

**AN EVALUATION OF THE MAIN  
EFFECTS OF SHIFT WORK AND THEIR  
IMPACT AS VIEWED BY NEW  
ZEALAND MEDICAL RADIATION  
TECHNOLOGISTS**

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## **ABSTRACT**

This thesis investigated the impact of shift work as viewed by New Zealand Medical Radiation Technologists (MRTs). The topic was chosen because during my career as an MRT I have encountered all derivations of shift work, but was never informed of the associated effects or their potential impact. Therefore this study investigates what MRTs considered the main effects to be, while also exploring the perceived impact they have in order to propose recommendations as to the management of any effects and build a foundation of knowledge and information for all MRTs in New Zealand.

A large proportion of MRTs in New Zealand undertake shift work and minimal literature was found specific to this cohort with respect to their view of it, how they are impacted by the associated effects and other issues related to it. Notwithstanding the financial and service capability advantages to the departments in moving to this system, no-one to my knowledge has explored the effect this transition has had on the MRTs, potentially allowing substandard practices of a personal or professional nature to go unnoticed (Peate, 2007).

The thesis used a case study as the research method informed through an interpretive paradigm, with qualitative data gathered from a number of MRT participants throughout NZ via in-depth interviews and questionnaires and also through data collected by questionnaires from Charge MRTs. The key findings included the fact that the perception of shift work did not align with the actual reality. Many advantages associated with shift work were identified, such as variation of work, flexibility, free time during the day, remuneration and increased family and social time. The disadvantages identified included altered sleep patterns, a negative impact on health, decreased family and social opportunities, performance impairment and detrimental professional effects. Some MRTs felt that the thought of shift work was worse than actually working the shift, while most found that their attitude towards shift work had a huge impact on how they coped with it. Society's perception and treatment of shift workers had an impact, however most MRTs see themselves performing shift work in the longer term.

## DECLARATION OF WORK



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### Declaration

**Name of candidate:** Kara Leanne Heal

This Thesis/~~Dissertation/Research Project~~ entitled Shift work: An evaluation into the main effects and their impact as viewed by New Zealand Medical Radiation Technologists is submitted in partial fulfillment for the requirements for the Unitec degree of Masters of Health Science.

(a)

(b) CANDIDATE'S DECLARATION

I confirm that:

- This Thesis/~~Dissertation/Research Project~~ represents my own work;
- The contribution of supervisors and others to this work was consistent with the Unitec Regulations and Policies.
- Research for this work has been conducted in accordance with the Unitec Research Ethics Committee Policy and Procedures, and has fulfilled any requirements set for this project by the Unitec Research Ethics Committee.  
Research Ethics Committee Approval Number: 2009-957

Candidate Signature: *KLHeal*

Date: 25 September 2010

Student number: 1299857

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## **CHAPTER I: INTRODUCTION**

This research thesis will investigate the main effects of shift work and their impact on New Zealand MRTs. The objectives of this project were fourfold:

1. to investigate what MRTs view as being the main effects of shift work
2. to investigate the impact of the identified effects
3. to determine whether the expectations of shift work align with the perceived reality of performing shift work
4. to propose recommendations as to the management of those effects identified by MRTs as having the most profound impact on them.

There is no agreed definition of shift work in the literature, however it is loosely defined as a system where people work different periods of time often outside of normal daylight hours, on a regular basis as directed by the organisation they work for (Rosa & Colligan, 1997; Wilson, 2002; Boggild & Knutsson, 1999). Shift work is thought by Taylor, Briner and Folkard (1997, p. 67) to be “a form of work scheduling in which workers succeed each other at the same workstations in shifts that can be organised into rotating, continuous patterns or discontinuous patterns.” Shift work has many varied forms and does not solely include night shift as is the common belief, but encompasses afternoon and evening shifts, nights, rotating shifts, on-call work and with the inclusion of regular dayshifts (Blachowicz & Letizia, 2006; Rosa & Colligan, 1997; Jay, n.d.). Shift schedules may be part time or full time and may rotate through different times of the week or month with rosters frequently changing between days, afternoons or evenings and nights, or shifts may be permanent and regular (Rosa & Colligan, 1997). Shift lengths also vary and shifts may run consecutively over many days or weeks (Rosa & Colligan, 1997; Berger & Hobbs, 2006). Knutsson (2004) brings to the fore the fact that the term ‘shift work’ has been used in different ways in scientific literature which makes it difficult to compare the results of some studies.

Shift work is inherent in many healthcare positions, as it is necessary for in-patient services to be provided on a 24 hour basis and it is essential to provide patients with optimum levels of continuous care, as is the case for the medical imaging service in New Zealand (Scott, 2007; Wilson, 2002; Peate, 2007). The United Kingdom Royal College

of Nursing (1997) consider shift work to be an occupational hazard and this is supported by the Accident Compensation Corporation (ACC) (2006) as they comment that it disrupts natural circadian rhythms which leads to patient and worker safety, productivity and staff health being negatively affected.

Medical Radiation Technologists (MRTs) in New Zealand work a varied range of shift schedules, depending on their employer workload requirements, but typically encompassing the various aspects of shift work in a rotating or on-call manner. Staff may be required to work their shift in the department unaccompanied with no additional support, particularly in the evenings or on nightshift, with napping dissuaded and scheduled rest breaks frequently not possible during these times. If staff are working on-call, they are not required to be at work but they must be contactable at all times and be able to get to work quickly if the need arises. The effect of shift work on health, safety, family and social life are well noted in the literature, however while some people prefer shift work it appears that most staff do not actively seek it, simply accepting it as a necessary part of their chosen profession or because no other job option is available (Canadian Centre for Occupational Health & Safety, 1999; Rosa & Colligan, 1997).

