

Cardiovascular Complications In Transplant Patients

August 25, 2024

CVD -Transplant

- CVD is one of the leading cause of death post transplant
- MI
- Cardiac Arrest/arrythmias
- Risk assessment is critical
 - Metabolic Syndrome, immunosuppressive therapy, HTN, DM, CKD
 - Smoking
 - weight
 - Previous CVD risk factors pre transplant
 - Family history
 - Donor history
 - ISP



Calculator

<https://www.mdcalc.com/calc/10601/cardiovascular-risk-in-orthotopic-liver-transplantation-car-olt>

Sex	Men 0	Women +1
Current age, years	<45 0	
	45-49 -6	
	50-54 -4	
	55-59 +2	
	60-64 +5	
	≥65 +8	
Race	Others 0	
	White +7	
Working status	Working for income 0	
	Not working for income +10	
Education level	College + 0	
	≤ High school/unknown +5	
Atrial fibrillation	No 0	Yes +25
Respiratory failure on ventilator at transplant	No 0	Yes +13
Pulmonary hypertension	No 0	Yes +9

HCC	Yes 0	No +6
Hypertension	No 0	Yes +4
Diabetes	No 0	Yes +4
Heart failure	No 0	Yes +7
14 points CAR-OLT Score		
8 % Low cardiovascular risk in orthotopic liver transplantation		
Copy Results Next Steps >>>		

ADVICE

- Results can be used to counsel patients on risk during informed consent discussions.
- A high score should trigger formal cardiology evaluation and optimisation, not automatic transplant exclusion.

MANAGEMENT

- Optimise modifiable risk factors for all candidates (e.g., glycemic control, blood pressure and lipid management, smoking cessation).
- Very-low and low-risk patients may be able to proceed without provocative cardiac testing.
- For higher scores, consider:
 - Cardiology consultation.
 - Noninvasive stress imaging +/- invasive cardiac testing.

Calculator

<https://professional.heart.org/en/guidelines-and-statements/prevent-risk-calculator/prevent-calculator>

Sex	☒ Male ☐ Female	Anti-hypertensive medication	☐ No ☒ Yes	CVD	ASCVD	Heart Failure	
Age	48 years	Lipid-lowering medication	☒ No ☐ Yes	Estimated 10-year risk of ASCVD	2.4%	Estimated 30-year risk of ASCVD	13.7%
Total Cholesterol	210 mg/dL	The following three predictors are optional for further personalization of risk assessment. When they are clinically indicated or available, please click on yes and enter the value					
HDL Cholesterol	80 mg/dL	UACR	☒ No ☐ Yes	CVD	ASCVD	Heart Failure	
SBP	142 mmHg	HbA1C	☐ No ☒ Yes	Estimated 10-year risk of Heart Failure	3.4%	Estimated 30-year risk of Heart Failure	24.5%
BMI	35.2	Zip Code (for estimating social deprivation index [SDI])	☐ No ☒ Yes				
eGFR	75	44070		CVD	ASCVD	Heart Failure	
Diabetes	☐ No ☒ Yes	Calculate Reset		Estimated 10-year risk of CVD	4.3%	Estimated 30-year risk of CVD	25.3%
Current Smoking	☒ No ☐ Yes						

Calculator

<https://tools.acc.org/ascvd-risk-estimator-plus/#!/calculate/estimate/>

Current Age ⓘ *	Sex *	Race *
48 Age must be between 20-79	☒ Male ☐ Female	☒ White ☐ African American ☐ Other
Systolic Blood Pressure (mm Hg) *	Diastolic Blood Pressure (mm Hg) *	
142 Value must be between 90-200	94 Value must be between 60-130	
Total Cholesterol (mg/dL) *	HDL Cholesterol (mg/dL) *	LDL Cholesterol (mg/dL) ⓘ ○
210 Value must be between 130 - 320	80 Value must be between 20 - 100	124 Value must be between 30-300
History of Diabetes? *	Smoker? ⓘ *	
☒ Yes ☐ No	☐ Current ⓘ ☐ Former ⓘ ☒ Never ⓘ	
On Hypertension Treatment? *	On a Statin? ⓘ ○	On Aspirin Therapy? ⓘ ○
☒ Yes ☐ No	☐ Yes ☒ No	☐ Yes ☒ No
Do you want to refine current risk estimation using data from a previous visit? ⓘ ○		
☐ Yes ☒ No		

