



**Shift Hours in the Australian Ambulance
Industry: An Issues Paper on Workforce Health
and Safety, Patient, and Public Safety**

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The Council of Ambulance Authorities Inc

The Council of Ambulance Authorities Inc. (CAA) formerly incorporated in December 2002 having operated as an informal grouping of the ambulance services of Australia, New Zealand, and Papua New Guinea since 1962. The CAA is the peak body representing the principle statutory and other providers of ambulance services in Australia, New Zealand and Papua New Guinea.

The Board of the CAA commissioned its Strategic and Business Advisory Committee to develop a reference paper to provide jurisdictions with an overview of available sources of evidence and current practice on work hours.

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Executive Summary

This compendium draws together a number of issues, findings and policy positions from the following sources:

- Research evidence from Australia and overseas related to:
 - fatigue;
 - sleep deprivation;
 - shift work;
 - circadian rhythm; and
 - relationships between increases of fatigue and decline in cognitive functioning, impaired performance, increase of error and reduced safety.
- The policy position from the ACTU on Health and Safety Guidelines for Shift Work and Extended Working Hours.
- Papers published by the Australian Council for Safety and Quality in Health Care, which focus on minimising the likelihood and effects of errors in patient care, particularly:
 - The Literature Review Report on Safe Staffing and Patient Safety published in January 2003 which identified 230 papers from both health (152 papers) and non-health literature (78 papers) which have implications for staff physical and mental health, hours of work, shift work, numbers of staff and fatigue; and
 - The Safe Staffing Consultation Report published in March 2005.
- Papers from the AMA on the issue of its Safe Hours Project including:
 - The AMA's National Code of Practice: Hours of Work, Shiftwork and Rostering for Hospital Doctors (1999); and
 - Safe Hours Audit (2006).
- Workplace Health and Safety papers issued on shiftwork in various Australian jurisdictions including:
 - Queensland Workplace Health and Safety Fatigue Management Guide (November 1997);
 - Australian Safety and Compensation Council, Work-related Fatigue: Summary of Recent Indicative Research and Summary of Recent Regulatory Developments (2006);
 - Shiftwork: How to Devise an Effective Roster, Work Cover NSW; and
 - Work Safe Western Australia Commission paper on Reducing the Risk of Fatigue at Workplaces.

- Papers commissioned by the Queensland Ambulance Service prepared by the Queensland University of Technology, School of Human Movement Studies covering a number of issues including work practices, work demands, fatigue and impacts on cognitive effects affected by fatigue and the importance of circadian rhythm in designing and reviewing roster systems and fatigue risk management programs.
- Legislative responsibilities of employers in Australia to protect the health and safety of their employees.
- Duty of care responsibilities of employers to have safe systems of work for employees and safe systems to ensure patient safety.
- Papers dealing with fatigue in the transport industry in Australia including:
- Beyond the Midnight Oil: An Inquiry into Managing Fatigue in Transport.

The ambulance industry has a need for shiftwork for its staff to address public safety obligations and public demands for access to emergency services to deal with medical emergencies in a timely manner regardless of the hour of the day when emergencies arise.

As the ACTU and Workplace Standards Authorities at state level indicate, employers owe a duty of care to employees which includes that health and safety effects are always considered in planning rostering and working arrangements.

The information contained in the research papers (referred to in the attached literature reviews) and reports clearly demonstrates that there are patient care, staff safety and public safety issues related to the long shifts common within the ambulance industry.

The role of ambulance personnel involves several components which include:

- Travelling to and from life threatening incidents, often at high speed to ensure a rapid response, to reduce health risks to patients, and help protect life for those in need of pre-hospital care. Generally ambulance personnel have special approval to exceed vehicle speed limits and go beyond normal road rules applicable to other motorists in the public interest.
- Providing a range of patient care skills (patient assessment, advanced life support techniques and administration of medications) in time critical environments where cognitive functioning of ambulance personnel should not be impaired by fatigue in the interests of safe patient care.

The emergency operations driving/travelling component within the ambulance industry, involving authorised speed above levels applicable for the general driver population, raises issues for:

- the safety of the ambulance officer carrying out the driving duties;
- the safety of the second officer on the ambulance crew;
- the safety of the patient travelling in the vehicle; and
- the safety of other road users and pedestrians during the periods when the ambulance crew is travelling to and from an incident, particularly while on emergency driving conditions.

This compendium of papers provides a summary of the published evidence related to such issues as fatigue and its effects on cognitive functioning of staff which in combination have significant implications for safety of staff and safe patient care.

Introduction

This issues paper provides information on the possible effects of fatigue on the ambulance industry according to research evidence and through analysis of literature from health and other similar industries. This paper will give the ambulance industry a reference document for individual ambulance jurisdictions that plan to review their rosters and shift practices, and also provides a starting point for possible further work by the Council of Ambulance Authorities (CAA) at a national level.

The first section of the paper will outline the possible causes and consequences of fatigue and the symptoms of fatigue. It will describe the circadian rhythm and the part it plays in fatigue as well as defining sleep debt and its role in fatigue. The paper describes the physical and mental repercussions of fatigue and how this relates to safe work practices. The paper then goes on to discuss the long and short-term possible effects of fatigue on health and wellbeing and what this means in relation to work force planning for the ambulance industry.

The paper will discuss both employers and employees responsibilities when it comes to fatigue and how it is important for them to work together in order to overcome this issue as well as outlining possible fatigue management strategies and how they relate to the ambulance industry.

The next section of the paper outlines the research evidence on fatigue from Australia and overseas and what this means for the ambulance industry. Evidence from the literature is used to demonstrate the possible impact of fatigue on cognitive abilities for ambulance personnel and how this in turn relates to safety.

The next section of the paper reviews and outlines findings and recommendations from a variety of sources. The ACTU Health and Safety Guidelines (2000) examined shift length, rosters and fatigue. The recommendations from the ACTU Health and Safety Guidelines (2000) outline possible ways to assess the risk of fatigue and control measures.

The Australian Council for Safety and Quality in Health Care (2000) literature review and safe staffing consultation report outlines research and stakeholders opinions and observations on the issue of fatigue and its implications for the health industry. The consultation report outlines the Councils intended actions to address the issue of fatigue and workplace safety.

The Australian Medical Association (AMA) National Code of Practice and the Safe Hours Audit are summarised and reviewed. The AMA's national code of practice recommends various measures in relation to hours of work, shift work and rostering for Hospital doctors. By using a risk assessment model to assess data collected through a survey the safe hours audit demonstrates that a majority of hospital doctors currently use unsafe work practices.

Workplace health and safety papers from various jurisdictions and industries show how broadly the issue of fatigue is recognised. The fatigue management guide from the Queensland Department of Industrial Relations outlines the roles and responsibilities of employers and employees in the workplace in regards to health and safety. Papers from the Australian Safety and Compensation Council provide an overview of recent indicative research and recent regulatory developments.

Queensland Ambulance Service review of work practices, workload, and health profiles are analysed and reviewed. The Parker et al. (2003) study explores findings from a questionnaire as well as analysing workload through unit hour utilisation for different areas in Queensland. Results from this study provide the ambulance industry with an overview of the impact of fatigue on ambulance personnel and possible solutions to this issue.

The paper then goes on to outline the legislative responsibilities of employers in Australia to protect the health and safety of their employees and the duty of care responsibilities of employers to have safe systems of work for employees and safe systems to ensure patient safety.

The next section 'Fatigue in the transport industry' outlines papers and evidence designed for the transport industry and summarises the possible relationship between fatigue in the transport industry and fatigue in ambulance services. Beyond the midnight oil: An inquiry into managing fatigue in transport is a document produced for the minister for transport and regional services in order to report on fatigue in the transport industry.

An article from the Journal of Emergency Medical Services demonstrates how lengthened shifts have resulted in serious incidents and also the impact on patient care. An article on Victorian police and 12 hour shifts is summarised. The Australian Industrial Relations Commission comments on 12-hour shifts and the risk of fatigue in the police work force.

In conclusion, the above research, policy papers, and findings are summarised. The recommendations from the compendium are outlined as well as suggestions for fatigue management. The paper discusses the possible implications of fatigue on the health and safety of ambulance personnel and what this could mean for the future of ambulance services in relation to demand, workforce planning, and public expectations.

The Aetiology of Fatigue

The definition of fatigue is highly debated and is often defined through causes and not consequences. Fatigue is a very general term used to describe a feeling of tiredness and exhaustion accompanied by poor judgement, slowing of reaction times, and decreased ability in everyday tasks (Commission for occupational safety and health, 2004). Fatigue is a result of inadequate rest that results in impaired physical and mental abilities (Parliament, 2000).

Dawson, McCulloch, & Baker (2001), describes fatigue as, 'a mental state that results from insufficient recuperative sleep' (p. 15). Factors that contribute to fatigue include: the time of day a person works, the length of time worked in direct work related activities, and the quality and amount of sleep acquired surrounding work hours.

Industry related factors such as insufficient staff numbers, poor rostering, poor work scheduling, work related stress and environmental factors can also contribute to fatigue. Pay methods such as increased rate of pay for overtime, or meal payments can also contribute to an increased risk of fatigue. Individual variables such as age, fitness level, and medical conditions can contribute to fatigue.

Acute fatigue is short term fatigue experienced as a direct consequence of excessive physical or mental activity. Chronic fatigue is a gradual build up of tiredness which can result in decreased alertness over a longer term and is related directly to the physiological need for sleep. **A person's perceived fatigue and actual fatigue is not always aligned. Fatigue can be perceived physiologically, the physical need for sleep and perceived subjectively, how tired a person feels.**

- Early warning signs of fatigue include the following:
 - drowsiness;
 - blurred vision;
 - difficulty keeping eyes open;
 - head nodding;
 - excessive yawning; and
 - repeatedly drifting out of lane when driving.
- Indicators of fatigue include:
 - feeling unrefreshed even after sleep;
 - a tendency to fall asleep while at work;
 - frequent naps during days off; and
 - increased errors and loss of concentration while at work.

Circadian rhythms

Circadian rhythms program the body to be at differing levels of wakefulness depending on the hour of the day. A main impact of working night shifts is that it interrupts the circadian rhythm that regulates the body. The circadian rhythm programmes the human body for periods of wakefulness and sleep, high and low digestion, depending on what time of the day it is (ACTU, 2000).