The review of the literature on shift work to date has located much literature pertaining to shift work over all professions worldwide, however a lack of literature was found pertaining to shift work in New Zealand. In Australia, where working conditions and environments are similar for MRTs, there appears to also be a shortage of information, with Zhao and Turner (2008) commenting that their extensive literature review located no studies on Australian nurses with respect to shift work and health effects. The only study found was set in Australia and conducted by Pisarski et al. (2006) on reasons for nurse turnover where shift work was found to be a key factor. It would appear that there are some large gaps in the New Zealand literature on shift work, particularly for MRTs and so this research is pioneering in this field.

Zhao and Turner (2008) believe that it is imperative to have a greater knowledge of the impact shift work has on health care professionals, and until the main issues for MRTs undertaking shift work are understood, and the alignment between the expectation and

perceived reality of this phenomenon is comprehended, service to the patient cannot be enhanced, nor can the profession be allowed to move forward in this area. It is for the aforementioned reasons that this topic holds great significance and importance within the MRT profession, making this study a worthwhile topic for my Masters Thesis.

Therefore, this thesis will investigate the main effects of shift work and their impact as viewed by New Zealand MRTS with the additional aim of determining whether the expectation of shift work align with the perceived reality of performing shift work and proposing recommendations as to the management of those effects identified by MRTs as having the most profound impact on them. It uses a case study research method with qualitative data gathered from a number of MRT participants through in-depth interviews and questionnaires and also through data collected by questionnaires from Charge MRTs. Only the effects of shift work identified by MRTs will be included in the thesis. The thesis will cover the background of shift work, including a historical overview, reasons for shift work in a modern society and legal requirements pertaining to shift work. The literature review will investigate sleep patterns and deprivation, fatigue, health effects, social and family effects, performance and impairment and professional effects. The research procedures chapter will include the research and data collection methodology, data analysis, evaluation of methods and ethical considerations. This will be followed by the discussion chapters, which address the initial and overall stance on shift work and the identified main effects. The implications and recommendations as a result of this research are discussed in the conclusion.



## **CHAPTER II: BACKGROUND**

### **HISTORICAL OVERVIEW**

The first traceable history of shift work goes back to nomadic tribes that required camp guards and shepherds to protect those who were sleeping during the evening hours (El-Ad, 2009). As time progressed, shift work was performed by soldiers of military camps who protected against surprise attacks and sailors who kept watch at night to ensure their ship did not run aground (Shift Worker Online, 2005; El-Ad, 2009). Prior to the invention of the light bulb by Thomas Edison in 1879, shift work was relatively rare as workers could not see what they were doing, however the ancient Greeks and Romans did use candlelight and flaming torches to assist them in bringing products and supplies into Rome during the evening hours (Shift Worker Online, 2005; Glazner, 1991). The growth of shift work was temporarily halted during the Middle Ages (Glazner, 1991) but was partially revived during the Renaissance as the importance of commerce heightened and passengers and materials required frequent transportation at any hour of the day or night (El-Ad, 2009).

Towards the end of the industrial revolution shift work took on a whole new meaning and was revitalized as the demand increased and the ability to work in the dark existed (Phillips & Houghton, 2007; El-Ad, 2009). In the late 1800s, industrialists realised the benefits of shift work and this, coupled with the discovery of electricity, meant shift work quickly became predominant in the manufacturing industry as multiple shifts throughout the 24 hour period meant maximum use of equipment and buildings and the potential to manufacture more products which meant increased profits for the company (El-Ad, 2009; Cohn, 2007). It is proposed that in England during this period, approximately 7% of the workforce was performing shift work (Glazner, 1991).

Shift work was common during the First and Second World Wars and at the completion of World War Two, the use of shift work swiftly spread throughout society (Shift Worker Online, 2005). As societies progressed and expanded it was recognised that many facilities and services would need to increase to cope with the demand and many services such as communication, transport, navigation, law enforcement, health care and food

delivery became more important and consequently shift work was introduced and has since become common practice in these areas (El-Ad, 2009). Shift work is now considered to be “an essential aspect of modern society due to the needs of industry and the widespread demand for 24 hour services” (Reid, Roberts & Dawson, 1997, p. 447).

#### **REASONS FOR SHIFT WORK IN MODERN SOCIETY**

Throughout the last century, the standard working week was Monday-Friday, 9am-5pm and was designed so as not to encroach on workers’ social time and the eight hour workday evolved from the belief that “the 24 hour day should be split evenly between work, recreation/relaxation and sleep” (Lindsey, 2007, p. 3). During the past 50 years, many modifications have taken place in the organisation of shift schedules as was necessary to meet the needs of the modern 24 hour society (Spurgeon, 2003). The prevalence of shift work varies from country to country and year to year and is typically driven by the requirements of the industry as opposed to the preferences of the worker (McMenamin, 2007; Glazner, 1991).

It is necessary for medical facilities to provide a 24 hour service, meaning that shift work becomes a critical element of the health organisation, as it is in the emergency services field with firemen and police working continuously and for personnel within the Military (Wilson, 2002; McMenamin, 2007; Hughes & Stone, 2004; Phillips & Houghton, 2007). Due to the fact these occupations supply continuous critical services around the clock, other support services such as transport services, communication personnel, hygiene services, food and retail outlets and broadcasting services have been required to expand their hours and service to accommodate the needs of these shift workers. Shift work is now utilised in many different industries worldwide, particularly as countries have become more globally intertwined due to time zone differences (Phillips & Houghton, 2007; Wilson, 2002; Grosswold, 2004; Murphy, Wideman & Nadzam, 2003; Cohn, 2007).

