

Opinion

Work stress and cardiovascular disease: a life course perspective

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Abstract: Individuals in employment experience stress at work, and numerous epidemiological studies have documented its negative health effects, particularly on cardiovascular disease (CVD). Although evidence on the various interrelationships between work stress and CVD has been accumulated, those observations have not yet been conceptualized in terms of a life course perspective. Using the chain of risk model, we would like to propose a theoretical model incorporating six steps: (1) work stress increases the risk of incident CVD in healthy workers. (2) Among those whose work ability is not fully and permanently damaged, work stress acts as a determinant of the process of return to work after CVD onset. (3) CVD patients experience higher work stress after return to work. (4) Work stress increases the risk of recurrent CVD in workers with prior CVD. (5) CVD patients who fully lose their work ability transit to disability retirement. (6) Disability retirees due to CVD have an elevated risk of CVD mortality. The life course perspective might facilitate an in-depth understanding of the diverse interrelationships between work stress and CVD, thereby leading to work stress management interventions at each period of the lifespan and three-level prevention of CVD.

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People experience stress across all stages of the lifespan¹, and its adverse effect on health has repeatedly been demonstrated². Stepping into the 21st century, the life course approach has started to attract attention in our

attempts to understand chronic diseases³.

During the economically active period, many individuals spent one-third of their lifetime in the workplace. Some studies have found that exposure to work stress accumulated throughout one's life, as estimated by exposure matrix or retrospective data, was associated with increased all-cause mortality^{4,5} and poorer mental health⁶. Cardiovascular disease (CVD) is one of the health outcomes whose links with work stress have been well established based on numerous prospective studies. However, this relationship has not been examined based on a life course perspective.

In 2002, the World Health Organization released a report regarding policy and research implications of life course perspectives on CVD. In the category of "Unspecified recommendations," it was stated that "There is some, though weak, evidence to suggest that general strategies to reduce stress in the adult environment (e.g., in the workplace) may be beneficial in reducing CVD risk"⁷.

Throughout the past decade, evidence on the interrelationships of work stress and CVD has been accumulated. Adopting the chain of risk model, which refers to a sequence of linked risk factor and outcome occurring one after one⁸, we would like to propose a theoretical model that may inform examination of work stress and CVD based on a life course perspective.

As illustrated in Fig. 1, our model consists of six steps:

Step 1: Work Stress Increases the Risk of Incident CVD in Healthy Workers.

Numerous studies have been conducted related to step 1. In general, the excess CVD risk for workers exposed to work stress is 10%-40% compared with those without work stress⁹, as measured by the well-established work stress model, mainly Karasek's Job-Demand-Control (JDC) model¹⁰ and Siegrist's effort-reward imbalance (ERI) model¹¹. Notably, in most prior prospective studies, work stress had been measured on only one single occasion, i.e., at baseline. In view of life course approach con-

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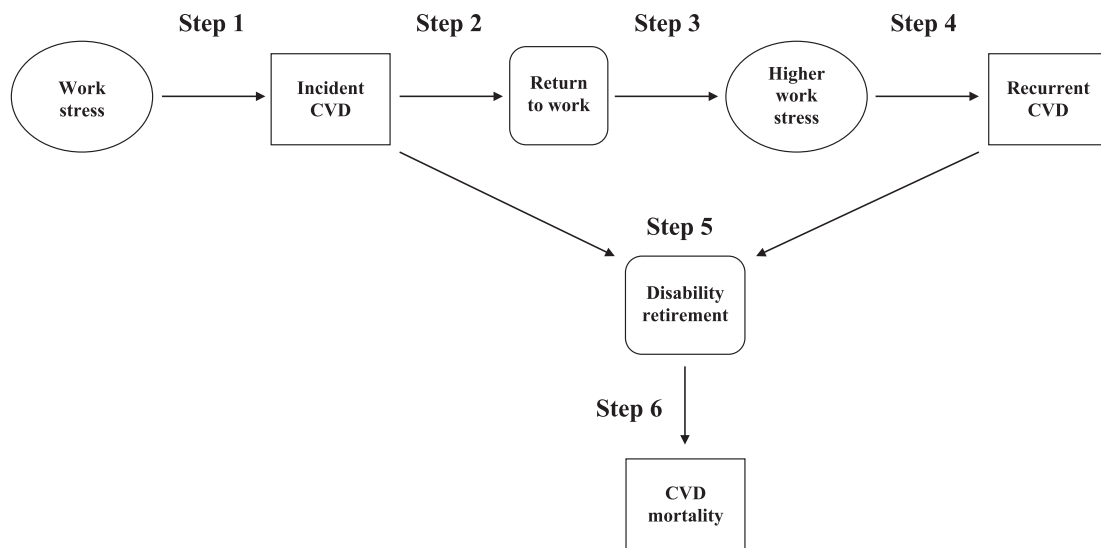


Fig. 1. Work stress and cardiovascular disease: a life course perspective

cepts, accumulation of risk reflected by repeated measures of work stress would be superior to one single-time measure⁸⁾. Some recent studies have shown that multiple exposure assessments improved the risk estimations of incident CVD and relevant cardiovascular factors (such as blood pressure and metabolic syndrome)¹²⁻¹⁶⁾.

