

VALVULAR HEART DISEASE IN PREGNANCY

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OBJECTIVES

- Upon completion of this course, the participant will be able to:
 - List common valve diseases of pregnancy
 - Identify who to screen for valvular disease
 - Understand basic management of common valve disease, including intervention in pregnancy

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OVERVIEW

Case Presentation

The scope of cardiovascular disease in pregnancy

Risk stratification for cardio-obstetrics

Right-sided valvular disease

Left-sided valvular disease

Cardiac intervention in pregnancy

Delivery and postpartum considerations



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Disclosures: No financial disclosures

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CASE PRESENTATION

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RESPIRATORY DISTRESS AT 23 WEEKS' GESTATION

- 35yo P2002 admitted at 23w2d
 - Recent immigration from Djibouti
 - 2 prior SVDs – husband states had hemoptysis in 2nd pregnancy (no workup, no follow up)
- Presented to OSH with dyspnea & hemoptysis
 - Rapid respiratory decompensation --> intubated
 - Hypotensive --> given IVF, requiring 2 pressors
 - Transferred to our OB ICU
- Workup:
 - CTPE --> negative for PE, +pulmonary edema
 - SARS-CoV-2, RSV, influenza negative
 - ECG sinus tachycardia, +RV hypertrophy
 - BNP 94 (OSH), high sensitivity troponin 155 -> 96

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RESPIRATORY DISTRESS AT 23 WEEKS' GESTATION

- MFM, Cardiology, & Pulmonology consults
 - BMZ for fetal lung maturity, mag sulfate for fetal neuroprotection advised due to unclear maternal status
- TTE performed
 - Severe rheumatic mitral stenosis (mean gradient 27 mmHg, HR 92 bpm)
 - Severe LA enlargement
 - Mild/mod tricuspid regurgitation, mild RV dysfunction
 - Estimated RVSP 59 mmHg
- Valve team consulted

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WHAT IS CARADIOOBSTETRICS

And why does it matter?

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WHAT IS CARADIOOBSTETRICS?



Davis et al, JACC Focus Seminar 2021

- A village!
- Coordinated cardioobstetric programs **decrease adverse cardiac outcomes** in pregnancy
- Members of the team vary based on underlying lesion
 - Acquired or congenital
- Opportunities for discussion of:
 - Pregnancy risk
 - Optimization of cardiac health
 - Medication review & adjustment
 - Surveillance plan for pregnancy/postpartum
 - Delivery planning
 - Contraception

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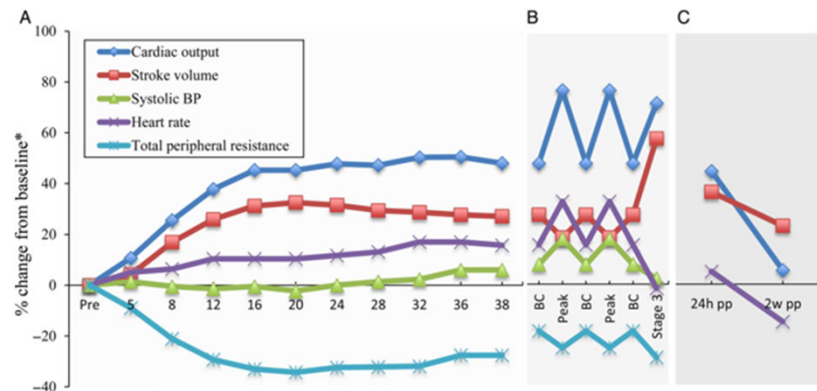
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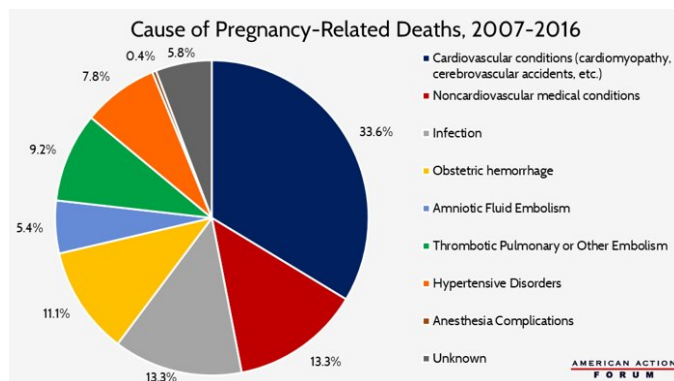
PREGNANCY AS A CARDIAC STRESS TEST

- Hemodynamic changes of pregnancy and delivery unmask hearts predisposed to cardiovascular disease
- Exacerbates underlying conditions



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MATERNAL MORTALITY



- Cardiovascular disease is the leading cause of maternal death
- Women of color are disproportionately likely to die

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INCIDENCE OF VALVULAR HEART DISEASE

- 1-2% of women of reproductive age have valvular disease
- 1/3 of heart disease in pregnant people is valve disease
- Most common etiology in the USA = congenital
 - Acquired rheumatic heart disease is most common etiology worldwide

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WHO SHOULD BE SCREENED FOR VALVULAR DISEASE?

