



RESEARCH ARTICLE

Interactions between home, work, and sleep among firefighters

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Abstract

Background: Firefighters endure large occupational burdens and generally operate under conditions of chronic sleep deficiency and circadian disruption due to long shifts, plus interrupted sleep due to emergency calls during the night. A typical shift for firefighters is 24-h on/48-h off, and firefighters are expected to use time-off to recover from any sleep debt, while balancing social, family, and home responsibilities. This qualitative study sets out to assess family dynamics and how firefighters prioritize sleep and recovery at home based on relationship or family status, as well as a fire department's current shift schedule.

Methods: Focus groups were conducted via convenience sampling in Portland, OR, with full-time firefighters, battalion chiefs, and their spouses. Grounded theory, using NVivo 12 Plus, was used to code transcripts to reveal reoccurring concepts and themes.

Results: Major themes centered around the increase of nonemergent calls contributing to compassion fatigue. Spouses can help improve the sleep of firefighters by creating opportunities for recuperative sleep at home. However, spouses also conveyed underlying tones of “resentment” relating to their firefighter being unavailable for emotional and instrumental support. While married firefighters discussed choosing family and home obligations over reducing sleep debt to maintain relationships, single and divorced firefighters spoke of fewer conflicts impeding their ability to prioritize sleep at home.

Conclusions: These results improve our understanding of how firefighters prioritize sleep at home based on family dynamics and can inform future decision-making for fire departments in addressing concerns related to work–family conflict, sleep loss, and compassion fatigue among their members.

KEYWORDS

emergency workers, occupational health, qualitative analysis, shift work, workload

1 | INTRODUCTION

Firefighters endure large occupational burdens including shift work, physical exertion, exposure to high temperatures and toxic fumes, and the witnessing of trauma¹—all occupational stressors that can impact sleep quality and quantity. For example, Billings & Foct,² found in a sample of United States firefighters that 73% experience sleep loss due to their work schedule. Commonly, fire departments across the country operate on a 24-h on and 48-h off (24/48) shift schedule, but many fire departments allow for firefighters to take on extra shifts, with some departments allowing for unlimited 24-h shifts in a row before taking a day off. Compared with a more traditional 8-h work day, firefighters tend to prefer the 24-h shift schedule, which they feel has allowed for improved comradery and crew cohesion, efficiency, and cost savings, while still allowing for opportunities to sleep when the station is quiet (i.e., naps during the day with longer sleep periods at night), plus increased continuous days off work.³ This development of positive relationships and sense of community among emergency workers, and the perceived collective efficacy, can increase job satisfaction and be protective against the negative health effects associated with workplace stress and exposure to traumatic events.⁴⁻⁸ However, the increased urbanization in the United States over the last 70 years, in conjunction with the growing number of houseless residents and the opiate epidemic,⁹⁻¹¹ has resulted in four times the number of calls to fire departments in the last 20 years.¹² Yet, the growing number of career firefighters barely outpaces the average growth of major cities, with approximately 1 firefighter for every 1000 persons in many cities in the United States.¹³ This increased call volume can reduce a firefighter's ability to obtain rest,³ and in a worst-case scenario, could result in wakefulness for the entire 24-h shift.

Acutely, sleep restriction leads to deficits in cognitive performance,^{14,15} which raises the additional concern that subjective feelings of sleepiness do not accurately track objective measures of sleepiness.¹⁴ This discrepancy is an issue that potentially leads to a serious situation whereby firefighters may respond to an emergency and consider themselves to be adequately alert but perform below optimal levels. Acute sleep loss can also affect physical health, including an individual's weight and contributes to increased risks for developing chronic disease, such as cardiovascular disease in firefighters.¹⁶⁻²³

Disruptions in sleep are also known to be strongly associated with mental health and mood with meta-analysis revealing that sleep deprivation more strongly affects mood than either cognitive or motor performance.²⁴ Moreover, shift work, which is invariably associated with chronic sleep disruption, has been independently linked to impairments in memory, mood, vigilance, and reaction times, and with increased chronic disease such as cardiovascular disease, cancer, gastrointestinal disturbances, and obesity²—all morbidities commonly observed in firefighters.^{23,25-27}

Apart from personal health and well-being, a work shift that requires a night or more away from home, such as a firefighter's common 24/48 shift schedule, also affects family and marital relationships.