View Advice Summary for this Patient

- **LDL-C:** Statin initiation is indicated in the context of a clinician-patient risk discussion.
- **Diabetes:** Dietary counseling and ≥ 150 minutes/week of moderate intensity or ≥ 75 minutes/week of vigorous physical activity recommended. Metformin as first line drug to improve glycemic control to reduce CVD may be considered.
- **Smoking:** Assess for tobacco use at every visit and avoid second hand smoke.
- **Aspirin:** No justification found in for routine aspirin use in patients with low ASCVD risk.

Lifestyle: The most important way to prevent ASCVD is to promote a healthy lifestyle throughout life. Medications to reduce ASCVD risk should only be considered part of a shared decision-making process for optimal treatment when a patient's risk is sufficiently high. Decisions around the therapies listed above are assumed to be made in the context of ACC/AHA guideline-recommended lifestyle interventions.

Projected 10-Year ASCVD Risk

~% with no treatments selected yet



Quit
Smoking ⓘ



Start/Intensify Statin ⓘ



Start/Add Blood Pressure
Medication(s) ⓘ



Start/continue aspirin
therapy ⓘ

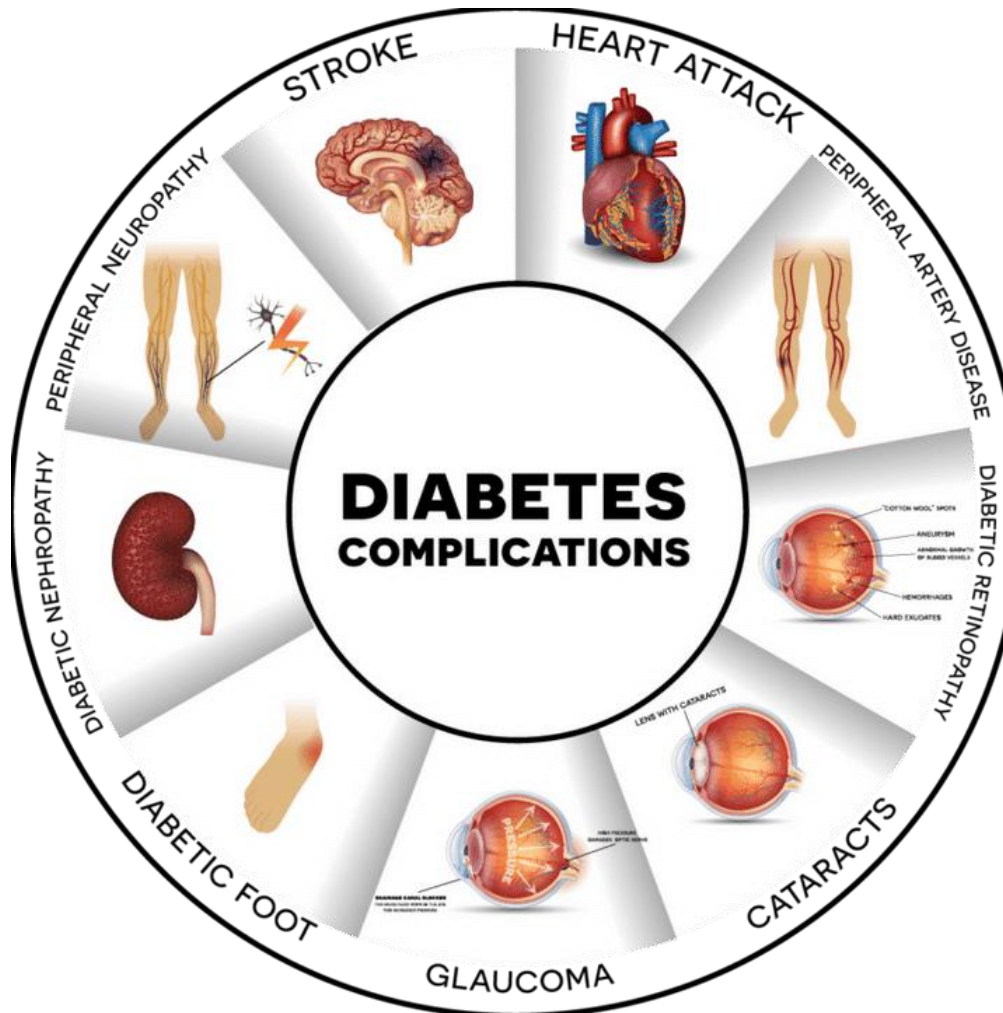
*Guidelines do not recommend statin therapy for patients with 10-year risk $< 5\%$

