Evaluating Sleep Habits Among Emergency Service Workers

Lieutenant Lance Routson

Urbandale Fire Department, Urbandale, Iowa

CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed: Lance W. Rowton

Abstract

The problem was the members of the Urbandale Fire Department suffer detrimental health impacts as a result of broken sleep patterns from current shift schedules. The purpose of the research was to identify a shift schedule that will best serve the needs of the department and the public. The action research method was used in this project. Three research questions were used: (a) What are the impacts of sleep deprivation in the members of the Urbandale Fire Department? (b) What shift schedules are currently being utilized in other emergency service organizations? and (c) What is the most ideal shift schedule for the members of the Urbandale Fire Department? The procedures used included a survey of Urbandale Fire Department members that currently work a 24-hour on/48-hour off schedule, a review of industry articles and publications regarding the impact of fatigue and sleep deprivation, and a review of industry articles and publications that discussed the positive and negative impacts of specific shift schedules. Results from this research included the specific identification of current health and wellness impacts being experienced by Urbandale Fire Department members as a result of working the 24/48 shift, the authoring of a draft training outline and standard operating guideline to facilitate fatigue management and education for members of the Urbandale Fire Department, and identification of several different scheduling options used throughout the emergency services profession. Recommendations from this research were a) the Urbandale Fire Department should continue to use the 24/48 shift schedule, b) the Urbandale Fire Department should implement a fatigue training program and associated standard operating guideline and c) a call for further research in the area of fatigue and its impact on the health of firefighters in the United States as there is currently little research available in this area.

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Public safety services must be able to respond at a moment's notice, regardless of the time of day. The random and unpredictable nature of emergencies does not allow service providers to only be available at certain times. Rather, there is a need for service availability 24 hours a day, seven days per week, and 365 days per year. In order to be prepared for this reality, many organizations staff their facilities by using a 24-hour shift schedule (Picarello, 2016). The Urbandale Fire Department (UFD) currently uses this type of schedule. UFD employees work a 24-hour shift, followed by 48 hours off duty.

The 24-hour shift schedule does have advantages. For example, this type of shift allows for infrequent shift exchanges and provides employees that can work more than a 40-hour workweek. It also provides coverage throughout the calendar year, including weekends and holidays (Picarello, 2016). But are there drawbacks to this type of scheduling practice? Does this type of schedule impact sleep habits or impact levels of fatigue amongst employees? Some agencies are not able to utilize the 24-hour schedule as it results in excessive fatigue among employees (Picarello, 2016). Is this scheduling practice appropriate for busier departments? Is it appropriate for slower departments?

Public safety culture often causes public safety employees to view the loss of sleep and rest as part of a sense of duty. These views can have a detrimental impact on the health and safety of employees and place citizens of the community at greater risk. Sleep deprivation and fatigue must be understood by public safety leaders in order to best combat these potential negative health implications (Policeone.com, 2016).

The problem was the members of the Urbandale Fire Department suffer detrimental health impacts as a result of broken sleep patterns from current shift schedules. Most of the

members of the department currently work a "24/48" shift, where employees are on duty in the fire station for 24 hours, and then are off duty for 48 hours. Exceptions to the rule include a small contingent of part-time employees that work a variety of 12-hour shifts. These shifts are from 0700-1900 and 1900-0700. Senior administrative members of the department work a more traditional 40-hour workweek. However, this is not a rigid schedule and some senior members may work more during the week. The scope of this applied research project focused on the 24/48 schedule, as this is the schedule worked by the majority of employees. This project aimed to identify the ramifications on the health and well-being of personnel assigned to this shift schedule and to identify a better alternative to this scheduling arrangement, if one exists.

The purpose was to identify a shift schedule that will best serve the needs of the employer and the public while also mitigating the impacts of broken sleep patterns to the extent possible. To best address this problem, three research questions were used to guide the project. These research questions were (a) What are the impacts of sleep deprivation in the members of the Urbandale Fire Department? (b) What shift schedules are currently being utilized in other emergency service organizations? (c) What is the most ideal shift schedule for the members of the Urbandale Fire Department?

The method applied to this research was the action research method. This method was chosen because it allows for the development and proposal of a training program outline that can be utilized to educate the members of the Urbandale Fire Department on sleep deprivation, its impact on overall health and performance, and mitigation measures. This method also allows for the development and proposal of alternative shift schedules (and associated standard operating guideline), should they be identified during the research.

Background and Significance

The Urbandale Fire Department is located in Urbandale, Iowa. The department primarily operates in a suburban environment and serves a resident population of approximately 44,000 people. Urbandale is a suburb of Iowa's capital city, Des Moines. The department currently employs 45 people and provides fire suppression and emergency medical services. This includes a full-time Fire Chief, two full-time Assistant Chiefs, a full-time Fire Marshal, and a part-time Assistant Chief. There are six full-time Lieutenants, six full-time Driver/Engineers, 19 full-time Firefighter/Paramedics and five full-time Firefighter/Emergency Medical Technicians. The remainder of personnel includes part-time Firefighter/Paramedics, part-time Firefighter/Emergency Medical Technicians, a full-time billing specialist, a part-time inspector, and a part-time billing specialist.

The background to this problem included several different variables. First, the Urbandale Fire Department has experienced significant growth in recent years. This was reflected by the increase in the resident population as well as the increase in calls for service. When assessing sleep deprivation and cumulative fatigue on employees, it is prudent to consider the amount of times they typically respond to calls for service, and when those calls occur. It is also important to consider the amount of calls that occur during the overnight hours. For the sake of this research, "overnight hours" were defined as 2200-0600. Table 1 shows the increases in population and calls for service over the last ten years, as well as the amount of calls during overnight hours.

Table 1

Population Growth, Calls for Service, and Overnight Calls in Urbandale, Iowa (2007-2017)

Year	Population Estimate	Calls for Service	Calls between 2200-0600
2007	37,746	2309	506
2008	38,418	2503	508
2009	38,959	2373	477
2010	39,486	2477	491
2011	39,742	2484	488
2012	40,194	2606	496
2013	40,655	2731	508
2014	41,517	2920	555
2015	42,319	3092	569
2016	43,018	3319	645
2017	43,592	3824	675

Note. Data for Urbandale, Iowa, retrieved from United States Census Bureau (2018) and the Urbandale Fire Department (2018).

One can assume that along with an increase in calls for service, as well as an associated increase in the amount of calls that occur during the overnight hours, employees would be subject to an increased amount of sleep interruption, deprivation, and associated fatigue. According to Kujawski et al. (2018):

> Firefighters require the ability to maintain high levels of attention for prolonged periods; even the smallest mistake while performing procedures can lead to failure on a huge level. Several studies confirm that the ability to maintain attention is susceptible to sleep deprivation. (p. 1171)

In addition to generalized fatigue, an increase in interrupted sleep is associated with several detrimental health impacts. In order for the Urbandale Fire Department to best promote the health and wellness of its employees, it would be best served to examine the current shift schedule and associated culture to minimize the impacts of a 24-hour shift. Sleep deprivation has been found to be associated with decreased vigilance, alertness, and mental performance. It is also associated with increased sleepiness, fatigue, and depression. A poor quality of life, and increased risk for cardiovascular events, digestive disorders, obesity, diabetes, obstructive sleep apnea, altered immune responses, and malignancies have all been associated with sleep deprivation (Carey, Al-Zaiti, Dean, Sessanna, & Finnell, 2011).

