Title

Work-related musculoskeletal disorders, reporting attitudes, and reporting behavior among direct care workers in long-term care facilities in South Korea

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Work-related musculoskeletal disorders, reporting attitudes, and reporting behavior among nursing assistants in long-term care facilities in South Korea

by
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Work-related musculoskeletal disorders, reporting attitudes, and reporting behavior among direct care workers in long-term care facilities in South Korea

Minjung Kyung

Abstract

Background: Work-related musculoskeletal disorders among direct care workers have been a major concern in long-term care facilities worldwide. However, many work-related musculoskeletal disorders went unreported due to perceived barriers of direct care workers. Workers are encouraged to report even minor injury or near misses to their managements in many countries, but in Korea, the injury reporting responsibility of workers is not defined or described.

Methods: This dissertation study used cross-sectional survey data from 377 direct care workers in 19 long-term care facilities in South Korea from May 2022 ~ August 2022. Long-term care facilities included long-term care hospitals and nursing homes in three cities in Gyeonggi, which is one out of eight provinces and represents 26% of Korean population. In the study, direct care workers refer to trained care staffs providing the most direct personal care such as feeding, bathing, dressing, and toileting regardless of the certification. Direct care workers who were employed for at least three months or longer in their current job, and able to read, write, and understand Korean were eligible to participate in the study.

Results: A systematic review showed a high level of underreporting of work-related injuries or illnesses to management or Workers' Compensation programs, ranging 20%-91% in the United States and identified contributing factors and reasons for underreporting of work-related injuries or illnesses. Analysis of the survey data from direct care workers in long-term care facilities showed that more than half of direct care workers had a work-related musculoskeletal disorder in the past 12 months, but only 13.5% of them reported it to their management. Also, half of direct care workers had no intention to report their symptoms.

Direct care workers' reporting behavior was associated with their attitudes toward reporting, safety climate, symptom severity, and witnessing injury reporting of others. Direct care workers' reporting attitudes were associated with duration of work, work arrangement, safety training, safety climate, experience of work-related musculoskeletal disorders, and frequency and severity of symptoms. Direct care workers having positive reporting attitudes were more likely to have intention to reporting and actual reporting of work-related musculoskeletal disorders.

Conclusion: This study provides important insight into workers' reporting behaviors and attitudes of work-related musculoskeletal disorders and informs future efforts to reduce underreporting and underestimation of occupational health problems.

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Chapter1: Introduction

Work-Related Musculoskeletal Disorders

Work-related musculoskeletal disorders (WRMSDs) refer to diseases and disorders that occur in the musculoskeletal system and connective tissue, which are induced or aggravated by work itself or the work environment (Punnett & Wegman, 2004). WRMSDs are distinguishable from occupational diseases, which have a single factor that directly causes the disease (Hales & Bernard, 1996). WRMSDs result from an interactive relationship between external exposures to physical and mental loads and internal biomechanical, physiological, and psychological responses of individuals (Kumar, 2001). Given the multifactorial etiology, a variety of factors such as physical, psychosocial, and individual factors contribute to the development of WRMSDs (Punnett & Wegman, 2004). The aging workforce also plays a role in the wide spread of WRMSDs due to decreased physical work capacity with increasing age (Nunes & McCauley, 2012).

Musculoskeletal disorders (MSDs) remain the most common work-related health problems that cause the disabilities of workers; in 2019, an estimated 1.7 billion people were affected by MSDs worldwide (Cieza et al., 2020; Kataria et al., 2021). MSDs constitute more than a third of occupational diseases in the U.S. and the European Union (EU)-28 (Bureau of Labor Statistics [BLS], 2016; European Agency for Safety and Health at Work, 2019). In a study of the U.S. working population, Tanaka et al. (2001) estimated that approximately 40% of upper extremity MSDs were attributable to occupational exposures (Tanaka et al., 2001). The European Agency for Safety and Health at Work reported that three out of every five workers in the EU had MSD complaints and that a third of workers perceived that their work affected their health negatively (European Agency for Safety and Health at Work, 2019). In Korea from 2016 to 2020, WRMSDs represented approximately two thirds of occupational diseases (Kee, 2023). The incidence rate of WRMSDs was 5.1 per 10,000 workers in 2021 with a 43% increase compared to the previous year, and it has increased over the last five

years (Kee, 2023).

WRMSDs cause substantial economic losses and social costs to workers and the community including increased wage compensation costs, medical expenses, and reduced productivity (Kee, 2023). According to the data from the European Agency for Safety and Health at Work (2019), WRMSDs accounted for almost half of the costs of occupational diseases. Moreover, more than half of the workers were days away from work due to WRMSDs and a quarter of workers with chronic WRMSDs were absent from work more than eight days in 2015 (European Agency for Safety and Health at Work, 2019). Similarly, in the United States, WRMSDs were responsible for 29% of the days away from work (Summers et al., 2015). Many studies have supported the relationship between the WRMSDs and the productivity loss (Daneshmandi et al., 2017; Ng et al., 2014). As a major contributor to disability, WRMSDs also lead to early retirement from work, reduced ability to participate in society, and lower quality of life by limiting workers' mobility and dexterity (Cieza et al., 2020).

Reporting of Work-Related Musculoskeletal Disorders

Accurate estimation of work-related injuries or illnesses is indispensable for identifying potential workplace problems and providing proper treatment to injured workers in a timely manner (Azaroff et al., 2002). Occupational health surveillance largely depends on two levels of injury or illness reporting: the organizational level (i.e., reporting from organizations to regulatory authorities) and the individual level (i.e., reporting from workers to their organizations or employers) (Probst & Graso, 2013). Workers' reporting of injuries to their management—the individual level of reporting—is the first gate to capture work-related health problems (Azaroff et al., 2002). Workers are encouraged to report even minor injury or near misses that could have led to injury but did not, to their managements because it can prevent serious incidents from happening (Simpson et al., 2005). However, many injuries or

illnesses go unreported due to workers' perceived barriers (Lee et al., 2021; Tucker et al., 2014; Yang et al., 2019).

WRMSDs may be more prone to underreporting given the multifactorial etiology and insidious onset of the symptoms (Qin et al., 2014). Researchers indicate that the longer latency period of some disorders make it difficult to recognize them as work-related or manifest after workers leave the job (Azaroff et al., 2002; Pransky et al., 1999). In a study of U.S. healthcare workers in Veteran administration hospitals, 35% of workers with a WRMSD in the last 12 months that required them to reschedule their work did not report it to their management (Siddharthan et al., 2006). A study of U.S. firefighters found that 32.5% of participants suffering from an on-duty WRMSD had not made injury reports (Potts et al., 2021). A similar underreporting pattern was also observed in Korea. Park and Yoon (2021) found that, of 2,862 workers in a semiconductor and liquid crystal display company in Korea, 55.2% had felt at least one musculoskeletal symptom during the past year and that more than 25% of them did not report it to their management (Park & Yoon, 2021).

Many studies have identified factors associated with WRMSD reporting (Biddle & Roberts, 2003; Qin et al., 2014; Rosenman et al., 2000; Siddharthan et al., 2006). In regards to Workers Compensation (WC), a study of U.S. workers identified that WRMSD reporting was associated with annual income, length of employment, severity of WRMSD, coworker support, and type of healthcare providers (Rosenman et al., 2000). In a prospective cohort study of U.S. workers, Biddle and Roberts (2003) also found the relationship of WRMSD reporting with age, WRMSD severity, physical exertion required at work, and general health status (Biddle & Roberts, 2003). In a study of U.S. nursing home workers with low back pain, Qin et al. (2014) identified the significant relationship between WRMSD reporting and psychosocial work environment and WRMSD severity (Qin et al., 2014). For WRMSD reporting to management, Siddhartahn et al. (2006) showed that age, race/ethnicity, job

tenure, work shift, safety climate, and WRMSD frequency contributed to WRMSD reporting (Siddharthan et al., 2006).

Work-Related Musculoskeletal Disorders and Subsequent Reporting among Direct Care Workers

Direct care workers are defined as a paid caregiver who provides hands-on personal care for people having difficulty in activities of daily living, such as nursing assistants (NAs) and personal care aids (U.S. Department of Labor, 2015). Direct care workers are at elevated risk of WRMSDs. According to the U.S. Bureau of Labor Statistics, a direct care worker had the second highest incidence rates of MSDs (BLS, 2008). In 2018, NAs had 15,360 MSD cases ranked second in occupations at high risk for WRMSDs and these MSD cases accounted for 52% of all days away from work among NAs (BLS, 2018).

Higher repetition of tasks, combined with other MSD risk factors such as awkward posture and high force, can contribute to the development of MSD (Bernard & Putz-Anderson, 1997). Work-related psychosocial factors such as high work demands, high job strain, low job decision latitude, low social support, and low job satisfaction are also known as MSD risk factors (Deeney & O'Sullivan, 2009). The tasks of direct care workers particularly in long-term care settings pose a higher risk for WRMSDs. Direct care workers are exposed not only to these ergonomic risk factors during patient handling and mobility tasks but also to poor psychosocial work environments (Bernal et al., 2015; Pieretti et al., 2020). Furthermore, WRMSDs are expected to increase due to a shortage of staff and aging workforce (Haryanto, 2019; Juraschek et al., 2019). Compared to nursing personnel in hospitals, physical load and level of disability were higher among nursing personnel in the long-term care industry, where frail, elderly residents are highly dependent on physical and mental care and encounter a lack of assistive equipment to transfer them safely (Caponecchia et al., 2020; Peterson et al., 2004).

Despite the heightened risk of WRMSDs, many WRMSD cases among care workers may go unreported. Studies on WRMSD reporting provide the evidence. For example, Siddharthan et al. (2006) found that 35% of nursing personnel with WRMSDs in a U.S. Veterans Administration hospital did not report the problems to their management and they were likely to tolerate their symptoms and take their WRMSDs for granted as a natural part of their jobs unless the disorders interfered with their work activities (Siddharthan et al., 2006). Likewise, in a focus group interview with U.S. healthcare workers, nursing personnel had a belief that injuries happened to most people in healthcare industry and that nurses should always take care of others and put themselves last (Galizzi et al., 2010). Care workers in the nursing homes also perceived that they were not qualified to work in long-term care facilities (Galizzi et al., 2010) as caregivers if they failed to take care of themselves.

Occupational Injury and Illness Surveillance

Most countries have occupational injury and illness surveillance systems primarily undertaken by national and state government agencies and require workers participation to report workplace injuries or illnesses (Yang et al., 2022). Although the definition and implementation of health surveillance varied by countries, all 28 EU countries adopted Workers' Health Surveillance (WHS) programs to track work-related injuries and illnesses (Colosio et al., 2017). In the United States, major national occupational health surveillance systems have been implemented, such as the Bureau of Labor Statistics (BLS) national Survey of Occupational Injuries and Illnesses (SOII), and the Census of Fatal Occupational Injuries (CFOI) (Yang et al., 2022). There are two major occupational health surveillance systems in Korea: WC insurance system and the national survey on health status and experience of occupational diseases (Rhee & Choe, 2010). Under the Occupational Safety and Health (OSH) Act, the national government agency manages WC insurance as a social

service and regulates employers to report occupational problems that require three or more days away from work at the time of onset (Rhee & Choe, 2010). In Korea, although employers' reporting of occupational injuries or illnesses is mandatory, the injury reporting responsibility of workers is not unequivocally defined or described. Despite the occupational health surveillance systems, underreporting and underestimation of work-related injuries and illnesses has continued to be a significant concern in Korea and worldwide (Yang et al., 2022).

Conceptual Framework

This dissertation research was based on two theories: the ecological model by Sauter and Swanson (1996) and the theory of Planned Behavior (Ajzen, 1991). The ecological model was designed to address the pathways from work technology to musculoskeletal outcomes such as symptom reporting, healthcare utilization, disability, and performance problems, incorporating biomechanical, psychosocial, and cognitive structures in the framework (Sauter & Swanson, 1996). As a psychological model, the Theory of Planned Behavior describes how attitudes towards behaviors, social norms, and perceived behavioral control connect to the intention to exert the behavior (Ajzen, 1991).

A theoretical framework for this study is proposed in Figure 1. This study assumes that work-related factors including job, physical, and psychosocial factors and individual factors such as demographic and WRMSD characteristics may affect to injury reporting intention as well as behavior and this relationship is mediated by reporting attitudes. Although intention is supposed to be related to behavior according to the theory of planned behavior, the association between reporting intention and behavior was not examined considering the focus of this study.

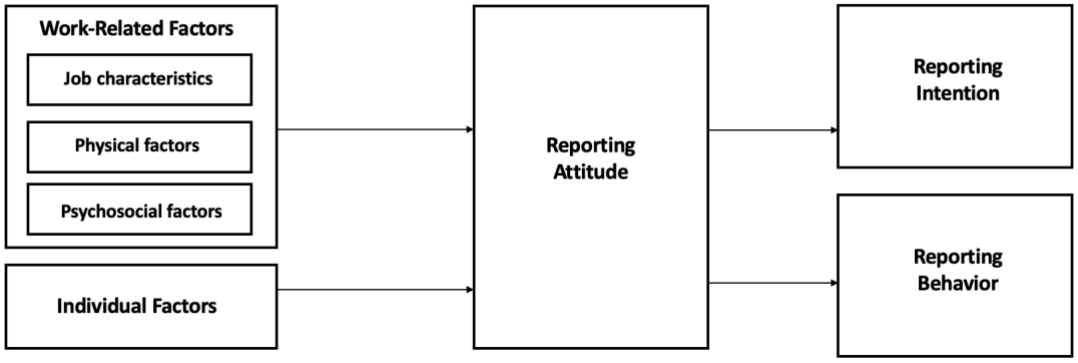

Figure 1.1. the conceptual framework of this study

Purpose and Specific Aims

The purpose of this dissertation study is to understand the WRMSD reporting behaviors of NAs and the factors that contribute to WRMSD reporting attitudes and behaviors. This study has three specific aims:

Aim 1: Synthesize evidence on factors contributing to reporting of work-related injuries or illnesses.

Aim2: Investigate the WRMSD reporting behaviors and associated factors among direct care workers in long-term care facilities in Korea.

Aim3: Identify the factors associated with WRMSD reporting attitudes and examine the relationship between WRMSD reporting attitudes and reporting intentions and behaviors among direct care workers in long-term care facilities in Korea.

Aim3-1: Examine whether demographic and job characteristics, physical and psychosocial work factors, and WRMSDs are associated WRMSD reporting attitudes.

Aim3-2: Test the moderating effect of worker safety as a priority on the relationship examined in aim3-1.

Aim3-3: Examine the relationship between WRMSD reporting attitudes and WRMSD reporting intention and behavior.

Significance and Innovation

The Theory of Planned Behavior (TPB) holds that behavioral intention plays a leading role in voluntary behaviors and describes how attitudes towards behaviors connect to the intention to exert the behavior (Ajzen, 1991). Building on the theory of planned behaviors, previous studies have identified that personal attitudes play a crucial role to predict behavioral intention and behaviors (Gavaza et al., 2011; Jiang et al., 2018; Pfeiffer et al., 2010). In a study of U.S. transportation workers, Jiang et al. (2018) found that reporting of workplace aggression and near-miss cases decreased as workers had negative reporting attitudes (Jiang et al., 2018). Given this evidence, WRMSD reporting attitudes may lead to the development of WRMSD reporting behaviors; however, reporting attitudes have not been highlighted in research on WRMSD reporting. This is one of the first research efforts taking reporting attitudes into consideration in the WRMSD reporting framework for direct care workers in long-term care settings.

The present study is concerned with the human factors that contribute to reporting attitudes and behavior of work-related injuries or illnesses. The human-centered approach highlights the psychological factors that potentially influence human behaviors given the individual differences. Although workers' reporting decision and behaviors may be affected by psychological factors, only a few studies have identified the factors contributing to workers' reporting by applying a human-centered approach in Korea. To the best of our knowledge, this is the first study identifying the factors associated with WRMSD reporting attitudes and behaviors among direct care workers.

Presentation of the Dissertation

The dissertation is organized in five chapters. **Chapter 1** provides the background and significance and purpose and specific aims of the dissertation. **Chapter 2** is a systematic review of existing research on the barriers and facilitators of workers' reporting of work-related injuries or illnesses in the United States to determine the factors associated with injury reporting by workers. This review has been published in the *BMC Public Health*. **Chapter 3** is the quantitative analysis providing the WRMSD underreporting magnitude and factors contributing to WRMSD reporting among direct care workers in long-term care facilities in Korea. This research manuscript is currently under review by the *BMC Nursing*. **Chapter 4** presents the second data-based manuscript that investigated factors contributing to WRMSD reporting attitudes and relationship between WRMSD reporting attitudes and WRMSD reporting intention and behavior. This paper is in preparation for submission to a peer-reviewed journal in the field of occupational health. **Chapter 5** provides a summary and synthesis of study findings, discussion of significance, strengths, and limitations, conclusions, and implications for future research and practice.

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Chapter 2: Underreporting of Workers' Injuries or Illnesses and Contributing Factors: A Systematic Review

Abstract

Background: Accurate identification of work-related health problems is important to understand workplace safety issues and develop appropriate interventions. Although workers' reporting of work-related injuries or illnesses is the very first step of the reporting process, many workers may encounter challenges in reporting them to their management or workers' compensation (WC) programs. This systematic review aimed to identify the level of workers' underreporting of work-related injuries and illnesses and the contributing factors and reasons for underreporting among US workers.