- Red flag symptoms
- Exam findings
 - Loud systolic murmur, any diastolic murmur, wheezing/crackles, significant edema
- Known repaired congenital heart disease
- Certain familial conditions (ex: bicuspid aortic valve)
- Preconception should have transthoracic echocardiogram, stress test, or both
 - Invasive hemodynamics can be considered

Peripartum Red Flag Signs and Symptoms

Chest Pain	Tachycardia
Dyspnea	Non-Vagal Syncope
Orthopnea	Headache
Cough	Visual Changes
Edema	Hypotension/Hypertension

Patients and clinicians need to be aware of signs and symptoms that may signal cardiovascular complications during and after pregnancy.

JACC Focus Seminar 2021

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RISK STRATIFICATION FOR CARDIOOBSTETRICS

- **Modified WHO classification (mWHO)**
 - Initially for congenital heart disease – acquired conditions now added
- **ZAHARA**
 - CHD specific, includes fetal outcomes
- **CARPREG II**
 - All cardiac disease – updated in 2018 to CARPREG II
 - Cardiac outcomes for CARPREG II: maternal cardiac death, cardiac arrest, sustained arrhythmia, LV CHF/pulmonary edema, RV heart failure, CVA or TIA, cardiac VTE, MI, vascular dissection
- **New scoring system for valvular disease: DEVI score**
 - Published in JACC October 2023, not yet widely adopted

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MWHO CLASSIFICATION

TABLE 3 Modified WHO Risk Stratification Model

Modified WHO Class	Conditions	Predicted Risk, %
I—No higher risk than the general population	Uncomplicated, small or mild lesions including pulmonary stenosis, VSD, PDA, and mitral valve prolapse with no more than trivial mitral regurgitation Successfully repaired simple lesions including ostium secundum ASD, VSD, PDA, and TAPVD Isolated PVCs and PACs	2.5-5
II—Small increased risk of maternal morbidity and mortality	Unoperated ASD Repaired tetralogy of Fallot Most arrhythmias Coarctation of the aorta without significant gradient or aneurysm (repaired or unrepaired) Long QT syndrome	5.7-10.5
II to III	Mild LV impairment Hypertrophic cardiomyopathy Marfan syndrome without aortic dilation Heart transplant Native or tissue valve disease not considered WHO class IV Bicuspid aortic valve without aortic dilation	10-19

III—Significant risk of maternal morbidity and mortality

Mechanical valve 19-27

Systemic RV
Post-Fontan operation
Cyanotic heart disease
Other complex congenital heart repair
Aortic dilation without known fibrinogen disease
Coarctation of the aorta with residual gradient or aneurysm (repaired or unrepaired)
Marfan syndrome with aortic root dilation <45 mm or following aortic replacement
Bicuspid aortic valve with aortic root dilation 45 to 50 mm

IV—Pregnancy contraindicated

Pulmonary arterial hypertension of any cause 40-100

Severe left ventricular dysfunction (LVEF <30% or NYHA functional class III to IV)
Previous peripartum cardiomyopathy with any residual impairment of LV function
Severe left heart obstruction (AVA <1 cm² or peak gradient >50 mm Hg; MVA <1.5 cm²)
Marfan syndrome with aortic dilation >45 mm
Bicuspid aortic valve with aortic dilation >50 mm

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TABLE 2 ZAHARA Risk Prediction Model Derived From Patients With Congenital Heart Disease

ZAHARA Predictors	Points
Prior arrhythmia	1.5
Cardiac medications before pregnancy	1.5
NYHA functional class \geq II	0.75
Left heart obstruction	2.5
Moderate or severe mitral regurgitation	0.75
Moderate or severe tricuspid regurgitation	0.75
Mechanical valve	4.25
Cyanotic heart disease (corrected or uncorrected)	1
ZAHARA Score	Predicted Risk, %
0-0.5	2.9
0.51-1.50	7.5
1.51-2.50	17.5
2.51-3.50	43.1
>3.50	70.0

NYHA = New York Heart Association; ZAHARA = Zwangerschap bij Aangeboren HARTafwijking (Pregnancy in Women With Congenital Heart Disease) study.