*Guidelines do not typically recommend aspirin therapy for patients with 10-year risk $< 10\%$

Diabetes

- Pre-existing DM
- Obesity
- Family hx
- Age - >45 years of age
- Sex
- Ethnicity
- Diet
- Medications
 - Tacro/steroids decrease insulin secretion
 - mTOR inhibitors increase insulin resistance

Diabetes



Diabetes

- Post transplant DM
 - 16% at 1 year and 24% at 3 year
 - Due to insulin resistance and secretion defect
 - Should not be diagnosed until 45 days post (Birdwell & Park)
- Sulfonylurease and meglitinides
 - Avoid metformin
- SGLT1/SGLT2
 - Volume depletion and increase urinary tract infection

Diabetes

Diagnosis/Monitoring

- BS monitoring/glycated hgb
- Endocrinology

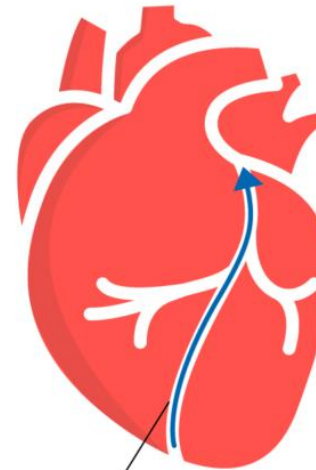
Management

- Lifestyle changes
- Diet/exercise
- Medication management
- Insulin/oral agents

Hypertension

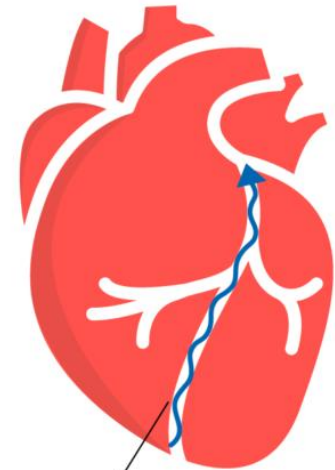
- Many studies show that HTN is not well controlled in post transplant
 - Kasiske et al. 56% have systolic <140 at one year post
 - Recommendation is to have <130/80 for patient and graft survival
 - 80-90% in the post kidney world untreated
- Target - <130/80
 - Individualized
 - Aggressive

No Hypertension
Heart Pumping Normally



Blood flows easily through vessels

Hypertension
Heart Pumping Harder



Blood may not flow easily through vessels

- Risk Factors

- Age
- Pre-existing condition
- Ethnicity
- family history
- ISP
- CKD
- Fluid retention
- sleep apnea/obesity
- Donor risk factors



HTN

- Complications
 - Graft dysfunction
 - CAD
 - Stroke
 - HF, LV hypertrophy
 - Reduced patient survival
- Monitoring
 - Frequent measuring
 - Medications
 - Lab draws



HTN

- Management
 - Lifestyle
 - Diet, exercise
 - Smoking and alcohol cessation
 - Medication
- Calcium channel blockers
- Ace/ARBS
- Beta-blockers
- diuretics



Dyslipidemia

- LDL target – variable dependent on type of transplant
- Kidney Disease Improving Global Outcomes – suggest all kidney transplant recipients start on a statin.
- Predisposition or ISP
- 18% kidney with borderline/elevated LDH (Bridwell & Park)

