

# Tiredness Takes its Toll: An Integrative Review on Sleep and Occupational Outcomes for Long-Term Care Workers

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## ABSTRACT

Poor sleep quality and duration among health care professionals have negative impacts on worker safety, work readiness, and well-being. However, the consequences of impaired sleep among long-term care (LTC) workers remain understudied. The current integrative review sought to explore associations between sleep and occupational outcomes in LTC workers. Multiple database searches yielded 1,543 articles; nine articles met inclusion criteria. Results synthesized from included articles revealed sleep-associated occupational outcomes across three themes, *Burnout/Fatigue*, *Mental and Physical Health*, and *Well-Being*, which may affect performance measures and predict injuries/errors. Exploring outcomes of poor sleep quality and duration among LTC workers has highlighted the needs of this population and may inform future intervention development. LTC organizations should consider implementing strategies to better support the sleep quality of their workforce. In addition, further research is needed to explore how impaired sleep contributes to negative worker outcomes and patient care quality. [*Journal of Gerontological Nursing*, 49(1), 27-33.]

**S**leep is essential for maintaining good health and quality of life by preventing chronic illnesses and infections (Healthy People 2020, n.d.a). Despite the importance of sleep health and its impact on various health outcomes, it remains understudied and underrecognized as a public health opportunity (Hale et al., 2020; Harvey, 2022). Although

sleep health was added as a priority topic to the Healthy People 2020 (n.d.b.) Initiative, little progress has been made on sleep health promotion and increasing community understanding of the importance of sleep, as Healthy People 2030 (n.d.) sleep objectives remain virtually the same after 10 years. Sleep can be impacted by stress from work, where more

stress leads to shorter sleep duration and worse sleep quality (Charles et al., 2011). Poor or insufficient sleep has been linked to health issues, including obesity, depression, heart disease, stroke, certain cancers, and diabetes (Cappuccio & Miller, 2017; International Agency for Research on Cancer, 2020). Prior research has highlighted the effects of poor sleep quality and duration among nurses, such as decreasing safety (Zhang et al., 2018), likely due to decreased cognition related to extended periods of wakefulness (Van Dongen, 2003). Other evidence suggests lack of quality sleep and adequate duration may impair nurses' psychosocial functioning or well-being (Caruso et al., 2017). Diminished well-being and psychosocial functioning may affect nurses' work readiness and ability to engage in or complete tasks in their working lives—a concept known as *work ability* (Ilmarinen, 2009).

Health care workers are required to multi-task and quickly problem solve while demonstrating empathy and administering high-quality care. However, research suggests sleep deficiencies are associated with a decrease in safe and quality patient care (Stimpfel et al., 2020). Specifically, *fatigue*, a sequelae of sleep loss and/or physical and mental exertion (Lerman et al., 2012), has been found to directly

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impact decision making (Castro & de Almondes, 2018) and is associated with lack of concentration (Jaradat et al., 2020). Sleep concerns are not restricted to nurses. Nursing aides have also been found to report poor sleep quality (23%) and duration (46%), reporting <6 hours of sleep per night on average in a study by Zhang et al. (2016). With approximately 950,000 licensed practical nurses/licensed vocational nurses (LPNs/LVNs) in the United States (Smiley et al., 2021), there is scant evidence surrounding their sleep health. However, their shift scheduling is similar to RNs and aides, putting them at risk for poor sleep and fatigue as well.

Despite the known consequences of poor sleep, the impact of poor sleep on occupational outcomes for long-term care (LTC) workers has not been comprehensively explored previously. LTC workers include nurses and others involved in providing direct care (i.e., RNs, LPNs/LVNs, social workers, and nursing assistants). LTC workers generally work outside the hospital setting in post-acute facilities, such as nursing or care homes, rehabilitation centers, extended care facilities, assisted living, or skilled nursing facilities (Organisation for Economic Cooperation and Development, 2015). LTC nursing roles involve indirect care tasks (e.g., liaison for administration, completing documentation, chart reviews, managing inventories and supply stock, placing orders, scheduling) and direct care tasks (e.g., providing treatment, completing procedures, administering medication) (Montayre & Montayre, 2017). LTC social workers provide psychosocial support and address the emotional and social needs of residents (e.g., empowering residents, offering coping mechanisms, advocating for resident rights) (Roberts et al., 2021). Individuals in these roles may work long hours with high volume patient assignments (Harrington et al., 2016).