Step 2: Work Stress Determines the Process of Return to Work after CVD Onset.

Generally, people would be absent from work for a while after CVD onset, and the traditional research and practical applications related to return to work focus on several determinants, such as medical factors (severity of disease and comorbidity), demographic distributions (age, gender, education), and psychiatric conditions (depression)^{17,18)}. The routine cardiac rehabilitation (CR) programs do not include any educational and training activities concerning psychosocial stress in the workplace¹⁹⁾. A few studies in later years indicated that a high level of work stress and a low level of job satisfaction were also the major risk factors for nonreturn to work following CVD²⁰⁻²³⁾. Accordingly, recent recommendations from the Cardiac Rehabilitation Section of the European Association of Cardiovascular Prevention and Rehabilitation of the European Society of Cardiology are, however, highlighting the importance of psychosocial risk factors including work stress as “a component of every CR program”²⁴⁾.

Step 3: Patients with CVD Experience Higher Work Stress after Return to Work.

To date, rehabilitation programs have mainly focused on return to work among those with chronic diseases,

while less attention has been paid to helping them to remain in employment²⁵⁾. Because of their reduced health-related work performance²⁶⁾, work environments (such as task and worktime arrangements) may be re-designed for chronically ill workers. However, a recent review suggests that workers with chronic diseases experience a poor quality of working life after return to work²⁷⁾. It has been hypothesized that functional impairments may conceivably limit the ability of employees with chronic diseases to cope with their workload; meanwhile, they seem to have limited resources to influence their work arrangements that cause a sense of reduced autonomy; in addition, chronically ill workers often experience less promotion opportunities and financial improvement after return to work²⁷⁾. Nevertheless, only one observational study measured work stress before and after first CVD onset; this study suggested that work stress levels increased after the workers with CVD returned to work²⁸⁾. Again, comprehensive CR programs might be helpful to address this issue: a preliminary study showed supportive evidence that an additional second phase of CR addressing work stress may significantly reduce psychosocial stress at work in patients with CVD after their return to work²⁹⁾.

Step 4: Work Stress Increases the Risk of Recurrent CVD in Workers with CVD.

Little is known about the role of work stress in the development of recurrent CVD events in patients who remain employed after their first CVD. According to a recent meta-analysis based on five papers derived from four cohort studies, work stress (as measured by either the JDC model or the ERI model) in employees with CVD was associated with a 65% excess risk to develop recurrent CVD events³⁰⁾. However, a recent study did not con-

firm those previous findings, indicating that work stress was not associated with recurrent CVD events³¹). Additional studies are needed to improve our understanding of step 4.

Step 5: Patients with CVD Who Suffer Full and Permanent Loss of Work Ability Transit to Disability Retirement.

Either after a first or recurrent CVD events, a couple of studies highlighted that severe CVD may result in complete loss of work ability, thereby leading to retirement, i.e., patients with CVD who lose their work ability permanently exit from the labor market with disability pension³²). In the same vein, two recent prospective cohort studies suggested that work stress measured by the JDC model or the ERI model seemed to be an important risk factor of disability pension due to CVD^{33,34}).

Step 6: Disability Retirees due to CVD are at Increased Risk of CVD Mortality.

It has been observed that disability retirement predicts higher all-cause mortality rate³⁵). Recently, a large cohort study with 4.9 million individuals confirmed disease-specific relationships: individuals with disability retirement due to CVD were at a threefold to fourfold elevated risk of CVD mortality³⁶). The mechanisms potentially underlying this observation are, however, not yet fully understood: it has been suggested to conceptualize disability retirement as an independent risk factor of premature death, in addition to the underlying disease itself. Perhaps psychosocial stress originating from the disability retirement may play an important role, such as loss of status, feeling of worthlessness, worsening economic burden, and social isolation³⁶).

One needs to bear in mind that the abovementioned theoretical assertions are mostly derived from evidence produced in developed countries. In view of the current socioeconomic and epidemiologic transition in developing countries, work stress³⁷) and CVD³⁸) in these regions have become pandemic during the past two decades. Therefore, respective research on work stress and CVD in low-income and middle-income countries is urgently needed. Preliminary results based on two large internationally collaborative case-control studies (the INTERHEART study and INTERSTROKE study) covering a large number of developing countries indicated that besides the traditional CVD risk factors, psychosocial stress, including work stress, was significantly associated with myocardial infarction and stroke across gender, age, and all over the world^{39,40}).

In summary, although evidence for each of the depicted steps is available, some more than others, longitudinal

studies linking multiple steps are still lacking. Therefore, we are hoping for powerful epidemiological cohort studies with repeated measures of cardiovascular function, work stress, employment status, and utilization of rehabilitation services to test our model: the life course perspective on work stress and CVD. Moreover, such research would be highly relevant to clinical practice, highlighting the role of work stress in the accumulation of adversities across the life course and CR. Finally, interventions in the workplace that aim at reducing work stress at each period of the lifespan and disease development are warranted, i.e., focusing not only on primary prevention but also on secondary/tertiary prevention⁴¹).

Conflict of Interest: None declared.

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