Cardiac Rehabilitation in Surgical Condition



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<u>Outline</u>

- <u>Cardiac Rehabilitation</u>
- 1. Coronary bypass graft(CABG)
- 2. Valvular heart disease (VHD)
- 3. Heart transplantation Recipients (HTRs)















	Coronary bypass graft (CABG)			
Anatomy	"Revascularization"			
Indication	<u>Goal</u> 1.Improved survival			
Case Study	2.Relieved symptoms			
Assessment				
Rehab. MX.				





	Coronary bypass graft (CABG)
	CABG in Patients With STEMI: Recommendations
Anatomy	CLASS I 1. Urgent CABG is indicated in patients with STEMI and coronary anatomy not
Indication	amenable to PCI who have ongoing or recurrent ischemia, cardiogenic shock, severe HF, or other high-risk features. (Level of Evidence: B)
Case Study	 CABG is recommended in patients with STEMI at time of operative repair of mechanical defects. (Level of Evidence: B)
Assessment	CLASS II a 1. The use of mechanical circulatory support is reasonable in patients with STEMI who are hemodynamically unstable and require urgent CABG. (Level of Evidence: C)
Rehab. MX.	CLASS II b 1. Emergency CABG within 6 hours of symptom onset may be considered in patients with STEMI who do not have cardiogenic shock and are not candidates for PCI or fibrinolytic therapy. (Level of Evidence: C)
	2013 ACCFIANA Guidaline for the Management of ST-Elevation Myocardial Inferction

	Coronary bypass graft (CABG)
Anatomy	
Anatomy	1. Unprotected Left main
Indication	2. 3 vessel disease with or without
	proximal LAD artery disease
Case Study	3. 2 vessel with proximal LAD disease
Accoment	4. 2 vessel without proximal LAD, with
Assessment	extensive ischemia
Rehab. MX.	5. 1 vessel proximal LAD artery with LIMA
	for long term benefit
	6.Poor LV function
	Hills LD, Smith PK, Anderson JL, Bitl JA, Bridges CR, Byrne JG, et al. 2011 ACCF/M44 guident for coronary arter bypass graft surger- xeacutive summary: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. The Journal of thoracic and cardiovacular surger; 2012;145(1):4-34.

	Coronary bypass graft (CABG)
Anatomy Indication	?
Case Study Assessment	A 60 -year- old, type 2 DM is admitted due to exercise – induced angina pectoris. He was history of COPD and still smokes 10 cigarettes/ day. His cholesterol is 270 mg/dL, His BMI is 28 , His
Rehab. MX.	blood pressure is 165/95 mmHg and HbA 1C is 10.5 %. His currently treated with Metformin and Ditiazem. On admission, troponin remain normal, and a CAG shows a Lt. Main stem stenosis 90%. Echocardiography shows a moderated LV hypertrophy but preserved systolic function. CABG is suggested.



	Coronary bypass graft (CABG)		
Anatomy	Problem List??		
Indication			
Case Study	1.Underlying dz.: DM, COPD		
Assessment	2.Risk factor : Current smoking, Obesity , HT, DM		
Rehab. MX.			

	Coronary bypass graft (CABG)		
Anatomy	Preoperative		
Indication			
Case Study Assessment	- Breathing exercise - Quit smoking		
Rehab. MX.	 Improved nutrition Aerobic exercise for improved aerobic capacity and reduce weight (Elective case) Control blood sugar (Elective case) 		





	Coronary bypass graft (CABG)		
Anatomy Indication	Cochrane review: Preoperative physical therapy for elective cardiac surgery patients		
Case Study Assessment	 8 Randomized controlled trials with 856 patients used a mixed intervention(Aerobic exercise or breathing exercise) that received preoperative physical therapy had a reduced risk of postoperative atelectasis relative risk (RR) 0.52; CI 0.32 to 0.87:P= 0.01 and pneumonia RR 0.45; 95% CI 0.24 to 0.83; P= 0.01) 		
Rehab. MX.	but not of pneumothorax (one study with 45 participants, RR 0.12; 95% Cl 0.01 to 2.11; P = 0.15) or mechanical ventilation for > 48 hours after surgery (two studies with 306 participants, RR 0.55; 95% Cl 0.03 to 9.20; P = 0.68). Postoperative death from all causes did not differ between groups (three studies with 552 participants, RR 0.66; 95% Cl 0.02 to 18.48; P = 0.81)		



	Coronary bypass graft (CABG)
Anatomy Indication	Postoperative
Case Study Assessment Rehab. MX.	 Hemodynamic Issue Pulmonary Issue Neurological Issue Sternal Wound
	Margereson, C. and Riley, J. (2008) Post-Operative Care following Cardiothonacic Surgery, in Cardiothonacic Surgical Nursing, Blackwell Science Ltd, Oxford, UK. doi: 10.1022/8780470774441.dr8