The introduction of modern technology has made this transition to shift work more feasible in the modern era and it has become a widespread phenomenon with modern society moving towards a pattern of working 24 hours per day (Rosa & Colligan, 1997;

Zhao & Turner, 2008; Spurgeon, 2003). The number of shift workers worldwide has risen markedly over the past several decades and it is believed that approximately 20% of workers participating in the work force in developed countries are shift workers (Zhao & Turner 2008; Pisarski, Bohle & Callan, 2002; Admi, Tzischinsky, Epstein, Herer & Laue, 2008). Shen et al. (2006) cite a recent European Union survey conducted in 2000 on working conditions and this estimated that only 24% of the working population of the 15 European Union countries included undertook a 'normal' or 'standard' work schedule and this implies a much larger number conducting shift work than that that proposed by Pisarski et al. (2002), however the numbers fluctuate markedly over the years, as does the definition of shift work which may explain this discrepancy.

Despite the fact that shift work has been necessary in the healthcare environment as in-patient wards needed to be staffed continuously with Nurses and Doctors, it has not been until recently in New Zealand that shift work has been introduced into the radiographic workforce as previously, "the majority of the radiographic workforce tended to work on-call or on stand-by, rather than a shift pattern" (Society of Radiographers, n.d., p. 29). Many medical imaging departments around the world have made the transition towards rostered shift work for varying reasons such as apparent financial savings and observance of pertinent legislation (Society of Radiographers, n.d.). Although shift work is a necessary aspect of modern life and society has become dependent on it for the effective functioning of many services, many problems are caused by its implementation and as a result, people must make lifestyle choices that encourage optimal biological functioning (Department of Labour, 1998; Phillips & Houghton, 2007; Berger & Hobbs, 2006).

#### **INDIVIDUAL ACCEPTANCE FOR SHIFT WORK**

Most shift workers live in a society that is orientated towards working during the day and recuperating at leisure in the evening and shift work causes great disruption to this pattern, with the degree of disruption dependant on when it imposes on this cycle. Some workers may have chosen to conduct shift work, while others have had it imposed on them as a consequence of their choice of job and as a result, different individuals display considerable varied abilities to be able to tolerate shift work, with workers who accept and are content with their shift schedules coping better than those who are not (Taylor et

al., 1997; Occupational Safety & Health, 1998a; Wilson, 2002; Hughes & Stone, 2004; Berger & Hobbs, 2006). Shift workers living with people who are orientated to a day shift roster are thought to be especially vulnerable (Learthart, 2000; Reid & Dawson, 2001).

Shift work strain may be a factor in this level of acceptance, incorporating disruption to circadian rhythms, impact on sleep patterns and social factors (Wilson, 2002). The role of shift work as a stressor leading to intolerance may be due to several prevailing variables. These incorporate individual characteristics such as age, gender and fitness, home environment incorporating family situation and marital status, social and community factors including social life, hobbies and length of commute to work, work environment including job satisfaction, workload and job stress and shift work schedule incorporating overtime requirements, length of shifts and frequency of weekends off (Garabino et al., 2002; Scott, 2000). Due to the complex nature of shift work, the degree of individual acceptance may be continually evolving.

## **LEGAL REQUIREMENTS**

### **Employment Agreement between MRT and Employer**

Shift work is a major issue for any industry or organisation that utilises it. Negotiations over shift work conditions and contracts can be time consuming and are often the most incommensurate of negotiations between an employer and their employees (Department of Labour (DOL), 1998). The majority of MRTs in New Zealand who are in paid employment will have signed either an individual employment agreement or come under the umbrella of a collective employment agreement which is legally binding between the MRT and employer. The Employment Relations Act (2000) aims to “build productive employment relationships through the promotion of mutual trust and confidence in all aspects of the employment environment and of the employment relationship” (MidCentral District Health Board, 2008, p. 19). The employer is responsible for meeting their obligations set out under this Act, including “compliance with the appropriate employment agreement covering each individual employee” (ibid), while the employee is also responsible for being familiar and complying with the Act, as well as

with the organisation's disciplinary procedures, rules of conduct and their own employment agreement (ibid).

### **Health and Safety in Employment Act**

The Health and Safety in Employment (HSE) Act (1992) is legislation that applies to all New Zealand workplaces and seeks to promote the prevention of harm to all people at, or within, the vicinity of a workplace (DOL, 2009). The HSE Act was first passed in 1992, but was reviewed and amended substantially in 2002. It is administered and enforced in most workplaces by the DOL and its objective is to promote the prevention of harm to all people at work and others in, or in the vicinity of, places of work (DOL, 2009). The Act applies to “all New Zealand workplaces and places duties on employers, the self-employed, employees, principals and others who are in a position to manage or control hazards” (DOL, 2009, p. 1).

The HSE Act (1992) states that “employers are required to take all practicable steps to prevent harm occurring to employees” (DOL, 1998, p. 2). In order to achieve this, the law emphasises that employers are required to “adopt a systematic approach to identifying, assessing and controlling hazards at work” (DOL, 1998, p.2). Despite its complex nature, shift work has been successfully implemented in many industries and organisations in New Zealand and the New Zealand Occupational Safety and Health (OSH) service suggest this is possible by focusing on the entire context of shift work as opposed to just focusing on the specific roster design (DOL, 1998).