Occupational stress and lack of sleep create higher levels of parenting stress, lower parenting satisfaction, and feelings of loneliness among spouses.^{4,28} Firefighters' spouses have reported that a firefighter's schedule can contribute to their partner's increased time spent with younger children, but at the expense of couple time and communication.⁴ Further, spouses and older children note feeling anger toward their related firefighter as a result of the firefighter's physical absence during a shift plus any psychological absence when the firefighter is home yet cannot engage appropriately with their family, as they may be processing a traumatic event.⁴ Social support can help the post-work sleep of emergency workers by "buffering" their high levels of occupational stress.²⁹ In contrast, the absence of social support can increase the severity of occupational stressors, making social support an important structure to invest in while at home post-work.³⁰ Thus, the ability of family members to fulfill their own emotional and instrumental needs also likely affects the ability of firefighters to reduce stress and obtain restorative sleep.⁴ However, it remains unclear how firefighters manage their sleep loss when at home or how spouses may help to encourage sleep, while balancing positive family engagement and household processes. As social support and family engagement have been shown to reduce the occupational and home stressors that disrupt sleep, it is important to clearly identify the reasons behind prioritization levels of sleep and recovery at home for the short- and long-term physical, social, and mental health of firefighters and their families.^{29,30} The identification of firefighters' prioritization of sleep and recovery in relation to their family and marital relationships, can lead to interventions (e.g., changes to their work schedule, educational programs) that improve sleep and recovery prioritization practices at the individual, family, and organizational levels. Such interventions may foster well-being, sleep, and recovery both at home and work. This information would be especially prudent regarding decision-making among fire departments around the United States who are considering shifting from a 24/48 shift schedule to alternative work shift schedules. Schedules such as the 48-h on and 96-h off (48/96) require multiple days on shift, which may increase accumulated sleep loss. However, schedules like the 48/96 also increase the number of consecutive days off, which is a clear motivation for many firefighters. In this way, the 48/96 or similar schedule, creates a potential opportunity for increased time for recovery and improved family or marital relationships. Thus, we conducted an exploratory analysis of focus groups with full-time firefighters, their managers, and their families to examine family dynamics and sleep and recovery prioritization practices on an individual level when at home. This exploratory analysis is part of a larger study designed to examine sleep and firefighter work schedules, at both individual and organizational levels.

2 | MATERIALS AND METHODS

2.1 | Development of interview guide

To evaluate the state of current health and wellness among firefighters in Oregon, a needs assessment was conducted with union

TABLE 1 Interview guide used for firefighter focus groups

Firefighter interview guide
<ol style="list-style-type: none"> 1. What are the pros and cons of your current shift schedule? <ol style="list-style-type: none"> a. Sleep? b. Health? c. Family life? d. Job and Productivity? e. Scheduling (Kelly Days, Shift Pick Ups, Call Outs)? <ol style="list-style-type: none"> i. Predictability ii. In-Advance Notification iii. Satisfaction
<ol style="list-style-type: none"> 2. What does a good night's rest look like to you? How does the ability to sleep or not sleep affect other aspects of your health? <ol style="list-style-type: none"> a. How do you feel mentally and physically after a good night of sleep? b. Physical Health? c. Mental Health? d. Social relationships? e. In your experience, what potential issue can arise from poor sleep at work and/or at home? f. How does sleep fit in order of behaviors important to health? g. What level of prioritization would you rank sleep while on a shift? Why? (e.g., where does sleep lie in order of importance among job duties, eating, socialization, and relaxation?) h. What level of prioritization would you rank sleep while at home? Why? (e.g., where does sleep lie in order of importance among family/pet responsibilities, eating, socialization, and relaxation?)
<ol style="list-style-type: none"> 3. Describe the fire station's environment and how this environment contributes to your sleep health? <ol style="list-style-type: none"> a. Describe your sleep routine. Take me through your day. <ol style="list-style-type: none"> i. What kind of changes could be implemented to make it more consistent if not routinely regular? b. What prevents you from sleeping at night? c. Describe your sleeping quarters, are they ideal? <ol style="list-style-type: none"> i. If not, how can they be improved upon? d. What are your thoughts surrounding sleep disorders? e. If you were diagnosed with a sleep disorder how would your fellow firemen respond?
<ol style="list-style-type: none"> 4. Describe your physical and mental state while working a shift? How do you cope with these states while on a shift? <ol style="list-style-type: none"> a. Describe and take me through your day. b. If tired, what are the sources of this? c. Which strategies have or haven't worked for going to sleep? d. Which strategies have or haven't worked for staying awake? e. What are your reasons for wanting to stay awake? f. After napping while on a shift, how do you feel waking up?
<ol style="list-style-type: none"> 5. What type of injuries occur while on the job? <ol style="list-style-type: none"> a. What specific factors influence these injuries? b. What are your experiences when traveling home after a shift? c. If extremely fatigued what do you do?
<ol style="list-style-type: none"> 6. Describe your environment at home and its contributions to sleep health. <ol style="list-style-type: none"> a. Take me through your day after a shift and describe your home sleep routine. <ol style="list-style-type: none"> i. What times or time of day are you usually sleeping? ii. If not consistent, what changes could be implemented to make them consistent?

(Continues)

TABLE 1 (Continued)

Firefighter interview guide
<ol style="list-style-type: none"> <ol style="list-style-type: none"> <ol style="list-style-type: none"> iii. Is it better to stay consistent with your sleep routine no matter if you are at the fire station or at home? Why or why not? b. How do family/pet responsibilities affect your sleep schedule at home? c. After sleeping at home, how do you feel waking up? d. What strategies have or haven't worked for going to sleep? e. Which strategies have or haven't worked for staying awake?
<ol style="list-style-type: none"> 7. What does an ideal day-off from firefighting look like to you? What prevents you from achieving this ideal? <ol style="list-style-type: none"> a. What are your reasons for wanting to stay awake? b. Why are certain activities important to achieve on an ideal day-off?
<ol style="list-style-type: none"> 8. Circling back to our first question on the pros and cons of your current shift schedule, after having this discussion are there any other improvements you think could help regarding your current shift schedule? If so, what improvements do you think could help? <ol style="list-style-type: none"> a. What is your ideal work schedule? b. What improvements could be made to your workplace/home environment? c. What resources would be beneficial to maintain or improve your current shift schedule?

representatives and healthcare stakeholders associated with firefighters in Oregon using the Oregon Healthy Workforce Center's Safety, Health, and Well-Being Baseline Checklist.³¹ Findings from this needs assessment were used to develop a semistructured focus group questionnaire (Table 1). A modified version of the initial firefighter questionnaire was created for family members.