	Coronary bypass graft	(CABG)
Anatomy	Hemodynamic	
Case Study	Early Postoperative Hemodynamic Parameters	Expected Values
Assessment	Moon ortarial prosours (MAD)	60.00 mmHz
Rehab. MX.	Vestal a relia pressule (MAP) Systolic blod pressure (SBP) Rt. Arterial pressure (RAP) Pulmonary artery wedge pressure(PAWP)	90-140 mmHg 5-15 mmHg 10-15 mmHg
	www.accesssurgery.com.mlprox.csmc.edu/content.aspx?alD=5591	15367. Accessed October 30, 2013.



	Coronary bypass graft (CABG)			
Anatomy	Pulmonary Issue			
Indication	- Sternotomy shown to cause an important			
Case Study	acute reduction in pulmonary function. - 30 % reduction in vital capacity and			
Assessment	expiratory flows at 1 st weeks			
Rehab. MX.				

Coronary	bypass	graft	(CABG)

Anatomy	Factors contributing to sternal wound infection /dehiso		
Indication	Pre- operative factors	Intra- operative factors	Post- operative factors
Case Study	Diabetes mellitus Chronic obstructive	Use of bilateral and Single internal mammary artery IMA	Hypotension/ Hypoperfusion Sympathomimetic agents
Assessment	Pre operative Intensive care stay Obesity	Long operative time(> 4 Hr.) Long cardiopulmonary time(> 2 Hr.)	Ventilatory support > 48 hours Post -operative CPR Reopening of chest Banked blood transfusions
Rehab. MX.	Advanced age(> 70 years) Sex(Male) Cigarette smoking Impaired immune response		Hypoxemia





	Coronary bypass graft (CABG)
Anatomy	Sternal External Fixation
Indication	
Case Study	
Assessment	A prospective RC1, 2539 patient post median sternotomy Used Posthorax corset 24 hr. for at least 6 week Results: better and effective prevention deep sternal wounds
Rehab. MX.	and a second



	Coronary bypass graft (CABG)
Anatomy Indication Case Study Assessment Rehab. MX.	The patient is referred to ambulatory cardiac rehabilitation 1 week after discharge from triple vessel bypass operation. He complaint SOB when walking from parking lot to rehabilitation center No history of orthopnea. Clinical examination shows normal heart sound, reduced breath sounds over the left lower lung and swelling at Rt. Ankle.

	Coronary bypass gra	aft (CABG)
Anatomy Indication	Frequency of pulmonary complication	ns after cardiac surgery
Case Study	complication	Frequency,%
Assessment	Pleural effusion Atelectasis	27-95 16.6 - 88 20 75
Rehab. MX.	Prolonged mechanical ventilation Diaphragmatic dysfunction Pneumonia Diaphragmatic paralysis Pulmonary embolism ARDS Aspiration Pneumothorax	$\begin{array}{c} 30 - 75 \\ 6 - 58 \\ 2 - 54 \\ 4.2 - 20 \\ 9 \\ 0.04 - 20 \\ 0.4 - 2 \\ 1.9 \\ 1.4 \end{array}$



	Coronary bypass graft (CABG)
Anatomy Indication	Leg edema
Case Study Assessment Rehab. MX.	 RCT, 295 post CABG patient (396 limbs)received 2 difference types of compression (both provide 18 mmHg of compression) medical compression stocking (TED) and elastic bandage-type on donor limbs after CABG Average 12 day (Admission per)
	Result: using the kind of knee length compression stocking (TED stocking.) is more effective edema at foot and heel regions in donor limbs after CABG than elastic bandages.



Exercise program Anatomy Indication Case Study Assessment Rehab. MX:				
Exercise program Anatomy Indication Case Study Assessment Rehab. MXX				
Exercise program Anatomy Resistance Exercise : "Sternal Precaution" Indication Variable n Case Study Assessment 2 Rehab. MX. Utilize resistions specified statisty 2 Indication colspan="2">Case Study Assessment 1 Rehab. MX. 1 1				
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Other 7 Weight restrictions specified initially - 1 lg 2 2-5 lg 16 6-10 lg 1 Utiling of any weight prohibited 1 Neight restrictions specified at discharge - 1 lling of any weight within pain limitation 1 Assessment - Rehab. MX. - -	21.7	5	Restricting the height an object can be lifted to	Indication
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No overhead lifting 6	13.0	3	Lifting height to ≤90° of shoulder flexion	
	26.1	6	No overhead lifting	
No height restriction applied 13	56.5	13	No height restriction applied	
Other 3	13.0	3	Other	

