Received: 28 June 2020 | Accepted: 30 April 2021

DOI: 10.1111/scs.13006

Scandinavian Journal of Caring Sciences

REVIEW

Return to work after coronary artery bypass grafting and aortic valve replacement surgery: A scoping review

Michael Mortensen RN, CCN, MSc, PhD-student[1] | Reidun K. N. M. Sandvik RN, PhD, Associate professor[1] | Øyvind S. Svendsen MD, PhD, Anesthesiologist[2] | Rune Haaverstad MD, PhD, Professor[3,4] | Asgjerd L. Moi RN, CCN, PhD, Professor[1,5]

[1]Department of Health and Caring Sciences, Western Norway University of Applied Sciences, Bergen, Norway

[2]Department of Anaesthesia and Intensive Care, Haukeland University Hospital, Bergen, Norway

[3]Section of Cardiothoracic Surgery, Department of Heart Disease, Haukeland University Hospital, Bergen, Norway

[4]Department of Clinical Science, Faculty of Medicine, University of Bergen, Bergen, Norway

[5]Department of Plastic, Hand and Reconstructive Surgery, National Burn Centre, Haukeland University Hospital, Bergen, Norway

Correspondence
Michael Mortensen, Department of Health and Caring Sciences, Western Norway University of Applied Sciences, PO Box 7030, NO-5020 Bergen, Norway.
Email: miahm@hvl.no

Abstract

Background: Coronary artery bypass grafting surgery and aortic valve replacement surgery are essential treatment options for people suffering from angina pectoris or aortic valve disease. Surgery aims to prolong life expectancy, improve quality of life, and facilitate participation in society for the individuals afflicted. The aim of this review was to explore the literature on work participation in patients following coronary artery bypass grafting or aortic valve replacement surgery, and to identify demographic and clinical characteristics associated with returning to work.

Methods: A scoping review framework of Arksey and O'Malley was chosen. Four electronic databases: Medline, CINAHL, Embase, and Google Scholar were searched for studies in English, Swedish, Danish or Norwegian between January 1988 and January 2020. A blinded selection of articles was performed. The data were then charted and summarized by descriptive numerical analyses and categorized into themes.

Results: Forty-five out of 432 articles were included in the final full-text analysis. Absence from work following coronary artery bypass graft grafting or aortic valve replacement surgery lasted on average 30 weeks, whereas 34% of the patients never returned to work. Being female, suffering from pre-existing depression, having limited secondary education, or low income were associated with decreased return to work rates. Previous employment was a decisive factor for returning to work after surgery. Data on return to work after aortic valve replacement were scarce.

Conclusions: A significant number of patients never return to work following coronary artery bypass grafting or aortic valve surgery, and the time interval until work return is longer than expected. Failure to resume work represents a threat to the patients' finances and quality of life. Nurses are in a unique position to assess work-related issues and have an active part in the multi-disciplinary facilitation of tailored occupational counselling after cardiac surgery.

KEYWORDS

Aortic valve replacement, coronary artery bypass grafting, employment, cardiac surgery, nursing, rehabilitation, return to work, scoping review

INTRODUCTION

Healthcare services play an essential role in improving the social participation of patients suffering from cardiovascular diseases (CVDs). CVDs include diseases of the heart and aorta, vascular diseases of the brain, and peripheral vascular disease [1]. Despite a roughly 50% mortality decrease from the 1980s to the early 2000s [2], CVDs still accounted for 20% of all deaths in Europe in 2016 [3].

Cardiac surgery patients in the working-age group most frequently undergo either coronary artery bypass grafting surgery (CABG) or aortic valve replacement (AVR). Older people with cardiac disease are frequently referred for less invasive interventions, such as percutaneous coronary intervention (PCI) or transcatheter aortic valve implantation (TAVI). CABG is the most common intervention in cardiac surgery and is performed on around 800,000 patients worldwide each year [4]. AVR was in 2003 around 290,000 operated patients [5], although this patient group is expected to increase to 850,000 by 2050 [6], as current low-income countries get better access to cardiac surgery. Thus, an increasing number of cardiac patients are excepted to be admitted to hospital to receive surgical procedures in order to sustain or improve life expectancy, quality of life (QoL), as well as social and occupational participation [7].

Unemployment and sickness leave are known to be expensive for society and have a negative impact on patients [8]. Work participation has been widely documented to improve a person's QoL and to be essential for a person's income, perception of personal identity, sense of accomplishment and capability of socialising with others. Consequently, work-related activities are central to human lives [9].

On the other hand, being unemployed or out of work due to illness has been shown to harm psychological health due to insecurity, stress, loss of dignity and lack of social belonging as a human being. Unemployment may lead individuals to experience loss of self-esteem and involuntary isolation [10, 11]. Notably, patients suffering from CVDs and especially heart-related diagnoses (e.g. angina pectoris and myocardial infarction) have been reported to have a lower return to work rate compared to patients with other diagnoses [12].

The importance of employment among the working-age population, in combination with the societal need for a higher average retirement age in the future, make occupational rehabilitation and counselling a vital issue in cardiac care and in the curriculum of all health education programmes. Beyond survival, the role of nursing is to see the whole person and to integrate patient goals into the fundamentals of care [13]. Moreover, aftercare and nurse-led follow-up have been central to nursing and research [14]. However, work-related issues seem to be sparsely covered in critical care nursing literature as well as nursing literature in general.

Two previous reviews have been performed on the impact of cardiac rehabilitation on return to work after heart valve surgery. One is an overview, and the other a systematic review consisting of two articles with a small number of patients [15, 16]. Hence, reviews that are broad in scope and summarise current evidence are warranted. This scoping review aims, therefore, to explore and describe the existing research literature on the return to work rate (RTWR) and the return to work time (RTWT), as well as factors related to return to work (RTW) in patients after CABG or AVR. By focusing this review on factors that hinder a RTW for this patient group, we may reveal the need for more knowledge and attention from nurses and healthcare personnel throughout the trajectory of treatment and rehabilitation [17]. Thus, this review addresses the following two research questions:

1. What is known about the RTWR and RTWT related to postoperative cardiac CABG and AVR surgery patients?
2. What are the clinical and demographic factors associated with RTWR and RTWT in postoperative cardiac CABG and AVR patients?

METHODS

Return to work is known to be related to both medical and non-medical factors [18]. The area is complex, and therefore a scoping study based on the framework of Arksey and O'Malley was chosen [19]. A broad literature search was conducted to explore both current knowledge and gaps in the existing research on the RTW after CABG and AVR. Furthermore, the review was based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) extension for Scoping Reviews [20].

The Arksey and O'Malley framework has five stages, as presented below:

Stage 1 - Identification of the research question

In the first stage, we developed and operationalised our research questions to broadly explore the RTWR and RTWT, including facilitating and limiting factors, after first-time cardiac surgery. Research questions were developed, and based on these questions, we developed search terms and a search strategy. The PICO framework supported this process by creating a search focused on the population, intervention, outcomes and study design [21]. The research questions were discussed, and inclusion criteria were agreed upon with the whole multi-disciplinary research team.

Stage 2 - Identifying relevant studies

The systematic search for literature was conducted in collaboration with a health science librarian, using the following electronic databases: Medline, CINAHL, Embase and Google Scholar. The search was limited to the past 30 years (1st January 1988 to 31st December 2018). This time limit was discussed within the research group, and the exclusion was based on an anticipated declining relevance of study findings. Medical Subject Headings (MeSH) search terms and keywords were used with Boolean operators and appropriate truncations: thoracic surgery OR coronary artery bypass OR internal mammary-coronary artery anastomosis OR heart valve prosthesis implantation OR heart valve surgery OR heart valve replacement OR aortic valve surgery OR aortic valve prosthesis OR cardiac valve AND sick leave OR return to work OR back to work OR job re-entry OR work resumption. The database search was conducted between December 2018 and January 2019 (Figure 1). Studies of patients who had undergone first-time CABG or AVR or a combination of these surgeries were included. The terms 'return to work', 'RTW', 'back to work' or 'job re-entry' had to be in the article. The language had to be English, Danish, Swedish or Norwegian. Only original articles were included, whereas opinion letters, systematic reviews and case studies were excluded. The literature search was updated in January 2020, but no recent articles matched the inclusion criteria.

Stage 3 - Selecting the studies

The software Rayyan [22] was used in the process of selection, which allowed total blinding between researchers (MM and ALM), thereby minimising the risk of bias. The initial search identified 624 articles from the database search. Following the removal of 192 duplicates, a total of 432 articles were transferred into Rayyan. First, a blinded pilot screening of titles and abstracts was performed on 20 randomly chosen articles in order to identify any needs for clarification concerning the inclusion process. The screening resulted in a conflict in five papers and better concordance in the subsequent inclusion process.

