EXERCISE HEMODYNAMICS AMONG PATIENTS WITH DYSPNEA ON EXERTION

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Pulmonary Hypertension Registry

A pulmonary hypertension registry exists at ICE

Inclusion criteria

Patients who have been identified as having an elevated RVSP on echocardiogram

Patients with symptoms of dyspnea, effort intolerance, exertional fatigue

Protocol

All patients had a 6 or a 7 french venous access

Sedation was minimized

After obtaining baseline hemodynamics patients had 2.5 pound wrist weights fastened and did arm movements (similar to jumping jacks) for 3 minutes.

Baseline Pulmonary Artery Pressures

Total patients 172

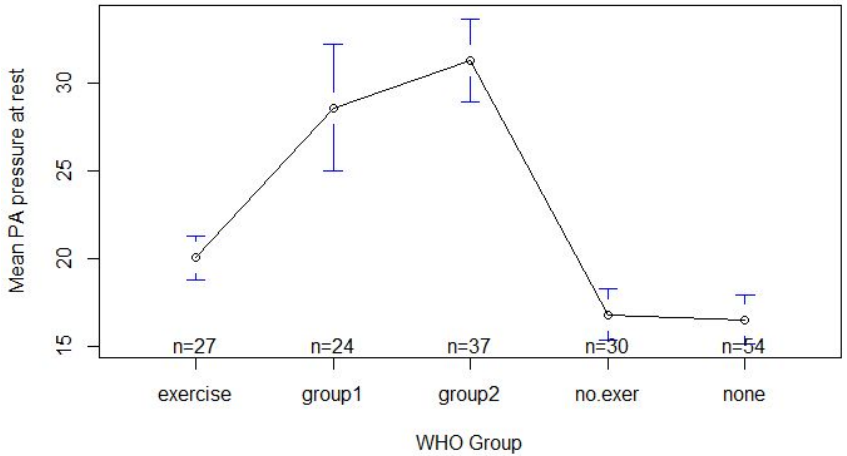
WHO Group 1 24 (13.9%)

WHO Group 2 37 (21.5%)

Exercise induced 27 (15.7%)

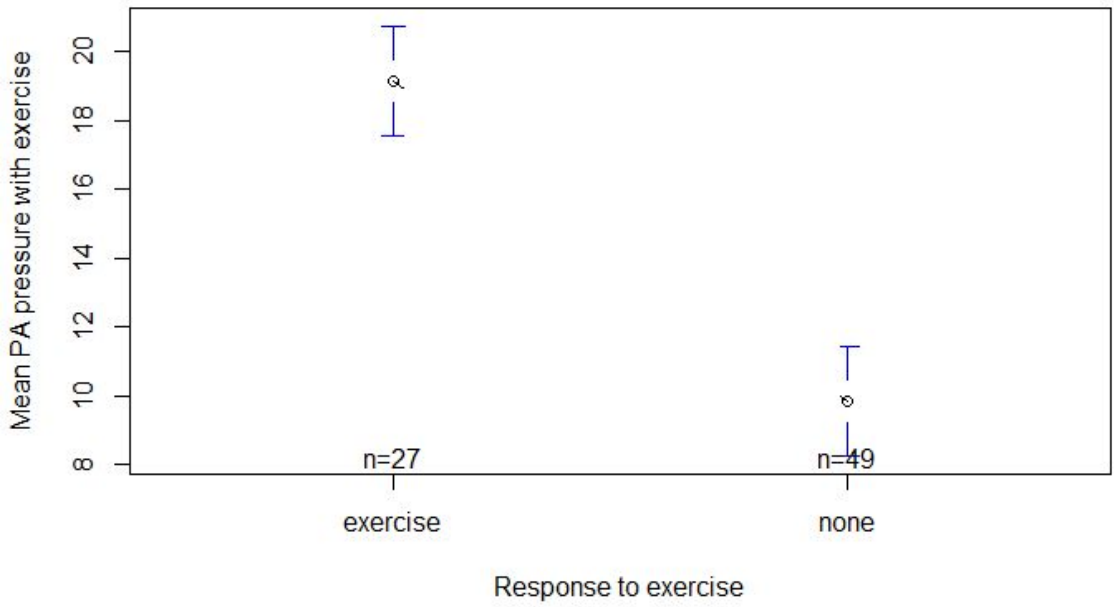
Normal 54 (31.4%)

