial resistance (hormones, placenta).



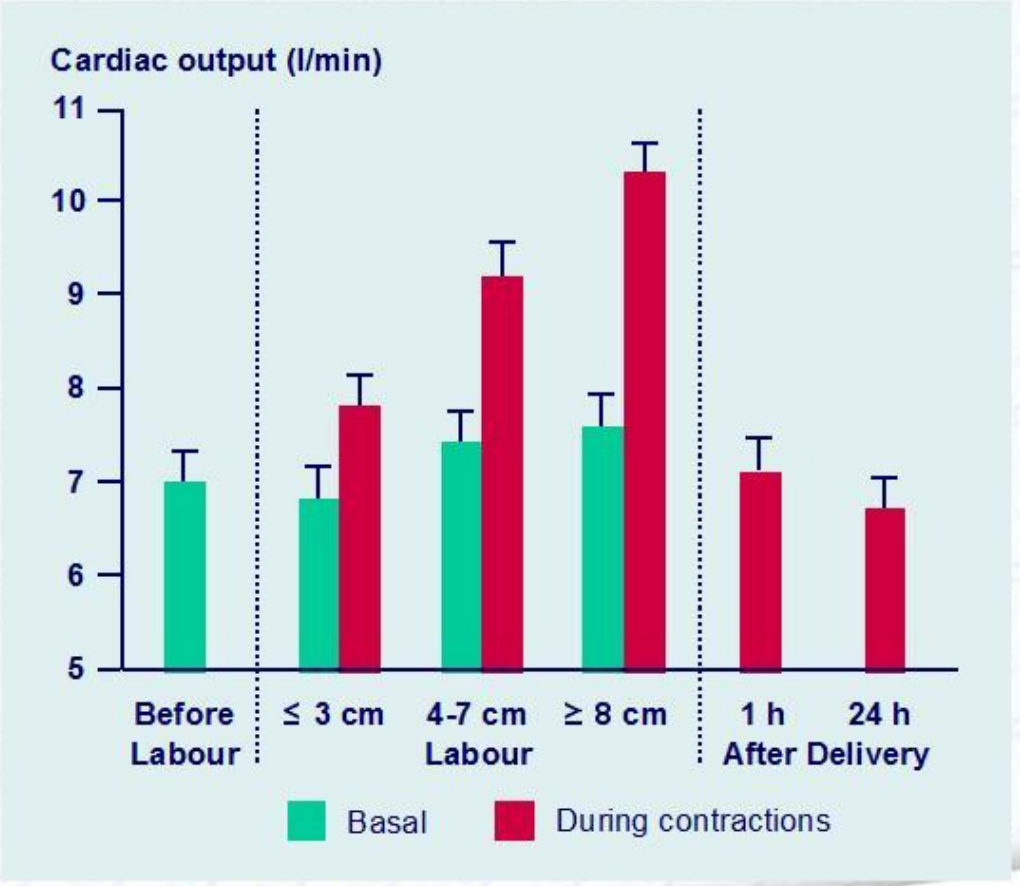
Thorne Heart 2004;90:450-6

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

EUROPEAN SOCIETY OF CARDIOLOGY®

Haemodynamic Changes During Delivery

- Labour:
  - ↑ O_2 consumption,
  - ↑ baseline cardiac output,
  - ↑ cardiac output and blood pressure during uterine contractions, depending on modalities of delivery (epidural analgesia, Cesarean section)
- Post-partum:
  - ↑ blood shift from placenta,
  - ↑ preload and cardiac output.



Hunter et al. *Br Med J* 1992;68:540-3

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Other Changes during Pregnancy

- Haemostasis:
  - increased platelet adhesiveness,
  - increased concentration of coagulation factors, fibrinogen,
  - impaired fibrinolysis.

    → ***Hypercoagulability***

- Maternal glucose metabolism.

- Drug metabolism:
  - absorption, excretion, and bioavailability.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Part II
General Recommendations

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

ESC Guidelines: Classes of Recommendations

- Evidence and/or general agreement that a given treatment or procedure *is beneficial, useful and effective.*
- Conflicting evidence and/or divergence of opinion about the usefulness/efficacy of the given treatment or procedure:
  - Weight of opinion/evidence is in favour of usefulness/efficacy.
  - Usefulness/efficacy is less well established by evidences/opinion.
- Evidence and/or general agreement that the given treatment or procedure *is not useful/effective and in some cases may be harmful.*

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

ESC Guidelines: Levels of Evidence

- Data derived from *multiple* randomized clinical trials or *meta-analyzes.*
- Data derived from *a single* randomized clinical trial or large-non randomized studies.
- Consensus of opinion of the experts and/or small studies, restropective studies, registries.