Next, the researchers (MM and ALM) performed a blinded screening on the titles and abstracts of the 432 identified articles. When opening the blinded mode, the revealed mode showed that 21.9% of the articles were included, 64.9% excluded, and 13.2% (57 articles) had a conflict. All conflicts throughout the screening process were discussed and consensus was obtained between the researchers. If an abstract was not available in Rayyan, the article was identified from the databases directly and selected according to the same criteria in order to determine if the article was relevant or not. The screening resulted in 108 articles being eligible for a full-text review. Two researchers (MM and ALM) independently read through the full text of all included articles. As with the title and abstract screening, conflicts were resolved through discussion and finding consensus.

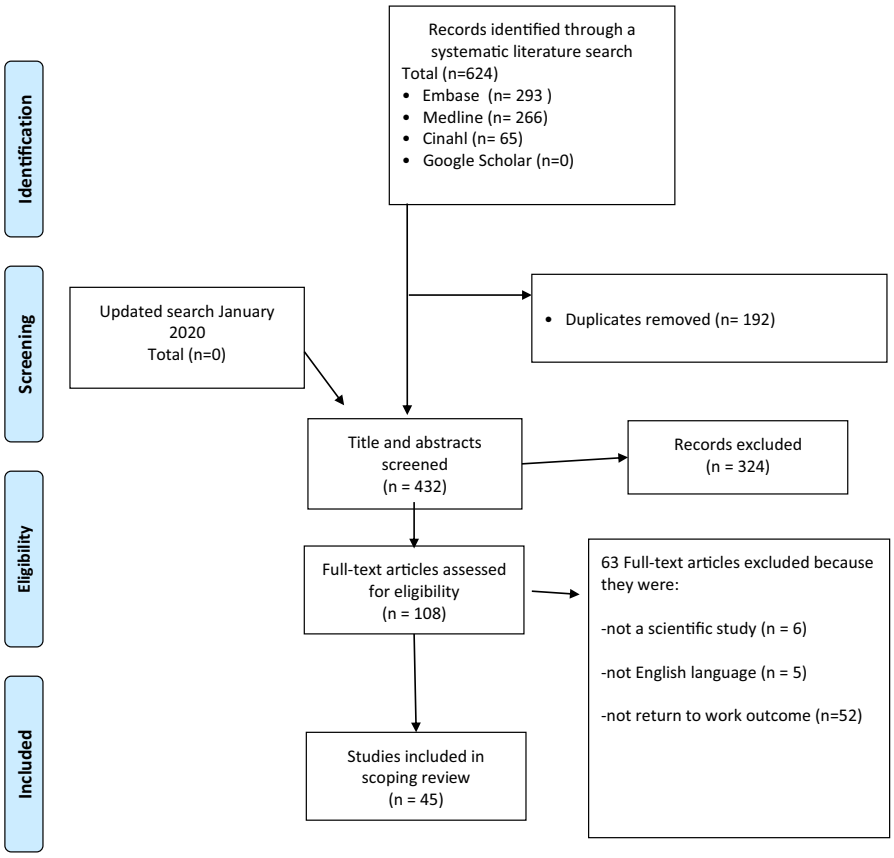

FIGURE 1 PRISMA flow diagram of study selection process modified from Moher et al. [97]

Being a scoping review, the researchers did not perform a quality appraisal. Overall, we identified 45 articles for final inclusion, as shown in Figure 1. The identified articles were made available for the rest of the research team. For final inclusion of the studies, return to work had to be an outcome in the articles.

Stage 4 - Charting the data

We chose a narrative review approach and after reading the 45 articles, the researchers charted the information in a table in order to categorise critical design issues and study findings (Tables 1 and 2). The obtained data were entered into the programme Excel.

The information in the data charting form was collected and sorted as follows:

- Author(s), year and country
- Aim of the study
- Design
- Study population (age, sex, surgical treatment, mean age)
- RTWR
- RTWT
- Positive factors for RTW
- Negative factors for RTW

Stage 5 - Collating, summarising and reporting the results

The process of collating and summarising the results was based on the information in the charting table. We followed the Arksey and O'Malley framework, with two distinct steps: fundamental numerical analysis followed by a synthetic and thematical analysis [19]. In the first step, a narrative account of the data was performed by describing the number of studies, their geographical distribution, research methods, RTWR and RTWT [19]. This step included a descriptive numerical summary analysis in determining the proportion of patients returning to work. The percentage of patients that returned to work was calculated by dividing the total number of patients returning to work through all studies by the total number of patients included in the studies. Furthermore, the overall RTWT was calculated as the weighted average throughout the studies, where this information was available using the number of patients in the study as the weighting factor.

In the second step, factors that facilitated, limited or delayed the patients' return to work were synthesised thematically [19]. Limiting and hindering factors and the summary of RTWR/RTWT became the primary unities of our narrative review. In the following, findings from the articles are presented based on the thematic summary of the results.

RESULTS

Setting and sample

The review identified 45 articles representing a total of 39,801 patients being treated with first-time CABG or AVR. The mean age of the patients was 56.3 years (SD ± 7.3), and 16% were women. They had mainly undergone CABG surgery ($n = 39.621$), whereas a single study included AVR patients ($n = 139$) and also approached patients after they had been offered both surgeries ($n = 41$) [23].

Of the 45 papers included in this review, the majority ($n = 44$) employed quantitative research, whereas one used a mixed-method design. The study designs were eight registry studies [23–30], seven clinical trials (six randomised trials and one non-randomised) [31–37], 18 cohort studies (15 prospective studies and three retrospective studies) [38–55], one mixed-method study [56], two case-control studies [57, 58] and nine cross-sectional studies (three surveys and six cross-sectional studies) [59–67].

The present study included articles originating from Europe ($n = 29$) [23, 24, 26–30, 32–34, 36, 38, 40, 44, 45, 47, 50–54, 56, 58–60, 62–65], USA ($n = 10$) [25, 31, 35, 37, 41, 42, 46, 57, 67, 68], Australia ($n = 3$) [55, 61, 66], Iran ($n = 2$) [39, 43] and Israel ($n = 1$) [49].

Return to work rate and return to work time

Patients were either employed, on sick leave or out of work at the time they were included in the studies. On average, 66.5% (13%–93%) ($n = 34$) resumed employment after surgery, and the mean RTWT was 30 weeks (9.3–36 weeks) ($n = 14$).

Clinical factors associated with return to work

Clinical factors predicting an increased RTWR were normal ejection fraction [38, 39, 61, 64], and the absence of angina pectoris, as well as the absence of chest pain after surgery [41, 45, 47, 50, 52, 53, 55, 63, 67, 68]. Patients with significant comorbidity (e.g. diabetes, chronic obstructive pulmonary disease, renal failure, dyspnoea, atrial fibrillation and cerebral vascular diseases), as well as a severe dysfunction according to the New York Heart Association (NYHA) Functional Classification system, were less likely to RTW [24, 28, 37, 39, 41, 47, 55, 61, 64]. The Duke Activity Status Index (DASI) for measuring functional capacity has been demonstrated to correlate with the NYHA classification. Patients that were not working due to cardiac complaints and a high NYHA class also scored low on DASI [28].

TABLE 1 Data charting table of the included articles in the review

Author, Year & Country	Aim of the study	Design	Study population	RTW rate	RTWT (weeks)	Positive factors for RTW	Negative factors for RTW
Agren et al. (1993), Sweden	Evaluation of short-and long-term adjustments related to coping strategies to metabolic variables after surgery.	Mixed method study using semi-structured interviews and a prospective cohort study (5 years of follow-up)	36 CABG patients. Mean age 55. 100% of males.	71%	N/A	Full-time employment, younger, less cardiac symptoms	Cardiac symptoms
BARI investigators (1997), USA	Investigation on differences between CABG and PTCA patients on functional status, QoL, employment and healthcare costs.	Randomised trial 1, 3- and 5-years of follow-up	914 CABG patients. Mean age 61. 73.7% of males.	72%	N/A	PTCA more rapid RTW than CABG, but after five years, rates are equal.	
Bergvik et al. (2012), Norway	Determination of psychosocial and treatment-related factors associated with RTW among PTCA and CABG patients	Survey 13–15 months follow-up	89 CABG patients. Mean age 57. 84% of males.	56%	N/A	Higher primary education, stronger internal locus	
Boudrez et al. (2000), Belgium	To analyse variables that predicted RTW after an acute myocardial infarction or CABG.	Cohort study. 1-year follow-up.	137 CABG patients. Mean age 48.7.	80.8%	15.7	High LVF (Left Ventricular Fraction), complete revascularisation, a feeling of job security, pre-operative employment, less distrust, expectations on returning to work expressed at the hospital.	Discharge, retirement, heavy manual work.
Bradshaw et al. (2005), Australia	To determine the association between returning to work after CABG and clinical and socio-demographic factors.	Survey One year before and 1-year after CABG surgery	2061 CABG patients. Mean age 59.	42%	N/A	White-collar, younger age	Blue-collar workers, increasing age, high pre-operative NYHA, females
Butt et al. (2017), Denmark	Return to the workforce following coronary artery bypass grafting: A Danish nationwide cohort study	Registry study. 1-year follow-up	6031 CABG patients Mean age 55. 88.9% of males.	80%	N/A	Younger age, male sex, higher primary education, higher income, absence of significant comorbidities	Urgent surgery, heart failure, stroke, atrial fibrillation, HTA, chronic kidney disease, COPD, liver disease
D'Allones et al. (2002), France	To analyse the long-term prognosis in patients with isolated stenoses of the left main coronary artery following surgical revascularisation.	Survey (5 years of follow-up)	One hundred six patients with isolated stenoses of the left main coronary artery. Mean age 61. 68.9% of males.	77%	N/A	No difference in outcome was found between these patients and traditional CABG patients.	