2.2 | Focus group implementation

The focus groups were conducted by two female researchers, one acting as a facilitator and the second took notes and interjected with additional probing questions when appropriate. The focus groups were held in meeting rooms at either a participating fire station in Portland with firefighters being seated at their kitchen table, or in a community meeting room for family focus groups. During the needs assessment, it was identified that firefighters would likely be more vocal in a focus group held with their firefighter 'family' and at the kitchen table as this would maintain their brotherhood/family style setting in a location where they usually socialize and often joke that this is where they solve "life and world problems." During the focus group discussions, participants were encouraged to engage in a dialog among themselves, rather than answering the facilitator's questions. Theoretically, this approach allows for the group perspective as well as an individual's own experiences to be promoted and shared.³² To provide an open environment to speak freely about their health and family dynamics, we ensured that focus groups were no more than six firefighters, battalion chiefs, or family members at once, and were completed with their regular, full-time crew for the firefighter and battalion chiefs focus groups. Firefighter and battalion chiefs participated in separate

focus groups to allow for more open discussion unaffected by interaction pressures between ranks. At the time of the interview, participating firefighters had a station tenure of at least 1 year. The facilitator began with Question 1 from the interview guide (Table 1) and allowed the conversation to flow freely. If the conversation ended or trailed off, the facilitator would introduce a question from the interview guide that had not been brought up yet. The focus groups were audio-recorded, using the software Audacity® (version 2.3.3, freeware, ©1999–2019 Audacity Team; Audacity is a registered trademark of Dominic Mazzoni). Recordings were transcribed verbatim by a member of the study team and included group dynamics via field notes regarding nonverbal cues. Participants were provided refreshments as partial compensation for their time.

2.3 | Population

Focus groups conducted among Portland Firefighter Association firefighters, battalion chiefs (management), and family members from April 2019 to August 2019 were included. Participants were recruited through the Portland Firefighters Association, who shared the study opportunity with their members via word of mouth and a recruitment flyer and provided study team members contact information of firefighters who were interested in participating. Following these initial contacts and subsequent focus group sessions, we used snowballing (a respondent-driven recruitment method where participants recruit other people they know to participate, and so on), as well as purposeful sampling to recruit firefighters from stations with a range of call volumes from low to high.³³ Stakeholders classified call volume cut-offs of low, medium, and high, based on the prior year's department-wide call log. Low volume stations represent the lowest quartile of calls (≤ 1770 calls/year), medium volume stations represent the median number of station calls (~2360 calls/year), and high volume stations represent the top quartile of calls (≥ 3700 calls/year). Additionally, we intentionally recruited to ensure the final sample resembled the general makeup of Portland Firefighters regarding race, age, gender, and sexual preference.

2.4 | Focus group analysis

The qualitative data analysis software, QSR International's NVivo 12 Plus, was used to analyze each transcript. The auto-coding option was initially used to capture unbiased "nodes" (i.e., a code, theme, or idea that summarizes the essence of a response or phrase). A female researcher (S. L. W.) went through each auto-code node to check validity before beginning coding of additional nodes by hand. Grounded theory was used to conduct this analysis, which includes three stages of coding: (1) Open Coding, discovering and labeling responses or phrases; (2) Axial Coding, relating responses or phrases to one another to create broader concepts and categories; and (3) Selective Coding, creating core themes for all categories.³⁴ Using Grounded theory, each speaker's response was coded individually according to its specific subject, based on meaningful quotes and

phrases, and then categorized into broader, overarching topics. A second female researcher (M. A. S.) independently coded each transcript to reduce bias and allow for richer coding discussions and use of researchers "lived experiences" to improve the qualitative analysis.³⁵ Both participating researchers in the analysis process went through each meaningful phrase or quote and came to a consensus on its designated node. If both researchers could not come to a consensus on a node, a third female researcher (N. P. B.) was brought in for final judgment. After coding the 10 interviews, we found no new codes to add to the NVivo code library, which provided some evidence for theoretical saturation, meaning that after subsequent data collections and examinations, no new information was revealed.³⁶ After reaching data saturation consensus, broad nodes were organized into key themes to allow for the searching of patterns within and across the original subsections. These patterns were then compared with the original key concepts of the study.