Exercise not done 30 (17.4%)



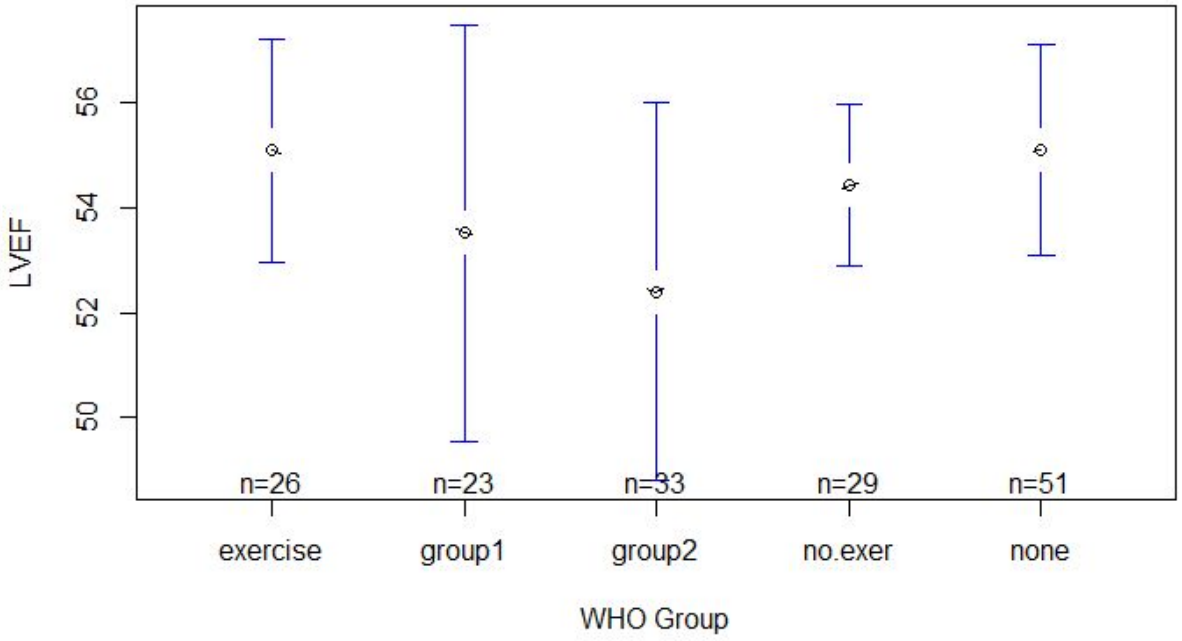
Response to exercise

A third of those with resting PA pressures less than 25 showed an elevation with exercise.



Resting LVEF

The groups were similar with regards to resting LVEF

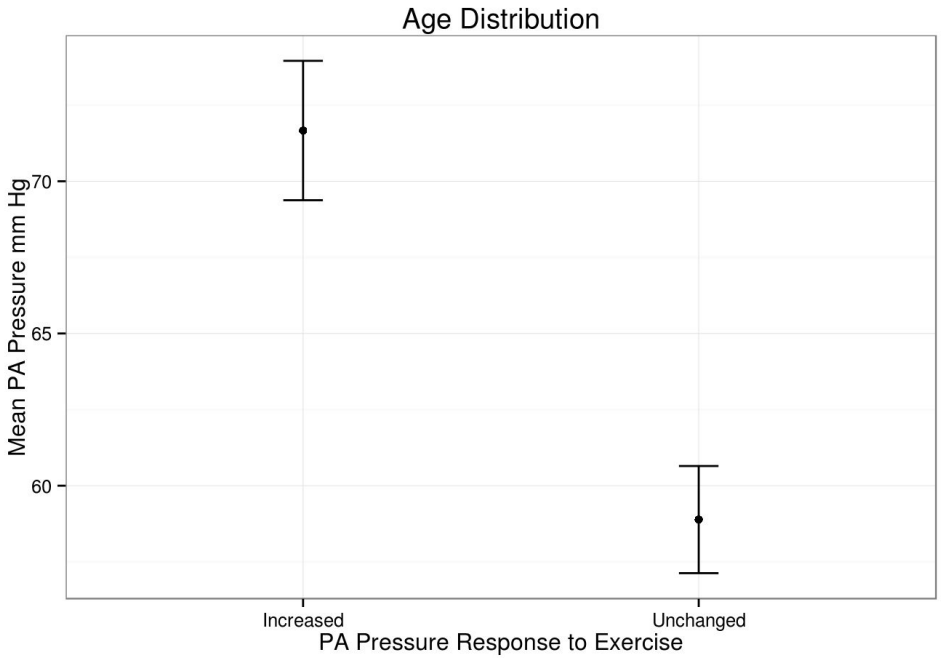


Baseline Demographics

Gender, Hypertension, Smoking status, Dyslipidemia, BMI were similar amongst the groups.