(Continues)

TABLE 1 (Continued)

Author, Year & Country	Aim of the study	Design	Study population	RTW rate	RTWT (weeks)	Positive factors for RTW	Negative factors for RTW
Davoodi et al. (2003), Iran	To predictive power of risk factors as well as clinical status in determining long-term social functioning and rate of return to work following isolated bypass surgery.	Cohort study. 2, 3 and 4 years of follow-up	178 CABG patients. Mean age 60.1. 87.6% of males.	51.68%	N/A	Female	Male, left ventricular dysfunction, diabetes, cerebral vascular disease, LOS in hospital >14 days.
De Canniere et al. (2001), Belgium	To compare a combination of minimally invasive direct coronary artery bypass and PTCA with double CABG as a treatment for double-vessel coronary artery disease involving the proximal left anterior descending.	Randomised controlled trial. Two years of follow-up	20 CABG patients. Mean age 63. 75% of males.	N/A	12.7	Hybrid coronary revascularisation	
Engblom et al. (1994), Finland	To compare RTW after standard care at a hospital or cardiac rehabilitation.	Randomised controlled trial 1-year follow-up	125 CABG patients. Mean age 51.5. 100% of males	47%	N/A	Younger, individual expectations and desire regarding work, length of absence from work before surgery.	
Engblom et al. (1997), Finland	To investigate whether rehabilitation influences QoL and work status after CABG	Randomised controlled trial Five years of follow-up	228 CABG patients. Mean age 54. 88.1% of males.	34%	N/A	Pre-operative employment, pre-operative expectations on RTW	Sickness absence before surgery
Fonager et al. (2014), Denmark	To describe work status in two years around the time of cardiac surgery and estimate the probability of returning to the workforce.	Registry study Two years of follow-up.	501 CABG patients. 139 valve surgery patients. 41 combo patients. Mean age 55.75. 85% of males.	62%	N/A	Pre-operative employment, working before surgery	Unemployment one year before surgery, sickness absence before surgery
Geissler et al. (2002), Denmark	A qualitative assessment of pain relief and functional improvement after CABG	Cross-sectional study Two years of follow-up	546 CABG patients. Mean age 70.5. 80.7% of males.	N/A	17	Employment private sector	Employment in the public sector
Hällberg et al. (2009), Finland	To establish which factors, influence patients' return to work and how well they remain at work CABG.	Cohort study Ten years of follow-up	569 CABG patients.	54%	N/A	Younger age, pre-operative employment, higher primary education, absence of a history of TIA or stroke	High total cholesterol, diabetes mellitus, high pre-operative NYHA, low ejection fraction, family history of cardiac disease
Hlakty et al. (1998), USA	To study patterns of employment among patients in the Bypass Angioplasty Revascularization Investigation (BARI)	Randomised trial –BARI investigation Four years of follow-up	934 CABG patients. Mean age 62. 72% of males.	63%	N/A	Younger age, pre-operative employment, planned to return to the same job, private source of medical insurance	

(Continues)

TABLE 1 (Continued)

Author, Year & Country	Aim of the study	Design	Study population	RTW rate	RTWT (weeks)	Positive factors for RTW	Negative factors for RTW
Kastanioti et al. (2007), Greece	To compare functional and economic outcome of off-pump and on-pump surgery at 1-year follow-up.	Non-randomised trial 1-year follow-up	102 Mean age 65.5. 87.2% of males.	24%	N/A	No differences were found between the two groups after one-year follow-up.	
Kon et al. (2007), USA	To compare hybrid coronary revascularisation with results from conventional off-pump coronary artery bypass.	Prospective case-controlled study 1-year follow-up	30 off-pump CABG patients. Mean age 65. 63% of males.	N/A	19.1	Hybrid coronary revascularisation	Off-pump CABG
Leahy et al. (2015), USA	A review of all active-duty patients undergoing cardiac surgery in an active-duty military population.	Retrospective registry study 1-year follow-up	29 CABG patients. Mean age 40. 85% of males.	83%	N/A	Higher rank in the military, shorter length of stay (LOS) in hospital	
Lundbom et al. (1992), Norway	Factors influencing RTW after CABG.	Cross-sectional study 19-52 months post-surgery.	250 CABG patients. Mean age 57.9. 89.6% of males.	39%	N/A	Living in rural areas, short waiting time before surgery	Emergency surgery, angina, type of work, previous infarction, sickness absence before surgery
Mark et al. (1992), USA	Construction of a model to predict premature departure from the workforce of patients with coronary disease and to validate a model prospectively in an independent cohort of patients.	Prospective cohort study 1-year follow-up	449 CABG patients. Mean age 56.	79%	N/A	Younger of age, male	Older, female, black, diabetes, hypertension, impairment of angina, fewer socio-economic resources at baseline, lower primary education, lower income, health concerns, anxious, more depressed, lower energy levels, heavy manual work
Mark et al. (1994), USA	To measure the effects of PTCA, CABG, and medical therapy on employment in patients with coronary artery disease.	Prospective cohort study 1-year follow-up.	217 CABG patients.	82%	10.9	Younger of age, male, white	Race black, female, cardiac disease, diabetes, hypertension, lower ejection fraction
Maznyczka et al. (2015), UK	Comparison of RTW and QoL after PTCA or CABG	Cross-sectional study >1-year follow-up.	88 CABG patients.	62%	13	PTCA, younger age, EF >30%	Diabetes, being self-employed

(Continues)

TABLE 1 (Continued)

Author, Year & Country	Aim of the study	Design	Study population	RTW rate	RTWT (weeks)	Positive factors for RTW	Negative factors for RTW
McGee et al. (1993), Irland	To measure RTW after PTCA or CABG	Cross-sectional study using interview by telephone. 6-18 months following treatment	112 CABG patients. Mean age 55.75.	59%	N/A	Less angina, PTCA	
Mehrdad et al. (2016), Iran	Identification of factors predictive of early RTW in patients who underwent CABG	Prospective cohort study Six months follow-up.	226 CABG patients. Mean age 54.2. 99.1% of males.	87%	N/A	Higher SF−36 scores, normal serum troponin-T level, shorter pump time in surgery, normal MAP pre-surgery, higher serum magnesium (Mg) levels	
Messmer et al. (1989), Germany	To investigate late results after intracoronary thrombolysis and early CABG after acute myocardial infarction.	Registry study. 8-year follow-up	70 CABG patients. Mean age 56. 87.1% of males.	62%	N/A	Younger age	
Munro et al. (1990), UK	Measure work status before and after CABG	Registry study	79 CABG patients. 96.2% of males.	78%	N/A	Younger age, short seniority, working before surgery, white-collar	Higher age, higher seniority, blue-collar
Noyez et al. (1999), Netherland	To investigate whether patients ≤45-year-old benefit from myocardial revascularisation measured by NYHA, functional status and RTW.	Registry study. 1–10 years of follow-up	188 CABG patients. Mean age 41.7 93% of males.	47%	N/A	Pre-operative employment, attitude to RTW of healthcare personnel	Low social status
Owens et al. (2010), USA	To describe variables associated with the patients' ability to RTW and necessary and essential activities after CABG	Prospective cohort study 7–8 years of follow-up	63 CABG patients. Mean age 63. 84% of males.	88%	36	Younger age, previous employment	Angina, dyspnoea, atrial fibrillation
Perk et al. (1990), Sweden	To measure the effects of cardiac rehabilitation after CABG on readmissions, RTW and physical fitness.	A prospective case-controlled study. One year, and 38 months of follow-up	49 CABG patients. Mean age 57. 79.5% of males.	59%	32.9	Participation in cardiac rehabilitation increased physical work capacity	
Pinto et al. (2012), Australia	To measure RTW after CABG in patients aged under 50 years old.	A cross-sectional study with telephone interviews 86.4 ± 23.4 months follow-up	172 CABG patients. Mean age 45. 83.1% of males	93%	N/A	Male, blue-collar-workers, pre-operative employment, higher SF36, higher QoL	