	Forces required to pe	erform ADL
	Activity	Force pounds
Ameternu	Life I Ib dumbbell	2
Anatomy	Lift 3 lb dumbbell	4
	Lift 5 lb dumbbell	6
Indication	Lift 10 lb dumbbell	12.5
	Pushing open the door to CR	15.5
	Pulling open door to leave CR	22
Case Study	Lifting full laundry hamper	21.5
-	Hold elevator door from closing	14.5
Assessment	open refrigerator	9
	Pulling I gallon of milk from refrigerator	10.5
Rehab MX	Closed microwave door	63
	Pushing vacuum cleaner	7.5
	Pulling vacuum cleaner	8.5
	Flushing industrial toilet	13.5
	Lifting purse	7.5
	Lifting full coffee pot	6.5
	Opening car door	15.5







	Exercise a	fter CABG
Anatomy		
Indication Assessment Rehab. MX.	Aerobic exercise - Moderate intensity - Duration 20-60 min - Frequency 3-5 times/week - Modality: walking, cycling, treadmill, ergometry	Resistance exercise - 5-8 weeks post operation lifting with UE should restricted to 5-8 pounds. ROM and lifting 1-3 pounds with arms is permissible if no evidence of sternal instability
	Swimming = sterr	al precaution

	Coronary bypass graft (CABG)
Anatomy	Sexual Issue
Indication Case Study Assessment	 Decreased sexual activity among cardiac patients is frequently reported. Rates of ED among men with CVD are twice as high as those in the general population, with similar rates of sexual dysfunction in females with CVD. RCTs using a specific sexual counseling intervention would be useful in determining efficaciousness in reducing the incidence or severity of specific physical and psychological variables. Independent predictors for preoperative sexual problems in CARG: male ender and DM
Renad. MX.	ChoS - Initial generation and Dwin Resumed sexual activity in 6 to 8 weeks after a standard CABG surgery (Class II a; Level of Evidence B) or non-coronary open heart surgery (Class II a; Level of Evidence C), if the sternotomy is well healed.











	Valvular Heart Disease(VHD)
Anatomy	For supervised Exercise training
Indication	 Medically supervised training in postoperative valve surgery
Assessment	 Athletes with asymptomatic VHD Mitral valve prolapse
Rehab. MX.	Contraindication 1. Truly symptomatic aortic stenosis 2. Mitral valve prolapse with syncope 3. High BP (SBP>200 mmHg or diastolic >110 mmHg) 4. Uncontrolled or symptomatic arrhythmias

	Valvular Heart Disease(VHD)
Anatomy Indication Assessment	 Echocardiogram : diagnosing and quantifying VHD EKG: cardiac chamber size EST: diagnostic and prognostic information Value of exercise testing in patients with VHD
Rehab. MX.	To assess objective functional capacity To assess atypical symptoms Production of prior unnoticed symptoms To induce pathological hemodynamic response

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	<u>Valvular Heart Disease(VHD)</u>
Anatomy Indication	High- Risk exercise Tolerance test Findings in Asymptomatic Severe Aortic Stenosis
Assessment Rehab. MX.	 -Angina or dyspnea Failure to augment systolic blood pressure > 20 mmHg > or = 2 mm ST segment depression Significant ventricular arrhythmia Mean gradient increase > or = 18 mmHg by Doppler

	Valvular Heart Disease(VHD)				
Anatomy	Effect of exercise training				
Indication	RCT ,64 consecutive pt. who underwent	t			
Assessment	valve surgery				
Rehab. MX.	•				



	Exercise after Va	alve replacement
Anatomy		
Indication	Aerobic exercise	Resistance exercise
Assessment	 Moderate intensity Heart rate guided < 130 beats/min 	 5 REP for strength training Duration 1-3 sets of 6-10 upper and lower body
Rehab. MX.	 Duration 20-60 min Frequency 3-5 times/week Modality: walking, cycling, treadmill, ergometry 	exercise - Frequency 2-3 times/week - Modality: elastic bands, weight
	Swimming = sterr	al precaution











	Heart transplant Recipients(HTRs)
Anatomy	For Heart transplant ⁻ History of repeated hospitalizations for heart failure
Indication	 Need for ventricular assist device or artificial heart to support circulation Increasing types, dosages, and complexity of medications
Assessment	 Reproducible VO2 of less than 14 mL/kg per minute Ineligible for HTRs
Rehab. MX.	 Irreversible pulmonary hypertension Active infection Cancer