To explore what is known about LTC workers and their sleep health,

the current integrative review aimed to answer the following question: Among post-acute/retirement center/LTC workers, is insufficient sleep duration and/or poor sleep quality associated with increased occupational injuries, incidents, errors, and/or other performance measures (e.g., absenteeism, presenteeism, intent to leave)? This integrative review was guided by Whittemore and Knaff's (2005) five stage methodology, which includes problem identification, literature search, data evaluation, data analysis, and data presentation. Results may help mitigate sleep challenges faced by LTC workers, so that efforts can be considered to improve their health and the health of their patients. This review did not seek Institutional Review Board approval because it did not include human subject participation.

## METHOD

### Literature Search

A health sciences research librarian was consulted regarding the search strategy. Online databases of PubMed, CINAHL, Scopus, and NIOSHTIC were reviewed for articles to answer the guiding question in July 2021. Keywords included *sleep*, *nursing homes*, and *nurses* with different phrasing depending on database requirements (Table A, available in the online version of this article). Limits were placed on the search to exclude articles published before 2010, remove articles >10 years old, and include more current evidence for consideration. Inclusion criteria were: (a) work setting was a post-acute care facility (e.g., nursing home, rehabilitation center, assisted living, skilled nursing facility); (b) workers were nursing assistants (or equivalent), LPNs, or RNs; (c) the study was performed in a high-income country (where results may be comparable to the U.S. LTC health system) as defined by the World Bank designation; and (d) articles were written in English. Studies involving outpatient care, review articles, and grey literature were excluded.

A total of 1,543 articles were identified in the literature search. After 14 duplicates were removed, 1,529 article abstracts were screened for initial eligibility. A total of 1,385 articles were excluded, and the full text of 144 articles read to determine eligibility. A total of 135 articles did not meet inclusion criteria, and nine articles were included in the final review. Figure 1 shows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses flowchart for the search, screening, and inclusion process of articles (Moher et al., 2009). Included articles were critiqued based on the Johns Hopkins Evidence Level and Quality Guide (Dang & Dearholt, 2018). This method assigns a level of I to V based on the type of study design used (I = experimental; II = quasi-experimental; III = non-experimental; IV = opinion piece; and V = experiential or non-research evidence) and a grade of A (high quality), B (good quality), or C (low quality) to indicate overall quality.

Two authors (E.K., B.M.H.) were involved in screening articles and determining eligibility. Debated articles were reviewed by the third author (C.R.S.) to determine final eligibility. The two authors then independently reviewed the articles to rate their quality and discussed any discrepancies in quality ratings until agreement was met. Using Whittemore and Knaff's (2005) framework, data were extracted, ordered, and categorized by two researchers (E.K., B.M.H.) who grouped similar data together through qualitative data analysis (Miles et al., 2014). Patterns were iteratively compared and discussed to generate themes. Themes were triangulated by the third researcher (C.R.S.).

## RESULTS

Nine articles met eligibility criteria and were included in the current review. Studies were performed in the United States ( $n = 4$ ), Sweden ( $n = 2$ ), Austria ( $n = 2$ ), and Norway ( $n = 1$ ). All articles were rated as Level III due to their quantitative non-experimental

study designs. LTC workers of the included studies were RNs, social workers, certified nursing assistants (CNAs) or apprentices, and LPNs. One study included health care workers in a LTC setting with other individuals who did not perform direct patient care (i.e., administrative roles) (Buxton et al., 2018). Sample sizes ranged from 24 to 650, with reported study response rates ranging from 69.9% to 87%. Three studies explicitly reported Cronbach's alphas for reliability of their instruments. Sleep duration reported by LTC workers varied across studies from 5.8 hours before the first workday (Goffeng et al., 2018) to an average of approximately 6.5 hours each night (DePasquale et al., 2019) (Table B, available in the online version of this article).

### Data Analysis and Presentation

The quality of evidence ranged from high to low with one article rated A (high quality), five rated B (good quality), and three rated C (low quality). Results revealed occupational outcomes across three themes: *Burnout/Fatigue*, *Mental and Physical Health*, and *Well-Being*. As part of the data analysis process according to Whitemore and Knaf (2005), extracted data were converted into a matrix display to visually represent patterns across studies for data presentation (Table C, available in the online version of this article).