Methods: This study searched PubMed (Medline), PsycINFO (ProQuest), CINAHL (EBSCOhost), EMBASE (Embase.com), and Social Science Citation Index (Web of Science) using search terms related to underreporting of work-related injury or illness.

Results: Twenty studies (17 quantitative and three mixed methods studies) were identified. The studies investigated reporting to management (n = 12), WC programs (n = 6), multiple organizations (n = 1), and not specified (n = 1). The timeframe used to measure reporting prevalence varied from three months to entire careers of workers, with the most common timeframe of 12 months. This review indicated that 20-91% of workers did not report their injuries or illnesses to management or WC programs. From quantitative studies, contributing factors for injury or illness underreporting were categorized as follows: injury type and severity, sociodemographic factors (e.g., age, gender, education, and race/ethnicity), general health and functioning, worker's knowledge on reporting, job and employment characteristics (e.g., work hour, job tenure, work shift, type of occupation, and physical demand), psychosocial work environment (e.g., supervisor support, coworker support, and safety climate), and health care provider factors. From the review of qualitative studies, the reasons for underreporting included the following: fear or concern, cumbersome time and effort in the reporting process, lack of knowledge regarding reporting, perceptions of injuries as not

severe or part of the job, and distrust of reporting consequences.

Conclusions: The review findings indicated that low wage earners, racial/ethnic minority workers, and workers who perceive a poor psychosocial work environment encounter more barriers to reporting a work-related injury or illness. This review also identified variations in the measurement of work-related injury reporting across studies and a lack of standardized measurement.

Trial registration: The review was registered in the PROSPERO, an international database of prospectively registered systematic reviews in health and social care (CRD42021284685).

Keywords: mandatory reporting, underreporting, occupational accident, work-related illness, workers' compensation

Background

Accurate identification of work-related injuries or illnesses is an important action to understand workplace health and safety problems and develop an effective prevention program (Tucker et al., 2014). Identifying workplace health and safety problems early helps companies design and implement preventative strategies before the problems become more significant and prevalent (Azaroff et al., 2002). For injured workers, workers' compensation (WC) programs support them to receive timely health care, prevent long-term disability, and mitigate financial losses by providing wage replacement for lost workdays (Shannon & Lowe, 2002). Thus, underreporting of work-related injury or illness has important consequences for both employers and workers.

The measurement of occupational injuries and illnesses ultimately depends on workers' reporting behavior (Weddle, 1996). The United States Occupational Safety and Health Administration (OSHA) provides the legal foundation of employee's rights to report injuries free from retaliation and prohibits employers from taking any adverse actions against employees for the reporting (Occupational Safety and Health Administration [OSHA], 2022). According to the OSHA's 2014 updated reporting guidelines, employers are required to report all work-related fatalities within eight hours and all-in patient hospitalizations, amputations, and losses of an eye within 24 hours of finding out about the incident (Occupational Safety and Health Administration [OSHA], 2022). Despite the basic rights, researchers have indicated that many workers encounter challenges in reporting a work-related injury or illness to their supervisor or company official (Lee et al., 2021; Lipscomb et al., 2013). Scherzer et al. (Scherzer et al., 2005) found that among workers who had pain or discomfort during the previous 12 months, only 33% reported their symptoms to company officials and 26% filed a WC claim. Further, there have been changes in the nature of work including the demographic diversity of workers and non-standard work arrangements such as short-term contracts or

outsourcing of function in organizations. With these changes, more workers are subject to precarious employment which can result in reluctance to report their injury to a company or file a WC claim (National Academies of Sciences, 2018).

Workers' reporting of work-related injury or illness can be affected by various factors and an evaluation of underreporting may contribute to improvement of the reporting environment and system. Menzel (Menzel, 2008) reviewed underreporting of work-related injuries or illnesses to OSHA but reporting behaviors in this review were not limited to workers. Since documentations of work-related injuries and illnesses involve multiple steps, identifying the filters in each reporting step is important to develop and implement targeted interventions. To date, there has not been a systematic review of workers' injury reporting behaviors, which is the first step of the reporting process. Therefore, we conducted a systematic review of the literature to determine the prevalence of worker-level underreporting, factors contributing to their underreporting and why workers do not report work-related injuries or illnesses.

Methods

Eligibility Criteria

Studies were eligible for inclusion if they investigated workers' reporting behaviors to company officials or WC programs. In our review, a worker was defined as a person employed for wages or salary including apprentices. As the initial search located only a small number of studies that assessed contributing factors or reasons for reporting work-related injuries or illnesses, no restriction was placed on the publication date. Quantitative, qualitative, and mixed method studies were included in this review to achieve an adequate depth of understanding. Quantitative studies included randomized controlled trials (RCTs), non-randomized studies, and descriptive studies. Quantitative studies provided data on the magnitude of underreporting and the characteristics of workers who were more likely to

underreport an occupational injury or illness. Qualitative studies were included to identify more detailed information regarding why workers did not report a work-related injury or illness. As WC programs and reporting processes vary by country, this review only included studies conducted in the United States and written in English. Because the scope of this review was identification of factors and reasons associated with workers' reporting behavior, studies were excluded if they examined underreporting at the level of employers or physicians, such as reporting to OSHA or reporting to WC by physicians or employers.

Information Sources and Search Strategy

The following five databases were searched in collaboration with a librarian: PubMed (Medline), PsycINFO (ProQuest), CINAHL (EBSCOhost), EMBASE (Embase.com), and Social Science Citation Index (Web of Science). The last search was conducted on November 15, 2022. Multiple search terms were customized and applied to each database, including mandatory reporting, underreporting, underestimating, occupational injuries, occupational accidents, occupational diseases, and work-related illnesses. The search strategy is detailed in Appendix 1. Medical Subject Headings (MeSH) and text words were applied where it was appropriate. Searches were supplemented by hand-searching the reference lists of articles identified from initial database searching to locate additional relevant articles.

Selection and Data Collection Process

Retrieved articles from each database and reference search were imported into Covidence software (Covidence online review manager 2021, www.covidence.org). Duplicated records were identified and removed. The titles and abstracts of all the citations were independently screened by two reviewers (MK and CD). The remaining relevant articles were retrieved for full-text review to determine whether the studies met the eligibility criteria. For disagreements, the two reviewers discussed until they reached a consensus regarding inclusion or exclusion.

Data Items

Descriptive Data

The following descriptive data were extracted from each study: authors, publication year, study design, measures (e.g., questionnaire, interview, focus group, and administrative data), sampling method, sample size, gender, race/ethnicity, mean age, and workers and workplace setting.

Reporting behavior

As the outcomes of this review, reporting behavior was reviewed for the prevalence of not reporting, work-related injury or illness, contributing factors to reporting of work-related injury/illness, and reasons for not reporting. We also examined the type of reporting (e.g., reporting to management and WC filing) and type of injury/illness (e.g., any work-related injury or illness, musculoskeletal pain, sharp injury, etc.).

Study Risk of Bias Assessment

The risk of bias of included studies was appraised by the two reviewers who are enrolled in a PhD program, using the Mixed Methods Appraisal Tool (MMAT), a valid and reliable measure of systematic review of mixed method studies (Hong et al., 2018; Pace et al., 2012). The MMAT includes criteria for five study designs: qualitative research, RCTs, non-randomized controlled trials, quantitative descriptive studies, and mixed method studies. For ensuring appropriateness of using the tool, the MMAT comprises screening questions for all types of studies and a checklist for each study design. The latest version of MMAT (Hong et al., 2018) comprises five criteria for evaluating each study type; the scoring ranges from 1 to 5 with a higher score indicating better quality (5 = high, 3-4 = moderate, <3 = low). In this review, all included studies were evaluated using screening questions prior to applying the tool. Further details on the quality appraisal can be found in Supplemental Appendix 2.

Effect Measures and Synthesis Methods

Table 1 presents a summary of characteristics of the extracted studies. The review summary on the prevalence of no reporting, contributing factors, and reasons for not reporting of work-related injuries or illnesses are presented in Table 2. From quantitative studies, contributing factors to reporting of work-related injuries or illnesses were categorized with similar properties and summarized with various measures of association including odds ratio (OR), beta coefficient, and prevalence rate (PR). From qualitative studies, reasons for not reporting work-related injuries or illnesses were analyzed in three stages using a thematic synthesis (Thomas & Harden, 2008). First, all texts were coded inductively. Second, codes were categorized by similarity to organize descriptive themes. Third, in an interpretation stage, analytical themes were generated.

Reporting Bias and Certainty Assessment

The overall certainty of the evidence was determined by a single reviewer (MK) using two separate tools. For quantitative evidence, the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach was used (Guyatt et al., 2011). The certainty of evidence was defined as high, moderate, low, or very low by considering potential limitations due to risk of bias, inconsistency, indirectness of results, imprecision, and publication bias for each outcome (Guyatt et al., 2011). For mixed methods studies, the certainty of evidence was examined using the criteria of support by Bray et al. (Bray et al., 2020). This criteria consisted of truth value/bias, explanation credibility, weakness minimization, consistency between inside and outside view, and publication bias using five assessment levels: strong, moderate, low, very low, and inconsistent (Bray et al., 2020).

Results

Study Selection

The literature search yielded 1,872 unique references, of which 1,805 records were excluded after screening of the titles and abstracts. After full texts of the remaining 55 articles were reviewed, 37 were excluded because they did not meet the eligibility criteria as described in Figure 1. An additional two articles were identified from searches of publication citations, resulting in 20 studies for the final synthesis. The study selection process is illustrated in Figure 1 with reasons for exclusion.

Study Characteristics

Among the 20 studies included in this review, 17 used quantitative study designs and three used mixed methods (Table 1). Almost all studies (n = 18) used a cross-sectional design. One study used a prospective cohort design and another study used an RCT. For data collection, 12 studies used questionnaires or interviews; eight studies used two or more data collection methods such as questionnaire, interview, administrative data, or focus group. Thirteen studies had convenience samples and seven had random samples. The sample size of included studies ranged from 135 to 15,319. The percentage of females ranged from 1% to 99% and the percentage of Whites ranged from 30% to 92%. The mean age of study participants ranged from 27 to 59 years. The study samples included various workers such as healthcare workers, cleaning staff, carpenters, construction workers, and radiologists.

Risk of Bias in Studies

Review of the risk of bias of each study is presented in Table 1. The overall quality of the RCT study (n = 1) was moderate due primarily to an unclear description of double-blinding (Green et al., 2019). Among nine non-randomized studies, the risk of bias was high for three studies and moderate for six studies because of non-representative samples and no control of potential confounders (Biddle & Roberts, 2003; Boden et al., 2015; Fan et al.,

2006; Lee et al., 2021; Lipscomb et al., 2013; Makary et al., 2007; Qin et al., 2014; Rosenman et al., 2000; Yang et al., 2019). All descriptive quantitative studies used clearly defined measures of injury or illness underreporting and six studies used a convenience sampling method resulting in a limited generalizability (Anderson et al., 2021; Deipolyi et al., 2017; Donnelly et al., 2013; Gershon et al., 2007; Haiduven et al., 1999; Scherzer et al., 2005; Weddle, 1996). Five studies reported response rates ranging from 26% to 49% or did not report a response rate (Anderson et al., 2021; Deipolyi et al., 2017; Donnelly et al., 2013; Gershon et al., 2007; Haiduven et al., 1999). The risk of bias in the three mixed method studies was poor to moderate (Moore et al., 2013; Pompeii et al., 2016; Siddharthan et al., 2006). Siddharthan et al. (Siddharthan et al., 2006) adequately described the rationale for their study, but the divergences and inconsistencies between the quantitative and qualitative findings were not fully addressed and the integration of results was considered ineffective. Moore et al. (Moore et al., 2013) also did not explain the integration of qualitative and quantitative results and divergences and inconsistencies between them. The moderate quality of the study by Pompeii et al. (Pompeii et al., 2016) resulted from a lack of a rationale for the study and a limited description of divergences and inconsistencies between qualitative and quantitative results.

Results of Individual Studies

Measurement methods and the prevalence of underreporting of work-related injuries or illnesses are presented in Table 2. Among the included studies, six studies measured underreporting of work-related injuries or illnesses to WC programs (Anderson et al., 2021; Biddle & Roberts, 2003; Fan et al., 2006; Green et al., 2019; Qin et al., 2014; Rosenman et al., 2000), 12 studies measured underreporting to management (Boden et al., 2015; Deipolyi et al., 2017; Donnelly et al., 2013; Gershon et al., 2007; Haiduven et al., 1999; Lee et al., 2021; Lipscomb et al., 2013; Makary et al., 2007; Moore et al., 2013; Pompeii et al., 2016;

Weddle, 1996; Yang et al., 2019), and one study measured underreporting to both (WC programs and management) (Scherzer et al., 2005). The remaining study did not specify the entity of reporting (Siddharthan et al., 2006). The timeframe used to measure the prevalence of underreporting varied from three months (n = 2) (Qin et al., 2014; Rosenman et al., 2000), six months (n = 2) (Green et al., 2019; Yang et al., 2019), 12 months (n = 11) (Anderson et al., 2021; Biddle & Roberts, 2003; Boden et al., 2015; Donnelly et al., 2013; Fan et al., 2006; Gershon et al., 2007; Lee et al., 2021; Pompeii et al., 2016; Scherzer et al., 2005; Siddharthan et al., 2006; Weddle, 1996), five years (n = 3) (Deipolyi et al., 2017; Haiduven et al., 1999; Makary et al., 2007), to across entire careers (n = 2) (Lipscomb et al., 2013; Moore et al., 2013). The types of reported injury or illness included injury from sharps or exposure to blood or body fluid (n = 7) (Boden et al., 2015; Deipolyi et al., 2017; Donnelly et al., 2013; Gershon et al., 2007; Haiduven et al., 1999; Makary et al., 2007; Yang et al., 2019), musculoskeletal injury or illness (n=4) (Biddle & Roberts, 2003; Qin et al., 2014; Rosenman et al., 2000; Siddharthan et al., 2006), workplace violence (n = 1) (Pompeii et al., 2016) and chemical-related symptom (n = 1) (Lee et al., 2021). The measurement of reporting to WC programs also varied by study. Three studies (Biddle & Roberts, 2003; Fan et al., 2006; Rosenman et al., 2000) used conservative definitions of injury or illness reporting such as injury or illness resulting in missed work for more than seven consecutive days or a diagnosed work-related disease.

Results of Syntheses

Overall, workers' underreporting prevalence ranged from 20% to 91%. Specifically, the prevalence of underreporting to management ranged from 20% to 74% (Boden et al., 2015; Deipolyi et al., 2017; Donnelly et al., 2013; Gershon et al., 2007; Haiduven et al., 1999; Lee et al., 2021; Lipscomb et al., 2013; Makary et al., 2007; Moore et al., 2013; Pompeii et al., 2016; Scherzer et al., 2005; Weddle, 1996; Yang et al., 2019) and workers'

underreporting to WC programs ranged from 25% to 91% (Anderson et al., 2021; Biddle & Roberts, 2003; Fan et al., 2006; Green et al., 2019; Qin et al., 2014; Rosenman et al., 2000; Scherzer et al., 2005). The risk of bias of the included studies was overall moderate. As presented in Table 2, 12 studies examined the association between various factors and reporting of work-related injuries or illnesses (Biddle & Roberts, 2003; Boden et al., 2015; Fan et al., 2006; Green et al., 2019; Lee et al., 2021; Lipscomb et al., 2013; Makary et al., 2007; Pompeii et al., 2016; Qin et al., 2014; Rosenman et al., 2000; Siddharthan et al., 2006; Yang et al., 2019). Those contributing factors were grouped into seven categories: injury type and severity, sociodemographic factors, general health and functioning, worker's knowledge regarding reporting, job and employment characteristics, psychosocial work environment, and healthcare provider. Twelve studies investigated the reasons for workers' underreporting of their injury or illness (Anderson et al., 2021; Deipolyi et al., 2017; Donnelly et al., 2013; Gershon et al., 2007; Green et al., 2019; Haiduven et al., 1999; Moore et al., 2013; Pompeii et al., 2016; Scherzer et al., 2005; Siddharthan et al., 2006; Weddle, 1996; Yang et al., 2019). Five overarching themes were derived from the thematic synthesis of the reasons similar in nature: (1) fear; (2) cumbersome time and effort in reporting process; (3) lack of knowledge regarding reporting; (4) perceptions of injuries as not severe or part of the job; (5) distrust of reporting process.

Contributing Factors

Injury type and severity. Six studies (Biddle & Roberts, 2003; Makary et al., 2007; Pompeii et al., 2016; Qin et al., 2014; Rosenman et al., 2000; Siddharthan et al., 2006) identified injury type and severity as a significant contributing factor to injury or illness reporting. There was a positive association between higher severity and injury or illness reporting to WC (Biddle & Roberts, 2003; Qin et al., 2014; Rosenman et al., 2000). Workers with needlestick injuries involving a high-risk patient such as HIV, hepatitis B, hepatitis C, or

injection drugs were more likely to report their injury or illness to management than those with injuries not involving a high-risk patient (Makary et al., 2007) and workers experiencing serious injury were more likely to report the injury to management (Pompeii et al., 2016). Workers who had more than three work-related injuries in the past 12 months (Siddharthan et al., 2006) were less likely to report their injury than those who had three or fewer injuries.

