

REVIEW ARTICLE

Policy changes for preventing and recognizing overwork-related cardiovascular diseases in Taiwan: An overview

Heng-Hao Chang¹  | Ro-Ting Lin² 

¹Department of Occupational and Environmental Medicine, National Cheng Kung University Hospital, Tainan, Taiwan

²Department of Occupational Safety and Health, College of Public Health, China Medical University, Taichung, Taiwan

Correspondence

Ro-Ting Lin, Department of Occupational Safety and Health, College of Public Health, China Medical University, Taichung, Taiwan.
Email: roting@mail.cmu.edu.tw

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Abstract

Objective: Overwork-related cardiovascular and cerebrovascular disease (CVD) has a large impact on workers' rights and labor standards across East Asian countries. This article describes the background and impact of policies regarding overwork-related CVD in the past decades in Taiwan.

Methods: We reviewed government policies, guidelines, literature, and news addressing the problems and impact of policy changes to prevent and recognize overwork-related CVD since the 1990s, and collected data on overwork-related CVD cases in Taiwan from 2006 to 2017.

Results: In 2017, overwork-related CVD accounted for 13% of all cases of occupational diseases, but 79% of all deaths due to occupational diseases. Guidelines for recognizing overwork-related CVD cases were established in 1991; however, under-recognition exists in Taiwan due to poor exposure data on working hours and psychological factors and because most medical expenses are covered by the national health insurance system. Amendments on the guidelines, and stricter policies on overwork prevention were enforced following calls from labor unions, nongovernmental organizations, and legislators, but health disparities were introduced when certain industries were exempted from restrictions.

Conclusions: Long working hours and other work characteristics increase the risk of overwork-related CVD. By reviewing the changes in policy for preventing overwork and recognizing overwork-related disease, we identified the need for clearly defined guidance on evaluating overwork-related CVD, with specific criteria for working hours and other risk factors regarding work characteristics. National policies that lead to better working conditions and prevent overwork-related diseases must be developed.

KEYWORDS

cardiovascular diseases, health policy, karoshi death, occupational disease, recognition of occupational disease, working hours

1 | INTRODUCTION

Cardiovascular disease (CVD, herein including cerebrovascular disease) is the leading cause of death globally.¹ The

2016 Global Burden of Disease study has estimated that from 2006 to 2016, one-third of deaths worldwide could be attributed to CVD, while the total number of CVD deaths increased by 14.5%.² In Taiwan, CVD is among the top three

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leading causes of death over the past 10 years.³ In 2017, more than 32 000 people died from CVD, accounting for 18.8% of total deaths in Taiwan.³

The etiology of CVD includes individual characteristics, genetic susceptibility, and risk behaviors, such as smoking, unhealthy diet, and lack of exercise. Traditionally, policy and measures on tackling CVD have focused mainly on metabolic and behavioral risk factors.⁴ Since the 1960s, there has been growing evidence that CVD is also associated with occupational risk factors, particularly psychosocial hazards in the workplace and long working hours.^{5,6} Long working hours have also been found to have significant adverse effects on many risk factors of CVD, such as depressive symptoms and sleep deprivation.^{7,8} Previous meta-analysis studies conducted by European, US, and Australian researchers have demonstrated dose-response relationships between working hours and the risk of CVD.^{9,10} In Taiwan, Cheng et al¹¹ found that Taiwanese men who worked over 60 hours per week had a higher risk of CVD compared with those who worked 40–48 hours per week. Another Taiwanese study found that working 16 hours or more a day for a consecutive week may increase the risk of stroke.¹²

Japan, Korea, and Taiwan are the only three countries in the world whose official workers' compensation guidelines recognize long-term overtime hours as a work-related factor for CVD.¹³ These recognition guidelines were established to help labor inspectors, occupational physicians, and the Committee on Occupational Diseases Appraisal—which includes government officers, occupational physicians, industrial hygienists, and lawyers—make decisions about recognizing and compensating work-related disease. Workers who suffer from CVD that is recognized as caused or aggravated by work are eligible to apply for workers' compensation.¹⁴ Such legal regulations in Japan, Korea, and Taiwan were also appreciated by other Asian countries, such as China where long working hours deemed as an emerging public health issue but the compensation scheme did not particularly consider the “work-relatedness” between any psychosocial hazards and CVD.¹⁵