Under the Act, employers and employees have clear and defined responsibilities. Employers are responsible for involving their employees in decisions regarding shift work and ensuring that the roster allows staff to work in a safe manner (DOL, 2007b). Employers are required to train and educate their staff about the hazards they face in the work place, including the management of fatigue and they should be aware of staff who may not be coping and monitor their health when they face significant hazards (DOL, 2007b; Shift Work Services, n.d.). Employers are also obliged to manage the change to shift work to help accommodate the employee's lifestyle and minimise harm to their health, work performance and quality of life (New Zealand Safety Council, 2003). The

Act requires employees to arrive fit for work, behave safely in the workplace, use opportunities for recuperation wisely and ensure that their personal life choices do not present a risk of harm to either themselves or the people at their place of work (ACC, 2009; Department of Labour, 1998).

### **MRTB Code of Ethics**

The International Council of Nurses (2000) holds an official position on shift work and believes that nurses must be made aware of the associated professional and occupational implications. The Medical Radiation Technologists Board (MRTB) and New Zealand Institute of Medical Radiation Technologists (NZIMRT) hold no similar official position, although they have jointly generated a Code of Ethics (see Appendix One) to assist MRTs working in medical imaging to maintain a high standard of ethical conduct (MRTB, 2004a), however this does not allude to shift work in any way. Depending on the suitability of the individual MRT for shift work and the degree of health, sleep, performance, professional, social and family effects experienced as a result of shift work, there is the potential for a negative impact on each of the principles comprising the code of ethics which may be detrimental to the career of the MRT and the health and safety of the patient.

In summary, shift work is necessary in medical facilities for the provision of a 24 hour society, however the tolerance and acceptance of shift work by the individual worker as it clashes with the typical orientation of a diurnal society may impose negative consequences for the MRT and the patient. Legal requirements such as an Employment Agreement, the Health and Safety in Employment Act and MRTB Code of Ethics set out the requirements of the MRT and their employer where shift work is concerned. In order to uphold these regulations, the main effects of shift work must be identified and recognised so that all parties can ensure the pertinent legislative requirements are not breached.

## **CHAPTER III: LITERATURE REVIEW**

There are many effects of shift work reported in the literature. These include sleep deprivation and disruption to sleep patterns, fatigue and the manifestation of diverse health effects. Performance and impairment, social and family effects are also recognised. The literature review will explore these effects in detail.

### **SLEEP PATTERNS AND DEPRIVATION**

#### **Definition**

Blachowicz and Letizia (2006, p. 275) define sleep as “an active physiologic process that is fundamentally necessary for well-being and optimal functioning” of the human body, and Jay (n.d., p. 5) comments that “sleep is vital; no sleep equals death.” Sleep deprivation is thought to be the most immediate and worst consequence associated with shift work (Rajaratnam & Arendt, 2001; Rochfort, 2007).

Perkins (2001) and the Department of Labour (2007a) note that short term sleep loss such as sleeping less than eight hours for a night or two, may not cause serious problems, however several episodes of sleep loss can accumulate and create a sleep debt which they state has noticeable effects on performance. Sleep debt is calculated as the ideal amount of sleep required minus the actual amount of sleep obtained, hence the more sleep that a person misses, the greater the sleep debt that accrues and if left untreated, the consequences can be severe (Perkins, 2001; Peate, 2007; Jay, n.d.). Sleep loss and debt are cumulative and shift workers are at particular risk of accumulating a significant amount of sleep debt if the pattern of shift work continues and the effects of sleep loss and poor quality sleep accumulate (Department of Labour, 2007a; Jay, n.d.; Muecke, 2005).

#### **Sleep Cycles**

While sleeping, the body goes through an active process incorporating two different sleep cycles, Non-Rapid Eye Movement (non-REM) and Rapid Eye Movement (REM) (Phillips & Houghton, 2007; Thurston, Tanguay & Fraser, 2000). Non-REM sleep consists of four stages that reflect a range of mental activity and depth of sleep (Thurston et al., 2000). Stage one is where an individual transitions from wakefulness to a deeper

level of sleep and stage two consists of light sleep which occupies the longest part of a full sleep cycle (Blachowicz & Letizia, 2006; Thurston et al., 2000). During stages three and four restorative processes occur and control the degree to which an individual feels rested (Blachowicz & Letizia, 2006; Thurston et al., 2000). REM sleep has only one cycle which precedes stage four non-REM sleep and composes the last portion of a complete sleep cycle (Blachowicz & Letizia, 2006).

Each stage of sleeping is very important for different parts of the brain and the human body “needs sleep for rest and repair” (Perkins, 2001, p. 65). It is important to get uninterrupted sleep for long periods of time because each time sleep is broken, the cycle resets to the light sleep period, resulting in less overall replenishment for the body and mind (Phillips & Houghton, 2007; Jay, n.d.). The interruption of these processes when sleep is continually disrupted, as occurs when an MRT is on-call, could promote shifts as a better alternative as they potentially encourage a healthier sleep pattern.

### **Importance of Sleep**

Sleep, like hunger and thirst is a basic physiological necessity that cannot be denied (Reid et al., 1997; Department of Labour, 2007a). In general, 90% of the population require one hour of sleep for every two hours they are awake resulting in an average of eight hours sleep per 24 hour period (Lamond et al., 2004; Peate, 2007; Perkins, 2001). In addition to this, the body requires at least four hours of quality sleep which is continuous and uninterrupted in order to allow for deep, refreshing, slow wave sleep to replenish energy resources (Phillips & Houghton, 2007; Thurston et al., 2000). In the long term, the average amount of sustainable sleep needed for health and alertness is between seven and nine hours per night, however according to the Department of Labour (2007a, p. 7), “most people need at least six hours of unbroken sleep in any 24 hour period to remain alert, assuming a zero sleep debt.”