Dyslipidemia

Drugs	Side Effects
Corticosteroids	↑ triglycerides and cholesterol
Calcineurin Inhibitors	↑ LDL and triglycerides
	Tacrolimus less severe than cyclosporine
mTOR inhibitors	↑ triglycerides and cholesterol

Dyslipidemia

- Baseline prior to transplant
- Fasting lipids
- Screening for other causes
- Low fat, heart healthy diet
- Increase activity
- Optimization ISP
- Medical management



Dyslipidemia

LAB	TARGET
LDL	<100 mg/dl < 70 mg/dl high risk < 50 mg/dl heart
HDL	> 40 men and >50 women
Triglycerides	< 150 mg/dl

Dyslipidemia

- Diet/Exercise
- Statin
 - Pravachol/crestor preferred
- Ezetimibe
 - Zetia
- Repatha
 - Helps to lower LDL/cholesterol
- Fibrates
 - Lopid, tricor
- Niacin



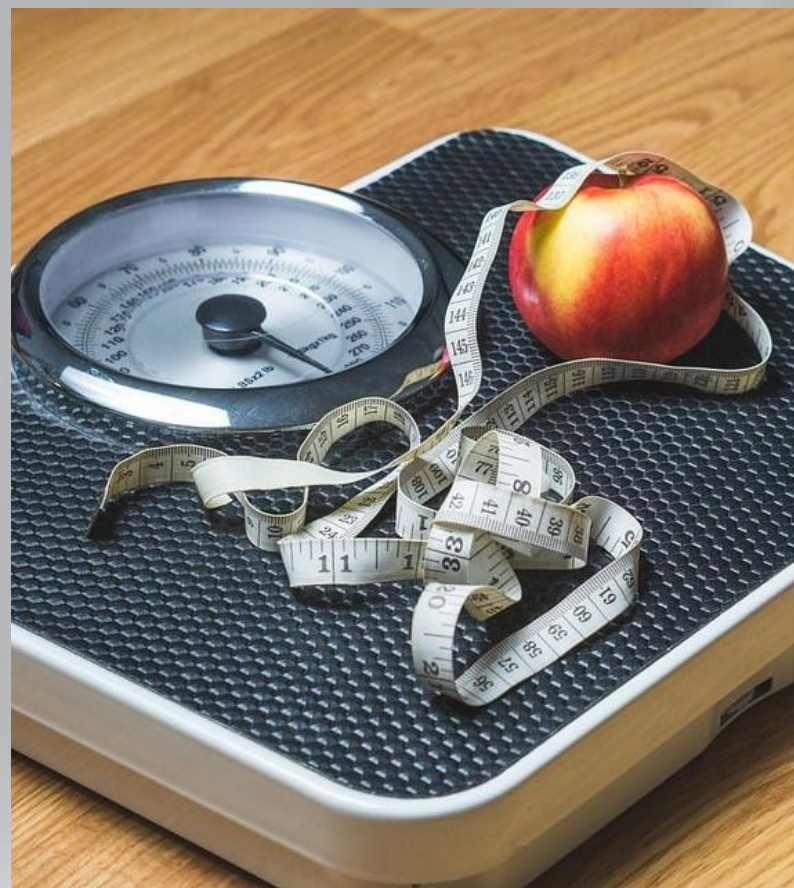
Dyslipidemia

- Use of mTOR
- Lab monitoring
- Liver function tests
- Side effects
 - rhabdo



Obesity

- At time of transplant as important as post
- Comes with other complications
 - HTN, DM, Dyslipidemia, metabolic syndrome, inactivity
- Post transplant weight gain 5-10%