*Burnout/Fatigue.* Four of nine studies specifically addressed the relationship between sleep and outcomes of burnout or fatigue among participants. Results of one study that sampled CNAs employed in LTC suggested a significant inverse relationship between decreased sleep duration and greater depersonalization—a component of burnout (Bamonti et al., 2019). Another study that sampled LTC workers with additional non-work caregiving roles showed that sleep quality can predict fatigue occurrence, as those with better reported sleep quality had 74% lower odds of reporting fatigue (DePasquale et al.,

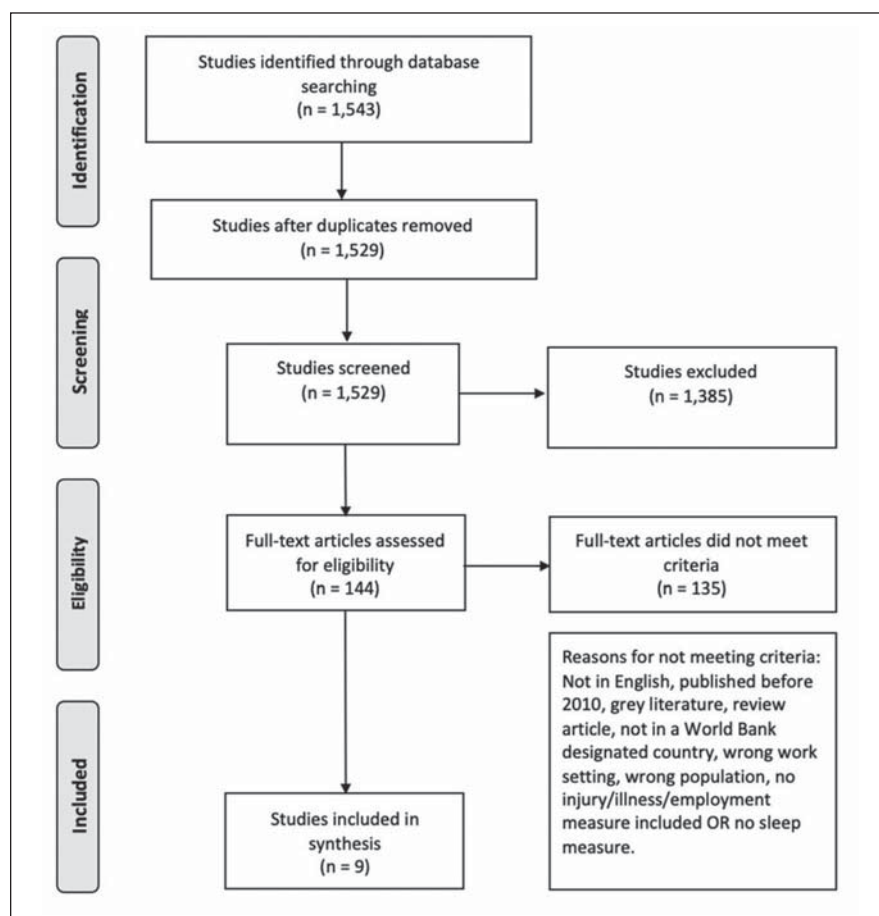


Figure 1. Flow diagram of study selection.

2019). Josefsson (2012) found that 37% of RNs working in care homes for older adults had feelings of fatigue or unhappiness related to their work; however, rest days seemed to improve fatigue and sleep quality for nurses working in nursing homes (Blasche et al., 2017).

*Mental and Physical Health.* Poor sleep quality was found to impact physical and mental health. Health care workers working in one nursing home (including RNs, social workers, and nursing assistants) reported experiencing sleeping issues, such as needing  $\geq 30$  minutes to fall asleep, spending  $\geq 30$  minutes awake in between sleep, and awakening 30 minutes early or before they wanted (Goffeng et al., 2018). The same study explored the physical impact of having greater variability in heart rate with less sleep duration before the first workday across four workdays, suggestive of

higher levels of cardiovascular stress (Goffeng et al., 2018). Another study reported the ability of sleep health (evaluated through self-reported measures of sleep apnea and sleep sufficiency, along with objective methods of actigraphy-assessed sleep timing and nap frequency and duration) to predict risk for cardiovascular conditions, including type 2 diabetes and obesity (e.g., cardiometabolic risk) (Brunzell et al., 2008; Buxton et al., 2018). More specifically, greater sleep sufficiency, shorter time of wake after sleep onset, and fewer or no daytime napping were linked to a decreased cardiometabolic risk in a sample of extended care workers, which included RNs, LPNs, CNAs, and others (Buxton et al., 2018).

Along with physical impacts, poor sleep quality from work resulted in spill-over effects for mental health. Among nursing assistants working in

nursing homes, a statistically significant association was found between poor sleep quality and lower mental health scores ( $\beta = -5.22, p < 0.01$ ) (Zhang et al., 2017). Poor sleep also mediated the relationship between work–family conflict and mental health in this population (Zhang et al., 2017). Furthermore, most RN participants working in care homes for older adults reported sometimes feeling physically (51%) and psychologically (52%) exhausted after work (Josefsson, 2012). Demanding work situations, categorized as time pressures ( $\rho = 0.275, p < 0.01$ ) and emotional pressures ( $\rho = 0.187, p < 0.01$ ), were significantly correlated to sleep disorders.