For reporting information on the study team, methods, study context, findings, analysis, and discussion of results, researchers used the consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups.³⁷ Through this method, researchers were able to check that quality information was reported in full for each step of the study process. Using, checklists such as the COREQ creates more validity and consistency in reporting for the qualitative research process.³⁷

3 | RESULTS

Ten focus groups were conducted and analyzed in total with participants from the Portland Firefighters Association and Portland Fire & Rescue, which is the largest fire and emergency services provider in the State of Oregon. During the study sampling period, Portland Fire & Rescue (~700 FTE sworn firefighters across 31 stations) operated on a 24/48 shift schedule. Firefighters worked from 8 a.m.–8 p.m. each shift. In 2019, the department, serviced 87,273 calls, with 28% of calls coming in between 10:00 p.m.–8:00 a.m. (end of shift). These calls include responses to fires, disaster mitigation, as well as medical and nonmedical emergencies (i.e., calls that do not require immediate firefighter/EMT/paramedic expertise, such as back pain, hangnails, or loss of remote control for television).³⁸ Portland Fire & Rescue is required to respond to all medical dispatches until a private ambulance company arrives to the incident. However, only private ambulance companies are responsible for transporting patients to local hospitals. Portland has made a number of progressive engineering updates to their facilities including personal sleeping quarters with individual tap outs or "pages" for call notification. Additionally, Portland Fire battalion chiefs and station captains allow for napping during the day as long as station duties have been completed and do not place restrictions on the time firefighters can go to bed.

Thirty-eight firefighters participated in seven of the focus groups (Table 2). Four battalion chiefs participated in one focus group, with similar characteristics of the full-time firefighters and six family members participated in two focus groups. The majority of firefighter

TABLE 2 Participant characteristics (n = 48)

Firefighters ^a		Family members	
Categories	%	Categories	%
Age (years)		Age (years)	
<25	0	<25	0
25–34	14	25–34	0
35–44	55	35–44	83
45 or older	29	45–54	17
Marital status		Relationship to firefighter	
Single, never married	1	Spouse/domestic partner	100
Married/domestic partnership	76		
Divorced/separated	14		
Years of fire service		Years partner has been in fire service	
<1	0	<1	0
1–10	29	1–10	17
11–20	45	11–20	83
21–30	21	21–30	0
30 or more	0	30 or more	0
Self-reported weekly call volume per crew ^b			
Low call volume (1–13 calls)	37		
Medium call volume (14–20 calls)	30		
High call volume (21+ calls)	34		

^aIncludes firefighters and battalion chiefs.

^bA crew of firefighters typically work three nonconsecutive 24-h work shifts in 1 week.

and battalion chief focus group participants were male, between the ages of 35 and 44 years, married or in a domestic partnership, which is consistent with national United States firefighters marital status demographics,³⁹ have been in the fire service for 10 years or more, and were equally distributed between low, medium, and high call volume stations. In 2019, the yearly night (10:00 p.m.–8:00 a.m.) call volume on average was 360 for low call volume stations, 690 for medium call stations, and 1603 for high volume stations. The majority of family member focus group participants were married female spouses of male firefighters, between the ages of 35 and 44, and have been involved with the fire service for 10 years or more.

Three main themes linked to recoverability and personal social relationships in their 24/48 shift schedule were identified including (1) work shift schedule and accumulated sleep loss impacting social and family relationships; (2) prioritization of home and family obligations over reducing sleep debt; and (3) importance of sleep support at home for firefighters. The frequency of coded concepts within each theme is referenced in Table 3. Although the study was designed to examine differences across call volume, themes were persistent across stations regardless of the call volume for this study

population, so frequencies provided in Table 3 were not stratified by station call volume.

3.1 | Work shift schedule and accumulated sleep loss impacting social/family relationships

Firefighters noted that sleep quality has not been as deep since they became a firefighter, due to their innate need to be quickly responsive to a call alert. They also noted improved sleep in recent years when opportunities were available due to a number of engineering improvements to their stations and sleep quarters including the availability of blackout curtains and individual dormitories with room-specific tap outs, which allow firefighters to be individually alerted if their engine or rescue vehicle is called, rather than the entire station. Yet, despite these structural changes, concepts related to the accumulated sleep loss over the years and the toll it has had on their personal relationships during time off were most consistently noted in each focus group. Four subthemes were identified.

a. Increased accumulated sleep loss due to an increased volume of non-emergent calls

One of the most prevalent issues impacting firefighters on their current shift schedule of 24/48 was the increased call volume due to an uptick of nonemergency calls. As a result, firefighters noted a decrease in their ability to sleep during their work shifts, plus emotional exhaustion due to compassion fatigue caused by the overuse of the public emergency system and resources for nonemergency events.

For example, one firefighter said:

The compassion fatigue, you know, and the sleep issues probably help compound something of that issue [compassion fatigue] when you're going on that call [non-emergent] that doesn't necessarily require that level of resources.(Firefighter Group 2)

b. Emotional unavailability and a lack of communication during time off

All firefighters (married, single, and divorced) spoke about being emotionally unavailable and being a poor communicator for at least the first 24 h after coming off a work shift. Firefighters with spouses as well as those divorced noted or alluded to both short tempers, as well as guilt for being detached during this recovery time. In turn, spouses voiced sympathy toward their partner due to their need to get some rest or to process traumatic events they may have witnessed, but spouses also intimated a level of resentment toward their partner due to the need to prioritize the firefighter's recoverability as the spouse continues to manage the household or attend social events without their partner. Concepts under this subtheme are outlined in Table 3.

