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working group of cardiovascular prevention and rehabilitation position paper
Peer-reviewed author version

De Sutter, Johan; Kacenenbogen, Raymond; Pardaens, Sofie; Cuypers, Sofie;
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Braeckman, Lutgart; Heyndrickx, Benedicte & FREDERIX, Ines (2020) The role of
cardiac rehabilitation in vocational reintegration Belgian working group of
cardiovascular prevention and rehabilitation position paper. In: ACTA
CARDIOLOGICA, 75 (5), pp. 388-397.

DOI: 10.1080/00015385.2019.1570675

Handle: <http://hdl.handle.net/1942/29573>

The role of Cardiac Rehabilitation in Vocational Reintegration

Belgian working group of Cardiovascular Prevention & Rehabilitation

Position paper

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Word count: 6628 words

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Cardiovascular disease is one of the main causes of morbidity and sick leave in Belgium, imposing a great socio-economic burden on the contemporary healthcare system and society. Cardiac rehabilitation is an evidence-based treatment strategy, that not only improves the cardiac patients' health state but also holds promise as to facilitate vocational reintegration in society. This position paper was developed and endorsed by the Belgian Working Group of Cardiovascular Prevention & Rehabilitation. It provides an overview of the currently available Belgian data with regard to the role of cardiac rehabilitation in return to work after an initial cardiac event. It identifies the relevant barriers and facilitators of vocational integration of cardiac patients and summarizes the contemporary Belgian legal and medical framework in this regard. Cardiac rehabilitation remains a primordial component of the post-acute event management of the cardiac patient, facilitating vocational reintegrating and thereby decreasing the pressure on social security. Despite the availability of a relevant legislative framework, there is a need for well-defined algorithms to assess readiness for return to work that can be used in daily clinical practice.

Abstract word count: 179 words

Keywords: Cardiac rehabilitation; vocational reintegration; legal framework; position paper

Introduction

As indicated by the latest European Society of Cardiology (ESC) Atlas report on cardiovascular disease statistics, the prevalence of non-communicable diseases and their associated morbidity/mortality remain huge in Europe, and in its respective member states [1].

In Belgium, the main cardiovascular risk factors are highly prevalent. 17.8% of the adult Belgian population suffers from arterial hypertension, 21.6% has hypercholesterolemia, and 4.7% has diabetes mellitus. Both males and females are frequently overweight (65.7% and 48.4 % respectively), obese (22.3% and 18.2%) and/or smoke (22.0% and 16.0% respectively). Consequently, a large incidence of different cardiovascular diseases is persisting. In 2015, there were 58 736 new male cases and 58 098 new female cases of cardiovascular diseases; including 31 881 ischemic heart disease cases in males and 27 980 cases in females. It has been calculated that 1 634/100 000 disability-adjusted life years (DALY's) are lost due to ischemic heart disease, 607/100 000 due to strokes, and 270/100 000 due to other cardiovascular diseases in males (696/100 000, 449/100 000, and 219/100 000 years for females). In 2013, 4 783 males died due to ischemic heart disease, 6 800 due to other cardiovascular diseases, which is significantly more than mortality due to other relevant chronic diseases (e.g. 4 597 died because of lung cancer). The same observation was made in females (3 444 died because of ischemic heart disease, 9 302 due to other cardiovascular diseases, compared with 2 290 due to breast cancer). These statistics clearly underscore the contemporary burden of cardiovascular disease, its impact on society (e.g. sick leave) and the healthcare system. In this regard, not only primary prevention is important but also comprehensive secondary prevention (i.e. cardiac rehabilitation) that focuses both on the health state of the patient as well as on his/her vocational reintegration.

There is a vast amount of evidence confirming the deleterious effects of chronic stressors (such as work related stress) on the cardiovascular system and the risk of adverse events. In the Whitehall II study, 10 308 patients, employed in 20 London civil service departments were followed up in a prospective cohort study assessing the association between work-related stress and the metabolic syndrome [2]. A dose-response relation was found between exposure to stressors over 14 years and the risk of metabolic syndrome. Employees with chronic work stress were more than twice as likely to have the syndrome. The Stockholm Female Coronary Risk study examined the impact of psychological stress in the family and work environment, on the progression on invasively assessed coronary atherosclerosis [3]. In this 3-year longitudinal follow-up study (N = 80), the patients with stress had a decreased coronary lumen by 0.20 mm in contrast to the stress less patients whose luminal diameter increased by 0.22 mm. The INTERHEART study assessed the relationship between chronic stressors and the incidence of acute myocardial infarction in 25 000 people from 52 different countries [4]. Stress was defined as feeling irritable and have sleeping disorders due to work and/or home related issues. The people reporting permanent stress, had > 2.1 time the risk for having an infarction. Similarly, the MRFIT (Multiple Risk Factor Intervention Trial) indicated that chronic work and/or marital stress leads to increased mortality rate due to cardiovascular disease in men followed for more than 9 years [5]. When one compares this with other relevant cardiovascular risk factors such as hypercholesterolemia, which increases the risk 1.9 times, it is clear that chronic stressors are characterized by risk gradients that are comparable and/or even steeper. In view of this evidence, attention should be focused on the operative solutions and interventions to balance or minimize the relationship between work stress and the risk of adverse cardiovascular events.

