Fatigue on the fireground: The DPI Experience

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Abstract

In the summer of 2006/07, almost 800 employees of the Department of Primary Industries Victoria (DPI) were heavily involved in Victoria's wildfire fighting efforts. These operations required prolonged rotations and lengthy shifts as the intensity and scale of the fires was unprecedented in Victoria. DPI's corporate risk management strategy recognised the difficulties in both maintaining effective deployments of staff whilst ensuring their occupational health and safety (OHS). One of the key issues identified was the impact of fatigue on fire fighters and its management so that OHS was not compromised and the fire fighting effort was maximised. DPI undertook a quality assurance review for all aspects of OHS during the fire campaign. The reviews consisted of structured interviews, observations and debriefs. These were conducted by a team of medical practitioners, organisational psychologists, OHS and fire fighting experts. Two-way ANOVA showed that those staff who were deployed as general fire fighters or to night shift roles worked significantly longer shifts than did day shift or fire ground support workers. Significant challenges to fatigue management that were identified included: lack of adequate sleep for staff working night shift; travel time between the fire line and the staging area due to remote fire-fighting operations; driving following long shifts, the heavy demand placed on those performing specialised roles (e.g. mapping and rural recovery), dislocation from "normal life" and accommodation. The review identified challenges in how staffing rosters are applied and areas where opportunities for improvement exist. This paper provides practical solutions for the management of fatigue based on data obtained during the review. A discussion on the need to create a paradigm shift in order to meet OHS legislative obligations is provided.

Key Words
Fatigue Management; Occupational Health and Safety; Corporate Risk Management; Wildfire

Introduction

The 2006/2007 fire season started in November 2006, among the earliest starts to a fire season in recorded Australian history. Arguably Victorian fire agencies faced the biggest crisis in their history of fire fighting due to the size and number of fires throughout Victoria burning under unprecedented drought and weather conditions. Due to the dynamic nature of fire ground conditions each day presented challenges different to the previous day. The State's Premier at that time, Steve Bracks, described the situation as the worst fire season on record. Almost 800 Department of Primary Industries (DPI) staff contributed to the fire campaign. It was in this context that the DPI corporate risk management strategy recognised the difficulties in both maintaining effective deployments of staff whilst ensuring their occupational health and safety (OHS) and undertook a quality assurance review for all aspects of OHS during the fire campaign.

Challenges of fatigue will vary depending on the fireground role which staff fulfil. Although general fire fighters (GFF) are rostered onto 12 hour shifts (day: 7am-7pm; night: 7pm-7am) it is typical for them to work longer hours than this due to the logistics of fire fighting.

Staff working in the Staging Area (staging) prepare materials for the briefing of crews, organise equipment and cater to fire fighters coming off the fire line. They typically work long hours and are often required to extend their shift until all fire fighters have reported back from the fire line.

Staff working in the Incident Management Team (IMT) may also work long hours, particularly at the beginning of a fire. Staff in the IMT are responsible for decision-making and organising operations, logistics and planning for the overall fire fight. They typically work a 12 hour day or night shift.

It is DPI policy to deploy Rural Recovery (RR) staff within 24 - 48 hours of a fire passing through private landholdings. RR has a number of phases (an immediate response phase and an agricultural recovery phase). In the immediate response phase the priority is for animal welfare officers to assess the welfare of livestock on private land, put down and bury animals if necessary, check for outbreaks of disease and prioritise the relief effort (e.g. feeding of livestock). Other RR staff are involved in gathering data and assessing damage (e.g. to properties and fences) and monitoring environmental issues that may result from the fire (e.g. salinity, etc.) All RR field staff work only day shift.

Arguably, fatigue has not traditionally been well managed by emergency service organisations (ESOs). Effective fatigue management requires challenging the 'can do' attitude that has been traditional among ESOs. Whilst the 'can do' attitude may help ESOs in promoting a culture of getting in and getting the job done, often it is at the expense of basic safety management principles. Fighting wildfires places physical stressors on personnel in different ways. The role of a general firefighter is often physically demanding, whereas the role of personnel in support in IMT's are more prone to demands on cognitive functioning, particularly in specialist roles such as mapping. During campaign fires it is typical for personnel to work for extended periods of time often in hot, smoky, noisy, chaotic and stressful environments.