For example, when discussing the transition from a challenging shift to time at home, one firefighter said:

TABLE 3 Theme frequency

Theme name	Number of references ^b
Work shift schedule and accumulated sleep loss impacting social and family relationships	259
• Increased accumulated sleep loss due to an increased volume of nonemergent calls	108
• Emotional unavailability and a lack of communication during time off	
o Level of resentment for nonfirefighter spouse ^a	25
o Reduced emotional availability	25
o Reduced communication	79
• Compounded responsibilities for spouse ^a	14
• Inflexibility of family power dynamics ^a	8
Prioritization of home and family obligations over reducing sleep debt	108
• Prioritization of family and home responsibilities due to shift schedule	75
• Low sleep prioritization at home ^a	11
• Power through at home for family responsibilities	22
Importance of sleep support at home for firefighters	82
• Spousal understanding	42
• Sleep support	40

^aUnanimous among family member focus groups.

^bNumber of times coded concept or theme was noted in focus group transcripts.

...you go home and you're not well-rested and you're asked, "Where are we going to dinner tonight?" and it seems like such an insignificant question, [but] that's when a lot of people shut down and they just don't talk and what's important to your significant other you don't care about. Then that creates some tension which goes in a lot of different directions, like divorce.

(Firefighter Group 5)

Similarly, a spouse noted:

Sometimes there's a little bit of resentment that can be there...I'll be like "I've had a bad day too." I always feel like my feelings sometimes would have to take the backseat to the fact that I don't work in an industry where I'm saving lives and I'm not seeing trauma. So, a lot of times my feelings would have to take a little bit of a backseat to his and I would have to step-up even more, and I think that's kind of the lifestyle of being a firefighter family.(Spouse Group 1)

c. *Compounded responsibilities for spouse*

Along with reduced communication and emotional availability when firefighters are home, married firefighters and their spouses spoke on the compounded responsibilities placed on the nonfirefighter spouse when their firefighter is away at the fire

station, creating additional tension and stress on spouses and families.

For example, one spouse noted the restrictions of a 24/48 schedule and the extra burden she had to carry as a result:

He's not there and that is always a struggle for me because I have to get three kids out the door by myself, and he isn't there for two of those mornings in a row because he always goes in early. He always leaves by 6, even though he's not scheduled technically to start till 8. But he'd be there by 7 for that hour carry over.(Spouse Group 1)

d. *Inflexibility of family power dynamics*

Both firefighters and their spouses, discussed challenges regarding household authority when the firefighter returned home from their work shift. Many participants noted that the spouse at home desired to remain "in charge."

We live dual lives, we live a life at the firehouse, and our life at the firehouse is habitually different than our life at home.... all of us who are married can probably attest to this, I'll come home and sometimes I'll have to keep myself in check because my wife is like "Look, I've been home

with the kids for three days and you come in here and you just want to rule the roost, and make the rules, and do this and that your way.", and she's been doing it her way for the last three days.

(Firefighter Group 4)

3.2 | Prioritization of home and family obligations over reducing sleep debt

While support from family can reduce reactivity to stressful or traumatic events and thus can be protective of sleep,²⁹ married firefighters, including married battalion chiefs, noted a compulsion to stay awake after a shift so that they could not only care for children or the household, but also attend social activities such as watching their child play a sport or attempt to watch a movie with a spouse. This was in contrast to single and divorced firefighters who expressed a larger degree of control over their time off work. The difference in sleep prioritization is highlighted below.

3.2.1 | Married firefighters

A common thread among married firefighters, including married battalion chiefs (who spoke often of their experiences as a firefighter before becoming a battalion chief which allows for more flexibility in their schedule, but have increased occupational burdens such as on-call and off-duty administrative work which impacts their sleep) was the need to "power-through" the day after their 24-h work shift to complete home and family responsibilities rather than opting to sleep and recover. Married firefighters and battalion chiefs with children primarily expressed that childcare needs and their desire to be at sporting events or dance recitals was the main limitation for getting sleep on their time off.

There's very few days that would provide the availability to get a nap. Especially if you work a lot. I get home and I have listed 10 things that need to get done and about time for two of them. And so, and that list just grows day by day. I feel like I have an obligation to keep ticking away at that and providing stuff for the family and being there as a dad and family time as much as possible, life obligations.

(Married Firefighter Group 1)

3.2.2 | Divorced firefighters

Divorced firefighters, including divorced battalion chiefs, expressed a more relaxed approach toward prioritization of home and family obligations over reducing sleep debt compared with their married

counterparts, and instead chose to prioritize sleep and recreational activities, proven coping strategies used to lessen the effects of compassion fatigue,^{40,41} on days they were not spending with their children. This can be attributed to reduced oversight by a partner, which allows them to choose freely how to spend their off time from work.

A divorced firefighter in response to a question based on how they prioritize their day after a shift said:

In the wintertime it's ski. I never make first chair, so I usually go before noon and ski until last chair. Go home and watch my son play basketball or something and get up, do it again the next day. Mountain bike in the summer and try to do that, but I don't do much else. I don't have a yard. I live in a decent situation. The more I think about it there used to be [while married] some satisfaction with that for me, but now it's like, I want to go do things instead of take care of stuff.