	Heart transplant Recipients(HTRs)			
Anatomy	<u>For LVAD</u>			
Indication	 High risk surgical procedures, such as CABG or VHD in patients with poor preoperative LV function Post-operative cardiogenic shock 			
Assessment	Contraindications - Aortic regurgitation or prosthetic aortic valve			
Rehab. MX.	 Aortic aneurysm or dissection Severe aortic or peripheral vascular disease Left ventricular or left atrial thrombi Bleeding diathesis -Uncontrolled sepsis 			

	<u>.</u>	eart tr	anspl	ant R	ecipier	<u>its(HT</u>	<u>ˈRs)</u>	
		<u>(</u>	Compare e	exercise a	nd Post-exe	ercise		
Anatomy		Function	nal Capac	ity and Pu	Ilmonary Fu	Inction Tes	<u>sts</u>	
			¢		HTx	LW	Ð	_
· · · · · · · · · · · · · · · · · · ·	r000-	17.49 ± 4.31	After exercise 19.58 ± 58 [±]	Before exercise 17.25 ± 4.07	*9.46 ± 4.04 ³	Before exercise	After exercise 15:13 + 3.42 ⁺	- <u>p</u>
Indication	FeV ₁₁₆	79.47 ± 15.94	80.73 ± 15.72"	83.54 ± 19.05	86.85 ± 15.86"	67.74 ± 30.95	77.94 ± 26.94"	.26
	FVC% FeV./FVC%	85.41 ± 16.84 78.17 ± 9.21	88.87 ± 17.16" 75.82 ± 8.53	82.46 ± 18.31 82.71 ± 6.98	90.08 ± 15.52" 78.87 ± 9.67	72.02 ± 25.29 76.14 ± 21.37	82.18 ± 22.78" 77.24 ± 19.31	.43 .28
			0		and Death			_
Assassment			Compare	exercise	and Post-ex	xercise		
Aggegginent			SF 3	6 and Psv	choloaic iss	sue		
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Dahah MV	Before exe	Cise Anere	sxercise be	store exercise	After exercise	Before exercise	After exercise	P
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Nonals, miss	PR 30.45 ± 3	¥6.02 50 :	2 40/40 41			4Z.00 ± 47.20	41.07 ± 40.05	
Nonab. mix.	PR 30.45 ± 3 P 65.95 ± 2	16.02 50 6.30 72.00	± 19.70 51	.42 ± 29.59	77.96 ± 18.96°	42.80 ± 47.25 61.29 ± 34.81	80.67 ± 18.36	5 ⁿ .10
	PR 30.45 ± 3 P 65.95 ± 2 GH 44.71 ± 2	16.30 72.00 16.70 49.21	± 19.70 51 ± 24.72 55	.42 ± 29.59 i.57 ± 21.30	$\begin{array}{l} 77.96 \pm 18.96^{\circ} \\ 66.43 \pm 23.84^{\circ} \end{array}$	42.80 ± 47.25 61.29 ± 34.81 49.00 ± 27.26	80.67 ± 18.36 72.33 ± 32.85	5° .10 ? .44
Nonabi mini	PR 30.45 ± 3 P 65.95 ± 2 GH 44.71 ± 2 V 58.05 ± 2	16.02 50 16.30 72.00 18.70 49.21 4.80 67.75	± 19.70 51 ± 24.72 55 ± 17.50° 64	.42 ± 29.59 i.57 ± 21.30 i.74 ± 23.91	$\begin{array}{l} 77.96 \pm 18.96^{\circ} \\ 66.43 \pm 23.84^{\circ} \\ 78.57 \pm 17.47^{\circ} \end{array}$	42.80 ± 47.25 61.29 ± 34.81 49.00 ± 27.26 62.14 ± 21.58	80.67 ± 18.36 72.33 ± 32.85 83.33 ± 11.65	5° .10 2 .44 7° .48
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	PR 30.45 ± 3 P 65.95 ± 2 GH 44.71 ± 2 V 58.05 ± 2 SF 68.02 ± 2 ER 34.98 ± 3 MH 64.05 ± 2	96.02 50 16.30 72.00 18.70 49.21 14.80 67.75 18.26 70.91 7.32 52.83 0.02 68.70	\pm 19.70 51 \pm 24.72 55 \pm 17.50° 64 \pm 24.84 52 \pm 40.12° 42 \pm 40.12° 42	42 ± 29.59 57 ± 21.30 74 ± 23.91 26 ± 31.91 1.97 ± 41.34	$77.96 \pm 18.96^{\circ}$ $66.43 \pm 23.84^{\circ}$ $78.57 \pm 17.47^{\circ}$ $77.71 \pm 20.73^{\circ}$ $65.31 \pm 40.16^{\circ}$ 72.71 ± 16.40	42.80 ± 47.23 61.29 ± 34.81 49.00 ± 27.26 62.14 ± 21.58 52.00 ± 31.63 44.33 ± 45.76 68.86 ± 19.80	41.07 ± 40.00 80.67 ± 18.36 72.33 ± 32.80 83.33 ± 11.65 73.17 ± 38.04 62.00 ± 44.85 82.67 ± 16.01	6" .10 2 .44 3" .48 4 .11 1" .18