Obesity

- Diet
- Exercise
- medication

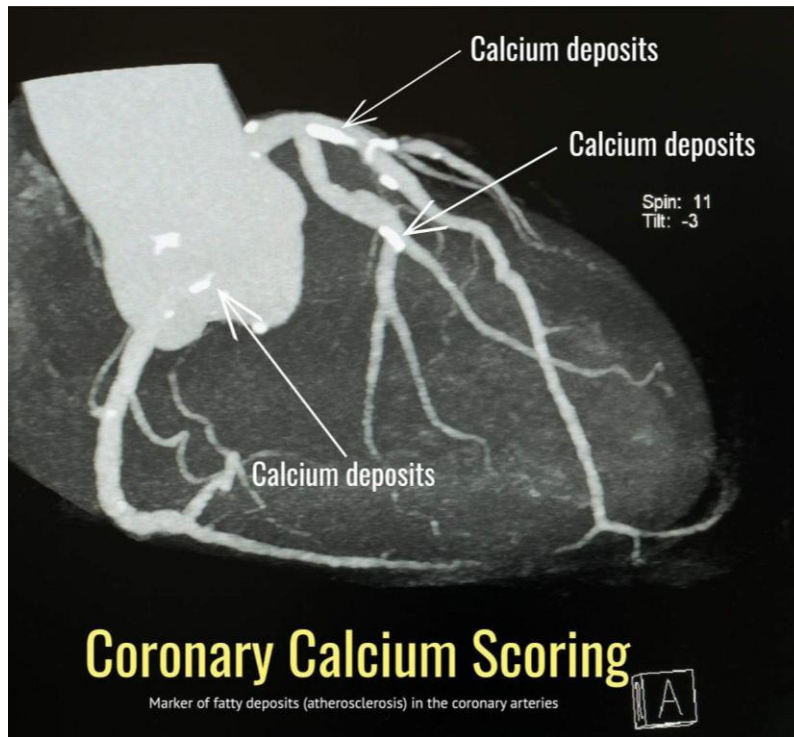


Coronary Artery Disease

- Most common complication
 - Recent study – 12% revascularization in the first year
 - Pre transplant troponin levels, increased risk of 30-day mortality post and new CAD post transplant
- Metabolic Syndrome, Immunosuppressive therapy, HTN, DM, CKD
- Risk factors:
 - Age
 - Prior MI or CAD
 - Dyslipidemia