(Divorced Firefighter Group 7)

3.2.3 | Single firefighters

Single firefighters, including single battalion chiefs, were rather easy to identify at each station as they were often playfully ridiculed for their "tough life," (stated sarcastically). While single firefighters did express enjoyment spending time with loved ones, they also acknowledge that lack of competing prioritizations allows them to sleep, exercise, or engage in recreational activities as they deem fit during their days off, which similarly to their divorced counterparts can lessen the effects of compassion fatigue.^{40,41}

I leave here, go to the gym, I like to play golf. So, I'll go to the gym and then I go play golf. But, if we had a busy night [in the station], then I'm saying scrap the gym, scrap golf, I'm going home, napping until noon, one, two, or whenever.

(Firefighter Group 2)

3.3 | Importance of sleep support at home

3.3.1 | Married firefighters

Spouses had a slightly different take on sleep than the firefighters. Spouses discussed creating opportunities for their firefighter to sleep, such as driving to an event so their partner could get even 20 min of rest, removing themselves and their children from the home so their firefighter can get a brief nap after a shift, or changing their bedrooms to be darker during the day and cooler in

temperature. Although spouses acknowledged the difficulty of having a partner who was additionally missing because of the need to sleep, they also expressed the importance of having a more present and less moody spouse.

We encourage him to nap. There's a tricky element to that since he's just getting home from a shift and it's hard to just get in bed, so he needs a winding down period or needs to do something so he can get to that point to be able to take a nap. We definitely do what we can to give him the time and space to do that.

(Spouse Group 2)

Spouses also spoke of how their firefighter partners at times fight the request to rest upon returning home after a shift.

Like I said, we definitely encourage him to nap. There's days he doesn't want to because he doesn't want to miss out on anything, so he will lay on the couch and turn on a movie and feel like he's watching it with the boys but doze and at least he's getting a little bit of rest. If he's able to nap, I will take the boys outside and or we will leave so he has quiet. You know, just encouraging him to rest and take it easy to and do whatever is needed to recover from that last night of work.

(Spouse Group 2)

3.3.2 | Divorced firefighters

Divorced firefighters, who did not have a spouse or significant other in their home, expressed reduced sleep opportunities and sleep prioritization when they returned home to be a single parent after a long or hard shift. When their children were present, sleep was not only delayed because of childcare responsibilities, but also the desire to have some personal time when the children were at school or sleeping.

It's hard to get enough (sleep), really. Get the kids to bed by 8 pm, 8:30 pm and you're like I just put in a whole shift by myself so I'm not going to just go to sleep right now. I want to actually have a break from everything for a little bit. I end up going to bed at 11 pm or midnight. Just to feel like I had a break from everything, then I wake up at 5:30 am So, I get about 5 and a half hours of sleep a day maybe.

(Divorced Firefighter Group 7)

3.3.3 | Single firefighters

Without conflicting interests that prevent sleep opportunities, single firefighters described ample time to sleep after a shift.

For me being single, I don't have any kids. The most important thing is I sleep a lot when I'm at home. I mean I can put in 12 hours a day.

(Firefighter Group 2)

4 | DISCUSSION

Sleep, as much as a healthy diet and an adequate amount of physical activity, is increasingly recognized as a vital component for preventing disease and increasing one's lifespan.^{42,43} For emergency workers, poor sleep can also threaten the safety of the public.⁴⁴ Yet, as highlighted in our study of a sample of firefighters with an average of 15 years of full-time experience and spouses of firefighters, opportunities for firefighters to sleep during their 24-h shifts are increasingly limited due to the growing number of nonemergency calls, that were self-reported by the participating firefighters and consistent with national trends.⁴⁵ Firefighters from all stations, high, medium, and low call volume, expressed limited opportunities for sleep while on shift due to the increased use of the public emergency system for nonemergency events. Reduced sleep at night necessitates increased sleep during days off to reduce sleep debt.⁴⁶ However, firefighters, who pride themselves in their relationship-building at home, within their crew, and within the community, rather optimistically plan their days off to involve childcare, home improvement activities, and social activities. While single and divorced firefighters without children are able to reprioritize planned events when the need to sleep is high, married firefighters are compelled or required to stay awake to care for children or engage with family and at times require innovative strategies by the spouse to encourage sleep. Divorced firefighters with children sit between married firefighters with children and single and divorced firefighters without children with regard to the prioritization of family and sleep. This reflects the ability to alternate parenting duties with an ex-spouse, which allows personal time for themselves to recoup sleep when their children are away. This personal time may be perceived as much needed due to shouldering the challenges of maintaining a one-parent household when their children are home with them. Firefighters who are fathers (although an increased number of firefighters are women, the field remains dominated by men and interviewed women did not disclose having children) are chronically tired, but desire to spend more time with their children. This shift in firefighters being the sole breadwinner for the family to spending more time caring for their children, coincides with the changing societal family dynamics regarding sharing family roles.⁴⁷ Moreover, firefighters may feel that the inability to be present for their family is a shortcoming, amplified by workload and the development of compassion fatigue.^{48,49} As a result, firefighters are attempting to "do it all" by being strong and responsive at work to care for the public and assist their fellow firefighter, but also provide a flexible household where their spouse or ex-spouse does not have to carry the full emotional and