There has been abundant research into the affects of fatigue on work performance [for example, see Australian Safety and Compensation Council (2006) Work Related Fatigue: Summary of Recent Indicative Research for a review]. It may be concluded that the effects of fatigue on cognitive functioning, reaction times, vigilance and driving ability exceed that of the impairment of alcohol intoxication. The Centre for Sleep Research (University of South Australia) has found that driving performance after 17 hours of work is the equivalent of driving while at .05% blood alcohol content and driving after 24 hours of work is the equivalent of driving at .10% blood alcohol content. Most alarmingly, self assessments of personal fatigue have proven to be insensitive and unreliable (that is, people's performance and ability to recover are much more compromised by fatigue than individuals estimate).

Fatigue as a result of long work hours will be exacerbated by such factors as total amount of sleep, hydration and nutrition. The DPI Emergency Management Taskforce commissioned a quality assurance review with the aim to identify fatigue related factors that may impact upon DPI staff deployed during the current fire season in support of the Department of Sustainability and Environment (DSE).

Method

A total of 66 DPI staff (39 males and 27 females) were interviewed. Forty were interviewed face-to-face at DPI regional offices and 26 were interviewed by telephone.

A combination of quantitative and qualitative data was gathered. All participants were asked to supply details of:

- their DPI role, division and regional location
- the number of fireground tours they had completed in the current fire season
- the length of tours
- where these tours had been located and how much travel had been involved
- average and longest shift lengths and total hours/days worked
- nature and quality of accommodation and food
- number of days off on return from tour

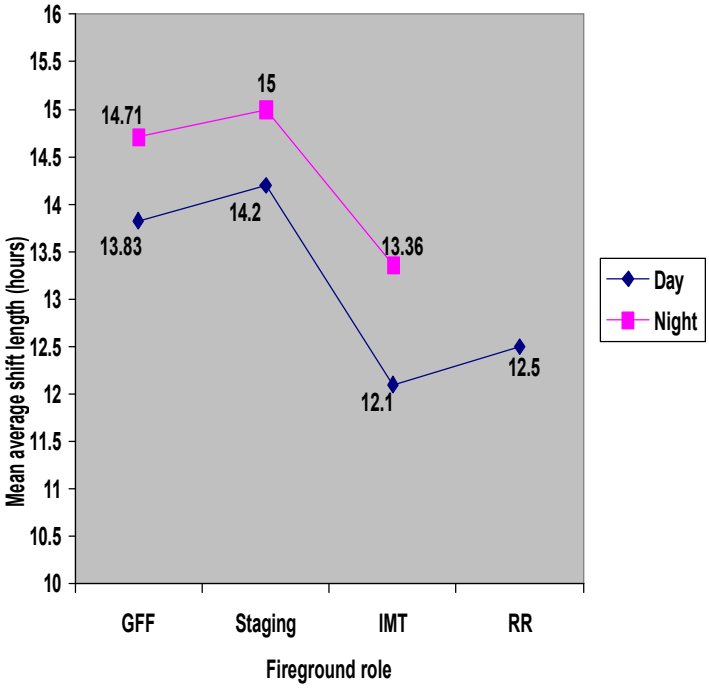
Participants were also asked to respond to a number of open-ended questions in order to identify any problems they may have experienced with fatigue during or after their tour. Interviews were tape recorded with the permission of the participants. All participants were assured that their responses would remain anonymous and confidential.

Participants represented a range of regional offices across the State and a range of DPI divisions. Data-gathering occurred over a four week period from January-February, 2007.

Results

Two-way Analysis of Variance is a statistical procedure for determining whether means of a number of groups differ significantly. Means of the average shift length in hours were calculated separately for day and night shift workers according to their fire ground role. Results are shown in Figure 1 below.

Figure 1: Mean average shift length by Role and Shift type



Two-Way Analysis of Variance results [with mean average shift length (hours) as the dependent variable] showed a significant main effect for role [$F(3,65) = 4.7$, $p = .005$]. Those staff who worked as general fire fighters or in the staging area worked significantly longer hours on average than those staff who worked in the IMT or RR. No RR staff worked night shift. There were no significant differences between night shift and day shift in average shift length.

Interview data identified significant challenges with fatigue. The key findings were:

1. Those staff who worked as night shift fire fighters reported the greatest problems with fatigue and those staff who worked night shift in IMT also reported significant issues with fatigue.

2. Fatigue was significantly affected by the type of accommodation provided to night shift staff. Participants who had worked day shift generally had a positive evaluation of the quality of accommodation provided. Participants who had worked night shift uniformly had a negative evaluation of accommodation provided. All mentioned the difficulty of trying to sleep during the day in conditions that were hot, too light and noisy. Most said that they had experienced poor quality of sleep and had averaged only 3-4 hours of sleep per rest period. Those night shift staff who had been accommodated in single, air-conditioned, darkened motel rooms reported being able to obtain 5-6 hours of sleep on average per shift.