*Well-Being.* Included studies found a negative relationship between sleep deprivation and well-being. Declines in well-being for nurses working in nursing homes were reported to be greater during subsequent days of working 12-hour shifts compared to non-working days (Blasche et al., 2017), and lack of sleep was reported most before working days (Goffeng et al., 2018). RNs working in care homes also expressed difficulty leaving behind thoughts from their workday daily (16%), suggestive of intrusive or repetitive thoughts about work events (Josefsson, 2012). Moreover, a significant association was found between work–family conflict and poor sleep quality (prevalence ratio = 1.53,  $p < 0.01$ ) among nursing assistants working in nursing homes (Zhang et al., 2017). Haluza et al. (2019) argued that nurses employed in LTC settings work in a physically and psychologically demanding work environment, where inadequate recovery would lead to sleep deprivation and diminished performance, undoubtedly affecting well-being. Conversely, sustainable work ability (e.g., lower sickness absence) of assistant nurses working on older adult care units was associated with sleeping well and feeling recuperated (Hägglund et al., 2011).

## DISCUSSION

The long-term effects of poor sleep on well-being, mental and physical health, and burnout/fatigue can impact performance measures and increase the risk of occupational errors and injuries among LTC workers. Burnout specifically has been correlated with turnover intention in a study of care workers in LTC hospitals (Youn et al., 2016). In the same study, elements of mental health, including emotional labor and job stress, were also correlated with care workers' intention to leave (Youn et al., 2016). More job stress and strain related to less manager support has further been found to increase LTC workers' risk for cardiovascular disease and decrease their sleep duration per day (Berkman et al., 2010). Yet, improved physical health with increased physical activity has been found to lower sickness absences generally (Amlani & Munir, 2014). Finally, well-being has been linked to job satisfaction in general, which is related to commitment and turnover (Brunetto et al., 2012).

Lack of sleep among LTC workers found in the current integrative review (durations ranging from 5.8 to 6.5 hours each night) suggests poor sleep is related to negative effects on worker mental and emotional health, leading to burnout and fatigue, and diminishing well-being levels (DePasquale et al., 2019; Goffeng et al., 2018). Sleeping less than the recommended amount of 7 to 8 hours per night for adults (National Heart, Lung, and Blood Institute, n.d.) places LTC workers at increased risk for adverse health outcomes. Moreover, poor sleep health decreases productivity, increases costs for worker health (Buxton et al., 2018), and as a result, may increase risk for poor patient outcomes (Stimpfel et al., 2020).

Nurses in various specialties have similarly reported fatigue from lack of sleep and heavy occupational workloads because of mandatory overtime, long work hours, and consecutive working shifts (Sagherian et al., 2017). Although LTC workers

face similar work hours contributing to fatigue and sleep deficits, research suggests there are some individual and organizational contributors that may be unique to this worker population compared to health workers in acute care settings. Specifically, combined workloads of off-duty caregiving among LTC workers can contribute to poor sleep quality and fatigue (DePasquale et al., 2019). Van Houtven et al. (2020) reported that among 958 LTC workers, approximately 61% had double or triple unpaid child or other relative caregiving roles. In the same study by Van Houtven et al. (2020), one in six LTC workers reported having a second job. Not only may LTC workers be engaged in unpaid caregiving, but many also hold second and third jobs due to suppressed hourly wages. This additional workload not only impacts LTC workers' time for social and family obligations, but also affects their ability to adequately recover from work or ensure necessary sleep quality and duration is achieved. Moreover, when work–family conflict or work–life balance is affected (Zhang et al., 2017), well-being is also impacted (Kossek et al., 2014).

As the current review found results of fatigue across studies of LTC workers, there is a need to reduce fatigue and its occupational consequences, such as burnout, in this population. To do so, LTC organizations should implement specific protective workplace policies that support workers, such as ensuring appropriate staffing and scheduling so employees can take breaks during their shifts (Gurubhagavatula et al., 2021; Lerman et al., 2012; Wong et al., 2019). Organizations can also consider providing education regarding how to engage in recovery and promote quality sleep, which can be included in annual staff retraining programs (Lerman et al., 2012; Wong et al., 2019). In addition, organizations may implement fatigue detection devices that provide alerts when a worker is fatigued (Lerman et al., 2012; Wong et al., 2019).