instrumental load of caring for the family and household. With competing objectives during time off, sleep at home becomes a secondary priority for firefighters, specifically for those who are married and/or have children. In the immediacy, reduced sleep further compounds the emotional and physical symptoms of compassion fatigue with decreased patience, increased irritability, and reduced attention. The consequences of poor sleep and compassion fatigue add to family conflict at home as well as accident risk at both home and at work.⁵⁰ Consequently, a growing contingent of firefighters perceive that the current 24/48-h shift schedule puts them at serious odds to reconcile intense work and personal life demands, which in light of recent interest in extended shift lengths, such as the 48-h on/96-h off shift (48/96),⁵¹ these concerns could potentially be exacerbated. Taken together, participant responses highlight the need for increased efforts to reduce firefighters' call volume, as well as additional training in sleep hygiene practices that maximize recovery to improve the mental and physical health of firefighters while also preserving time during days off from work to promote family and relationship cohesion.

4.1 | The family cornerstone

Firefighters are normally at work approximately one-third of the time (based on a 24/48 schedule), but this can increase substantially when taking on additional shifts or to cover for colleagues. Thus, partners of firefighters are required to take on extra responsibilities and conduct them with minimal support. When the firefighter is home but emotionally unavailable because of accumulated sleep loss or processing exposure to a recent traumatic event, spouses are no longer exclusively running a single-parent household, but also providing the space or encouraging the firefighter's recovery. Management of these compounded responsibilities by the partner of the firefighter creates tension and stress on the family unit, and reduces the marital and family satisfaction that accompanies shared home and family responsibilities.⁵² To provide some level of household stability or perhaps as a measure of self-preservation, married and divorced firefighters and spouses spoke about the need to maintain the family power dynamics even when the firefighter comes home from a shift. Otherwise, there could be resentment based on a perceived intrusion into the family's set schedule, creating increased social and family dynamic issues that are repeated each time a spouse leaves and returns from a shift.⁵³ A similar need for stability of family power dynamics for the protection of a partner's emotional and physical needs as well as the needs of their children is also noted in the reintegration of military members to their families after a deployment.⁵⁴ This stability in rules and power within the family may support the development of young children, whereas, consistent disruptions within the family system can stunt a child's development.⁵⁴ In contrast, some spouses of firefighters with children have spoken about the positive benefits of shift work in the parenting arrangement, which allows for flexibility, creates more time for firefighters to be with their children during daytime hours

and is beneficial for consistent child care at home rather than using daycare facilities.⁴

The ability to spend quality time with family members can improve health outcomes.⁵⁵ However, for married firefighters, home and family obligations were prioritized over the reduction of sleep debt, even if the firefighter could not perform these family responsibilities well due to sleepiness (e.g., spouses reported that firefighters would fall asleep trying to spend time with their children/family members or become agitated doing small inconveniences). The creative tactics implemented by spouses to produce opportunities for their firefighter to sleep while also internalizing their own emotional needs and continuing to physically care for the household, suggest firefighters are perhaps not effectively "powering through" their sleep loss. The intervention and push of sleep support by partners reflect a firefighter's altered perception of their emotions and underestimation of impairment as a result of chronic sleep loss, which contributes to the underestimation of fatigue-related accidents and injuries that contributes to workplace health and safety risk.⁵⁶ In this way, intervention by partners not only supports the firefighter's career by better preparing them to meet the physical and mental demands of the job, but also encourages a more mentally and engaging parent for emotionally meaningful interactions.⁴

Despite sleep support from spouses, married firefighters voiced concerns over impeded home recovery. This feeling of perpetual exhaustion reflects the large sleep debt in conjunction with a mentally and physically strenuous job. This sleep debt and exhaustion can diminish a firefighter's motivation to share family and home tasks during their days off to improve the quality of family and marital relationships.⁵² The added stress of family and household responsibilities in conjunction with compassion fatigue potentially caused by non-emergent call volume increase could compound hypervigilance and further reduce sleep efficiency.^{48,57} This reduction in sleep efficiency can not only happen during the night, but also during the nap encouraged by their significant other due to increased conditioning to be prepared for a call tone or call tone-like sound to go off at any time at work or at home. Thus, even with a supportive sleep environment, a firefighter may not reduce their sleep debt entirely, which highlights the importance of consistent sleep support at home to obtain even small amounts of sleep loss recuperation.

This study underscores the steadfast role a spouse, as well as a firefighter's shift schedule and call volume play in a firefighter's recoverability. However, unlike firefighters who have their crewmates to share traumatic events, partners of firefighters are usually isolated from one another and often feel they cannot bond with other families who do not share similar work schedules let alone experience secondary trauma.^{4,58} As noted above, this situation can lead to resentment toward their firefighter, which itself can lead to reduced communication and a lack of intimacy.^{59,60} These findings highlight the need for educational opportunities for spouses to support their mental health and preserve communication with their partner. Thus, a home-based sleep intervention program in conjunction with educational approaches to improve expectations for both family members and firefighters during days off-duty that supports healthy

routines, may ultimately improve family relationships and a firefighter's recoverability, as well as improve upon current practices of sleep support at home.