(Continues)

TABLE 1 (Continued)

Author, Year & Country	Aim of the study	Design	Study population	RTW rate	RTWT (weeks)	Positive factors for RTW	Negative factors for RTW
Pocock et al. (1996), UK	To measure QoL, employment status after PTCA or CABG	A randomised controlled trial Three years of follow-up.		50%	N/A	PTCA	Angina, cardiac disease
Poston et al. (2008), USA	Comparison of economic and patient outcomes with Minimally Invasive Versus Traditional Off-Pump CABG	Prospective cohort study 1-year follow-up	100 mini-CABG patients. Mean age 66.2.	N/A	13.3	Mini-CABG	
Salzwedel et al. (2016), Germany	To evaluate cardiopulmonary exercise testing parameters as predictors for RTW.	Registry study. 26.5±11.9 months follow-up	84 CABG patients. Mean age 51.	13%	N/A	High exercise capacity in cardiopulmonary exercise testing.	
Samuels et al. (1996), USA	To define the issues of CABG in patients in their third decade of life.	Cross-sectional study using questionnaires. Mean three years (1–5 years) follow-up	52 CABG patients. Mean age 35. 82.7% of males.	38%	N/A		Psychosocial issues.
Sellier et al. (2003), France	To evaluate the predictive factors of RTW after CABG for the subgroup of professionally active patients aged less than 60 years old.	A prospective multicentre cohort study 1-year follow-up	530 CABG patients. Mean age 50.5. 94.5% of males.	67.5	13.9		>51 years old, blue-collar, South-East France, angina, dyspnoea, duration of exercise <420 s
Shuster et al. (1995), USA	To investigate gender differences in the outcomes of participants, in-home programmes compared to those in structured cardiac rehabilitation programmes.	A prospective descriptive comparative study. 6 months follow-up	130 CABG patients. Mean age 63.9. 56.1% of males.	N/A	11.8	No difference in the female/male group.	
Simchen et al. (2001), Israel	To explore the putative effect of cardiac rehabilitation programmes on the health-related quality of life and RTW after CABG.	A retrospective descriptive comparative study. 1-year follow-up	124 CABG patients.	53.10%	N/A	White-collar, male, younger age, participation in cardiac rehabilitation, higher scores Health-related quality of life (HRQOL)	
Skinner et al. (1999), UK	To investigate patient-related outcomes after CABG.	Prospective cohort study 3, 6, 12- and 60-months follow-up	353 CABG patients Mean age 57.2. 84% of males.	34%	N/A	Age under retirement, pre-operative employment, absence of angina, male sex and waiting time before surgery <6 months.	

(Continues)

TABLE 1 (Continued)

Author, Year & Country	Aim of the study	Design	Study population	RTW rate	RTWT (weeks)	Positive factors for RTW	Negative factors for RTW
Søderman et al. (2003), Sweden	To investigate the power of depression as a predictor of RTW.	A prospective cohort study.	73 CABG patients. Mean age 51.34.	76%	N/A	Higher education, full-time employment, younger age	Depression before surgery
Speziale et al. (1996), Italy	To measure RTW and QoL after CABG	A prospective descriptive study with interviews. 38 ± 6 months follow-up	246 CABG patients. Mean age 62.1. 78.8% of males.	54.4%	N/A	White-collar workers, absence of chest pain, pre-operative employment, higher educational level	Blue-collar worker, low educational level, living in the south of Italy, chest pain, advanced age.
Speziale et al. (1996), Italy	To evaluate QoL in patients that have undergone CABG	A prospective descriptive study with interviews 39.4 ± 39.2 months follow-up	197 CABG patients. Mean age 61.3. 79.3% of males.	47.4%	N/A	Younger age, higher education	Angina, low educational levels, living in the south of Italy
Strauss et al. (1991), Germany	To evaluate pre-operative and late postoperative psychosocial state following CABG.	A prospective descriptive study with questionnaires. 21- and 27-months follow-up	45 CABG patients.	44%	N/A		Depression before surgery, low scores on QoL
Voss et al. (2012), Sweden	To investigate sickness absence after first CABG or PTCA.	Retrospective registry study >180 sick leave days defined as long-term absence after CABG	22985 CABG patients Mean age 56.3. 84% of males.	N/A	31.4	Male, absence of significant comorbidities	Women, comorbidity, sickness absence pre-operative
West et al. (2004), UK	To evaluate outcome between endoscopic atraumatic coronary artery bypass (endo-ACAB) versus off-pump CABG on postoperative recovery, blood loss and RTW.	Case-control study. Mean 30.2 months follow-up for CABG patients	29 endo- ACAB patients. 29 off-pump CABG patients. Mean age 60.	60%	11.8	Endo-ACAB for grafting of the left internal mammary artery to the LAD	
Worcester et al. (2013), Australia	To determine RTW and identify predictors of non-RTW and delayed resumption of work	A prospective cohort study. 1-year follow-up	207 CABG patients. Mean age 57.77.	90.3%	9.3	Delayed RTW: Angina, three or more grafts, longer LOS, physically active job, depressive symptoms, negative attitude to resuming work, attending cardiac rehabilitation.	Perceived financial stress, reporting fewer hours, negative perception of health, significant comorbidity, physically active job.

Abbreviations: COPD, Chronic Obstructive Pulmonary Disease; HT, Hypertension; LOS, Length of Stay; LVF, Left Ventricular Fraction; MAP, mean arterial pressure; NYHA, New York Heart Association; PTCA, Percutaneous transluminal coronary angioplasty; QoL, Quality of Life; RTW, Return to Work; RTWT, Return to Work Rate.; SF 36, Short Form Health Survey; TIA, transient ischemic attack.

TABLE 2 Return to work after CABG and AVR surgery

	Mean	Min	Max
Return to work time (weeks)	30	9.3	36
Return to work rate (%)	66	13	93

*Based on findings from 45 studies and 39 801 patients.

A single study from Iran in 2016 identified four new medical factors that could be used as predictors of early RTW after CABG [43]. The study found that normal serum troponin and high levels of serum magnesium at admittance, normalisation of blood pressure before surgery (Middle Arterial Pressure (MAP) ≤90 mmHg), and a shorter extracorporeal pump run time during surgery with a mean of 64.3 min, were associated with early RTW. A relatively longer RTWT was observed in the group that had a mean pump run time of 78.8 min [43].

Psychological predictors for return to work

The impact of anxiety and depression on peoples' lives was confirmed, with pre-surgery depression shown to be a negative predictor for RTW [51, 54]. Depression was found to be prevalent among individuals undergoing cardiac surgery [41, 51, 54, 55]. One particular study reported that 47% of 141 CABG patients were psychologically depressed before surgery, whereas 61% were depressed after surgery or prior to discharge from the hospital [69].

Illness and being out of work have an impact on the patient's QoL after surgery. This was demonstrated in a Norwegian study showing coronary disease patients undergoing PCI or CABG and who RTW had a stronger internal locus of control beliefs than those who did not RTW [59]. Furthermore, several studies reported that patients who RTW after surgery had a significantly increased QoL compared to those who did not resume working [43, 49, 54, 66, 67]. On the other hand, patients that had a low score on the self-reported Short Form Health Survey (SF-36) or a QoL questionnaire and also had negative health perceptions were less likely to RTW [66].

Socio-demographic, economic and occupational predictors for a return to work

The socio-demographic factors that predicted a higher RTWR were being male [24, 41, 46, 49, 66] and being of younger age [24, 37, 41, 43, 47, 49–52, 61, 64]. Several of the studies found that patients with a 'white-collar' job as opposed to a 'blue-collar' job [41, 43, 47, 49, 52, 55, 63, 66] were more likely to RTW after surgery. A 'white-collar' job refers to a job that mostly or entirely involves mental work or desk work, for example, in an office. 'Blue-collar' job refers mainly to manual jobs, such as artisanship and factory work.

Three of the studies included in the review illustrate that the region from which the patients originate may be a predictor of RTW. One study from Italy and one from France observed that patients from southern Italy and south-eastern France, respectively, were less likely to RTW [47, 52]. In a Norwegian study [63], it was observed that a relatively large number of patients domiciled in rural parts of Norway resumed work after surgery as compared to patients originating from urban areas.