As part of the background to this problem, it was important to note the attempts made by the Urbandale Fire Department to identify potential problems with sleep deprivation and associated fatigue, and improvement measures that have been implemented. There was concern about employees commuting home following a night of little, broken, or no sleep. As an attempt to improve this situation, UFD implemented a Safe Sleep Room Initiative. As part of the program, employees are encouraged to stay after their shift is concluded and rest until they feel they can safely drive home. Dedicated sleep rooms are provided and all attempts are made to provide undisturbed sleep facilities. Some of the actions taken were installation of black out shades, no call alerting (or reduced volume) in the dedicated room, and signage that identifies that the room is occupied (J. Holt, personal communication, January 3, 2017).

Another initiative implemented by the Urbandale Fire Department in an attempt to provide more opportunities for rest when they are warranted was a change in the times that employees are allowed to sleep in the fire station. For several years, employees were not allowed to sleep prior to 2100 hours. However, a recent change allows employees to retire to their sleeping quarters as early as 1900 hours. In addition, employees are empowered to take naps as part of their one-hour lunch break. This is also a change from the past, as naps while on duty were not previously allowed.

This study is significant to the Urbandale Fire Department for three reasons. First, data from the past ten years indicates that the population of the City of Urbandale will continue to grow. Along with the population growth, an increase in service demand can be anticipated. While several improvements have been made to help alleviate sleep deprivation and associated fatigue, a next logical step would be to assess the impact of the 24-hour shift. Following this assessment, UFD can determine if it is best to continue with the current shift scheduling arrangement or try an alternative solution.

Second, the study can help identify the detrimental health impacts on employees that are part of working "non-traditional" shifts. For the sake of this study, "non-traditional" shift can be defined as any shifts other than a 40-hour workweek. By identifying specific risks, disease patterns, and negative health impacts as part of this study, training programs and health and wellness initiatives can be implemented to educate personnel before they begin their work on a 24-hour shift. By educating them as soon as possible, mitigation measures can be implemented.

Third, this study could be used by other emergency service organizations to assist them in their decision making as they consider the best way to staff their departments. Should staffing plans and schedules be different for larger cities? Smaller cities? By comparing different

departments and their data sets to those of UFD, other organizations may be better able to understand the impact of a 24-hour shift on a suburban department similar in size and stature to the UFD.

The first goal of the Unites States Fire Administration (USFA) is to "reduce fire and life safety risk through preparedness, prevention, and mitigation" (USFA, n.d., p. 10). This study relates to USFA Strategic Goal #1 as it better prepares the Urbandale Fire Department and its personnel to reduce the risks and negative aspects of sleep deprivation and chronic fatigue. It allows for the development of a training program and associated standard operating guideline that can be used by not only the UFD, but also other emergency service organizations to address this growing problem. Establishing fatigue prevention and mitigation programs, as well as risk management principles for the Urbandale Fire Department and other emergency services, allows for all stakeholders to assess their shift staffing models to identify what works best for them.

The primary goal of the Executive Leadership course is "…to develop the ability to conceptualize and employ key processes used by effective executive-level managers in the exercise of adaptive leadership" (USFA, 2015, p. vii). The ability to effectively manage the detrimental health impacts associated with shift work and broken sleep patterns will require an adaptive approach. Many variables impact the ability to manage these problems. A simple changing of shift work schedules is not likely to be the only way to combat this problem. Rather, it should be viewed as a piece of a larger process that can be utilized to reduce negative health impacts. One of the aims of this research project was to identify shift schedules and practices that can be implemented as part of this adaptive solution.

Literature Review

Employees that work shifts outside of a traditional 40-hour week (from approximately eight in the morning until five in the evening, five days per week) are exposed to unique circumstances. When working unorthodox schedules, shifts may be as long as 12, 24, or 48 hours. 24-hour shifts, commonly used in the fire service, subject employees to a lack of sleep and interrupted sleep because calls for service are received at all hours of the day (Merrick, 2012). These hours may be worked during the day, overnight, or a combination of both. These shift schedules can impact employees in several ways. For the sake of this project, shifts outside of the 40-hour workweek described above will be referred to as "non-traditional" schedules. Firefighters often work these non-traditional shifts. The role of firefighters has changed over time. Increased service delivery demands and varying roles have led to fatigued personnel (Carey, 2016).

Fatigue is a consideration when assessing the impact of non-traditional work schedules. According to Paley and Tepas (1994), fatigue has often been thought of as a simple function related to the amount of time spent laboring in the workplace. As such, this approach would predict that fatigue is directly related to the amount of physical labor performed while at work. This perspective was used to develop regulations on the amount of time commercial transportation drivers could operate their vehicles. However, this approach suggests that by regulating when drivers may or may not operate their vehicles, that risk may be mitigated. Paley and Tepas (1994) highlight this as a shortcoming of this approach.

Shift work has been shown to impact the amount of time a person may sleep. Paley and Tepas (1994) note past research has shown employees work during the afternoon or evening shift sleep the most, workers on the day shift sleep a little less, and those on the overnight shift sleep

the least amount. Johnson and Naitoh (as cited in Paley & Tepas, 1994) state the only thing that is certain about sleep loss is that the sleep-deprived person will be sleepy. As such, the person will likely experience fatigue, irritability, inability to concentrate, and periods of misperception.

Koen (as cited in Poole, 2015) argued the quantity of sleep is not as important as the quality of uninterrupted, deep restorative sleep. Departments with employees working overnight shifts that experience one or two sleep interruptions each night may not be significantly impacted, but three or more interruptions of sleep may result in the ability to work safely and effectively.

A 2012 study conducted by Basinska and Wiciak (as cited in *The Impact of Fatigue on the Public Safety Workforce, n.d.)* found police officers suffered from numerous effects of fatigue. The impacts included: being more prone to accidents and on-duty injuries, higher risk of injury or death while on duty, higher risk of burnout, larger use of sick time, time-management problems, a tendency to sleep on duty, and communication problems with superiors and other coworkers. Merrick (2012) also noted that sleep deprivation results in higher rates of absenteeism and turnover in the workplace.

Employees that work night shift for several years have been found to suffer apparent cumulative effects. Martin (1995) found this is the case because the body is exposed to conflicting synchronizing clues over time (such as sleep during the day and work at night compared to work during the day and sleep at night). Martin (1995) further noted this resulted in decreased longevity in animal models and there is currently legal precedent in Japan that allows for night work to be a compensable cause of premature death.

Widmar (2003) notes different individuals require different amounts of sleep, and this is dictated by hereditary and genetic factors. A normal amount of sleep is six to ten hours and most people sleep seven and a half to eight and a half hours during a 24-hour cycle.