	PR 30.45 ± 3 P 65.95 ± 2 GH 44.71 ± 2 V 58.05 ± 2 SF 68.02 ± 2 ER 34.98 ± 3 MH 64.95 ± 2	96.02 50 16.30 72.00 18.70 49.21 14.80 67.75 18.26 70.91 7.32 52.83 10.03 68.79	\pm 19.70 51 \pm 24.72 55 \pm 17.50° 64 \pm 24.84 52 \pm 40.12° 42 \pm 19.23 64	42 ± 29.59 5.7 ± 21.30 5.7 ± 23.91 2.6 ± 31.91 2.97 ± 41.34 4.42 ± 22.35	$\begin{array}{l} 77.96 \pm 18.96^{\circ} \\ 66.43 \pm 23.84^{\circ} \\ 78.57 \pm 17.47^{\circ} \\ 77.71 \pm 20.73^{\circ} \\ 65.31 \pm 40.16^{\circ} \\ 72.71 \pm 16.40 \end{array}$	42.80 ± 47.25 61.29 ± 34.81 49.00 ± 27.26 62.14 ± 21.58 52.00 ± 31.63 44.33 ± 45.76 66.86 ± 13.80	80.67 ± 18.36 72.33 ± 32.85 83.33 ± 11.65 73.17 ± 38.04 62.00 ± 44.85 82.67 ± 16.91	6° .10 2 .44 3° .48 4 .11 5° .18 1° .33
	PR 30,45 ± 3 P 65,95 ± 2 GH 44,71 ± 2 V 58,05 ± 2 SF 68,02 ± 2 ER 34,98 ± 3 MH 64,95 ± 2 STAI State 45 GTAI Train 45	96.02 50 26.30 72.00 18.70 49.21 14.80 67.75 7.32 52.83 0.03 68.79 27 ± 8.84 0 27 ± 8.84 0	\pm 19.70 51 \pm 24.72 55 \pm 17.50° 64 \pm 24.84 52 \pm 40.12° 42 \pm 19.23 64 44.63 \pm 7.38 42.89 \pm 0.09	42 ± 29.59 5.57 ± 21.30 5.74 ± 23.91 5.26 ± 31.91 5.97 ± 41.34 5.42 ± 22.35 43.97 ± 8.67 42.99 ± 0.59	$\begin{array}{l} 77.96 \pm 18.96^{\circ} \\ 66.43 \pm 23.84^{\circ} \\ 78.57 \pm 17.47^{\circ} \\ 77.71 \pm 20.73^{\circ} \\ 65.31 \pm 40.16^{\circ} \\ 72.71 \pm 16.40 \\ \end{array}$	42.80 ± 47.25 61.29 ± 34.81 49.00 ± 27.26 62.14 ± 21.58 52.00 ± 31.63 44.33 ± 45.76 66.86 ± 13.80 48.00 ± 2.77 48.14 ± 4.98	80.67 ± 18.36 72.33 ± 32.85 83.33 ± 11.65 73.17 ± 38.04 62.00 ± 44.86 82.67 ± 16.91 45.64 ± 6.95	6 ⁴ .10 2 .44 3 ⁴ .48 4 .11 5 ⁴ .18 1 ⁴ .33 i .49 i .49
	PR 30,45 ± 3 P 65,95 ± 2 GH 44,71 ± 2 V 58,05 ± 2 SF 68,02 ± 2 ER 34,98 ± 3 MH 64,95 ± 2 STAI State 45 STAI Trait 45 BDI 12	36.02 50.0 26.30 72.00 38.70 49.21 14.80 67.75 18.26 70.91 7.32 52.83 0.03 68.79 27 ± 8.84 05 ± 9.42 14 ± 10.39 14 ± 10.39	\pm 19.70 51 \pm 24.72 55 \pm 17.50° 64 \pm 24.84 52 \pm 40.12° 42 \pm 19.23 64 44.63 \pm 7.38 43.88 \pm 9.08 7.91 \pm 6.91°	1.42 ± 29.59 1.57 ± 21.30 1.74 ± 23.91 1.26 ± 31.91 1.97 ± 41.34 1.42 ± 22.35 1.439 ± 9.58 7.36 ± 7.46	$\begin{array}{r} 77.96 \pm 18.96^{\circ} \\ 66.43 \pm 23.84^{\circ} \\ 78.57 \pm 17.47^{\circ} \\ 77.71 \pm 20.73^{\circ} \\ 65.31 \pm 40.16^{\circ} \\ 72.71 \pm 16.40 \\ \hline \\ 45.58 \pm 6.88 \\ 6.88 \pm 6.28 \\ 6.88 \pm 7.23^{\circ} \\ \end{array}$	42.06 ± 47.25 61.29 ± 34.81 49.00 ± 27.26 62.14 ± 21.58 52.00 ± 31.63 44.33 ± 45.76 66.86 ± 13.80 48.00 ± 2.77 48.14 ± 4.88 11.29 ± 7.39	$\begin{array}{c} 0.67 \pm 0.03, \\ 0.67 \pm 10.34, \\ 0.23 \pm 32.42, \\ 0.33 \pm 32.42, \\ 0.33 \pm 32.42, \\ 0.33 \pm 31.65, \\ 0.33 \pm 11.65, \\ 0.20 \pm 4.4, \\ 0.20 \pm 4.4$	6 ⁿ .10 2 .44 3 ⁿ .48 4 .11 5 ⁿ .18 1 ⁿ .33 1 .49 ! .35 1 ⁿ .9