A

B

C

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Cardiovascular Diagnosis

- Clinical assessment: diagnosis, tolerance:
  - case history,
  - examination: auscultation.
- ECG.
- Echocardiography.
- Magnetic resonance imaging:
  - without gadolinium.
- Exercise testing:
  - before pregnancy,
  - during pregnancy (80% of predicted maximal heart rate).

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Radiation Exposure

- No evidence of increased fetal risk for doses < 50 mGy.
- Avoid radiation exposure, in particular before 12 weeks.
- Main exceptions:
  - CT scan for pulmonary embolism,
  - percutaneous cardiac interventions.

Procedure	Fetal exposure		Maternal exposure	
Chest radiograph (PA and lateral)	< 0.01 mGy	< 0.01 mSv	0.1 mGy	0.1 mSv
CT chest	0.3 mGy	0.3 mSv	7 mGy	7 mSv
Coronorary angiography	1.5 mGy	1.5 mSv	7 mGy	7 mSv
PCI or radiofrequency catheter ablation	3 mGy	3 mSv	15 mGy	15 mSv

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Complications of Pregnancy: Infective endocarditis

- The same measures as in non-pregnant patients apply according to recent modifications of guidelines.
- Endocarditis prophylaxis is now only recommended for patients at highest risk to aquire endocarditis and with highest risk procedures.
- Antibiotic prophylaxis is **not** recommended during vaginal or caesarean delivery (IIIC).

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Timing and Mode of Delivery

- Favour spontaneous onset of labour and vaginal delivery in most cases of stable heart disease.
- Wide use of lumbar epidural analgesia.
- Indications for Caesarean section:
  - pre-term labour in patients on oral anticoagulants,
  - Marfan and other ascending aortic aneurysms (IIaC if > 45 mm, IIbC if 40-45 mm),
  - aortic dissection (IIaC),
  - severe aortic stenosis (IIaC),
  - Eisenmenger syndrome (IIaC).
- Multidisciplinary care for high-risk patients.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Risk Stratification

- WHO classification:
  - overall assessment in 4 classes.
- CARPREG:
  - score for congenital and valvular heart disease,
  - validated in different populations.
- ZAHARA, Khairy:
  - congenital heart disease.
- Disease-specific analyses:
  - small series with limited statistical power.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Risk Stratification - CARPREG

Predictors of maternal cardiovascular events and risk score from the CARPREG study

Prior cardiac event (heart failure, transient ischaemic attack, stroke before pregnancy or arrhythmia).
Baseline NYHA functional class > II or cyanosis.
Left heart obstruction (mitral valve area < 2 cm^2, aortic valve area < 1.5 cm^2, peak LV outflow tract gradient > 30 mmHg by echocardiography).
Reduced systemic ventricular systolic function (ejection fraction < 40%

CARPREG risk score: for each CARPREG predictor that is present a point is assigned.
Risk estimation of cardiovascular maternal complications.
0 point 5%
1 point 27%
>1 point 75%

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Stratification

High risk states - contraindications for pregnancy

Conditions in which pregnancy risk is WHO IV (pregnancy contraindicated)
• Pulmonary arterial hypertension of any cause.
• Severe systemic ventricular dysfunction (LVEF < 30%, NYHA III-IV).
• Previous peripartum cardiomyopathy with any residual impairment of left ventricular function.
• Severe mitral stenosis, severe symptomatic aortic stenosis.
• Marfan syndrome with aorta dilated > 45 mm. • Aortic dilatation > 50 mm in aortic disease associated with bicuspid aortic valve.
• Native severe coarctation.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Part III
Most common cardiac disease groups during pregnancy

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Heart Diseases during Pregnancy (I)

- Congenital heart disease:
  - most frequent cause of cardiac complications in industrialised countries (70-80%), rare in developing countries (10-20%).
- Valvular disease:
  - most frequent cause of cardiac complications in developing countries (50-90%), 15% in industrialised countries.
- Cardiomyopathies:
  - rare but severe.
- Coronary heart disease:
  - rare but increasing frequency.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

