

Pregnancy and heart diseases



© CanStockPhoto.com - csp51660255

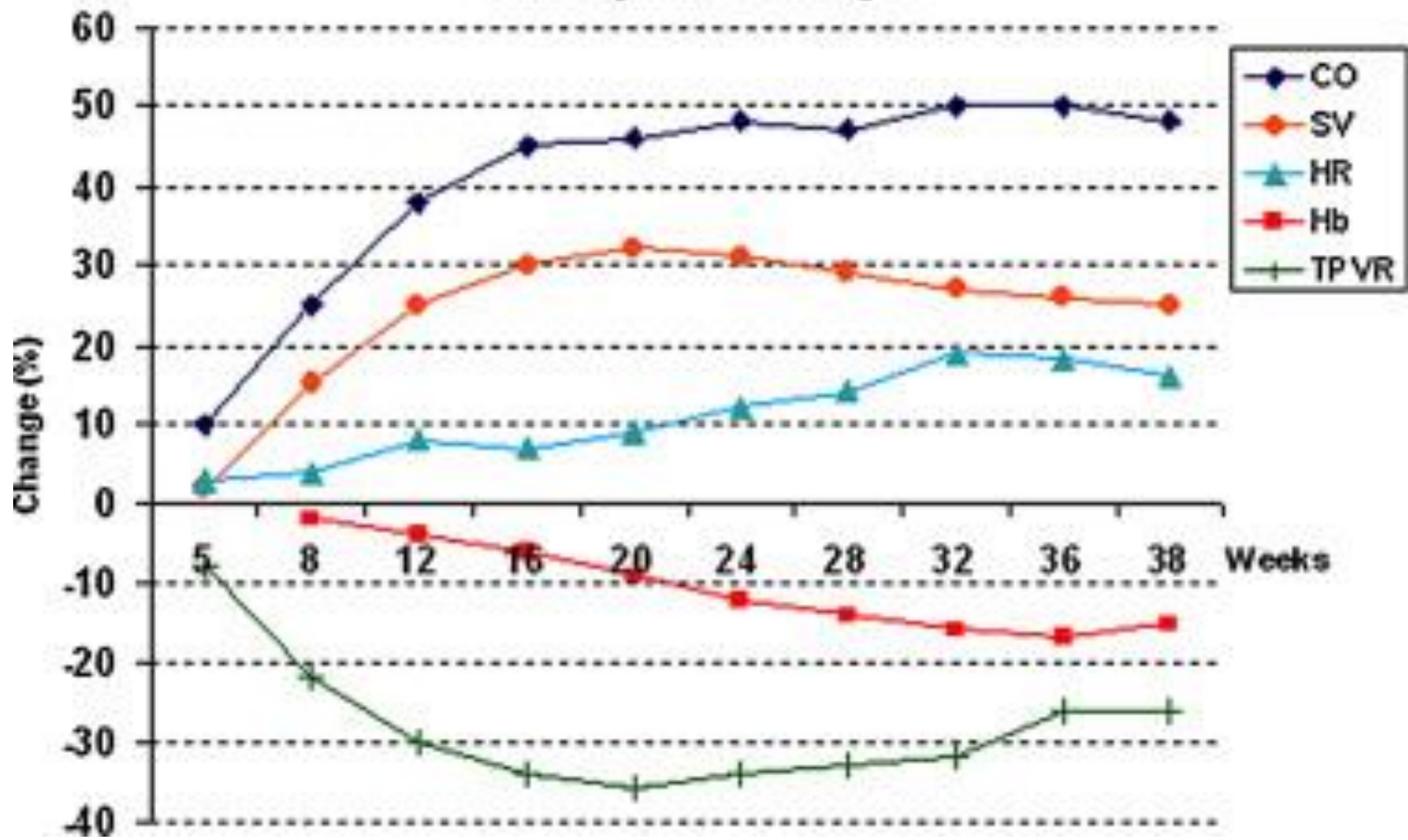
Outline

- Pregnancy and labour physiology
- Pre pregnancy assessment and risk stratification
- Team work
- Specific considerations

Pregnancy and circulation

1. Increase in blood volume 40 % above baseline at 24 weeks of gestation
2. Increase in cardiac output at about 30 - 50 %.
 - at early pregnancy related to rise in stroke volume
 - in late pregnancy mostly due to rise in heart rate, which starts to rise at 20 weeks until 32 weeks and remains high 2-5 days after delivery
3. Reduction in systemic vascular resistance, vasodilatation resulting in systolic blood pressure falls at the beginning of pregnancy diastolic is usually about 10 mmHg below baseline at the second trimester. In the third trimester DBP increase to non-pregnant values by term.