Sociodemographic factors. The relationship between age and injury or illness reporting was inconsistent in two studies (Biddle & Roberts, 2003; Siddharthan et al., 2006). Biddle and Roberts (Biddle & Roberts, 2003) found that older workers were more likely than younger workers to file a WC claim for their injury or illness. In contrast, Siddharthan et al. (Siddharthan et al., 2006) found a negative association between being older age and injury or illness reporting. The findings on the relationship between gender and injury or illness reporting were also mixed. Two studies (Boden et al., 2015; Makary et al., 2007) found that male workers were less likely than females to report their injuries to their management. Contrary to these findings, Lee et al. (Lee et al., 2021) and Yang et al. (Yang et al., 2019) found that female workers were less likely to report their work-related symptoms to management than male workers. Conflicting results were also found for the association between education and reporting (Biddle & Roberts, 2003; Lee et al., 2021; Qin et al., 2014). In a study of nursing home workers who had low back pain in the past three months (Qin et al., 2014), workers with a higher education level were less likely to file a WC claim. On the other hand, among cleaning workers, higher reporting of work-related symptoms to management was associated with a college education (Lee et al., 2021). There was a significant association between race/ethnicity and injury or illness reporting (Boden et al., 2015; Lee et al., 2021; Siddharthan et al., 2006). For reporting to management, racial/ethnic minority workers such as Hispanic and Asian were less likely than White workers to report their injury or illness (Lee et al., 2021; Siddharthan et al., 2006). For reporting to WC, non-

White workers were more likely than White workers to file a claim (Boden et al., 2015). In addition, lower annual income (less than $40,000) and being married were associated with higher reporting of injury or illness to WC (Fan et al., 2006; Rosenman et al., 2000).

General health and functioning. Three studies (Biddle & Roberts, 2003; Fan et al., 2006; Yang et al., 2019) investigated the relationship between general health and functioning and injury or illness reporting. There was a positive association between obesity and injury or illness reporting to WC (Fan et al., 2006). Workers with better perception of general health were less likely to report their injury or illness to WC and management (Biddle & Roberts, 2003; Yang et al., 2019).

Worker's knowledge regarding reporting. Injury or illness reporting was associated with worker's knowledge regarding reporting (Makary et al., 2007). Among 699 surgeons, those who had not heard of reporting experience from their peers were less likely to report their injury or illness to management (Makary et al., 2007).

Job and employment characteristics. Seven studies (Biddle & Roberts, 2003; Fan et al., 2006; Makary et al., 2007; Pompeii et al., 2016; Qin et al., 2014; Siddharthan et al., 2006; Yang et al., 2019) examined the association between job and employment characteristics and injury or illness reporting. Two studies identified work hours as a significant factor for reporting, but the findings were inconsistent. In a study of hospital workers (Siddharthan et al., 2006), those who worked more than 80 hours per two weeks were more likely to report work-related pain. In contrast, in a study of medical residents, longer work hours were associated with underreporting of injury or illness to management (Yang et al., 2019). Night shift workers were also less likely than day time workers to report their injury or illness (Siddharthan et al., 2006). The following job and employment characteristics were associated with higher reporting to WC programs or management: longer job tenure (Rosenman et al., 2000), higher physical demand (Biddle & Roberts, 2003; Qin et

al., 2014), certain occupations such as nurse, nurse aid, security guard (Pompeii et al., 2016), service occupations, precision, craft, and repair occupations, and operators, fabricators, and laborers (Fan et al., 2006).

Psychosocial work environment. Five studies (Boden et al., 2015; Green et al., 2019; Qin et al., 2014; Rosenman et al., 2000; Siddharthan et al., 2006) reported a significant association between psychosocial work environment and injury or illness reporting. In five studies (Green et al., 2019; Lipscomb et al., 2013; Qin et al., 2014; Rosenman et al., 2000; Siddharthan et al., 2006), a good psychosocial work environment including supervisor support, coworker support, safety training, and safety climate was positively associated with higher injury or illness reporting to WC. Conversely, in a study of patient care workers, an inverse association was identified between organizational policies and safety practices and sharp injury reporting to management (Boden et al., 2015).

Healthcare providers. The type of health care provider was associated with injury or illness reporting (Rosenman et al., 2000). In a study of general workers, those who filed for WC were more likely to receive treatment from a provider not belonging to the company, such as a specialist, surgeon, orthopedic, and physical or occupational therapist (Rosenman et al., 2000).

Reasons for Underreporting

Fear or concern. Twelve studies (Anderson et al., 2021; Deipolyi et al., 2017; Donnelly et al., 2013; Gershon et al., 2007; Green et al., 2019; Haiduven et al., 1999; Moore et al., 2013; Pompeii et al., 2016; Scherzer et al., 2005; Siddharthan et al., 2006; Weddle, 1996; Yang et al., 2019) reported fear as a reason for underreporting of workers' injury or illness. Identified barriers to reporting work-related injuries or illnesses included fear of negative consequences on employment status such as missed promotions, job loss, not being hired again (Moore et al., 2013; Pompeii et al., 2016; Scherzer et al., 2005) or being labeled

as a complainer or careless worker and subsequent discrimination (Anderson et al., 2021; Deipolyi et al., 2017; Donnelly et al., 2013; Gershon et al., 2007; Haiduven et al., 1999; Moore et al., 2013; Siddharthan et al., 2006; Weddle, 1996; Yang et al., 2019). In a focus group study of 28 hospital workers, concern of negative peer attitude was also found as a barrier to reporting (Siddharthan et al., 2006). Concerns about administration fortifying safety rules and lack of staffing were identified in two different studies (Moore et al., 2013; Weddle, 1996).

Cumbersome time and effort in reporting process. Ten studies (Deipolyi et al., 2017; Donnelly et al., 2013; Gershon et al., 2007; Green et al., 2019; Haiduven et al., 1999; Moore et al., 2013; Pompeii et al., 2016; Scherzer et al., 2005; Siddharthan et al., 2006; Yang et al., 2019) identified cumbersome time and effort in the reporting process as a reason for underreporting. In the studies by Weddle et al. (Weddle, 1996), Haiduven et al. (Haiduven et al., 1999), Moore et al. (Moore et al., 2013), and Pompeii et al. (Pompeii et al., 2016), most workers indicated that they were too busy to report their injuries or illnesses to management. A study of construction workers revealed that workers could not afford to take time off work without payment to see a doctor (Moore et al., 2013).

Lack of knowledge regarding reporting. Nine studies (Anderson et al., 2021; Deipolyi et al., 2017; Donnelly et al., 2013; Gershon et al., 2007; Green et al., 2019; Moore et al., 2013; Pompeii et al., 2016; Scherzer et al., 2005; Siddharthan et al., 2006) identified lack of knowledge of the reporting process as a reason for underreporting. Many workers did not know the official protocols for reporting; for example, how, where, or to whom to report (Donnelly et al., 2013; Gershon et al., 2007; Green et al., 2019; Pompeii et al., 2016). Studies revealed that some workers did not even know that they should report work-related injury or illness to management (Scherzer et al., 2005) and did not receive any training related to reporting (Deipolyi et al., 2017). Moreover, many workers did not report because they were

uncertain about work-relatedness of their injury or illness (Moore et al., 2013; Siddharthan et al., 2006).

Perceptions of injury as not severe or part of the job. Seven studies (Deipolyi et al., 2017; Green et al., 2019; Haiduven et al., 1999; Moore et al., 2013; Pompeii et al., 2016; Weddle, 1996; Yang et al., 2019) found that minor injury status and perceptions of injury as not severe or part of the job was a reason for underreporting. If the injuries or illnesses were tolerable and sufficiently managed with home treatment, anti-inflammatories, or pain medications, workers perceived their symptoms as minor and chose not to report them (Deipolyi et al., 2017; Green et al., 2019; Haiduven et al., 1999; Moore et al., 2013; Pompeii et al., 2016; Weddle, 1996; Yang et al., 2019). The perception that injury is inevitable as part of their job was noted as an obstacle to reporting in two studies (Moore et al., 2013; Pompeii et al., 2016).

Distrust of reporting consequences. Six studies (Deipolyi et al., 2017; Donnelly et al., 2013; Gershon et al., 2007; Haiduven et al., 1999; Moore et al., 2013; Pompeii et al., 2016) addressed distrust of administrative responses as a barrier to injury reporting. In three studies, some workers pointed out that they perceived no benefits or had no post-event follow-up after injury reporting (Deipolyi et al., 2017; Donnelly et al., 2013; Haiduven et al., 1999; Pompeii et al., 2016). Some workers did not trust management in keeping the confidentiality of their reporting (Gershon et al., 2007). Some workers also reported that, instead of reporting work-related injuries or illnesses to WC, they would choose to get safety incentive benefits for no lost-time injury (Moore et al., 2013).

Reporting Biases and Certainty of Evidence

Confidence in the body of evidence is presented in Table 3. The quantitative evidence was rated *very low* for sociodemographic characteristics and general health and functioning and rated *low* for injury type and severity, psychosocial work environment, job and

employment, knowledge regarding reporting, and healthcare provider. The quality of outcome was *very low* due to limitations in the study design and sampling methods, inconsistent results, and heterogenous instruments. The qualitative evidence was rated *moderate* for fear, cumbersome time and effort, and perception of injuries as not severe or part of the job and rated *low* for distrust for reporting and lack of knowledge. The quality of outcome was *low* due to the absence of the data related to the concept consisting of both subjective and objective views and the potential of reporting bias.

Discussion

The purpose of this systematic review was to estimate the prevalence of underreporting of work-related injuries or illnesses and to identify contributing factors and reasons for underreporting. The review of the eligible 20 studies showed that a substantial number of workers who experienced work-related injuries or illnesses (20-91%) did not report their symptoms to management or WC programs. We identified the following contributing factors to injury or illness underreporting: injury type and severity, sociodemographic factors, general health and functioning, worker's knowledge about reporting, job and employment characteristics, psychosocial work environment, and healthcare providers. Consistent with a previous study by Azaroff et al. (Azaroff et al., 2013), underreporting was higher among racial/ethnic minority workers, those with lower income, and workers in poor psychosocial work environments. The relationships of age, gender, educational levels, work hour, and safety climate to underreporting were inconsistent across studies. Our findings are also in line with findings of Pransky et al.'s study (Pransky et al., 1999), which identified the following as reasons for underreporting: fear or concern, cumbersome time and effort in the reporting process, lack of knowledge regarding reporting, perceptions of injuries as not severe or part of the job, and distrust of reporting consequences.

Methodological Limitations of Included Studies

Measurement of work-related injuries or illnesses is important information to compare and synthesize results from different studies on the prevalence, contributing factors, and reasons for workers' underreporting of injuries or illnesses. This review identified that the measurements of work-related injuries or illnesses varied across studies and were not always denoted. The constitution of reportable injuries may vary by company ranging from including near misses and unsafe conditions to only actual injuries (Probst et al., 2017). In regard to WC systems, the eligibility for WC benefits for medical treatment is consistent across states in the US, but the length of time that workers can receive temporary disability benefits for lost workdays differs from state to state (Spieler & Burton, 2012). Biddle and Roberts (Biddle & Roberts, 2003) and Rosenman et al. (Rosenman et al., 2000) used multiple approaches to measure underreporting rates for WC medical benefits and temporary disability benefits. On the other hand, Scherzer et al. (Scherzer et al., 2005), Fan et al. (Fan et al., 2006), Qin et al. (Qin et al., 2014), Anderson et al. (Anderson et al., 2021), and Green et al. (Green et al., 2019) measured underreporting in a relatively broad extent of work-related injuries or illnesses. All of the studies except for Fan et al. (Fan et al., 2006) measured reporting of any work-related injury or illness without requiring a confirmed diagnosis by a physician. It is also important to note that the timeframe used to measure the prevalence of underreporting varied across studies. The prevalence of underreporting was lowest in Lipscomb et al.'s study measuring lifetime prevalence (Lipscomb et al., 2013) and the highest in Qin et al.'s study measuring with three-month prevalence (Qin et al., 2014), which may be due to recall bias. If a timeframe of reporting used in the survey question was too short, the reporting experience of workers may not have been fully captured. Conversely, if a time frame was too long, workers may have only remembered severe injury events. The differences in measurement of underreporting of work-related injury or illness using different timeframes across studies

interfere with comparisons of study findings.

Strengths and Limitations of the Current Review

The present study is one of the first systematic reviews that investigated workers' underreporting of occupational injury or illness in the United States. Including both quantitative and qualitative design in the review strengthens the review findings. This review has several limitations. First, this review used only five electronic databases and included only English publications. Therefore, this review may have not fully captured all relevant studies. Second, this review has limited generalizability due to heterogeneity of included sample characteristics and study setting, study design, low certainty of overall evidence, and potential publication bias toward studies. Last, although revised OSHA 2014 reporting regulations may have influenced on workers' reporting behaviors, we identified and included only eight studies that were published after 2014; however, there was no big difference of the findings between studies published before and after 2014.

Implications for Future Research

This systematic review demonstrates that various factors have affected the reporting of work-related injuries or illnesses among workers and there are many challenges to adequately measuring the level of underreporting. To accurately and fully capture all work-related injuries and illnesses, it is important to minimize barriers that workers can experience in the process of reporting their work-related injuries or illnesses. In addition, an objective measurement for underreporting of work-related injury or illness is required. However, we found an absence of a standardized approach to measuring injury or illness reporting, and this resulted in a wide variation in the measured prevalence of underreporting across studies. In the present review, most of included studies employed a cross-sectional study design, which limited the ability to determine causal relationship between various factors noted above and workers' underreporting of injury or illness. All these findings highlight the need for future

research employing a longitudinal study design and standardized measurement of workers' underreporting.

Conclusion

Our review findings show that the level of underreporting of work-related injury or illness varied by measurement approaches. Nevertheless, underreporting of work-related injury or illness was found to be common among workers, particularly among vulnerable groups such as racial/ethnic minorities with low wages and poor psychosocial work environments. Our findings can give insights for employers and public health administrators into improving organizational safety culture and climate, and for empowering these vulnerable groups regarding work-related injury or illness reporting. Future research applying a standardized measurement and longitudinal study design can provide strong evidence for the development of interventions to eliminate the barriers to reporting work-related injuries or illnesses.

Table 2.1: Characteristics of Included Studies

Author, Year	Study design, Measure	Sampling method	Sample characteristics		Worker and workplace setting	Quality appraisal, Certainty
			Size	Gender, Race/ethnicity, Mean age		
Weddle.,1996	CS, Q	Convenient	368	F: 56% M:44% Not provided Mean 39 years	Workers in the environmental service department of 5 hospitals in Baltimore	2, Low
Haiduven et al.,1999	CS, Q	Convenient	549	Not provided	Healthcare workers in a public teaching hospital in Santa Clara	3, Moderate
Rosenman et al., 2000	CS, Q and I	Random	1,598	F: 41% M:59% W: 67% B:28% Not provided	General workers in Michigan	5, High
Biddle &Robert., 2003	PC I and AD	Random	1st wave: 1,598 2nd wave: 1,118	Not provided	General workers in Michigan	4, Moderate
Scherzer et al., 2005	CS, Q	Convenient	941	F: 99% M:1% H: 76% Mean 42 years	Las Vegas hotel room cleaners	4, Moderate
Fan et al., 2006	CS, Q	Random	321	F: 47% M: 53% W:88% Not provided	General workers in Washington, DC	5, High
Siddharthan et al., 2006	CS (MM), Q and F	Convenient	Q: 15,319 F: 28	F: 84% M:16% W:70% B:17% Mean 50-59years	Workers at veteran administration hospitals in Washington, DC	2, Low
Gershon et al., 2007	CS, Q	Random	1,156	F: 87% M:13% Not provided Mean 49 years	Unionized registered nurses (RNs) employed in a wide range of non-hospital settings in New York	4, Moderate
Makary et al., 2007	CS, Q	Convenient	699	F: 31% M: 69% Not provided Not provided	Surgeons in training at residency programs in general surgery certified by the Accreditation Council for Graduation Medical Education	4, Moderate
Donnelly et al., 2013	CS, Q	Convenient	336	Not provided	Residents, fellows, and practicing dermatologists	3, Moderate
Lipscomb et al., 2013	CS, Q	Convenient	1,020	Not provided Not provided Mean 27 years	Carpenter apprentices in 3 union training programs in Chicago, Illinois, St. Louis	4, Moderate
Moore et al., 2013	CS (MM), Q and F	Convenient	135	F:1% M:99% W: 92% Mean 45 years	Union construction workers in Northwest	2, Low

Author, Year	Study design, Measure	Sampling method	Sample characteristics		Worker and workplace setting	Quality appraisal, Certainty
			Size	Gender, Race/ethnicity, Mean age		
Qin et al., 2014	CS, Q	Convenient	2,639	F:90% M:10% W: 50% B: 37% Not provided	Nursing homes workers in Maine, Maryland, Massachusetts, and Rhode Island	4, Moderate
Boden et al., 2015	CS, Q and AD	Convenient	1,572	F:91% M:9% W: 77% Not provided	Patient care workers	3, Moderate
Pompeii et al., 2016	CS Q and F	Convenient	5,385	F: 72% M:28% W: 45% B: 23% A: 9% H: 7% Not provided	All workers in 6 hospitals in Texas and North Carolina who were likely to interact with patients and/or visitors as part of their job	4, Moderate
Deipolyi et al., 2017	CS, Q	Random	908	F:10% M:90% Not provided Mean 45 years	Interventional radiologist members of the Society of Interventional Radiology	4, Moderate
Green et al., 2019	RCT, Q	Random	390	F:55% M:45% W: 30% H:68% Not provided	Full-time janitors in the Service Employees International Union	4, Moderate
Yang et al., 2019	CS, Q	Random	7,395	F:38% M:61% Not provided Not provided	Residents taking the 2017 American Board of Surgery In Training Examination	5, High
Anderson et al., 2021	CS, Q and I	Convenient	620	F:57% M:43% W:57% H:13% Mean 45 years	Janitors and custodians who are currently employed or had been employed in the past year	3, Moderate
Lee et al., 2021	CS, Q and I	Convenient	171	F: 58% M:42% A:67% H:20% Mean 48 years	Cleaning workers in Northern California	4, Moderate