Cooper (2003, p. 77) describes sleep as “that mysterious thief that consumes one third of our life” and although sleep is a biological necessity there appears to be a sense by others that sleep is either optional, a luxury or simply unimportant, as opposed to a compulsory requirement (Blachowicz & Letizia, 2006; Colten & Altevogt, 2006). Some people



accept sleep deprivation and constant sleepiness as an inevitable part of their professional role as a shift worker, or their personal role as a spouse or caregiver, resulting in professional performance or social responsibilities taking preference over obtaining the necessary sleep, while others perceive sleep to be an antisocial activity (Colten & Altevogt, 2006).

The cause of sleep deprivation for shift workers is multi-factorial and includes exogenous sources such as behavioral factors (physical exercise, drug or caffeine use), environmental conditions, social and domestic factors (age and underlying sleep disorders), and job characteristics (incorporating shift schedule and utilisation of breaks); and endogenous sources such as sleep (including the quality and quantity) and circadian rhythms (and their alignment with the sleep/wake cycle) (Scott, 2000; Jay, n.d.).

### **Shift Schedule**

Shift work has the potential to negatively influence sleep disturbances due to the reduced quantity and quality of sleep which is common during shift work, particularly with night shift (Occupational Health & Safety, 1998a; Santos et al., 2004). A study performed by Sveinsdottir (2006) found no association between types of shift schedule and quality of sleep. However this is in stark contrast to the majority of the literature which shows that shift work, especially if it follows a rotating nature, displaces sleep patterns and causes sleep disruption which hugely affects the duration and quality of the sleep obtained compared to the dayshift (Lavie, 2001; Department of Labour, 1998; Kivimaki, Kuisma, Virtanen & Elovainio, 2001). In fact Ruggiero (2005) comments that shift work reduces the quantity of sleep by up to two hours per day while simultaneously negatively impacting on the quality of sleep obtained. Akerstedt, Ingre, Broman and Kecklund (2008) conducted a self-report study of 3,493 Swedish citizens and found that there were significant differences between the sleep obtained on night shift and day shift, with night shift staff reporting 'too little sleep' and 'nodding off during work' to be problematic, however it must be noted that this study was conducted on randomly selected citizens, not within the medical field and it was not succinctly written, with limited discussion and conclusions drawn.

Gold et al. (1992) performed a hospital based survey in a Massachusetts hospital that examined the impact of work schedule on sleep patterns, sleepiness and accident rate of 635 female nurses. The rotating and night shift nurses in their study reported fewer hours of sleep, respectively reporting 1.8 and 2.8 times the increased odds of reporting poor quality sleep than their dayshift colleagues respectively. Nodding off during the shift occurred in 35.3% of rotating nurses and 32.4% in nightshift nurses, compared to 2.8% of the dayshift nurses; however it was not noted if any activities promoted this occurrence. The chances of reporting an accident or error during the shift was twice as high for rotating nurses as for dayshift nurses. Although the data collected is all self-report and the study is quite dated, the results demonstrate that sleep deprivation and the misalignment of the circadian phase as experienced during rotating shift work has a significant influence on sleep duration and quality and the resulting impact on performance as shown by the results is undeniable. Santos et al. (2004) conducted a study in Brazil and their results support these findings as they revealed that the sleep patterns of 32 bus drivers were shorter and more fragmented and therefore of degraded quality when sleep occurred during the day following a shift, albeit that the drivers fell asleep more quickly which is most likely due to their increased sleep debt and fatigue levels.

The aim of the study conducted in Sweden by Axelsson, Akerstedt, Kecklund and Lowden (2004) was to analyse precisely what phase of the shift schedule related to the differences in reported work satisfaction, specifically with the problems reported for sleep and fatigue. They conducted a survey of 317 non-medical professionals and then invited 100 of these participants to be involved in a diary and actigraphy study (based on most and least satisfaction scores from the survey), of which 56 participants (36 males and 20 females) accepted. The results showed that there were significant variations in the timing of sleep and total sleep time with subjective ratings of sleep sufficiency and quality decreasing as the shift schedule progressed through days, evenings and night shifts. Dissatisfied workers reported more sleepiness during their shifts than their satisfied counterparts, however as this effect disappeared after recovery sleep there was no evidence in support of sleepiness accumulating across the shift cycle, which appears to be contradictory to the main body of literature. Interestingly, Axelsson et al. (2004)

found no main effects for decreased performance as measured by reaction times or concentration lapses with respect to shift schedule, time, satisfaction or gender. This result was unexpected and also appears to contradict the literature. These two contradictions may however be explained by the very small sample size and lack of females, which may have either masked some of their issues or overemphasized those of the males and thus these findings should be considered with prudence.

### **Effects of Sleep Deprivation**

Although there is no consensus on the amount of impairment resulting from a given amount of sleep deprivation, there are varied and serious consequences on job performance and social functioning (Rajaratnam & Arendt, 2001; Scott, 2000). Sleep deprivation can affect the quality of a shift worker's life as it can damage their health, personal relationships and the care they provide their patients (Perkins, 2001). Moore et al. (as cited in Colten & Altevogt, 2006, p. 174) note that "there can be considerable negative socio-cultural consequences when the sleep behaviour, either intentionally or unintentionally, is unacceptable." Sleep deprivation can affect brain function and a health practitioner affected by a large amount of sleep deprivation is at risk not only of chronic fatigue and stress, but also altered behaviour patterns or mental health status (Jay, n.d.; Morshead, 2000; Perkins, 2001; Berger & Hobbs, 2006). A large burden of sleep deprivation may also impair body functions and the immune response may be diminished, the body may be forced to resort to micro-sleep, the appetite may be increased or the individual may experience glucose intolerance or insulin resistance (Perkins, 2001; Jay, n.d.; Department of Labour, 2007a).