There are four different stages of sleep. These include an initial relaxed and semiconscious state, the actual beginning of sleep, deeper sleep, and final stage of the deepest sleep (Widmar, 2003). Sleep then proceeds to the rapid-eye movement (REM) phase. If a person is awoken in the first two stages of sleep, they are more likely to be alert and refreshed. However, if they are awoken in the third or fourth stage, they are more likely to be confused and suffer from decreased performance (Widmar, 2003).

Several specific negative health impacts have been associated with firefighters' shift work schedules and broken sleep. Extended shifts, night shifts, and overtime shifts have been tied to higher risk of fatigue, sleep disturbances, impaired mood, illnesses, negative cardiovascular outcomes, injuries, and impaired work performance (Haddock, Poston, Jitnarin, & Jahnke, 2013). Sleep deprivation has been found to adversely impact memory (Carey, 2016). It has also resulted in negative health impacts for several other occupations that include pilots, long-haul truck drivers, ship crews, and resident physicians (Haddock et al., 2013). Shift workers have been found to be more prone than day workers to significant medical conditions, including heart attacks, ulcers, depression, and serious sleep disorders (Widmar, 2003).

Studies of emergency medical service (EMS) providers have found that encountering personal threats and dealing with uncooperative and abusive patients has contributed to high levels of occupational stress and attrition (Mock, Wrenn, Wright, Eustis, & Slovis, 1999). The authors also note that long working hours and 24-hour shifts are both contributors to burnout, and workers who are burned out often provide less than ideal care (Mock et al., 1999).

Disruption of the circadian rhythm can also be a drawback to some work schedules. The circadian rhythm can be defined as "an inborn, genetically-programmed, self-sustained rhythm in behavior, physiology and metabolism, developed over evolutionary time that enables living organisms to cope with the 24-hour daily rotation of the planet" (Martin, 1995, p. 83). Forced changes in the circadian rhythm result in sleep disruption and deprivation (Martin, 1995). It should also be noted that employers could be held liable for accidents involving their sleep-deprived workers (Lorber, 2006).

In an article on air medical crews, employees who had their circadian rhythm disrupted were also found to suffer from gastrointestinal dysfunction, infertility, and increased rates of error and on-the-job injuries (Martin, 1995). Considering the circadian rhythm in the scheduling of rotating shifts can decrease complaints (and possibly mistakes, accidents, and injuries) in half (Martin, 1995). According to *The Impact of Fatigue on the Public Safety Workforce* (n.d.), circadian rhythm interruption has also been linked to other negative health problems, such as an increased risk for cardiovascular events, obesity, depression, and bipolar disorder.

Circadian rhythms differ slightly from person to person, and most people experience peak energy and alertness in the mid-morning and late afternoon or early evening. Periods of decreased alertness and higher levels of sleepiness usually occur early in the afternoon and at night (Widmar, 2003). Some individuals prefer to rise early and go to bed early, while others rise later and go to sleep later (Widmar, 2003). Lorber (2006) also noted that each person adjusts to shift schedules differently, and some are unable to adjust at all.

Research has equated the effect of sleep deprivation to those of being impaired by alcohol. Being awake for 18 hours has been shown to impair an individual as if they had a blood-alcohol content of .05 and being awake for 24 hours impairs an individual as if they had a

blood-alcohol content of .10. As such, a sleep-deprived individual may be as dangerous as an individual intoxicated by alcohol (Widmar, 2003).

Some specific indications of sleep deprivation have been identified (Widmar, 2003). They include: requiring an alarm clock to wake you up on time, struggling to get out of bed, irritability, tiredness, feeling stressed, trouble concentrating and remembering, falling asleep in meetings and in classrooms, needing a nap, feeling drowsy, and falling asleep within five minutes of going to bed.

Takeyama et al. (2005) noted in their study that many fire stations require their employees to take naps and sleep in a dormitory setting along with other on-duty firefighters. They noted that because of this, sleep is easily disturbed by other firefighters in the room. They also noted firefighters who did not have access to individual rooms commonly asked for access to private rooms. They noted work conditions, to include private sleeping areas, should be considered when assessing sleep quality and abrupt awakening.

Merrick (2012) noted it is very important for employers to convey to their employees that having a quality sleeping environment is essential. Specifically, bedrooms at home and at work should be cool (between 65 and 70 degrees Fahrenheit), comfortable, and should include comfortable pillows, bedding, and mattresses.

There are nearly fifteen million full-time workers that work non-traditional shifts (Brogmus & Maynard, 2006). Research has shown there has also been an increase in workplace injuries during non-traditional shifts. Brogmus and Maynard (2006) stated that work-related injuries increased 15.2 percent on afternoon shifts and 27.9 percent on night shifts relative to morning shifts. In addition, injury risk has been shown to increase in a linear fashion after the eighth hour of work, culminating in a 13 percent risk on a 10-hour shift and nearly a 30 percent

risk on a 12-hour shift. Brogmus and Maynard (2006) further noted injury risk increases as time between breaks increases and injury risk increases as consecutive shifts increase. Martin (1995) noted that most injuries in shift workers occurred between 2200 and 0200, and that firefighters are more often injured on the night shift.

To help reduce the risk of injury associated with shift work, Brogmus and Maynard (2006) made several suggestions. They recommended that each worker maintain a schedule that allows for two consecutive rest days, with one being a Saturday or Sunday if possible. They also suggested educating workers on the importance of getting enough sleep, avoiding quick shift changes, considering avoiding assignment to permanent night shifts, and considering all aspects of a workers' job and home lives when changing to a new schedule format.

Many authors agreed that there is currently very little research on the topic of shift work and sleep deprivation in firefighters. There are currently very few studies that assess the impact of work schedules on firefighters in the United States (Caputo et al., 2015). However, Paley and Tepas (1994) noted this should not reduce the importance of further research and examination in this topic area.

Haddock et al. (2013) noted it is quite difficult to make generalizations about fatigue amongst firefighters based on observations of other occupations. This is due to the fact that each department is different in the number of calls it responds to, number of personnel on duty, and scope of services delivered. They further noted that little is known about the prevalence and epidemiology of sleep deprivation or the degree of sleep disorders among United States firefighters. They concluded that more research must be done specifically on United States Fire Service personnel.

In his dissertation, Billings (2014) stated when considering small differences in shift length (such as eight-hour shifts versus 12-hour shifts), the relationship between shift lengths, sleep quality, and work performance is unclear. As such, Billings (2014) noted the need for more studies so we can better understand the discrepancies between existing studies and to also better assess the impact of long-term shift arrangements.

There have been social implications that have been attributed to disruption of the circadian rhythm and sleep deprivation. Mood swings and a higher rate of divorce have been found (Martin, 1995). Merrick (2012) found another problem associated with fatigue and shift workers is that they rely on over-the-counter drugs, caffeine, and energy drinks to try to remain alert during the day.