In Taiwan, overwork-related CVD has attracted serious attention in recent years. Most Taiwanese workers spend long hours at work. When compared with the Organisation for Economic Co-operation and Development (OECD) countries, Taiwan had the third highest number of hours, with an average of 2,035 annual working hours in 2017.^{16,17} Moreover, Taiwanese news sources have reported increasing cases of suspected overwork-related CVD, or even *karoshi* (sudden death due to overwork), in regard to particular occupations, such as security guards, drivers, and health care professionals.^{16,18–20}

Regulations concerning workers' compensation are scattered throughout several laws, including the Labor Insurance Act, the Labor Standards Act, and the Protection for Workers Incurring Occupational Accidents Act. The

workers' compensation scheme under the Labor Insurance system insured around 10 million workers in 2017.²¹ This system provides no-fault compensation for medical expenses and temporary and partial income replacement, as well as permanent disability and death benefits. Workers who suspect their illness is related to work can go to occupational medical outpatient clinics in the hospital, and then apply for compensation from the Bureau of Labor Insurance if the case is recognized by occupational physicians. The role of occupational physicians is to provide medical consultations, conduct medical reviews and investigations, and issue certificates for workers' compensation cases, following medical standards, regulations, and recognition guidelines issued by the Taiwan Occupational Safety and Health Administration.²²

To further protect workers' interests, Taiwan has in recent years revised its Labor Standards Act, Occupational Safety and Health Act, and recognition guidelines for overwork-related diseases.^{23,24} The amendments to these policies were products of diverse voices and points of view from different stakeholders.^{26,27} However, in 2017, government authorities attempted to modify the Labor Standards Act again to allow more overtime, reduce overtime pay, and allow employers to rearrange rest days.^{29,30} After a preliminary review, the Taiwan legislature passed the first and third readings of the amendments to the Labor Standards Act on December 4, 2017 and January 10, 2018, respectively, and the amendments have been in effect since March 1, 2018.^{30,31} From the perspective of stakeholders, these policies are too loose and lag far behind international standards. Stakeholders also raised the concern that the new revisions may have reversed progress and produced more overwork problems.^{32,33}

Multiple changes were made in the disease recognition and prevention policy of overwork-related diseases in the past decades. The social context and the impact of specific regulatory amendments, such as the Labor Standards Act, the Occupational Safety and Health Act, and recognition guidelines of overwork-related CVD, have not yet been identified. Therefore, this review aimed to provide an overview of the background, revision, and impact of policy changes regarding overwork-related CVD in Taiwan. Firstly, a historical analysis of the development and modifications of recognition guidelines for overwork-related CVD were provided, with an emphasis on significant events related during this process. Statistics regarding recognized overwork-related CVD cases was also briefly shown. Secondly, we summarized how the government responded to the public's attention on overwork-related CVD with some preventive measures. Next, we discussed overwork-related CVD recognition status by comparing Taiwan with Japan and provide some explanations of the under-recognition problem in Taiwan. Lastly, we commented on the effectiveness of the policy to prevent overwork-related CVD in Taiwan.

2 | METHODS

We reviewed governmental policies, guidelines, literature, and news addressing the problems and the impact of policy changes to prevent and recognize overwork-related CVD since the 1990s. We retrieved relevant articles in English from PubMed and those in Chinese from Airiti Library, irrespective of publication date. Our search keywords included occupational, work-related, cardio- and cerebral vascular disease, overwork, compensation, compensated, Japan, Korea, and Taiwan. We obtained official recognition guidelines and national preventive measures regarding work-related CVD in Taiwan. We also collected data on overwork-related CVD cases in Taiwan from 2006 to 2017.