### **FATIGUE**

#### **Definition**

Fatigue is defined by Occupational Safety and Health (1998a, p. 7) as "the temporary inability, or decrease in ability, or strong disinclination to respond to a situation, because of previous over-activity, either mental, emotional or physical." Despite sharing many characteristics, sleepiness differs from fatigue because sleepiness is reported by Knutsson (2004, p. 1039) as "difficulty staying awake even when wakefulness is required" while fatigue is described as an omnipresent phenomenon of weariness or weakness that is

constantly reported in the healthcare setting for physical, emotional and mental reasons and is often cited as a major reason for intolerance to shift work (Shen et al., 2006; Occupational Safety & Health, 1998b; Society of Radiographers, n.d.). Williamson and Feyer (2000, p. 649) report that “recent authors have argued that society has too easily accepted the hazards of fatigue, despite evidence of increased risk to health and safety” and cite Mitler et al. (1988) and the Report on the National Commission on Sleep Disorders Research (1993) as two such examples, however no indication is given as to the context of the fatigue experienced or how it is measured.

Fatigue is a common outcome of stress and a recognised consequence of shift work and its effects can compromise workplace health and safety (Blachowicz & Letizia, 2006; Occupational Safety & Health, 1998a, 1998b). Reports of fatigue are higher among shift workers than those solely working during the day, highest during night work, less on the morning shift and least on the afternoon shift (Occupational Safety & Health, 1998a; Harrington, 2001; Society of Radiographers, n.d.). Chronic fatigue can lead to feelings similar in nature to jet lag and it is important to recognise the seriousness of fatigue as an occupational hazard (Lindsey, 2007; New Zealand Safety Council, 2003). Lindsey (2007, p. 7) mentions that “fatigue is a serious, challenging problem that requires informed, forward thinking managers to take action sooner rather than later.”

### **Causes of Fatigue**

Many lifestyle and work related factors can contribute to fatigue including: shift work, particularly night shift; physical and mental task demands, including workload; environmental conditions, such as lighting and noise; biological factors, including sleep and pre-existing medical conditions; and activities away from work, such as family and social commitments (ACC, 2009; Department of Labour, 2007a; Jay, n.d.). Shift workers are thought by Hossain, Reinish, Kayumov, Bhuiya, and Shapiro (2003) to be at particular risk of experiencing work-related fatigue as a result of the desynchronisation of their internal circadian rhythms with external cues and the resultant sleep deprivation that ensues.

The aim of a study performed in Canada by Shen et al. (2006) was to examine the effects of the frequency of shift work on subjective fatigue and sleepiness ratings. An array of eight questionnaires was sent to 800 participants who worked at a major Ontario employer, but for whom no specific details are provided. 489 were not deterred by the immense volume of information required of them, resulting in an acceptable 61% return rate. The results of the study indicated that the frequency of shift work significantly affected the severity of the subjective fatigue experienced by the participants, as measured by the Fatigue Severity Scale (FSS). As the frequency of shift work increased, so too did the mean subjective FSS score between the control group who had never done shift work and the group who worked shifts three or more times every week. This result was not extended to subjective sleepiness ratings as measured by the Epworth Sleepiness Scale (ESS). Gender was not found to have an effect on FSS or ESS, however as only 52 of the 489 participants were female, the reliability of this result appears questionable. Garabino et al. (2002) commented that female shift workers experience sleep issues and chronic fatigue more often and to a greater extent than their male colleagues, based on the stress and disruption to their hormonal cycles. While the results appear plausible, a flaw in the experimental design of this study was the solitary use of a self-reporting, subjective data collection method as it can be susceptible to reporting biases or premeditated fabrications. They acknowledged this flaw as a limitation and suggested that the use of an objective measurement tool would have allowed the results to be confirmed. The use of interviews or focus groups as a data collection method, in conjunction with the questionnaires would have enabled the results to be triangulated and validated, increasing the reliability of the study.

### **Effects of Fatigue**

Fatigue is linked to deterioration in performance and poor judgment, which increases the risk of accidents and injuries, often these may be inconsequential and create only minor delays, however the risks of severe equipment damage, personal injury and public safety can be far greater (Knutsson, 2004; Lindsey, 2007). Fatigue induced human errors such as Three Mile Island and Chernobyl had major consequences for public safety as well as for the workers involved (Department of Labour, 2007a). Lindsey (2007, p. 5) states that “research suggests that fatigue-related errors are common well before the point at which

an individual no longer can stay awake. Inattention may get much of the blame, but fatigue often is the culprit.” In a medical setting, the Department of Labour (2007a) reported that a study of New Zealand Anaesthetists found that 32% recalled making a fatigue-related mistake in the six months prior to the study, however no specific details regarding the study were supplied to facilitate further investigation.

The long term health of the shift worker may also be affected as a consequence of fatigue as it may be associated with individual misery, impulsiveness, aggression, irritability and angry outbursts that can lead to counterproductive behaviours emerging (Lindsey, 2007; Muecke, 2005; Department of Labour, 2007a). According to Blachowicz and Letizia (2006, p. 275), fatigue may result in an “increase in the use of stimulants to combat chronic sleepiness” and they also note that “individuals may consume more high-fat, high-sodium fast foods and get less exercise” (p. 275), which can have adverse effects on their overall general state of health.