Proper training of employees on how to perform their allocated tasks at work, and clear descriptions of what is expected from them by the employer, are two examples of how this can be addressed. In addition to initiatives trying to reduce work-related stress and thereby prevent adverse events, contemporary and future efforts should focus on the optimization of vocational reintegration after the acute cardiovascular event. As indicated below in this manuscript, 38% of Belgian patients is professionally active at the time of the acute cardiovascular event. This underscores the magnitude of the number of patients who are eligible for vocational reintegration and hence the resulting potential socio-economic benefits for both the healthcare system and society. The fact that vocational counselling is one important core component of current Belgian cardiac rehabilitation programs, highlights the possible valuable role these programs have in improving return to work (RTW) rates. In order to address this highly relevant topic, the Belgian Working Group of Cardiovascular Prevention & Rehabilitation elaborated this position paper with the objective to: (I) delineate the currently existing legal and medical framework related to RTW; (II) define the relevant barriers/facilitators for vocational reintegration; (III) give an overview of the available (Belgian and international) data related to the efficacy of cardiac rehabilitation to improve RTW; and (IV) highlight the need for (inter)national guidelines regarding RTW.

Main manuscript

Contemporary Belgian legal and medical framework related to vocational reintegration

The European health and safety law was introduced in 1989 (Framework Directive 89/391/EEC) and is transposed into Belgian national legislation as The Act of 4 August 1996 on well-being of workers in the performance of their work. Its implementing decisions known as Royal Decrees apply to every employer who employs workers [6].

In Belgium, occupational health services (OHS) are compulsory for each company whatever the type of activity or the nature of hazard. Therefore, the coverage of OHS is very high (95%) and every salaried worker has free access to an occupational physician. Occupational health is completely financed by the employers and largely based on the total number of health assessments.

According to the Act on well-being, risk assessment and health surveillance should be provided by the OHS. Depending on specific risks (such as exposure to chemicals, biological and physical agents, psychosocial and ergonomic factors, a safety function,...) some categories of salaried workers are obliged to undergo a number of health examinations with the occupational physician (OP): a) pre-employment examination; b) periodical examination (usual on an annual basis); c) RTW examination in case the worker has taken up again his work after an absence of at least 4 weeks due to disease, accident or childbirth. At the end of these examinations, the OP has to decide if the worker is (partially) fit for his job or (temporarily or definitely) not.

Other types of health surveillance are non-obligatory and these are freely accessible to all workers whether or not they are exposed to any risk. In the case of work-related complaints, employees may ask for a spontaneous consultation with the OP. They also have the legal right to benefit from a health consultation in the event of a work incapacity “prior” to RTW when they are still on sick leave. In the latter, the OP gives only an advice on work(in)capacity instead of taking a decision.

The OP must promote health and maintain employment opportunities for all workers and this also applies to persons with chronic (cardiovascular) diseases or disability. All the health examinations and in particular the medical consultations enable the OP to propose preventive and protective measures, based on his knowledge of the working conditions and on the worker's state of health. With the agreement of the worker, the OP can consult with the

treating physician and the insurance doctor to obtain additional medical information. If necessary, possible recommendations and proposals may concern work adjustments of working hours e.g. work less hours per day/per week, progressive part time work; adjustments of tasks and work organization e.g. lower work pace or task rotation, less physical or emotional demanding tasks, customized and ergonomic work material or tools,... When there are no opportunities to adapt the job because of technical issues and high financial costs, the OP should advise and redirect the worker to another job preferably in the same company. However, in small companies, a job change is not always possible and as a (unwanted) result the worker can be dismissed.

The number of long-term sick people in Belgium has increased drastically in recent years. Expenses for disability and invalidity put enormous pressure on social security. To keep the system affordable and to get sick employees back to work, new legislation has been approved.

On 1 December 2016, two Royal Decrees came into practice : the Royal Decree of 28 October 2016 on reintegration of disabled workers amending the Royal Decree of 28 May 2003 concerning the health surveillance of workers (Federal Public Service Employment Work and Social Dialogue) and the Royal Decree of 8 November 2016 for disabled people with no employment contract amending the Royal Decree of 3 July 1996 implementing the law concerning the compulsory insurance for medical care and benefits (Federal Public Service Social Affairs). In the first reintegration legislation, the OP has the key role because he is familiar with the working conditions in a particular company and is a known point of contact for the employer and employee. In the reintegration process elaborated for disabled people without an employment contract, the advising physician of the health insurance fund takes the lead and cooperates with, among others, the regional employment services.