To mitigate the mental and physical health impacts of short sleep duration and poor sleep quality on workers in the LTC environment, resources can be made available that support healthy lifestyles and sleep health promotion. In addition, offering peer support groups may help workers manage and discuss shared experiences regarding sleep and overall health effects. Implementing peer support groups may be an effective strategy in supporting the psychological health of workers and provide them a space to talk about how they are coping with their jobs and other caregiving roles and workloads (Pereira et al., 2021). Organizations could also provide subscriptions to mobile meditation applications (apps) to promote positive mental health and quality sleep. Using relaxation techniques from apps, such as Calm or Headspace, are useful and convenient ways to help workers prepare for healthy sleep (U.S. Department of Health and Human Services & National Heart, Lung, and Blood Institute, 2011).

To promote well-being in the workplace, LTC workers and management can endeavor to create a culture of health. Efforts may include management providing incentives or stipends for workers who engage in wellness activities, including tracking healthy sleep-promoting habits or participating in regular screening for sleep disorders with tools, such as the Global Sleep Assessment Questionnaire (Roth et al., 2002). Wellness stipends are becoming more popular among companies as a means for supporting employees in a more holistic manner and addressing their unique health needs (Compt, n.d.). Prioritizing employee health and sleep may lead to positive impacts for worker well-being and the workplace itself, indirectly improving patient care and organizational outcomes.

## LIMITATIONS

The current review has several limitations. First, the literature search was limited to articles that were published

online and searchable in databases, risking omission of relevant research. Second, there was the inclusion of studies completed in various countries to fulfill the research question. However, this inclusion may reduce the generalizability of results to other LTC settings. Third, studies used differing scales to assess variables of interest (e.g., sleep, fatigue, burnout, coping, insomnia) and could not be combined or compared for deeper understanding.

Despite these limitations, countries where included studies were performed were all high-income countries, thus, results are generalizable to the U.S. population. Furthermore, some studies used validated measures with acceptable reliability to gather data, resulting in credible results. As the included studies were all non-experimental quantitative designs and most were cross-sectional, future studies using a quantitative longitudinal approach or a qualitative design may aid in a richer understanding of the needs of LTC workers.

## CONCLUSION

Findings from the current integrative review suggest that poor sleep health among LTC workers can impact occupational injuries, errors, and performance measures by affecting worker health and safety outcomes of well-being, mental and physical health, and burnout/fatigue. Continued exploration for ways that LTC organizations can better support their unique workforce is needed, with consideration of their other workloads and caregiving roles. Understanding how the workplace impacts sleep and leads to negative health outcomes for LTC workers may support the urgency for these organizations to adopt additional strategies that promote the overall health of their workers through improved sleep. Potential considerations include providing sleep education programs and ensuring appropriate staffing to reduce fatigue and burnout, offering peer support groups at work and free relax-

ation mobile apps to support positive mental and physical health, and offering wellness stipends for engaging in healthy sleep-promoting behaviors to enhance overall employee well-being. Making organizational changes to mitigate risks associated with poor sleep quality and duration may further support the sustained work ability of LTC workers and improve patient outcomes.

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**Table A.** Database Search Terms/Variations.

<b>Database</b>	<b>Search String</b>
PubMed	(((("Sleep"[Mesh]) OR "Sleep Deprivation"[Mesh] OR "Sleep Wake Disorders"[Mesh] OR "Sleep Hygiene"[Mesh] OR sleep*[tiab]) AND ("Nursing Homes"[Mesh] OR "Rehabilitation Centers"[Mesh] OR "Assisted Living Facilities"[Mesh] OR "nursing home*" [tiab] OR rehabilitation center*[tiab] OR assisted living[tiab] OR "Long-Term Care"[Mesh] OR "long-term care"[tiab] OR "Subacute Care"[Mesh] OR "subacute care"[tiab] OR "post-acute care"[tiab] OR "retirement center*" [tiab] OR "Housing for the Elderly"[Mesh] OR "housing for the elderly"[tiab]) AND ("Nurses"[Mesh] OR "Nursing Assistants"[Mesh] OR "Licensed Practical Nurses"[Mesh] OR nurse*[tiab] OR "nursing assistant*" [tiab] OR "licensed practical nurs*" [tiab] OR LPN[tiab] OR "licensed vocational nurs*" OR LVN OR "registered nurs*" OR RN))
Scopus	TITLE-ABS-KEY (("Sleep") OR ("sleep quality") OR ("sleep duration") OR ("sleep disorder") OR ("sleep-wake disorder") OR ("sleep deprivation") OR ("sleep hygiene")) AND (("extended care") OR ("nursing home")) AND (("nursing aide") OR ("nursing assistant") OR ("nurse") OR ("licensed practical nurse") OR ("licensed vocational nurse") OR ("registered nurse")). The search returned 869 documents, which were then limited to articles published after 2010
CINAHL	(MH "Sleep Disorders, Circadian Rhythm") OR (MH "Sleep Disorders") OR (MH "Sleep") (MH "Sleep Deprivation") OR (MH "Sleep-Wake Transition Disorders") OR (MH "Sleep Hygiene") AND (MH "Nursing Homes") OR (MH "Assisted Living") OR (MH "Rehabilitation Centers") OR (MH "Senior Centers") OR (MH "Housing for the Elderly") OR (MH "Long Term Care") OR (MH "American Long Term and Sub Acute Nurses Association") AND (MH "Nurses") OR (MH "Practical Nurses") OR (MH "Nursing Assistants") OR (MH "Registered Nurses")
NIOSHTIC	Sleep OR sleep quality OR sleep duration OR sleep disorders OR sleep-wake disorders OR sleep deprivation OR sleep hygiene AND extended care OR nursing home AND nursing aides OR nursing assistants OR nurse OR licensed practical nurse OR licensed vocational nurse OR registered nurse