3 | RECOGNITION GUIDELINES FOR OVERWORK-RELATED CVD

In the early 1990s, the Council of Labor Affairs (now the Ministry of Labor, since 2014) initiated a project to establish occupational disease recognition guidelines for several diseases, including CVD. This project was prompted by mounting pressure from the public and news media after several governmental officials had acute onset of CVD in public that was suspected to be related to overwork.³⁵ The first version of the guidelines was announced in 1991.³⁵ However, CVD was not on the official list of occupational diseases at that time; eligibility for compensation for suspected work-related CVD cases was thus decided case by case. For CVD cases associated with abnormal work stress prior to the event, only the onset of CVD occurring at the workplace could be recognized as work-related.^{27,36} Moreover, overwork-related CVD cases were recognized only if the workload, either in quantity or quality, was heavier during the period right before the CVD event compared with the typical workload. In other words, if a worker consistently worked long hours, such a workload did not meet the criteria for recognition at that time.

3.1 | Cases that led to revising recognition guidelines

In 2001, a newspaper editor had a stroke, which was suspected to be related to long working hours, severe work pressure, and threats of dismissal.³⁷ The Bureau of Labor Insurance disapproved his worker compensation application by claiming that no abnormal work stress was found. With the support of labor union of this editor's newspaper company, nongovernmental organization (Taiwan Association for Victims of Occupational Injuries), and a legislator, not only was the case approved for compensation, but the recognition guidelines for overwork-related CVD were also

modified. The legislator—Dr Ming-Chien Kao, who was a neurosurgeon—played an important role by holding several press conferences and public hearings as well as having interpellation about the recognition guideline in the congress of Taiwan.^{27,38} With advocacy for around two years, the first case finally received compensation from the company. Ministry of Labor also convened meetings to discuss the modification of recognition guidelines in 2002 and the revised version was announced in 2004. The revised criteria for recognition included: (a) 24 consecutive hours of work prior to the onset of CVD, (b) 16 hours of work per day during the week prior to the onset of CVD, (c) 100 hours or more of overtime (or 284 hours per month in terms of total working hours) during the month prior to the onset of CVD, (d) average of 80 hours overtime (or 264 hours per month in terms of total working hours) over 2-6 months prior to the onset of CVD, and (e) the occupation-attributable fraction accounted for more than 50% compared with other personal factors. Since 2004, more types of CVD cases were recognized as eligible for compensation in the guidelines (Table 1). Other job characteristics, such as irregular working hours and shift work, were also listed for evaluation.²⁵

In 2010, a 29-year-old electrical engineer was found dead in front of his computer desk at home.³⁹ His overtime hours were 111.5 hours during the month prior to his sudden death. The cause of his death was found to be cardiogenic shock and hypertrophic cardiomyopathy, and these diseases did not fulfill the 2004 recognition criteria. His family asked Ms Sue-Ying Huang, another legislator who had continuously been involved with labor issues, for assistance. She helped organize several press conferences with the support from nongovernmental organization (Taiwan Labour Front). These actions, with the continuous report from the news media, had aroused serious public attention due to the white-collar elite image of electrical engineers and their strenuous working conditions. Ms Huang also requested the Ministry of Labor to collect information on the recognition for overwork-related diseases from other countries for the modification of the guidelines and further proposed freezing the execution of the budget to urge immediate reaction. Finally, within three months, the Ministry of Labor organized a meeting to discuss a modification to the recognition guidelines⁴⁰ and the revised guideline was announced in 2010. The second case was eligible for application and eventually approved by the Committee on Occupational Diseases Appraisal under the new guidelines. The 2010 revision specified that CVD cases aggravated by work stress were considered compensable; in other words, if the disease and the occupational exposure, such as working hours, met the criteria, the worker would receive compensation even if he or she presented with personal factors of CVD.³⁵ In addition, more types of CVD were included in the group of targeted diseases, and the criteria for eligible overtime hours were shortened by 8 hours

TABLE 1 Recognition guidelines for overwork-related cardiovascular and cerebrovascular disease (CVD) in Taiwan