However, the “formal” reintegration trajectory is very complex, time consuming and labor intensive. So far, the majority of these reintegration trajectories have ended in the dismissal of

the worker. An explanation is that a significant proportion of the long-term sick workers who enter the reintegration trajectory have a serious medical problem and have already past the stage of a good 'person-job fit' for the current job.

Practice shows that the best results are achieved with “informal” consultations such as the spontaneous ones and those prior to RTW. The OP and the worker can sit quietly together and discuss how preservation of work is possible and when RTW is feasible. In this manner, there is enough time to consult all parties involved, to inform the employer and colleagues and to adjust the work conditions. Workers should therefore be encouraged to contact the OP in time, to freely consult him with their medical issues who affect their work or vice versa without fear of losing their job.

Relevant barriers/facilitators for vocational reintegration

According to a recently published review by Gragnano et al. [7] RTW may be primarily regarded as a non-medical issue. Disease-related factors seem to have a limited impact on vocational reintegration with disease history, cardiac diagnosis and type of treatment playing a minor role [8]. A cohort study of almost 22 000 Danish patients hospitalized for acute coronary syndrome mentioned however that patients with less severe events such as Non ST-elevation myocardial infarction (NSTEMI) or a percutaneous coronary intervention (PCI) had a higher probability of RTW compared to those having a coronary artery bypass grafting (CABG) procedure [9]. The latter result was also further confirmed in the overall review of Gragnano et al. [7]. Left ventricular function appeared to have a predictive value in RTW among CABG and myocardial infarction patients, [10, 11] though this is not further supported in more recent literature [7, 12]. In addition, the presence of symptoms such as dyspnea, chest pain and physical complaints may negatively affect work resumption to some extent but

evidence is of rather moderate quality [8]. In contrast, exercise capacity, as expressed by a higher workload and a lower VE/VCO₂ slope, has independently been associated with a higher probability of RTW [13]. Apart from these cardiac disease related factors, the presence of comorbidities including chronic obstructive pulmonary disease (COPD), diabetes and psychiatric diseases was associated with a lower rate of return to the labor market during a mean follow-up of 1.3 years among the Danish cohort [9]. Major psychiatric diseases included schizophrenia but also depression.

The negative impact of depression on RTW after myocardial infarction has been extensively described in a review by O'Neil et al. [14] covering the literature since the mid-nineties. Besides depression being a significant predictor of failure or delay in RTW at 6 to 12 months, [14, 15] a dose-response relationship was also found between the severity of depression and the likelihood of RTW, 6 to 12 months after a cardiac event [14]. Anxiety on the other hand, appeared to have a more limited effect on RTW [7, 15]. Furthermore, the association between anxiety and RTW diminished after controlling for depression, further indicating the major role of depression [15]. Similarly, a recent observational study [16] concluded that lower self-reported depression scores were predictive of early RTW. Psychological co-morbidities were stronger predictors of RTW, when compared to disease-related factors. Unfortunately however, depression is still highly prevalent after a hospitalization for an acute cardiovascular event. It often remains neglected in this patient population. This is at least partially due to the fact that the average length of hospitalization for an acute cardiac event is becoming shorter and shorter. As a result, not much time is available to adequately assess this psychological co-morbidity and address it if necessary. Given its multidisciplinary nature, including also psychosocial counseling, cardiac rehabilitation can be valuable in this regard [17]. It has been shown [18] that multidisciplinary rehabilitation has a positive effect on self-assessed occupational competence in depressed patients. A recent Cochrane review [19] including 23

studies (N = 5996 depressed patients) found moderate quality evidence that the addition of psychosocial management (a core component of cardiac rehabilitation) was more effective in reducing sick leave than usual care alone.

In addition to disease-related and psychological factors, differences in socio-demographic background may also impact the likelihood of RTW after a cardiac event. Higher age and female gender are generally regarded as major barriers to vocational reintegration [7, 9, 14]. Although women are less likely to RTW, Dreyer et al. [20] has demonstrated that this discrepancy may be rather a result of differences in socio-demographic characteristics, health status and psychosocial factors instead of gender. Furthermore, the level of education seems to influence the return to labor market with higher education strongly facilitating RTW [7-9, 15, 20]. Likewise, a higher socioeconomic status and being married or living with a partner have also been reported to positively impact RTW. Though, the latter findings are less extensively supported in literature than the three abovementioned factors [7, 9, 20]. The important role of socio-demographic factors in the return to labor market, has also been observed among other chronic diseases such as mental disorders and cancer, with older people with a low education level and a low socioeconomic status being at the highest risk of not returning to work [7].