Working night shifts interrupts the circadian rhythm and this interruption can lead to a variety of consequences. When evaluating fatigue and shift work, it is important that these influences are noted. The ability to concentrate and perform tasks is at its lowest between 2am and 6am due to the low body temperature of a person (ACTU, 2000). For night shift workers the risk of fatigue will be greatest during the early morning hours due to this natural body cycle, which can cause drowsiness.

- Circadian rhythms are the internal body clock that regulates every 24 hours (Queensland Department of Industrial Relations, 2005). These rhythms affect:
 - body temperature;
 - digestion;
 - hormone levels;
 - mental alertness
 - sleeping patterns; and
 - other human functions.
- The following body functions show more activity during the day and a decrease in activity during the night and include the following:
 - body temperature;
 - heart rate and blood pressure;
 - respiration rate; and
 - adrenalin production.

Shift work can disrupt the circadian rhythm which in turn influences performance at work because of a decrease in the quality and quantity of sleep gained while working night shifts (Queensland department of industrial relations, 2005).

Sleep debt

Sleep debt is when a person does not sleep the required number of hours in order for the body to recover mentally and physically from the activities of the previous day or night. To calculate an individual's sleep debt, you calculate the difference between the required amounts of sleep to restore functions compared with the actual amount of sleep gained. A person requires approximately eight hours of sleep per night.

Sleep is the only effective way to combat fatigue as it is the brain's natural way of recovering. In order for the brain to recover, humans need to experience the two stages of sleep, which are rapid eye movement (REM), and non-rapid eye movement (NREM). The sleep cycle consists of approximately 80 minutes of NREM sleep followed by 10 minutes of REM sleep repeated three to six times per night. In order for the brain to recover, several sleep cycles are required.

The effects of fatigue

Fatigue affects work performance by reducing performance and productivity and increasing the risk of incidents that occur (Queensland Department of Industrial Relations, 2005). **Fatigue affects judgement and ability to think clearly, and the ability to self-monitor levels of fatigue. This means that people suffering from fatigue cannot adequately judge their own decrease in performance, which may result in unsafe practices.**

- The most noticeable effects of fatigue are:
 - desire to sleep;
 - lack of concentration;
 - irritability;
 - poor judgement;
 - reduced hand-eye coordination;
 - impaired memory in relation to timing and events;
 - reduced visual perception;
 - reduced alertness;
 - slowing of reaction times; and
 - increase in risk taking behaviour.

In relation to the workplace, fatigue may cause health and safety risks to the employee themselves and others around them. Tasks most likely affected by fatigue where the consequence of an error will be serious are:

- operating machinery and driving vehicles; and
- performing critical tasks that require high levels of concentration.

Micro sleeps

Micro sleeps are a potential risk factor for ambulance personnel driving long distances. A micro sleep is a very brief sleep that lasts approximately 4-5 seconds. When a person does not gain the required amount of sleep for the brain to recover, the human brain may automatically shift into a temporary sleep mode to try to gain the required sleep. A person experiencing a micro sleep may not be aware of its occurrence and can occur with a person's eyes still open (RTA, 2006).

Micro sleeps occur due to fatigue and a person who experiences them is not usually aware of this occurrence causing a concern for safety. Micro sleeps can occur when a person is standing, operating machinery or driving. Micro sleeps are more likely to occur at certain times of the day when the body is programmed to sleep through the circadian rhythm. The occurrence of micro sleeps increase with amounts of sleep debt (RTA, 2006).

Effects of fatigue on health

As well as being a risk factor to employees at work, fatigue has various repercussions on a person's health in the short term and in the long term. Lack of sleep and disruption to the circadian rhythm has been linked to the following:

- **heart disease**
 - coronary heart disease (blocked arteries in the heart)
 - ischemic heart disease (blocked arteries leading to lack of oxygen to the heart muscle)
 - myocardial infarction (heart attack)
- **high blood pressure**
- **stomach ulcers and gastrointestinal disorders**
 - bowel habit changes
 - digestive complaints
- **depression**
- **women's reproductive health**
 - lowered fertility
 - increased risk of miscarriage
 - low birth weight
 - higher risk of premature birth

Research Evidence

This section of the report aims to explore research evidence from Australia and overseas on fatigue and outline the possible implications for the work place. Questions that relate to the ambulance industry include:

- what period of time can paramedics be expected to work before fatigue creates an unacceptable level of risk; and
- what amount of resting period between shifts is required to stop fatigue from interfering with subsequent shifts?

The section also aims to explore the definition of fatigue and possible effects of fatigue on ambulance personnel in the workplace.

Although there is a substantial amount of research on the topic of fatigue, many of the studies are poorly designed with inadequate measures which make it difficult to draw conclusions from the existing literature. The quality of research is dependable on many factors, and results in one situation may not be replicable in different situations. This relates to studies conducted in a 'lab' environment, where many external environmental factors that will impact on results are controlled. For studies conducted in the 'real world', self selection of participants can create results that do not accurately represent the group of interest.

Dawson et al., (2001) suggests that fatigue has linear relationships with error rates. Errors caused by fatigue are comparable to errors made under the effects of alcohol. A study conducted by Fletcher, Lamond, van den Heuvel, and Dawson (2003) explored the relationship between sleep deprivation, alcohol intoxication, and objective behavioural performance.

The Fletcher et al., (2003) study aimed to compare sleep deprivation, fatigue, and alcohol intoxication. The results found a moderate to very strong relationship between fatigue and neurobehavioral performance. Results found that the higher level of sleep deprivation, the higher level of fatigue a person experiences and this in turn negatively affects behaviour. The results found that after 17 hours of wakefulness, fatigue related impairment is equal to 0.05% blood alcohol concentrate with 24 hours of wakefulness equivalent to 0.10 blood alcohol concentrate.

It is unacceptable for a paramedic to work under the influence of alcohol but fatigue levels could be impairing judgement to the same extent as alcohol intoxication. Previous research conducted by Dawson and Reid (1997) found that sleep deprivation and fatigue associated with common work shifts produced greater impairment than alcohol intoxication. Alcohol intoxication produce delayed reaction times, impaired reasoning, reduced vigilance, and impaired hand-eye coordination.

Australian researchers (Dorrian, Lamond, van den Heuval, Pincomve, Rogers, & Dawson, 2006) investigated the relationships between work hours, sleep, fatigue, and occurrence of errors in Australian nurses. 23 fulltime nurses completed daily

recordings on their work schedules, sleep length and quality, sleepiness, and fatigue levels for one month. Frequency and type of error, near misses, and observed errors were also recorded. Results found that nurses struggled to remain awake during 36% of shifts. Nurses reported extreme drowsiness while driving home on 45 occasions with 3 reports of near accidents. Results from the recordings found 20 errors were made, 13 near misses, and 22 observed errors. The participants made 4 potentially severe errors in the month observed. These results indicate that decreased sleep may lead to an increase of errors and a decrease in the ability to observe other people's errors.

Another issue for night shift workers is that the intervention of the circadian sleep cycle can lead to sleeping difficulties and affect the quality and quantity of sleep. The human body needs around 8 hours of sleep in order to function at an optimum level. When the body does not get an adequate amount of sleep, it can result in sleep debt. Sleep debt is when over time the body needs longer periods of sleep in order for the body to recover and for optimum function of the mind and body.

The more sleep debt a person accrues, the more likely they will fall asleep or suffer the affects of fatigue. Contrary to popular belief, circadian rhythms cannot be reversed (ACTU, 2000). Sleep deprivation can cause significant impairments to hand-eye coordination, decision-making, memory, cognition, visual search performance, response speed, and response accuracy (Dawson et al., 2004). When reviewing potential shift changes these issues need consideration.

Increasing scientific evidence indicates a relationship between increases of fatigue and decline in cognitive functioning, impaired performance, increase of error, and reduced safety (Beumont et al., 2001; Lieberman et al., 2002; Harrison, Horne, 2000; Dinges et al., 1997; Gander et al., 2000; Neri, Shappell, & DeJohn, 1992; in Dawson et al., 2001, p. 3). According to Dawson et al., (2001) high levels of fatigue is associated with; reduced workplace performance and productivity, and increased risk of incident and injury. After 8 hours of work, risks of incident increase (Dawson et al., 2001). Accidents are also likely to occur driving to and from work, especially if the operator has a significant amount of sleep debt.

The Centre for Sleep Research, University of South Australia (Petrilli, Lamond, Roach, & Dawson, 2000) conducted a study entitled, 'Identifying the cognitive skills that are most affected by fatigue within a decision-making framework'. This study reviewed 62 sleep deprivation and decision-making studies in order to identify the main cognitive skills affected by fatigue. The study found that 5 cognitive skill dimensions are affected by fatigue and these include; situation assessment, memory, mental simulation ability, performance insight, and controlling emotion. Factors that also affect decision-making include level of expertise and the type of situation involved. This study is useful to review as it can give insight into the impact fatigue will have on decision-making ability of paramedics.

Comprehension involves the understanding and interpretation of noticeable cues involved with the current situation. If perception cues are misread, the meaning of the situation may be misunderstood. Comprehension involves drawing on previous knowledge and selecting an existing procedure or model from memory. In the case of a paramedic, treating a patient requires a process for initiating procedures, fatigue could cause a mistake, due to misdiagnosis or not being able to recall treatment procedures.

Projection is the cognitive ability to project current situations into the future (Petrilli et al., 2000, p. 4). In the case of the paramedic, this cognitive ability is vital in order to predict treatment outcomes. Memory consists of long-term and short-term and involves encoding, recall, retention, and retrieval of information (p. 7). Fatigue is detrimental to memory as it can impair ability to retrieve past experiences, which for paramedics is vital in deciding treatment and course of action to take.

The third dimension affected by fatigue is mental simulation ability. This ability refers to higher-level mechanisms such as mental imagery and spatial ability (Petrilli et al., 2000, p. 7). The paramedic mentally simulates events in order to predict outcomes of moving critically injured patients, and ways of minimizing the impact of the move. The fourth dimension is performance insight, which involves self-monitoring and meta-cognitive parts of decision-making (p. 7). For a paramedic it would involve the ability to recognise and assess potential fatigue risk on cognitive abilities such as memory.

The last dimension involved is controlling emotion. This factor is important because emotion acts as a global factor, and confounds performance when negative (Petrilli et al., 2000, p. 7). This factor could influence decision making in regards to paramedics, because they are often in emotion provoking situations, which could negatively influence decision-making. Decision-making involves a combination of the above dimensions and fatigue can influence all levels of decision-making.