Furthermore, income and education levels seemed to have an impact on RTW as patients with a higher income, or a higher education level resumed work more often [24, 40, 51, 52, 59]. Employment before surgery has repeatedly been recognised as necessary to increase the probability of later employment, while unemployed patients or those on sick leave before surgery are less likely to RTW. In other words, feelings of job security and employment before surgery are likely to be two of the strongest predictors associated with a high likelihood of a RTW [23, 24, 35, 41, 43, 52, 53, 61]. The patient's own expectations of returning to employment were found to be of importance. When the subject of work and returning to work is orally communicated to the patient by hospital healthcare personnel, it has been demonstrated that this has a strong correlation to whether the patient returns to work or not [34, 38, 41, 70].

Cardiac rehabilitation is often offered to patients after surgery and consists of physical training, education and social support [71]. Some patients in the studies were transferred directly to a specific cardiac rehabilitation centre after discharge from the hospital. Participating in cardiac rehabilitation improved their health-related quality of life (HRQOL) [49] and was related to an increase in physical work capacity, less use of anxiolytics, fewer readmissions, and generally improved physical health [44].

DISCUSSION

Cardiac surgery is each year offered to a significant number of patients each year [4, 5]. Even so, it is a scarcity of reviews summarising the impact of surgery on the patients' return to work. This scoping review considers both periods of working absence after CABG or AVR surgery, as well as the different components, hindering or facilitating RTW after surgery. The purpose of this scoping review was both to summarise current evidence and to identify current gaps in knowledge gaps.

Articles included

The majority of studies concerning return to work were conducted in Europe, followed by the USA and Australia. No studies were identified from the African continent, and only three

originated from Asia. This may suggest that there are differences in research possibilities that could reflect dissimilarities in health care systems as well as employment on these continents. This was confirmed in previous studies from Europe and the USA, which are at the forefront in return to work research [72].

All of the included studies were of quantitative methods, except for one study that had a mixed approach. From the sample and setting we used, qualitative studies describing the patients' own stories and opinions on returning to work from a more humanistic perspective, were absent.

Impact of CABG and AVR surgeries on return to work

Given that 20% of deaths in Europe are related to heart disease, this patient population is a substantial cohort that healthcare personnel often encounter in hospitals and primary care settings. The findings in this review identify several at-risk groups whose RTWR is lower than for other patient groups. In terms of RTW in cardiac surgery patients and RTWR, the review revealed that most patients RTW even though 34% do not. The time on sick leave varies across the studies, and our review found an average time of 30 weeks, with a minimum time away of nine weeks and a maximum of 36 weeks, among those who RTW.

The postoperative period after cardiac surgery is known to be troublesome for many patients, caused by pain and restrictions on carrying heavy weights or using their arms due to the sternotomy. A Danish article claims that patients are recommended to be on sick leave for 4–8 weeks following a sternotomy [73]. The difference in RTWT between this medical recommendation (4–8 weeks) and what is found in the present review (30 weeks) is significant. However, a Swedish study discovered that patients with severe cardiovascular problems have lower RTWR in general [12]. Additionally, each country has its own set of rules and regulations when it comes to sick leave after surgery [74]. It may be that countries with stricter regulations on sick pay or countries that do not have statutory sick pay, have shorter RTWT than countries with more permissive regulations [75]. After surgery, some patients are transferred to cardiac rehabilitation (CR). The role of CR is found to be a positive factor in some studies with improved HRQOL and general physical health in patients [44, 49]. Reviews on valve surgery and participation in CR have shown conflicting results, and it has been found that RTW was facilitated after CR [16]; in contrast, another review found no significant difference between those who participated in CR and the patients who did not [15]. More research is granted on the role of CR directly linked to RTW in both CABG and AVR patients.

There is increasing awareness that the longer patients stay off work, the less likely it is they will RTW. Research has shown that in general, returning to full employment decreases significantly after 6 months of sick leave, and the probability of ever returning to work falls to 50 per cent by the third month after injury or illness [75]. Moreover, there has been a shift from medical models to more holistic models combining medical information with workplace, cultural, economic and social factors in our understanding of RTW after illness [76].

The patient's stay in the cardiothoracic surgery intensive care unit

Cardiac surgery is associated with severe risks of postoperative complications such as bleeding, circulatory instability and general inflammation response, hence patients are referred to postoperative surveillance in Cardiothoracic Surgery Intensive Care Units (CTICUs) [77]. In some single studies, clinical predictors of complications were measured and identified, such as serum troponin-T levels and shorter time of extracorporeal bypass circulation. However, there were few such studies, and they only took into account specific measurements [43]. We identified a knowledge gap in the postoperative phase and particularly in what happens in the CTICU. Factors such as ventilator time, length of stay in the Intensive Care Unit (ICU) and delirium are known to increase cognitive, mental and physical side-effects of ICU treatment and further studies is needed to examine the impact of the ICU treatment on RTW [78].

Impact of demographic factors associated with return to work after surgery

Several demographic factors are correlated with the RTW after surgery, such as age, sex, economic status, area of residence, type of professional work and education level [24, 52, 59, 61, 66]. Women accounted for only 19% per cent of the sample in this review. In a Finnish study, it was demonstrated that women tend to have a lower RTWR than men after cardiac operations [61]. The study concluded that in the general population and within different health problems such as CVDs, women also had more prolonged periods of sick leave than men [79]. Women have been known to be a missing group in cardiology research [80]. Even though ischaemic heart disease accounts for a third of all female deaths globally, women are still underdiagnosed and are less likely to receive appropriate treatments [81]. A recent study also indicates that female sex was associated with long-term mortality after cardiac surgery [82]. The reasons behind the gender difference with regards to RTW have not yet been identified, and more research is warranted within this field.

Differences were identified between 'blue-collar' and 'white-collar' workers in the present review. While

'white-collar' workers have a higher RTWR than 'blue-collar' workers, it is essential to keep in mind that 'blue-collar' workers have traditionally more manual and more physically demanding jobs. The lifting restriction after surgery has an impact on when these patients RTW. Engaging in manual labour after a recent sternotomy could be difficult and may explain the difference in the RTWT between these two groups of workers. The rehabilitation time may be three months for patients resuming office work, but the double for those with a physical demanding workload. In this matter, a mini-sternotomy approach may be beneficial in some patients with AVR as compared to a full sternotomy [83]. Transcatheter aortic valve implantation could theoretically be an advantage for earlier RTW after AVR, but in the younger population, this is still not accepted as good medical practice as compared to a surgical AVR [84].

The patient's level of education was identified as a contributing factor for returning to work after surgery. Several studies concluded that higher education had a positive correlation with the RTW. Given that most 'blue-collar' workers have lower secondary education, both lower education and the nature of the work could be negative factors for this group when it comes to returning to work. The educational factor has several elements, such as the difficulty for patients with a lower education to enter, stay in or re-enter the labour force due to poorer physical health and the nature of the work [85]. Secondly, patients may not have the psychological means to be able to find or remain in employment due to inadequate or reduced health [86]. Moreover, the negative impact of a low level of education, and poor physical and mental health on work-life participation are highest in a person's late work-life [87].

Another predictor that has been identified in three studies is the patient's geographical residence. In two of the studies, one from France and one from Italy, researchers found that in lower gross domestic product (GDP) rural regions of these countries, patients had a lower RTWR than within the rest of the country per capita [47, 52, 88]. As GDP is higher in populated areas than rural areas, we also find this phenomenon in Norway when comparing rural regions with urban regions. Surprisingly, in a study from the middle part of Norway the opposite was found, that is a higher number of patients from rural areas RTW after surgery than in the urban areas [63]. Further studies could be of interest by identifying the link between economy, geographic location and RTW. However, the patient's private financial condition seems to be closely linked with RTW.

Return to work after CABG and AVR surgery and its association with quality of life

Work and work participation have previously been described as crucial to patients' QoL but are also significant on a socio-economic level; thus, helping patients back to employment after surgery is of great importance. Furthermore, there has been a change in how society perceives being out of work and it is a multifactorial issue affected not only by the patients but also by the different systems in a country [76]. Studies show that employment is essential for a more rapid recovery and for both the physical and mental health of patients [89]. Previous studies have also shown that prolonged sickness absence tends to make RTW less likely, especially in women [90]. Moreover, long-term sick leave has been related to increased mortality in both sexes [91–93].