	1st edition, 1991	1st revision, 2004	2nd revision, 2010
Targeted diseases	Cardiovascular diseases: 1. Cardiac arrest/sudden cardiac death 2. Acute myocardial infarction 3. Acute heart failure Cerebrovascular diseases: 1. Cerebral hemorrhage 2. Cerebral thrombosis 3. Cerebral embolism 4. Cerebral infarction 5. Subarachnoid hemorrhage	Cardiovascular diseases: 1. Sudden cardiac death 2. Acute myocardial infarction 3. Acute heart failure 4. <u>Aortic dissection</u> Cerebrovascular diseases: 1. Cerebral hemorrhage 2. Cerebral thrombosis 3. Cerebral embolism 4. Cerebral infarction 5. Subarachnoid hemorrhage 6. <u>Hypertensive encephalopathy</u>	Cardiovascular diseases: 1. Acute myocardial infarction 2. Acute heart failure 3. Aortic dissection 4. <u>Coronary artery disease</u> 5. Cardiac arrest 6. Sudden cardiac death 7. <u>Serious arrhythmia</u> Cerebrovascular diseases: 1. Cerebral hemorrhage 2. Cerebral infarction 3. Subarachnoid hemorrhage 4. Hypertensive encephalopathy
Workload criteria: working hours	Abnormal work stress (compared to typical circumstances): 1. Work 24 hours continuously right before the event 2. Work 16 hours every day during the week prior to the event	Abnormal work stress (compared to typical circumstances): 1. 24 consecutive hours of work prior to the onset of CVD 2. 16 hours of work every day during the week prior to the onset of CVD 3. <u>100 hours or more of overtime (284 working hours in total) within one month prior to the onset of CVD</u> 4. <u>Average of 80 hours overtime (264 working hours in total) over two to six months prior to the onset of CVD</u>	Short-term excessive workload: 1. Whether the worker had extreme long working hours within one day prior to the onset of CVD 2. Whether the worker had regular long working hours within one week prior to the onset of CVD 3. <u>Previous definition regarding the number of hours was deleted</u> Long-term excessive workload: 1. <u>92 hours or more of overtime (276 working hours in total) within one month prior to the onset of CVD</u> 2. <u>Average of 72 overtime hours (256 working hours in total) over two to six months prior to the onset of CVD</u>
Workload criteria: psychosocial factors	Abnormal work stress (compared to typical circumstances): Excessive work (usually twice in terms of time or amount) which caused physical or mental burden (including shock with sudden fear)	Excessive work-related mental burden was listed: irregular work patterns, extreme long working hours, frequent business travel, shift work or night work, temperature, noise, and jet lag	Abnormal events: 1. The events occurred approximately within one day prior to the onset of the disease 2. <u>The events may induce rapid blood pressure change or vasoconstriction, such as natural and fire disaster</u> 3. The events included those which caused physical or mental burden, or rapid and obvious work environment change Evaluation of work characteristics and excessive work-related mental burden: 1. Irregular work patterns, extreme long working hours, frequent business travel, shift work or night work, work environment (abnormal temperature, noise, and jet lag), work with excessive mental stress 2. <u>Evaluation aspects were provided</u> 3. <u>These factors should be used in combination with working hours</u>

(Continues)

TABLE 1 (Continued)

	1st edition, 1991	1st revision, 2004	2nd revision, 2010
Other factors	While considering other non-occupational factors, only when the abnormal work stress may induce early-onset or aggravation of CVD can be recognized	<ol style="list-style-type: none"> 1. <u>Compared to personal risk factors, the attributable fraction of abnormal work stress should be more than 50%</u> 2. Exclusion of intoxication due to drugs 	<ol style="list-style-type: none"> 1. The attributable fraction of workload should be more than 50%, <u>but whether it needed to outweigh personal risk factors was deleted</u> 2. <u>The responsibility for proving the workload was shifted from the employees to the employers</u>
Benchmark	Japanese guideline in 1987	Japanese guideline in 2001	Japanese guideline in 2001

Important differences between guidelines are marked with an underline.

The regular working hour limit was cut from 84 hours every 2 weeks to 40 hours per week in 2016; therefore, the guideline in terms of long-term excessive workload was modified as: 100 hours or more of overtime (or 276 hours per month in terms of total working hours) within one month prior to the onset of CVD; or average of 80 hours overtime (or 256 hours per month in terms of total working hours) over 2-6 months prior to the onset of CVD.

