Organizational and patient-level predictors for reaching key risk factor targets in cardiac rehabilitation after myocardial infarction – the perfect-CR study

H. Ogmundsdottir Michelsen[1], P. Henriksson[2], J. Wallert[3], M. Back[4], I. Sjolin[5], M. Schlyter[5], E. Hagstrom[6], A. Kiessling[2], C. Held[6], E. Hag[7], L. Nilsson[8], A. Schiopu[9], M.J. Zaman[10], M. Leosdottir[5]

[1]Hospital of Helsingborg, Department of Internal Medicine, Helsingborg, Sweden; [2]Karolinska Institute, Department of Clinical Sciences Danderyd Hospital, Stockholm, Sweden; [3]Karolinska Institute, Centre for Psychiatry Research, Department of Clinical Neuroscience, Stockholm, Sweden; [4]Sahlgrenska University Hospital, Department of Occupational therapy and Physiotherapy, Gothenburg, Sweden; [5]Skane University Hospital, Department of Cardiology, Malmo, Sweden; [6]Uppsala University, Department of Medical Sciences, Cardiology and Uppsala Clinical Research Centre, Uppsala, Sweden; [7]Ryhov County Hospital, Department of Internal Medicine, Jonkoping, Sweden; [8]Linkoping University, Department of Health Medicine and Caring Sciences, Linkoping, Sweden; [9]Lund University, Department of Clinical Sciences, Malmo, Sweden; [10]James Paget Hospitals, Department of Cardiology, Norfolk, United Kingdom

Background: The benefits of specific cardiac rehabilitation (CR) programme components on patient outcomes after myocardial infarction (MI) remain unclear, as does their relative predictive strength compared to patient-level predictors.

Purpose: To identify CR organizational and patient-level predictors for reaching risk factor targets at one-year post-MI.

Methods: This was an observational survey- and registry-based study. Data on CR organization at all 78 CR centres in Sweden was collected in 2016 and merged with individual patient data from nationwide registries (n=7549, median age 64 years, 24% females). Cross-validation resampled orthogonal partial least squares discriminant analysis identified predictors for reaching treatment targets for low-density lipoprotein-cholesterol (LDL-C<1.8 mmol/L), blood pressure (BP<140/90 mmHg) and smoking abstinence (yes/no). Predictors with Variables of Importance for the Projection (VIP) value >0.8 and 95% confidence intervals (CI) excluding zero, were considered meaningful.

Results: Of the 71 analysed organizational variables, 36 were identified as meaningful predictors for reaching LDL-C and 35 for BP targets (Figure 1). The strongest predictors (VIP [95% CI]) for LDL-C and BP were: offering psychosocial management at initial CR assessment 2.09 [1.70–2.49]; 2.34 [1.90–2.78], having a CR team psychologist 1.59 [1.28–1.91]; 2.00 [1.46–2.55], having extended CR centre opening hours 2.17 [1.95–2.40]; 1.51 [1.03–2.00], staff reporting satisfaction with CR centre facilities 1.55 [1.07–2.04]; 1.96 [1.64–2.28], having a medical director 1.71 [1.45–1.97]; 1.47 [1.07–1.87], nurses using protocols for antihypertensive and/or lipid lowering medication adjustment 1.58 [1.35–1.81]; 1.56 [1.03–2.08], having operational team meetings 1.36 [1.08–1.64]; 1.34 [0.99–1.70], and using audit data for quality improvement 1.00 [0.79–1.20]; 1.27 [0.99–1.56]. Offering pre-exercise-based CR (exCR) assessment and different modes of exCR were predictors for reaching both targets. The strongest patient-level predictor of reaching LDL-C target was low baseline LDL-C 3.90 [3.25–4.56], and for BP it was having no history of hypertension 2.93 [2.74–3.12]. Second, participation in exCR was the strongest predictor for both outcomes 1.60 [0.83–2.37]; 1.50 [1.15–1.86]. For smoking abstinence, 5 organizational variables were identified as meaningful predictors, the strongest being prescription of varenicline by the centre physicians 1.98 [0.13–3.84] (Figure 2). The strongest patient-level predictors were exCR participation 2.51 [2.24–2.79] and socioeconomic status variables e.g., income 1.67 [1.28–2.06], living with partner 1.47 [0.84–2.09] and education 0.80 [0.48–1.12].

Conclusion: The study identified multiple CR organizational and patient-level predictors for reaching key risk factor targets one-year post-MI. The results might contribute to defining the optimal composition of comprehensive CR programmes.
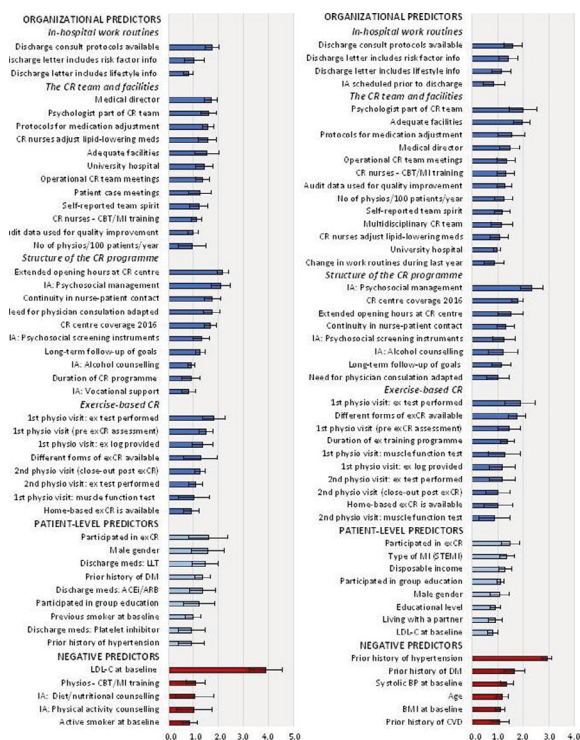
Figure 1. Organizational and patient-level variables identified as meaningful for the prediction of reaching LDL-C and BP targets.
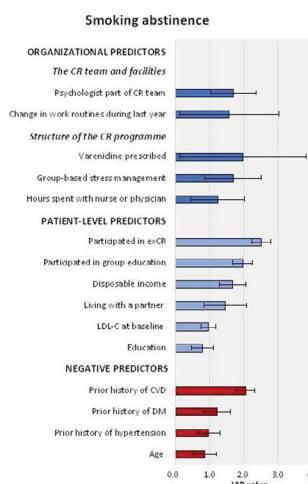

Figure 2. Organizational and patient-level variables identified as meaningful for the prediction of smoking abstinence.