As part of the literature review, it was discovered that in a study performed by Haddock et al. (2013), firefighters were not found to be at increased risk for excessive daytime sleepiness compared to the general population and other members of the workforce. Mock et al. (1999) found in their study that EMS providers actually had lower mean anxiety scores than a normative sample of working adult males. The authors found this surprising but note that it may be possible to be highly stressed but have low levels of anxiety. The authors also noted it is possible that anxiety levels may decrease with time in the EMS profession, as the mean age of participants in their study had 11 years of experience.

Martin (1995) noted that sleep-deprived subjects show decreased cognitive functions in some realms but not all. Sleep-deprived individuals tend to have more errors of omission in work-paced tasks, such as monitoring, telemetry, and suturing. However, in self-paced tasks (such as problem solving), speed was decreased but accuracy remained high.

The literature review performed as part of this project identified several areas of significance that need to be considered by the Urbandale Fire Department. These areas of interest will be an important part of the overall approach to help address fatigue among shift workers and reduce the associated risk. First, it must be acknowledged that over time, shift workers will likely experience fatigue and its associated symptoms. This could become more of a pressing issue as the department is currently undergoing significant growth and call volume increases. The Urbandale Fire Department should train its personnel in recognizing the symptoms of fatigue and provide education and corrective measures that can be utilized to assist employees if they are suffering from fatigue.

Second, the risk that comes with employees who are responding to emergencies while tired and fatigued should be taken very seriously. While the Urbandale Fire Department did take action to address some of these issues, the fire service as a whole should consider a cultural shift when equating tired employees with weakness or poor performance. The literature review has shown that tired and fatigues employees are statistically more likely to suffer injury while working. There is also an acknowledgement among the research community that the impacts of sleep deprivation and fatigue on American firefighters had not been well researched, and we were still learning more about this important subject.

Third, it is important for firefighters to understand the importance of maintaining a quality work-life balance. Shift work and the associated strains that can impact personal and family living should not be underestimated. Firefighters should seriously consider their sleeping environments both at home and at work. Firefighters must utilize their time off to rest and to recover from shift work. Sleep deprivation has a cumulative impact and firefighters must gain restorative sleep when not on duty. This can be difficult at times due to circadian rhythm

disruptions. However, firefighters must be well rested when they report for duty. These three areas of significance influenced the results of this research project and were incorporated into material produced in Appendices B and C.

Procedures

The action research method was chosen for this project. The action research method is used to apply new information to solve organizational problems (National Fire Academy (NFA), 2013). Since there was currently little research available on the impacts of sleep deprivation and fatigue on American firefighters, the information obtained as part of this project can be used as part of best practice solutions to fatigue-related issues. The goal of the project was to identify a shift schedule (or verify that the current schedule was most appropriate) that best serves the needs of the employer and the public while introducing information and concepts that can be used to reduce the impacts of fatigue and broken sleep to the extent possible.

To answer research question one, a survey was administered to members of the Urbandale Fire Department. The purpose of the survey was to identify life impacts that the survey respondents feel are the direct result of shift work and sleep deprivation. There were a total of 39 Urbandale Fire Department members that were invited to take the survey and 26 responses were received for a return rate of 67%. These employees were chosen because they are the members that work 24/48 shifts. Members of the department who do not work 24/48 shifts were not invited to take the survey. Survey invitations were sent out on September 17, 2018, via electronic mail, and the Survey Monkey Internet survey platform was used. It was stated that the survey would be available for completion until September 27, 2018. A collection of survey questions and associated material can be found in Appendix A.

Research question number two was answered by assessing different schedules that are utilized by other public safety agencies. An Internet search was utilized to identify different scheduling formats. This allowed the researcher to identify several different options that provide fire department staffing over a 24-hour period. It also allowed the researcher to compare the Urbandale Fire Department to other public safety institutions for similarities and differences that impact shift schedules and design. As part of the research for question number two, a search of the National Fire Academy Learning Resource Center (NFALRC) was conducted to identify books, articles, and other print resources that could be used as references for the project. Specifically, the search included inquiries on different staffing formats for 24-hour coverage, assessment of different industries and their associated scheduling practices, and the impacts of shift work on fire department employees.

Research question number three was answered by a similar method. An Internet search was used to identify the health impacts of each different shift arrangement. As part of the research, attempts were made to identify the positive and negative aspects of each shift arrangement to allow for reasonable comparison to the current environment at the Urbandale Fire Department. This allowed for an appropriate identification of the most ideal shift arrangement for the members of the Urbandale Fire Department. Another NFALRC search was carried out to identify the different schedules utilized by other agencies as well as the rationalization for selecting of such schedules. By conducting the research in this manner, the researcher was best prepared to make a recommendation to the Urbandale Fire Department about how to provide 24-hour service delivery in a way that is best for the employer and the employee.

There were some limitations to this project. First, this project made an effort to identify as many different staffing arrangements as possible. However, it is not possible to claim that all

staffing arrangements have been identified. Each department is home to a unique social, political, and financial environment. As such, a shift schedule arrangement that works in one location my not work in the other. For example, departments that responded to a significant level of daily emergency response calls may not be able to staff their department the same way that a department with fewer daily calls did.

Second, this project only assessed the impact of fatigue that results from shift work and associated sleep deprivation. This project did not assess the impacts of sleep deprivation and fatigue that are the result of activities outside of the employee being on duty. This project assumed that employees reported to duty well rested and well prepared for their shift. In reality, this was likely not always the case. As such, the fatigue and associated negative health impacts experienced at work may be the result of influences that occur while off duty.

Third, this project was limited to the fact that there was little published research regarding fatigue and sleep deprivation as it related to shift work for firefighters in the United States. As a result, studies should be performed in the future that provide more insight on this issue. However, as of the writing of this project, those resources were not available.

Fourth, while this research did result in a recommendation regarding 24-hour shift coverage for the Urbandale Fire Department and formulation of associated training and informational material, it assumed that employees could abide by the recommendations and work to reduce the impacts of fatigue and interrupted sleep. However, when an employee was off duty, it would be up to them to take appropriate action to help address this issue and to prioritize appropriate rest and recovery.

Finally, this project identified that some scheduling practices may be more appropriate for certain fire departments while not appropriate for others. Most of these recommendations

were based on call volume; particularly regarding the amount of calls for service that occur during the overnight hours. However, this project looked exclusively at call volume and did not consider the impact of other activities that occur throughout the day. Public relations activities, public appearances, training, and fire inspections are examples of activities that also occur daily in many fire departments and their impact on firefighters should be considered. This project did not assess the amount of calls that are required to identify the threshold of becoming "too busy". Is there a specific amount of calls that a unit must respond to before they are considered busy? Do the call types matter? Do fire alarm, emergency medical calls, and structure fires all carry the same weight as it relates to fatigue and sleep disruption?

Results

Research question one was used to determine the impacts of sleep deprivation and fatigue as viewed from the perspective of a UFD employee. A series of questions were asked of UFD employees that are currently assigned to 24-hour shifts. The content of the questions was based on the findings noted in the literature review of common negative health impacts associated with shift work.