Previous research has supported a classic view that limiting hours of work is an effective fatigue management strategy but in fact it is designed to manage physical fatigue, not mental fatigue. For night shift workers circadian biology influences the time needed to recover. For example a worker given 12 hours break after a night shift, will have significantly reduced amount of recovery sleep in comparison with a 12-hour break after a day shift. Dawson et al., (2004) notes,

In our opinion, estimating the level of mental fatigue associated with a given pattern of work is linked more to the timing and duration of sleep and wake within the break, rather than the duration of the break alone (p. 4).

The Dawson et al., (2004) report notes that it would be beneficial to achieve the management of safety risks in a variety of organisation or industry specific ways. A potential limitation to safety management is that it assumes that it reliably determines whether an individual will be fatigued or not and that individuals always use breaks between shifts as an opportunity for appropriate amounts of sleep. It may not be just a matter of being tired after a night shift and being able to have adequate

sleep. Sleep is a complex process that involves various stages, and a full sleep cycle takes approximately 8 hours for the average adult (ACTU, 2000).

A literature review by Dawson and McCulloch (2004) critically analyses research studies on fatigue and sleep deprivation. The review describes how in the past prescriptive rule sets on hours of service have regulated fatigue management, where hours of work, and hours of rest measure potential fatigue. This review suggests that measurement of potential fatigue involves measuring the amount of sleep individuals' gain in the 24 and 48-hour periods prior to shift starts.

International research

There seems to be little health industry related international research on the topic of fatigue. International research focuses on the transport and construction industry, with the majority of research on general fatigue. However, many of the general fatigue studies face methodology issues and findings may not be accurate.

General fatigue research has found that although fewer injuries are sustained during night shift, the severity was often more serious depending on length of shift (Folkard & Lombardi, 2006). Driskell and Mullen (2005) found that work performance improved after long naps and that naps may provide an effective counter measure as part of a fatigue risk assessment strategy.

A study on the impact of extended duration shifts on medical errors, adverse events, and attentional failures (Barger, et al. 2006) conducted a survey of 2,737 residents in their first postgraduate year across the United States. The results found that as the number of extended duration shifts increase, the reported rates of fatigue related medical errors also increase. Interns working frequent extended duration work shifts were significantly more likely to fall asleep during surgery, while examining patients, during rounds, and during lectures, impacting their ability to deliver safe patient care and to further their learning.

Arnedt, Owens, Crouch, Stahl, and Carkadon (2005) conducted a study on the effects of hours of work, workload, and alcohol on the performance of 34 resident medical officers over a 4 week period. Performance was measured through a standardised driving tests and self perception questionnaire. Results found that performance impairment following a heavy workload was equivalent to or worse than a blood alcohol rating of .05.

The National Institute of Occupational Safety and Health (Barger, Cade, Najib, Ayas, Cronin, Rosner, Speizer, Czeisler, 2005) commissioned a study to explore the relationships between extended shifts for medical interns and car crashes. The results found that for interns working shifts over 24 hours were twice as likely to have a crash compared to interns working a normal shift. The implications of the results of this study demonstrate that fatigue and extended shifts not only create a risk for the work environment but can also create a risk for other parts of society when the results of extended working hours overflows into other parts of the employees life.

The Australian Council of Trade Unions

Health and safety guidelines for shift work and extended working hours

In September 2000, the ACTU released guidelines examining health and safety hazards that relate to shift work and extended working hours. The guidelines recommend assessment and control measures in order to minimise hazards. The guidelines are based on the argument that all shift work and extended working hours involve hazards that need to be eliminated or reduced where possible.

The ACTU acknowledges that it is an employers legal duty of care to ensure employees health and safety are considered when planning rosters and working hours. The ACTU also acknowledge that it is an employer's legal duty of care to ensure the effects of working hours on family and social life are considered when planning rosters.

In order to address the issue of fatigue rosters should be designed to minimise sleep debt and fatigue. The ACTU recommend that rest days be evenly distributed throughout the working week to allow workers to recover from the effects of fatigue. The ACTU does not recommend the compressed working week in roster design as the 'banking' of rest days does not allow for workers to recover adequately from shifts.

To overcome hazards relating to shift work and extended hours, the ACTU propose that employers consult with employees in order to minimise unwanted effects. Changing a roster impacts various aspects of an employees' life and this change could be unwanted even if employees' are aware of compromised safety. Employers need to identify to staff members why the changes are needed and outline the benefits and the disadvantages of the current system. The ACTU suggests that employers can use a survey, interviews and group meetings to explore these issues.

The ACTU recommend that any changes to shifts and roster systems should be on a 12-month trial basis, with a 6-month review. The ACTU provides a survey that explores employees' attitudes to current working arrangements. This survey can be used to evaluate employee attitudes before, during, and after the changes and enables employees to be an active part of the process. At the end of the trial, a detailed evaluation can be used to explore the effectiveness of the changes and to explore employee reactions, changes in hazards, and organisational criteria. Organisation criteria could consider accident/injury rates, absenteeism, staff turnover, etc (ACTU, 2000, p. 13). To evaluate the effects of the changes to the system individual employees could be given a medical examination prior to and subsequent to the trial to evaluate health effects.

The ACTU suggests that treatment of working hours needs to be assessed in the same way as other occupational health and safety hazards (ACTU, 2000, p. 14). Risk assessment involves identifying the hazards, assessing the risks involved, and eliminating or minimising the hazards. Identification of hazards can involve

investigating employee complaints, analysing accident and absentee records, conducting surveys, environmental and medical monitoring, reviewing scientific and medical literature; and investigating incident, injury and illness patterns (ACTU, 2000, p. 13).

The ACTU guidelines suggest that various factors need to be considered when assessing risk and these include; workload, length of shifts, overtime, night work, extended 12 hour shifts, breaks during shifts and between shifts, rest days, timing of shifts, rotation and roster pattern, standby/on-call duties, hand-over, travel, information, and facilities provided (ACTU, 2000, p. 15-22).

- The ACTU make recommendations that relate to the emergency industry which include:
 - night shifts limited to a maximum of two per week;
 - 12-hour shifts limited to no more that two consecutively;
 - maximum hours worked in a day should be no more than 12 (including overtime);
 - hours rostered should not be over 48 in a week;
 - overtime limited to 12 hours per week;
 - breaks between shifts should be no less than 12 hours;
 - extended shifts should be compensated by longer rest breaks;
 - days off between shifts should be evenly distributed;
 - shift changes to be forward rotating;
 - roster patterns to be predictable; and
 - mechanisms need to be in place to allow appropriate hand over of shifts.

The ACTU acknowledges that these recommendations may not always be possible to meet. However, the ACTU suggest that employees only work over 12 hours in emergencies, as this is a high-risk practice. The ACTU recommends that employees view night work as a hazard in itself and that night work imposes a greater workload than the same time worked during the day. Night shifts should be minimised to 8 hours duration (ACTU, 2000, p. 17).

The ACTU recommends that employees on standby or on-call duties are given an adequate rest period between on-call hours. The ACTU understands that on-call work is also associated with fatigue and stress. In regards to travel, extended shifts in particular can increase safety risk and the ACTU recommends that in these situations employers provide transport. The ACTU recommends that employers provide adequate rest areas and meal facilities. Employers should also provide assistance to enable employees to modify their homes in order for adequate sleep for night shift workers (ACTU, 2000, p. 22).

The ACTU recognise that shift work will always be associated with certain hazards and that it is not possible to eliminate every hazard due to the nature of some work. However, employers have a responsibility to constantly monitor hazards and eliminate or reduce these hazards in order to maintain a safe work environment. Specific industries such as emergency services are particularly affected by the ACTU guidelines, but the ACTU identify that hazards need to be addressed in every industry.

The Australian Council for Safety and Quality in Health Care

Safe staffing and patient safety literature review

In 2003, the Commonwealth Department of Health and Ageing commissioned the Australian Resource Centre for Hospital Innovations on behalf of the Australian Council for Safety and Quality in Health Care to conduct a comprehensive literature review on both published and unpublished literature on safe staffing and patient safety.

The literature review aimed to analyse research in order to identify factors that influence the relationship between staff and patient safety and to analyse the quality and content of research in this area. 230 papers (152 health and 78 non-health) were reviewed in the areas of: staff physical and mental health; communication and feedback; hours of work, shift work, numbers of staff and fatigue; and competency, supervision and staffing mix (ARCHI, 2003, p. 5).

The results from the literature review reveal gaps in the current research in relation to many safe staffing and patient variables. The review identified 14 papers in the area of staff physical and mental health. In relation to the issue of fatigue the below results are of interest:

- A study designed to assess the impact of staff fatigue while doing chest compressions during CPR practice on the patient outcome of resuscitation found that participants did not recognise that they were fatigued until two minutes after compressions became ineffective (Ochoa et al, 1998 in ARCHI, 2003); and
- long hours, shift work, and stress affect mood, mental health and emotional wellbeing which in turn impact clinical decision making, alertness, vigilance and effective communication.

The review identified 31 papers in the area of communication and feedback. The papers identified a common theme of safety culture in the research highlighting that communication improvements improve the overall safety of an organisation. The results from the literature indicate that:

- Communication breakdown can be a critical component in adverse events.
- Contributing factors to ineffective communication include;
 - high staff turn-over
 - inexperienced staff
 - low self-esteem
 - irritability from tiredness
 - interpersonal conflict

The review identified 64 papers in the area of hours of work, shift work, number of staff and fatigue. The health related research on the relationship between working hours and patient safety indicate that:

- working long hours and rotating shifts creates a major health and safety concern for health workers and increases risk of fatigue
- possible affects on work performance of health professionals are;
 - speed of procedures
 - alertness and vigilance in identifying problems
 - fatigue affects mood which in turn affects communication
- Driving accidents on the way home from shifts is a fatigue related risk
- High workload and rostering of staff contributes to adverse events
- Shifts that allow longer sleep breaks for employees are associated with improved performance and improved quality of care

The key points from the non-health related papers, which mainly focus on fatigue include:

- condensed working hours into a shorter working week can result in increased productivity, improved job satisfaction, and increase in leisure time
- industries that commonly use long working hours indicate that fatigue creates a serious safety issue and include:
 - drowsiness
 - confusion
 - decreased alertness
 - increase in potentially fatal error
- fatigue can result in physical problems such as; headaches, back pain, nose congestion, and mood swings
- inexperienced operators are more likely to be involved in a fatigue related accident
- shift workers are more likely to have a motor vehicle accident and the most dangerous time for this is during shift rotation

The last section of the review identified 117 papers in the areas of competence, supervision and staff mix. Some of the common themes from health related research are:

- care coordination, poor management, poor documentation, and limited system for reporting adverse events result in high levels of patient complaint and hospital review
- supervision of inexperienced staff is vital in managing patient safety
- delays in diagnosis can have major impact on long term well being of patients

The common themes from non-health related papers are:

- identifying and eliminating faults in design by implementing rules and guidelines is economically imperative and will ensure commercial viability
- poor judgement and ineffective communication can lead to very serious fatal accidents
- an employees ability to perceive, comprehend and project is vital in preventing accidents and decreasing risks

The non-health related papers suggested various solutions to enable a safer work place and these include:

- implementing a health and safety program within the organisation with the aim of continuous improvement
- using technology to prepare and educate staff
- use of computer feedback on performance

The review found large gaps in the health related research in relation to safe staffing variables that would benefit from further research. However, the literature review revealed that staff performance is dependent on knowledge and skills related to job type and many other factors including; environmental, mental and physical health, interpersonal skills, communication skills, and systems used.

