Center of Rehabilitation Research

Cardiopulmonary Exercise Variables as Independent Predictors of Return to Work in Cardiac Rehabilitation Participants

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Introduction

Cardiopulmonary exercise testing (CPX) has an independent prognostic value, especially in cardiovascular patients. We aimed to evaluate parameters of CPX as predictors for return to work (RTW) at discharge of cardiac rehabilitation (CR).

Methods

We analyzed sociodemographic and clinical data (Tab. 1) from a prospective registry of 489 patients (mean age 51.5 ± 6.9 years, 87.9 % men), who were referred to short-term (3 weeks) inpatient CR between 06/2009 to 12/2011, predominantly after PCI (62.6 %), CABG (17.2 %) and heart valve replacement (9.0 %).

Table 1. Characteristics of patients with and without return to work

Return to Work	Yes (n = 373)	No (n = 116)	p-Value
Sociodemographic data			
Age (years)	51.0	53.1	0.004
Gender (m)	87.9 %	87.9 %	0.999
BMI (kg/m²)	27.5	28.7	0.003
Main diagnosis			
PCI/Stent with ACS	60.3 %	54.3 %	0.250
PCI/Stent without ACS	4.6 %	0.9 %	0.065
CABG with ACS	4.3 %	3.4 %	0.689
CABG without ACS	11.3 %	19.0 %	0.032
Heart valve replacement	9.4 %	7.8 %	0.593
Other cardiac disease	10.2 %	14.7 %	0.183
Comorbidities			
No.	0.44	0.76	<0.001
Psychological impairments	7.5 %	16.4 %	<0.001
Orthopedic impairments	47.7 %	71.6 %	<0.001
HADS-D-Anxiety Score			
> 10	12.1 %	3.9 %	0.036

BMI, Body Mass Index; PCI, Percutaneous Coronary Intervention; ACS, Acute Coronary Syndrome; CABG, Coronary Artery Bypass Surgery; HADS, Hospital Anxiety and Depression Scale.

At admission, patients underwent noninvasive cardiac diagnostic (2D echo, exercise ECG, 6-minute walk test) and a physiodiagnostic screening (Hospital Anxiety and Depression Scale). CPX was performed at discharge for defining fitness (Tab. 2).

Table 2. Functional parameters depending on return to work

Return to Work	Yes (n = 373)	No (n = 116)	p-Value
NYHA I / II at discharge	98.8 %	98.1 %	0.578
6MWT (m)			
Admission	397	391	0.496
Discharge	497	489	0.334
EF (%)	55.5	52.7	0.004
Bicycle stress test at admission (Watt)	120	103	< 0.001
CPX			
Capacity at termination (Watt)	167	139	< 0.001
VO_2 peak (ml/min/kg body weight)	24.7	21.0	< 0.001
VO_2 AT (ml/min/kg body weight)	15.7	13.6	< 0.001
VE/VCO_2-Slope (%)	28.3	30.6	0.001
VE/VCO_2-Slope >31 (%)	23.7	31.9	0.167
O_2/HR (ml)	16.3	14.7	< 0.001
RER at termination (load > 1.10)	1.20	1.10	0.049

NYHA, New York Heart Association; 6MWT, 6-Minute Walk Test, EF, Ejection Fraction; CPX, Cardiopulmonary Exercise Testing.

Results

During a mean follow up of 26.5 ± 11.9 months 373 (76.3 %) patients returned to work, 116 (23.7 %) did not and 60 (12.3 %) were retired (Fig. 1). A higher number of comorbidities (p = 0.011) and heavy work (p < 0.001) were negatively associated with RTW whereas a higher exercisecapacity at entry of CR (p < 0.001) and elective PCI (p = 0.02) increased the probability of RTW. After adjustment for covariates, max. work load (Watt) at CPX termination and the VE/VCO2-slope had an independent prognostic significance for RTW (Fig. 2). A higher work load increased (p = 0.009) while a higher VE/VCO2-slope decreased (p = 0.027) the probability of RTW. Even for retirement, CPX had a prognostic value: the likelihood of retirement was smaller with increasing VO2AT (p = 0.016).

Fig. 1. Percentage of patients without return to work after inpatient rehabilitation depending on work intensity (%)

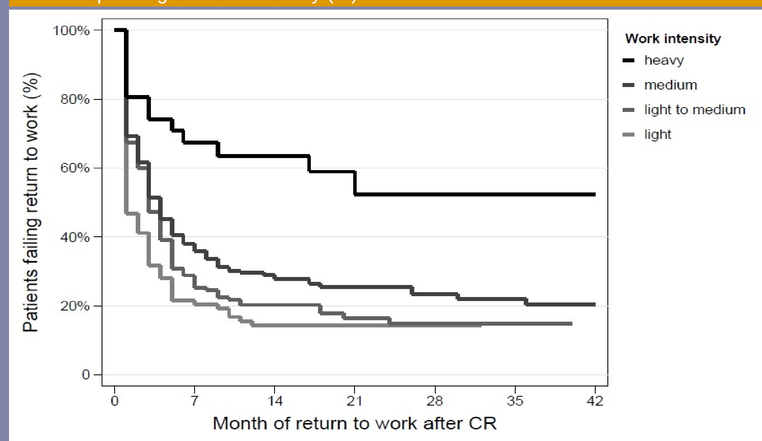
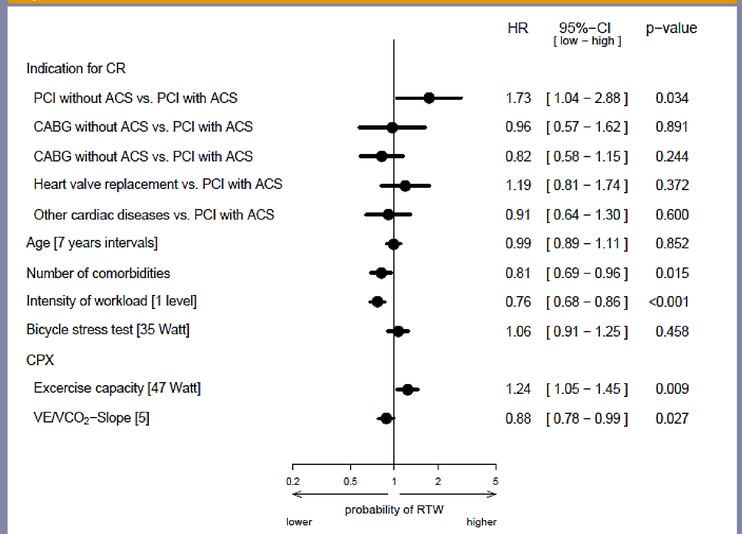


Fig. 2. Predictors of return to work



CR, Cardiac Rehabilitation; PCI, Percutaneous Coronary Intervention; ACS, Acute Coronary Syndrome; CABG, Coronary Artery Bypass Surgery; CPX, Cardiopulmonary Exercise Testing.

Conclusions

CPX is a meaningful objective tool to assess patients' ability for return to work. Therefore it should be an essential part of functional assessment in CR for predicting participation in employment during two years after CR.

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