Our review found that patients' QoL increased after surgery, and those with a higher QoL went back to work faster or more often than those with a low QoL. Notably, returning to work has been related to return to a stronger internal locus of control beliefs, indicating that patients believed they could influence events and their outcomes positively after cardiac surgery [59]. Providing adequate information to patients, however, is a paradox, as we know that the time the nurse spends with patients is decreasing and has been reported to be as low as just 37% of the nurses' time during a single shift [94]. Theoretically, communication and employment information when meeting with the patient could have an impact on RTW [34, 38, 41, 70].

The importance of nurses in the multidisciplinary care of the post-cardiac surgical patient

Meetings between a patient and a nurse are unique and diverse, and nurses meet and interact with patients in all stages throughout the hospital stay. In these meetings, trust and interaction are established in a nurse–patient relationship that is important for further care and treatment; hence, the relationship is the core of the fundamentals of care framework by Kitson [13]. The nurse has a unique role in caring for cardiac patients, from admission, through critical care nursing in the CTICU, to discharge, and finally, in the setting of cardiac rehabilitation. In these encounters, the awareness of work status should be given priority in nurse–patient communication. The RTW counselling in cardiac rehabilitation has been demonstrated to be lacking and is highlighted as an important measure that needs to be more consistently delivered to this patient group [95]. A more holistic approach to discharge planning and aftercare, tailored to each patient's physical and psychosocial health, their social and cultural context, resources and limitations, is central to nursing.

Besides, a closer collaboration between clinicians and researchers, as well as a more robust curriculum in both medical and nursing educations with emphasise on work and the importance of work for their patients, could improve RTWR after CABG and AVR in the future. Moreover, more seamless

collaboration between health professionals working in in-patient and out-patient settings is needed.

Implications of the study

The bio-medical perspective is imperative for patient survival in cardiac surgery care. However, patients should be viewed in a larger context, and nurses have to conduct integrated care of the whole patient [13]. Nurses have a close interaction with patients and their families and the rest of the multi-disciplinary team, and therefore a special responsibility to establish plans beyond hospital care. Our study results can impact several levels, such as both the education and clinical training in nursing. These findings can be useful for students and experienced nurses. In a clinical setting for nurses, new educational objectives could be implemented, such as raising a more direct focus on patient's employment and knowledge on RTW before leaving the hospital by a nurse-led conversation. Students in universities should be sensitised to learn more about RTW in cardiac surgical patients and the importance of RTW for all patient groups as a concept. Furthermore, the lack of knowledge on this topic indicates that more research is warranted to prevent long-term unemployment and improve care and follow-up after cardiac surgery.

LIMITATIONS AND STRENGTHS OF THE REVIEW

There are limitations to the findings of this review. It is possible that relevant articles were unidentified, even though the correct search terms were used. The search was only performed for English and Danish, Swedish and Norwegian languages, meaning that there could be articles in other languages that may provide additional insight into the subject.

Even though an RTW has been claimed as a reliable endpoint [96], directly measuring the first RTW does not describe the stability of work participation. Throughout the articles, several endpoints and follow-ups have been observed from 6 months up to 10 years. A limitation is that each country has its own set of rules and regulations when it comes to sick leave after surgery, and this could have an impact on the observations found in this review. Based on the results of our study, it seems that patients tend to stay on sick leave for longer than expected, and this has to be taken into account when deciding what follow-ups should be applied in future studies.

The strengths of our review were that we used blinded mode when screening articles in Rayyan, minimising the risk of bias. Furthermore, researchers repeated the search in January 2020 before submitting this article in order to identify new articles published during the year.

CONCLUSION

The postoperative rehabilitation phase after cardiac surgery is known to be demanding for patients, and it takes time until the patients are fully recovered. However, our review showed that the average RTWT across studies was significantly longer compared to the time indicated in the pre-operative information that was given to patients. Older patients, female patients, patients with previous psychological depression, and those with a low income and low level of education seem to be at higher risk of work absence and require more extended sick leave than other patient groups before resuming work. A multi-disciplinary and systematic approach is needed to identify patients at risk of no return or delayed RTW after CABG and AVR. Moreover, professional counselling should be part of the standard follow-up after cardiac surgery. The role of the nurse in assessing work-related issues before and after surgery is important from the perspective of the fundamentals of care. Even so, more knowledge is needed on specific interventions to improve RTW after CABG/AVR surgery. Thus, it is time to look beyond survival and to focus more on improved quality in nursing care aiming at higher resumption of work after cardiac surgery.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

AUTHOR CONTRIBUTION

Manuscript ID- SCS-2020-0332. Planning: All authors. Data collection: Michael Mortensen, Asgjerd Litleré Moi. Data analysis: All authors. Manuscript preparation: Michael Mortensen, Asgjerd Litleré Moi. Manuscript review: All authors.

ORCID

Michael Mortensen https://orcid.org/0000-0003-0445-2672

REFERENCES

1. Mendis S, Puska P, Norrving B, Organization WH. Global atlas on cardiovascular disease prevention and control. Geneva: World Health Organization; 2011.
2. Ford ES, Capewell S. Coronary heart disease mortality among young adults in the U.S. from 1980 through 2002: concealed leveling of mortality rates. J Am Coll Cardiol. 2007;50(22):2128–32.
3. Townsend N, Wilson L, Bhatnagar P, Wickramasinghe K, Rayner M, Nichols M. Cardiovascular disease in Europe: epidemiological update 2016. Eur Heart J. 2016;37(42):3232–45.
4. Nalysnyk L, Fahrbach K, Reynolds MW, Zhao SZ, Ross S. Adverse events in coronary artery bypass graft (CABG) trials: a systematic review and analysis. Heart. 2003;89(7):767–72.
5. Musumeci L, Jacques N, Hego A, Nchimi A, Lancellotti P, Oury C. Prosthetic aortic valves: Challenges and solutions. Front Cardiovasc Med. 2018;5:46.
6. Yacoub MH, Takkenberg JJM. Will heart valve tissue engineering change the world? Nat Clin Pract Cardiovasc Med. 2005;2(2):60–1.