On top of the disease- and patient-related factors, several aspects related to work seem to be important in the process of vocational reintegration. A first group of work-related factors can be classified as organizational aspects such as the type of employment. Dreyer et al. [20] demonstrated that patients engaged in a professional or clerical type of work had a higher probability of returning to work compared to patients in manual work, which may reflect the higher physical job demands of the so-called blue-collar work [8, 13]. Similar to these physical job requirements, high psychological job demands and perceived work strain may also impede work resumption [7, 20]. On the other hand, perceiving supervisor support and

job control may strongly facilitate RTW [7]. Besides these organizational aspects, a person's appraisal of his working conditions and his intrinsic characteristics may even have a larger impact on RTW. These characteristics include self-efficacy and motivation, but also how a person perceives the importance of his work and whether his disease may be an obstacle to RTW [7, 10]. As a result, patients that are satisfied with their job are more likely to early RTW compared to those with low job satisfaction [21]. These findings suggest the importance of early assessment of patients' psychosocial work environment and emotional distress, in order to promote a safe and healthy work resumption after a cardiac event [22].

Evidence on the efficacy of cardiac rehabilitation to improve return to work: Belgian data

Results of a recent survey that was conducted in 2017 in 4 cardiac rehabilitation centers in Flanders, Belgium (AZ Maria Middelaers Ghent, AZ Sint-Lucas Ghent, University Hospital Ghent and AZ Yperman, Ieper) are presented here. In total 330 consecutive cardiac rehabilitation patients were enrolled of which 128 (38%) were at work before their cardiac event. Of the 202 other patients, 158 (48%) were retired, 32 (10%) were already on sick leave and 12 (4%) were unemployed before their cardiac event.

Of the 128 patients that were at work before their cardiac event and entered cardiac rehabilitation, 96% returned to work within 1 year. Remarkably, 67% of them already returned to work during their cardiac rehabilitation program (50% of blue collar workers, 63% of white collar workers and 92% of independent workers). As is shown in figure 1, the majority of patients that were full-time at work before their cardiac event returned to their full time job during or after cardiac rehabilitation. Figure 2 shows the proportion of cardiac rehabilitation patients returning to working according to time. More than half of the patients returned to work within 3 months after the start of the cardiac rehabilitation program. In total

11% of the 128 patients returned to work later than 180 days after the start of the cardiac rehabilitation program. These patients were mostly patients who entered cardiac rehabilitation after hospitalization for decompensated heart failure or valvular heart surgery.

RTW is an important part of the role devoted to cardiac rehabilitation. One of the aims of cardiac rehabilitation is indeed to maximize the rate of sustained RTW at one year and more. The key to success is sometimes the exercise-training related improvement in the patients' physical capacity. More often [10] it is due to the provided psychosocial support, stress management, recognition and treatment of anxiety and depression, and avoidance of overprotection by the family as part of the cardiac rehabilitation related psychosocial counseling program. In addition as vocational counselling is one core component of cardiac rehabilitation in Belgium, recognized rehabilitation centers have at least one occupational therapist that facilitates the elaboration of a structured RTW plan. In a number of cases, this necessitates modification of the working conditions through a direct contact at any level in the company, depending on the size of the company, in the benefit of both the patient and the company. Sometimes, an initial partial RTW with progressively increasing work intensity over time and/or switch to another work is necessary.

Evidence on the efficacy of cardiac rehabilitation to improve return to work: international literature

According to the literature, a large percentage of patients RTW up to 12 months after a cardiac event [23,24]. Of these, a small part decides to retire shortly after, and a significant proportion has to reduce their working hours that might in part be due to remaining fatigue as well as cognitive problems [24,25].

In general, many factors have been shown to be associated with RTW. Salzwedel et al [26] analyzed data from a registry of 489 working-age patients (51.5 +/-6.9yrs; 88% men) who had undergone inpatient cardiac rehabilitation after PCI, CABG or heart valve replacement. After adjustment for covariates, a high physical capacity was found to predict RTW after a cardiac event (HR1.17; 95% CL1.02-1.35; p=0.028). In line, Latil et al established a strong association (p<0.001) between exercise performance and the likelihood of work resumption in a group of self-employed workers admitted to the hospital for acute coronary syndrome: i.e. the higher the exercise capacity the more patients were returning to work [27]. Moreover, it is generally recognized that the RTW is not a simple function of clinical status and the workplace, but is also influenced by psychological factors such as anxiety and depression [28].

Bountiful evidence has documented the favorable effect of cardiac rehabilitation on both physical capacity [29,30] and mental health [31]. As such cardiac rehabilitation carries a strong potential to contribute positively to occupational outcome. Some scarce evidence documents that patients who participate in cardiac rehabilitation are more likely to RTW than non-cardiac rehabilitation participants [32]. Additionally, recall of work-related information has been shown to be better among patients admitted to a rehabilitation facility (65%) compared to those who did not receive rehabilitation (p<0.05) [27].