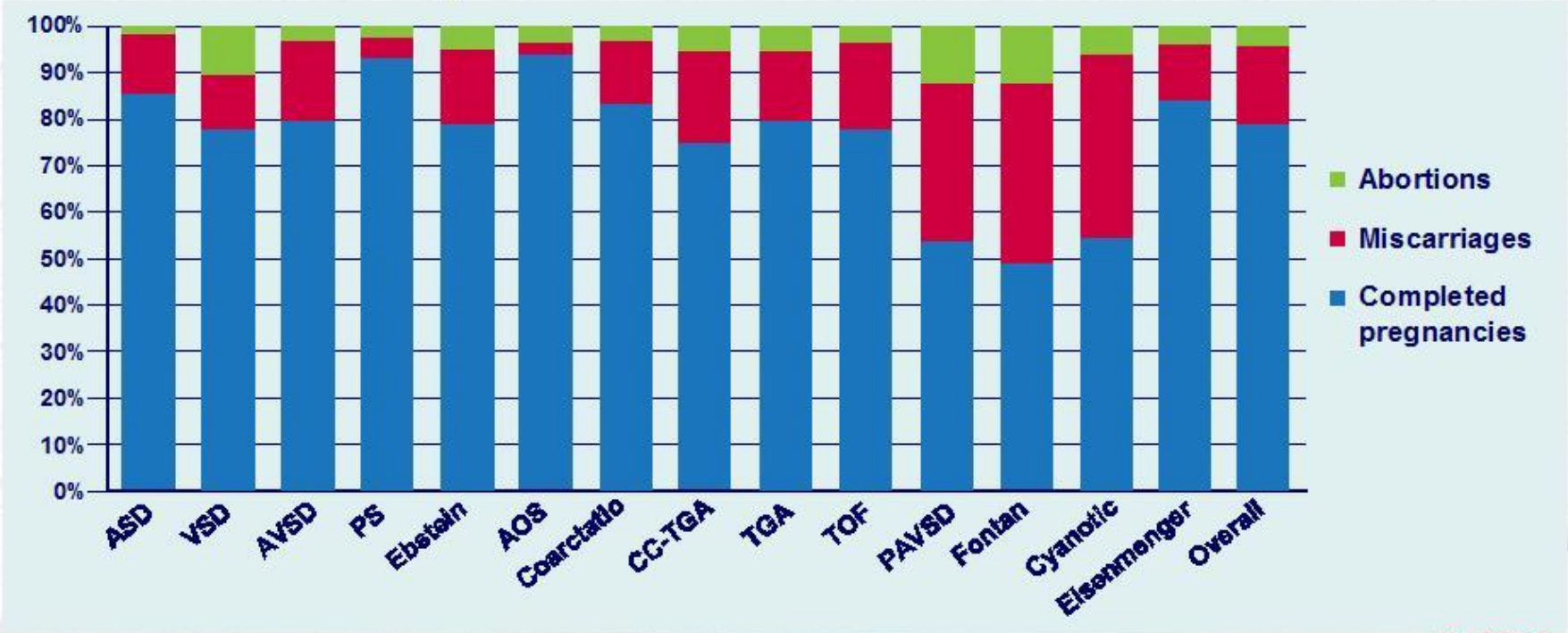
Heart Diseases during Pregnancy (II)

- Hypertension:
  - frequent (6-8% of pregnancies) but severe complications are rare.
- Arrhythmias:
  - frequently combined with stuctural heart disease.
- Venous thromboembolism:
  - deep vein thrombosis,
  - pulmonary embolism.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Congenital Heart Disease

- Risk for fetus depends on the underlying maternal heart disease as well as maternal ventricular and valvular function, functional class, cyanosis, use of anticoagulants.
- Overall fetal mortality 4%.



European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Congenital Heart Disease

- Left to right shunts:
  - low to moderate risk.
- Right to left shunts (cyanotic heart disease):
  - moderate risk if previously repaired,
  - high fetal risk if not repaired and O_2 saturation < 85%,
  - major maternal risk (30-50% mortality) if Eisenmenger syndrome contraindication for pregnancy or early termination.
- Obstructions without shunts:
  - high risk if severe left ventricular outflow tract obstruction.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Low risk patients

- Patients who have undergone previous successful surgical repair for congenital heart disease tolerate pregnancy often well if:
  - no mechanical valve is implanted,
  - the exercise tolerance is good,
  - the ventricular function is normal.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Pregnancy contraindications in cong. HD

- Women with pulmonary hypertension.
- Women with an oxygen saturation below 85% at rest.
- Patients with transposition of the great arteries and a systemic right ventricle with > moderate impairment of RV function and/or severe TR.
- Fontan patients with depressed ventricular function and/or moderate to severe atrioventricular valvular regurgitation or with cyanosis or with protein losing enteropathy.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Congenital Heart Diseases:
Specific maternal high risk conditions WHO (III)-IV

Condition	Expected outcome
Pulmonary hypertension	Neonatal survival 87-89%. *(Bedard, EHJ 2009)*
Eisenmenger syndrome	Maternal mortality of 20-50%. Life birth 12% if O_2 saturation < 85%. *(Presbitero, Circ 1994)*
Cyanotic HD without PH	Depends on maternal oxygen saturation. Life birth 12% if O_2 saturation < 85%. *(Presbitero, Circ 1994)*
Severe LVOTO	Should be treated before pregnancy. If not, discourage pregnancy.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Congenital Heart Diseases:
Specific defects

Specific defect	Maternal and fetal risk, management and delivery
ASD, VSD, AVSD, CoA, PST, AVST	Low to moderate risk, WHO I or II
Fallot, Ebstein's anomaly	Should be repaired before pregnancy: WHO II
Transposition of great arteries	WHO III Irreversible decline in maternal cardiac function in 10 % of pregnancies
Congenitally corrected TGA	WHO III, Fetal loss increased, Pregnancy contraindicated if EF < 40%
...	...

