



Return to Work following Myocardial Infarction: A Welder's Case Report

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Abstract. The return to work assessment is crucial for the employee following a cardiac event. The process of returning to work is intricate and multifaceted, influenced by numerous factors. In this case, six months post-event, the management sought to reinstate the employee to his previous position. Objective: This study aims to conduct the risk assessment to determine the feasibility of resuming employment by analyzing multiple aspects. A comprehensive medical evaluation and understanding of the workplace are crucial to prevent recurrence or exacerbation upon reentry to work. Methods: This is a case report of a 48-year-old male from the year 2020. He is employed as a welder at a stainless-steel processing plant and experienced chest pain, palpitations and weakness during his work. The patient was diagnosed with acute myocardial infarction (MI). Subsequent to this diagnosis, percutaneous transluminal coronary angioplasty (PTCA) was conducted. Result: Based on anamnesis, the employee has not reported any problems in the last three months. Risk evaluations that involve a physical examination, tolerance, disability status, potential hazards to himself, coworkers, and the workplace provide positive outcomes. Conclusion: A six-month post-PTCA return to work has been approved for the worker based on his health state. This status will be reviewed in three months to evaluate work efficacy and any job-related complaints.

Keywords: Return to work, Myocard infarct, Welders.

1 Introduction

Cardiovascular disease (CVD) represents a major global health concern, serving as the leading cause of illness, morbidity, and a considerable contributor to mortality and early death [1,2]. CVD refers to a collection of illnesses affecting the heart and blood vessels, including coronary heart disease (CHD) [1]. The disease was responsible for approximately 19.1 million deaths worldwide in the year 2020 [2]. The initial clinical

sign of CHD is the myocardial infarction (MI), with chest pain as the main complaint [3,4]. MI occurs when a coronary artery is obstructed or nearly occluded, leading to a substantial decrease in blood flow. Decreased coronary blood flow results in myocardial ischemia [3-5]. A systematic review conducted by N. Salari et al. indicates that the worldwide incidence of MI in people younger than 60 years old was 3.8%, whereas it increased to 9.5% in those over 60 [6].

The majority of cases of CHD are seen in industrialized countries; nevertheless, its presence is also frequently found in developing countries [3,6]. In Indonesia, according to the 2013 and 2018 Basic Health Research (Indonesia: Riskesdas) data, the prevalence of the disease has increased from 0.5% in 2013 to 1.5% in 2018 [7]. CHD has a substantial economic impact. In 2021, the health and social care systems of the EU incurred a €77 billion expense due to coronary heart disease. Healthcare accounted for 37% of the total cost of CHD, while 2% was attributed to social care, 24% to productivity loss, and 37% to informal care [8]. Similar situation in Indonesia, in 2023 accounted for the most funding, totaling IDR 22.8 trillion [7].

CHD is becoming more prevalent among the working-age population [9-11]. Research has demonstrated that severe cardiovascular disease can contribute to a reduction in workability, which can result in early retirement, disability, and an increased risk of cardiovascular disease mortality [9,12]. Return to work (RTW) is crucial for the establishment of a sense of normalcy, which can contribute to self-esteem, social identity, and quality of life [10-13]. Employment correlates with enhanced health and wellbeing [14]. Unemployed individuals exhibit elevated rates of premature mortality, increased risk of coronary heart disease, higher prevalence of depression along with financial difficulties [13,14]. Consequently, assessing the return to work following a MI event is crucial.

The return to work is of enormous societal relevance, because MI is associated with significant expenditures that emerge from patients' work absenteeism [11,15]. However, the process of returning to work is intricate and influenced by a variety of factors [16,17]. RTW after MI has been associated with medical characteristics, demographic distributions, individual characteristics, and certain barriers, including physical limitations, mental well-being and assistance within health and social services systems [11,12,14,16,17]. The ability of an individual with a MI to continue working may be contingent upon the physical and intellectual demands of the job. Jobs are exceedingly diverse, necessitating individual evaluation [15]. Recognition of the primary effective variables in the RTW process may prevent the loss of workdays at work [9,11,14]. Consequently, it is crucial that physicians are informed of the effective causes and resume work in accordance with the determinant indices of MI.

The purpose of this case report is to perform a risk assessment to evaluate the viability of resuming employment through the analysis of various factors. A thorough case study of a MI patient and the guided use of the various risk assessment components are included in this paper. It is imperative to conduct a comprehensive understanding

of the work environment and medical assessment, in order to prevent recurrence or deterioration upon returning to work.