	PR 30.45 ± 3 P 65.95 ± 3 GH 44.71 ± 2 V 58.05 ± 2 SF 68.02 ± 2 ER 34.98 ± 3 MH 64.35 ± 2 STAI State 45 BDI 12	36.02 50.0 26.30 72.00 38.70 49.21 44.80 67.75 18.26 70.91 17.32 52.83 0.03 68.79 27 ± 8.84 .05 ± 9.42 14 ± 10.39	$\begin{array}{c} \pm 19.70 & 51 \\ \pm 24.72 & 55 \\ \pm 17.50^{\circ} & 64 \\ \pm 24.84 & 52 \\ \pm 40.12^{\circ} & 42 \\ \pm 19.23 & 64 \\ 44.63 \pm 7.38 \\ 43.88 \pm 9.08 \\ 7.91 \pm 6.93^{\circ} \end{array}$	$\begin{array}{c} 4.2 \pm 29.59 \\ 5.7 \pm 21.30 \\ 7.7 \pm 23.91 \\ 2.26 \pm 31.91 \\ 2.26 \pm 31.91 \\ 4.42 \pm 22.35 \\ \hline \\ \hline \\ 43.97 \pm 8.67 \\ 43.89 \pm 9.58 \\ 7.36 \pm 7.48 \\ \end{array}$	$\begin{array}{c} 77.96 \pm 18.96^{8} \\ 66.43 \pm 23.84^{8} \\ 78.57 \pm 17.47^{8} \\ 77.77 \pm 20.73^{8} \\ 65.31 \pm 40.16^{8} \\ 72.71 \pm 16.40 \\ \hline \\ 45.64 \pm 6.95 \\ 45.58 \pm 6.88 \\ 5.86 \pm 7.73^{8} \\ \end{array}$	$\begin{array}{l} 42.86 \pm 47.25 \\ 61.29 \pm 34.81 \\ 49.00 \pm 27.26 \\ 62.14 \pm 21.58 \\ 52.00 \pm 31.63 \\ 44.33 \pm 45.76 \\ 66.86 \pm 13.80 \\ \hline \\ 48.00 \pm 2.77 \\ 48.14 \pm 4.88 \\ 11.29 \pm 7.39 \end{array}$	$\begin{array}{c} 41.07 \pm 40.03\\ 80.67 \pm 18.34\\ 72.33 \pm 32.82\\ 83.33 \pm 11.66\\ 73.17 \pm 38.04\\ 62.00 \pm 44.84\\ 82.67 \pm 16.91\\ 45.64 \pm 6.95\\ 42.83 \pm 5.44\\ 5.00 \pm 6.02\\ \end{array}$	6 ⁿ .10 2 .44 3 ⁿ .48 4 .11 5 ⁿ .18 1 ⁿ .33 5 .49 1 .35 1 ⁿ .89
	PR 30.45 ±3 P 65.95 ±2 GH 44.71 ±2 V 58.05 ±2 SF 68.02 ±2 ER 34.96 ±3 MH 64.95 ±2 STAI State 45 BDI 12	36.02 50.0 265.30 72.00 38.70 49.21 14.80 67.75 18.26 70.91 17.32 52.83 10.03 68.79 27 ± 8.84 .05 ± 9.42 .14 ± 10.39	$\begin{array}{c} \pm 19.70 & 51 \\ \pm 24.72 & 55 \\ \pm 17.50^{\circ} & 64 \\ \pm 24.84 & 52 \\ \pm 40.12^{\circ} & 42 \\ \pm 19.23 & 64 \\ 44.63 \pm 7.38 \\ 43.88 \pm 9.08 \\ 7.91 \pm 6.93^{\circ} \end{array}$	$\begin{array}{c} 4.2 \pm 29.59 \\ 5.7 \pm 21.30 \\ 7.7 \pm 23.91 \\ 2.26 \pm 31.91 \\ 2.26 \pm 31.91 \\ 7.44 \pm 22.35 \\ \hline \\ 43.97 \pm 8.67 \\ 43.89 \pm 9.58 \\ 7.36 \pm 7.48 \\ \end{array}$	$\begin{array}{c} 77.96 \pm 18.96^{\circ} \\ 66.43 \pm 23.84^{\circ} \\ 78.57 \pm 17.47^{\circ} \\ 77.71 \pm 20.73^{\circ} \\ 65.31 \pm 40.16^{\circ} \\ 72.71 \pm 16.40 \\ \hline \\ 45.64 \pm 5.95 \\ 45.58 \pm 6.88 \\ 5.86 \pm 7.73^{\circ} \\ \end{array}$	$\begin{array}{l} 42.86 \pm 47.25 \\ 61.29 \pm 34.81 \\ 49.00 \pm 27.26 \\ 62.14 \pm 21.58 \\ 52.00 \pm 31.63 \\ 44.33 \pm 45.76 \\ 66.86 \pm 13.80 \\ \hline \\ 48.00 \pm 2.77 \\ 48.14 \pm 4.88 \\ 11.29 \pm 7.39 \\ \end{array}$	$\begin{array}{c} 40.67 \pm 0.35\\ 80.67 \pm 0.32\\ 72.33 \pm 32.82\\ 83.33 \pm 11.66\\ 73.17 \pm 38.04\\ 62.00 \pm 44.84\\ 82.67 \pm 16.91\\ 45.64 \pm 6.95\\ 42.83 \pm 5.44\\ 5.00 \pm 6.03\\ \end{array}$	6 ⁶¹ .10 2 .44 9 ⁶¹ .48 4 .11 5 ⁶¹ .18 1 ⁶¹ .33 5 .49 2 .35 1 ⁶ .89