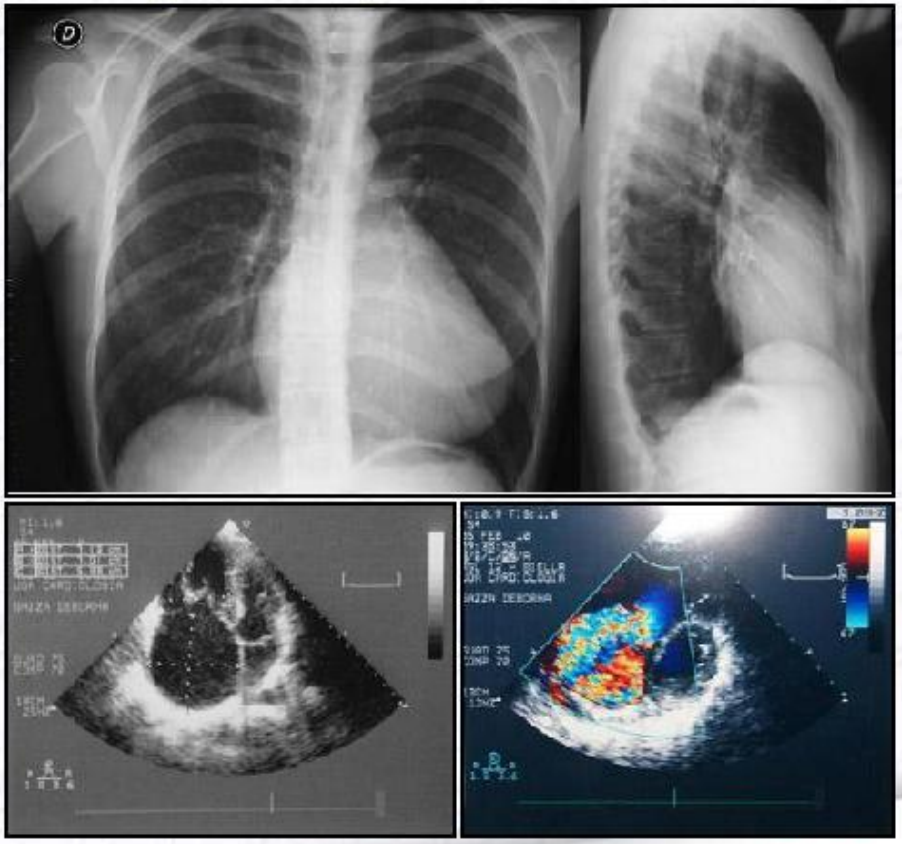
European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Congenital HD - examples

Ebstein and Pregnancy

Symptomatic patients with Ebstein's anomaly with cyanosis and/or heart failure should be treated before pregnancy or advised against pregnancy.	I	C

- In asymptomatic patients haemodynamic problems during pregnancy depend largely on the severity of the tricuspid regurgitation an functional capacity of the right ventricle.
- Closure of the PFO or ASD should be considered in patients at high risk for thromboembolism if right ventricle is well.



European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Congenital HD - examples

Fontan operation

Anticoagulation treatment should be considered during pregnancy in Fontan patients.	IIa	C
Fontan patients with depressed ventricular function and/or moderate to severe atrioventricular valvular regurgitation or with cyanosis or with protein-losing enteropathy should be advised against pregnancy.	III	C

Maternal death	2%
Live births	45%
Maternal complications	20%

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Congenital Heart Diseases (CHD): Essential messages

- Women with CHD may tolerate pregnancy well.
  The risk depends on the underlying specific constellation.
- All patients with CHD should be seen by the end of the first trimester and an individualized follow up plan should be established.
- Vaginal delivery can be planned in most patients.
- Discuss high risk conditions, contraindications and indications for Caesarean delivery on an individual basis.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Diseases of the Aorta

Increased risk of dissection during pregnancy
May lead to consider prophylactic surgery

	Risk of dissection
• Marfan syndrome	aortic Ø > 45 mm
• Bicuspid aortic valve	lower risk than Marfan
• Ehlers Danlos type IV	even if non-dilated aorta
• Turner syndrome	consider body size aortic Ø > 27 mm/m² BSA