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TABLE 1 CARPREG II Risk Prediction Model

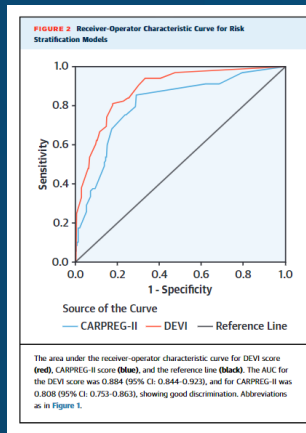
CARPREG II Predictors	Points
Prior cardiac event or arrhythmia	3
Baseline NYHA functional class III to IV or cyanosis	3
Mechanical valve	3
Ventricular dysfunction	2
High-risk left-sided valve disease/LVOT obstruction	2
Pulmonary hypertension	2
Coronary artery disease	2
High-risk aortopathy	2
No prior cardiac intervention	1
Late pregnancy assessment	1
CARPREG II Score	Predicted Risk, %
0 to 1	5
2	10
3	15
4	22
>4	41

CARPREG = Cardiac Disease in Pregnancy Study; LVOT = left ventricular outflow tract; NYHA = New York Heart Association.

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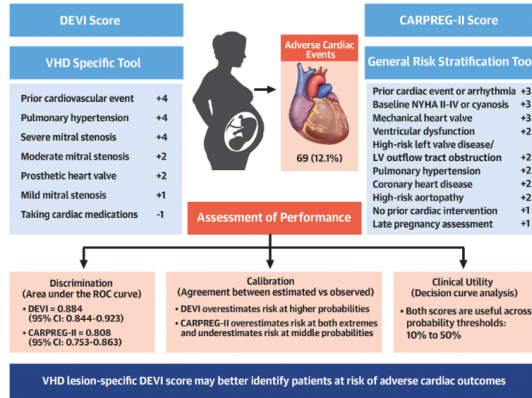
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CENTRAL ILLUSTRATION Validation of Risk-Stratification Models in Pregnant Patients With Valve Disease

577 pregnant patients with valvular heart disease (VHD) in a middle-income setting



Pande SN, et al. J Am Coll Cardiol. 2023;82(14):1395-1406.

In this cohort of 577 pregnant women with valvular heart disease, risk stratification was performed using the DEVI and CARPREG-II scores to assess the utility of these scoring systems in predicting composite adverse cardiac events during pregnancy and the immediate postpartum period. Individual predicted risk was calculated using the original logistic regression provided in the original studies. Composite cardiac events were observed in 12.1%. Both scores were shown to aid in discriminating women who develop composite cardiac events from those who did not, but the agreement between predicted and observed events was better with the DEVI score. Risk stratification model developed from a homogeneous population of pregnant patients with valvular heart disease (VHD), may better identify patients at risk of adverse cardiac outcomes. CARPREG-II = Cardiac Disease in Pregnancy; DEVI = Adverse Cardiac Events in Valvular Heart Disease in Pregnancy score; ROC = receiver-operator characteristic.

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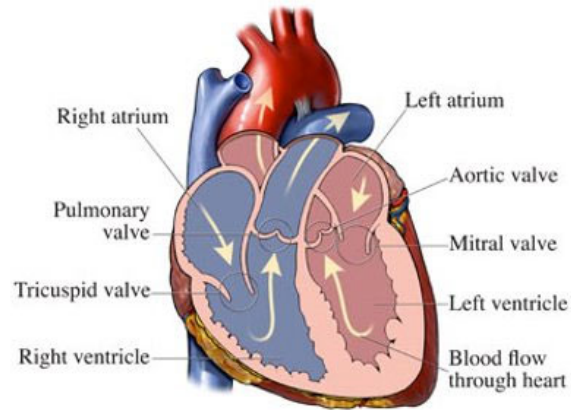
GENERAL PRINCIPLES OF VALVE DISEASE

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VALVE DISEASE IN PREGNANCY

- Always consider:
 - Volume
 - Pressure
 - Rate
- How will changing these parameters impact flow across the valve & subsequent complications?
- No sudden moves!
 - Avoid sudden vascular fluid shifts (BP, HR)



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RIGHT SIDED VALVULAR DISEASE

Tricuspid and pulmonic valves

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GENERAL PRINCIPLES

- Right sided lesions (stenotic & regurgitant) are typically well tolerated
- If congenital, fetal echocardiogram is recommended
- Common complications: Right heart failure & arrhythmias