Note. *CS* cross sectional, *PC* prospective cohort, *RCT* Randomized controlled trial, *MM* mixed method, *Q* questionnaire, *I* interview, *AD* administrative data, *F* focus group, *F* female, *M* male, *W* White, *B* Black, *H* Hispanic, *A* Asian

Table 2.2: Prevalence, contributing factors, and reasons for reporting of work-related injuries or illnesses

Author, Year	Type of reporting	Type of injury/illness	Prevalence of not reporting	Contributing factors to injury/illness reporting	Reasons for not reporting
Weddle, 1996 [4]	Reporting to management	All injuries including needlesticks, cleaning chemical burns and eye splashes, back pain after heavy lifting, and any others for 12 months	39%		• Fear • Cumbersome time and effort • Perceptions of injuries as not severe or a part of the job
Haiduven, 1999 [24]	Reporting to management	All percutaneous/mucocutaneous injuries in the last 5 years	47%		• Cumbersome time and effort • Perceptions of injuries as not severe or part of the job • Distrust of reporting
Rosenman, 2000 [17]	workers' compensation (WC) filing	1.Diagnosed repetitive trauma with neck, upper extremity, and low back work-related musculoskeletal disease during the 12-week 2. Resulting in missed more than 7 consecutive days of work during the 12-week	1. 74% 2. 25%	*Facilitators* • Sociodemographic factors : Lower annual income • Job and employment : Increased length of employment • Injury type and severity : Restriction on activity : Off from work 7 days or more • Psychosocial work environment : Workers' dissatisfaction with Coworkers • Health care providers : A provider not belonging to the company	
Biddle, 2003 [18]	WC filing	1.Work-related pain in backs, wrists, hands, or shoulders (repetitive trauma) identified by physicians in the past 12 months 2. Resulting in lost work time 3. Resulting in missed more than 7 consecutive days of work	1. 68% 2. 45% 3. 27%	*Facilitators* • Sociodemographic factors : Older age • Injury type and severity : Severe wrist condition • Job and employment : Higher physical exertion required *Barriers* • General health and functioning	

Author, Year	Type of reporting	Type of injury/illness	Prevalence of not reporting	Contributing factors to injury/illness reporting	Reasons for not reporting
				: Better role functioning : Better current health	
Scherzer, 2005 [8]	Reporting to management, WC filing	Any pain or discomfort during the past 12 months that he/she feels might have been caused or made worse by one's work as a hotel room cleaner	Management: 67% WC: 74%		• Fear • Cumbersome time and effort • Perceptions of injuries as not severe or part of the job • Lack of knowledge
Fan, 2006 [19]	WC filing	Positive response to at least one of the following: • In the past 12 months, have you been injured while performing your job? • Has a doctor or other medical professional told you that you have a work-related illness?	47%	*Facilitators* • Sociodemographic factors : Being married • Job and employment : Service occupation : Precision, craft, repair occupation : Operators, fabricators, laborers • General health and functioning : Obesity	
Siddharthan, 2006 [29]	Not specified	Work-related musculoskeletal pain in the last 12 months that require to reschedule work	35%	*Facilitators* • Sociodemographic factors : Age 50 years or older : Hispanic workers *Barriers* • Injury type and severity : More than 3 injuries in the last 12 months • Job and employment : Job tenure 5 years or more : Evening or Night shift : Work more than 80 hours in 2 wks • Psychosocial work environment : Worker's safety as a priority of management	• Fear • Cumbersome time and effort • Perceptions of injuries as not severe or part of the job • Lack of knowledge

Author, Year	Type of reporting	Type of injury/illness	Prevalence of not reporting	Contributing factors to injury/illness reporting	Reasons for not reporting
Gershon, 2007 [25]	Reporting to management	Exposure to blood and body fluids in the last 12 months	49%		• Fear • Cumbersome time and effort • Lack of knowledge • Distrust of reporting
Makary, 2007 [20]	Reporting to management	Needlestick injuries in the past 5 years	51%	*Barriers* • Sociodemographic factors : Male workers • Injury type and severity : Injury not involving a high-risk patient : Total number of needlesticks during training • Job and employment : Occurrence in operating room • Knowledge on reporting : No information from other person	
Donnelly, 2013 [26]	Reporting to management	Sharp injuries in the past 12 months	65%		• Fear • Cumbersome time and effort • Perceptions of injuries as not severe or part of the job • Lack of knowledge • Distrust of reporting
Lipscomb, 2013 [6]	Reporting to management	Any work-related injury or illness (entire life)	20%	*Facilitators* • Psychosocial work environment : Safety incentive for not having an injury : Coaching for unsafe behaviors *Barriers* • Psychosocial work environment : Discipline behaviors for the injured	

Author, Year	Type of reporting	Type of injury/illness	Prevalence of not reporting	Contributing factors to injury/illness reporting	Reasons for not reporting
Moore, 2013 [30]	Reporting to management	Any work-related injury or illness (entire life)	27%		• Fear • Cumbersome time and effort • Perceptions of injuries as not severe or part of the job • Lack of knowledge • Distrust of reporting
Qin, 2014 [21]	WC filing	Low back pain in the past 3 months at least once	91%	*Facilitators* • Injury type and severity : Severe pain • Job and employment : Higher physical demand : Higher job strain : Higher social support *Barriers* • Sociodemographic factors : Higher education level	
Boden, 2015 [22]	Reporting to management	Sharp injuries during the past 12 months	21%	*Facilitators* • Sociodemographic factors : Female workers • Psychosocial work environment : Safety practice scale	
Pompeii, 2015 [31]	Reporting to management	Type II violence (patient/visitor-on-worker) in the past 12 months	51%	*Facilitators* • Injury type and severity : involving in serious injury such as Physical assault or threat • Job and employment : Nurse : Nurses' aid : Security guard	• Fear • Cumbersome time and effort • Perceptions of injuries as not severe or part of the job • Lack of knowledge • Distrust of reporting

Author, Year	Type of reporting	Type of injury/illness	Prevalence of not reporting	Contributing factors to injury/illness reporting	Reasons for not reporting
Deipolyi, 2017 [27]	Reporting to management	Needlestick injuries in the past 5 years	33%		• Fear • Cumbersome time and effort • Perceptions of injuries as not severe or part of the job • Lack of knowledge • Distrust of reporting
Green, 2019 [16]	WC filing	Any work-related injury or illness in the past 6 months	84%	*Facilitators* • Psychosocial work environment : Safety training	• Fear • Cumbersome time and effort • Perceptions of injuries as not severe or part of the job • Lack of knowledge
Yang, 2019 [23]	Reporting to management	Needlestick injuries in the past 6 months	29%	*Facilitators* • Sociodemographic factors : Male workers • Job and employment : Had less than 8 hours off and between shift 3 times or more : Worked more than 80 hours 3 times or more in a week • General health and functioning : Poor general health status	• Fear • Cumbersome time and effort • Perceptions of injuries as not severe or part of the job
Anderson, 2021 [28]	WC filing	Any work-related injury or illness in the past 12 months	55%		• Fear • Lack of knowledge
Lee, 2021 [7]	Reporting to management	Chemical-related symptoms in respiratory, eye, skin, neurological, and gastrointestinal systems (e.g., cough, burning in nose or throat, itchy or burning eyes, rash, headache, and nausea) in the past 12 months	74%	*Facilitators* • Sociodemographic factors : College education *Barriers* • Sociodemographic factors : Female workers : Asian workers	

Table 2.3: The certainty of evidence using GRADE and the criteria support for the concept in the mixed methods synthesis

GRADE				
Contributing factors	Studies	Sample size	Assessment	Explanation
Sociodemographic characteristics				
Age	Biddle&Robert. (2003),	1,598	Low	
Sex	Makary et al., (2007), Boden et al., (2015), Yang et al., (2019), Lee et al., (2021)	9.837	Very low	Risk of bias, Inconsistency
Race/ethnicity	Boden et al., (2015), Lee et al., (2021)	1,743	Very low	Risk of bias, Inconsistency
Education	Qin et al., (2014), Lee et al., (2021)	2,810	Very low	Risk of bias, Inconsistency
Income	Rosenman et al., (2000)	1,598	Low	
Marital status	Fan et al., (2006)	321	Very low	Imprecision of result
Injury type and severity				
Activity limitation	Rosenman et al., (2000)	1,598	Low	
Absence from work	Rosenman et al., (2000)	1,598	Low	
Severe symptoms	Biddle&Robert.(2003), Makary et al., (2007), Qin et al., (2014)	4,936	Low	Indirectness of evidence
Number of injuries	Makary et al., (2007)	699	Very Low	Risk of bias
Psychosocial work environment				
Social support	Rosenman et al., (2000), Qin et al., (2014)	4,237	Moderate	
Safety training	Lipscomb et al., (2013), Boden et al., (2015)	2,592	Very low	Risk of bias, Indirectness of evidence
Safety incentive	Lipscomb et al., (2013)	1,020	Low	Risk of bias
Job strain	Qin et al., (2014)	2,639	Low	Risk of bias
Job and employment				
Physical demand	Biddle&Robert.(2003), Qin et al., (2014)	4,237	Moderate	
Job tenure	Rosenman et al., (2000)	1,598	Low	
Type of work	Fan et al., (2006), Makary et al., (2007),	1,020	Very low	Risk of bias
Work hour	Yang et al., (2019)	7,395	Low	
General health and functioning				
	Biddle&Robert.(2003), Fan et al., (2006), Yang et al., (2019)	9,264	Very low	Risk of bias, Indirectness of evidence
Knowledge regarding reporting				
	Makary et al., (2007)	699	Low	
Healthcare provider				
	Rosenman et al., (2000)	1,598	Low	
The criteria of support for the concept in the mixed-methods synthesis				
Reasons for not reporting	Studies		Assessment	Explanation
Fear	Siddharthan et al., (2006), Moore et al., (2013), Pompeii et al., (2015)		Moderate	Inside-outside
Cumbersome time and effort	Siddharthan et al., (2006), Moore et al., (2013), Pompeii et al., (2015)		Moderate	Inside-outside
Perceptions of injuries as not	Siddharthan et al., (2006),		Moderate	Inside-outside

GRADE				
Contributing factors	Studies	Sample size	Assessment	Explanation
severe or part of the job	Moore et al., (2013), Pompeii et al., (2015)			
Distrust of reporting	Siddharthan et al., (2006), Moore et al., (2013), Pompeii et al., (2015)		Low	Publication bias, Inside-outside
Lack of knowledge	Moore et al., (2013), Pompeii et al., (2015)		Low	Publication bias, Inside-outside

Risk of bias: limitations in study design and implement; Inconsistency: heterogeneity in study results; Indirectness of evidence: heterogeneity in measurement tools used or operationalization of outcome; Imprecision of results: wide confidence intervals and small sample size; Truth value/bias: the inferences related to an analytical concept remain sensitive to, and clearly reflective of the numeric and textual data from the primary studies; Explanation credibility: the analytical concept and the related inferences are theoretically and conceptually sound; Weakness minimization: the concept is supported by a range of data from different study designs; Inside-outside: the data related to the concept consists of both subjective (insider) views and objective (outsider) observations; Publication bias: there is at least one study that shows non-significant, null, or contrasting results.

Appendix 2.1: Search strategies

PubMed via MEDLINE (Search date: November 10, 2022; 1140 results. post deduplication 1,138)

#	Searches	Results
1	("Accidents, Occupational"[MeSH]) OR ("Occupational Diseases"[MeSH]) OR ("Occupational Injuries"[MeSH]) OR ("occupational disease*"[Title/Abstract]) OR ("occupational injur*"[Title/Abstract]) OR ("work related illness*"[Title/Abstract]) Filters: **English**	158,215
2	("Mandatory Reporting"[MeSH]) OR ("underreport*"[Title/Abstract]) OR ("under-report*"[Title/Abstract]) OR ("underestimat*"[Title/Abstract]) OR ("under-estimat*"[Title/Abstract]) OR ("undercount*"[Title/Abstract]) OR ("under-count*"[Title/Abstract]) OR ("underrecord*"[Title/Abstract]) OR ("under-record*"[Title/Abstract]) Filters: **English**	95,099
3	(("Accidents, Occupational"[MeSH]) OR ("Occupational Diseases"[MeSH]) OR ("Occupational Injuries"[MeSH]) OR ("occupational disease*"[Title/Abstract]) OR ("occupational injur*"[Title/Abstract]) OR ("work related illness*"[Title/Abstract])) AND (("Mandatory Reporting"[MeSH]) OR ("underreport*"[Title/Abstract]) OR ("under-report*"[Title/Abstract]) OR ("underestimat*"[Title/Abstract]) OR ("under-estimat*"[Title/Abstract]) OR ("undercount*"[Title/Abstract]) OR ("under-count*"[Title/Abstract]) OR ("underrecord*"[Title/Abstract]) OR ("under-record*"[Title/Abstract])) Filters: **English**	1,140

PsycINFO via ProQuest (Search date: November 13, 2022; 200 results. post deduplication 200)

#	Searches	Results
1	subject(industrial accident) OR subject(work related illness) OR (accidents, occupational) OR (occupational disease*) OR (occupational injur*) Filters: **English**	24,512
2	subject(mandatory report*) OR underreport* OR under-report* OR underrecord* OR under-record* OR underestimat* OR under-estimat* OR undercount* OR under-count* Filters: **English**	17,619
3	(((accidents, occupational) OR subject(industrial accident) OR subject(work related illness) OR (occupational disease*) OR (occupational injur*)) AND la.exact("ENG")) AND (subject(mandatory report*) OR underreport* OR under-report* OR underrecord* OR under-record* OR underestimat* OR under-estimat* OR undercount* OR under-count*)	200

CINAHL via EBSCO (Search date: November 14, 2022; 192 results. post deduplication 180)

#	Searches	Results
1	(MH accidents, occupational OR occupational disease* OR occupational injur* OR work related illness*) AND **English** (Languages)	15,541
2	(MH mandatory reporting OR underreport* OR under-report* OR underrecord* OR under-record* OR undercount* OR under-count* OR underestimate* OR under-estimat*) AND **English** (Languages)	27,788
3	1 AND 2	192

Embase via Embase.com (Search date: November 11, 2022; 1,352 results. post deduplication 1.349)

#	Searches	Results
1	(('occupational accident'/exp) OR ('occupational disease'/exp) OR ('occupational injury'/exp) OR ('occupational accident') OR ('occupational disease'))AND [english]/lim	226,089
2	(('mandatory reporting'/exp) OR ('under reporting'/exp) OR (under reporting) OR (undercount)) AND [english]/lim	13,636
3	1 AND 2	1,352

Social Science Citation Index via Web of Science (Search date: November 13, 2022; 287 results. post deduplication 254)