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

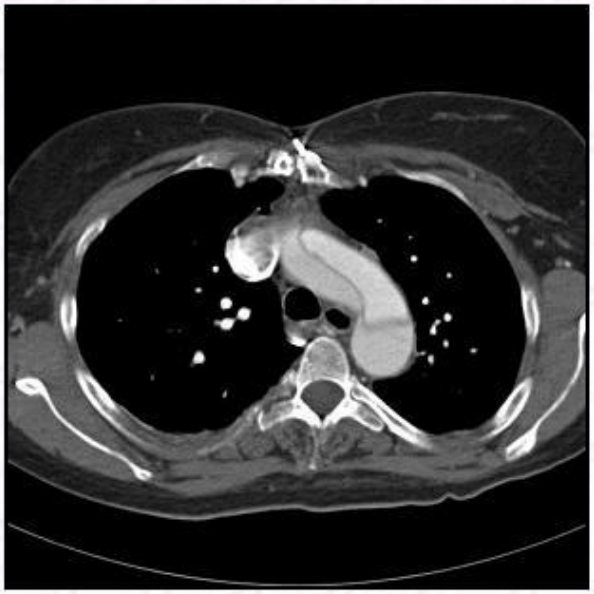
Aortic diseases - Delivery

Ascending aorta diameter

• < 40 mm	Vaginal delivery is favoured.
• 40-45 mm	Decision on individual basis.
• > 45 mm	Caesarean delivery should be considered.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Aortic diseases



- Full assessment and counseling should be performed before pregnancy in all patients with known aortic disease.
- Patients with (or history of) type B dissection should be advised against pregnancy.
- In pregnant women with known aortic dilatation, (history of) type B dissection or genetic predisposition for dissection strict blood pressure control is recommended.
- Prophylactic surgery should be considered during pregnancy if the aortic diameter is ≥ 50 mm and increasing rapidly. When the fetus is viable, caesarean delivery followed directly by aortic surgery is recommended.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Valvular Heart Disease (I)

- Stenotic valve disease:
  - high risk of haemodynamic decompensation if:
    - moderate and severe mitral stenosis consider percutaneous intervention during pregnancy if symptoms persist (IIaC),
    - symptomatic aortic stenosis.
  - intervention is indicated before pregnancy (IC).
- Regurgitant valve disease:
  - good prognosis if preserved left ventricular function,
  - medical therapy is recommended (IC),
  - avoid surgery during pregnancy.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Valvular Heart Disease (II)

- Oral anticoagulation (OAC) with vitamin K antagonists are the safest therapy to prevent valve thrombosis and are therapy of choice during the second and third trimester (IC).
- During the first trimester continuation of OAC should be considered when warfarin daily dose is < 5 mg (IIaC).
- With higher dose requirements, unfractionated or low-molecular weight heparin should be considered with strict dose adjustment according to APTT or anti-Xa levels (weekly control) (IIaC).
- At the 36th week, OAC should be discontinued and replaced by dose-adjusted heparin (IC).

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Recommendations for the management of valvular heart disease

Mitral stenosis

Recommendations	Class	Level
In patients with symptoms or pulmonary hypertension, restricted activities and ßI-selective blockers are recommended.	I	B
Diuretics are recommended when congestive symptoms persist despite ß-blockers.	I	B
Patients with severe MS should undergo intervention before pregnancy.	I	C
Therapeutic anticoagulation is recommended in the case of atrial fibrillation, left atrial thrombosis, or prior embolism.	I	C
Percutaneous mitral commissurotomy should be considered in pregnant patients with severe symptoms or systolic pulmonary artery pressure > 50 mmHg despite medical therapy.	IIa	C

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Recommendations for the management of valvular heart disease

Aortic stenosis

Recommendations	Class	Level
Patients with severe AS should undergo intervention pre-pregnancy if:		
• the are symptomatic,	I	B
• or LV dysfunction (LVEF < 50%) is present.	I	C
Asymptomatic patients with severe AS should undergo intervention pre-pregnancy when they develop symptoms during exercice testing.	I	C
Asymptomatic patients with severe AS should be considered for intervention pre-pregnancy when a fall in blood pressure below baseline during exercice testing occurs.	IIa	C

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Recommendations for the management of valvular heart disease

Regurgitant lesions

Recommendations	Class	Level
Patients with severe aortic or mitral regurgitation and symptoms or impaired ventricular function or ventricular dilatation should be treated surgically pre-pregnancy.	I	C
Medical therapy is recommended in pregnant women with regurgitant lesions when symptoms occur.	I	C

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Recommendations for the management of valvular heart disease