Coronary Artery Disease

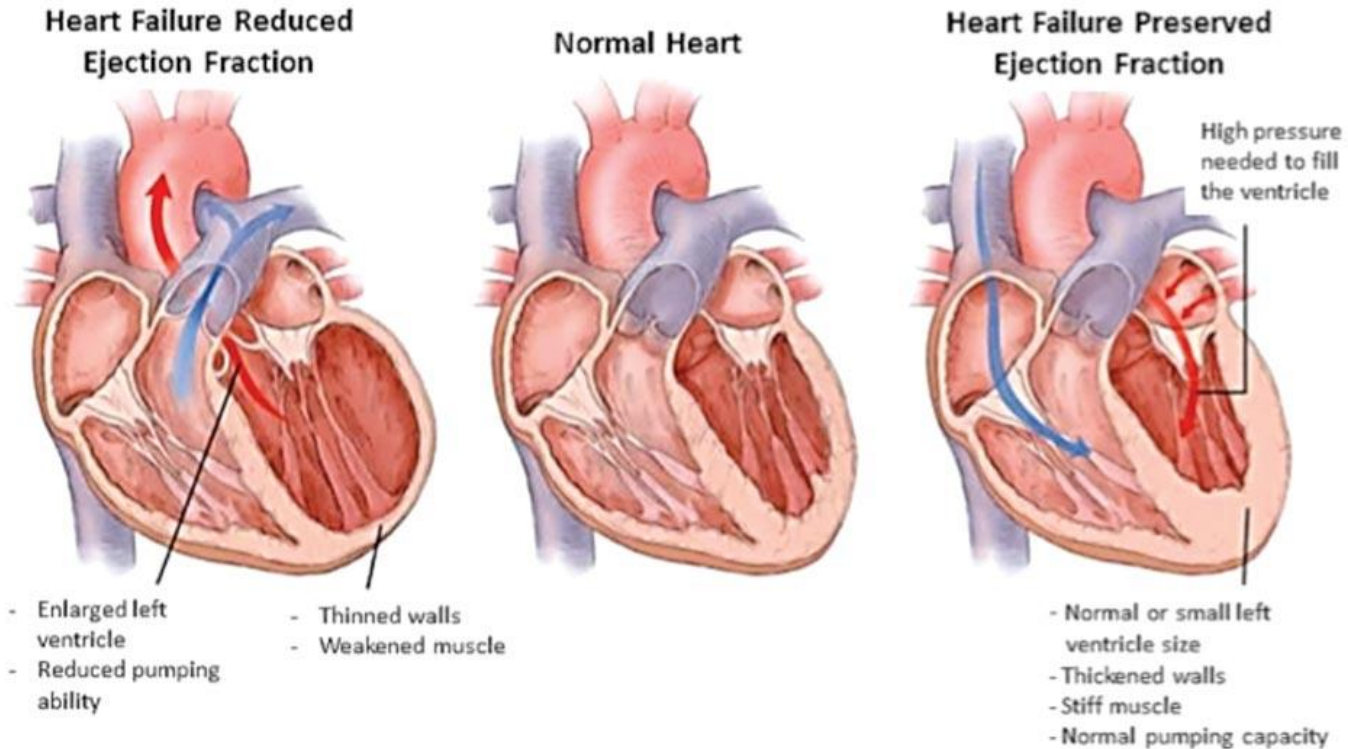


- Stress testing
 - NM, dobutamine
- Cardiac score
 - CT
- NM perfusion scan
 - TID Transient Ischemic Dilatation
→ LHC
- Cath
 - Lesion to amend
 - Will need DOAIC therapy – length dependent on lesion and amount

Heart Failure

- Risk Factors
 - Age, CAD, arterial HTN, valvular disease, DM, alcohol use, pregnancy, chemo
- Two types:
 - HF with decreased EF (HFrEF)
 - HF with preserved EF (HFpEF)
- Diastolic Dysfunction pre transplant
 - Increase in HFpEF post
 - Increased risk of rejection/failure
- Systolic Dysfunction
 - Resting EF <55%
 - No increase in CO when exercise, medication, volume

Heart Failure



Heart Failure

TABLE 2. Comparison of the NYHA classes and ACC/AHA stages of heart failure^{4,5}

NYHA functional classification	Description	ACC/AHA stage of heart failure	Description
Class I	No limitation of physical activity; ordinary physical activity does not cause undue fatigue, palpitation, dyspnea	Stage A	At high risk for the development of HF; no identified structural or functional abnormality; no signs or symptoms
Class II	Slight limitation of physical activity; comfortable at rest; ordinary physical activity results in fatigue, palpitation, dyspnea	Stage B	Developed structural heart disease that is strongly associated with the development of HF, but without signs or symptoms
Class III	Marked limitation of physical activity; comfortable at rest; less than ordinary activity results in fatigue, palpitation, or dyspnea	Stage C	Symptomatic HF associated with underlying structural heart disease
Class IV	Unable to carry on any physical activity without discomfort; symptoms of HF at rest; if any physical activity is undertaken, discomfort increases	Stage D	Advanced structural heart disease and marked symptoms of HF at rest despite maximal medical therapy
ACC = American College of Cardiology; AHA = American Heart Association; HF = heart failure; NYHA = New York Heart Association.			

Heart Failure

- EKG – look for prolonged QT interval
 - Increase sudden death when >0.5
 - May need cardiology consult
 - Medications
- Echo may not show any diastolic dysfunction
 - May mask intrinsic changes
 - Some studies have shown increased contractility and $EF > 65\%$ may predispose patients to CKD
- Dobutamine stress test to look for ischemia

Heart Failure

- Diet, exercise, weight
- Medication
 - Diuretics
 - ACE/ARB, ARNI, Betablocker, Aldosterone antagonist
 - inotropes
- Non medical management
 - Implantable defibrillator
 - BiV pacing
 - LVAD
 - Surgery to repair valves

CVD – Transplant



- Identify CVD risk factors
- Identify if CVD is present
- Research/further studies

QUESTIONS



REFERENCES

- Agarwal , A., & Prasad, R. (2016, March 24). Post-Transplant Dyslipidemia: Mechanisms, diagnosis and management . <https://www.wjgnet.com/2220-3230/CitedArticles?id=10.5500/wjt.v6.i1.125>
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