The first survey question asked if UFD employees had experienced changes in their daytime sleepiness levels after beginning work on a 24-hour shift. Of those that responded, seven said their daytime sleepiness was much more than it was prior to working a 24-hour shift, 13 said their daytime sleepiness was somewhat more than it was prior to working a 24-hour shift, five said their daytime sleepiness was about the same as it was before working a 24-hour shift, one said it was somewhat less than it was prior to working a 24-hour shift, and zero said it was much less than it was prior to working a 24-hour shift.

The second survey question asked if UFD employees had experienced changes in their daily anxiety levels after beginning work on a 24-hour shift. Of those that responded, six said their daily anxiety levels were much more than they were prior to working a 24-hour shift, three said their daily anxiety levels were somewhat more than they were prior to working a 24-hour shift, 13 said their daily anxiety levels about the same as they were before working a 24-hour shift, three said their daily anxiety levels were somewhat less than they were prior to working a 24-hour shift, and one said their daily anxiety levels were much less than they were prior to working a 24-hour shift.

The third survey question asked if UFD employees had experienced changes in their levels of depression after beginning work on a 24-hour shift. Of those that responded, one said their depression level was much more than it was prior to working a 24-hour shift, three said their depression was somewhat more than it was prior to working a 24-hour shift, 22 said their depression level was about the same as it was before working a 24-hour shift, zero said their depression level was somewhat less than it was prior to working a 24-hour shift, and zero said their depression level was much less than it was prior to working a 24-hour shift.

The fourth survey question asked if UFD employees had experienced changes in the amount of times they get generally sick (cold, flu, general illness) after beginning work on a 24-hour shift. Of those that responded, two said they got sick much more than they did prior to working a 24-hour shift, six said they got sick somewhat more than they did prior to working a 24-hour shift, 17 said they got sick about as often as they did before working a 24-hour shift, one said they got sick somewhat less than they did prior to working a 24-hour shift, and zero said they got sick much less than they did prior to working a 24-hour shift.

The fifth survey question asked if UFD employees had experienced changes in their level of burnout after beginning work on a 24-hour shift. Of those that responded, seven said their level of burnout was more than it was prior to working a 24-hour shift, eight said their level of burnout was about the same as it was before working a 24-hour shift, two said their level of burnout was less than it was prior to working a 24-hour shift, nine said they have never felt burnout out in their career, and zero said they felt burned out prior to working 24-hour shifts, and now they don't feel burned out at all.

The sixth survey question asked if UFD employees had experienced significant weight gain (more than 10% of their weight than when they started working 24-hour shifts) after beginning work on a 24-hour shift. Of those that responded, six said they had experienced significant weight gain. 20 said they had not experience significant weight gain.

The seventh survey question asked UFD employees what shift schedule they would like to work if they could make their own choice. Of those that responded, 13 said they would prefer to work a 24 hours on/48 hours off schedule just as they do now, six said they would like to work a 48 hours on/96 hours off schedule, zero said they would like to work a rotation of 10-hour day shifts and 14-hour night shifts, and three said they would like to work a rotation of 8-hour shifts (such as 7a-3p, 3p-11p, 11p-7a). In addition, four custom answers were given when the respondents chose "other" for their response. Those answers were "24/72", "California Swing", "24 on/24 off for five days and four days off in a row following", and "three on and four off".

The eighth survey question asked UFD employees about the quality of sleep they get while working a 24-hour shift. Of those that responded, 14 said their quality of sleep was much worse than the quality of sleep they get off when off duty, 10 said their quality of sleep was somewhat worse than the quality of sleep they get off when off duty, two said their quality of

sleep was about the same as the quality of sleep they get off when off duty, zero said their quality of sleep was somewhat better than the quality of sleep they get off when off duty, and zero said their quality of sleep was much better than the quality of sleep they get off when off duty.

The ninth survey question asked UFD employees to state the best part about working the 24/48 shifts. There were 24 answers to this question and two respondents skipped this question. Answers to this question were:

-The time off and the improved pay

-The ability to take care of things during the day/business hours when off duty.

-Getting two days off. Every workday is a "Friday"

-Having 48 hours straight of time to spend with family

-Having two days off in between shifts

-Having two days off between shifts

-No real advantages in my opinion

-Working the amount of hour all at one time. Getting in all the different types of calls that occur at different times of the day while maximizing coverage for the city. Having two days off following the shift

-Having two days off during the week

-Having two days off

-Only being there 24 hours

-Building relationships with your crew. Only one day away from family at a time.

-Ability to have two days off in-between shifts. Gives the opportunity to have another income

-Two full days off

-The time off

-Every day is a Friday

-Having the ability to have two days off in between shift days

-Consistency. I know my schedule a year in advance

-Two days off

-Two days off with the family

-Going to Costco at 11 on a Wednesday. Two days off every time I go to work

-Every shift is like a Friday (unless working a time trade or overtime). I do my job for 24 hours, then I get to go home

-The two days off

-Having days off during the week

The tenth survey question asked UFD employees to state the worst part about working the 24/48 shifts. There were 24 answers to this question and two respondents skipped this question. Answers to this question were:

-Time trades that run concurrent with your regular shift reversing the 24/48 to a 48/24

-The lack of sleep or restfulness of the sleep we get

-Only having two days off between shifts

-On the 48 hours off, you are either coming off shift or getting ready to go on shift the next day. There is never an entire day off

-Being away from family for the night time routine

-Lack of sleep

-Every day off you either just come off shift or you are on shift the next day

-You're always working either Friday, Saturday, or Sunday. You always feel like you're either getting off work or going to work

-Over many a year time period I have missed countless significant children's events, family functions, and special occasions that occur at night, on weekends, and during holidays

-Missing family events

-Only get one night to relax on days off

-Being woken up for calls. It's part of the job and I'm happy to do it. It can be frustrating when it's for something like a smoke detector battery that's been chirping for a week, or someone feeling nauseous for two days and is capable of driving

-Your first day off is often not optimal since you are tired. Productivity level is much less than the second day off when you actually slept at home

-Poor sleep, recovering your first day off

-I'm either recovering or preparing for shift

-Lack of sleep

-Always feel like you are coming to or going from work. Difficult to plan seeing family and friends

-Potentially not getting any sleep and having to spend your first day off catching up on sleep

-First day off is committed to sleeping

-Lack of sleep at times, but it isn't terrible though

-Every day is affected by work either I'm getting off it or getting ready to go back

-If my crew and I are up running calls all night, then my first day back at home is spent catching up on sleep, making the first day off somewhat unproductive

-Possibility of being up 24 hours straight

-Missing some of my children's activities

Research question number two addressed the various types of shift schedules that were being used by other emergency service organizations. A study performed by Paley and Tepas (1994) discussed the use of a rotating 8-hour shift schedule. In this format, firefighters worked a day shift (8:00 a.m. until 4:00 p.m.), an afternoon/evening shift (4:00 p.m. until midnight), or an overnight shift (midnight until 08:00 a.m.). Firefighters would spend two weeks on the day shift, two weeks on the afternoon/evening shift, and two weeks on the overnight shift. After this cycle of shift work, the process would be continually repeated.