Average of overtime hours over two to six months refers to either the average during 2 months, 3 months, 4 months, 5 months, or 6 months prior to the onset of CVD.

as: 92 hours or more of overtime (or 276 hours per month in terms of total working hours) during the month prior to the onset of CVD and an average of 72 hours overtime (or 256 per month in terms of total working hours) 2-6 months prior to the onset of CVD.³⁵ Finally, the responsibility for proving the workload of the employee was shifted to the employer.³⁵ The regulation specifying that CVD must have occurred at the workplace was also modified in 2010. Table 1 shows the comparison of overwork-related CVD recognition guidelines in the past decades. As of 2016, the maximum number of working hours was cut from 84 hours every 2 weeks to 40 hours per week, and the guidelines were slightly modified in a few other ways, but the necessary criteria for total working hours remained unchanged.^{35,41} The guidelines were modified again with minor changes in 2018, providing more concrete explanations of above-mentioned rules.³⁵

3.2 | Statistics about overwork-related CVD cases

Although overwork-related CVD cases were eligible for compensation on a case-by-case basis beginning in 1991, it was not until 2006 that the first case of overwork-related CVD was recorded by the Bureau of Labor Insurance. Criticism remained about its transparency and lack of data analysis compared with Japan.⁴² More data have become available since 2012 when the parliament required the Bureau of Labor Insurance to disclose information.

Figure 1 shows the number of recognized overwork-related CVD cases by severity (death, disability, and illness) from 2006 to 2017.¹⁶ Before 2010, the total number of overwork-related CVD cases ranged from 13 to 37 annually. After the introduction of new recognition guidelines in 2010, the number of cases increased drastically and, since 2011, the number of cases has ranged between 67 and 92 annually. As for the proportion of cases by severity, death accounted for the majority of cases in most years, followed by illness. In

2017, overwork-related CVD accounted for 79% of the total number of deaths due to occupational diseases in Taiwan, although they accounted for only 13% of total cases of occupational disease (including death, disability, and illness).

4 | REGULATIONS REGARDING OVERWORK PREVENTIVE MEASURES

In Taiwan, the minimum standards for working conditions are guaranteed mainly by the Labor Standards Act,³¹ including protection of wages, working hours, break, vacation leave, and female workers. When the Labor Standards Act was first announced in 1984, the rules stated that a worker should not exceed 8 hours a day and 48 hours a week of regular working hours. In addition, the extension of working hours should not exceed 3 hours per day and 46 hours per month for male workers and 2 hours per day and 24 hours per month for female workers. Regulations regarding regular working hours were amended to 84 hours every 2 weeks in 2000, and extension of working hours combined with the

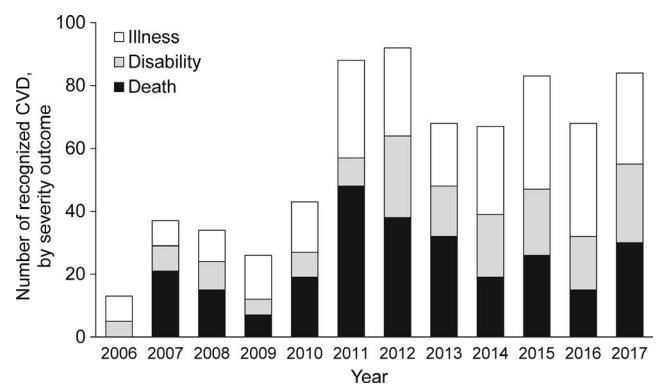


FIGURE 1 Number of recognized overwork-related cardiovascular and cerebrovascular disease (CVD) cases by severity outcome, 2006-2017

regular working hours was also amended to 12 hours a day, with overtime hours not to exceed 46 hours per month in 2002. The number of regular working hours was shortened to 40 hours in 2015.^{43,44} Despite the amendments' stricter regulations, it is important to note that the amendments also created a greater degree of flexibility in the regulations.³⁴ For instance, some professions in certain industries identified by the Ministry of Labor may now be exempted from the regulations, which has caused some disparities. The 2018 amendments allowed employers, with the consent of the employees or the labor union, to increase the maximum amount of overtime hours to 54 hours per month, but not more than 138 hours for every 3-month period.³¹