The research also revealed that staff and patient safety are influenced by a variety of inter relating variables. Long hours and shift work negatively influence physical and mental health of staff and can result in a decrease in clinical decision-making, alertness, vigilance, and communication skills. A breakdown in communication skills can be a critical component in adverse events and is often a result of low self-esteem, irritability from tiredness, and interpersonal conflict.

The safe staffing literature review makes recommendations under each category reviewed. The recommendations review the evidence of individual variables on safe staffing and outline key areas for further research. The review recommends further research in the following areas:

- **Staff physical and mental health**
 - research to provide a better understanding of the relationship between staff physical and mental health and patient safety
- **Communication and feedback**
 - research to provide strategies to improve incident reporting, the reduction of adverse events and the improvement of staff morale
- **Hours of work, shift work, number of staff and fatigue**
 - research to provide staffing models collaborated from a range of professions to develop rosters that allow for both continuity of care and enable adequate rest for clinicians

Although the safe staffing literature review reveals many gaps in the research in relation to shift work and patient and staff safety that gives conclusive evidence, it reveals the importance of the many interacting variables that influence patient and staff safety. The review emphasises the importance of conducting further research in order to provide conclusive evidence on under researched safe staffing variables for the health industry to improve safety of staff.

Safe staffing consultation report

In 2000, the Australian Government established The Australian Council for Safety and Quality in Health Care (the Council), lead by the Australian Government Health Minister and supported by the Australian Health Ministers. The purpose of the Council is to provide national leadership in the area of safety and quality in health care and to focus on minimising errors and failure in the systems.

In 2003, the Council set up a taskforce to examine how changes to current staffing systems may positively impact patient safety. The taskforce examined safety factors by conducting a comprehensive literature review, which developed into a discussion paper based on the findings. The taskforce then conducted a consultation with stakeholders to raise awareness of the Council's safe staffing activities and to gain the stakeholders views on the role of the Council.

Stakeholders participated from a wide range of health areas including; medicine, nursing, emergency, obstetrics, surgery, neurology, social workers, physiotherapists, pathologists, radiographers, hospital administration, risk managers, and quality managers.

Stakeholders were enthusiastic about the Council's role in safe staffing and felt that safe staffing was vital in the provision of safe patient care. The issue of fatigue was a point of much discussion for the stakeholders. Stakeholders held varying views on the severity of fatigue. The definition of fatigue was debated and the difficulties in measuring the variable.

Stakeholders agreed that

fatigue is not only caused by long working hours but by the intensity of work and the acuity of patients which have both been increasing in recent years (the Council, 2003, p. 20).

Stakeholders felt that a possible contributor to fatigue is the lack of management skills in middle management and lack of support from administrators. This lack of management adds to stress and fatigue sometimes resulting in high staff turnover. Stakeholders recognised that fatigue results from various factors including working hours, intensity of work, and other non work related variables.

Stakeholders agreed that there is currently no formal process in place to identify and manage fatigue and the current health care culture plays a significant role in the lack of fatigue management. As there is currently no formal fatigue management process in place, as well as an increase in the demand for health professionals, staff feel pressured to work while fatigued. Fatigue was recognised as a problem for staff but felt there was no other option but to continue working.

Stakeholders agreed that the culture of the health care industry is a top-down 'army style' command model built on a hierarchical system. Staff felt that long hours and working while fatigued was an expectation of the industry. Staff also felt that complaining about fatigue would be viewed as a lack of commitment and that working the long hours would be the only way to further their career.

Another feature of the culture was the caring nature of the industry. Health care industry staff are often drawn to their jobs because they are passionate about helping people and this can come at a cost to their own lifestyle. The culture of the health industry was described as a 'blaming culture', and described risk management as 'pointing the finger' and focusing on individual accountability. Stakeholders felt that it was important to address these cultural issues and to encourage a culture of openness and communication in order to address the issue of fatigue.

Many stakeholders agreed that regulatory action is required to ensure change. However, it was recognised that in order to make these changes there would have to be adequate resources to do so. It was also recognised that regulations would need to be flexible in order to accommodate the diversity in the industry.

Stakeholders agreed that fatigue management would involve strategies for individuals, organisation support, and system wide mechanisms. Due to the difficulty in monitoring fatigue, individuals need to take a certain accountability and responsibility. Stakeholders agreed that education was vital in order to raise awareness of the risk of fatigue and create individual responsibility, to allow individuals to recognise fatigue, and provide fatigue management strategies.

Stakeholders explained the need for a balance between employers and employees. It was recognised that employers need to provide the support and resources to allow fatigue management and to encourage culture change within the industry. To support culture change employers need to positively reinforce staff when using the

fatigue strategies. Stakeholders agreed that fatigue management would also involve system wide mechanisms. These mechanisms would allow greater transparency of staff, to allow employers to monitor hours worked across different agencies.

In relation to workforce planning and sustainability

Stakeholders were adamant that macro issues of workforce planning are crucial for successful and sustainable outcomes in safe staffing (p. 33).

Stakeholders felt that any safe staffing strategies would not eventuate unless the issue of workforce supply was adequately addressed.

- The Council is progressing the following issues:
 - development of national principles and tools to recognise, prevent, and mitigate fatigue in health workers
 - nationally improve clinical handover processes to ensure high standard of patient care
 - development of a national patient safety education framework to enhance health worker competency and;
 - developing a safety management systems checklist to ensure safe environments

The Australian Council for Safety and Quality in Health Care was designed to ensure that health care professionals operate in safe working environments to allow the delivery of safe patient care. Some stakeholders agreed with the viewpoint of the literature review that more research is necessary. However, many stakeholders hold the view that there is enough research on the topic and what is needed is commitment and facilitation to allow the health industry to make changes. The consultation report revealed that stakeholders acknowledge that fatigue is a significant issue for patient and staff safety; however, current funding, workforce supply, and cultural issues limit the amount of change currently feasible.

In November 2006 the Australian Commission on Safety and Quality in Health Care (formerly Council) released a five year work plan from 2006/07 to 2010/11 detailing key strategies, actions, timeframes, key outputs and outcomes. The Commission will work in close partnership with key stakeholders to facilitate and achieve sustainable systemic change.

The Australian Medical Association

National code of practice

The Australian Medical Association (AMA) developed a National Code of Practice – Hours of Work, Shiftwork and Rostering for Hospital Doctors. In March 1999, the Federal Council of the AMA adopted this code and distributed throughout the medical industry. The Code is widely accepted as the standard for safe working hours for doctors in Australia and is often referenced by standards organisations such as; the Australian Council for Safety and Quality in Health Care, Australian Council on Healthcare standards, and the Postgraduate Medical Education Council.

The Code of Practice has been positively accepted by the medical profession, however, lack of adequate resources in hospitals limit the extent to which the code is adhered to. The Code of Practice was designed as a guidance document on how to minimise or eliminate risks associated with shiftwork and extended working hours. The Code does not have any legislative standing but provides employers with a set of recommendations to use in meeting general duty of care to employees.

The Code of Practice recognises the risks associated with shiftwork and extended hours of work on the health and safety of the individual employee and the possible impact on the quality of care provided to the patient. As Paramedics provide out of hospital clinical care and face similar hazards to hospital doctors, this code of practice is useful in reviewing current risks associated with ambulance personnel, shiftwork and extended working hours.

Section 2.3 'Risk assessment' recommends that employers assess and identify any risk associated with the above hazards. A risk is the likelihood of injury or illness arising from any exposure to a hazard (AMA, 1999, p. 11). It is an employer's duty to control risk by removing the hazard or by minimising the risk. The code recommends that risk assessment methods should include the following (AMA, 1999, p. 11-12):

- utilising a scheduling and shiftwork specialist
- using techniques to calculate potential sleep deprivation and fatigue
- consultation with staff to cover individual differences
- utilising current research on shift work and fatigue

The code of practice recommended under section 2.1 'hazard identification' that, 'employers should ensure that all hazards associated with shiftwork and extended working hours in a hospital are identified (AMA, 1999, p. 8)'.

- Typical hazards associated with shiftwork and extended working hours can result from the following conditions:
 - excessive consecutive hours worked in any one period
 - lack of rest breaks between shifts
 - inappropriate speed and direction of shift rotations
 - irregular and unpredictable work schedules
 - night shift and extended hours that lead to night shift
 - type of work and additional work load
 - potential exposure to other hazards

The above hazards can result in fatigue through significant sleep debt and create disruption to the circadian rhythm. In order to control for the above hazards the Code of Practice makes the following recommendations under the following headings:

- **Consecutive Hours**
 - minimise the amount of shifts over 10 hours duration
- **Rest Breaks**
 - minimum break between shifts should enable a minimum of 8 hours continuous sleep
 - compensation of longer break between shifts if working hours extended
 - maximise the opportunity to take breaks during shifts
- **Shift Speed and Direction**
 - slowly forward rotating shift schedules
 - avoid rapid shift changes
 - employers should provide a 24 hour break before new shift rotation
- **Work Schedules**
 - ensure doctors have a minimum of regular 24 hours free of work in a 7 day period for unrestricted sleep
 - prepare for replacing staff due to absence and sickness
- **Night Shifts**
 - minimise consecutive night shifts to minimise performance reductions
 - working a night shift is a hazard in itself
 - ensure longer breaks between and following night shifts are provided

- **Type of Work and Work Load**

- complex tasks should be scheduled during the day
- routine and administrative tasks to be minimised
- complex task should be undertaken early in the shift where practicable

Point 2.2.6 suggests that type of work and additional workloads can present a hazard. According to the code, research has indicated particular tasks are performed at differing levels according to the time of day or night. The circadian rhythm can cause lowest alertness from 2am to 6am, which can affect performance levels. The code states,

For doctors this means that performance may be maintained over longer periods for complex tasks but simpler, routine medical or administrative tasks may not be completed to a satisfactory level (AMA, 1999, p. 11).