The Groups differed with regards to Age

The age difference amongst those without pulmonary hypertension and those with exercise induced pulmonary hypertension is shown here.



Statistics

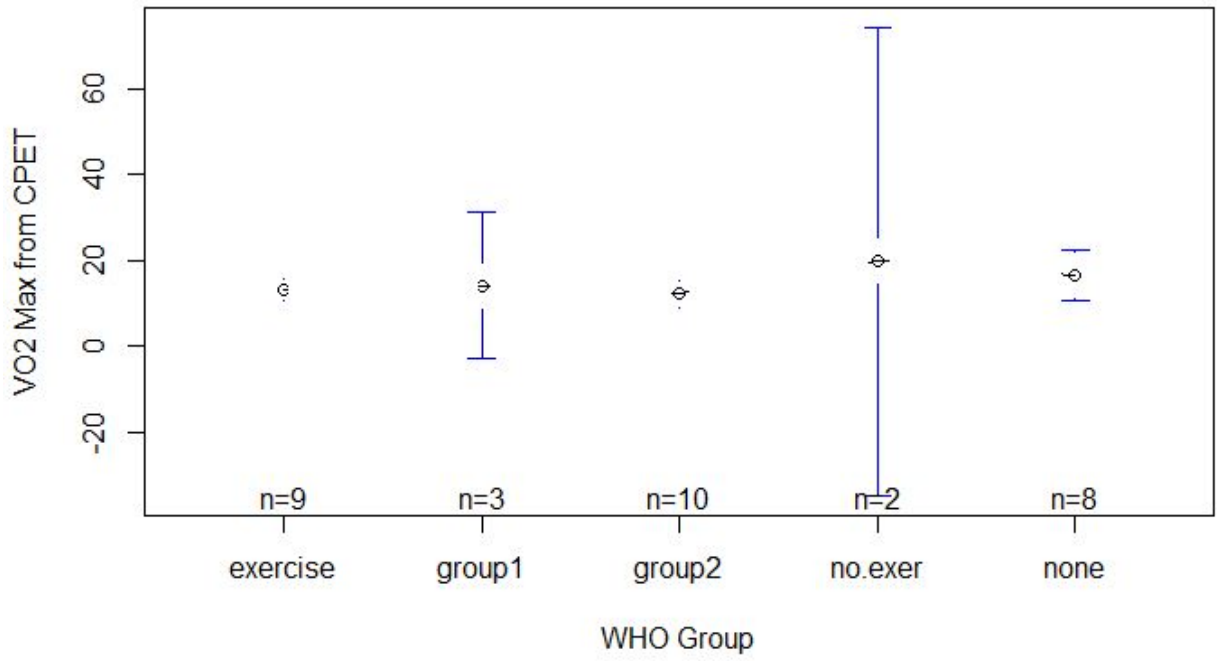
	Df	Deviance	Resid. Df	Resid. Dev	Pr(>Chi)
NULL	149	125.06			
Age	1	13.1999	148	111.86	0.00028***
Gender	1	0.8558	147	111.01	0.35491
BMI	1	0.3107	146	110.7	0.57727
Echo.EF	1	0.3664	145	110.33	0.54495
Hypertension	1	0.3125	144	110.02	0.57615
Diabetes	1	1.0421	143	108.98	0.30733
Dyslipidemia	1	0.5768	142	108.4	0.44756
Smoking	3	3.5145	139	104.89	0.31888