On the other hand, clinical studies investigating the effect of cardiac rehabilitation on RTW are scant, are mainly published before 2000 and poorly or inconsistently report on RTW and therefore results remain inconclusive. Ben-Ari et al [33] found that the rate of RTW at 18 months was significantly higher for PCI patients following cardiac rehabilitation than for other patients (84% vs 64% p<0.01). Similarly, Engblom [34] reported a higher RTW in the rehabilitation group compared to the standard care group at 2 and 3 years following an acute coronary syndrome, but not at 5 years of FU. The difference was not significant in the group

as a whole. In an earlier study, Engblom found no significant difference between both groups with regard to RTW, except in the young patients that seemed to gain in this respect. More recently, Lamberti et al [35], enrolled 204 working age patients with recent ACS in a cross-sectional study (130 in cardiac rehabilitation program, 74 in control group). All patients returned to work after a variable period of 1-2 months from hospitalization. Participation in a cardiac rehabilitation program favorably affected indicators of work outcome. Namely, although patients with more strenuous work activity returned to work later than those with a less physically active job, all patients, irrespective of workload, that had undergone cardiac rehabilitation resumed work after a significantly shorter period of time. On top of that, cardiac rehabilitation was effective in achieving a reduction in working days lost due to illness. In line, Yonezawa et al found that discontinuing a phase II cardiac rehabilitation program induced more chronic psychosocial stress after RTW in middle-aged post AMI patients [36]; whereas regular exercise was associated with greater job satisfaction [37].

The variable effectiveness of cardiac rehabilitation programs on RTW outcomes may be in part also due to the presence or absence of program characteristics in developing a work context supportive of RTW as well as in cardiac rehabilitation ease in worker resilience vis a vis RTW and work reintegration. In this context, in-depth interviews with 12 Canadian workers returning to work following disabling cardiac illness revealed that cardiac rehabilitation programs were experienced as having only a modest influence on work reintegration [34]. Limited intensity, lack of specificity to work activities and program focus were three factors limiting the impact of cardiac rehabilitation on work reintegration [38]. As medical and rehabilitative support have among its objectives to promote the RTW, efforts should be dedicated to more intensively address RTW in the cardiac rehabilitation programs that are offered [25].

Although the large majority of patients return to work after cardiac rehabilitation, this is not the case for some specific high risk patients, including patients who survived an out of hospital arrest, patients who were treated for infective endocarditis and patients admitted for heart failure.

- Out-of-hospital cardiac arrest (OHCA) survivors.

Recently 3 larger studies evaluated the prevalence and factors associated with RTW in OHCA. In a larger nationwide Danish register from 2001 to 2011, of 796 30-day survivors 76.6% returned to work in a median time of 4 months after the cardiac arrest [39]. During the study period, the percentage of survivors returning to work increased significantly, along with improved survival. Decatha et al [40] evaluated 153 OHCA survivors aged 18-65 years and found that two thirds returned to work within an average of 714 days after OHCA (mostly to the same job, 75%). Patients with a higher-level job and with the arrest occurring in the workplace were more likely to return to work. Lilja et al [41] reported on 287 OHCA survivors included in the TTM trial (Target Temperature Trial) in a follow-up 180 days post-event and compared their findings to 119 matched control patients with ST-elevation myocardial infarction (STEMI). The RTW without any change for OHCA was lower than STEMI patients (46% versus 72%) and 22% of OHCA survivors as compared to 8% of STEMI patients returned to work with reduced working hours. Of note, 25% of OHCA survivors were on sick leave as compared to only 6% of STEMI patients and those with cognitive impairment were 3x more likely to be on sick leave as compared to those without cognitive impairment. Clearly, OHCA survivors are at higher risk for worse long-term outcome, but evidence to support specific designs of rehabilitation programs is largely missing. A simple follow-up intervention including screening for cognitive and emotional problems, information and referrals when needed was however found to be cost-effective and facilitating earlier RTW [42,43]

- Patients who were treated for infective endocarditis

Infective endocarditis still has a high in hospital mortality (up to 20-25%) and a significant number of patients treated for infective endocarditis may be left with life-changing physical and mental disabilities due to the traumatic and potentially life-threatening character of the disease. Verhagen et al [44] reported in a small study of 37 patients with infective endocarditis that only 65% were working 1 year after discharge. More recently Butt et al [45] studied, using Danish nationwide registries, 1065 patients aged 18-60 years with a first-time diagnosis of infective endocarditis who were part of the workforce prior to admission and alive at discharge. Of these patients 7 of 10 (70%) were returned to the workforce 1 year later. Younger age and higher socioeconomic status were associated with a higher likelihood of returning to the workforce. In contrast, co-morbidities, stroke during admission, longer length of hospital stay, and additional hospital admissions within a year post discharge were associated with a lower likelihood of returning to the workforce. These data indicate that specific programs are needed with a focus on specific co-morbidities in the setting of endocarditis to facilitate RTW after treatment.

