

# Factors Influencing Return-to-Work in Myocardial Infarction Patients: A Review

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## Abstract

Coronary heart diseases, commonly manifesting as Myocardial Infarction, remains as a leading cause of death and disability worldwide. It also contributes to the rising economic burden, with an overall cost expenditure reaching \$219 billion every year in the United States. Therefore, prompt return-to-work following myocardial infarction is needed to reduce this financial burden. However, there is a lack of study investigating how variables are linked to return-to-work rate in these patients. This study aims to provide a review of the factors that affects return-to-work duration and quality in previous researches. It is expected that this literature may serve as a guide for physicians and stakeholders to place more focus on patients with factors leading to less favorable conditions.

Keywords: return to work; myocardial infarction; coronary heart disease

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## 1. Introduction

Globally, cardiovascular disease (CVD) is a leading cause of death and disability, with an estimate of up to 18,6 million death in 2019 [1]. However, not only does it pose a threat to the health sector, the world also sees a rising economic burden due to CVD. The Centers for Disease Control and Prevention (2021) reported that approximately 660.000 heart disease cases resulting in morbidity occurs in the United States every year [2]. It is also reported that the overall cost expenditure reaches \$219 billion every year. Of these figures, the majority is attributed to coronary heart diseases (CHD).

Myocardial infarction (MI) is one of the most common clinical manifestations of coronary heart disease. It is caused by obstruction of blood flow to the myocardium, leading to decreased oxygen input and eventually myocardial necrosis [4]. Symptoms of MI range from fatigue, nausea, dyspnea, to pressure-like chest pain that radiates to the jaw, shoulder, or arm. Percutaneous Coronary Intervention (PCI) is one of the primary acute treatments used for reperfusion. It is a nonsurgical and invasive method to reduce coronary artery occlusions [3]. Treatment by PCI would require a patient to take time off from work.

Figueredo et al. (2020) has defined return-to-work (RTW) as a multidimensional behavior that is predominantly affected by psychosocial factors rather than medical [5]. Ensuring RTW in patients is essential as recovering patients would have to readjust themselves in their working environment while adapting to their health-related situations. It serves as an indicator of transition between the state of being ill and being well [6]. A successful RTW has been associated with more positive mental and physical functioning. Subsequently, it can be said that RTW has a significant impact on patient's quality of life.

There have been limited researches studying the factors affecting RTW duration. This article aims to provide a review and summary of previous studies regarding this matter. It is expected that researchers, physicians, and stakeholders may benefit from this review in terms of managing MI cases.

## 2. Method

A comprehensive search of the keywords or phrases 'return to work' and 'myocardial infarction' was carried out with electronic databases such as PubMed, ScienceDirect, and Google Scholar. The inclusion criteria includes reviews and observational studies that address the factors affecting RTW outcomes in MI patients. The publication year was limited from 2013 to 2023 to ensure relevance. No ethical approval was needed as this study reviews existing studies.

## 3. Results

Myocardial Infarction (MI) occurs when oxygenation to the myocardium is impaired due to acute obstruction of the coronary arteries [4]. The process begins when an atherosclerotic plaque in the coronary arteries ruptures and causes an occlusion, leading to reduced oxygenation. In this condition, ATP is not able to be produced and triggers the ischemic cascade [7]. Prolonged ischemia causes liquefactive necrosis to occur, and thus cell death of the endocardium.

As MI affects the coronary arteries, its risk factors are similar to those of coronary artery disease (CAD). Modifiable risk factors have been mentioned to include smoking, abnormal lipid profile, hypertension, diabetes mellitus, abdominal obesity, psychosocial factors, and lack of physical activity [8]. While non-modifiable risk factors are older age, male gender, and genetic susceptibility [4].