2 Case Description

A 48-year-old male worker reported experiencing chest pain, palpitations, weakness, and diaphoresis while employed as a stainless steel welder. Following physical examination, treadmill testing, and echocardiography, the patient was diagnosed with acute MI, and percutaneous transluminal coronary angioplasty (PTCA) was conducted. Two weeks post-PTCA, the employee resumed work, performing administrative tasks for four hours at the workplace. Four weeks later, the worker was able to log 8 hours daily as an administrative organizer of goods at the warehouse. Following six months of PTCA, the company's management sought to reinstate the worker to his old position as a stainless- steel welder and consulted the occupational physician for the decision of return to work.

3 Assessment for Return to Work

The following are the stages for conducting RTW:



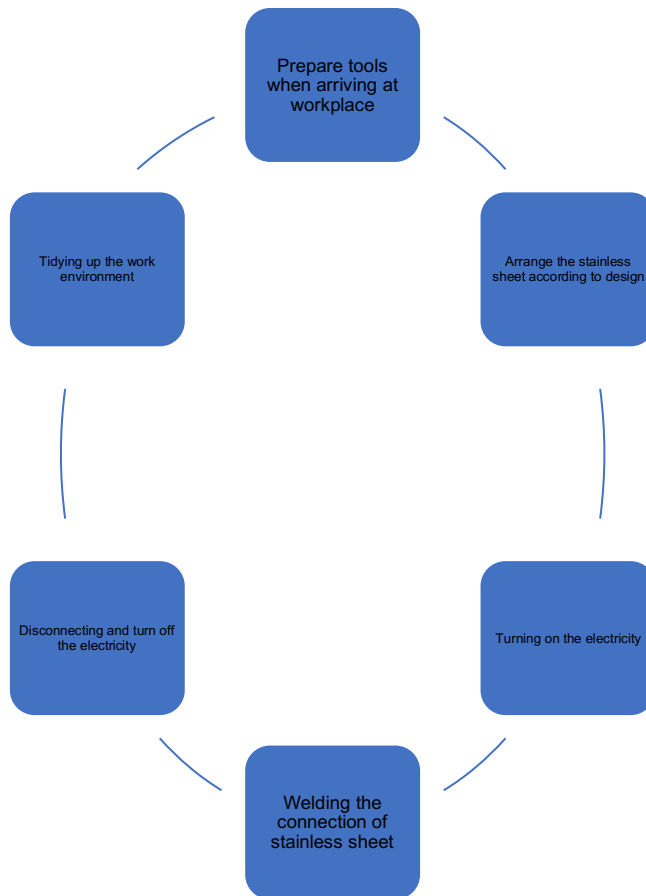
4 Job Description

4.1 Task Description

Workers are stainless steel welders on a machine construction project team. One team includes a machine designer, welders, grinders, quality control, and a supervisor. Welders are responsible for cutting the stainless- steel sheet components and integrating them in alignment with the specified design parameters. Workers do not have contact with the public. Workers must travel to clients' locations both inside and outside of the country while building big machinery that requires assembly.

The work area is 100 x 250 x 8 meters and has adequate ventilation; yet, the welding process produces heat. Workers are free to unwind and drink between jobs. Workers are occasionally asked to work at heights equal to the height of the machine being built. Some tank-shaped machine components may need the worker to work inside the tank, which is a confined space. Work starts at 7:00 a.m., with breaks at 12:00 and 13:00, and lasts until 16:00. The worker commute to work on a motorcycle, which take about 5 - 10 minutes.

4.2 Activities as a Welder



4.3 Use of Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE)

Smooth leather gloves.
Safety Shoes
Uniform shirt
Welding helmet
Filter mask to prevent fumes