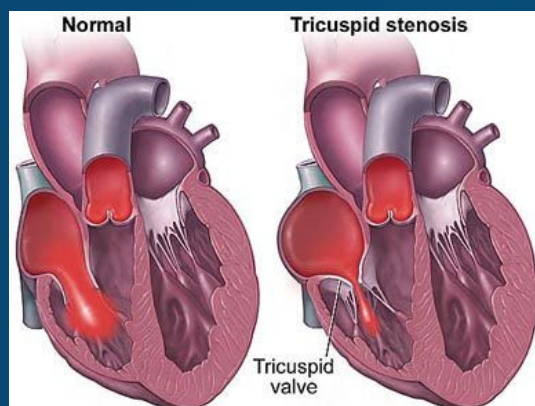
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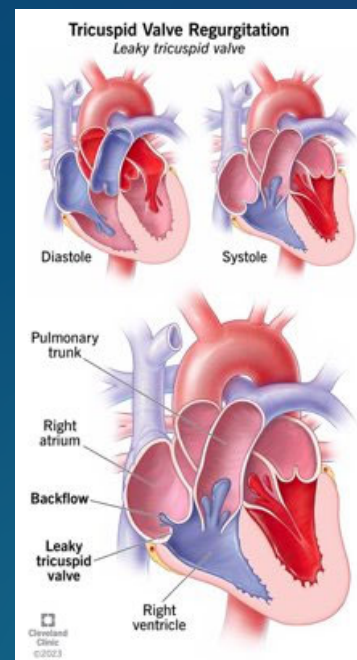
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TRICUSPID VALVE DISEASE

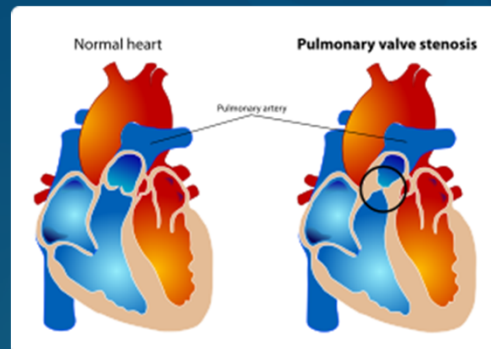
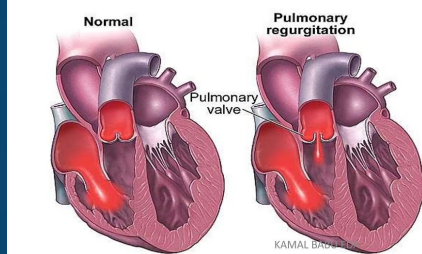
- Tricuspid stenosis is acquired (rheumatic) or congenital – very rare
 - Rheumatic tricuspid disease is almost never isolated
 - Pregnancy has limited outcome data
- Tricuspid regurgitation is acquired (prior endocarditis, annular dilation from RV overload) or congenital (Ebstein's, AV canal)
 - Mod/severe TR with normal RV function: arrhythmia risk
 - Mod/severe TR with decreased RV function: heart failure risk --> manage with diuretics
- Rare need for intervention in pregnancy
- Echocardiogram in 3rd trimester at peak volume, rhythm monitor if symptoms
- Vaginal delivery preferred

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PULMONARY REGURGITATION



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PULMONIC VALVE DISEASE

- Pulmonic disease is usually congenital
 - Fetal echocardiogram recommended
- Pulmonic stenosis
 - Usually well tolerated, rare maternal risks
 - Increased risk of preterm birth in severe PS
 - Symptomatic right heart failure (rare complication) if RV dysfunction --> diuretics
- Pulmonic regurgitation – repaired Tetralogy of Fallot, post-valvuloplasty
 - 3% risk of adverse maternal cardiac events with moderate-to-severe PR
 - Right heart failure – most common if concomitant RV dysfunction or RV hypertrophy
 - Ventricular tachyarrhythmia
- Echocardiogram in 3rd trimester at peak volume, rhythm monitor if symptoms
- Vaginal delivery preferred

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LEFT SIDED VALVULAR DISEASE

Mitral and aortic valves

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GENERAL PRINCIPLES

- Regurgitant lesions tend to be well tolerated, even if severe
 - EXCEPTION = concurrent left ventricular failure
- Stenotic lesions obstruct the LVOT
 - Fixed cardiac output
 - Preload dependent
 - High risks of arrhythmia, hypoxia, pulmonary edema