Recommendations	Class	Level
Continuation of OACs should be considered during the first trimester if the warfarin dose required for therapeutic anticoagulation is < 5 mg/day (or phenprocoumon < 3 mg/day or acenocoumarol < 2 mg/day), after patient information and consent.	IIa	C
Discontinuation of OAC between weeks 6 and 12 and replacement by adjusted-dose UFH (a PTT ≥ 2 × control; in high risk patients applied as intravenous infusion) or LMWH twice daily, (with dose adjustment according to weight and target anti-Xa level 4-6 hours post-dose 0.8-1.2 U/mL) should be considered in patients with a warfarin dose required of more than 5 mg/day (or phenprocoumon > 3 mg/day or acenocoumarol > 2 mg/day).	IIa	C
LMWH should be avoided, unless anti-Xa levels are monitored.	III	C

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Recommendations for the management of valvular heart disease

Recommendations	Class	Level
OAC should be discontinued and dose-adjusted UFH (a PTT ≥ 2 × control) or adjusted-dose LMWH (target anti-Xa level 4-6 hours post-dose 0.8-1.2 U/mL) started at the 36th week of gestation.	I	C
In pregnant women managed with LMWH, the 4-6 hours post-dose anti-Xa level should be assessed weekly.	I	C
LMWH should be replaced by intravenous UFH at least 36 hours before planned delivery. UFH should be continued until 4-6 hours before planned delivery and restarted 4-6 hours after delivery if there are no bleeding complications.	I	C

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Coronary Artery Disease

- Acute coronary syndromes:
  - complicate 3-6/100,000 pregnancies,
  - may be due to atherosclerosis but also thrombosis on normal arteries or coronary dissection,
  - should be managed invasively with angiography and percutaneous coronary intervention if indicated, except if non-ST elevation ECG and no risk factors.
- Stable coronary artery disease:
  - pregnancy may be considered in women with known CAD, if there is no residual ischaemia and EF > 40%.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Coronary Artery Disease

- ACS in pregnancy is rare, complicates 3-6 of 100,000 deliveries.
- ECG and Troponin T levels should be obtained in all women with chest pai (I).
- Spontaneous dissection of coronary arteries is more frequent in pregnant than in non pregnant women.
- Coronary angioplasty is the preferred reperfusion strategy for STEMI (I).
- Pregnancy may be considered in women with known CAD, if there is no residual ischemia and EF > 40%.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Cardiomyopathies
Peripartum Cardiomyopathy

- New-onset left ventricular dysfunction without other cause, occurring at the end of pregnancy or following delivery.
- Non-specific presentation and medical therapy (excluding ACE-inhibitors) (IB).
- Spontaneous recovery in half of cases.
- Risk of recurrence during subsequent pregnancies, even after recovery of left ventricular function.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Peripartum cardiomyopathy (PPCM)

- HF can develop rapidly, use guidelines for acute and chronic HF, consider contraindications for some drugs (I).
- Spontaneous recovery can occur (up to 50%).
- Avoid ACEI, ARB and renin inhibitors, if possible.
  Prefer hydralazine and nitrates, dopamine, levosimenden, digitalis; ß1 selective blockers; use diuretics with caution.
- Use anticoagulation with LMWH or OAC according to pregnancy state in pts with intracardiac thrombi, embolisms, atrial fibrillation (I).
- Deterioration in LV function occurs in up to 50% and carries a poor prognosis.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Other Cardiomyopathies

- Dilated cardiomyopathy:
  - left ventricular dysfunction pre-exists or is revealed at the beginning of pregnancy,
  - high risk if left ventricular ejection fraction < 40%,
  - treatment as in PPCM,
  - women with DCM should be informed about the risk of deterioration during gestation and peripartum,
  - LVEF < 40% is a predictor of high risk. If LVEF is < 20%, maternal mortality is very high and termination of the pregnancy should be considered.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Other Cardiomyopathies

- Hypertrophic cardiomyopathy:
  - low risk if previously well tolerated,
  - severity of LVOTO determines risk during pregnancy and delivery,
  - beta-blockers indicated according to hypertrophy and gradient (IIaC),
  - treat AF, use LMWH or OAC if AF occurs.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Arrhythmia

- Arrhythmias requiring treatment develop in up to 15% of the patients with structural and congenital heart disease.
- In haemodynamically unstable patients with tachycardias direct cardioversion should be considered.
- Atrial flutter and atrial fibrillation are rare, prefer cardioversion after anticoagulation.
- Life-threatening ventricular arrhythmias during pregnancy are rare.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Hypertension