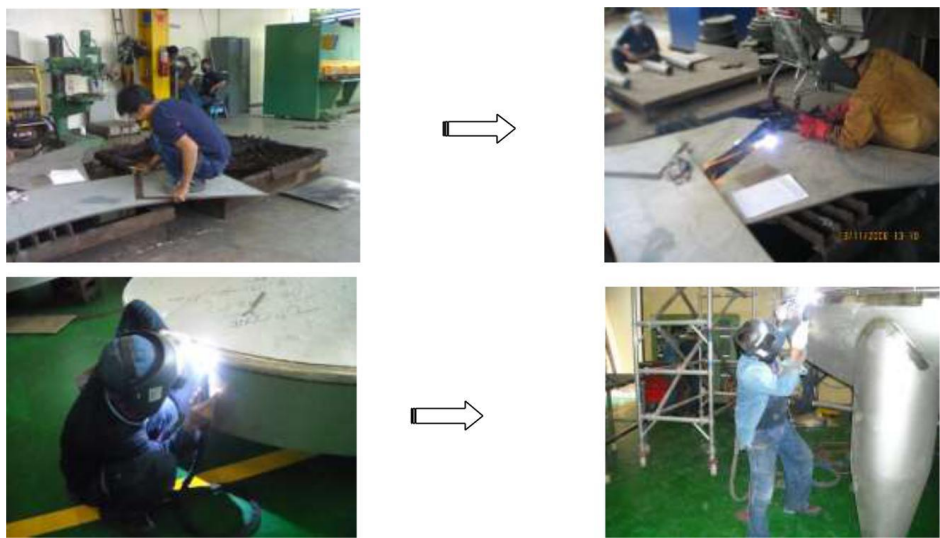


Figure 1. Procedure Machine building work procedure in welding sector.



Figure 2. Workspace / welding area

4.4 Potential Hazard in Welding

Physical Hazard	Chemical Hazard	Biological Hazard	Ergonomical - Psychosocial Hazard	Accident Hazard
Ultraviolet (UV) radiation exposure that causes skin cancer and burns. A brief exposure to ultraviolet light known as "welder's flash" can cause temporary eye enlargement and fluid discharge, as well as temporary blindness. High noise from welding apparatus, power sources, and processes Chronic exposure to UV radiation may result cataract or pterygium.	Irritation of lungs due to heat and UV radiation Zinc fumes can cause metal fume fever, a brief disease comparable to flu. Possible contact with metals such as chromium, nickel, steel, cadmium, shielding bases (including carbon dioxide, argon, and helium), and manganese. Bronchitis and lung fibrosis as a result of mineral dusts or vapors Chronic exposure to beryllium results in pulmonary granulomatous disease.	No substantial biological exposures are anticipated.	Common musculoskeletal problems include back pain, fatigue from prolonged standing, sprains from carrying heavy machines or metal products Pain in the wrist, elbow, or shoulder joint as a result of repetitive motion while supplying material (Repetitive Strain Injury - RSI) Job demand Poor support/relationships with the supervisor, colleagues Job dissatisfaction (Inadequate reward and recognition) Poor work organization Bullying in the workplace	Injuries resulting from sparks or hot metal entering the creases of rolled-up sleeves, pant cuffs, or work boots Falls while working on ladders, above ground, or in restricted areas. Fire or explosion brought on by welding sparks coming into touch with flammable materials Electric shock from extra moisture and contact with "electrically hot" metal objects Flying debris, acids or caustic liquids can cause injuries to the eyes and face

4.5 Job demand

Job Demand
Physical Capacity: Welding labor is classified as light category work, requiring metabolic equivalents (METs) ranging from 2.2 to 3.4. Workers must also be able to handle a 3 kg welding rod for extended periods of time and lift stainless steel sheets weighing up to 30 kg in groups. Mobility: The workers must be able to walk at a rate of about 2 miles per hour (3 METs), as well as sit and stand, without help or complaint. Workers must also be able to climb stairs (3.6 - 6.3 METs). Sensing: The worker has to be able to identify variations in temperature (excellent skin sensitivity), hear normal conversation, and have vision at least 6/18 with or without correction. Balance: Ability to stand, walk, sit, and change positions without intervention. Motor skills: The worker can grab the welding rod tightly and direct it to the proper location on the material to be welded. Communication: Capable of effectively communicating with coworkers, providing and understanding information, and carrying out orders. Mental aspects: The worker can follow instructions and handle work-related obligations without experiencing significant complaints. Organizational aspects: The worker can work in a team. Work Environment aspects: The worker exhibits the capacity to use the appropriate personal protection equipment and work steadily at heights. Sometimes, workers must do activities in cramped areas, and they should alert others when they notice indicators of oxygen deprivation (ejection fraction normal or greater than 50%). Employees must have the ability to travel great distances by air, sea, or land. (6 METs) Temporal aspect: The worker can work at least 8 hours every day with a one-hour break period. Ergonomic aspects: The worker can adjust to the workplace design. Can perform grabbing movements, focussing the welding rod, bending, crouching, sitting, and standing as needed without discomfort.

4.6 Worker's Health Condition

Anamnesis (6 months following PTCA). For the last three months, the employee has not complained of any symptoms, including chest pain, weariness, or tightness. The worker is able to ride a motorcycle and can run for around fifteen minutes in the afternoon without experiencing any problems. The worker can move up and down about 15 to 20 stairs without experiencing any pain. He does not smoke and always takes their medications as directed by their doctor. Additionally, all of the abilities needed for the prior role can be used without any changes or restrictions.