**Table B.** Article Characteristics.

Author & Date	Purpose & Design	Sample & Setting	Results	Strengths & Limitations	Evidence Level, Quality
Bamonti et al., 2019	<p>To examine if coping and cognitive emotion regulation strategies can predict burnout while controlling for age and sleep duration</p> <p><b>Quantitative non-experimental cross-sectional design</b></p>	<p>56 direct certified nursing assistants (CNAs) employed in long-term care (LTC)</p> <p>Four skilled nursing facilities in the United States</p>	<p>Shorter sleep duration was significantly associated with greater depersonalization as an aspect of burnout (<math>\beta = -0.27, p = 0.01</math>)</p> <p>On average, participants slept 6 hours per night on work nights</p>	<p>Cronbach's alphas were reported for each scale; valid and reliable tools were used</p> <p>Limitations were acknowledged</p> <p>Relatively small sample size and no power analysis reported</p> <p>Sample lacked racial, ethnic, and shift time diversity</p> <p>Survey response rate not included</p>	Level III, B
Blasche et al., 2017	<p>To assess recovery time (through measures of fatigue, vigor, distress, and sleep quality) across two consecutive 12-hour day shifts and three rest days</p> <p><b>Quantitative non-experimental design</b></p>	<p>48 day shift RNs</p> <p>Three public Austrian nursing homes</p>	<p>At least three rest days are needed for full recovery (e.g., adequate time for rest to prevent against prolonged fatigue) after working two consecutive 12-hour day shifts</p> <p>Compared to working days, participants have lower perceptions of fatigue and higher well-being on rest days</p>	<p>Sample size was smaller, but reported as adequate based on a power analysis and effect size</p> <p>Methods described clearly and limitations were acknowledged</p>	Level III, C

			<p>Sleep quality was significantly worse on the two workdays, as compared to the reference (second rest day)</p>	<p>Demographic and sleep diary questionnaires were adapted from pilot testing, revised with participant remarks, but were not based on theory or valid/reliable tools</p> <p>Fatigue, distress, vigor, and sleep were measured with standardized tools with supported reliability (listed Cronbach's alphas) but validity was not mentioned</p> <p>Self-reported data could introduce bias</p> <p>No controls reported to decrease confounders</p>	
Buxton et al., 2018	To explore if indicators of sleep health can predict 10-year estimates for cardiometabolic risk scores (CRS) among extended care workers vs. information technology (IT) workers	Workers in extended care ( $N = 1,275$ ), including RNs and licensed practical nurses (29%), CNAs (65%), and other positions, including administrators, educators, and food service	<p>On average, extended care workers worked 40.53 hours per week (<math>SD = 10.59</math>)</p> <p>Average body mass index (BMI) of extended care workers was 29.43 kg/m<sup>2</sup> (<math>SD = 6.94</math>), so most (61%) fell below the obese range (BMI &lt;30 kg/m<sup>2</sup>)</p>	<p>85% participation rate noted among eligible employees and 87% participation rate among eligible managers</p> <p>Limitations were acknowledged</p> <p>Extended care employees were compared to IT</p>	Level III, B