Groups were similar

With regards to

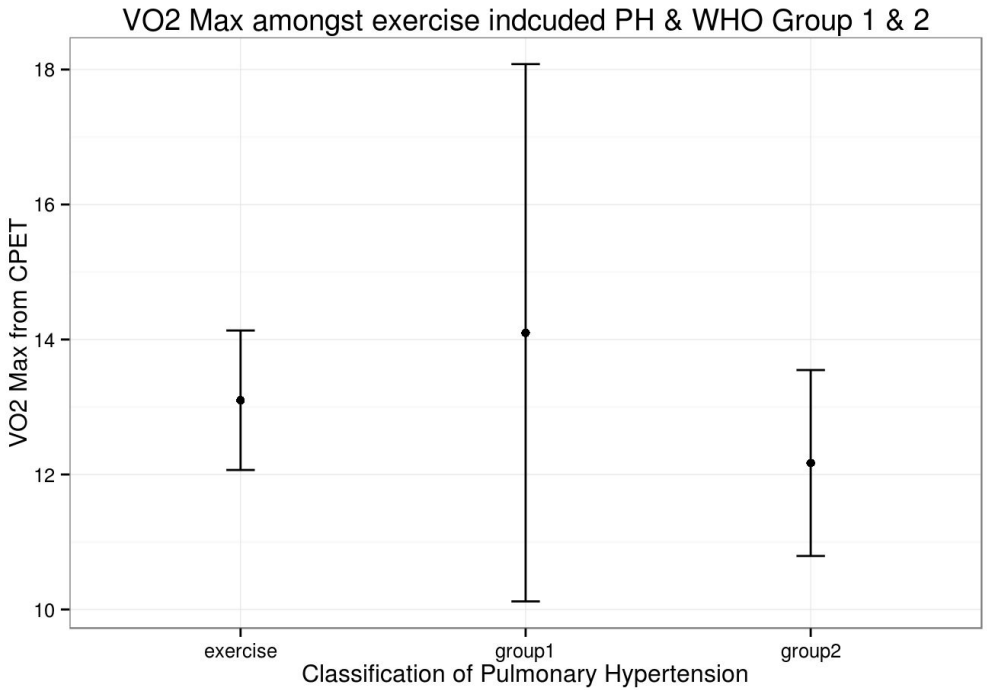
- Baseline Symptoms
- Baseline Echo EF
- Baseline Echo RVSP

VO2 max on CPET (n=32)