	PPR 30.45 ±3 P 65.95 ±2 GH 44.71 ±2 V 58.05 ±2 SF 68.02 ±2 ER 34.98 ±3 MH 64.95 ±2 STAI State 45 BDI 12	36.02 50.0 36.7 49.21 14.80 67.75 18.26 70.91 17.32 52.83 10.03 68.79 27 ± 8.84 0.5 ± 9.42 .14 ± 10.39 10.39	$\begin{array}{c} \pm 19.70 \\ \pm 19.70 \\ \pm 24.72 \\ \pm 17.50^{\circ} \\ 64 \\ \pm 24.84 \\ 52 \\ \pm 40.12^{\circ} \\ 44.63 \\ \pm 7.38 \\ 43.88 \\ \pm 9.08 \\ 7.91 \\ \pm 6.93^{\circ} \end{array}$	1.62 ± 29.59 1.57 ± 21.30 1.74 ± 23.91 1.97 ± 41.34 1.42 ± 22.35 43.97 ± 8.67 43.89 ± 9.58 7.36 ± 7.46	$\begin{array}{c} 77.96 \pm 18.96^{\circ} \\ 66.43 \pm 23.84^{\circ} \\ 78.57 \pm 17.47^{\circ} \\ 77.71 \pm 20.73^{\circ} \\ 65.31 \pm 40.16^{\circ} \\ 72.71 \pm 16.40 \\ \hline \\ 45.56 \pm 6.88 \\ 5.86 \pm 7.73^{\circ} \\ \end{array}$	$\begin{array}{c} 42.86 \pm 47.25 \\ 61.29 \pm 34.81 \\ 49.00 \pm 27.26 \\ 62.14 \pm 21.58 \\ 52.00 \pm 31.63 \\ 44.33 \pm 45.76 \\ 66.86 \pm 13.80 \\ 48.00 \pm 2.77 \\ 48.14 \pm 4.88 \\ 11.29 \pm 7.39 \end{array}$	$\begin{array}{c} 41.07 \pm 40.5, \\ 80.67 \pm 18.34 \\ 72.33 \pm 32.86 \\ 83.33 \pm 11.66 \\ 73.17 \pm 38.04 \\ 62.00 \pm 44.84 \\ 82.67 \pm 16.91 \\ 45.64 \pm 6.95 \\ 42.83 \pm 5.42 \\ 5.00 \pm 6.03 \end{array}$	6 ⁶ .10 2 .44 9 ⁶ .48 4 .11 5 ⁶ .18 1 ⁶ .33 5 .49 2 .35 3 ⁶ .89
	PPR 30.45 ±3 P 65.95 ±2 GH 44.71 ± 2 V 58.05 ± 2 SF 68.05 ± 2 SF 68.05 ± 2 STAI State 45 STAI Trait 45 BDI 12	36.02 36.0 72.00 28.0 72.00 49.21 14.80 67.76 1826 70.91 17.32 52.83 10.03 68.79 27 ± 8.84 .05 ± 9.42 .14 ± 10.39	$\begin{array}{c} \pm 0.70 & 51\\ \pm 24.72 & 55\\ \pm 17.50^{\circ} & 64\\ \pm 24.84 & 52\\ \pm 40.12^{\circ} & 42\\ \pm 19.23 & 64\\ 44.63 \pm 7.38\\ 43.88 \pm 9.08\\ 7.91 \pm 6.93^{\circ}\\ \end{array}$	$\begin{array}{c} 4.2 \pm 29.59 \\ .57 \pm 21.30 \\ .74 \pm 23.91 \\ .26 \pm 31.91 \\ .97 \pm 41.34 \\ .42 \pm 22.35 \\ \hline 43.97 \pm 8.67 \\ .43.99 \pm 9.58 \\ 7.36 \pm 7.46 \\ \end{array}$	$\begin{array}{c} 77.96 \pm 18.96^{\circ} \\ 66.43 \pm 23.84^{\circ} \\ 78.57 \pm 17.47^{\circ} \\ 77.71 \pm 20.73^{\circ} \\ 65.31 \pm 40.16^{\circ} \\ 72.71 \pm 16.40 \\ \hline 45.64 \pm 6.96 \\ 45.58 \pm 6.88 \\ 5.86 \pm 7.73^{\circ} \\ \end{array}$	$\begin{array}{c} *2.60\pm4/.20\\ 61.29\pm44.81\\ 49.00\pm27.26\\ 62.14\pm21.58\\ 52.00\pm31.63\\ 44.33\pm45.76\\ 66.86\pm13.80\\ 48.00\pm2.77\\ 48.14\pm4.88\\ 11.29\pm7.39\end{array}$	$\begin{array}{c} 41.07 \pm 0.05,\\ 80.67 \pm 18.34\\ 72.33 \pm 22.85\\ 83.33 \pm 11.65\\ 73.17 \pm 38.04\\ 62.00 \pm 44.84\\ 62.67 \pm 16.91\\ 45.64 \pm 6.92\\ 42.83 \pm 5.44\\ 5.00 \pm 6.03\\ \end{array}$	6° .10 2 .44 9° .48 4 .11 5° .18 1° .33 5 .49 5 .35 3° .89