Hemodynamic changes



Physiological changes in labour and delivery

- Uterine contractions and pain further increase heart rate, intravascular blood volume and cardiac output to 80 % above pre-pregnancy levels
- After delivery aorto-caval decompression and acute volume loading – empty uterus contracts and auto-transfuses blood into the systemic circulation
- Cardiac output falls 10 – 20 % above pre delivery within 1 hour of delivery depending of the amount of blood loss with delivery
- In order to reduce blood loss around delivery the changes in production of the coagulations factors occur leading to a hypercoaguable state.
 - decrease of the tissue plasminogen activator tPA, protein C and S
 - increase of the factors V, VII, VIII, IX, X, XII and von Willebrand

After delivery

- Most hemodynamic changes are reversed in the first 2 weeks after delivery with further normalisation toward pre conception values after 3 – 12 month

Normal findings in pregnant woman

- **Physical examination:**
 - increased in heart rate
 - peripheral edema
 - slight elevation of venous pressure
 - during later stages of pregnancy : physiological fixed splitting of the second heart sound
 - systolic murmurs are common secondary to the increased cardiac output
- Diastolic murmurs are **unusual**
- **Ekg:** Q waves in III and aVF, inverted T in III, V1 – V2

Clinical evaluation prior to pregnancy

- Physical examination
- Oxygen saturation
- Holter
- Cardio-pulmonary exercise test
- Catheter or surgical interventions if needed, to improve hemodynamics and reduce risk for decompensation and arrhythmia
- Information about genetic risks of transmitting congenital heart disease

Pregnancy and delivery planning

- Pre-pregnancy counselling
- Maternal cardiac and obstetric risk,
Residual shunts, obstructive lesions, regurgitant valves, aneurysmal vessels
ventricular dysfunction and arrhythmia risk
If relevant discussion of maternal and neonatal risks associated with
different antycoagulations strategies.
- Neonatal complications

Review of the literature

- 2491 pregnancies (including 377 miscarriages and 114 elective abortions):
 - Adverse cardiac events were noted in 11 %
 - Heart failure in 4,8 %
 - Arrhythmias (mostly SVT) in 4,5 %.
 - Myocardial infarction, stroke and death were limited to patient with Eisenmenger syndrom and palliated or uncorrected cyanotic congenital heart disease

Drenthen W, Pieper PG, Roos-Hesselink, JW *et al.* Outcome of pregnancy in women with congenital heart disease: a literature review. *J. Am. Coll. Cardiol.* 49(24), 2303–2311 (2007).

Risk factors for a combined cardio-vascular end point consisting of cardiac death, pulmonary edema or arrhythmia, CARPREG

- NYHA class III or IV or cyanosis
- Left ventricular ejection fraction less than 40 %
- History of cardiac event prior to pregnancy
- Left heart obstruction
 - mitral valve area < 2.0 cm kv.
 - aortic valve area $< 1,5$ cm kv. or peak left ventricular outflow tract gradient > 30 mm Hg.
- Rate of primary cardiac event was :
 - 5 % if no one risk factor
 - 27 % if one risk factors
 - 75 % if two or more risk factors

WHO classification

- WHO 1 low risk
- WHO 2 intermediate risk
- WHO 3 high risk
- WHO 4 contraindication for pregnancy

WHO 1, low risk

- ASD
- VSD
- PDA
- Asymptomatic aortic stenosis with LV EF > 50 % och low mean gradient

WHO 3, high risk

- Transposition of the great arteries
22% arrhythmias
11 % heart failure
- Fontan operation
16 % arrhythmias
6 % heart failure
- Mechanical valves
10 % valve thrombosis
4 % maternal mortality
- Hypertrophic obstructive cardiomyopathy
28 % heart failure
- Bicuspid aortic valve (if aortaic diameter < 50mm)
< 1 % aortic dissektion
- Marfan syndrom
10 % aortic dissektion
- Turners syndrom
5 % aortic dissektion