Acute management of MI usually involves reperfusion through percutaneous coronary intervention (PCI), followed by management through lifestyle modification and administration of statins to lower lipid levels, antithrombotic agents, as well as beta blockers and/or ACE inhibitors [7]. Following treatment, patients are expected to be able to function back as well as they do before disease onset. This includes the capability to return to work (RTW). RTW has been mentioned as a multidimensional behavior which is an indicator of health in a patient [5]. Previous researches have revealed that it is more affected by psychosocial factors rather than medical ones. However, this may vary between countries due to the differences in working culture, attitude of society, and overall socio-demographic situation [9].

Previous studies have formulated several classifications on the duration of RTW following MI. One of which classified patients into those returning early (within 3 months post-discharge) and late (over 3 months post-discharge) [10]. Mirmohammadi et al. (2016) also reported that the mean time of return to work in MI patients is 6 weeks [11].

RTW can be affected by numerous factors, such as age, gender, work demand, and more [12]. In general, predictors of RTW post-PCI can be divided into 3 groups: medical and patient factors, psychosocial factors, as well as job and economic related factors.

### 3.1. Medical and Patient Factors

Medical and patient factors include patient's age, gender, severity of disease, risk factors, poor left ejection fraction (LVEF), and low physical activity capacity.

The association between age and RTW duration has been mentioned in numerous studies. Sun et al. (2022) found that those who are younger have a better likelihood of returning to work earlier [13]. It is suggested that this could be due to the rising risk of MACE (Major Adverse Cardiovascular Event) as age increases,

resulting in difficulties for those with older age to return to work. Smedegaard et al. (2017) and Savitsky et al. (2020) respectively discovered that older patients are more likely to RTW within 3 months but less likely to do so within 1 to 2 years compared to younger patients [14][15]. This trend may be due to a higher motivation to maintain employment in older individuals as they may face difficulties in finding new job opportunities due to their age [15]. In contrast, in a study conducted at 53 hospitals across China, it is revealed that older patients are more likely to not return to work within 3 months [6].

Previous studies have demonstrated that women are less likely to RTW following MI [14][15][16]. One of the reasons might be that women take on a larger caregiving role within the family [9]. Particularly in Asian culture, women are expected to manage household chores, such as cooking, house cleaning, and serving their husbands, while also contributing to the family's financial stability. These gender expectations may lead to greater mental burden and lower quality of life for women [9]. In context of societal gender expectations, men may also achieve faster RTW due to the perception of their role as the 'breadwinner' within the family [16]. As men are expected to earn the majority of the household's earnings, this pressures them to recover faster resulting in a more successful rate of RTW [6].

Several earlier findings reported that unlike non-medical factors, clinical factors such as infarction site, completeness of reperfusion, and left ventricular ejection fraction (LVEF) did not significantly affect probability of RTW. However, results from a study by Mirmohammadi et al. (2014) indicated that LVEF is one of the major predictors of RTW in patients [11]. Another study also revealed that patients with an ejection fraction of <40% tend to have worse self-perceived health, longer RTW, and overall mortality [17]. Meanwhile, Hu et al. (2023) also presented similar findings where patients with LVEF of  $\geq 50\%$  exhibited up to twice higher RTW rate than those with lower LVEF [16].

Risk factors of MI such as smoking, diabetes, and dyslipidemia have been shown to affect RTW rate as well. Both a history of or current smoking has been associated with lower probability of RTW [6][9]. Sun et al. (2022) added that individuals who stopped smoking have a better likelihood of RTW than active smokers. This is due to the fact that smoking is one of the most significant risk factors of cardiovascular events [13]. It is also linked to poor socioeconomic status and psychological health, which is in turn associated with poor lifestyle habits. Aside from that, comorbidities, particularly diabetes and dyslipidemia, was shown to induce higher probability of not returning to work [9][13]. This might be due to the fact that these diseases are closely linked to the pathophysiology of MI and is thus an indicator of worse patient health status. Additionally, more comorbidities may result in patients less likely to RTW within 3 months [13].

### 3.2. Psychosocial Factors

Psychosocial factors were mentioned as the patient's mental status, perception of disease, and self-motivation to return to work [10]. The presence of adequate social support may affect the decision of work resumption. A previous study reported that this could be indicated by marital status [10]. Single patients were found to exhibit a higher percentage of not returning to work, which may be due to the absence of responsibility to a significant other. Other studies also demonstrated that the presence of a spouse was associated with better likelihood of RTW [9][15].