The main symptom of fatigue is an uncomfortable, general feeling of weariness and apathy and these may often be associated with sleepiness and increased micro-sleeps or falling asleep on the job, irritability, lightheadedness, depression, changes in mood and increased susceptibility to illness may also transpire (Occupational Safety & Health, 1998a; Knutsson, 2004; Lindsey, 2007; ACC, 2009; New Zealand Safety Council, 2003; Blachowicz & Letizia, 2006). Fatigue may impair many physical abilities including strength, speed, response time, co-ordination, decision making and balance (Jay, n.d.).

## **HEALTH EFFECTS**

### **Definition**

The World Health Organisation (as cited in Atkinson, Fulick, Grindey & Maclaren, 2008, p. 672) defines health as “the state of complete physical, emotional and social wellbeing, not merely the absence of disease or infirmity.” Shift work is a source of occupational stress that can have severe acute or long-term effects on the physiological and psychological health of workers (Pisarski et al., 2002; Morshead, 2000). Stress is defined as being “a particular relationship between the person and the environment that is

appraised by the person as taxing or exceeding his or her resources and endangering his or her wellbeing” (Lazarus & Folkman, as cited in Boggild & Knutsson, 1999, p. 89).

There are a number of health effects associated with shift work and some of the main effects regarded as being particularly important include cardiovascular disease, reproductive effects, gastrointestinal disorders and mental health issues, with other adverse effects appearing to be diverse and affecting shift workers overall sense of well-being (Society of Radiographers, n.d.; Peate, 2007; Spurgeon, 2003; Reid et al., 1997). Reeves, Newling-Ward and Gissane (2004, p. 216) comment that the above disorders can all “be linked to disruption of the natural circadian rhythm, changes in physical activity levels and dietary food intake habits.” Shift workers may also experience more common colds and influenza than non-shift workers and may be more susceptible to viral and bacterial infections due to the immunological response of the body being weakened in proportion to the amount of sleep deprivation accumulated (Scott, 2007; Learthart, 2000; Poissonnet & Veron, 2000; Harrington, 2001; Perkins, 2001). Most immediate disturbances associated with shift work are related to the shift schedule and often persist only for limited lengths of time (Knutsson, 2003).

In addition to the unfavourable impact of shift work on performance, family and social life, there is also an increasing amount of literature which supports shift work as being unhealthy and resulting in increased risks of behavioural and health related morbidity, as shift workers experience more untoward health effects than their day working colleagues (for example, Phillips & Houghton, 2007; Scott, 2007; Zhao & Turner, 2008). Surprisingly, the study results reported by Admi et al. (2008) conflict with this wealth of literature, as they found that non-shift working nurses complained significantly more than shift working nurses about their health problems and sleep disturbances. There may be many reasons for this which were not explored, for example shift nurses may choose to work shifts, or they may be more accepting that these effects are part of the job and so ignore them, alternatively they may work through their illness and sleep deprivation because they know their shifts will be difficult to fill at the last minute or they value the remuneration which working shifts provides. Knutsson (2004) believes that we still know very little about the causal pathways leading from shift work to the associated health problems.

### **Gastrointestinal (GI) Disorders**

The most frequently reported health problems reported by shift workers are GI disorders (Spurgeon, 2003; Reid et al., 1997). Research suggests that shift workers experience more upset stomachs and general gastric discomfort, heartburn, dyspepsia, constipation, flatulence, stomach ulcers and bowel disease (such as constipation, diarrhoea, stomach, ulcers, gastroduodenitis, chronic gastritis and colitis) than day workers, which might result from digestion following its own circadian rhythm that is disrupted by the shift work schedule (Rosa & Colligan, 1997; Blachowicz & Letizia, 2006; Reid et al., 1997; Society of Radiographers, n.d.; Thurston et al., 2000; ACC, 2006; Wilson, 2002; Garabino et al., 2002).

The cause of GI disorders in shift work is thought to be multi-factorial in nature, incorporating dietary factors and lifestyle choices, in conjunction with circadian rhythm disruption, as the body is not designed for a nocturnal intake of energy and nutrients (Harrington, 2001; Scott, 2000; Atkinson et al., 2008). The shift schedule and schedule-related changes in eating can interfere with GI function because inadequate timing of food intake with respect to the optimal circadian phases of gastric secretion and emptying mean the digestive system is ill-equipped to cope with the quantity and composition of a normal daytime meal when consumed in the evening (Garabino et al., 2002; Spurgeon, 2003; Atkinson et al., 2008). Shift work can interfere with regular eating and digestion patterns, but Rosa and Colligan (1997, p. 18) notes that “digestive problems also could be caused by lack of nutritious food” and as a result Thurston et al. (2000) believe that it is imperative that healthy food is available in the workplace for shift workers.

### **Cardiovascular Disease (CVD)**

CVD is a major medical concern as it is “the leading cause of death and disability in most industrialized countries” (Boggild & Knutsson, 1999, p. 85). There is escalating evidence of an association between shift work and CVD, particularly with night shift, however the link is not considered to be as strong as that between shift work and GI disorders (Spurgeon, 2003; Reid et al., 1997). Shift workers have a slightly higher incidence of CVD and ischaemic heart disease than their non-shift working colleagues,



specifically an increased incidence of raised blood pressure, angina, coronary artery disease, hypertension and myocardial infarctions are observed in shift workers (Occupational Safety & Health, 1998a; Learthart, 2000; Poissonnet & Veron, 2000; Blachowicz & Letizia, 2006; Scott, 2007; Reeves et al., 2004).