The Code designed a risk assessment checklist and guide to measure possible hazards. The guide was designed as a hazard assessment tool and made note that when assessing risk employers need to consider the following:

- lifecycle;
- intensity and nature of work;
- work environment; and
- incidence of sleep disorders.

The code recommended that staff numbers need appropriate allocation according to predicted daily, weekly, seasonal and annual demand in order to minimise risk (AMA, 1999, p. 16). The code also recommended that information on shift work are provided to doctors so that they are well informed about the associated hazards, how to identify hazards, services available, and system for reporting related problems.

The code recognises that both employers and employees have a responsibility in minimising individual and patient risk. It is part of the employees responsibility to participate in the appropriate shiftwork risk training programs, use breaks between shifts appropriately, report incidence resulting from shift work hazards, report to supervisor when fatigue becomes a risk to patient care and individual, and understand the implications of working extended hours on risk of health and safety of patient.

The AMA's Code of Practice gives a good indication of the potential problems and possible solutions in relation to shiftwork and extended working hours to ambulance services. Although the guide is not a legislative instrument, it provides a comprehensive assessment of fatigue related hazards and the responsibilities of employers and employees in dealing with this issue.

Safe hours audit

In May 2006, the AMA conducted a survey of all doctors employed in public hospitals. The online survey collected data on doctors' working hours, on-call hours, non-work hours, and sleep time in order to assess fatigue risks. The data collected through the survey was analysed against a pre-established risk assessment model developed by the AMA in 2000.

The risk model was established from the AMA's code of practice and identifies individual risk factors reducing this to a numerical score, which can be categorised into a risk rating scale. Participants are categorised into either lower risk, significant risk, or higher risk. Risk is determined through total weekly hours, amount of night work, shift length, on-call requirements, break lengths, and long-term work patterns.

Results from the AMA survey found that according to current patterns of work, 62% of doctors are in the significant risk or higher risk fatigue category. Surgeons are at the highest risk for fatigue with 85% in the significant risk or higher risk category. Average hours worked by participants in the significant risk category were 60 hours with those in the higher category having an average of 78 hours in any seven-day period.

Participants in the significant risk category had shift lengths ranging from 9-35 hours and an average of 15 hours, with those in the higher risk category ranging from 10-39 hours and an average of 16 hours. 72% of doctors did not have a day off from work in a seven-day period. 39% of doctors in a high risk category had three or more days on-call in a seven day period with only 35% of doctors having no on-call days. For participants in the high risk category, 18% had no meal breaks for one – two days and 7% has no meal breaks for three or more days in a seven day period.

The AMA recognises that fatigue related to unsafe work schedules can threaten doctors' personal well-being as well as the quality and safety of patient care. The AMA also recognises that long working hours for doctors is a tradition deeply rooted in the medical culture and that this culture will take time to change. The survey revealed that a majority (62%) of doctors are in the significant - high risk category for fatigue which should act as a wake up call to health and government departments in Australia. The AMA will continue to follow up safe working hours for doctors federally and at state level in order to address the issue of patient safety at every available opportunity.

In a media release on the 19th January 2007, the president of the AMA, Dr Mukesh Haikerwal, introduced a web based fatigue risk assessment tool with the aim of making hospitals safer for both patients and doctors. The website allows doctors to determine whether they are at risk of fatigue through analysis of work hours, recreational hours, and sleeping hours to give them a fatigue risk rating. Dr Haikerwal noted that, 'a serious approach to safe hours is well overdue in the health industry', and that, 'equally, hospitals have a responsibility to ensure patients receive the best possible care from doctors who are well-rested and alert' (AMA, 2007).

Workplace Health and Safety Queensland

Fatigue management guide

The Workplace Health and Safety Queensland Fatigue Management Guide (2005) identify shift work and extended working hours as key contributors to the risk of fatigue. The guide was designed to enable employers to address the issue of fatigue in Queensland workplaces and provides strategies to both employers and employees on best how to manage fatigue. The guide identifies and describes fatigue and the possible effects of fatigue on work performance and health.

Through the Workplace Health and Safety Act (1995) the guide outlines the responsibilities and obligations of the employers and employees in regards to health and safety issues in the workplace. **It is an employee's obligation not to wilfully place themselves or any other person's health and safety in danger. In relation to fatigue, employees should, 'ensure that their personal behaviour outside of work does not contribute to workplace fatigue' (p. 9).**

Fatigue management is the shared responsibility between the employer and the employee. The guide outlines a fatigue management approach that involves; identifying hazards, assessing risk, deciding on control measures, implementing control measures, and monitoring the effectiveness of control measures.

- The first step is to identify any factors that contribute to fatigue. The guide suggests looking at the following factors:
 - shift length
 - previous hours and shifts worked
 - type of work performed
 - time of day that work is performed
- In order to identify factors that contribute to fatigue the guide suggests the following:
 - inspection of rosters
 - consultation with employees
 - consultation with health and safety representatives
 - conducting audits
 - analysing injury and accident reports with emphasis on time of day that incident occurred
 - surveying workers

The second step involves assessing the risk. Assessing the risks involves calculating the likelihood of an incident occurring in the workplace combined with how extreme

the consequences would be to come up with a risk rating. The guide suggests considering the following when assessing the risks involved with fatigue:

- incidents are more likely to occur between the hours of 2am to 6am
- employees are more likely to feel fatigued in the final hours of a shift
- incidents are more likely to occur if employees are not given adequate time to sleep and recover
- incidents are more likely to occur if an employee is fatigued on a regular basis
- incidents are more likely to occur if a higher number of employees are fatigued
- training and competence to perform and manage fatigue

The third step involves deciding on the control measures. Fatigue is caused by a combination of factors which means that a combination of control measures is needed in order to adequately minimise the risk. The guide provides examples of measures used to control fatigue:

- limiting shift work to essential jobs
- redesigning shift work so that administration tasks are minimised for night shift workers
- scheduling later start times
- scheduling low risk work during high risk fatigue times
- scheduling complex tasks during day shifts

The fourth step involves implementing the control measures. In order for the control measures to operate effectively work procedures, communication strategies, training programs, and supervision need to be in place. The fifth step involves monitoring and reviewing fatigue management processes. This step is necessary to find out if control measures are working and if there are any new problems to deal with as a result of the control measures. Fatigue management is an ongoing process that involves constant monitoring and evaluation.

The Queensland workplace fatigue management guide provides employers and employees with information on the many factors that influence fatigue, ways of identifying and minimising fatigue, and the importance of ongoing evaluation and monitoring of fatigue.

Australian Safety and Compensation Council

Work related fatigue: summary of recent indicative research

The Summary of Recent Indicative Research (2006) provides a review of research conducted between 2005 and 2006 on work related fatigue taking place in Australia and overseas. The report acknowledges that fatigue can compromise health and safety and in particular can have serious implications for safety critical industries where fatigue could contribute to potentially dangerous and costly incidents.

The summary found that there has been substantial development in fatigue management during 2005 and 2006. In particular legislation has been developed in the transport and health industries. The main findings from this report found that research on work related fatigue has focused on the transport and health industries due to the increased risk of safety for employees and also public safety concerns.

The summary commented that a broad based approach to fatigue management in the workplace is inappropriate because the implications of fatigue factor in the nature of the work, skills and capacities required, and the potential consequences of decreased performance. The summary found that fatigue research does not clearly explain the relationship between work patterns, job tasks, sleep duration, and performance due to poorly designed studies. It is difficult to draw conclusions on fatigue and the potential risk it poses through the existing research.

Work related fatigue: summary of recent regulatory development

The Summary of Recent Regulatory Developments (2006) provided by the Australian Safety and Compensation Council provides an overview of regulatory developments across industries and government in recent years. The paper covers these three key messages:

1. Transport has been a major focus of regulatory activity in Australia following the release of the Commonwealths *Burning the Midnight Oil* report released in 2000.
 2. In 2005/06 New South Wales, Western Australia, Queensland, and Victoria have been active in creating fatigue related regulations.
 3. Development in fatigue related regulation have focused on the restriction of hours of work and focused on transport and health care industry. Recent developments have created an interest in the use of fatigue management programs to complement prescriptive hours of work regulations.
- Currently there is legislation on fatigue in the following areas:
 - National Transport Commission Heavy Vehicle Driver Fatigue Reform
 - National Transport Commission Rail Safety Reform
 - Civil Aviation Safety Authority

- NSW Long Distance Truck Driver Fatigue
- WA Fatigue Management in the Commercial Vehicle Sector
- Codes of practice on fatigue exist for the following:
 - WA working hours (all industries)
 - WA Fatigue management in the Commercial Vehicle Sector
 - TAS Forest Safety Code
 - NT Road Transport Fatigue Management
 - Australian Medical Association: Hours of work, shiftwork and rostering for hospital doctors
- Guidelines on fatigue exist for the following;
 - Australian Maritime Safety Authority
 - Air Services Australia
 - NSW Long Distance Truck Driver Fatigue
 - WA Fatigue Management in the Commercial Vehicle Sector
 - QLD Fatigue Management (all industries)
 - VIC Healthbreak program (all industries)
 - VIC Fatigue Management in the Forestry Industry

There have been recent international developments on fatigue management in the transport industry in USA, Canada, the UK, and Sweden. Internationally the health industry is recognising fatigue as a key risk to both employees and patients. Fatigue management has developed in Australia, the UK, and the USA, and has focused particularly on managing fatigue through limitations on hours in the hospital setting.

Work Cover NSW

Shiftwork: how to devise an effective roster

Work Cover NSW brought out a guide on shift work and roster design. This guide provides employers with a brief overview on fatigue and the potential risks it presents in the workplace. The guide covers the following topics:

- hazards of shiftwork
- the body clock
- nightshift
- sleep cycles
- on-the-job fatigue
- health effects
- managing shiftwork
- devising an effective roster

The guide recommends that roster design incorporates and takes into account circadian rhythms, rest periods, and social needs. Specific factors to take into consideration include:

- In seven consecutive days, shifts to consist of six 8 hour shifts or four 12 hour shifts
- forward shift rotations
- limit the number of nights worked, three 8 hour shifts or four 12 hour shifts recommended
- allow for two free weekends per month
- minimum of 11 hours between shifts
- avoid rostering someone to work alone at night where possible

Work Safe Western Australia Commission

Reducing the risk of fatigue at workplaces

A guidance note on reducing the risk of fatigue at the workplace (2001) was released by the government of Western Australia through the Work Safe Western Australia Commission. The guidance note provides information to employers on reducing the risk of fatigue in the workplace through education on the meaning, causes, and effects of fatigue. The guide also provides information on the requirements that employers and employees are required to meet.