Tulloch et al. (2014) mentioned that there is a bidirectional relationship between PTSD and cardiac events, meaning that PTSD contributes to cardiovascular events while cardiovascular events may lead to PTSD and trauma [18]. This population is at a higher risk of recurrence and mortality. Moreover, it has been explained that poor psychological health is linked to poor lifestyle habits, such as lower physical activity, smoking, and poor diet, and is thus linked to an increased risk of cardiac events [19].

### 3.3. Job and Economic Related Factors

Work environment may be a determining factor of patient's RTW, as demonstrated by previous researches. White collar workers, or those with more administrative jobs, were found to be more likely to resume work [14]. Additionally, it is discovered that patients with more mentally demanding jobs have almost 3 times a greater likelihood of RTW than those with more physically demanding jobs [16]. Physical limitations following disease remission is one of the major causes for this.

Aside from work type, it was explained that higher income positively predicts RTW [14]. This is because generally, employees of low-income jobs have less autonomy over their working environment, creating a higher degree of stress and ultimately the decision of not returning to work. Similarly, Savitsky et al. (2020) also found that having lower income increases the likelihood of not returning to work. They explained that while it is not always the case, lower income jobs are more likely to be more physically demanding. Therefore, returning to work in this case would be more difficult, resulting in hindered RTW [15].

## 4. Conclusion

Myocardial Infarction (MI) is a leading cause of death and disability worldwide. It has also contributed to the escalating economic burden within the health sector. A prompt return-to-work (RTW) following MI treatment may help to reduce this economic loss. However, there is still only a limited amount of study that observes this phenomenon. This article has reviewed the factors that may either prolong or fasten RTW based on previous literatures. There have been differences in discovery, which may be attributed to the differences in societal norms and working culture. To better understand the factors affecting RTW, a comprehensive research employing a large number of samples may be needed. It is hoped that the results of these findings could help guide health practitioners and stakeholders in determining policies best suited to reduce the economic and social burden of MI.

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## References

- [1]G. A. Roth et al., "Global Burden of Cardiovascular Diseases and Risk Factors, 1990-2019: Update From the GBD 2019 Study," *Journal of the American College of Cardiology*, vol. 76, no. 25, pp. 2982–3021, Dec. 2020, doi: <https://doi.org/10.1016/j.jacc.2020.11.010>.
- [2]CDC, "Health Topics - Heart Disease - POLARIS," Centers for Disease Control and Prevention, Aug. 17, 2021. <https://www.cdc.gov/policy/polaris/healthtopics/heartdisease/index.html>
- [3]M. Ahmad, P. Mehta, Anil, and Sudhir Mungee, "Percutaneous Coronary Intervention," Nih.gov, Jun. 05, 2023. <https://www.ncbi.nlm.nih.gov/books/NBK556123/> (accessed Dec. 28, 2023).
- [4]N. Ojha and A. S. Dhamoon, "Myocardial Infarction," PubMed, 2023. <http://www.ncbi.nlm.nih.gov/books/NBK537076> (accessed Nov. 05, 2023).
- [5]J.-M. Figueredo, C. García-Ael, A. Gragnano, and G. Topa, "Well-Being at Work after Return to Work (RTW): A Systematic Review," *International Journal of Environmental Research and Public Health*, vol. 17, no. 20, p. 7490, Oct. 2020, doi: <https://doi.org/10.3390/ijerph17207490>.