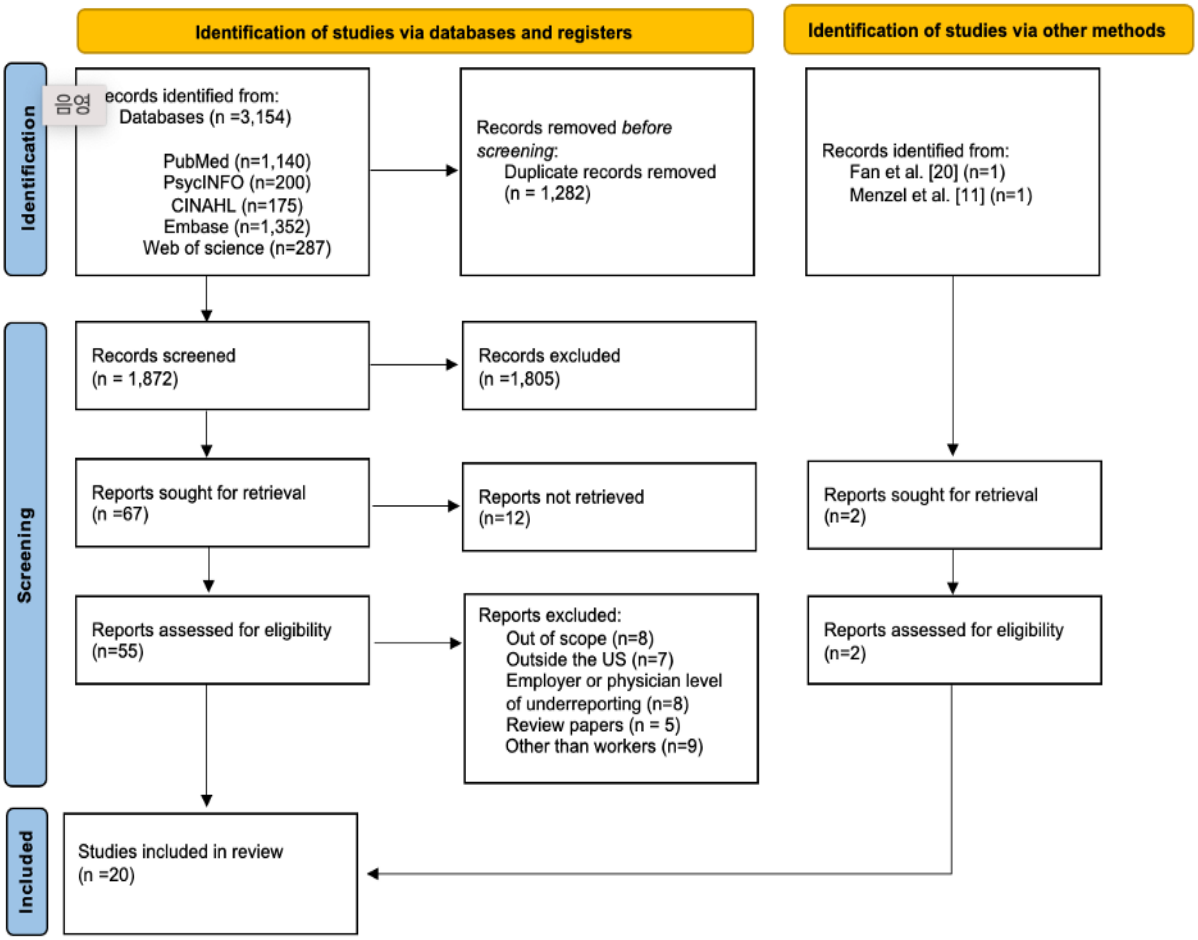
#	Searches	Results
1	TS=(occupational accident* OR occupational injur* OR occupational disease* OR work related illness*) AND **English** (Languages)	17,094
2	TS=(mandatory report* OR underreport* OR underestimat* OR undercount* OR underrecord* Or under-report* OR under-count* OR OR under-estimat* OR under-record*) AND **English** (Languages)	26,983
3	#1 AND #2	287

Appendix 2.2: MMAT quality appraisal profile

Screening	S1. Are there clear research questions or objectives? S2. Do the collected data allow the research questions or objective to be addressed?					
	RANDOMIZED CONTROLLED TRIALS					
Author, year	Is randomization appropriately preformed?	Are the groups comparable at baseline?	Are there complete outcome data?	Are outcome assessors blinded to the intervention provided?		Did the participants adhere to the assigned intervention?
Green et al., 2019	Yes	Yes	Yes	Can't tell		Yes
	NON-RANDOMIZED STUDIES					
Author, year	Are the participants representative of the target population?	Are measurements appropriate regarding both the outcome and intervention (or exposure)?	Are there complete outcome data?	Are the confounders accounted for in the design and analysis?		During the study period, is the intervention administered (or exposure occurred as intended?
Rosenman et al.,2000	Yes	Yes	Yes	Yes		Yes
Biddle &Robert, 2003	Yes	Yes	Yes	No		Yes
Fan et al., 2006	Yes	Yes	Yes	Yes		Yes
Makary et al., 2007	No	Yes	Yes	Yes		Yes
Lipscomb et al., 2013	No	Yes	Yes	Yes		Yes
Qin et al., 2014	No	Yes	Yes	Yes		Yes
Boden et al., 2015	No	Yes	Yes	No		Yes
Yang et al., 2019	Yes	Yes	Yes	Yes		Yes
Lee et al., 2021	No	Yes	Yes	Yes		Yes

Author, year	QUANTITATIVE DESCRIPTIVE STUDIES				
	Is the sampling strategy relevant to address the research question?	In the sample representative of the target population?	Are the measurements appropriate?	Is the risk of nonresponse bias low?	Is the statistical analysis appropriate to answer the research question?
Weddle., 1996	Yes	No	No	No	Yes
Haiduven et al.,1999	Yes	No	Yes	Can't tell	Yes
Scherzer et al., 2005	Yes	No	Yes	Yes	Yes
Gershon et al., 2007	Yes	Yes	Yes	No	Yes
Donnelly et al,, 2013	Yes	No	Yes	No	Yes
Deipolyi et al., 2017	Yes	No	Yes	No	Yes
Anderson et al,, 2021	Yes	No	Yes	No	Yes
Author, year	MIXED METHOD STUDIES				
	Is there an adequate rational for using a mixed methods design to address the research question?	Are the different components of the study effectively integrated to answer the research question?	Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?	Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?
Siddharthan et al., 2006	Yes	Yes	No	No	No
Moore et al., 2013	No	Yes	Yes	No	No
Pompeii et al., 2015	No	Yes	Yes	Yes	No

Figure 2.1: PRISMA flow diagram of the screening



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Chapter 3: Reporting of Work-Related Musculoskeletal Disorders and Associated Factors Among Direct Care Workers in Long-Term Care Facilities in South Korea

Abstract

Background: Direct care workers are at increased risk for work-related musculoskeletal disorders (WRMSDs), and reporting of injuries and symptoms can be affected by various factors. The purpose of this study is to describe the characteristic of WRMSD reporting and identify associated factors among direct care workers in long-term care settings in South Korea.

Methods: This study analyzed cross-sectional survey data from 200 direct care workers in 19 long-term care facilities in Korea. Multivariable analyses were conducted to examine the association between WRMSD reporting and demographic and job characteristics, physical and psychosocial work factors, WRMSD characteristics, and WRMSD reporting attitudes.

Results: Of the participants, 53% had WRMSD in the past 12 months and only 14.5% of those with WRMSD notified it to their management. Reporting of WRMSDs was more prevalent in direct care workers who perceived their management prioritize worker safety (adjusted OR [aOR] = 4.54; 95% Confidence interval [CI] = 1.54 –13.36), witnessed injury reporting of others (aOR = 4.55; 95% CI = 1.15-17.9), and had more positive attitudes toward WRMSD reporting (aOR = 2.01; 95% CI = 1.21-3.29). Conversely, direct care workers who changed job or tasks due to their symptoms (aOR = 0.24; 95% CI = 0.07-0.76) were less likely to report WRMSDs to their managers.

Conclusions: Underreporting of WRMSDs is prevalent among direct care workers. This study findings suggest that underreporting may be mitigated by good workplace safety climate. Open communication among coworkers and between management and workers are needed, especially for workers with negative reporting attitudes.

Keywords: musculoskeletal disorders, mandatory reporting, direct care workers, long-term care facility

Introduction

Musculoskeletal disorder (MSD) is one of the most prevalent occupational health problems (European Agency for Safety and Health at Work, 2019). MSD affects approximately a third of workers worldwide as a leading cause of lost work time, reduced quality of life, and loss of productivity by limiting physical capacity and functional ability (Briggs et al., 2018). In the United States, MSD is related to an estimated 30% of cases involving days away from work (BLS, 2018). MSD is also a main contributor to temporary or permanent disability (Yasobant & Rajkumar, 2014). According to the Global Burden of Disease (GBD) study —a collaboration of over 3,600 researchers from 145 countries, MSDs accounted for 16% of all years lived with disability (YLDs), and that there was a 61.6% increase of disability-adjusted life years (DALYs) from 1990 to 2016 (GBD 2016 DALYs and HALE Collaborators, 2017).

Direct care workers such as nursing assistants (NAs) and personal care aids are at increased risk for work-related musculoskeletal disorders (WRMSDs) than workers in other occupations (Caponecchia et al., 2020; Ching et al., 2018). According to data from the U.S. Bureau of Labor Statistics, NAs had the second highest WRMSD cases among all private industries in 2008, and these NA cases made up more than a half of all days-away-from-work cases (Bureau of Labor Statistics [BLS], 2020). Direct care workers encounter multiple risk factors during their work routines such as manual handling of heavy loads, awkward postures, and repetitive movements (Ching et al., 2018). The risk of WRMSDs is even greater for direct care workers in long-term care settings, where frail elderly residents are highly dependent on physical care and a lack of assistive devices in patient handling (Caponecchia et al., 2020; Peterson et al., 2004). Previous research supported that WRMSDs were more prevalent in NAs in nursing home than hospital-based NAs (Meyer & Muntaner, 1999).

An early identification of occupational health problems is important to prevent further disorders among workers and to ensure the quality of care for patients in long-term care settings

(Ching et al., 2018). The U.S. Occupational Safety and Health Administration (OSHA) provides the legal foundation of employee's rights to report injuries free from retaliation and prohibits employers from taking any adverse actions against employees for the reporting (Occupational Safety and Health Administration [OSHA], 2022). However, there exist perceived barriers to reporting and many injuries or symptoms may go unreported (Kyung et al., 2023a). Research indicated that 20-74% of U.S. workers who experienced a work-related injury or symptom did not report it to their management (Kyung et al., 2023a). WRMSDs are more likely to be underreported because the multifactorial etiology and insidious onset of musculoskeletal symptoms make it difficult to prove the work-relatedness of the MSDs (Park & Yoon, 2021; Qin et al., 2014).

Many researchers have addressed underreporting of work-related injuries or illnesses among care workers. Boden et al. (2015) found that 21% of patient care workers did not report sharp injuries to their management (Boden et al., 2015). Similarly, in a study of bloodborne pathogen exposures, Gershon et al. (2007) noted that 49% of unionized registered nurses in non-hospital settings were reluctant to report exposure to blood and body fluids (Gershon et al., 2007). In Siddharthan et al. (2006)' study, 35% of nursing personnel in a Veterans Administration hospital did not report WRMSDs (Siddharthan et al., 2006). Further, the nursing personnel tended to tolerate their symptoms and took WRMSDs for granted as a natural part of their jobs unless the disorders interfered with their work activities (Siddharthan et al., 2006). Despite these studies, the variability of reporting magnitude is considerable and only few research done related to WRMSD reporting among direct care workers in long-term care settings. Therefore, this study aimed at describing the characteristics of WRMSD reporting and identifying associated factors among long-term care direct care workers in Korea.

Methods

Study Design, Sample, and Data Collection

A cross-sectional study was conducted using a convenience sample of 200 direct care workers in long-term care facilities in South Korea between May and August 2022. Long-term care facilities included long-term care hospitals and nursing homes in three cities in Gyeonggi, which is one out of eight provinces and represents 26% of Korean population (Korean Statistical Information Service, 2022b). In this study, long-term care hospital refer to facilities providing in-patient service and long-term care for people who need a longer hospital stay under the Medical Service Act (Kim et al., 2015). Nursing homes refer to facilities that primarily offer social services under the Welfare of Senior Citizen Act to people aged 65 or older who are unable to live independently but generally do not require the skilled level of medical care (Kim et al., 2015). Whereas long-term care hospitals keep medical doctors on staff to provide clinical decision-making and medical care for each patient, nursing homes contract with medical doctors to visit every other week for general check-ups and update prescriptions (Kim et al., 2015). Direct care workers refer to trained direct care staffs providing the most direct personal care such as feeding, bathing, dressing, and toileting (Kim & Tak, 2018). Since the certification is not mandatory for direct care workers in long-term care hospitals in Korea, the broad definition of direct care workers was applied regardless of the certification. Direct care workers who were employed for at least three months or longer in their current job, and able to read, write, and understand Korean were eligible to participate in this study.

Study information and recruitment letters were faxed or emailed to 110 long-term care facilities, which accounts for 4.8% of 2,267 institutions in Gyeonggi area (Korean Statistical Information Service, 2022a; Ministry of Health and Welfare of South Korea, 2022). The long-term care facilities were chosen based on convenience sampling method. Of

110 settings contacted (31 long-term care hospitals and 79 nursing homes), three long-term care hospitals and 16 nursing homes were responded. With permissions from 19 settings, a flyer with contact information was placed on the department bulletin boards in each organization; Three long-term care hospitals had 96 to 196 beds and 16 nursing homes had 9 to134 beds. The sample institutions represented 5.8% for long-term care hospitals and 5.3% for nursing homes.

This study collected data using a self-administered questionnaire. The questionnaire was pilot tested with 20 direct care workers in a long-term care hospital. The study questionnaire was distributed and collected during each institution's monthly staff meeting or training program offered by the National Health Insurance Service (NHIS). A 10,000 won gift was given to each participant after completing the survey. A total of 403 direct care workers from 19 institutions participated in the study with the overall response rate of 86% (70-81% for long-term care hospitals and 86-95% for nursing homes). Of these, 24 participants were removed because of direct care worker experience less than three months (n=11) or missing responses 5% or more (n=13). The final sample of 200 participants who had WRMSDs was included in the analysis. The flow diagram of the study participation is depicted in Figure 1. The study was approved by both the Committee on Human Research of the BLINDED FOR REVIEW and by the Public Institutional Review Board in South Korea.

Study Variables and Instruments

Demographic and job characteristics

Demographic and job characteristic variables included the following: age, sex, immigrant status (citizen or non-citizen), marital status, education (elementary school, middle school graduate, high school graduate, or college 1 year or more), duration of employment, workplace type (long-term care hospitals or nursing homes), and work arrangement (permanent, temporary, or independent),.

Physical work factors

Physical work factors included number of assigned patients and physical exertion. Respondents were asked to indicate how physically demanding their present work was and the responses ranged from 1 for 'not strenuous' to 5 for 'extremely strenuous' (Neupane et al., 2020).

Psychosocial work variables

Psychosocial work variables included job stress and safety climate. The Korean version of Effort-Reward Imbalance (ERI) questionnaire consisting of effort (6 items), reward (10 items), and overcommitment (6 items), was used to measure job stress (Eum et al., 2007; Siegrist, 1996). The ERI questionnaire has been validated in many studies (Eum et al., 2007; Siegrist, 1996). Effort refers to the job demand or obligations imposed on workers (e.g., "I have constant time pressure due to a heavy workload") and reward is something that workers can gain from work such as money, esteem, and job security (e.g., "I receive the respect I deserve from my superior or a respective relevant person") (Van Vegchel et al., 2005). The ERI model assumes that stress occurs when a reciprocal relationship between effort and reward breaks and this can be intensified by overcommitment (e.g., "I get easily overwhelmed by time pressures at work") (Siegrist et al., 2004). All scale items used a 4-point Likert scale ranging from 1 for 'strongly disagree' to 4 for 'strongly agree.' The effort, reward, and overcommitment scores were calculated as the sum of the item responses. The ERI ratio was obtained by dividing efforts by rewards and a correction factor of 3/5 so that an ERI ratio of 1.0 indicates balance between efforts spent and rewards received (Siegrist et al., 2004). Safety climate refers to workers' perceptions of workplace safety such as organizational commitment to safety, communication and feedback, and safety program, policy, and practice (Gillen et al., 2002). Safety climate was assessed by a single question, "Do you think the health and safety of workers are a high priority of management where you

work?", where response were yes or no (Kines et al., 2011). In the present study, the safety climate was regarded as good for 'yes' and poor for 'no'. For safety training for injury reporting, respondents were asked to indicate if they ever received a training regarding reporting of workplace injuries or illnesses from their organization.

WRMSDs

Respondents were asked whether they had any musculoskeletal pain or discomfort in neck, shoulder, back, upper extremities, or lower extremities during the past 12 months and if their pain or discomfort made worse or caused by work. For affirmative answers to WRMSDs, respondents were also asked to indicate how often and severe this pain or discomfort was. The frequency of pain was measured on a 6-point Likert type scale ranging from 1 for 'never' to 6 for 'daily' by modifying the questionnaire used in the Nurses' Work Life and Health study (Lipscomb et al., 2002). The severity of pain was measured on a 5-point Likert type scale ranging from 1 for 'none' to 5 for 'extreme' (Dennerlein et al., 2012). Respondents were also asked to specify whether they visited a physician, missed work for one or more days, changed jobs, tasks, or the way they worked due to the pain or discomfort.

WRMSD Reporting

Reporting experience was measured by a single question, "In the past 12 months, did you report at least one of your musculoskeletal symptoms to the company official that you belong?" with yes or no. The participants were also asked to indicate whether they have ever witnessed the injury reporting of others to management. Reporting attitude was measured using the modified 4-item instrument developed by Probst and Graso (2013) validated with Cronbach's alpha of 0.76. The original version of questionnaire was modified for direct care workers in long-term care facilities by changing 'accidents and injuries' to 'work-related injuries or illnesses.' The modified English version of the questionnaire was translated and back translated to Korean language by two independent bilingual people, and the Korean

questionnaire was finalized through consultation with a third bilingual person. The Cronbach alpha of the Korean version of questionnaire was 0.80. Respondents were asked to indicate their thoughts toward reporting of WRMSDs to managers as follows: “Work-related injury or illness investigations are mainly used to assign blame,” “Nothing gets fixed, so why bother reporting an injury or illness,” “Reporting a work-related injury or illness hurts my chances for job-related rewards,” and “Musculoskeletal pain or discomfort is a normal part of my job. They can’t all be prevented.” The instrument was measured on a 7-point Likert scale ranging from 1 for ‘strongly agree’ to 7 for ‘strongly agree’ with higher values reflecting more positive attitudes toward injury reporting. The reporting attitudes scores were calculated as the average score of the sum of item responses.

Data Analysis

All data were analyzed using STATA version 16.0 (Stata Corporation, College Station, TX). Study variables were described using descriptive statistics such as frequency, percentage, mean, and standard deviation. Chi-square tests or Fisher’s exact tests were used to examine the differences between categorical variables and two-tailed t-tests were used to compare the means of continuous variables between direct care workers who reported their WRMSD to manager and those who did not report a WRMSD. Multivariable logistic regression on reporting experience were conducted to identify associated factors to reporting experience. After checking multicollinearity, the variables with p-value less than 0.05 from the bivariate analysis were included in multivariable analysis. Odds ratios (ORs) and 95% confidence intervals (CIs) were obtained.