Physical examination. Blood pressure is 140/80 mmHg, and the heart rate is 83 beats per minute. Heart and lungs within the normal range, muscle tone and motor movements are within the normal range.

Final treadmill outcome. Functional class: I, Aerobic class: 10.17 METs, and Fitness class: Sufficient.

Echocardiogram findings. Normal EF is greater than 50%. Findings from completing the Stress Diagnosis Survey (SDS) questionnaire: showed no signs of stress at work.

Treatment. Ascardia 1x80 mg, Maintate 1x5 mg, Atorsan 1x20 mg, Flavix 1x1 tab, and Notrocaf retard 3x1

Disability Status Determination. Impairment:/Disability: none, Handicap: none.

Potential Hazards to Self, Colleagues, or the Environment Based on the history, physical examination, and supporting assessment. There are no symptoms or signs indicating that the worker requires special needs or adjustments to the environment or among coworkers. There is no desire to endanger himself or his colleagues.

Tolerance. The worker expresses a desire to return to work, which is supported by managers and coworkers who are ready to reintegrate the individual into the project.

Workability Status. The evaluation results indicate that the worker may do the original duties without compromising their medical condition. This is predicated on the subsequent considerations:

1. The worker is a post-PTCA myocardial infarction patient with no present subjective problems.
2. The job description and work environment necessitate a worker with no subjective complaints, a
3. minimum of 6 METs, functional class I, and a low risk for re-

infarction.

3. The worker is currently in satisfactory condition, exhibiting no complaints, with grade I hypertension.
4. Treadmill results indicate METs of 10.17, corresponding to functional class I, and a minimal risk for re-
5. infarction, with no inclination towards occupational stress.
6. There is no opposition or reluctance from employees, supervisors, colleagues, or the work environment
7. on the prospect of resuming employment as a stainless steel welder.

This status will be revisited in three months to assess the effectiveness of work and any job-related complaints. Workers should be advised about the following:

- a. Engage in physical activity of low to moderate intensity on a weekly basis, preferably three to five
- b. times. Swimming and vigorous walking are viable exercises.
- b. Strive to consume five servings of fruits and vegetables each day.
- c. Maintain a blood pressure of 140/90 mm Hg.

5 Discussion

The Return to Work (RTW) program is a crucial element of occupational health services and community-based rehabilitation systems, as the workplace is acknowledged as a potentially hazardous environment [15]. This program is effective in minimizing the economic and human costs linked to work-related injuries and illnesses, thereby promoting optimal physical conditions and recovery. The process of returning to work after MI is complex and affected by several sociodemographic and other factors. Age is the principal predictor of the sociodemographic variable. In most previous studies, age was recognized as a predictor variable for reemployment [9,14,17,18]. Gender and lower levels of education [11,14,17,19] are also significant factors. The other predictor for RTW are cardiac risk factors, psychological and occupational factors.

Cardiac Risk Factors [16, 18, 20, 21]

Certain cardiac variables may influence work capacity and/or elevate the likelihood of recurrent cardiac events, potentially interacting with specific working conditions such as residual ischemia and diminished left ventricular ejection fraction, which reduces return-to-work prevalence estimates. A left ventricular ejection fraction of less than 40% indicates that operating under strenuous conditions is hazardous. Work-related stress can induce arrhythmia (irregular heart rate) and tachycardia (excessively rapid heart rate). Untreated or treatment-resistant hypertension is deemed harmful when above 160/100 mmHg, significantly elevating the patient's risk of a repeat cardiac event. Smoking cessation is also essential for preventing cardiac events [22].

The Psychosocial Factors [9,10,12,19,23]

The psychological aspects of returning to work following a cardiac incident are the most significant and determining variables. This includes post-MI anxiety and despair, job stress, motivation to return to work, and patient impression of disease severity. RTW is associated with higher mean HRQoL (healthrelated quality of life) score [12] Chronic stress in the workplace is a consequence of high demands and limited decision-making capacity. Insufficient support from coworkers or supervisor and external factors/social factors (such as financial and socioeconomic circumstances, life events, and work stress) also associated with a increased risk for recurrent major cardiac events. Therefore, support from spouses or family and stress management training play a crucial role in the rehabilitation process.