The guide outlines factors that may contribute and increase the risk of fatigue in the workplace and include the following:

- **The Environment**
 - continual noise exposure
 - poor workplace design
 - no external stimuli
 - working in isolation
 - no means of early identification of fatigue
 - poor ventilation
 - poor lighting

- **The task**
 - physically demanding
 - irregular and unpredictable hours
 - requires concentration
 - involves the use of machinery or plant
 - repetitive
 - duration of jobs or long hours

- **The person**
 - other commitments (family, social, and financial)
 - injury or illness
 - second job or work

The guidance note provides information on assessing the risk factors involved with fatigue. The level of risk resulting from fatigue will depend on the type of task. Tasks that involve a high level of concentration, coordination and strength result in a higher risk. Tasks involved with the work of ambulance operational personnel require all of the above qualities. Acceptable levels of fatigue will vary between

industries due to type of work, it is important for each industry/occupation to assess the risk individually according to type of work required for the particular job.

The guidance note recommends controlling workplace hazards through the following:

- providing safe systems of work;
- providing information, instruction, training and supervision; and
- consultation and cooperation.

Employees can play an important role in reducing fatigue in the workplace by making responsible lifestyle choices and taking responsibility for managing their own fatigue. Employers play an important role in reducing fatigue by providing safe systems of work through management of work schedules, rosters and through providing education to employees on how to best manage fatigue.

The guidance note accepts that while fatigue is not a new hazard facing workplaces, due to new patterns of work such as; 24 hour operations, contracted work, and employees having multiple jobs, fatigue is a hazard that is very relevant to workplaces today.

Queensland Ambulance Service

A review of the work practices, workload and health profiles of Queensland Ambulance Service operational personnel

Queensland University of Technology (Parker, & Hubinger, 2003) conducted a review of work practices, workload and health profiles of Queensland Ambulance Service operational personnel commissioned by Queensland Ambulance Service (QAS). The review produced four separate booklets:

- Health and Work Profiles of Queensland Ambulance Service Operational Personnel;
- Description of On-Road Workload for Queensland Ambulance Service Operational Personnel between and within regions;
- Description of Telephone Workload for Queensland Ambulance Service Communication Centres; and
- Summary and Recommendations: Implications for Resource and Health Management.

Book 1: *Health and Work Profiles of Queensland Ambulance Service Operational Personnel* explored findings from a questionnaire designed to investigate the health, work practices, and workload of ambulance operational personnel. The questionnaire focused on demographics, health, lifestyle, work patterns, anxiety, fatigue, sleep, training and support, and job satisfaction.

The results from the Parker et al., (2003) survey indicated various direct and indirect factors that relate to risk of fatigue for ambulance personnel. The risk factors include; duration of shift, duration of fatigue breaks, length of on-call period, and rotation of shift. Although the survey uses self-report measures, the findings confirm the need for all jurisdictions to examine current work practices for ambulance personnel.

The current study found that 81% of respondents rated their health as either good or excellent (Parker et al., 2003, book 1, p. 29). However, a measure of Body Mass Index (BMI) found that 45% of respondents were in an overweight BMI range and a further 20% in the obese range. The survey found that 50% of young student officer respondents were in an overweight BMI range. It is a concern that 20% of participants are in the obese BMI range because health and fitness is an important factor in managing fatigue.

There are many health and lifestyle issues associated with obesity. A shift workers opportunity for exercise and healthy eating would differ from that of a non-shift worker. The study found that personnel consumed larger meals on the night shift, often fast food, used as a defensive reaction against fatigue. These findings raise concerns about the health and lifestyle behaviour of ambulance personnel.

The Parker et al., (2003) study found that 40% of respondents reported working overtime on a regular basis. Working 14-hour night shifts is a risk factor for fatigue related accidents. Overtime lengthened the shift to an average of an additional 2 hours, which meant that a 14-hour night shift could turn into a 16-hour shift. **Studies have found that shifts over 12-hour duration are a risk factor for fatigue related incident (Folkard, 1997; SIRC, 1996; in Parker et al., 2003).**

The Parker et al., (2003) results found that Advanced Care Paramedics and Intensive Care Paramedics experienced more frequent and higher levels of fatigue compared to other categories. Comments indicated that 14-hour night shifts resulted in the most fatigue. An interesting finding was that officers' working day shifts and on call for nights reported high levels of fatigue.

Respondents commented that an 8-hour break between shifts was inadequate and did not take into account driving time and mealtime. When looking at reviewing current rosters and length of fatigue breaks, it is important to take into consideration travelling time. Both on-road officers and communication officers commented that the drive home after a long shift could be unsafe due to fatigue.

In the Parker et al., (2003) study, on-road officers reported completing documentation and driving as the tasks most likely to be affected by fatigue. Evidence on fatigue supports this finding, that fatigue is more likely to affect menial tasks (Dawson, 2005). On-road respondents reported that patient care was the least effected by fatigue. Respondents suggested that, 'emergency driving, particularly in heavy traffic, or at night in poor visibility was difficult near the end of a long shift (Parker et al., 2003, book 1, p. 62)'. Respondents suggested that fatigue affected concentration and mental alertness.

In the current study, 95% of those surveyed felt they were more susceptible to fatigue in the second half of their shift. For respondents working the night shift this meant that they felt more vulnerable to fatigue from midnight to 0700 hours. When evaluating shift length this is an important finding to take into consideration as circadian influence causes lowest concentration from 0200 – 0600 hours. Respondents reported that fatigue was higher in the second half of the shift. This is an important issue as on road officers found that the task most affected by fatigue was driving.

In the Parker et al., (2003) study during day shift, 60% of respondents reported getting around 7-8 hours of sleep and quality of sleep as being good to very good. The survey found that while working on night shift 80% of respondents slept for 6 or less hours and 30% reported 4 hours sleep over the 24 hours with 50% of respondents reporting sleep quality as poor or very poor. The current findings support research on the effects of circadian rhythm. When evaluating fatigue breaks between night shifts, the circadian influence keep in mind. Between night shifts, fatigue breaks need to be appropriate, as amount and quality of sleep decrease when sleeping out of the normal routine.

In some stations there is potential for sleep as workload is low. The Parker et al., study (2003) found that some ambulance officers were able to sleep an average of 2 hours at the station during night shift. The benefits of napping while on shift are that it can decrease fatigue. However, hours of sleep during night shifts varied significantly and it was not abnormal for officers to have no sleep at all while on night shift. Take consideration that low workload is also a risk factor for fatigue, and on-call officers experience less sleep and sleep of poorer quality.

Book 2: *Description of On-Road Workload for Queensland Ambulance Service Operational* investigated on-road work practices and identified factors that affect fatigue levels. Data collected from 214 ambulance services throughout Queensland represented various levels of stations and workload for a 12-month period.

The study analysed Code 1 and 2 responses (emergency requiring lights and siren) and Code 3 and 4 responses (non-urgent). Data was also analysed by category of station which ranges from a category 1 (on-call only) up to a category 5 (two paramedics, 24 hour station). Unit Hour Utilization (UHU) was analysed representing, 'the portion of time that an Ambulance crew is actively involved in a call for service and therefore unable to respond to new calls (Parker et al., 2003, book 2, p. 14)'.

Results found that workloads and UHU varied considerably across all station categories. Category 4 and 5 stations experienced a dramatically higher workload compared to category 2 and 3 stations. Category 5 stations sometimes exceeded the 40% UHU level, while stations in remote regions experienced much lower workloads. **However, the study noted that smaller workload is still a risk factor for fatigue as waiting for the phone to ring and under load of work links to an increase of fatigue and increased risk of accident.**

The (Parker et al., 2003) study found that across all levels of stations workload did not vary greatly across the 7-day period besides slightly elevated emergency work on Fridays and Saturdays. Emergency work followed a similar pattern over the 24-hour period. In the study, it states:

This was characterised by lower work demand in the early morning hours, gradually increasing from 0700 to 1100 hours, peaking around midday, remaining elevated across the afternoon with another peak at 1700-1800 hours and then gradually declining into the evening and night time hours (Parker, et al, 2003, book 2, p. 60).

The Parker et al., (2003) study found that some category 5 stations had a UHU of over 40% for most of the 24-hour period and across the early morning hours. The study noted that this is a potential issue as risk for fatigue increases in the early morning hours due to circadian influences and in these stations; officers may not always be able to take appropriate meal breaks, adding to risk of fatigue. As demand for ambulance service continues to increase across Australia, analysis of workload of each station will be vital to match resources to workload and to decrease risk factors of fatigue.

Book 3: *Description of Telephone Workload for Queensland Ambulance Service* Communication Centres described an analysis of 3 months of telephone data for 8 communication centres in Queensland found that regardless of the day, a reliable pattern formed across the 24-hour period. Call rate was lowest in the early morning hours, increasing between 0700 to 0900 hours and peaking between 1100 and 1200 hours, call rate remained high throughout the day with a further peak around 1600 to 1800 hours. For communication officers' workload varied depending on the hour of the day.

Communication officers experience high workloads at certain times of the day, and this coupled with long hours and exposure to indirect trauma via the telephone is a risk factor for fatigue. Communication officers experience higher stress and anxiety when answering emergency triple 000 calls compared to other calls. When evaluating shift duration and current rosters, consideration of workload by hour of day and type of call, is important in the management of fatigue.