Results

Characteristics of the Study Sample

The characteristics of the study participants by reporting experience are presented in Table 1. Among the study participants who had WRMSDs in the past 12 months (N = 200), 27 direct care workers (13.5%) reported it to their management. Of the participants, 91% were female and 22% were non-citizen. The majority were married (96%) and high school graduates or less (91%). The mean age was 60.1 years, and the mean duration of employment as a direct care worker was 5.6 years. Approximately a third of participants (32.3%) worked in long-term care hospitals and two thirds (68.7%) worked in nursing homes. Half of the participants were temporary workers and rotation or round-the-clock work shifts (i.e., working all day and night without stopping) (87%) were most frequent. Participants cared for 7.4 patients per shift on average and the mean physical exertion of their job was 3.9 out of five. The majority of participants received safety training regarding reporting (91%). For job stress, the mean score of effort was 15.1, reward 26.0, overcommitment 13.8, and effort-reward imbalance ratio was 1.3. The proportion of the participants perceiving that their organization put workers health and safety as a top priority was significantly higher among those who reported WRMSDs than their counterparts (25.9% vs. 44.8%, $p = 0.001$).

WRMSDs and Reporting Characteristics

Table 2 shows comparisons of WRMSDs and reporting characteristics between direct care workers who reported WRMSDs to management and those who did not. Compared with the not reported injury group, the reported injury group had a higher frequency of WRMSDs ($p = 0.010$), higher severity of WRMSDs ($p = 0.044$), more likelihood of missed work ($p = 0.012$), and more likelihood of changed job, task, or the way they work ($p = 0.010$). For reporting attitudes, the reported injury group was more likely than the not reported injury group to have positive attitudes toward injury reporting ($p = 0.013$). Specifically, the reported

injury group was more likely to perceive that injury or illness reporting is mainly used to assign blame (p = 0.004) and nothing gests fixed, so why bother reporting an injury or illness (p = 0.010). The reported injury group also had significantly higher proportion of direct care workers who have witnessed the injury reporting of others (88.9% vs. 57.6%, p = 0.002)

Factors Associated with Reporting of WRMSDs to Managements

Table 3 provides multivariable analysis results on factors associated with WRMSD reporting. WRMSD reporting of direct care workers was positively associated with safety climate (adjusted OR [aOR] = 4.54, 95% confidence interval [CI] = 1.54 –13.36), witnessing the injury reporting of others (aOR = 4.55, 95% CI = 1.15-17.9), attitudes toward reporting (aOR = 2.01, 95% CI = 1.21 – 3.29). Conversely, direct care workers who changed job, task, or the way they work due to WRMSDs (aOR = 0.24, 95% CI 0.07-0.76) were less likely to report WRMSDs to their management.

Discussion

The present study explored the characteristics of WRMSD reporting among direct care workers in long-term care institutions in Korea and identified associated factors. Our findings showed that a substantial number of direct care workers with a WRMSD (84.4%) did not report it to their management. This figure is higher than that of previous studies ranging from 21% to 74% (Kyung et al., 2023a). WRMSD reporting was related to injury reporting attitudes, experience of witnessing the injury reporting of others, safety climate, and WRMSDs resulting in changed jobs, tasks, or work.

The present study found a significant association between reporting attitudes and injury reporting. Notably, more positive attitudes toward injury reporting were strongly associated with higher prevalence of WRMSD reporting. Similar to our findings, in a study of U.S. transportation workers, attitudes toward safety-related reporting were positively associated with reporting of workplace aggression and near misses, which refers to incidents

that could have led to injury but did not (Jiang et al., 2018). Tucker and Turner (2013) also found that teen workers with negative reporting attitudes were less likely to report work-related problems to their management.(Tucker & Turner, 2013) In the theory of planned behavior, personal attitude serves as one of the key factors that leads to individual behavior via behavioral intention (Ajzen, 1991). Although the relationship between attitudes and behavior is still on the debate, meta-analyses reviews provided the evidence of the attitude-behavior relationship (L. R. Glasman & D. Albarracín, 2006; Marcinkowski & Reid, 2019; Wallace et al., 2005).

This study found that witnessing the injury reporting of others was associated with a greater likelihood of reporting. This result is consistent with previous findings (Makary et al., 2007). Markary et al. (2007) found that the odds of needlestick injury reporting were 19.29 times higher among surgeons who were aware of injury by another person than those who were not (Makary et al., 2007). Workers' inexperience of injury reporting of others was one of the reasons for not reporting of WRMSDs in a Korea semiconductor company (Park & Yoon, 2021). By witnessing other's experience, workers may gain specific information or knowledge such as where, how, and to whom to report their work-related problems. Another possible explanation lies in workers' reporting attitudes. Workers may hesitate to report a problem without precedents due to fear of repercussions and uncertainty if their voice would influence in the workplace.

This study finding indicates that safety climate is an important factor affecting workers' reporting decision and behavior. Mounting evidence supports the role of safety climate on injury reporting. Lipscomb et al. (2015) found that management safety priority was associated with higher prevalence of injury reporting (Lipscomb et al., 2015). The prevalence of injury reporting without fear was also increasing when workers perceived good safety climate (Lipscomb et al., 2015). Similar patterns were observed in other studies (Probst & Estrada, 2010; Tucker & Turner, 2013). The number of accident reporting increased as the safety climate

was perceived to be more positive (Probst & Graso, 2013). Furthermore, the likelihood of speaking up increased when workers perceived their managements was genuinely open to hearing concerns of workers (Tucker & Turner, 2013). When workers perceive that their management values workers' safety, they may feel themselves being protected and believe that the company will do something to fix safety problems—all of which may facilitate workers' engagement in reporting of work-related problems.

This study found an inverse relationship between changed jobs or tasks due to WRMSDs and injury reporting. This finding aligns with research that workers with injury or illness resulting in any changes in jobs or tasks were less likely to file a workers' compensation (WC) claim (Kyung et al., 2022; Ruseckaite & Collie, 2011). In a study of Australian workers with a repeated WC claim, workers who changed their working conditions had longer duration between first and second claim than those who did not (Ruseckaite & Collie, 2011). Workers who experienced aggravation of symptoms while performing certain jobs or tasks can feel better by changing jobs, tasks, or working condition. Lower likelihood of WRMSD reporting can be attributed to new working environment. Workers who changed jobs may hesitate to report their work-related problems since they are not familiar with new reporting systems and changed safety climate.

Limitations

Limitations of this study should be acknowledged. First, a convenience sampling approach used in this study may introduce selection bias impacting on external validity. Yet, based on the data collected from 19 long-term care facilities which represent 5.4% of the facilities in three cities and the high response rates (82%) in the present study, findings on this study may be generalizable to direct care workers in other long-term care settings in Korea. Second, the study findings may have been affected by a healthy workers effect—those who remain employed tend to be healthier (Arrighi & Hertz-Picciotto, 1994). Although the half of

the participants had WRMSDs and more than 70% of them visited a doctor due to their symptoms in the present study, direct care workers with severe WRMSD condition may already be left out from the workplace, which may have led to an underestimation of the findings. Last, as the study findings depended on a self-reported questionnaire, reporting or recall bias cannot be excluded regarding the WRMSDs status and prevalence of reporting. However, according to Gabbe et al. (2003), approximately 80% of participants accurately recalled the number of injuries they had and the affected physical regions (Gabbe, 2003).

Conclusions

WRMSD is a prevalent problem among direct care workers, but there is a significant level of underreporting of WRMSDs. This study found that reporting was significantly associated with experience of witnessing injury reporting of others, safety climate, WRMSD experience resulting in changed jobs, and attitudes toward WRMSD reporting. These findings suggest that workplace safety climate may provide workers with cues regarding whether injury reporting will be reinforced or punished. This calls for the need to build a good safety climate and provide more support, particularly for workers with negative attitudes toward reporting and who have never witnessed injury reporting of others. recommended developing an open communication with a focus on problem-solving and learning among workers and between workers and management to facilitate injury reporting (Moore et al., 2013). Tucker and Turner (2013) reached a similar conclusion based on their research that managements need to show that they genuinely care workers safety and health (Tucker & Turner, 2013). Further research with larger samples in different settings and a prospective cohort study design are needed to validate the findings of this study.

Table 3.1: Demographic, job, and psychosocial characteristics by injury reporting among direct care workers with work-related musculoskeletal disorders

	Total (n=200)		Reported injury (n=27)		Not reported Injury (n=173)		*ρ*
	N	**%**	**N**	**%**	**N**	**%**	
Sex							0.256
Male	18	9.0	4	14.8	14	8.1	
Female	183	91.0	23	85.2	159	91.9	
Immigrant status							0.126
Citizen	156	77.6	18	66.7	138	79.8	
Non-citizen	45	22.4	9	33.3	35	20.2	
Marital status							0.924
Married	191	96.0	1	3.7	7	4.1	
Single	8	4.0	26	96.3	164	95.9	
Education							0.675
Elementary school	6	3.0	1	3.7	5	2.9	
Middle school graduate	24	12.0	4	14.8	20	11.6	
High school graduate	150	75.0	21	77.8	128	74.4	
College or more	20	10.0	1	3.7	19	11.1	
Workplace type							0.546
Long-term care hospital	65	32.3	10	37.0	54	31.2	
Nursing home	136	68.7	17	63.0	119	68.8	
Work arrangement							0.056
Permanent	55	28.5	6	23.1	49	29.5	
Temporary	94	48.7	18	69.2	76	45.8	
Independent contract	44	22.8	2	7.7	41	24.7	
Work shift							0.360
Day	21	10.5	5	18.5	16	9.4	
Evening	0	0	0	0	0	0	
Night	5	2.5	1	3.7	4	2.3	
Rotation	107	53.8	11	40.7	96	56.1	
Round the clock	66	33.2	10	37.1	55	32.2	
Safety training for injury reporting							0.337
Received	183	91.0	26	96.3	157	90.8	
Not received	18	9.0	1	3.7	16	9.2	
Safety climate[a]							**0.001**
Good	98	48.5	7	25.9	77	44.8	
Poor	103	52.5	20	74.1	95	55.2	
			Mean	**SD**	**Mean**	**SD**	
Age, years	60.1	6,5	60.2	6.8	60.1	6.5	0.975
Duration of employment, years	5.6	4.8	59.1	43.9	68.0	59.9	0.461
Number of assigned patients	7.4	7.5	7.9	6.9	7.3	7.7	0.712
Physical exertion (1-5)	3.9	0.7	4.0	3.7	3.9	3.8	0.260
Effort (6-24)	15.1	2.5	15.5	2.7	15.0	2.4	0.301
Reward (10-40)	26.0	3.5	25.7	3.6	26.1	3.5	0.622
Overcommitment (6-24)	13.8	2.3	14.4	2.8	13.7	2.2	0.148
Effort-reward imbalance (0.25-4)	0.99	0.27	1.04	0.49	0.99	0.22	0.410

Table 3.2: Work-related musculoskeletal disorders (WRMSDs), witness experience of reporting, reporting attitudes by injury reporting among direct care workers

	Reporting of WRMSD (n=27)		Not reporting of WRMSD (n=173)		*p*
	Mean	**SD**	**Mean**	**SD**	
Symptom frequency (1-6)	4.7	1.6	3.7	1.8	**0.010**
Symptom severity (1-5)	3.2	0.7	2.9	0.8	**0.044**
The number of affected body regions (0-4)	2.1	1.0	1.9	1.0	0.250
Reporting attitudes (1-4)[a]	4.3	1.2	3.7	1.1	**0.013**
Injury/illness reporting is mainly used to assign blame	4.8	1.5	4.0	1.4	**0.004**
Nothing gets fixed, so why bother reporting an injury or illness	4.7	1.5	3.9	1.5	**0.010**
Reporting an injury or illness hurts my chances for job-related rewards	4.4	1.7	4.0	1.6	0.228
As a natural part of job, an injury or illness can't be all prevented	3.1	1.4	2.8	1.3	0.268
	N	**%**	**N**	**%**	***p***
WRMSD consequences					
Saw a health care provider	21	77.8	122	71.3	0.488
Missed work	6	23.1	12	7.4	**0.012**
Changed job, task, or work	9	34.6	23	14.2	**0.010**
Witnessed the injury reporting of others	24	88.9	99	57.6	**0.002**

*Bold indicates significant $p<0.05$

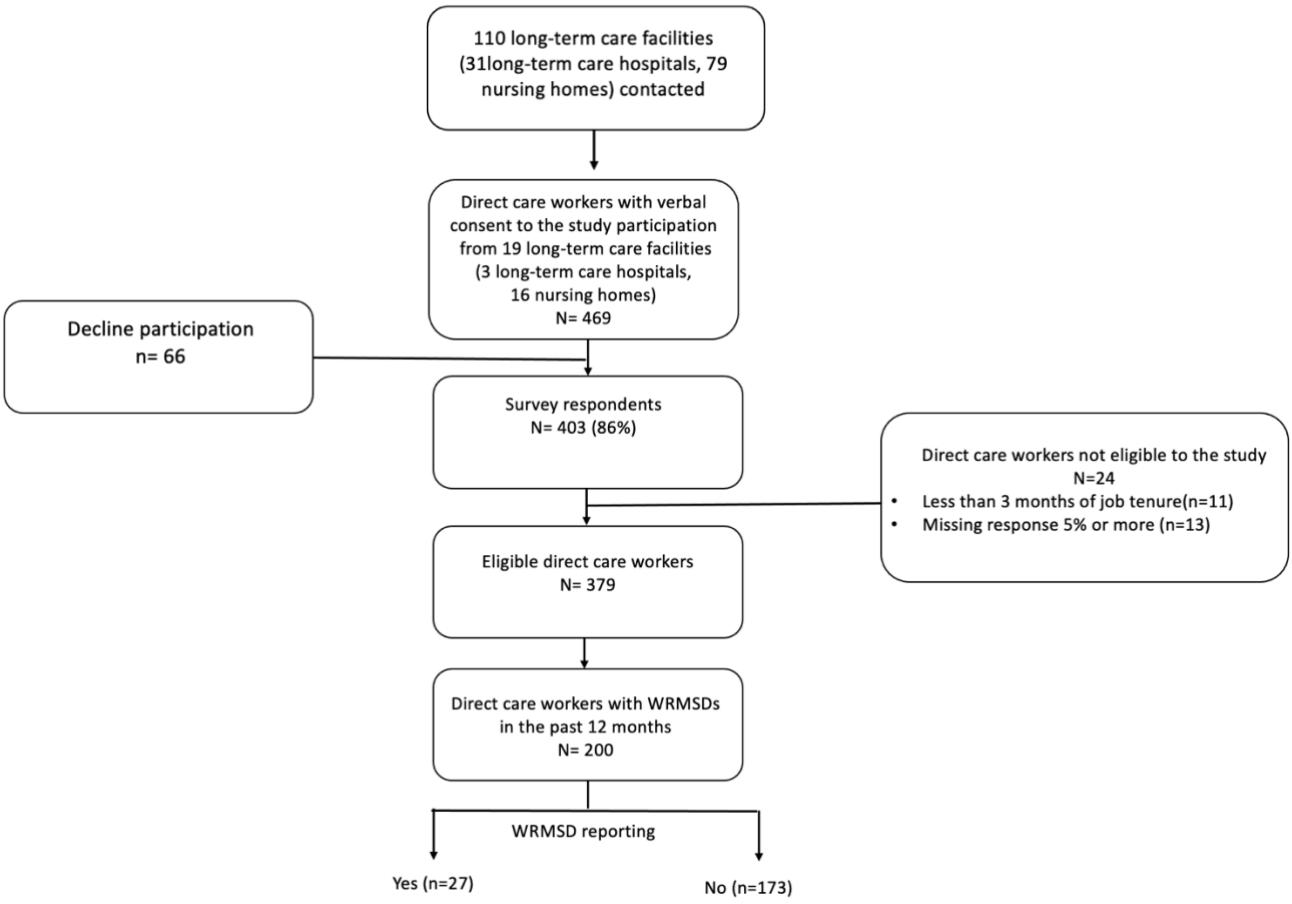
a. Higher scores indicate more positive attitudes toward injury reporting.

Table 3.3: Factors associated with reporting of work-related musculoskeletal disorders (WRMSDs) among direct care workers: multivariable analysis

Variables	WRMSD reporting (n=184)	
	OR	**95% CI**
Good safety climate	**4.54**	**1.54-13.36**
Symptom frequency	1.36	0.95-1.95
Symptom severity	1.26	0.56-2.8
Missed work due to WRMSDs	0.52	0.14-2.02
Changed job, task, or work due to WRMSDs	**0.24**	**0.07-0.76**
Witnessed the injury reporting of others	**4.55**	**1.15-17.9**
WRMSD reporting attitudes	**2.01**	**1.21-3.29**

*Bold indicates significant $p<0.05$
Abbreviation: OR, odds ratio; CI, confidence interval.

Figure 3.1: Flow diagram of the study participation.