- Heterogeneous entity: pre-existing hypertension, gestational hypertension and pre-eclampsia.
- No benefit of treating mild-to-moderate hypertension (< 170/110 mmHg).
- Severe hypertension (≥ 170/110 mmHg) is an emergency and hospitalisation is recommended (IC).
- Alpha-methyl-dopa is the drug of choice, followed by labetalol. Calcium-channels blockers are drugs of second choice.
- ACE inhibitors, angiotensin II antagonists and direct renin inhibitors are strictly contraindicated in pregnancy.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Venous Thromboembolism

- Assessment of risk factors for venous thromboembolism is recommended in all pregnant women (IC).
- Antenatal and postpartum (6 weeks) prophylaxis with LMWH:
  - is recommended in high-risk patients (IC),
  - should be considered in intermediate-risk patients (IIaC).
- D-dimer measurement and compression ultrasonography is recommended in patients with suspected venous thromboembolism (IC).
- CT pulmonary angiography is favoured for the diagnosis of pulmonary embolism.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Check list - risk factors for venous thromboembolism

Pre-existing risk factors
Previous recurrent VTE.
Previous VTE-unprovoked or oestrogen related.
Previous VTE-provoked.
Family history of VTE.
Known thrombophilia.
Medical co-morbidities, e.g. heart or lung diseases, SLE, cancer, inflammatory conditions, nephritic syndrome, sickle cell disease, i.v. drug use.
Age > 35 years.
Obesity, BMI >30 kg/m^2.
Parity ≥ 3.
Smoker.
Gross varicous veins.

Obstetric risk factors
Pre-eclampsia.
Dyhydration/hyperemesis/ovarian hyperstimulation syndrome.
Multiple pregnancy or assisted reproductive therapy.
Emergency caesarean section.
Elective caesarean section.
Mid-cavity or rotational forceps.
Prolonged labour (> 24 hours).
Peripartum haemorrhage (> 1 L or transfusion).
Transient risk factors
Current systemic infection.
Immobility.
Surgical procedure in pregnancy or < 6 weeks post-partum.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Recommendations for the management of venous thromboembolism

Recommendations	Class	Level
In all women who are pregnant or consider pregnancy, assessment of risk factors for VTE is recommended.	I	C
Mothers should be informed about the signs and symptoms of VTE in pregnancy and the necessity to contact the physicians if they occur.	I	C
High risk patients should receive antenatal prophylaxis with LMWH as well as post-partum for the duration of 6 weeks.	I	C
In intermediate risk patients post-partum prophylaxis with LMWH should be given for at least 7 days or longer, if ≥ 3 risk factors persist.	I	C
In low risk patients early mobilization and avoidance of dehydration is recommended.	I	C
Graduated compression stockings are recommended antepartum and post-partum in all women at high risk.	I	C
D-Dimer measurement and compression ultrasonography is recommended in patients with suspected VTE during pregnancy.	I	C
For treatment of acute VTE during pregnancy, UFH is recommended in high-risk and LMWH in non-high risk patients.	I	C

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Recommendations for the management of venous thromboembolism

Recommendations	Class	Level
Graduated compression stockings should be considered in women with intermediate risk during pregnancy and post-partum.	IIa	C
In intermediate risk patients, antenatal prophylaxis with LMWH should be considered.	IIa	C
Routine screening for thrombophilia should not be performed.	III	C

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Drug therapy in pregnancy

- No uniform recommendations!
- In case of emergency, drugs that are not recommended during pregnancy and breast feeding should not be withheld to the mother. The potential risk and benefit must be weighed against each other.
- Different sources of evidence such as U.S. Food and Drug Administration (FDA) classification, Internet databases, Pharmaceutical industry recommendations have different strength and weaknesses.
- Overview table with major CV drugs/families, FDA category, placenta permeability, transfer to breast milk, adverse effects.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Drug therapy in pregnancy

Recommendations for drug use

Drug	Classification (Vaughan Williams for AA drugs)	FDA category	Placenta permeable	Transfer to breast milk (fetal dose)	Adverse effects
Abciximab	Monoclonal antibody with antithrombotic effects	C	Unknown	Unknown	Inadequate human studies; should be given only if the potential benefit outweighs the potential risk to the fetus.
Acenocoumarol	Vitamin K antagonist	D	Yes	Yes (no adverse effects reported)	Embryopathy (mainly first trimester), bleeding (see further discussion in Section 5 for use during pregnancy).
Acetylsalicylic acid (low dose)	Antiplatelet drug	B	Yes	Well-tolerated	No teratogenic effects known (large datasets).
Adenosine	Antiarrhythmic	C	No	No	No fetal adverse effects reported (limited human data).
Aliskiren	Renin inhibitor	D	Unknown	Unknown	Unknown (limited experience).
Amiodarone	Antiarrhythmic (Class III)	D	Yes	Yes	Thyroid insufficiency (9%), hyperthyroidism, goitre, bradycardia, growth retardation, premature birth.
Ampicillin, amoxicillin, cephalosporins, erythromycin, mezlocillin, penicillin	Antibiotics	B	Yes	Yes	No fetal adverse effects reported.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Selected major gaps in evidence