- Patients who were admitted for heart failure (HF)

Although up to 14% of patients admitted to hospital with HF are likely to be < 65 years of age [46], data on RTW after an hospitalization of HF are scarce. In a large study, using individual-level linkage of nationwide Danish registries, Roth et al [47] identified 11880 patients (18-60 years) with a first hospitalization for HF who were in the workforce before HF hospitalization. One year after first hospitalization, 6.7% had died, 67.7% returned to the workforce and 25.1% did not. In multiple regression analyses, younger age, male sex, higher income, and higher level of education were positively associated with RTW, whereas co-morbidities (stroke, diabetes mellitus, cancer, COPD and chronic kidney disease) were associated with detachment from the workforce. Also, of those who returned to work by 12

months, 52% were detached at some point during the subsequent 3 years, and, even allowing for sick leave for up to 12 weeks, 38% were detached by 3 years. As the authors point out, better understanding the causes of not returning to work are important in HF patients. It may be related to their reduced functional capacity, but also to psychological or other consequences of a diagnosis of HF. It may also reflect fear among physicians to advise RTW or employers to take back patients. Of note, 1- year mortality (7%) was relatively low in these younger HF patients. Similar findings with a 1-year mortality between 6.5-7.5% in patients aged <60 years were reported from the MAGGIC meta-analysis (Meta-analysis Global Group in Chronic Heart Failure) [48]. A cardiac rehabilitation program could increase the changes to RTW if that program includes appropriate vocational counseling and skills with referral to occupational health services that have an up-to-date concept of HF and its therapy. Importantly, the topic should be raised early (during hospitalization of shortly thereafter) in the contacts between the physician, the multidisciplinary team and the patient [49].

Need for (inter)national guidelines regarding return to work

As indicated above, vocational reintegration after an acute cardiovascular event is a relevant topic applicable to > 35% of Belgian cardiac patients. In this regard cardiac rehabilitation plays an important role, as it facilitates RTW already in the first time period after the initial hospitalization [50]. Despite the availability of an elaborated Belgian legal framework, very practical guidelines on how to assess patients in the decision of readiness for returning to work are lacking. In particular clear and well-defined clinical algorithms, taking into account both physiological, psychological and/or work-related topics are needed. Common and evidence-based algorithms will homogenize the decision-making process and possibly further improve RTW rates.

Conclusion

Cardiac rehabilitation is an evidence-based comprehensive secondary prevention program, focused on different core components, including also vocational counselling. The persistent high prevalence and incidence rates of cardiovascular diseases in Belgium and the relatively large proportion of professionally active patients (i.e. before the acute cardiac event), underscore the big applicability these programs have in facilitating RTW. Despite the presence of some barriers hindering and/or delaying patients' vocational reintegration, the most recent available Belgian data are encouraging and in favor of cardiac rehabilitation in this regard. Although a clear legislative framework exists, there remains a need for more practical clinical algorithms that can be used in daily practice and aid the responsible caregivers in their decision-making process regarding RTW.

Acknowledgements, We would like to thank AM Willems, PhD (Department of Cardiology, AZ Maria Middelaers Ghent), H Van de Kerckhove, MD (Department of Cardiology, AZ Sint-Lucas Ghent), L Demulier, MD (Department of Cardiology, University Hospital Ghent), and E Viaene, MD (Department of Cardiology, AZ Yperman Ieper) for their support in the provision of the Belgian data described in this paper.

Funding. The work in this paper was not supported by any funding.

Conflict of interest. The authors report no conflicts of interest.

References

1. Timmis A, Townsend N, Gale C, et al, Atlas Writing Group. European Society of Cardiology: Cardiovascular Disease Statistics 2017. *Eur Heart J* 2018;39(7):508-579.
2. Chandola T, Brunner E, Marmot M. Chronic stress at work and the metabolic syndrome: prospective study. *BMJ* 2006;332(7540):521-5.
3. Wang HX, Leineweber C, Kirkeeide R, et al. Psychosocial stress and atherosclerosis: family and work stress accelerate progression of coronary disease in women. The Stockholm Female Coronary Angiography Study. *J Intern Med* 2007;261(3):245-54.
4. Rosengren A, Hawken S, Ounpuu S, et al; INTERHEART investigators. Association of psychosocial risk factors with risk of acute myocardial infarction in 11,119 cases and 13,646 controls from 52 countries (the INTERHEART study): case-control study. *Lancet* 2004;364:953– 62.
5. Matthews K, Gump B. Chronic work stress and marital dissolution increase risk of post trial mortality in men from the Multiple Risk Factor Intervention trial. *Arch Intern Med* 2002;162:309 –15.
6. http://www.werk.belgie.be/welzijn_op_het_werk.aspx.
7. Gragnano A, Negrini A, Miglioretti M, et al. Common Psychosocial Factors Predicting Return to Work After Common Mental Disorders, Cardiovascular Diseases, and Cancers: A Review of Reviews Supporting a Cross-Disease Approach. *Journal of occupational rehabilitation* 2018;28(2):215-231.
8. Detaille SI, Heerkens YF, Engels JA, et al. Common prognostic factors of work disability among employees with a chronic somatic disease: a systematic review of cohort studies. *Scandinavian journal of work, environment & health* 2009;35(4):261-81.