- [6]Z. Jiang et al., “Factors Associated With Return to Work After Acute Myocardial Infarction in China,” *JAMA Network Open*, vol. 1, no. 7, p. e184831, Nov. 2018, doi: <https://doi.org/10.1001/jamanetworkopen.2018.4831>.
- [7]O. J. Mechanic, S. A. Grossman, and M. Gavin, “Acute Myocardial Infarction,” National Library of Medicine, Sep. 03, 2023. <https://www.ncbi.nlm.nih.gov/books/NBK459269/>
- [8]C. Zhan, M. Shi, R. Wu, H. He, X. Liu, and B. Shen, “MIRKB: a myocardial infarction risk knowledge base,” *Database*, vol. 2019, Jan. 2019, doi: <https://doi.org/10.1093/database/baz125>.
- [9]R. P. Dreyer et al., “Return to Work After Acute Myocardial Infarction,” *Circulation: Cardiovascular Quality and Outcomes*, vol. 9, no. 2 Suppl 1, Feb. 2016, doi: <https://doi.org/10.1161/circoutcomes.115.002611>.
- [10]K. Isazaz et al., “Return to work after acute ST-segment elevation myocardial infarction in the modern era of reperfusion by direct percutaneous coronary intervention,” *Archives of Cardiovascular Diseases*, vol. 103, no. 5, pp. 310–316, May 2010, doi: <https://doi.org/10.1016/j.acvd.2010.04.007>.
- [11]S. J. Mirmohammadi et al., “Evaluation of the return to work and its duration after myocardial infarction,” *ARYA Atherosclerosis*, vol. 10, no. 3, pp. 137–140, May 2014, Accessed: Dec. 28, 2023. [Online]. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4144381>
- [12]C. Cancelliere et al., “Factors affecting return to work after injury or illness: best evidence synthesis of systematic reviews,” *Chiropractic & Manual Therapies*, vol. 24, no. 1, Sep. 2016, doi: <https://doi.org/10.1186/s12998-016-0113-z>.
- [13]W. Sun, L. Gholizadeh, L. Perry, and K. Kang, “Predicting Return to Work Following Myocardial Infarction: A Prospective Longitudinal Cohort Study,” *International Journal of Environmental Research and Public Health*, vol. 19, no. 13, p. 8032, Jun. 2022, doi: <https://doi.org/10.3390/ijerph19138032>.
- [14]L. Smedegaard, A. Numé, M. Charlot, K. Kragholm, G. Gislason, and P. R. Hansen, “Return to Work and Risk of Subsequent Detachment From Employment After Myocardial Infarction: Insights From Danish Nationwide Registries,” *Journal of the American Heart Association*, vol. 6, no. 10, Oct. 2017, doi: <https://doi.org/10.1161/jaha.117.006486>.
- [15]B. Savitsky, I. Radomislensky, S. Goldman, N. Gitelson, Z. Frid, and K. Peleg, “Socio-economic disparities and returning to work following an injury,” *Israel Journal of Health Policy Research*, vol. 9, no. 1, Jul. 2020, doi: <https://doi.org/10.1186/s13584-020-00392-3>.
- [16]Y. Hu et al., “Factors influencing return to work 3 months after percutaneous coronary intervention in young and middle-aged patients with coronary heart disease: A single-center, cross-sectional study,” *PLOS ONE*, vol. 18, no. 4, pp. e0284100–e0284100, Apr. 2023, doi: <https://doi.org/10.1371/journal.pone.0284100>.
- [17]W. Sun, L. Gholizadeh, L. Perry, K. Kang, and M. Heydari, “Factors Associated with Return to Work Following Myocardial Infarction: A Systematic Review of Observational Studies,” *Journal of Clinical Nursing*, Nov. 2020, doi: <https://doi.org/10.1111/jocn.15562>.
- [18]H. Tulloch, P. Greenman, and V. Tassé, “Post-Traumatic Stress Disorder among Cardiac Patients: Prevalence, Risk Factors, and Considerations for Assessment and Treatment,” *Behavioral Sciences*, vol. 5, no. 1, pp. 27–40, Dec. 2014, doi: <https://doi.org/10.3390/bs5010027>.
- [19]G. N. Levine et al., “Psychological Health, Well-Being, and the Mind-Heart-Body Connection: A Scientific Statement From the American Heart Association,” *Circulation*, vol. 143, no. 10, Jan. 2021, doi: <https://doi.org/10.1161/cir.0000000000000947>.