In 1984, the average number of actual hours worked per worker was as high as 207.5 hours per month in Taiwan. This number gradually decreased to 190.1 hours per month in 2000 and 169.6 in 2017; however, workers in Taiwan still work much longer hours than workers in most OECD countries.¹⁷ According to a report from the Ministry of Labor in 2011, 13.1% of Taiwanese workers logged more than 46 overtime hours per month.⁴³ Basic labor law violations are common due to the lack of investment in personnel and other resources to conduct proper labor inspections.⁴⁵

In 2011 the Ministry of Labor initiated "Suspected Work-related CVD Investigation Project" to assist workers to obtain working hour records when CVD occurred.⁴⁶ This project enabled the collection of more objective evidence through immediate and active data collection and interviews with the worker, family, and employer. In addition, the project achieved a more transparent and integrated process between labor inspections and worker compensation.²⁴

In 2013, the Occupational Safety and Health Act added an "overwork prevention statute" to prevent overwork and reduce overwork-related CVD. This statute regulated employers to adopt preventive measures to identify and evaluate high-risk groups, arrange for medical consultations and health guidance for workers, adjust or shorten working hours, change job duties, and promote health checkups.⁴⁷ The Taiwan Occupational Safety and Health Administration also published guidelines to prevent diseases resulting from abnormal workloads to help businesses comply with the laws and regulations.⁴⁸ These guidelines advise health professionals to use tools, such as the Framingham Risk Score, to estimate the 10-year cardiovascular risk of a worker, and then link the results to their workload (based on working hour records and burnout questionnaires). Such preventive strategies are based on the understanding that most overwork-related CVD cases occur as a progression of underlying diseases such as hypertension or atherosclerosis. Occupational physicians may suggest restricting the number of hours worked or changing jobs after interviewing the workers.

5 | DISCUSSION

5.1 | Comparison of overwork-related CVD recognition in Taiwan and Japan

To our knowledge, Japan, Korea, and Taiwan are the only countries that specifically recognize overwork-related CVD attributable to long working hours as compensable occupational diseases.¹⁴ In past decades, the number of compensated overwork-related CVD cases was lower in Taiwan than in Japan, despite that Taiwan had a higher average number of hours worked per month. In 2002 Japan saw a sharp increase in the number of recognized overwork-related CVD cases after the recognition criteria were amended in December 2001.⁴⁹ A study showed that the introduction of new criteria in 2010 for overwork-related CVD in Taiwan, which referenced the 2001 Japanese guidelines, was associated with an increase in the number of recognized overwork-related CVDs (number of cases/total number of employees) by a factor of 2.5.⁴¹ Despite an increase in the number of recognized CVD cases in Taiwan, overwork-related CVD is still under-recognized in Taiwan compared with Japan.⁴¹ Although Taiwan adopted the same criteria as Japan, the rate of recognized overwork-related CVD cases in Taiwan was less than half (0.42) of that in Japan.⁴¹ Lin et al identified a nonlinear association between industry-average monthly working hours and different severity levels of overwork-related CVD (ie death, disability, and illness).⁵⁰ Less severe CVD cases (eg illness) are not documented for compensation, however, because the majority of medical expenses are already covered by national health insurance.⁵⁰

A disparity exists between the rates of overwork-related CVD among male and female workers not only in Taiwan, but also in Japan.^{16,49} A Taiwanese study found higher burnout scores in women across all age groups and employment grades,⁵¹ despite that women had shorter working hours than men, and women generally have lower prevalence and mortality of CVD, especially those of working age from 15 to 64.^{3,52,53} As the focus of government's policy lay on the prevention of overwork-related CVD, male employees with high CVD risk profiles tended to receive more attention. It is important not to neglect the problem of overworked women and associated adverse psychosocial outcomes, such as mental health problems due to work-family conflict.⁵⁴