	<p><b>Quantitative nonexperimental cross-sectional design</b></p>	<p>aides (6%)</p> <p>From 30 distinct worksites located in the northeastern United States</p>	<p>Extended care workers were more likely to have less sleep sufficiency, more wakefulness after sleep onset, longer sleep duration, later and more variable sleep midpoint times, more naps, and longer naps compared to IT workers</p> <p>Higher perceptions of sleep sufficiency, fewer minutes of wake after sleep onset, and fewer or no daytime napping was associated with lower cardiometabolic disease risks among extended care workers</p>	<p>employees</p> <p>Reliability and validity not discussed for all measurements</p> <p>Scale used not fully validated yet</p> <p>Interviews were completed at the worksite, increasing risk for bias and coercion</p> <p>Self-reported measures decrease objectivity of data</p>	
<p>Depasquale et al., 2019</p>	<p>To examine sleep duration and sleep quality reduce fatigue among LTC employees with nonwork caregiving roles</p> <p><b>Quantitative nonexperimental micro-longitudinal design</b></p>	<p>166 women with nonwork caregiving roles for dependent children or adult relatives</p> <p>30 nursing homes across six U.S. states</p>	<p>Sleep duration, sleep quality, and fatigue occurrence significantly changed on nights before a workday compared to nights before a non-workday</p> <p>Tonight's sleep duration and quality predicts tomorrow's fatigue</p>	<p>85% response rate reported</p> <p>Limitations acknowledged</p> <p>Study was conceptually informed by the theoretical Work, Nonwork, and Sleep framework</p>	<p>Level III, B</p>

			Double duty caregiver roles moderated the relationship between participant sleep duration and fatigue	Reliability and validity of measurements not addressed, as each sleep and fatigue construct was measured with a single self-reported item	
Goffeng et al., 2018	<p>To investigate fluctuations in heart rate and the psychological and physical strain experienced during sleep and work among health care workers over four consecutive 14-hour work shifts</p> <p><b>Quantitative nonexperimental cross-shift/ cross-week design</b></p>	<p>24 health care workers (nurses, social workers, assistants/ apprentices)</p> <p>One nursing home in Norway</p>	<p>There was a higher level of cardiovascular stress during the first workday compared with the fourth workday</p> <p>21% (<math>n = 5</math>) of participants reported having general sleep problems the night before the first workday whereas 17% (<math>n = 4</math>) reported sleep problems before the fourth workday</p> <p>The night before the first workday, participants slept an average of 5.8 hours</p> <p>The night before the fourth workday, participants slept an average of 6.5 hours</p> <p>Differences in stress from Day 1 to Day 4 were not statistically significant</p>	<p>Sample size adequacy not reported; sample size is smaller</p> <p>Validation of tools reported but not described</p> <p>Director of nursing home encouraged participation increasing risk for bias</p> <p>Participants served as their own controls</p>	Level III, B

<p>Hagglund et al., 2011</p>	<p>To explore aspects of sustainable work ability in female nursing assistants caring for older persons</p> <p><b>Quantitative nonexperimental cross-sectional nested case-control design</b></p>	<p>366 female assistant nurses</p> <p>12 units older adult care units in a Swedish municipality</p>	<p>Sustainable work ability was associated with participants' ability to sleep well</p>	<p>Sample size and power analysis not explicitly discussed, but response rate of 73% and sample attributes were reported to support generalizability of results to those caring for older adults in Sweden</p> <p>Participants were recruited and surveys were completed at their place of work, increasing risk for bias</p> <p>Data collected as self-reports increases risk for bias</p> <p>Study did not control for potential confounding variables</p>	<p>Level III, C</p>
<p>Haluza et al., 2019</p>	<p>To explore recovery processes among nurses who work successive night shifts during their off-duty periods</p>	<p>53 night shift nurses</p> <p>Two public nursing homes in Austria</p>	<p>Findings of recovery suggest that well-being was impaired on days following working a night shift, while it improved following rest days</p> <p>Three rest days, one sleeping day (12 hours)</p>	<p>Cronbach's alphas reported for fatigue, vigor, and distress measures, supporting good internal consistency reliability but validity not reported</p>	<p>Level III, C</p>

	<b>Quantitative non-experimental design</b>		and two full days off-duty (48 hours), are needed to support recovery (where occupational physical and psychological fatigue has improved following shifts and during off days)	69.6% response rate reported  Small number of male study participants limits generalizability of results to both sexes  Self-reported questionnaire used and non-random sample increases risk for bias  Power of sample size not mentioned No controls reported to decrease confounders	
Josefsson, 2012	To describe work-related health problems, sickness presence and absence, along with perceptions of time, competence, and pressure at work, among nurses who work in community care of older people  <b>Quantitative nonexperimental descriptive design</b>	213 RNs 60 residential care homes in a large community in Sweden	Most nurse participants (52%) felt psychologically exhausted at times after work, whereas 12% reported often, 28% rather often, and 8% never  Most nurse participants (51%) felt physically exhausted after work at times, whereas 15% reported often, 21% rather often, and 13% never  Time pressures ( $\rho = 0.275$ , $p < 0.01$ ) and emotional	62% of target population participated, supporting a high response rate  Limitations acknowledged  No control group noted  Only one author risks adding bias to results	Level III, B