Occupational Factors [9],[24-27]

Certain occupational exposures have long been recognized as factors that can exacerbate the heart disease. Physical hazard such as noise and extreme temperatures have been associated with a heightened risk of acute cardiovascular events and hypertension. Chemical hazards, e.g., passive smoking, carbon monoxide, small particles ($<2.5\ \mu\text{m}$) may transiently elevate the risk of MI. The correlation between metal fume exposures and heightened risks of acute myocardial infarction are increasingly clear, especially in the context of metal welders [26]. Results from a large Danish study including male manufacturing workers involved in stainless-steel welding were similar in size to those from a Canadian study and an analysis of "welding and flame cutting occupations" found similar overall excess risks [26,27]. Shift work adversely impacts cardiovascular disease, both directly and indirectly through detrimental lifestyle choices. Ergonomic hazards, particularly those involving physically demanding tasks like lifting, are deemed hazardous primarily when performed irregularly by individuals with inadequate physical stamina. During an 8-hour workday, it is recommended that physical exertion remain below 30–40% of maximum VO_2 . Psychosocial hazard, including job demand/job strain, poor support/relationships with the supervisor or colleagues, and job dissatisfaction, significantly influence the risk of CHD.

In order to verify the patient's working capacity, particularly in physically demanding occupations, it is imperative to evaluate the job and workplace condition, as well as the worker's capabilities [16, 28]. The work demand can be categorized into four categories based on the metabolic equivalent (METs): <3 METs of very light work, 3–5 METs of light work, 5–7 METs of moderate work, and >7 METs of heavy work [28, 29]. METs is frequently cited in many protocols as a primary reference for assessing each individual's risk level [29].

According to The Compendium of Physical Activities 2024, welding necessitates only 3.5 METs for this task. The results of this patient's exercise test indicated that he was capable of performing the work. The Compendium of Physical Activities is a comprehensive catalog of metabolic equivalent (MET) intensity ratings for various physical activities, including occupational tasks [30].

Furthermore, according to cardiac risk stratification protocols published by various organizations, including the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR), the American Heart Association (AHA), the Brazilian Society of Cardiology (SBC), the Société Française de Cardiologie (SFC), and the Spanish Society of Cardiology (SEC), this patient is classified as low risk [23,

29,31] This category is based on the update of the worker's health condition: a MET value of 10.7, an ejection fraction greater than 50%, absence of chest pain and other symptoms, as well as a stable heart rate and adequate blood pressure. Cardiac risk stratification entails a comprehensive evaluation of the patient's clinical and functional status to classify the individual into a designated risk category (low, moderate, or high) [29].

It is crucial to assess the job setting, demands and patient's condition. Potential hazards present in the workplace for this worker include exposure to metal welding fume particles and as well as increased decibel levels caused by arc welding machinery, power supplies, and related operations. Both can elevate the risk of a cardiac event for the worker. Therefore, these hazards should be addressed with caution, and workers should utilize the appropriate personal protective equipment as well. Furthermore, it is important to consider the degree of job satisfaction, physical strain, and the occurrence of conflicts in the workplace. Following the findings from the Stress Diagnosis Survey (SDS) questionnaire, which indicated an absence of workplace stress, the assessment of potential hazards to self, colleagues, or the environment revealed no symptoms or signs suggesting that the worker requires special needs or environmental adjustments. Furthermore, the worker has expressed a desire to return to work, a sentiment supported by managers and colleagues who are prepared to reintegrate the individual into the project. This indicates that the worker is in a favorable psychological condition and ready for return to the work.

After an acute MI, patients who do not have complications like left ventricular dysfunction can return to prior jobs. Two weeks of sick leave are advised for light office work, three weeks for average manual labor, and six weeks for physically demanding work [21]. After a year, 80% of workers who were hospitalized for MI, coronary artery bypass graft surgery (CABG) or percutaneous coronary intervention (PCI), have generally returned to their jobs [16]. Timing and return-to-work rates differ markedly across countries; the median period is 50 days, while return to work rates within a year range from 60% to 93% in Danish study [32]. According to the SR study, estimates of RTW prevalence increased gradually, rising from 47.3% at three months to 88.0% at six months [17].

Based on the worker's health condition, as determined by anamnesis, physical examination, and additional supportive assessments, a six-month post-PCTA return to work has been authorized for this worker. In order to assess the efficacy of the work and resolve any job-related concerns, this status will be reviewed in three months. The worker should receive guidance on various preventive measures, including engaging in physical activities, maintaining a healthy diet, quitting smoking and adhering to treatment plans.

6 Conclusion

Returning to work is a complex and multi-factorial process. Clinical, psychosocial, and occupational elements are among the several predictors of returning to work that have been demonstrated exist. Decision of RTW for the employees should take all of factors into account. A successful return to work required a varied approach. The main objective of a medical evaluation for return to work is to ascertain that the worker can execute the required tasks efficiently while not jeopardizing their own health and safety or that of others. Avoiding recurrence or worsening upon return to work depends on a complete medical examination and understanding of the workplace. Effective return to work will become a realistic goal by removing several barriers.

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