Haddock et al. (2013) report that firefighters in the United States most commonly use one of several common shift schedules: 24-hours on/48-hours off, 24-hours on/72-hours off, 48-hours on/96-hours off, or a rotation of 10-hour day shift and 14-hour night shifts. This results in firefighters working approximately eight to twelve days per month.

The implementation of the 48-hours on/96-hours off schedule has been a growing trend, mostly in departments in the western United States (Poole, 2012). This schedule was implemented as a result of employees having to make significant commutes to work in the communities where they were employed. Many could not afford to live in the communities where they worked, as they were unable to afford homes in those locations (Poole, 2015).

A research study by Takeyama et al. (2005) identified another style of schedule being utilized in Japan. In this format, firefighters worked 24 hours on duty every other day, and after eight weeks they received 15 consecutive days off. As part of their 24-hour shift, they were

required to be awake for one of five night duty segments (22:00-00:00, 23:45-01:45, 01:30-03:30, 03:15-05:15, and 05:00 to 07:00).

Another shift scheduling alternative was the use of the 12-hour shift. This shift schedule was utilized by dispatch and law enforcement professionals (Higdon, 2011). A variant of this format included two 12-hour days, two 12-hour nights, and an eight-hour day every two weeks for payroll purposes (Higdon, 2011). This shift schedule had been growing in popularity in recent years in several professional fields, including nursing, law enforcement, dispatching, and paramedicine (Higdon, 2011).

Metcalfe (2003) suggested that allowing employees to partake in flexible work schedules may be of benefit. Research had shown that when a flexible work schedule was offered to employees, there was an overall increase in job satisfaction, morale, and productivity (Metcalfe, 2003). However, it must be understood that this was a difficult process and it involved a high degree of patience, commitment, and understanding (Metcalfe, 2003).

Rule (1997) suggested that fire departments can be more effective and productive by abandoning the 24-hour shift and changing to a 10-hour day/14-hour night shift arrangement. "This 10/14 schedule preserves all three shifts and the 56-hour work week. It can be scheduled on a 12-day, nine-day, or six-day cycle, depending on preference" (Rule, 1997, p. 46).

In some locations a nine-day scheduling rotation was used. In this arrangement, firefighters work a nine-day rotation that included three 24-hour shifts with 24 hours off after the first two shifts and 96 hours off after the third shift (Caputo et al., 2015). However, in the same study, no improvements were found in other health habits such as cigarette smoking, consumption of alcohol, and consumption of caffeinated beverages per day (Caputo et al., 2015).

Research question number three attempted to identify the most ideal shift schedule for the members of the Urbandale Fire Department. It was important to include employee involvement when considering schedule changes or assigning shift work (Brogmus and Maynard, 2006). Of the different scheduling options discussed in the results of research question number two, almost all had benefits and drawbacks. With that said, it must be understood that firefighting requires that response services be available at all hours of the day, some type of shift schedule must be utilized, and there is no single best system (Paley & Tepas, 1994).

The 8-hour rotating schedule resulted in less sleep, lower positive mood scores, higher negative mood scores, and higher sleepiness ratings when working the overnight shift (Paley & Tepas, 1994). It should be noted that most rotating schedules do not take circadian rhythm into account. Approximately two-thirds of these programs report sleep disorders and sleep deprivation twice as often as those that do consider circadian rhythm in their scheduling practices (Martin, 1995).

Anxiety levels in EMS providers who worked 12-hour shifts had been found to be similar to the levels found in providers who worked a 24-hour shift (Mock et al., 1999). The authors also found that a change from 24-hour to 12-hour shifts may have some benefits, but the schedule change alone did not appear to reduce anxiety levels in EMS providers to any considerable degree (Mock et al., 1999).

Higdon (2011) noted that there are health and safety problems associated with the 12-hour shift. Higher levels of stress, headaches, irritability, inability to concentrate, depression, and ischemic heart problems have all been tied to the 12-hour shift. Social problems can also be an issue with the 12-hour shift and the 24-hour shift. These shifts have been found to disrupt family activities, contribute to emotional exhaustion, and increase burnout (Widmar, 2003). The

24-hour schedule has been advertised as the most economical way to deliver fire and emergency medical services (Lorber, 2006).

Haddock et al. determined that firefighters that work a 48-hour shift, share a community sleeping area (not individual sleeping areas) and have second jobs outside of their fire department employment are more likely to suffer from excessive daytime sleepiness. A drawback of the 48/96 schedule is that employees must work both Saturday and Sunday every six weeks (Poole, 2015). The 48-hour on/96-hour off schedule allows for reduced commutes for employees (Poole, 2015). Another advantage of the 48/96 schedule is that employees wake up at home three out of every six days, while they wake up at home only three out of every nine days on the 24/48 schedule (Poole, 2015). Due to this increase in waking up at home and an increase amount of weekend time at home, many families perceive the firefighter to be more present at home (Poole, 2015). While working the 48/96, one department saw a reduction in injuries from 2004 to 2006. Additionally, sick time usage decreased by 5,031 hours in the same time frame (Poole, 2015). According to Poole (2015), some research has shown that workers assigned to the 48/96 schedules are actually less fatigued. This is attributed to the fact that employees slept more on average after being assigned to the 48/96 schedules.

The 48/96-hour schedule was also found to be beneficial in another recent study. Caputo et al. (2015) found that a group of 59 firefighters reported improved sleep patterns, improved feelings of burnout, and more time for personal schedules after moving to the 48/96 shifts.

The 10-hour day/14-hour rotating shift schedule has some benefits worth noting. This schedule allows for employees to work a 10-hour shift for a certain time period and then move to a 14-hour shift for the same time period. Rule (1997) noted that this type of schedule results in a reduction of sick time, overtime reduction, increases safety, more family contact, better project

management, increased productivity, and easier shift scheduling. Rule (1997) also noted some distinct disadvantages to this type of shift arrangement including problems associated with changing schedules and difficult employee commutes.

Based on the research conducted as part of this project and considering the results of the survey distributed to UFD employees, the most ideal shift arrangement for UFD appears to be the continued use of the 24/48 schedule. This schedule continues to provide adequate service delivery and was the most popular among those surveyed when compared to other shift schedule arrangements.

While the continuation of the 24/48 shift appears to be the most ideal shift arrangement for the Urbandale Fire Department, it must be understood that the 24-hour shifts presents significant threats to the health and well-being of employees. As an attempt to help address these issues and to reduce the associated risk to the extent possible, a draft training outline was produced as part of this research project for use in the training of current and future UFD employees. This outline can be found in Appendix B. In addition, a draft standard operating guideline addressing the use of the 24-hour shift was also authored. This can be found in Appendix C.