			pressures ( $\rho = 0.187, p < 0.01$ ) were significantly correlated to sleep disorders		
Zhang et al., 2017	<p>To explore the relationship between work-family conflict and the mediating effect of sleep quality and duration on the mental health of nursing assistants</p> <p><b>Quantitative non-experimental cross-sectional design</b></p>	<p>650 nursing assistants</p> <p>15 non-unionized nursing home facilities located in Maryland and New England, United States</p>	<p>Poor sleep quality mediated the association between work-family conflict and mental health</p> <p>More work-family conflict was correlated with lower mental health scores (<math>\rho = -0.16, p &lt; 0.01</math>)</p>	<p>Participants given the option to complete the surveys at home for privacy</p> <p>73% response rate</p> <p>Reliability and validity were reported although not described for all measurement tools</p> <p>Selection bias may exist due to differences in work characteristics between the participants included</p>	Level III, A

**Table C. Results Presentation.**

Occupational Outcomes		
Burnout/Fatigue	Mental and Physical Health	Well-Being
<p><u>Bamonti et al., 2019</u> Sleep duration was significantly and negatively associated with the burnout subscale of depersonalization (<math>p = -0.34</math>)</p> <p>As sleep duration increases, depersonalization decreases, and when sleep duration decreases, depersonalization increases</p>	<p><u>Zhang et al., 2017</u> After adjusting for sociodemographic and working conditions, there was a significant association found between mental health and poor sleep quality (<math>R^2 = 13.8\%</math>, <math>\beta = -5.87</math>, <math>p &lt; 0.01</math>)</p>	<p><u>Haluza et al., 2019</u> Average well-being was considerably worse on the first 2 days following working night shift, when compared to the first rest day</p>
<p><u>Blasche et al., 2017</u> Average level of perceived fatigue, vigor, distress, and sleep during Work Days 1 and 2 differed significantly from that of Rest Day 2</p> <p>On working days, participants were more fatigued, less vigorous, more distressed, and had a lower quality of sleep than on Rest Day 2</p>	<p><u>Goffeng et al., 2018</u> LF/HR ratio was significantly higher on the first compared to the fourth workday, and a high LF/HF ratio indicates high cardiovascular strain</p> <p>The night before the first work day, most participants (65%, <math>n = 15</math>) reported a sleep pattern of one or more of the following characteristics: <math>\geq 30</math> minutes to fall asleep, <math>\geq 30</math> minutes awake in between sleep, and awakening 30 minutes or before wanted</p>	<p><u>Hagglund et al., 2011</u> 31.5% (<math>n = 42</math>) of participants had good sleep ability and sustainable work ability Nurses with reported good sleep ability are estimated to be 0.69 (95% confidence interval [0.43, 1.1]) more likely to have sustainable work ability</p>
<p><u>Haluza et al., 2019</u> Average level of fatigue, vigor, and distress during Post Night Shift Day 1</p>	<p><u>Josefsson, 2012</u> Nurse participants reported work-related health problems, including work-related neck or back disorders,</p>	<p><u>Zhang et al., 2017</u> A significant association was found between work-family conflict and poor sleep quality (<math>PR = 1.53</math>, <math>p &lt; 0.01</math>)</p>

<p>and 2 differed significantly from that of Rest Day 1</p>	<p>dry skin, muscles or joint disorders, sleep disorders, and headache, along with high time pressure at work</p> <p>Sleep disorders were significantly related to time pressure (0.275, <math>p &lt; 0.01</math>) and emotional pressure (0.187, <math>p &lt; 0.01</math>)</p>	
<p><u>DePasquale et al., 2019</u> Fatigue occurred on 359 of 1,221 days (29%)</p> <p>The average fatigue severity score was 5.61 (<math>SD = 2.08</math>)</p> <p>The odds of reporting fatigue more than doubled (<math>OR = 2.48</math>, <math>p &lt; 0.001</math>) on workdays compared with nonwork days</p>	<p><u>Buxton et al., 2018</u> More sleep apnea symptoms (<math>r = 0.14</math>, <math>p &lt; 0.001</math>), more perceived sleep sufficiency (<math>r = 0.08</math>, <math>p = 0.0005</math>), and more numbers of naps (<math>r = 0.14</math>, <math>p &lt; 0.001</math>) were associated with higher cardiometabolic risks (CRS)</p> <p>One unit increase in sleep apnea symptoms was associated with 0.44% higher CRS</p>	<p><u>Josefsson, 2012</u> 37% of the RNs had episodes of fatigue/unhappiness/sadness because of their work and found difficulties overcoming these feelings</p> <p>Nurses (<math>n = 213</math>) stated these episodes occurred several times a year (51%), sometimes (37%), and rarely (12%). These episodes lasted either always (8%), some months (4%), some weeks (31%), or some days (57%)</p>