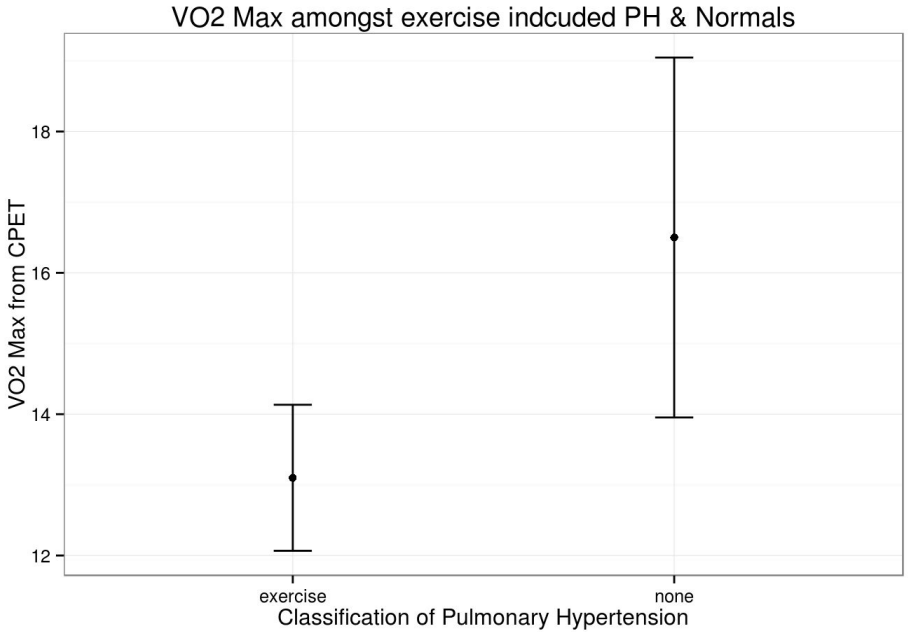
VO2 Max on CPET for those with PH

Among those for whom baseline CPET was available



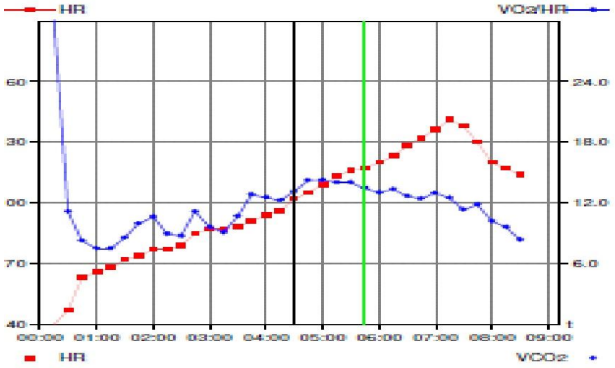
VO2 max

In comparison to those with normal exercise hemodynamics those with abnormal exercise hemodynamics had a lower VO2 max



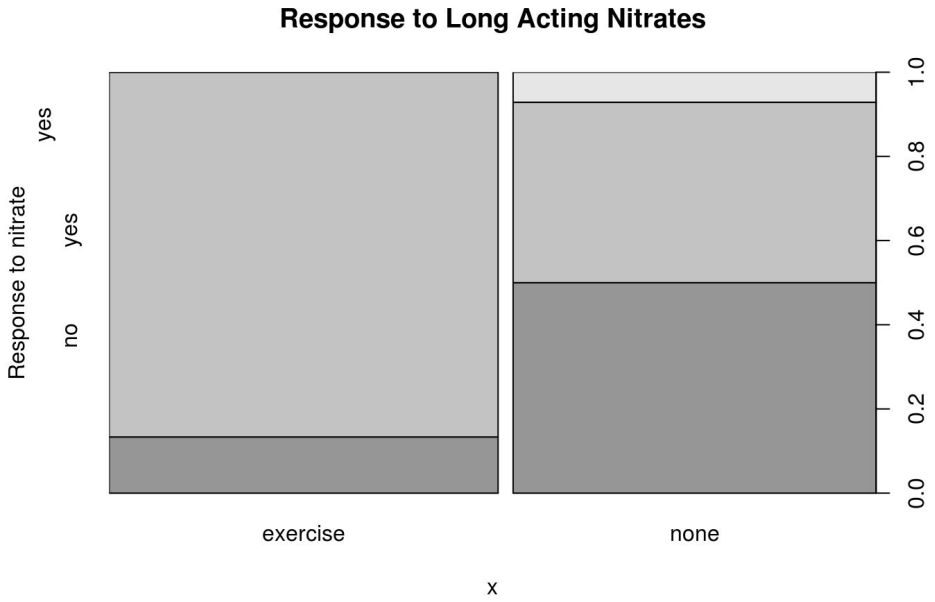
Wasserman curve flattened

A significant number of exercise induced patients showed a flat stroke volume response

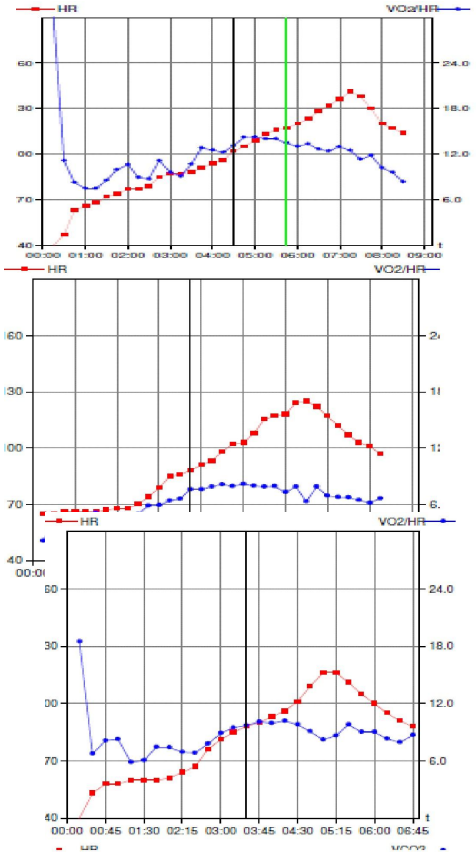


Response to long acting nitrates

Those with abnormal exercise hemodynamics had a significant improvement with Imdur