9. Osler M, Martensson S, Prescott E, et al. Impact of gender, co-morbidity and social factors on labour market affiliation after first admission for acute coronary syndrome. A cohort study of Danish patients 2001-2009. *PloS one* 2014;9(1):e86758.
10. Boudrez H, De Backer G. Recent findings on return to work after an acute myocardial infarction or coronary artery bypass grafting. *Acta cardiologica* 2000;55(6):341-9.
11. Nielsen FE, Sorensen HT, Skagen K. A prospective study found impaired left ventricular function predicted job retirement after acute myocardial infarction. *Journal of clinical epidemiology* 2004;57(8):837-42.
12. Biering K, Nielsen TT, Rasmussen K, et al. Return to work after percutaneous coronary intervention: the predictive value of self-reported health compared to clinical measures. *PloS one* 2012;7(11):e49268.
13. Salzwedel A, Reibis R, Wegscheider K, et al. Cardiopulmonary exercise testing is predictive of return to work in cardiac patients after multicomponent rehabilitation. *Clinical research in cardiology : official journal of the German Cardiac Society* 2016;105(3):257-67.
14. O'Neil A, Sanderson K, Oldenburg B. Depression as a predictor of work resumption following myocardial infarction (MI): a review of recent research evidence. *Health and quality of life outcomes* 2010;8:95.
15. de Jonge P, Zuidersma M, Bultmann U. The presence of a depressive episode predicts lower return to work rate after myocardial infarction. *General hospital psychiatry* 2014;36(4):363-7.
16. Stendardo M, Bonci M, Casillo V, et al. Predicting return to work after acute myocardial infarction: Socio-occupational factors overcome clinical conditions. *PLoS One* 2018;13(12):e0208842.

17. Piepoli MF, Corrà U, Adamopoulos S, et al. Secondary prevention in the clinical management of patients with cardiovascular diseases. Core components, standards and outcome measures for referral and delivery: a policy statement from the cardiac rehabilitation section of the European Association for Cardiovascular Prevention & Rehabilitation. Endorsed by the Committee for Practice Guidelines of the European Society of Cardiology. *Eur J Prev Cardiol* 2014;21(6):664-81.
18. Grahn P, Pálsdóttir AM, Ottosson J, Jonsdóttir IH. Longer Nature-Based Rehabilitation May Contribute to a Faster Return to Work in Patients with Reactions to Severe Stress and/or Depression. *Int J Environ Res Public Health* 2017;14(11). pii: E1310.
19. Nieuwenhuijsen K, Faber B, Verbeek JH, et al. Interventions to improve return to work in depressed people. *Cochrane Database Syst Rev* 2014;(12):CD006237.
20. Dreyer RP, Xu X, Zhang W, et al. Return to Work After Acute Myocardial Infarction: Comparison Between Young Women and Men. *Circulation. Cardiovascular quality and outcomes* 2016;9(2 Suppl 1):S45-52.
21. Fiabane E, Argentero P, Calsamiglia G, et al. Does job satisfaction predict early return to work after coronary angioplasty or cardiac surgery? *International archives of occupational and environmental health* 2013;86(5):561-9.
22. Fiabane E, Giorgi I, Candura SM, et al. Return to work after coronary revascularization procedures and a patient's job satisfaction: A prospective study. *International journal of occupational medicine and environmental health* 2015;28(1):52-61.
23. O'hagan FT, Thomas SG. Work adjustment in cardiovascular disease: job characteristics and social support. *J Cardiopulm Rehabil Prev* 2011; 31 (6):358-364.
24. Moolaert VRM, van Heugten CM, Gorgels TPM, et al. Long-term Outcome After Survival of a Cardiac Arrest: A Prospective Longitudinal Cohort Study. *Neurorehabil Neural Repair* 2017; 31 (6):530-539.