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Chapter 4: Factors Associated with Reporting Attitudes of Work-Related Musculoskeletal Disorders Among Direct Care Workers in South Korea

Abstract

Background: Workers' reporting of work-related injuries or illnesses is important for appropriate treatment and prevention of recurrences and their reporting attitudes may play a role in actual reporting. This study aimed to identify factors associated with reporting attitudes of work-related musculoskeletal disorders (WRMSDs), and examine the relationship between WRMSD reporting attitudes and reporting intention and actual reporting.

Methods: This cross-sectional study analyzed the data from 377 direct care workers employed in 19 long-term care facilities in South Korea.

Results: Of the study participants, 48.9% had no intention to report WRMSDs and 44.3% had negative attitudes toward WRMSD reporting. Among 200 direct care workers with WRMSDs, 86.5% did not report WRMSDs to their management. Reporting attitudes were associated with duration of work, independent work arrangement, safety training, management worker safety, WRMSD experience, and severity and frequency of musculoskeletal symptoms. Overall, 25% of reporting attitudes were explained in the model including 21 variables. The moderating effect of management worker safety on this relationship was not observed. There were significant relationships between reporting attitudes and reporting intention and actual reporting.

Conclusions/Applications to Practice: Our findings suggest that workers' intention to report and behavior maybe affected by their attitudes toward injury reporting. Organizational commitment to the priority of worker safety and safety training focusing on injury reporting is needed for workers especially those frequently exposed to musculoskeletal problems, in independent work arrangement, and with longer duration in employment to improve workers' attitude toward injury reporting and facilitate actual reporting.

Keywords: reporting attitude, injury reporting, reporting intention, direct care workers

Introduction

The International Labour Organization (ILO) estimates that around 350 million occupational incidents are occurred annually with high death rates (International Labour Organization, 2014). However, researchers have pointed out that the real scope of occupational health problems is masked due to the gross underreporting of occupational injuries and illnesses (Kyung et al., 2023b). According to the he Occupational Safety and Health Administration (OSHA) in the United States, workers must report all workplace incidents, hazardous conditions, and near misses to their management as soon as possible (Occupational Safety and Health Administration [OSHA], 2022). To urge worker's injury reporting, the OSHA further ensures workers' right to report injuries free from retaliation and prohibits employers from taking any adverse actions against workers for the reporting(OSHA, 2016). Despite these measures, many workers still face barriers to report work-related problems to their management (Kyung et al., 2023b). A recent review study found that 20% to 74% of workers who experienced a work-related injury or illness did not report it to their management (Kyung et al., 2023b).

According to behavioral theories such as the theory of planned behavior, personal attitudes play an important role in determining behavioral intention and behaviors (Ajzen & Fishbein, 1977; Gavaza et al., 2011; Jiang et al., 2018; Pfeiffer et al., 2010). In a study of US. transportation workers, Jiang et al. (2018) found that underreporting of workplace aggression and near miss events increased when workers had negative attitudes toward safety-related reporting (Jiang et al., 2018). Attitudes are assumed to be susceptible to change and adjustable depending on individual experience and work environment (Petty & Cacioppo, 1986). However, very few studies have been done as to which factors contribute to reporting attitudes of work-related injuries or illnesses.

Direct care workers are at elevated risk of work-related musculoskeletal disorders

(WRMSDs), but many of injuries are not reported (Caponecchia et al., 2020; Menzel, 2008; Siddharthan et al., 2006). Siddharthan et al. (2006) reported that nursing personnel tended to tolerate a WRMSD and took it for granted as a natural part of their jobs unless the problems interfered with their work activities, which led to underreporting of WRMSDs (Siddharthan et al., 2006). Given the essential role of reporting attitudes in injury reporting, understanding the reporting attitudes will provide meaningful information for further development of effective interventions to motivate workers' reporting behavior. Yet, most of the research to date focuses on what hinders workers from reporting occupational injuries or illnesses. This study aimed to: (1) describe WRMSD reporting attitudes among direct care workers in long-term care facilities, (2) identify associated factors of WRMSD reporting attitudes, and (3) examine the relationship between WRMSD reporting attitudes and reporting intention and reporting behavior.

Methods

Study Design and Sample

This study applied a cross-sectional design with a convenience sample of 377 direct care workers in 19 long-term care facilities in South Korea. These facilities represented 5.4% of long-term care facilities in Gyeonggi-do, the most populated province in Korea. Long-term care facilities in South Korea are classified into long-term care hospitals and nursing homes. Long-term care hospitals offer in-patient services and long-term care for people who need a longer rehabilitation stay and are required to staff healthcare professionals such as medical providers and nurses (Kim et al., 2015). Nursing homes primarily provide social services to people aged 65 or older who cannot live independently but do not generally require the skilled level of medical care (Kim et al., 2015). In the present study, direct care workers were defined as trained staff who provide the most direct patient care such as feeding, bathing, dressing, and toileting (Kim & Tak, 2018). Eligibility criteria included that direct care workers be employed for at least three months or longer in their current jobs, and able to read, write, and understand

Korean. First three months of employment are regarded as the probationary period for workers to settle into a new job and evaluate whether a job is a good fit (Borofsky et al., 1995).

Recruitment and Data Collection

A flyer with contact information was placed on the department bulletin boards in 19 long-term care facilities after receiving permission. Data were collected from May to August 2022, using a self-administered questionnaire pilot tested with 20 direct care workers in a long-term care hospital. The study questionnaire was distributed and collected during each institution's monthly staff meetings or training programs provided by the National Health Insurance Service (NHIS). Informed consents were obtained from all participants and a gift of 10 dollars (12,000 won) was given to each participant upon the survey completion. A total of 403 direct care workers completed the questionnaire with a response rate of 86% (70-81% in three long-term care hospitals and 86-95% in 16 nursing homes). After excluding 11 direct care workers employed less than three months and 13 direct care workers who did not respond to 5% or more of the questionnaires, the final sample of 377 direct care workers were included in this study. The Committee on Human Research of the University of California, San Francisco and the Public Institutional Review Board in South Korea approved the study.

Study Variables and Instruments

Demographic and job characteristics

Demographic characteristics included age, sex, immigration status (citizen or non-citizen), marital status, and education. Job characteristics included type of long-term care facility (long-term care hospital or nursing home), duration of employment as a direct care worker, and work arrangement (permanent, temporary, or independent).

Physical work factors

Physical work factors included physical exertion and number of assigned patients.

For physical exertion, respondents asked to indicate how physically demanding their present work is with responses ranging from 1 for ‘not strenuous’ to 5 ‘extremely strenuous.’ (Neupane et al., 2020).

Psychosocial and organizational factors

Psychosocial and organizational factors were assessed by job stress and management safety priority. Job stress was measured by the Korean version of the Effort-Reward Imbalance (ERI) Questionnaire with effort (6 items), reward (10 items), and overcommitment (6 items) (Eum et al., 2007; Siegrist, 1996). Effort reflects the job demands or obligations imposed on workers and reward refers to something that workers can acquire from work such as money, esteem, career opportunities, and job security (Van Vegchel et al., 2005). Overcommitment defines a set of attitudes, behaviors, and emotions reflecting excessive striving for approval and appreciation (Hasselhorn et al., 2004). In the ERI model, a lack of reciprocity between efforts spent and rewards received at work arouse emotional distress and subsequent adverse health outcomes (Siegrist, 1996). All scale items used a 4-point Likert scale ranging from 1 for ‘strongly disagree’ to 4 for ‘strongly agree’ with higher values indicating higher effort, reward, or overcommitment. The effort, reward, and overcommitment scores were calculated as the sum of item responses: the ERI ratio was obtained by dividing effort by reward and a correction factor of 3/5 adjusting for the unequal number of items of the effort and reward scales (Siegrist et al., 2004). For management safety priority, respondents were asked to indicate whether the health and safety of workers were a high priority of management where the workers belong (Yes/No) (Kines et al., 2011). In regard to safety training for injury reporting, respondents were asked to indicate if they ever received a training regarding reporting of workplace injuries or illnesses from their organization.

Musculoskeletal symptoms

Musculoskeletal symptoms included experience of WRMSDs, and the frequency and severity of musculoskeletal symptoms. For WRMSD experience, respondents were asked whether they had any musculoskeletal pain or discomfort during the past 12 months in the neck, shoulder, back, upper extremities, or lower extremities and if their pain or discomfort was made worse or caused by work (Pike et al., 1997). The frequency of musculoskeletal symptoms was measured using the modified responses from the Nurses' Work Life and Health study with a 6-point Likert scale ranging from 1 for 'never' to 6 for 'daily' (Lipscomb et al., 2002). The severity of pain was measured on a 5-point Likert scale ranging from 1 for 'none' to 5 for 'extreme' (Dennerlein et al., 2012).

Reporting attitudes

Reporting attitudes were measured using the modified version of 4-item questionnaire developed and validated by Probst and Graso (2013) with Cronbach's alpha of 0.76 (Probst & Graso, 2013). The original version of questionnaire was modified for direct care workers in long-term care facilities by changing 'accidents and injuries' to 'work-related injuries or illnesses.' The modified English version of the questionnaire was translated and back-translated to Korean language by two independent bilingual people and the Korean version of questionnaire was finalized through consultation with a third bilingual person. Respondents were asked to indicate their injury reporting attitudes as follows: "Work-related injury or illness investigations are mainly used to assign blame," "Nothing gets fixed, so why bother reporting an injury or illness," "Reporting a work-related injury or illness hurts my chances for job-related rewards," and "Injury or illness is a normal part of my job. They can't all be prevented." The instrument was measured on a 7-point Likert scale ranging from 1 for 'strongly disagree' to 7 for 'strongly agree,' with higher values indicating more positive attitudes toward reporting. The reporting attitudes scores were calculated as the mean of item

responses. Reporting attitudes were also dichotomized into two group using the median level of four as a cutoff. Cronbach's alpha of Korean questionnaire for the present study was 0.80.

WRMSD reporting intention and reporting experience

Reporting intention was assessed by a single question "If you experience work-related injuries or illnesses, would you be willing to report the disorders to your management?," where responses were 'yes' or 'no' (Conner & Heywood-Everett, 1998). For those who experienced WRMSDs within 12 months, respondents were asked to indicate whether they had reported WRMSDs to their management. Respondents were also asked to indicate the experience of witnessing injury reporting of others.

Data Analysis

Data analyses were performed using STATA version 16.0 (Stata Corporation, College Station, TX). Descriptive statistics included frequency and percentage for categorical variables and means and standard deviation for continuous variables. To deal with missing data, missing responses 5% or more of the questionnaires were initially excluded from the study and multiple imputation was used for multi-item measures. Multivariable linear regression was conducted to identify significant factors for reporting attitudes. Multicollinearity was checked by using variance inflation factor (VIF). The multivariable model included demographic and job characteristics, physical work factors, psychosocial work environments, musculoskeletal symptoms and witness experience of injury reporting based on literature review on injury reporting behavior. Next, the interaction effect of management safety priority was added to the model to test if the effect of management safety priority on injury reporting attitudes is the same across the long-term care facilities. The results were reported by standardized Beta coefficients. Explained variance by the model was reported by R square. Multivariable logistic regression was conducted to examine the relationship between reporting attitudes and reporting intention and behavior of WRMSD reporting, adjusting for the significant variables in the

multivariable linear regression. Odds Ratio (OR) and 95% Confidence Interval (CIs) were obtained. Statistical significance was set at a *p*-value of less than 0.05.

Results

Characteristics of the Study Participants

The study included a total of 377 direct care workers (139 direct care workers in long-term care hospital and 238 direct care workers in nursing homes) (Table 1). About 87% were female and 27% were immigrants. The majority of the participants were married (95.9%), high school graduate (68.6%), and temporary or independent workers (73.3%). The mean age was 60.7 years and the mean duration of employment as a direct care worker was 5.9 years. One-third (33.5%) of the participants perceived that worker safety was a priority in their organization and 91.2% received safety training for injury reporting. More than half of the participants witnessed the injury reporting of others (59.1%) and experienced WRMSDs within 12 months (54.6%). Nearly half of the participants (48.9%) did not have an intention to report their WRMSDs and the majority of participants who experienced WRMSD did not report it to their management (85.5%). The mean score of WRMSD reporting attitudes was 3.8, which indicates slightly positive attitudes.

Factors Associated with Reporting Attitudes

The results of multivariable analysis on factors associated with direct care workers' attitudes toward WRMSD reporting is presented in Table 2. NAs with longer duration of employment (β = -0.17, p = 0.02), independent work arrangement (β = -0.03, p = 0.03), and high frequency of musculoskeletal disorders (β = -0.21, p = 0.01) were less likely to have positive reporting attitudes. On the other hand, reporting attitudes were positively associated with safety training for injury reporting (β = 0.15, p = 0.02), experiencing WRMSDs (β = -0.85, p < 0.001), higher severity of musculoskeletal disorders (β = 0.32, p < 0.001), and management worker safety (β = 0.27, p = 0.001). The model including 21 variables explained

25.1% of variance in reporting attitudes. A moderating effect of management safety priority was added to the model, but there was no significant effect (data not shown).

The Relationship Between Reporting Attitudes and Reporting Intention and Behavior.

Table 3 presents the association between WRMSD reporting attitudes and WRMSD reporting intention and actual reporting. Direct care workers with positive attitudes toward WRMSD reporting had 8.5 times greater odds of WRMSD reporting than those with negative attitudes (aOR = 8.51, 95% CI =1.49 - 48.6). Direct care workers having good reporting attitudes were also more likely to have intention to report WRMSD to their management (aOR = 14.68, 95% CI = 7.33 - 29.4).

Discussion

This study investigated the factors associated with WRMSD reporting attitudes among direct care workers in long-term care settings in South Korea. In this study, 51% did not have intend to report the problem to their management if they had WRMSD and among 200 participants with a WRMSD, only 13.5% reported it to their management. WRMSD reporting attitudes were significantly associated with reporting intention and actual reporting of WRMSD.

This study found that the longer the duration of work, the less positive the reporting attitudes. Our findings is consistent with the report by Gavaza et al. (2011) that pharmacists with longer years in pharmacy practice were less likely to have favorable attitudes toward incident reporting than those who had fewer years of experience. This may be a signal of general frustration with the manner how reported injuries are managed. In general, longer duration of employment reflects older age of workers, seniority of work, and higher risk of work-related injuries or illnesses (Bohle et al., 2010). If workers have or observe negative reporting experiences such as punitive discipline or inadequate feedback on what action was taken for the health and safety problems in the workplace, they may develop negative attitudes toward injury reporting.

This study finding suggests that the type of work arrangement affect reporting attitudes. Direct care workers in independent work arrangement were less likely to have positive attitudes on injury reporting, compared to those in permanent work arrangement. Direc care workers in long-term care hospitals in Korea are primarily hired from outsourcing agencies with multi-party employment relationship: temporary and independent workers (Kwon et al., 2022). Not surprisingly, this study sample mostly consisted of temporary or independent workers. Unlike temporary workers who have social protections such as WC, independent workers— as workers directly hired from patients—are not eligible to have social protections. The Labor Standard Act (LSA) in South Korea defines an employee as a person who offers work to a business or workplace for the purpose of earning wages (Ministry of Employment and Labor). Under the LSA, independent workers such as freelancer and self-employed workers are not entitled to be employees, so they are excluded from the protection of the law (Ministry of Employment and Labor). Since independent contractors are generally not given paid sick leave, it is not easy for them to take off from work. Moreover, as the nature of work, independent contractors hardly modify the tasks. Based on limited benefits of reporting, workers in independent arrangements may doubt the value of reporting or feel powerless to bring about improvements in safety.

This study finding shows that reporting attitudes were associated with WRMSD experience. Not surprisingly, direct care workers who experienced a WRMSD within 12 months were more likely to have positive reporting attitudes than those who had not. Since the workers' right to report injuries or file a complaint about problems under OSHA is limited to injuries or illnesses that occurred at the workplace or are related to work, work-relatedness is an essential element of reporting. Hence, if workers meet this reporting criteria, they may perceive that reporting can be beneficial. Severity and frequency of musculoskeletal symptoms were also significantly associated with injury reporting attitudes, but the direction of the

relationship was different. In this study, there was positive relationship between severity of musculoskeletal symptom and injury reporting attitudes. Symptom severity has been identified as the main contributing factor to the actual injury reporting in many studies (Kyung et al., 2023a). Under the Serious Accidents Punishment Acts (SAPA) from OSHA in Korea, the employers whose workplace have been the site of a fatal incident are supposed to be punished due to poor compliance with the safety standard or insufficient efforts to prevent the incidents (The Serious Accident Punishment Act of Republic of Korea, 2020). As the severity of the symptom increases, workers may identify a clear need to take actions and report to the management to discuss options, for example, taking a sick leave or requesting for job modification or intervention to mitigate the problem or injury risk. On the other hand, the symptom frequency was inversely associated with injury reporting attitudes in this study. It is consistent with other findings that that identified symptoms frequency as a barrier to actual reporting (Siddharthan et al., 2006). This may be related to fear of repercussion. If an injury or illness occurred repeatedly to certain workers, the workers may be afraid of being stigmatized as a negligent worker and in turn, believe that injury reporting is mainly used to assign for blame. Increased frequency of injury may also lead to the normalcy of workplace injury.