Book 4: *Summary and Recommendations: Implications for Resource and Health Management* summarised a list of recommendations based on the questionnaire and workload of ambulance personnel findings. The following recommendations from the Parker et al. (2003) study outline the main areas that change is required:

- **Resource Allocation**

1. Reassess the matching of resources with workload demand
2. Match QAS projected workloads to projected demographic and population changes
3. Explore the use of computer simulation in resource allocation
4. Reassess the role of communications and on-road officers in patient transport services

- **Work Organisation**

5. Modify the existing roster system to take account of fluctuating workload demands, the extent of demand, the nature of the work being performed, employment category, and the need for better management of fatigue related issues
6. Reassess the current hours of work and on-call duties at small remote stations

- **Fatigue Management**

7. Develop and implement a comprehensive fatigue management program
8. Reassess incident reporting procedures to include key measures/indicators of fatigue
9. Any fatigue management strategy involve an evaluation of the work environment to identify any conditions which may compound any fatigue symptoms and lead to reduced alertness

10. Reporting procedures with respect to work schedules be upgraded for operational personnel, to enhance files and enable monitoring of fatigue in a more timely fashion
 11. Extend and reinforce the current education program on the nature and consequence of fatigue
- **Health Management**
 12. Extend the existing health and well-being program to include interventions designed to maintain and improve functional fitness and health
 13. Use the existing educational programs to provide targeted information on key areas of health deficiency identified in the research
 14. Review the current health surveillance practices within the QAS with the aim of developing a more preventative and proactive approach to health management
 15. When reviewing health practices and health related initiatives implement strategies which consider the needs of older workers
 16. Promote and encourage preventative use of the Priority One counselling service
 - **Management, Training and Worker Relations**
 17. Review the role of current management practices in the delivery of emergency ambulance services
 18. Implement a more centralised data storage facility to improve accessibility and utility of data sources
 19. Reassess job training, particularly ongoing training
 20. Develop closer working relationships between on-road and communications staff
 21. Investigate opportunities to improve the working conditions of communications officers
 22. Investigate opportunities to improve the working conditions of on-road officers
 23. Reassess the role of industrial practices in addressing issues such as missed meal breaks, extra hours of work
 24. Establish procedures to evaluate the efficacy of any changes to work practices in relation to the delivery of ambulance services and the health and well-being of the workforce
 - **Research**
 25. QAS define the scope and objectives of research concerned with work practices and the health of the workforce

In relation to resource allocation it was recommended that fluctuations across the 24-hour period be recognised, that staffing levels be increased to meet the growing demand of workload, and that a mobile workforce be developed. Findings of investigation suggest that at the time of study resource allocation and workload was unbalanced and inflexible in Queensland ambulance service. The paper makes a valid point when it states:

While no direct performance data has been obtained, reference to health related behaviour and workload demands allows identification of potential situations in which fatigue may be increased and health compromised (Parker, et al., 2003, book 4, p. 4).

Under the heading work organisation, the Parker et al., (2003) study recommended the eradication of the current 14-hour shifts (often extended by 2-3 hours overtime). The study recommended review of average weekly working hours and review of starting and finishing times of shifts. The study recommended that consecutive night shifts be limited to no more than 2 of 10 hours duration, and that the fatigue break be extended to a minimum of 12 hours. The study also recommended review of current hours of work and on-call duties for small remote stations.

To manage fatigue the study recommended development of a comprehensive fatigue management program. The study also made various recommendations for development and reinforcement of education of the consequences and management of fatigue. In the area of health management, the study recommended improvements of current interventions to improve fitness and health of personnel and review of educational programs.

Findings from the Parker et al. (2003) imply that ambulance services may need to better manage the balance between workload demands and the possible harmful effects of current work practices on the short and long term health of operational staff. The recommendations in the Parker et al., (2003) document may benefit ambulance services across Australia, but in order to act on the recommendations, further research into the workload of each individual service is required.

Following the Parker et al. (2003) study Queensland ambulance service has progressively implemented the recommendations from this study. QAS are proactively managing fatigue through resource management, resource re-allocation to match demand for service, more flexible shift arrangements through roster reform, reduction in shift duration, managing consecutive night shifts, work/break patterns, meal breaks and on-call arrangements (QAS, correspondence, 2007).

Legislative Responsibilities of Employers in Australia

State Occupational Health and Safety Acts provide employers with a general occupational health and safety framework from which to work from. It is an employer's general duty to ensure a safe and healthy work place is maintained. Legislation does not provide an employer with prescriptive measures to manage risk but requires employers to ensure safety and health standard outcomes. Legal duties are under different Acts for each state and territory but general content is similar.

Employers responsibilities

Employers have a duty to provide and maintain a hazard free work environment for their employees and ensure that the health of other non-employees is not harmed by their work (Commission for Occupational Health and Safety, 2004). Employers have the following responsibilities in ensuring health and safety of employees:

- Identify workplace factors that play a part in fatigue and to control or prevent these factors from occurring;
- eliminate or reduce risks to health and safety as much as practical (Occupational Health and Safety Act, 1985);
- provide employees with instruction, information, training or supervision to enable them to work while minimising risks to health and safety (Occupational Health and Safety Act, 1985);
- ensure that risks to health and safety in the workplace are identified, assessed, and eliminated or controlled (Occupational Health and Safety Act, 2000);
- promote a safe and healthy work environment for employees by protecting them from injury and illness and that is adapted to their physiological and psychological needs (Occupational Health and Safety Act, 2000); and
- consult with employees and elected health and safety representatives.

Employees responsibilities

It is an employee's responsibility to take care of their own health and safety at work (Commission for occupational health and safety, 2004), to comply with health and safety instructions of the employer (Workplace health and safety Act, 1995); and not to wilfully place themselves or others health and safety at risk while at the workplace (Workplace health and safety Act, 1995).

Duty of Care Responsibilities of Employers

Safe systems of work for employees and safe systems to ensure patient safety

Occupational Health and Safety Acts are based on duty of care principles. These principles are based on the prevention of workplace accidents, injuries and illness. Employers are required to organise work systems to ensure any person in the workplace is not put in danger.

- Employers' general duty of care applies to all people in the workplace and these principles include:
 - Ensure the health, safety and welfare of all employees and others while at their place of work;
 - ensure that all reasonably practicable measures are taken to control possible risks of injury as a result of the workplace;
 - general obligation of employees to cooperate with the employer on occupational health and safety issues; and
 - general obligation of employees to take care of others in the workplace.

- Employers' general duties under the Commonwealth Employment ACT (1991) include:
 - Provide safe plant and safe systems of work;
 - provide adequate facilities for employees welfare;
 - to ensure workplaces are safe and without risks to health;
 - to ensure persons can enter and leave workplaces without risk to health;
 - to ensure persons are safe when they use, handle, store, or transport plant or substances;
 - to ensure employees are provided with information, training and supervision in relation to occupational health and safety;
 - to consult with unions to develop occupational health and safety policy;
 - to continue consultation with unions on occupational health and safety issues;
 - to monitor employees health and safety at work and maintain appropriate records;
 - to provide appropriate medical and first aid supplies to employees;
 - to consult with employees and representatives on work health and safety; and
 - monitor working conditions to ensure hazards and risks to health and safety are eliminated or controlled.

Duty of care responsibilities in relation to fatigue and shift work

The implications under duty of care in relation to fatigue and shift work depend on whether employees are at risk of injuring themselves or others while at work. If it is the case that employees are at risk then an employer may be in breach of the occupational health and safety Act for that particular state or territory. Occupational Health and safety Acts from every State and Territory in Australia require employers to ensure that systems of work and the environment are safe and without risk to employees. Employers need to identify the risks associated with fatigue and shift work in order to control and minimise the risk to employees.

An employer is only required to ensure that all reasonably practicable measures are taken to control possible risks to the health and safety of employees. This means that if the risk is viewed as insignificant, but difficult and expensive to remove, the employer can argue that it is not reasonably practical to remove the hazard. However, if the risk has the potential to result in serious consequences and outweighs the cost of removal, the employer has a duty of care to remove the risk. The question to be asked is how significant is the risk of fatigue to employees and how much money and time will it cost to minimise this risk.

Beyond the Midnight Oil: An Inquiry into Managing Fatigue in Transport

In October 2000 the House of Representatives Standing Committee on Communications, Transport and the Arts were asked by the Minister for Transport and Regional Services to report on managing fatigue in the transport industry. The report highlights the current measures taken to manage fatigue in the transport industry and discusses potential ways to improve fatigue management in the transport industry.

The report acknowledges that better management of fatigue in the transport industry requires change in many aspects including; training and support, work practices, job scheduling, regulation, and awareness of work and rest patterns. The report also recognises that government and industries need to take responsibility for improving fatigue management through acknowledgement of the problem.

The report makes eleven key recommendations for the government to address. Recommendations that could relate to ambulance services include:

- promote through the Australian Transport Council and develop through state and territory law to make driving while fatigued an offence (recommendation 34)
 - involve the development of laws to suspend registration of a vehicle if driver is fatigued
 - develop fatigue testing technologies through funding research to be used at roadside and in the workplace
- the National Occupational Health and Safety commission to develop a national standard on fatigue in the workplace (recommendation 30)
 - develop a code of practice

The report discusses the role of regulations in fatigue management and how developing safety standards, codes of practice, and quality management accreditation to promote culture change is vital to change fatigue management processes. An accreditation scheme could promote a culture change through making driving while fatigued an offence similar to that of alcohol and drugs. The repercussions of driving while under the influence of alcohol or drugs is now widely accepted however fatigue is a major factor in vehicle incidents but is not viewed in the same way because of the difficulties in providing an objective measure of fatigue.

The inquiry notes that fatigue is not just an industrial issue but encompasses many areas,

Fatigue is not just an industrial issue to be negotiated between employers and employees. It is also an occupational health and safety issue, a commercial issue, a public safety issue and, at times an environmental issue. Individuals and organisations that fail to manage

human fatigue sensibly, risk having or creating accidents with a broad range of damaging and enduring consequences (p. 1-2, Dinges, 1995).

The report comments that fitness for duty should be a key element in fatigue management programs. Fitness for duty involves employees taking individual responsibility in using their rest breaks appropriately in order for them to maintain fitness commencing and during shifts. Fatigue detecting technologies are advancing and these technologies used prior to and during shifts could provide accurate measures of fatigue to employers. Computer based modelling systems can provide employers with a fatigue risk measure from the input of rosters to develop safer rostering systems.

The report acknowledged the economic causes of fatigue and the public expectations that the 24-hour society imposes on industries. Economic factors that lead to increased competitiveness between businesses have lead to less staff, working more hours, with increased workloads. Longer working hours leave less time for sleep and contribute to increasing fatigue levels.

The inquiry recognises that there is a great deal of research on the causes of fatigue. However, specific industry related research is minimal. Research on fatigue in operational settings to test management strategies is vital. Organisations spending money on this type of research can bring economic returns and improved safety. As fatigue influences long-term health prospects of employees, managing fatigue should be viewed as a long-term workforce retainment strategy.