In Japan, injured workers and their families, together with lawyers, were a driving force in the establishment and modification of national policies to compensate and prevent overwork-related disorders. Although their applications for worker compensation were denied by the labor authority at first, some family further filed lawsuits and received a positive decision from the court. The courts' decision did not absolutely follow the recognition guideline but provided several advancements. Due to several contradictory decisions, a lawyers' group, The National Defense Counsel for Victims of Karoshi, urged the

government to react to the public's growing concern and modify the recognition guidelines.²⁵ The Japanese government has responded and made the revision according to systemic analysis of relevant research. Japanese scholars have shown an interest in the relationship between long working hours and CVD, which led to better local epidemiological evidence.^{7,55,56}

In contrast, no guidelines existed for recognizing overwork-related CVD in Taiwan before 1991. Since 1991, the establishment of the Taiwanese guidelines has drawn heavily from the Japanese guidelines—the 2010 amendment was nearly identical to the 2001 Japanese guidelines. In contrast, any advancement in policies to address overwork-related CVD in Taiwan has been made largely with the assistance of nongovernmental organizations and congressmen in response to specific CVD cases.⁴⁵ The judiciary sector played very little role in forming the pressure for policy change. It was rarely noticed that the court overruled the Bureau of Labor Insurance's decision to reject a CVD case's worker compensation application. In addition, statistics and the content of workers' claims for compensation were not transparent and made public until 2012, which made it difficult to analyze data on social demographics, disease categories, and working conditions.

5.2 | Under-recognition of overwork-related CVD in Taiwan

The under-recognition of occupational diseases, including CVD, has been a grave concern in Taiwan. Many workers are not aware that their diseases are work-related, and very few clinicians provide information regarding compensation or refer cases to occupational physicians.²² As mentioned earlier, the Taiwanese universal health insurance system covers the majority of health expenditures related to illnesses and minor injuries or diseases, so workers lack incentive to apply for compensation for work-related diseases.^{22,57} The complex administrative application and appeal process may also hinder workers from applying for compensation.^{22,58} Many workers have experienced stigma and discrimination from bureaucratic compensation systems, which might be associated with mental health complaints post-injury.^{59,60} Low compensation rates may also reflect the difficulty in determining a causal relationship between disease and work, especially if occupational exposure data are insufficient. Employers may reject investigations by occupational physicians if they are worried the results might be used as evidence in a civil lawsuit.

In Taiwan, the recognition of occupational diseases, including CVD, relies on occupational physicians working in hospitals to interview, investigate, and provide certificates. If data on working hours are insufficient, occupational physicians may find it difficult to make a decision. Controversies can arise when occupational physicians, labor inspectors, and even judges disagree about what is considered “working time.” The recognition of work-related CVD has therefore

come to focus mainly on proving and defining workers' working time,⁵⁸ using tools like Global Positioning System (GPS), Internet access, work completed on the computer, and instant communication applications on devices.

As technology evolves and the nature of work becomes more varied, the distinctions between work and rest become less clear. Some employers assign tasks to employees via messages on instant communication applications during off-hours.⁶³ For workers who do not have a consistent workplace, such as news correspondents, insurance agents, and truck drivers, guidelines on how to record working hours may be inevitable.⁶⁴ Several recent studies have found that another risk factor for CVD is sleep deprivation, which is more common among people with long working hours.^{11,65,66} The current regulations do not provide a clear definition of what constitutes rest time, so some workers might still be on call during their rest time, or their rest time is fragmented and ambiguous. More attention is required to ensure continuous rest time due to its importance in reducing chronic fatigue and ultimately preventing CVD. The Labor Standards Act might include a regulation to ensure daily continuous rest time; for example, the European Union's regulation stipulates a “minimum daily rest period of 11 consecutive hours a day”.⁶⁷

5.3 | Suggestions of practical application of the Korean recognition guideline for Taiwan

The current Taiwanese guidelines for recognizing overwork-related CVD state several criteria for evaluating workload: abnormal events, long-term workload, and short-term workload (including both the number of hours worked and stress related to working conditions). However, in reality, the long-term number of hours worked were the main criteria used to determine overwork-related CVD due to its clear-cut definition. No other specific criteria were included for irregular work patterns, shift work or night work, temperature, noise, jet lag, and other work characteristics.