25. Miglioretti M, Gragnano A, Griffo R, et al. Does the return to work have a negative impact on the lifestyle of cardiovascular patients? Comments on the ICAROS results. *Int J Cardiol* 2014; 174 (1):193-194.
26. Salzwedel A, Reibis R, Wegscheider K, et al. Cardiopulmonary exercise testing is predictive of return to work in cardiac patients after multicomponent rehabilitation. *Clin Res Cardiol* 2016; 105 (3):257-267.
27. Latil F, Iliou MC, Boileau C, et al. [Returning to work after an acute coronary syndrome: When waiting is wasting]. *Ann Cardiol Angeiol (Paris)* 2017; 66 (2):81-86.
28. O'Neil A, Sanderson K, Oldenburg B. Depression as a predictor of work resumption following myocardial infarction (MI): a review of recent research evidence. *Health Qual Life Outcomes* 2010; 8:95.
29. Pattyn N, Beckers PJ, Cornelissen VA, et al. The effect of aerobic interval training and continuous training on exercise capacity and its determinants. *Acta Cardiol* 2017; 72 (3):328-340.
30. Vanhees L, Geladas N, Hansen D, et al. Importance of characteristics and modalities of physical activity and exercise in the management of cardiovascular health in individuals with cardiovascular risk factors: recommendations from the EACPR. Part II. *Eur J Prev Cardiol* 2012; 19 (5):1005-1033.
31. Knapen J, Vancampfort D, Moriën Y, et al. Exercise therapy improves both mental and physical health in patients with major depression. *Disabil Rehabil* 2015; 37 (16):1490-1495.
32. Moghei M, Turk-Adawi K, Isaranuwachai W, et al. Cardiac rehabilitation costs. *Int J Cardiol* 2017; 244:322-328.
33. Ebadarta L. Return to work after successful coronary angioplasty. *Journal of Cardiopulmonary Rehabilitation* 1992; 12 (1):20-24.

34. Engblom E, Korpilahti K, Hämäläinen H, et al. Quality of life and return to work 5 years after coronary artery bypass surgery. Long-term results of cardiac rehabilitation. *J Cardiopulm Rehabil* 1997; 17 (1):29-36.
35. Lamberti M, Ratti G, Gerardi D, et al. Work-related outcome after acute coronary syndrome: Implications of complex cardiac rehabilitation in occupational medicine. *Int J Occup Med Environ Health* 2016; 29 (4):649-657.
36. Yonezawa R, Masuda T, Matsunaga A, et al. Effects of phase II cardiac rehabilitation on job stress and health-related quality of life after return to work in middle-aged patients with acute myocardial infarction. *Int Heart J* 2009; 50 (3):279-290.
37. Peterson M, Dunnagan T. Analysis of a worksite health promotion program's impact on job satisfaction. *J Occup Environ Med* 1998; 40 (11):973-979.
38. O'Hagan FT, Coutu MF, Thomas SG, et al. Work reintegration and cardiovascular disease: medical and rehabilitation influences. *J Occup Rehabil* 2012; 22 (2):270-281.
39. Kragholm K, Wissenberg M, Mortensen RN, et al. Return to work in out-of-hospital cardiac arrest survivors. A nationwide register-based follow-up study. *Circulation* 2015;131:1682-1690.
40. Descatha A, Dumas F, Bougouin W, et al. Work factors associated with return to work in out-of-hospital cardiac arrest survivors. *Resuscitation* 2018;128:170-174.
41. Lilja G, Nielsen N, Bro-Jeppesen J, et al. Return to work and participation in society after out-of-hospital cardiac arrest. *Circ Cardiovasc Qual Outcomes* 2018;11:e003566.
42. Moolaert VR, Goossens M, Heijnders IL, et al. Early neurologically focused follow-up after cardiac arrest is cost-effective: a trial based, economic, evaluation. *Resuscitation* 2016;106:30-36

43. Moulaert VR, van Heugten CM, Winkens B, et al. Early neurologically-focused follow-up after cardiac arrest improves quality of life at one year: a randomised controlled trial. *Int J Cardiol* 2015;193:8-16.
44. Verhagen DW, Hermanides J, Korevaar JC, et al. Health-related quality of life and posttraumatic stress disorder among survivors of left-sided native valve endocarditis. *Clin Infect Dis* 2009;48(11):1559-65.
45. Butt JH, Kragholm K, Dalager-Pedersen M, et al. Return to the workforce following infective endocarditis – a nationwide cohort study. *Am Heart J* 2018;195:130-8.
46. National Heart Failure Audit (April 2013-March 2014). London: National Institute for Cardiovascular Outcomes Research; October 2015.
47. Rørth R, Wong C, Kragholm K, et al. Return to the workforce after first hospitalization for heart failure. A Danish nationwide cohort study. *Circulation* 2016;134:999-1009.
48. Wong CM, Hawkins NM, Petrie MC, et al; MAGGIC Investigators. Heart failure in younger patients: the Meta-analysis Global Group in Chronic Heart Failure (MAGGIC). *Eur Heart J* 2014;35:2714-2721.
49. Cowie M. Returning to work, a forgotten aspect of rehabilitation for heart failure. *Circulation* 2016;134:1010-1012.
50. Bettinardi O, Vilani GQ, Giorgi I, et al. Benefit of a multidisciplinary cardiac rehabilitation program on return to work. *Eur J Prev Cardiol* 2016;23:S10.

Figure 1. Return to work after cardiac rehabilitation.

Figure 2. Return to work according to time in cardiac rehabilitation.