Discussion

The literature review that was performed as part of this research project revealed that working a 24-hour shift and performing job duties during the overnight hours can present significant risks to personnel. An analysis of the survey administered to Urbandale Fire Department personnel that currently work a 24-hour shift provided some interesting insight into how UFD employees currently perceive the impact of the 24/48 shift on their well-being. Of those that responded to the survey, 77% said that their daytime sleepiness is “somewhat more” or

"much more" than it was prior to working a 24-hour shift. These findings are consistent with those found in the literature review. Sleep deprivation associated with working a 24-hour shift can show itself in many ways and feeling the need to take a nap during the day is a likely a result of sleep deprivation (Widmar, 2003).

A study referenced in the literature review assessed the impact of shift schedules on anxiety levels in emergency medical service (EMS) providers (UFD employees are also EMS providers). It was noted in the study conducted by Mock et al. (1999) that while certain stressors certainly exist in the emergency response environment, working various shifts did not appear to have an impact on anxiety levels. Many UFD survey respondents (50%) reported that their anxiety levels remained unchanged. Approximately 35% of respondents did note an increase in anxiety levels since they began working 24-hour shifts. These findings were largely consistent with the literature review.

A large majority (85%) of survey respondents reported that they did not feel any more depressed after they began working a 24-hour shift compared to before they worked a 24-hour shift, while 15% stated that they felt somewhat more depressed or much more depressed. These findings are very similar to those discovered during a study conducted by Carey et al. (2011). In their study, 112 shift-working firefighters were assessed for depression and approximately 11% reported significant levels of depression.

Survey respondents were asked if they had experienced increases in becoming generally ill after being assigned to a 24-hour shift. Most respondents (65%) stated that they got sick just as much as they did before starting 24-hour shifts. However, 31% reported that they either got sick somewhat more often, or much more often, since beginning 24-hour shift work. These

results were also consistent with the finding of Haddock et al. (2013). They also noted that non-traditional shifts had been associated with higher risk of general illness.

Survey respondents were asked if they had experienced changes in their level of burnout after being assigned to a 24-hour shift. Several respondents (65%) stated that they had never felt burned out or had not noticed any changes in burnout since going to the 24/48 shift. However, 27% reported that they were more burned out since beginning 24-hour shift work. These results were consistent with numerous sources cited in the literature review. Burnout had been associated with shift work and could lead to early retirement (*The Impact of Fatigue on the Public Safety Workforce, n.d.).* Interestingly, eight percent of respondents reported a decrease in burnout since beginning the 24-hour shift. No sources reviewed as part of this project reported a decrease in feeling of burnout amongst shift workers after they began work on a non-traditional shift.

Survey respondents were asked if they had experienced significant weight gain after being assigned to a 24-hour shift. For the purpose of this question, "significant weight gain" was defined as gaining more than 10% of their body weight when they started 24-hour shifts. Of the 26 respondents, six (23%) stated that they had gained a significant amount of weight. Weight gain was found to be associated with shift work during the literature review. These survey results were consistent with those findings. Widmar (2003) noted that sleep deprivation associated with shift work resulted in both increased appetite and weight gain.

Survey respondents were asked, if they had the choice, which shift schedule they would like to work. Half of the respondents (50%) stated that they would like to continue to work the 24/48 shifts as they do now and six (23%) stated they would like to work 48/96 shifts. An unexpected result for the researcher was the discovery that three (12%) of employees would

prefer a rotation of eight-hour shifts. In addition, two other respondents specifically stated that they wanted to work the "California Swing" schedule, where a nine-day rotation of 24 hours on, 24 hours off, 24 hours on, 24 hours off, 24 hours on, and 96 hours off is used. These results indicated that while the current 24/48 schedules were not perfect, they are sufficient at this time. With that said, the organization (UFD) my benefit by further researching schedule alternatives and their impact on operations for future consideration. Specifically, suggestions from shift workers indicate that a 48/96 and "California Swing" may be acceptable alternatives to the current scheduling format if a schedule change is considered or discussed in the future.

It is difficult to determine a universal shift schedule that best fits all fire departments. All departments are different in their service delivery models and they all work in a dynamic environment. Call volumes and service demands vary greatly between some departments (sometimes within different stations of the same department). In addition, staffing levels between departments are different and also impact the decision on how to best assign shift schedules (Haddock et al., 2013). This research did not identify any major or specific concerns related specifically to the 24/48 shifts. Rather, it appeared to have validated that at least half of UFD personnel were content working this schedule. What was identified was that several employees reported that they were suffering from many of the symptoms commonly associated with shift work in general. It was likely that if a shift schedule change were to occur, many of the same symptoms would remain. It does not matter which schedule is chosen, alertness and performance suffer when personnel work during times when the body wants to sleep (Widmar, 2003).

Survey respondents were asked about the quality of sleep they get while working a 24-hour shift. The majority of respondents (92%) stated their quality of sleep was somewhat worse

or much worse than sleep they experienced when not on duty. During the literature review, it was discovered that previous recommendations had been made calling for studies of the environmental conditions in firefighter sleeping rooms (Merrick, 2012). The findings found of the UFD survey strongly indicated that UFD firefighters may benefit from such a study as they reported poor sleep quality while at work. Implications of the survey results for this question suggested that a very high degree of attention should be placed on the quality of sleep UFD personnel were getting while at work and how that sleep experience may be improved. Bedding, environmental conditions (temperature control, humidity control, darkness levels), alerting systems and procedures, and other factors should be critically assessed.

Recommendations

This research led to several recommendations the Urbandale Fire Department can consider. First, consideration should be given to the importance of fatigue management for shift workers. It is important to understand that individual employees experience shift work and the associated impacts of sleep deprivation in different ways. The culture of UFD should not discount or belittle work-related fatigue symptoms. One such way to address this issue would be rotating workers from busier units to those that tend to respond to fewer calls.

Second, a training program for all current employees should be conducted and the establishment of a standard operating guideline that addresses the hazards associated with fatigue and shift work should be considered. A draft training outline and draft standard operating guideline are included in Appendices B and C of this research paper and could be used as a starting point for these topics.

Third, based on the input from the survey and that no shift schedule was found during the literature review to be superior to any others, the Urbandale Fire Department should continue to

use the 24/48 schedule. This research project did not produce any results that would indicate the need to change shift schedule arrangements.

Fourth, the Urbandale Fire Department should strongly consider the results of the survey when considering new ways to address employee fatigue and sleep deprivation. Specifically, survey results indicated that daytime sleepiness, workplace burnout, employee health and wellness (as indicated by weight gain), and the quality of sleep obtained while at work were significant issues. UFD should further investigate the reason that employees reported such poor scores when asked about the quality of sleep obtained at work. This project did not examine the specific reasons for the survey responses. Until those specific reasons are identified, it will be difficult to address sleeping arrangements effectively.

Finally, other researchers should consider the fact that there wass generally little research on the topic of fatigue and its impact on firefighters in the United States. This fact was discovered during the literature review. Any further research in this area would be of benefit and could further our understanding of this topic. In addition, other researchers should explore the reasons that employees were feeling tired at work. This research study only focused on the activities and calls for service that the employee experienced while they were on duty. This project did not examine other influences on employees and their level of sleepiness. This project assumed that all employees reported to work well rested and well nourished. In reality, this may not be the case. More research is warranted in this area.