	Heart transplant Recipients(HTRs)
Anatomy Indication Assessment	1. <u>Early – Mortality</u> - rejection - Infection 2. <u>Late –Mortality</u>
Rehab. MX.	

	Heart transplant Recipients(HTRs)
Anatomy	Reduce risk of infection
Indication	Good dental hygiene, no toothbrush older than 4 weeks Frequent handwashing using liquid soap Avoidance of close contact with people with infectious diseases
Assessment	(meases, crickenpox, mumps, mononucleoss, common colo, tiu) 4. Avoidance of contact with persons having received oral polio vaccination for 8 weeks 5. If indispensable, pets in the household only under strict precautions
Rehab. MX.	limiting contact 6. No gardening without gloves 7. No contact with decying plants, fulls, vegetables 8. No stay mace construction own and compost heaps 9. No mold inside the home 10. Hydroccuture (hydroponics) is better than potting compost in the home 11. Avoidance of swimming in public baths during the first months 12. Avoidance of hot tub, sauna, and whirlpool

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Heart transplant Recipients(HTRs)						
Anatomy	Exercise in HTRs					
Indication Assessment Rehab. MX.	Aerobic exercise - Intensity : RPE at anaerobic threshold - Duration:20- 60 min at prescribes intensity with warm up and cool down - Frequency: supervised setting 3 times /week, 6-8 weeks no study for indicated EKG monitoring is required	Resistance exercise - First 6 weeks after surgery, Sternal precaution 10 - 20 slow REP 1 to 3 sets of exercises for the major muscle groups. - Frequency: 2 - 3 sessions per week. - RPE ;12 - 14 - Immediately after cool down				

Thank you