- General
  - European databases on incidence and outcome of pregnancy complications needed.
  - Genetic testing, fetal and maternal risk assessment need prospective and systematic studies.
- Congenital HD
  - What is the optimal way of delivery for the different diagnosis?
  - What is the risk in the different diagnosis for irreversible effect of pregnancy on cardiac function?
- Valve thrombosis and venous thrombosis
  - Randomized studies on anticoagulation strategies are needed.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Selected major gaps in evidence

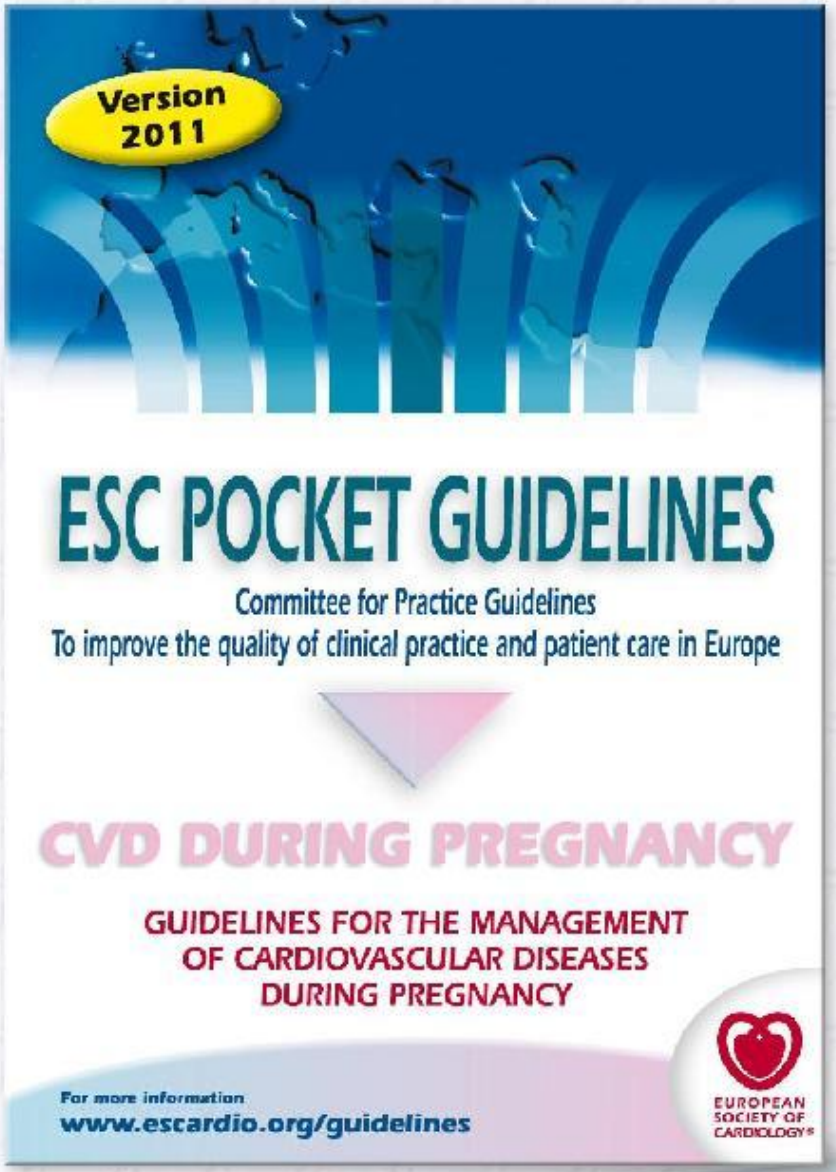
- Peripartum cardiomyopathy
  - Epidemiologic/clinical studies from European countries needed.
- Drug therapy
  - An European registry for complications of drug therapy in pregnancy is needed. Prospective Studies should be designed wherever possible.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

Conclusions

- Cardiovacsular diseases are the most frequent causes of maternal death in industrialised countries.
- The heterogeneity of heart diseases and inherent risks underline the need for an individual risk assessment and management.
- Counselling should start before pregnancy and may lead to prophylactic interventions.
- Interdisciplinary care should involve a team of gynecologists, cardiologists and others at each stage of pregnancy.
- High-risk women should be referred to specialised centres.

European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218



European Heart Journal 2011, doi: 10.1093/eurheartj/ehr218

EUROPEAN SOCIETY OF CARDIOLOGY®