Evidence suggests that a higher risk of acute cardiac events is associated with triggers such as strenuous physical exertion, episodes of anger, extreme emotional stress due to the natural disaster, and dramatic change of temperature.^{68,69} Studies have shown correlations between CVD and shift work or night work, with relatively consistent increased risks of adverse effects.^{71,72} However, the task of integrating and applying this scientific evidence in the guidelines for recognizing overwork-related CVD remains difficult and uncertain.

The recent modification of Korea's guidelines, which share many similarities with the Japanese and Taiwanese guidelines, may offer some recommendations. For night shift work between 10:00 PM and 6:00 AM, the Korean guidelines have added 30% to the daily working hours to calculate long-term workload. A process for evaluating the

combination of working hours and other risk factors is also clearly stated, particularly for those who do not comply with the limits on long-term overtime hours.⁷³ The change in Korea's guidelines resulted from a social consensus between physicians, labor unions, an employers' federation, and the government, and it provides valuable insight on how Taiwan can modify its guidelines to make the evaluation process for recognizing overwork-related CVD cases more justified and uniform.

5.4 | Preventive measures on overwork-related CVD

The Occupational Safety and Health Act requires employers to arrange for their workers to receive health guidance from doctors to prevent overwork-related CVD. The advice that workers receive from doctors, including restricting overtime working hours, however, is not always mandatory. Some employers therefore do not abide by the laws, and they often cite labor shortages and workers' personal risk behaviors to defend themselves. Some workers are reluctant to abide by the advice because they need overtime wages to compensate for their relatively low salary.

Reducing the number of working hours and addressing individual-level health behaviors of workers are equally important interventions, to prevent the occurrence of overwork-related CVD and the unethical dismissal of workers with preexisting CVD risks. Regulating work-related psychosocial hazards also requires a change in mindset and strategies from the management. Managers and employers must target not only the number of hours worked, but also the occupational safety and health climate at the workplace and other work-related stress at an organizational level.⁷⁴

At the government level, any institutions requesting that specific industries or workers be exempt from the work hour restriction should be seriously reevaluated. More personnel and resources are also needed to strengthen labor inspections to ensure that companies adhere to regulations and implement measures to prevent overwork-related CVD. Lastly, encouraging the establishment of labor unions may also contribute to a more balanced labor-capital relation, and help raise the awareness of workers for CVD prevention.

6 | CONCLUSION

In this paper, we briefly reviewed the national policy for recognizing and preventing overwork-related CVD in Taiwan. Despite growing evidence showing the relationship between workload and CVD, occupational physicians and industrial hygienists are unable to easily evaluate the causal relationship for an individual worker due to poor and limited exposure data. Determining which work-related

and psychosocial behaviors might contribute to CVD is ambiguous and more likely to be subject to value judgment than other occupational diseases with physical or chemical origins. To avoid controversy, Taiwan established official guidelines for recognizing overwork-related CVD cases, which drew heavily from Japan's guidelines.

In response to criticism about the low rate of compensation for overwork-related CVD in Taiwan, we explored the historical background, policy development, current circumstances, how the guidelines were amended in past decades, and the current challenges that Taiwan faces. Guidance on the evaluation process for determining overwork-related CVD cases must be clearly defined, with specific criteria for both working hours and other work characteristics. For prevention measures to be effective, employers must target not only individual workers, but also create a workplace climate that does not endorse overwork. The government must enforce laws that restrict overtime hours and invest in personnel and resources to strengthen labor inspections.

7 | AUTHOR CONTRIBUTORS

Heng-Hao Chang and Ro-Ting Lin contributed to idea formulation, data preparation, and writing of the manuscript.

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ORCID

Heng-Hao Chang  <https://orcid.org/0000-0002-4205-6091>

Ro-Ting Lin  <https://orcid.org/0000-0002-2687-203X>

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