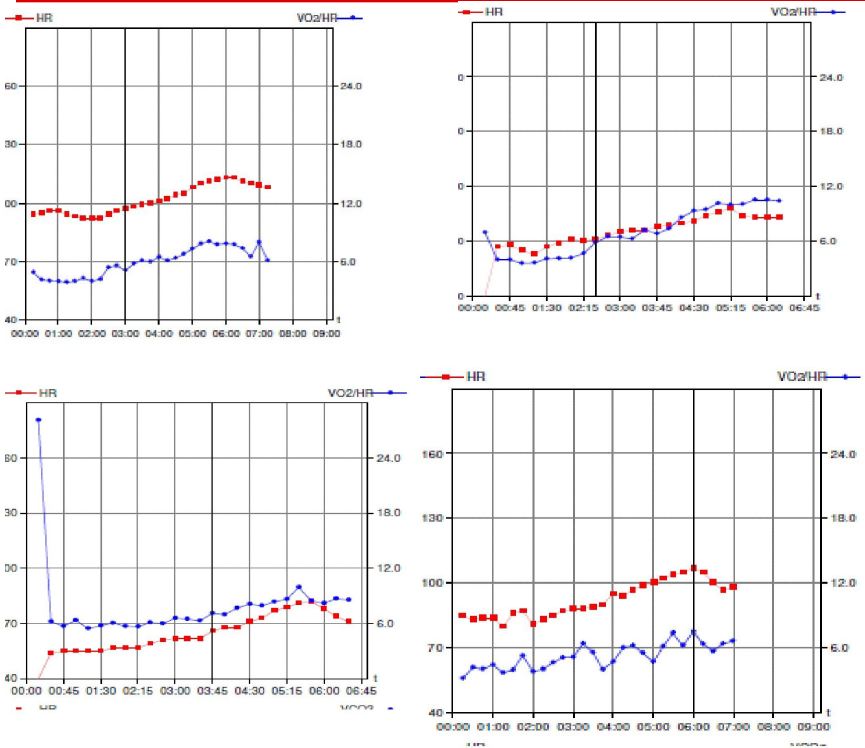


CPET Patterns



There is a flattened stroke volume curve
With increasing exercise increased heart rate results in increased cardiac output
Giving such a patient beta blocker would worsen things

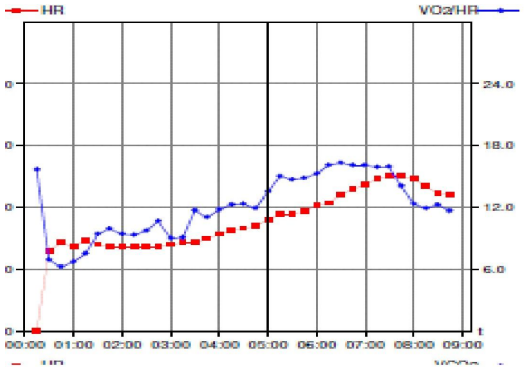
CPET Patterns

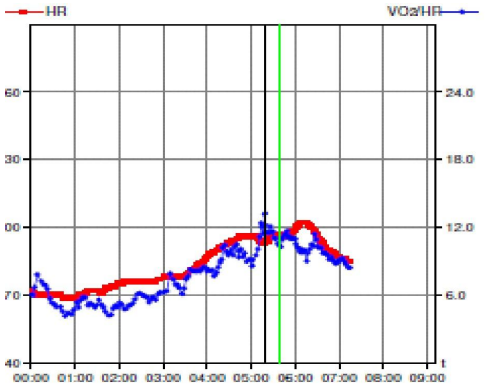


Patients with chronotropic incompetence

Beta blockers would worsen the symptoms in these patients

CPET Patterns





Some patients have a combined appearance on their Wasserman curve

Conclusions

Patients with shortness of breath and elevated RVSP on echocardiogram are quite restricted based on their VO2 max.

Their investigation with the exception of exercise right heart cath is benign

They have 3 distinct patterns of CPET findings

Conclusions

These patients have a favorable response with long acting nitrates

Using a beta blocker may worsen symptoms

The CPET provides an insight into this

a. they are heart rate dependent to increase cardiac output
b. they have chronotropic incompetence

Speculation

Underlying pathophysiology

1) Microvascular angina
2) Heart failure preserved EF

Further research into this is warranted

Conclusions

CPET is a valuable tool to assess dyspnea

All patients with elevated RVSP on echocardiogram should undergo a right heart cath

No right heart cath is complete without exercise.