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Appendix A – Survey Questions and Materials

Members of the Urbandale Fire Department:

As part of my fourth year Executive Fire Officer Class at the National Fire Academy, I am conducting a research project on the impact of broken sleep patterns that result from working 24/48 shifts. The purpose of this research is to identify different schedules (or verify the appropriateness of our current schedule) that may better serve the health and well-being of our employees as we attempt to mitigate the impacts of having to provide 24-hour service capability.

Below is a link to a short, 10-question survey regarding your experiences while working a 24/48 shift. Please complete the survey by 0800 on Thursday, September 27, 2018.

Please not that all survey responses are confidential and the identity of survey respondents will not be revealed at any time.

Here is a link to the survey:

https://www.surveymonkey.com/r/6D878B3

Thank you very much for your assistance with this research project! If you have any questions or concerns, you may contact me at lroutson@urbandale.org.

Sincerely,
Lance Routson
Lieutenant

EFO Year 4 Fatigue/Shift Work Survey

1. Generally speaking, since I began working a 24-hour shift, my daytime sleepiness is
    a) much more than it was prior to working 24-hour shifts
    b) somewhat more than it was prior to working 24-hour shifts
    c) about the same as it was prior to working 24-hour shifts
    d) somewhat less than it was prior to working 24-hour shifts
    e) much less than it was prior to working 24-hour shifts

2. Generally speaking, since I began working a 24-hour shift, my daily anxiety levels are
    a) much more than they were prior to working 24-hour shifts
    b) somewhat more than they were prior to working 24-hour shifts
    c) about the same as they were prior to working 24-hour shifts
    d) somewhat less than they were prior to working 24-hour shifts
    e) much less than they were prior to working 24-hour shifts

3. Since I began working a 24-hour shift, I generally feel
    a) much more depressed than I did before working 24-hour shifts
    b) somewhat more depressed than I did before working 24-hour shifts
    c) not any more or less depressed
    d) somewhat less depressed than I did before working 24-hour shifts
    e) much less depressed than I did before working 24-hour shifts

4. Since I began working a 24-hour shift, I get sick (cold, flu, general illness)
    a) much more often than I did before working 24-hour shifts
    b) somewhat more often than I did before working 24-hour shifts
    c) the same amount I did before I began working 24-hour shifts
    d) somewhat less often than I did before working 24-hour shifts
    e) much less often than I did before working 24-hour shifts

5) Since I began working 24-hour shifts, my level of burnout
    a) is higher than it was prior to working 24-hour shifts
    b) the same as it was prior to working 24-hour shifts
    c) is lower than it was prior to working 24-hour shifts
    d) I've never felt burned out in my career
    e) I felt burned out before I worked 24-hour shifts, but now I don't feel burned out at all.

6) I have gained considerable weight since I began working a 24-hour shift (more than 10% of my weight when I started working 24-hour shifts).
    a) true
    b) false

7) If it were up to me, I would prefer to work
    a) 24 hours on/48 hours off, just like we do right now
    b) 48 hours on/96 hours off
    c) a rotation of 10-hour day shifts and 14-hour night shifts
    d) a rotation of 8-hour shifts (for example, 7a-3p, 3p-11p, 11p-7a)
    e) other (please specify)

8) While working a 24-hour shift, the quality of sleep I get is
    a) much worse than the quality of sleep I get when off duty
    b) somewhat worse than the quality of sleep I get when off duty
    c) about the same as the quality of sleep I get when off duty
    d) somewhat better than the quality of sleep I get when off duty
    e) much better than the quality of sleep I get when off duty

9) The best part of working a 24/48-hour shift is

10) The worst part of working a 24/48 shift is

Appendix B – Training Program Outline

Fatigue and Shift Work Education Program

I. Importance of adequate sleep
   a. essential biological need (6-8 hours per night)
   b. governed by the Circadian rhythm
   c. Four stages of sleep
   d. Complications of being awoken in different stages of sleep

II. Sleep deprivation and its impacts
   a. sleep deprivation defined
   b. the impact of night work and shift work on natural sleep cycles
   c. indications you may be sleep deprived
      i. need for an alarm clock
      ii. irritability, drowsiness
      iii. need for naps
      iv. falling asleep in warm rooms and within five minutes of going to bed
      v. trouble concentrating and remembering
      vi. case studies (Exxon Valdez, Challenger, freight-train collision)
      vii. diabetes, depression, gastrointestinal dysfunction, drug and alcohol use
      viii. increased risk for heart attack, ulcers, and sleep disorders
      ix. increased risk for workplace injury during shift work

III. Risk Mitigation and Coping Strategies
   a. do not eat, read, or watch TV in bed
   b. eliminate nicotine and tobacco use
   c. reduce caffeine intake
   d. eat a healthy, nutritious diet
   e. avoid alcohol
   f. reduce the use of sleeping pills as much as possible
   g. reduce life stress as much as possible
   h. practice relaxation techniques

Source: Widmar, R. (2003, June). Sleep to survive: How to manage sleep deprivation. *Fire Engineering, 156*(6), 45-54.

Appendix C – Standard Operating Guideline

Purpose: The purpose of this SOG is to establish the procedures for providing 24-hour shift coverage for the Urbandale Fire Department. The nature of fire and emergency service delivery requires that units be able to respond at any hour, on any day. The requirements for 24-hour shift work can have cumulative health impacts on employees. This SOG also provides guidance to help manage chronic fatigue and threats to employee health that are inherent to working 24-hour shifts.

Scope: This SOG applies to all Urbandale Fire Department line personnel that are assigned to 24-hour shift work. Personnel shall use this SOG as the basis for staffing Urbandale Fire Department stations and front-line units. The scheduling procedures outlined in this SOG do not apply to senior officers and personnel not assigned to line positions.

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Scope and Purpose	New
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Procedures

1) The Urbandale Fire Department shall utilize a schedule that allows for 24-hour coverage of all fire stations. This allows for fire and emergency response at all hours of the day, on weekends, and on holidays.

2) The shift format that shall be utilized is the 24-hours on, 48-hours off schedule (24/48). In this format, shifts will begin at 0700 and will conclude at 0700 the following day. Employees are then off duty for 48 hours and shall report for duty at the completion of the 48 hours.

3) This shift arrangement is being utilized to ensure emergency response capabilities at all hours and is an attempt to meet the service delivery expectations of the public while considering the well-being of employees and the responsibility assumed by the City.

4) Employees are at risk for fatigue and other related health issues when working a schedule of this nature. While impossible to eliminate all risks, the Urbandale Fire Department will minimize risks to the extent possible. Employees are required to inform their supervisor if they feel fatigued and/or unfit for duty. Supervisors may move personnel to less busy units or allow for sleep periods. With this said, employees are expected to report for duty rested and well-nourished and should not plan on routine sleep periods while at work that are outside of normal sleeping hours.

5) As part of employee orientation, employees shall complete the “Fatigue and Shift Work Education Program” training course. This training course is an effort to educate employees on the challenges of working a 24/48 schedule and to introduce fatigue and risk mitigation measures.