4.2 | The art of being single

Single firefighters without children expressed high prioritization of sleep at home, rather than prioritizing family and home responsibilities, as well as time to invest in their hobbies. However, the benefit of going home and "knocking out for 12 hours" or spending a vacation sleeping, could also present as a barrier to establish and maintain healthy relationships, seeming more selfish as they prioritize individual needs over another's needs.⁶¹⁻⁶³ This perception can adversely affect single firefighters without children due to their sleep needs, which require them to reduce their sleep deficit during the day or during vacation to be physically and mentally prepared for their next work shift. Future research is needed to understand how prioritization of sleep and a spouse's perceptions of sleep outside of nocturnal sleep hours could affect a single firefighter's ability to develop meaningful relationships. Dating was not a discussed topic among single firefighters during focus groups.

Epidemiological evidence suggests that divorced individuals are at increased risk for sleep problems compared with married or single individuals,⁶⁴⁻⁶⁶ but divorced firefighters expressed increased sleep as a result of decreased conflict at home. Even when caring for children in accordance with custody agreements, divorced firefighters noted an increased ability to prioritize sleep at home. As an exception, divorced firefighters noted the need to stay up late after putting children to bed to process a traumatic work shift and have some time to themselves. In this way, the dissolution of a stressful marriage may improve psychological well-being while also reducing the instrumental support also needed for recoverability.^{67,68}

5 | LIMITATIONS

This study is strengthened by the inclusion of both firefighters and partners of firefighters, but they were not necessarily dyads and so narratives could not be directly connected. Secondly, as the original aim of the study was to examine the strategies used to cope with sleep loss on a 24/48 shift schedule, we did not purposely sample to include a greater number of single and divorced firefighters. Similarly, we were unable to speak with any divorced partners of firefighters to compare the portrait described by divorced firefighters despite efforts to recruit this population. Additionally, the interpretation of our data on the impact of family dynamics on sleep loss is limited as we did not collect data on family size, the age of children, if firefighters had children with special needs, or if their spouse worked outside the home. Finally, we did not explicitly ask about second jobs, but rather generally asked about the use of time when off from a firefighter shift. Two participants in this study mentioned a second job. It is possible that additional firefighters worked a second job, but subjectively felt that their second job did not impact

their sleep prioritization or family dynamics. Nationally, second jobs are common among firefighters and can further reduce sleep quality^{1,2}; however, we are unable to draw conclusions regarding the impact of second jobs on family dynamics and sleep at this time. We also recognize that although participants were extremely open about marital or family issues and their health, which can be emotional topics to discuss openly, there remains the possibility that some firefighters and/or family members may not have felt comfortable to openly and honestly report all pertinent information in the group setting.

6 | CONCLUSION

Our thematic analysis of focus groups conducted with firefighters and firefighters' partners highlights the increased tension and sense of loneliness among married firefighters who want to share in-home and social responsibilities while also addressing the effects of increased call volume—acutely manifesting as sleep loss, reduced cognitive flexibility (i.e., ability to switch between task), and reduced mental health. The resentment that can grow within a firefighter-partner relationship can impede home recovery as firefighters often choose to try to improve their relationship at the cost of insufficient recovery from sleep debt. In contrast, the ability of single and divorced firefighters to prioritize sleep and/or hobbies to some extent reduced compassion fatigue. For married firefighters, their partners' ability to provide a consistent homelife and monitor and encourage sleep, maybe a current practice that leads to any meaningful social engagement. Future studies should examine the extent by which family member sleep support reduces compassion fatigue and the impact on overall health. Moreover, our findings suggest that interventions that provide approaches at both the individual level (e.g., physical, mental, and social health) and the organizational level (e.g., call volume decrease, additional sleep hygiene practices—blackout curtains, comfortable mattresses, and outside noise control, and alternative work schedules) are needed to improve at-home recovery for firefighters. These approaches should also include support for the secondary trauma and internalization of emotional needs experienced by the family.

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CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

DISCLOSURE BY AJIM EDITOR OF RECORD

John D. Meyer declares that he has no conflict of interest in the review and publication decision regarding this article.

AUTHOR CONTRIBUTIONS

Shelby L. Watkins and Nicole P. Bowles participated in the creation of the study design. Shelby L. Watkins, Nicole P. Bowles, and Martina A. Shannon participated in implementing the study, as well as data analysis, and interpretation of the following work. Shelby L. Watkins, Nicole P. Bowles, David A. Hurtado, and Steven A. Shea drafted the following work, providing key revisions. Shelby L. Watkins, Nicole P. Bowles, David A. Hurtado, Steven A. Shea and Martina A. Shannon provided final approval of the work for publication and agreed to be responsible for all aspects of the following work and ensure that any questions related to the accuracy or integrity of any part of the work are appropriately examined and resolved.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS APPROVAL AND INFORMED CONSENT

The study was approved by the Oregon Health and Science University Institutional Review Board. Formal documentation of consent was not obtained in this study as it provides an opportunity to identify participants. Written informed consent was not required as approved by the Oregon Health and Science University's (OHSU) IRB. Instead, all participants were given an OHSU IRB-approved information sheet which was verbally reviewed with participants and a filled-out and turned-in demographics form (no indication of name provided) served as consent for study participation.

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