7. Morís C, Pascual I, Avanzas P. Will TAVI be the standard of care in the treatment of aortic stenosis? Revista Española de Cardiología. 2016;69:1131–4.
8. OECD. Sickness, Disability and Work: Breaking the Barriers [Internet]. 2010. Available from: https://www.oecd-ilibrary.org/content/publication/9789264088856-en
9. Eurostat. Final report of the expert group on quality of life indicators. 2017.
10. Hiswåls A-S, Marttila A, Mälstam E, Macassa G. Experiences of unemployment and well-being after job loss during economic recession: Results of a qualitative study in east central Sweden. J Public Health Res. 2017. https://doi.org/10.4081/jphr.2017.995
11. Batic-Mujanovic O, Poric S, Pranjic N, Ramic E, Alibasic E, Karic E. Influence of unemployment on mental health of the working age population. Materia Socio Medica. 2017;29(2):92.
12. Lidwall U. Sick leave diagnoses and return to work: a Swedish register study. Disabil Rehabil. 2015;37(5):396–410.
13. Kitson AL. The fundamentals of care framework as a point-of-care nursing theory. Nurs Res. 2018;67(2):99–107.
14. Moi AL, Storli SL, Gjengedal E, Holme AN, Lind R, Eskerud R, et al. The provision of nurse-led follow-up at Norwegian intensive care units. J Clin Nurs. 2018;27(13-14):2877–86.
15. Sibilitz KL, Berg SK, Tang LH, Risom SS, Gluud C, Lindschou J, et al. Exercise-based cardiac rehabilitation for adults after heart valve surgery. Cochrane Database Syst Rev. 2016. https://doi.org/10.1002/14651858.cd010876.pub2
16. Kiel MK. Cardiac rehabilitation after heart valve surgery. PM&R. 2011;3(10):962–7.
17. Nichols M, Townsend N, Scarborough P, Rayner M. Cardiovascular disease in Europe: epidemiological update. Eur Heart J. 2013;34(39):3028–34.
18. Dekkers-Sánchez PM, Hoving JL, Sluiter JK, Frings-Dresen MH. Factors associated with long-term sick leave in sick-listed employees: a systematic review. Occupat Environ Med. 2008;65(3):153–7.
19. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. Int J Soc Res Methodol. 2005;8(1):19–32.
20. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation The PRISMA-ScR statement. Ann Intern Med. 2018;169(7):467–73.
21. Methley AM, Campbell S, Chew-Graham C, McNally R, Cheraghi-Sohi S. PICO, PICOS and SPIDER: a comparison study of specificity and sensitivity in three search tools for qualitative systematic reviews. BMC Health Serv Res. 2014;14(1):579.
22. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. Syst Rev. 2016;5(1):210.
23. Fonager K, Lundbye-Christensen S, Andreasen J, Futtrup M, Christensen AL, Ahmad K, et al. Work status and return to the workforce after coronary artery bypass grafting and/or heart valve surgery: a one-year-follow up study. Rehabil Res Pract. 2014;2014:1–6.
24. Butt JH, Rørth R, Kragholm K, Kristensen SL, Torp-Pedersen C, Gislason GH, et al. Return to the workforce following coronary artery bypass grafting: A Danish nationwide cohort study. Int J Cardiol. 2018;251:15–21.
25. Leahy JM, Hoagl B, Strange RG, Antevil JL. Effects of cardiac surgery on duty status in the active duty military population. Military Med. 2015;180(7):798–802.
26. Messmer BJ, Uebis R, Rieger C, Minale C, Hofstadter F, Effert S. Late results after intracoronary thrombolysis and early bypass grafting for acute myocardial infarction. J Thoracic Cardiovasc Surg. 1989;97(1):10–8
27. Munro WS. Work before and after coronary artery bypass grafting. J Soc Occupat Med. 1990;40(2):59–64.
28. Noyez L, de Jager MJ, Markou ALP. Quality of life after cardiac surgery: underresearched research. Interact CardioVasc Thoracic Surg. 2011;13(5):511–5.
29. Salzwedel A, Reibis R, Wegscheider K, Eichler S, Buhlert H, Kaminski S, et al. Cardiopulmonary exercise testing is predictive of return to work in cardiac patients after multicomponent rehabilitation. Clin Res Cardiol. 2016;105(3):257–67.
30. Voss M, Ivert T, Pehrsson K, Hammar N, Alexanderson K, Nilsson T, et al. Sickness absence following coronary revascularisation. A national study of women and men of working age in Sweden 1994–2006. PLoS ONE [Electronic Resource]. 2012;7(7):e40952.
31. Five-year clinical and functional outcome comparing bypass surgery and angioplasty in patients with multivessel coronary disease. A multicenter randomized trial. JAMA. 1997;277(9):715. https://doi.org/10.1001/jama.1997.03540330037032
32. de Canniere D, Jansens JL, Goldschmidt-Clermont P, Barvais L, Decroly P, Stoupel E. Combination of minimally invasive coronary bypass and percutaneous transluminal coronary angioplasty in the treatment of double-vessel coronary disease: Two-year follow-up of a new hybrid procedure compared with "on-pump" double bypass grafting. Am Heart J. 2001;142(4):563–70.
33. Engblom E, Hamalainen H, Ronnemaa T, Vanttinen E, Kallio V, Knuts LR. Cardiac rehabilitation and return to work after coronary artery bypass surgery. Qual Life Res. 1994;3(3):207–13.
34. Engblom E, Korpilahti K, Hamalainen H, Ronnemaa T, Puukka P. Quality of life and return to work 5 years after coronary artery bypass surgery. J Cardiopul Rehabil. 1997;17(1):29–36.
35. Hlatky MA, Boothroyd D, Horine S, Winston C, Brooks MM, Rogers W, et al. Employment after coronary angioplasty or coronary bypass surgery in patients employed at the time of revascularization. Ann Intern Med. 1998;129(7):543–7.
36. Kastanioti C. Costs, clinical outcomes, and health-related quality of life of off-pump vs. on-pump coronary bypass surgery. Eur J Cardiovasc Nurs. 2007;6(1):54–9.
37. Owens SG, Agnew J, Curbow B, Selnes O, Fitzgerald S. The association of neurocognitive decline and other variables with return to work, hobbies, and activities of daily living after coronary artery bypass graft surgery. Phys Occupat Therapy Geriatrics. 2010;28(4):348–59.
38. Boudrez H, De Backer G. Recent findings on return to work after an acute myocardial infarction or coronary artery bypass grafting. Acta Cardiol. 2000;55:341–9.
39. Davoodi S, Sheikhvatan M, Karimi A, Hossein Ahmadi S, Sheikhfathollahi M. Determinants of social activity and work status after coronary bypass surgery. Asian Cardiovasc Thorac Ann. 2010;18(6):551–6.
40. Hallberg V, Palomaki A, Kataja M, Tarkka M. Working after C study group. Return to work after coronary artery bypass surgery. A 10-year follow-up study. Scand Cardiovasc J. 2009;43(5):277–84.
41. Mark DB, Lam LC, Lee KL, Clapp-Channing NE, Williams RB, Pryor DB, et al. Identification of patients with coronary disease at high risk for loss of employment. A prospective validation study. Circulation. 1992;86(5):1485–94.

42. Mark DB, Lam LC, Lee KL, Jones RH, Pryor DB, Stack RS, et al. Effects of coronary angioplasty, coronary bypass surgery, and medical therapy on employment in patients with coronary artery disease. A prospective comparison study. Ann Intern Med. 1994;120(2):111–7.
43. Mehrdad R, Ghadiri Asli N, Pouryaghoub G, Saraei M, Salimi F, Nejatian M. Predictors of early return to work after a coronary artery bypass graft surgery (CABG). Int J Occupat Med Environ Health. 2016;29:947–57.
44. Perk J, Hedback B, Engvall J. Effects of cardiac rehabilitation after coronary artery bypass grafting on readmissions, return to work, and physical fitness. A case-control study. Scand J Soc Med. 1990;18:45–51.
45. Pocock SJ, Henderson RA, Seed P, Treasure T, Hampton JR. Quality of life, employment status, and anginal symptoms after coronary angioplasty or bypass surgery. Circulation. 1996;94(2):135–42.
46. Poston RS, Tran R, Collins M, Reynolds M, Connerney I, Reicher B, et al. Comparison of economic and patient outcomes with minimally invasive versus traditional off-pump coronary artery bypass grafting techniques. Ann Surg. 2008:248;638–46.
47. Sellier P, Varaillac P, Chatellier G, D'Agrosa-Boiteux MC, Douard H, Dubois C, et al. Factors influencing return to work at one year after coronary bypass graft surgery: results of the PERISCOP study. Eur J Cardiovasc Prevent Rehabil. 2003;10(6):469–75.
48. Schuster PM, Wright C, Tomich P. Gender differences in the outcomes of participants in home programs compared to those in structured cardiac rehabilitation programs. Rehabil Nurs. 1995;20(2):93–101.
49. Simchen E, Naveh I, Zitser-Gurevich Y, Brown D, Galai N. Is participation in cardiac rehabilitation programs associated with better quality of life and return to work after coronary artery bypass operations? The Israeli CABG Study. Israel Med Assoc J. 2001;3(6):399–403.
50. Skinner JS, Farrer M, Albers CJ, Neil HA, Adams PC. Patient-related outcomes five years after coronary artery bypass graft surgery. QJM. 1999;92(2):87–96.
51. Soderman E, Lisspers J, Sundin O. Depression as a predictor of return to work in patients with coronary artery disease. Soc Sci Med. 2003;56(1):193–202.
52. Speziale G, Bilotta F, Ruvolo G, Fattouch K, Marino B. Return to work and quality of life measurement in coronary artery bypass grafting. Eur J Cardio-Thoracic Surg. 1996;10(10):852–8.
53. Speziale G, Ruvolo G, Marino B. Quality of life following coronary bypass surgery. J Cardiovasc Surg. 1996:37(1);75–8.
54. Strauss B, Paulsen G, Strenge H, Graetz S, Regensburger D, Speidel H. Preoperative and late postoperative psychosocial state following coronary artery bypass surgery. Thorac Cardiovasc Surg. 1992;40:59–64.
55. Worcester MU, Elliott PC, Turner A, Pereira JJ, Murphy BM, Gr L, et al. Resumption of work after acute coronary syndrome or coronary artery bypass graft surgery. Heart Lung Circ. 2014;23(5):444–53.
56. Agren B, Ryden O, Johnsson P, Nilsson-Ehle P. Rehabilitation after coronary bypass surgery: coping strategies predict metabolic improvement and return to work. Scand J Rehabil Med. 1993;25(2):83–95.
57. Kon ZN, Brown EN, Tran R, Joshi A, Reicher B, Grant MC, et al. Simultaneous hybrid coronary revascularization reduces postoperative morbidity compared with results from conventional off-pump coronary artery bypass. J Thorac Cardiovasc Surg. 2008;135(2):367–75.
58. West D, Flather M, Pepper J, Trimlett R, Yap J, De Souza A. Improved recovery after the endoscopic atraumatic coronary artery bypass procedure compared with sternotomy for off-pump bypass of the left internal thoracic artery to the left anterior descending coronary artery: a case-matched study. Heart Surg Forum. 2004;7(6):E546–E550.discussion E546-50.
59. Bergvik S, Sørlie T, Wynn R. Coronary patients who returned to work had stronger internal locus of control beliefs than those who did not return to work. Br J Health Psychol. 2012;17(3):596–608.
60. Revault d'Allonnes F, Corbineau H, Le Breton H, Leclercq C, Leguerrier A, Daubert C. Isolated left main coronary artery stenosis: Long term follow up in 106 patients after surgery. Heart. 2002;87(6):544–8.
61. Bradshaw PJ, Jamrozik K, Gilfillan IS, Thompson PL. Return to work after coronary artery bypass surgery in a population of long-term survivors. Heart Lung Circ. 2005;14(3):191–6.
62. Geissler B, Aggestrup S. Qualitative assessment of pain relief and functional improvement after coronary bypass operation. [Danish]. Ugeskr Laeger. 2001;164(11):1506–10.
63. Lundbom J, Myhre HO, Ystgaard B, Bolz KD, Hammervold R, Levang OW. Factors influencing return to work after aortocoronary bypass surgery. Scand J Thorac Cardiovasc Surg. 1992;26(3):187–92.
64. Maznyczka AM, Howard JP, Banning AS, Gershlick AH. A propensity matched comparison of return to work and quality of life after stenting or coronary artery bypass surgery. Open Heart. 2016;3(1):e000322.
65. McGee HM, Graham T, Crowe B, Horgan JH. Return to work following coronary artery bypass surgery or percutaneous transluminal coronary angioplasty. Eur Heart J. 1993;14(5):623–8.
66. Pinto N, Shah P, Haluska B, Griffin R, Holliday J, Mundy J. Return to work after coronary artery bypass in patients aged under 50 years. Asian Cardiovasc Thorac Ann. 2012;20(4):387–91.
67. Samuels LE, Sharma S, Kaufman MS, Morris RJ, Brockman SK. Coronary artery bypass grafting in patients in their third decade of life. J Cardiac Surg. 1996;11(6):402–7.
68. Owens SG. Neurocognitive changes after coronary artery bypass graft surgery and effect on return to work, hobbies and activities of daily living [dissertation]. The Johns Hopkins University; 2002.
69. Burker EJ, Blumenthal JA, Feldman M, Burnett R, White W, Smith LR, et al. Depression in male and female patients undergoing cardiac surgery. Br J Clin Psychol. 1995;34(1):119–28.
70. Mittag O, Kolenda KD, Nordman KJ, Bernien J, Maurischat C. Return to work after myocardial infarction/coronary artery bypass grafting: patients' and physicians' initial viewpoints and outcome 12 months later. Soc Sci Med. 2001;52(9):1441–50.
71. Balady GJ, Williams MA, Ades PA, Bittner V, Comoss P, Foody JM, et al. Core components of cardiac rehabilitation/secondary prevention programs: 2007 update: A scientific statement from the American heart association exercise, cardiac rehabilitation, and prevention committee, the council on clinical cardiology; the councils on cardiovascular nursing, epidemiology and prevention, and nutrition, physical activity, and metabolism; and the american association of cardiovascular and pulmonary rehabilitation. Circulation. 2007;115(20):2675–82.
72. Rollin L, Gehanno J-F. Research on return to work in European Union countries. Occupat Med. 2012;62(3):210–5.