3. It is common practice for DPI staff to be deployed in the early morning to night shift duties and then travel to the fire and commence a 12 hour night-shift that same night, resulting in them going without sleep for 24 + hours.

4. A number of fire fighters had worked in circumstances where they had a 2-3 hour drive between the fire line and the staging area (often after having worked 16+ hour or night shifts) due to only one road providing safe passage to a remote location. Driving while fatigued is arguably the greatest risk factor to which DPI staff are exposed on the fire ground. Those staff who had

worked as night shift fire fighters particularly commented on the dangerousness of driving from the fire line to the staging area after their night shift.

5. Heavy demands are placed on Mapping staff and RR staff due to the time critical nature of their work and a lack of sufficient staff qualified to perform these specialist roles.

6. In general Managers identified the management of fatigue of staff deployed to the fire fight as a significant challenge and believed that the DPI needs to engage in greater risk planning and prioritisation of project outcomes throughout inter in anticipation of the demands of emergency response during Summer (including drought, locusts and fire).

Discussion and implications

It is clear that fatigue associated with fire fighting activities continues to present challenges, both on the fire ground and upon return of DPI staff to normal duties. The results suggest that there are ongoing difficulties with: length of shifts; organisation of appropriate accommodation; the quality and length of rest for those working night shift; and driving while fatigued.

It is commonly assumed that DPI staff work only 12 hour rotating rosters during deployment to fires. In practice this rarely happens and it is typical for many staff (particularly those deployed to general fire fighting duties and those on night shift) to work significantly longer shift lengths (16-18 hours). It would appear that the requirements of the Fatigue Management (Fire and Emergency) Safe Work Practice (DSE-SWP-001) limiting shift lengths to 16 hours maximum (following the first day) have not been routinely enforced.

Rather than focus on the shift lengths that staff work, account needs to be taken of the "sleep debt" which staff accumulate over the course of their tours. Sleep debt is defined as the hours of sleep a person needs against the hours of sleep a person actually gets. Sleep debt involves a tendency to fall asleep the following day and can result in "microsleeps" (brief unintended loss of attention, particularly while performing routine tasks such as driving). Night shifts, in particular, result in disruption to the normal sleep/wake cycle and circadian rhythms.

Following the review the DPI committed to instituting a number of measures to improve the management of fatigue on the fire ground. These include:

1. Where practicable, DPI staff are to be encouraged to travel to the fire ground and accommodate themselves the day before taking up night shift duties.

2. Programs to increase Managers' awareness of the conditions under which staff deployed to general fire fighting duties may operate, particularly those deployed to night shift. An awareness has been promoted that staff are unlikely to return to peak performance for 4-5 days following their return from deployment to the fire ground. As far as possible, normal work demands should be structured to accommodate staff fatigue, e.g. by performing lighter duties, delegating or getting assistance with more demanding work tasks, taking naps if necessary, avoiding long drives and ensuring that staff get adequate sleep, hydration and nutrition.

3. Where practicable, staff rostered onto night-shift be given priority for accommodation in air conditioned, dark and quiet locations.

4. Further investigation of means by which driving by staff while fatigued may be reduced or avoided.

5. The institution of a mentoring system for staff deployed to the fireground, particularly for staff who are 'novices' in fire emergencies.

6. The introduction of an accreditation and training system for specialist staff such as mappers in order to increase the pool of staff able to perform this function.

7. Investigation of the training needs and number of staff assigned to RR roles in order to identify means of alleviating the heavy demands placed upon these staff.

8. The supply of RR field officers with technology that will permit them to enter data into systems while in the field (or, at least, record data that may be downloaded later). This will significantly reduce demands placed upon RR IMT staff and would probably also enhance accuracy of data collection.

The greatest challenge to the management of fatigue on the fire ground comes from the 12 hour shift system traditionally used to deploy fire fighters which, due to the logistics and demands of fire fighting, often extends to a 14-18 hour shift in practice. It has been suggested that fatigue could be better managed on the fire ground if a system of overlapping 9 hour shifts were adopted (e.g. 7am-4pm, 3pm-12pm, 11pm-8am). DPI believes that further research should be undertaken on this issue as it is understood that there is resistance to changes to the existing 12 hour shift system on the grounds that alternatives are likely to be unworkable in practice. DPI is currently not aware of any evidence that fire agencies have adopted an alternative shift system nor tested whether such a system would work.

DPI will continue to participate in fire emergencies as a member of the Networked Emergency Organisations (NEO) in Victoria. It will also continue to actively promote and monitor the health and safety of its staff. In doing so, it will continue its research into the prevention and safe management of fatigue during the upcoming fire season.