Currently self-assessment is the only measure to detect fatigue. Education in how to recognise and manage fatigue is the main part of current fatigue management strategies. The report indicates that industries must promote a culture that does not accept the practice of working while fatigued. This culture of non-tolerance of fatigue must be instilled at all levels of industry, from management to operational staff.

Beyond the midnight oil – appendix J

Appendix J (2000) was prepared by the Centre for Sleep Research. The view of the Centre for Sleep Research is that changing economic and social patterns as well as increased demand and social pressures have resulted in significant reductions in the quality and quantities of sleep for shift workers. The Centre has conducted research that demonstrates a strong relationship between fatigue related impairment and alcohol intoxication.

Current research is unveiling fatigue as one of the most significant safety issue being faced by the transport industry. Fatigue is a critical safety issue as it can impair the following physical and cognitive functions:

- response and reaction times;
- logical reasoning;

- decision making; and
- hand-eye coordination.

The Centre notes that fatigue is a major source of accidents and injuries, represents a significant cost to the community, and costs the Australian community approximately over 1 billion dollars annually through accidents and injuries, lost production, and indirect subsidies.

The Centre for Sleep Research has developed a comprehensive fatigue management program for the Australian Rail industry and has produced the following:

- Training and education
- fitness-for-work testing sensitive to fatigue, drugs, and alcohol;
- software based fatigue modelling and management systems; and
- risk management systems for controlling fatigue as an 'identifiable work place hazard' under Occupational Health and Safety legislation.

The Centre for Sleep Research suggests that fatigue should be managed as an Occupational Health and Safety issue and not an Industrial issue. The Centre also suggests that fatigue be managed through sharing the responsibility between the employer and employee.

The Police Association Vs Victoria Police Force

Victorian police are considering terminating twelve-hour shifts due to health and safety concerns and operational factors (CCH Australia, 2006). Victorian Police argue that 12-hour shifts are not safe given the nature of the work. According to the Australian Industrial Relations Commission (AIRC), 12-hour shifts do not violate safe workplace requirements but Victorian police are entitled to change employees' rosters due to genuine health and safety and operational reasons.

The AIRC found that fatigue was a genuine risk to employees working 12-hour shifts due to the cognitive abilities needed in police work. The report states,

The AIRC found that under the 12-hour shifts there was a genuine danger of fatigue, and in stations where police officers' had to make 'split second' decisions, it was in the interest of all parties' that any fatigue factor be reduced. It also found poor rostering practices needed to be improved to eliminate the short breaks that occurred when police officers' changed from day shifts to night shifts.

The AIRC found that the Victorian police have valid operational reasons to change shifts hours. These operational reasons include; increase in demand not matching up with hours worked, difficulty in contacting police officers, and delays in investigations. Ambulance services need to reassess working hours as it is clear that 12 hour shifts are being viewed as a potential health and safety hazard to employees and the public by similar industries.

Shorter Shifts, Fewer Errors & Alert Crews

An article in the Journal of Emergency Medical Services (Garza, 2006) outlines three recent incidents that have been linked to fatigue and what this means for shift lengths. On November 16th 2006, Brian Gould, a paramedic working for Poudre Valley Hospital Ambulance Service in Colorado died in a vehicle incident after working an all night shift. At 6.40am Brian's truck crashed head on into a trailer on the opposite side of the road. Investigators concluded that it was likely that Brian fell asleep at the wheel as the road was dry, the weather was clear, and there was no sign of drugs or alcohol.

In May 2006, a pair of fire dispatchers in New Jersey fell asleep at their computers and missed a medical call at the end of a 24 hour shift. In June, 2006, an ambulance crew in Washington, D. C., failed to respond to a chest pain call after being dispatched. The crew were found asleep in the front seats of the ambulance, parked in an alley, 25 minutes later.

These serious incidents combined with increasing knowledge and research in the area of fatigue has resulted in changes to rosters. A typical roster includes shifts no longer than 10-12 hours where previously paramedics often worked 24 hour shifts. The elimination of 24 hour shifts have not been popular with paramedics and some areas have implemented a new roster schedule that includes two 12 hour shifts in a busy station and a 24 hour shift at the slower stations. Other changes include no back to back shifts and a minimum of 10 hour breaks between shifts.

Conclusions

The findings of this compendium of papers and research demonstrate that fatigue is widely recognised as a health and safety issue throughout various industries and professions in Australia and Overseas. Although fatigue is widely recognised as a health and safety issue; cultural issues, demand for services, and workforce supply and sustainability are the challenges faced by the health industry in making significant changes to current shift work practices.

Various industries are currently addressing the issue of fatigue through legislation and regulation activities across Australia. Transport industries including vehicle, rail, and aviation are addressing fatigue through legislation. The Australian Medical Association recognises the risks involved for patients and doctors and is attempting to address fatigue for doctors working in hospitals through a code of practice. The AMA have also developed a web based risk assessment survey to provide doctors with a risk rating for different rosters to empower doctors to challenge current working hours.

Although there is a substantial amount of research on the topic of fatigue, it is important that ambulance services acknowledge that results from the research may not be replicable in the prehospital clinical care environment. It would be useful to conduct research specifically designed for the prehospital environment to explore the relationship between fatigue and patient and staff safety.

Research evidence on the possible impact of fatigue on a wide range of cognitive and physical abilities is increasing and the medical industry is focusing on research into the possible repercussions of fatigue on patient care. Findings from this research indicate that an increase in fatigue results in a decrease in cognitive abilities and this in turn can cause an increase in patient errors (Beumont et al., 2001; Lieberman et al., 2002; Harrison et al., 2000; Dinges et al., 1997; Gander et al., 2000; Neri, Shappell, & DeJohn, 1992; in Dawson et al., 2001, p. 3).

Although no specific research has been conducted on the impact of fatigue on ambulance personnel and patient outcomes, research has found fatigue related impairment to be similar to moderate alcohol intoxication. An Australian study found that 17 hours of wakefulness is comparable to 0.05% BAC and 24 hours comparable to 0.10 BAC (Fletcher et al., 2003). These findings indicate that fatigue related impairment produces the same behavioural and cognitive effects as alcohol intoxication which has obvious repercussions for the safety and quality of patient care.

The main recommendations from the compendium of policy papers, legislation, and guidelines to minimise the risks associated with shift work, extended hours, and fatigue include the following:

- Roster design should minimise the amount of consecutive night shifts, extended hours, and compressed working weeks.
- Shift length to be limited to two 12 hour shifts per week and 14 hour night shifts should be eradicated due to impairment of performance.
- Rosters to incorporate slow moving forward rotating shifts and to be predictable and regular.
- Rosters to incorporate adequate rest between shifts including longer fatigue breaks for night shifts and between shift rotations.
- The length of on-call hours needs review including adequate rest between on-call hours.
- Fatigue should be measured by the amount of sleep gained in a time frame rather than primarily through length of shifts and breaks.

Fatigue management is the responsibility of both the employer and the employee. Shift work is associated with certain hazards, and although not all hazards can be completely eradicated, these hazards can be minimised. Employers are responsible for maintaining a safe working environment through constant monitoring and evaluation of hazards in the workplace. **Employees are responsible for using breaks between shifts responsibly and not endangering the safety of themselves or others while at the workplace.**

Fatigue management is an ongoing process and needs to cover; rostering, establishing fitness for work, education of personnel in fatigue management, managing incidents, and establishing and maintaining appropriate workplace conditions. Employees and employers both have a responsibility in minimising patient and individual risk. Employees need to understand the health and safety implications of working extended hours and have the knowledge and skills to practice effective fatigue management (AMA, 2006).

Employers need to provide support and resources to allow fatigue management to occur and to encourage culture change as well as providing positive reinforcement to staff that use these strategies (Australian Council for Safety and Quality in Health Care, 2003). It is the Employees responsibility to; participate in shift work training programs, use breaks appropriately between shifts, report fatigue related incidence; and report to supervisors when fatigue becomes a risk to patient care or the individual.

A fatigue management plan will involve strategies for individual, organisational support, and system wide mechanisms (Australian Council for Safety and Quality in Health care, 2003). According to the AMA (2006) risk assessment methods should include; utilise a scheduling and shiftwork specialist, techniques to calculate

potential sleep deprivation and fatigue, consultation with staff; and reviewing current research.

In order for fatigue management to occur, change on a cultural level is required. The health industry needs to foster a culture of openness and communication in order for fatigue management processes to work effectively. Stakeholders at a health and safety workshop indicated that lack of middle management skills and lack of support from administration contribute to fatigue and these issues need addressing (Australian Council for Safety and Quality in Health Care, 2003).

Like many issues that influence various organisations within the health industry, fatigue is a complex issue that is multi factorial. Operational aspects of the ambulance industry play a significant role in the management of fatigue. Stakeholders at a workshop for the Australian Council for Safety and Quality in Health Care indicated that for safe staffing strategies to eventuate the issue of workforce supply and demand would need adequate addressing.

In order to minimise the risk of fatigue staff need allocation according to predicted daily, weekly, seasonal, and annual demand. Currently demand out numbers medical services available and as the age of the population increases this demand looks only to increase. The workforce is also ageing and the ability to recover from fatigue decreases with age. When managing fatigue, demand and workforce variables need to be analysed within each jurisdiction.

In order to match resources to workload, Unit Hour Utilisation can be analysed for each station (Parker et al. 2003). To further assess the risk that fatigue impairment can have on patient and staff safety, specific industry based research is required. The level of fatigue impairment differs throughout occupations and specific tasks, further research could identify the extent that fatigue impacts patient, public, and personnel safety.

Recent incidents in the Ambulance Industry Overseas involving paramedics falling asleep at the wheel at the end of long night shifts resulted in a death of one paramedic and failed responses to critical cases (JEMS, 2006). These incidents indicate the possible serious consequences of not addressing the issue of fatigue for ambulance services especially in light of evidence that driving at the end of night shifts are particularly effected.

Although there is increasing evidence of the consequences of fatigue, lack of sleep is not seen as a serious health and safety problem in the medical industry. The Public expectation for quality and service in pre-hospital care is increasing. Communities have become aware of the relationship between fatigue, excessive hours, and error rates and will not tolerate fatigue as an excuse for error.

Fatigue is a common experience as people in the 24 hour society compete for sleep amidst a variety of activities. Fatigue does not guarantee that an incident will occur,

but increases the risk of an occurrence. Unlike alcohol, there is currently no objective measure to test levels of fatigue. However, with mounting evidence, ambulance services need to take responsibility for the impact that work schedules may have on patient, public, and operational personnel health and safety.

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