73. Andreasen JJ. Convalescence and sick leave following cardiac surgery. Ugeskr Laeger. 2009/10/10 ed. 2009;171(40):2910–3.
74. Mittag O, Kotkas T, Reese C, Kampling H, Groskreutz H, de Boer W, et al. Intervention policies and social security in case of reduced working capacity in the Netherlands, Finland and Germany: a comparative analysis. Int J Public Health. 2018;63(9):1081–8.
75. Preventing needless work disability by helping people stay employed. J Occupat Environ Med. 2006;48(9):972–87. https://doi.org/10.1097/01.jom.0000235915.61746.0d
76. Aas RW. Workplace-based sick leave prevention and return to work : exploratory studies [Internet]. [Stockholm]: Karolinska Institutet. 2011. Available from: http://hdl.handle.net/10616/40625.
77. Fleitman J, King Jr, JE. Postoperative complications among patients undergoing cardiac surgery [Internet]. Vol. 2019. UpToDate; 2019. Available from: https://www.uptodate.com/contents/postoperative-complications-among-patients-undergoing-cardiac-surgery
78. Devlin JW, Skrobik Y, Gélinas C, et al. Clinical practice guidelines for the prevention and management of pain, agitation/sedation, delirium, immobility, and sleep disruption in adult patients in the ICU [Internet]. Critical Care Med. 2018;825–73. Available from: https://www.ncbi.nlm.nih.gov/pubmed/30113379
79. Leinonen T, Viikari-Juntura E, Husgafvel-Pursiainen K, Solovieva S. Cause-specific sickness absence trends by occupational class and industrial sector in the context of recent labour market changes: a Finnish panel data study. BMJ Open. 2018;8(4):e019822.
80. Dougherty AH. Gender balance in cardiovascular research: importance to women's health. Texas Heart Institute J. 2011;38(2):148.
81. Mehran R, Vogel B, Ortega R, Cooney R, Horton R. The Lancet Commission on women and cardiovascular disease: time for a shift in women's health. Lancet. 2019;393(10175):967–8.
82. Johnston A, Mesana TG, Lee DS, Eddeen AB, Sun LY. Sex differences in long-term survival after major cardiac surgery: a population-based cohort study. J Am Heart Assoc. 2019;8(17):e013260.
83. Furukawa N, Kuss O, Aboud A, Schönbrodt M, Renner A, Hakim Meibodi K, et al. Ministernotomy versus conventional sternotomy for aortic valve replacement: matched propensity score analysis of 808 patients. Eur J Cardio-Thoracic Surg. 2014;46(2):221–7.
84. De Backer O, Søndergaard L. Challenges when expanding transcatheter aortic valve implantation to younger patients. Front Cardiovasc Med. 2018;5:45.
85. Burgard SA, Lin KY. Bad jobs, bad health? How work and working conditions contribute to health disparities. Am Behav Sci. 2013;57(8):1105–27.
86. Taylor SE, Seeman TE. Psychosocial resources and the SES-health relationship. Annals N Y Acad Sci. 1999;896:210–25.
87. van Zon SKR, Reijneveld SA, Mendes de Leon CF, Bültmann U. The impact of low education and poor health on unemployment varies by work life stage. Int J Public Health. 2017;62(9):997–1006.
88. Eurostat. Regional GDP per capita ranged from 31% to 626% of the EU average in 2017 [Internet]. Palen R, editor. https://ec.europa.eu/eurostat/; 2017. Available from: https://ec.europa.eu/eurostat/documents/2995521/9618249/1-26022019-AP-EN.pdf/f765d183-c3d2-4e2f-9256-cc6665909c80
89. Waddell G, Burton AK. Is work good for your health and well-being? 2006.
90. Virtanen M, Kivimäki M, Vahtera J, Elovainio M, Sund R, Virtanen P, et al. Sickness absence as a risk factor for job termination, unemployment, and disability pension among temporary and permanent employees. Occupat Environ Med. 2006;63(3):212–7.
91. Vahtera J, Pentti J, Kivimäki M. Sickness absence as a predictor of mortality among male and female employees. J Epidemiol Commun Health. 2004;58(4):321–6.
92. Kivimäki M, Head J, Ferrie JE, Shipley MJ, Vahtera J, Marmot MG. Sickness absence as a global measure of health: evidence from mortality in the Whitehall II prospective cohort study. BMJ. 2003;327(7411):364.
93. Ferrie JE, Vahtera J, Kivimäki M, Westerlund H, Melchior M, Alexanderson K, et al. Diagnosis-specific sickness absence and all-cause mortality in the GAZEL study. J Epidemiol Commun Health. 2009;63(1):50–5.
94. Westbrook JI, Duffield C, Li L, Creswick NJ. How much time do nurses have for patients? A longitudinal study quantifying hospital nurses' patterns of task time distribution and interactions with health professionals. BMC Health Serv Res. 2011;11:319.
95. Supervia M, Turk-Adawi K, Lopez-Jimenez F, Pesah E, Ding R, Britto RR, et al. Nature of cardiac rehabilitation around the globe. EClinicalMedicine. 2019;13:46–56.
96. Giaquinto S, Ring H. Return to work in selected disabilities. Disabil Rehabil. 2007;29(17):1313–6.
97. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med. 2009;6(7):e1000097.

How to cite this article: Mortensen M, Sandvik RK, Svendsen ØS, Haaverstad R, Moi AL. Return to work after coronary artery bypass grafting and aortic valve replacement surgery: A scoping review. Scand J Caring Sci. 2021;00:1–17. https://doi.org/10.1111/scs.13006