The current study also identified that safety training for injury reporting affect workers' reporting attitudes. Direct care workers who received the safety training presented more favorable attitudes toward injury reporting than those did not received the one. This result is consistent with a study by Green et al. (2019) showing the positive impact of educational intervention on attitudes toward injury reporting. Similarly, Jansma et al. (2010) also found significant changes in workers' incident reporting attitudes and intention after receiving patient safety education regarding coping skill and background knowledge for medical incidents at an early stage. As an essential component to establish a safe workplace, safety and health training for workers is required to organizations (ILO, 2001; OSHA, 2016). The findings of this study

indicate that providing knowledge relevant to employee's right and injury reporting can improve workers' reporting attitudes.

This study finding suggest that safety climate affect workers' attitudes toward injury reporting. Direct care workers who perceived that the safety of workers was a priority of their management had more positive attitudes toward injury reporting, which is consistent with earlier findings of copper mining workers (Probst & Graso, 2013). Safety climate was also associated with actual injury reporting. Lipscomb et al. (2015) showed that the prevalence of non-reporting and workers' fear of reporting increased markedly when management put the value of worker safety forward (Lipscomb et al., 2015). Similarly, Siddharthan et al. (2006) showed that nursing personnel who perceived that their organization valued worker safety were more likely to report their WRMSDs (Siddharthan et al., 2006). The safety climate of an organization can provide workers with cues regarding whether injury reporting will be reinforced or punished. As managements support workers' safety behavior and provide appropriate resources showing a safety-prioritized attitudes, workers may find the value of injury reporting and be able to involve the reporting without concern.

It is important to note that there was a significant relationship between injury reporting attitudes and injury reporting intention. Compared to direct care workers with negative attitudes toward WRMSD reporting, those with positive attitudes were more likely to intend to report WRMSDs. This is consistent with the findings of earlier studies on more favorable attitudes in the group intending to report incidents (Gavaza et al., 2011; Pfeiffer et al., 2010). Given these findings, Pfeiffer et al. (2010) incorporated attitudes into a psychological framework on factors influencing the intention to report incidents. According to the theory of planned behavior, individual behavioral intention is assumed to be affected by attitudes as well as be a primary contributor to actual behavior (Ajzen, 1991). This finding highlights the importance of injury reporting attitudes on injury reporting.

This study found that injury reporting attitudes were also significantly associated with actual reporting behavior. This result was consistent with a previous study which found that the more positive reporting attitudes, the higher the actual reporting of occupational accidents (Probst & Graso, 2013). Many studies confirmed that negative attitudes toward injury reporting served as barrier of injury reporting (Evans, 2006; Pompeii et al., 2016). While researchers have attempted to figure out which attitude ultimately guides behavior for many decades, evidence for the attitudes-behavior association is mixed or the degree of the association varies (Laura R. Glasman & Dolores Albarracín, 2006). To predict behavior better, it is recommended to specify the attitudes that is similar to the behavior of interest (Heberlein & Black, 1976).

To our knowledge, the present study is the first study that examined WRMSD reporting attitudes in a sample of direct care workers in Korea. There are limitations in our study. First, this study collected data from direct care workers in a nonprobability sample of long-term care facilities, mostly nursing homes, in one province in Korea. This might limit the ability to generalize our findings to other settings. However, we do not find any evidence that direct care workers' injury reporting attitudes differ by region. Also, our sample represents 19 different long-term care facilities in three cities and obtained the high response rates (86%). These factors may improve the generalizability of study findings. Second, the data relied on self-reported questionnaires, and thus respondents' answers may have been influenced by recall or reporting bias, which may cause under or overestimating the results. Third, as we adopted a cross-sectional design, causal inferences were not guaranteed.

Conclusions

Identification of work-related injuries or illnesses in a timely manner is crucial to establish workplace safety and health, and workers' reporting to managements is the first step. Workers' attitudes toward injury reporting play a fundamental role in their decision to report and actual reporting behavior. This study demonstrated that injury reporting attitudes were significantly associated with reporting intention and reporting behavior among direct care workers. Injury reporting attitudes were also associated with duration of work, independent work arrangement, safety training, management safety priority, WRMSD experience, and severity and frequency of musculoskeletal symptoms. Organizational commitment to the priority of worker safety and safety training focusing on injury reporting is needed for workers especially those frequently exposed to musculoskeletal problems, in independent work arrangement, and with longer duration in employment to improve workers' attitude toward injury reporting and facilitate actual reporting. Future research using a longitudinal study design is needed to validate our findings.

Table 4.1: Demographic, job, psychosocial, and health characteristics among direct care workers in long-term care facilities in Korea (N=377)

Variables	n	%
Sex		
Male	48	12.8
Female	328	87.2
Immigrant status		
Immigrant	102	27.2
Non-immigrant	273	72.8
Marital status		
Married	354	95.9
Single	15	4.1
Education		
Elementary school	10	2.7
Middle school graduate	58	15.5
High school graduate	256	68.6
College 1 year or more	49	13.2
Type of long-term care facility		
Long-term care hospital	139	36.9
Nursing home	238	63.1
Work arrangement		
Permanent	96	26.7
Temporary	174	48.3
Independent	90	25.0
Management safety priority		
Yes	118	33.5
No	256	68.5
Safety training		
Received	348	92.5
Not received	28	7.5
Witnessing injury reporting of others		
Yes	221	59.1
No	153	40.9
Experience of WRMSD within 12 months		
Yes	200	54.6
No	166	45.4
WRMSD reporting to the employer		
Yes	27	13.5
No	173	86.5
WRMSD reporting intention		
Yes	183	48.9
No	191	51.1
	Mean	**SD**
Age, years	60.7	6.4
Duration of employment, years	5.9	5.0
Number of assigned patients	7.1	7.4
Physical exertion (1-5)	3.7	0.7
Effort (6-24)	14.3	2.6
Reward (10-40)	26.9	3.5
Overcommitment (6-24)	13.5	2.4
Frequency of musculoskeletal disorders (1-6)	3.1	1.9
Severity of musculoskeletal disorders (1-5)	2.5	1.0
WRMSD reporting attitudes (1-7)	3.8	1.2

Abbreviation: SD, standard deviation; WRMSD, work-related musculoskeletal disorder.

Table 4.2: Factors associated with attitude toward work-related musculoskeletal disorder (WRMSD) reporting and a moderating role of management safety priority: using multivariable analysis

Variables	WRMSD reporting attitudes	
	Standardized β	p-value
Age	-0.09	0.13
Female	-0.02	0.69
Immigrant	-0.07	0.41
Married	-0.04	0.47
Education (reference=ref. elementary school)		
Middle school graduate	-0.18	0.15
High school graduate	-0.30	0.06
College 1 year or more	-0.08	0.54
Nursing home (ref. long-term care hospital)	-0.06	0.65
Work arrangement (ref. permanent)		
Temporary	-0.07	0.20
Independent	**-0.03**	**0.03**
Duration of employment	**-0.17**	**0.02**
Experience of WRMSD within 12 months	**0.32**	**<0.001**
Frequency of musculoskeletal disorders	**-0.21**	**0.01**
Severity of musculoskeletal disorders	**0.27**	**0.001**
Number of assigned patients	0.01	0.92
Physical exertion (1-5)	0.03	0.65
Safety training for injury reporting (yes)	**0.15**	**0.02**
Management safety priority (yes)	**0.32**	**<0.001**
Effort	0.06	0.44
Reward	0.05	0.49
Overcommitment	-0.01	0.89
Witnessed injury reporting of others (yes)	-0.01	0.87
N	288	
R square	0.2511	

*Bold indicates significant $p<0.05$

Table 4.3: The relationship between reporting attitudes and reporting intention and actual reporting of work-related musculoskeletal disorders (WRMSDs): using multivariable analysis

	Reporting intention of WRMSDs[a] (n=148)		Actual reporting of WRMSDs[a] (n=292)	
Variable	OR	95% CI	OR	95% CI
Attitudes toward WRMSD reporting				
Positive	**8.51**	**1.49-48.6**	**14.68**	**7.33-29.4**
Negative	1		1	

*Bold indicates significant $p<0.05$

a. Adjusting for age, sex, education, marital status, immigrant, type of workplace, work arrangement, job tenure, number of assigned patients, physical exertion, management safety priority, safety training, frequency and severity of musculoskeletal disorders, effort, reward, overcommitment, witnessing injury reporting of others.

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Chapter5: Discussion

This dissertation study identified important factors that influence WRMSD reporting behaviors and attitudes. A summary and synthesis of the three aims of the study are presented below, followed by a discussion of the significance and limitations of the findings, and the implications for future research and practice.

Summary of Findings

Underreporting of workers' injuries or illnesses and contributing factors: A systematic review

A systematic review of the literature describing underreporting of work-related injuries or illnesses has confirmed that a substantial number of workers do not report their health problems to their management or WC program. Workers' injury reporting was associated with injury type and severity, sociodemographic factors, general health and functioning, knowledge regarding reporting, job and employment characteristics, psychosocial work environment, and type of healthcare provider. Workers did not report their injuries or illnesses due to fear or concern, cumbersome time and effort in the reporting process, lack of knowledge regarding reporting, perceptions of injuries as not severe or part of the job, and distrust of reporting consequences.

Reporting of WRMSDs and associated factors among direct care workers in long-term care facilities in Korea

Analysis of cross-sectional survey data from 200 direct care workers with WRMSDs in long-term care facilities found that underreporting of WRMSDs (85.5%) was prevalent. The odds of injury reporting were increased for direct care workers with positive attitudes toward injury reporting (aOR = 2.01, 95% CI = 1.21-3.29), management safety priority (aOR = 4.54, 95% CI = 1.54-13.36), and experience of witnessing injury reporting of others (aOR = 4.55, 95% CI = 1.15-17.9) and the odds of injury reporting were decreased for direct care workers with changing jobs or tasks due to WRMSDs (aOR = 0.24, 95% CI = 0.07-0.76).

Reporting attitudes of WRMSDs and associated factors among direct care workers in long-

term care facilities in Korea

Analysis of the cross-sectional survey data from 377 direct care workers in LTC facilities revealed that negative reporting attitudes were associated with longer duration of work, independent work arrangement, not receiving safety training, poor management safety priority, lower severity of musculoskeletal pain, and MSDs not related to work. Reporting attitudes were significantly related with reporting intentions and behaviors.

Synthesis of Findings

This study emphasizes that various factors hindered workers from reporting work-related injuries or illnesses and many injuries or illnesses still went unreported despite consistent initiatives encouraging workers to speak up about safety concerns and health problems on the job. In the presented study, the attitudes toward WRMSD reporting were also associated with management safety priority, safety training regarding injury reporting, work-relatedness of the disorders, severity and frequency of musculoskeletal pain, duration of work, and work arrangements. The following were identified as contributing factors for WRMSD reporting behaviors: management safety priority, change of jobs or duties due to WRMSDs, witnessing the injury reporting of others, and WRMSD reporting attitudes. In addition, significant relationships were shown in the study between WRMSD reporting attitudes and WRMSD reporting intentions and behaviors.

Management safety priority may affect both WRMSD reporting attitudes and reporting behaviors. Many studies provide support for the importance of a safety climate in safety performance behaviors (Christian et al., 2009; Clarke, 2006; Lee et al., 2019; Luo, 2020). The concept of a safety climate is broadly defined as workers' perceptions regarding the way that safety is managed within an organization and often reflects workers' shared perception of the priority of worker safety in their organization (Alingh et al., 2019; Zohar, 1980). A safety climate was found to be closely related not only to safety compliance generally mandated (e.g.,

following procedures, using personal protective equipment, and practicing risk reduction), but also safety participation referring to voluntary behaviors (e.g., communication/voice, exercising right/whistleblowing, civic virtue, and initiating safety-related change) (Christian et al., 2009). Specifically, injury reporting was decreased when worker safety as a priority was poor (Lipscomb et al., 2015; Siddharthan et al., 2006).

WRMSD reporting attitudes may influence a worker's behavior to report WRMSDs or not and may be simultaneously affected by various factors. This finding is aligned with the assumption of the Theory of Planned Behavior (TPB) that personal attitudes play a role in the behavior of interest. A study of transportation workers supported the inverse association between aggression reporting and safety-related reporting attitudes (Jiang et al., 2018). Attitudes are malleable and susceptible to change depending on individual experience and work environment (Petty & Cacioppo, 1986). Yet, there have been limited studies on which factors contribute to the formation of reporting attitudes, and to date only a few factors have been explored. Consistent with this study findings, management safety priority and safety education were identified as contributing factors to injury reporting attitudes (Jansma et al., 2010; Probst & Graso, 2013)

Significance of Findings

Research on injury reporting has focused on investigating the factors that deter workers from reporting. Based on the TPB, reporting attitudes may play a role in the development of reporting behaviors, but it has rarely been assessed in healthcare settings. Moreover, research on WRMSD reporting was very limited in Korea. Therefore, this is one of the first research designed to unravel WRMSD reporting attitudes and behaviors using direct care worker samples in institutional long-term care facilities in Korea. By elucidating the factors associated with attitudes toward WRMSD reporting, this research will provide new insights into the reporting framework in long-term care industry. Moreover, the results presented in this study

will convey valuable information for advocates to further initiate widespread awareness regarding injury reporting.

This study included 19 institutional long-term care facilities, which represented 5.4% of long-term care facilities in three cities in Gyeonggi (5.8% for three long-term care hospitals and 5.3% for 16 nursing homes), the most populated province in Korea, which may contribute to the generalizability of study findings to other long-term care settings in Korea.

Strengths

This is the first study identifying which factors drive WRMSD reporting attitudes and behavior using a sample of direct care workers in various long-term care facilities in Korea. This study included 19 institutional long-term care facilities including nursing homes and long-term care hospitals. The high response rate (86%) is also a strength of this study. The high response rate and included 19 long-term care facilities, which represent 5.4% of the facilities in three cities in Korea, may contribute to the generalizability of the study findings.

Limitations

This study has several limitations. First, the cross-sectional design limits the ability to draw inferences about causal pathways. Second, this study findings might have been affected by selection bias due to the convenience sampling method and healthy worker survivor effect. Third, the use of self-report measures may have introduced reporting bias due to memory, social desirability, or negative affectivity.

Implication for Future Research

This study calls for additional research that can validate the study findings and further broaden the knowledge regarding reporting attitudes and behavior of work-related health problems.

Further research is needed to elucidate the unexplained variance of reporting attitudes. In this study, about 25% of the variances were explained by the potential predictors

included; 75% of the variance remains unexplained. According to Ozili (2020), a low R-squared of at least 0.10 is acceptable in social science given that some of the explanatory variables are statistically significant (Ozili, 2022). Attitude is a complex phenomenon that varies by myriad factors and reflects more than just preference (Fogarty & Shaw, 2010). Although this study did not measure subjective norms or perceived behavioral control since validation of the TPB was not the purpose of the study, subjective norms and perceived behavioral control may contribute to the unexplained variance (Fogarty & Shaw, 2010). In addition to these two factors, accessibility of reporting programs may be associated with WRMSD reporting attitudes. Based on this study findings, investigating other potential predictors for WRMSD reporting attitudes could be meaningful.

This study suggests future research examining whether this study findings are applicable to other settings or cultures. Because this study was conducted with a sample of direct care workers in long-term care facilities in Korea, the participants are not likely to be representative of all direct care workers in other study settings or cultures. Even though there could be both institution-specific and province-specific differences in direct care workers in other settings or cultures, injury reporting may not be a regional issue; therefore, this study findings may be applicable to different settings or cultures. A prospective cohort study using larger random samples would be needed to validate the study findings.

Implications for Practice

Many countries ensure workers' responsibility to report work-related symptoms to their management and provide safety promotion programs to enhance awareness of workplace hazards and encourage working safely. However, this study confirms that many WRMSD cases went unreported by direct care workers in long-term care setting. This study proposed several implications for practice to manage WRMSD problems appropriately and to focus attention on worker safety and health.

Reflecting the safety climate as the common contributing factor to reporting attitudes and behaviors, managements play a crucial role in creating safe work environments at work. To have a better safety climate, managers should engage in regular communication with workers that focuses on problem-solving and learning from the cases, and deploy proactive safety management with adequate and timely feedback to follow up injury reporting. Commitment-based safety management—management approach that prioritizes worker safety by exhibiting role modelling behavior—was identified as the ideal and relevant approach for encouraging workers to speak up (Alingh et al., 2019). As such, if managements show that worker safety is highly valued, workers may reinforce that concern by reporting of work-related injuries or illnesses and consider it worthwhile to speak up.

This study findings support the significance of safety training for injury reporting on site. The International Labor Organization (ILO) strongly promotes safety and health training as an essential component to establish a safe workplace (ILO, 2001). Although safety training is required and has been conducted in many workplaces, many workers did not know exactly when, how, where, and what to report since the contents of the training is often ambiguous and superficial. Given this evidence, safety training including clear definition and range of WRMSDs and sharing previous reporting cases is needed. The good safety training of management is relevant to good safety awareness, and this can lead to motivation of WRMSD reporting decision for workers.

Conclusion

This study uncovers high levels of underreporting of WRMSDs linked to no intention of reporting among direct care workers in long-term care facilities in Korea. Particularly, underreporting of WRMSDs and negative attitudes toward WRMSD reporting were more prevalent among direct care workers who perceived poor safety climate. These findings suggest that a management approach that prioritizes worker safety and regular safety training for injury reporting may mitigate the barriers of underreporting and negative attitudes toward WRMSD reporting. This study also supports that WRMSD reporting attitudes play a role in WRMSD reporting intention and actual reporting behavior. Management support should be given to direct care workers, especially those in independent work arrangements and longer duration of work. Further research employing a random sampling method and prospective cohort design is needed to validate this study findings.

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