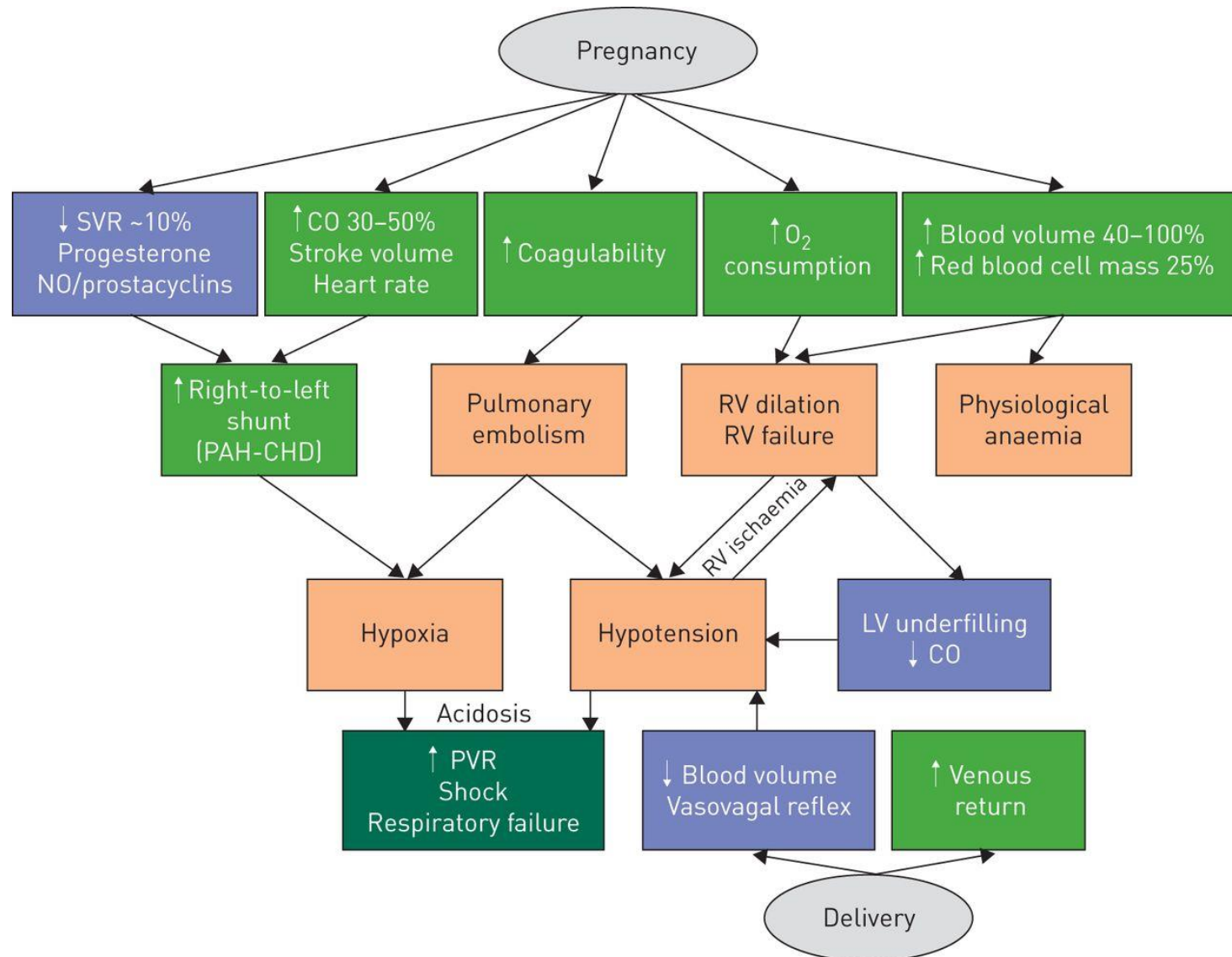
WHO 4, contraindication for pregnancy

- Pulmonary arterial hypertension 17-33 % risk for maternal mortality
- Peri-partum cardiomyopathy in previous pregnancy with abnormal ventricular function
 - 44 % reoccurens of heart failure
 - 20 % maternal mortality
- Eisenmengers syndrom 21 % heart failure
 - 50 % maternal mortality
- Ehler Danlos WHO 3-4 11,5 % maternal mortality

Pregnancy and delivery management

- Overall risk of pregnancy
- Management of medications
- Frequency of obstetrical and cardiac follow-up
- Risk of congenital anomalies in offspring, including screening and management plans
- Elaboration of a specific plan for delivery

Physiological changes in pulmonary arterial hypertension (PAH) patients which occur in response to pregnancy.



Karen M. Olsson, and Richard Channick Eur Respir Rev
2016;25:431-437

References

- Hemodynamic adaptation to pregnancy in women with structural heart disease
- J. Cornette, T.P.E. Ruys et al. *Journal of Cardiology* 61 (2013) 107–112
- Pregnancy in pulmonary arterial hypertension. Karen M. Olsson, and Richard Channick, *Eur Respir Rev* 2016;25:431-437
- Drenthen W, Pieper PG, Roos-Hesselink, JW et al. Outcome of pregnancy in women with congenital heart disease: a literature review. *J. Am. Coll. Cardiol.* 49(24), 2303–2311 (2007).
- Pregnancy and delivery in cardiac disease, Titia P.E. Ruys (MD)a,*, Jérôme Cornette (MD)b, Jolien W. Roos-Hesselink (MD, PhD), *Journal of Cardiology* 61 (2013) 107–112
- ESC Guidelines on the management of cardiovascular diseases during pregnancy. *European Heart Journal* (2011) 32, 3147–3197
- 2017 ESC/EACTS Guidelines for the management of valvular heart disease. *European Heart Journal* (2017) 38, 2739–2791
- Pregnancy and Delivery in Women With Congenital Heart Disease, *Circ J* 2015; 79: 1416 – 1421
- Susan M Fernandes, Katherine W Arendt, Michael J Landzberg, Katherine E, Economy & Paul Khairy (2010) Pregnant women with congenital heart disease: cardiac, anesthetic and obstetrical implications, *Expert Review of Cardiovascular Therapy*, 8:3, 439-448,
- Acute Myocardial Infarction Associated With Pregnancy, Arie Roth, MD,* Uri Elkayam, MD†, *Journal of the American College of Cardiology* Vol. 52, No. 3, 2008,
- Spontaneous coronary artery dissection, Daniele Giacoppo a, Davide Capodanno , George Dangas , Corrado Tamburino, *International Journal of Cardiology* 175 (2014) 8–20