Rosa and Colligan (1997) comment that heart problems are noted more often among shift workers than day workers, in particular, those with an extended length of shift work experience have an increased chance of developing heart disease. They provide an example of research performed on paper mill workers in a Swedish town, but do not reference the research. Twarog (2005) comments that many clinical studies have been performed to discover the hazards associated with shift work, noting that one study in recent years has pointed to an increased risk of CVD of 21% in shift working nurses who have worked for less than six years and 51% for those who have worked in excess of six years, however no specific details about the study were cited. Causal mechanisms are still not well defined but are likely to be a cumulative result of decreased social support, stress, diet, smoking and alcohol consumption, lack of exercise or a family history of heart disease (Perkins, 2001; Rosa & Colligan, 1997; Spurgeon, 2003; Boggild & Knutsson, 1999; Knutsson, 2003).

The association between shift work and CVD is largely debated in the literature with much of the research being conducted on industrial shift workers and not those in the medical profession (Poissonnet & Veron, 2000). Knowledge on the links between shift work and CVD is especially valuable because shift work problems can only be eliminated by controlling these links and not by removing exposure to shift work (Boggild & Knutsson, 1999). As shift work is an important aspect of working as an MRT, particularly in the public health sector, primary prevention should be aimed at the causes of CVD which might then act to reduce the incidence rate.

### **Mental Health**

Shift work can be a potential psychosocial stressor and can adversely affect mental health, however because shift workers are a self-selected population it is difficult to establish whether the cause is linked directly to shift work or whether it is inherent in the

population (Harrington, 2001; Society of Radiographers, n.d.). According to Rose et al., (as cited in Blachowicz & Letizia, 2006, p. 276) “neurotransmitters that regulate sleep and mood are also affected by circadian rhythm disruption; this may lead to an increase in headache, irritability, anxiety and depression among many shift workers (sic).” Harrington (2001) and the Society of Radiographers (n.d.) in the United Kingdom report that the neuroticism rate increases with increasing years of shift work experience, although they do add that neuroticism alone does not predict health related shift problems.

Skipper, Jung and Coffey (1990) report that their research unexpectedly found that shift work was not significantly related to either nurses’ physical or mental health, however they believe the unique job characteristics related to shift work may explain this finding. They comment that nurses’ job tasks and requirements are different for every shift which may have a moderating influence on the negative effects usually associated with shift work, as may their preference to shift work for personal reasons such as family or money benefits. They believe there are not always negative consequences to shift work and that working outside the non-shift work schedule may actually be beneficial to the health and wellbeing of some nurses.

Measuring the actual mental health status among nurses and analysing the association between mental health and medical errors was the aim of the study conducted by Suzuki et al. (2004). They conducted a survey amongst female nurses in eight Japanese hospitals and their questionnaire yielded a return rate of 94% with 4407 completed questionnaires returned to the person in charge of the survey based at each hospital, of which they selected 4279 questionnaires for their study; they did not specify why the 128 nurses were not included. The four types of accidents most commonly reported were drug administration errors, incorrect operation of medical equipment, patient identification errors and needlestick injuries. The results showed that 31.2% of nurses were considered to be in good mental health as measured by a score less than or equal to three on the General Health Questionnaire tool utilised, while 68.8% yielded a score greater than or equal to four and so were considered to be in mentally poor health. Poor mental health was observed in those nurses that performed shift work when compared to non-shift workers with scores of 69.8% and 55.6% respectively. The error rates for those who

were classified as being in mentally poor health were significantly higher than those who were mentally healthy and this trend was observed for all four error types, with shift work being an influential factor on the error rate. This research was well written and appears to have been designed to a high standard with robust data collection methods and analysis.

According to Spurgeon (2003, p. 50) “a number of researchers have investigated the possible psychological consequences of working on shifts. In general the results do not support the contention that shift work alone has adverse effects on mental health.” This opinion partly contradicts the findings of Suzuki et al. (2004) and Skipper et al. (1990), although it is recognised that working in the medical profession is psychologically demanding, regardless of the presence of shift work. Spurgeon (2003) suggests that apparent tolerance for shift work in some workers may constitute a form of denial and she cites a reminiscence study performed in 2006 by Spelton et al. on a group of retired policemen. Although no specific details of the research are documented, the results revealed that the policemen retrospectively perceived their situation as being far worse than they were aware of at the time and this is probably because shift workers gradually adjust to their problems and underestimate them at the time as a result of this.

## **Cancer**

Few studies have addressed the association between shift work and cancer, however this is an area of shift work research that is actively expanding (Knutsson, 2003). There have been some studies performed that have shown an elevated risk of specific cancers such as colorectal and breast cancer (for example, Schernhammer et al., 2001, 2003) and some discussion has occurred in the literature as to whether low levels of melatonin might increase the risk of these cancers (Reid & Dawson, 2001; Twarog, 2005; Knutsson, 2003).

Exposure to environmental light at night suppresses the physiological release of melatonin which normally peaks in the middle of the night and has anti-proliferate effects on intestinal cancers (Schernhammer et al., 2003). Light exposure has also been demonstrated as having a tumour promoting effect on chemically induced tumours in rodents (Van den Heiligenberg et al., 1999). This occurs because light exposure curbs nocturnal melatonin excretion in a characteristic dose-response pattern, meaning that the

brighter the light stimulus, the greater the repression of melatonin (Brainard, Rollag & Hanifin, 1997). Vician et al. (1999) report that colorectal cancer patients were found to have lower plasma levels of melatonin than healthy control subjects and this suggests a possible link between low melatonin levels and the development of colorectal carcinomas in humans.

With this in mind, Schernhammer et al. (2003) set to prospectively examine the relationship between working rotating night shifts and the risk of colorectal cancer among female participants who participated in the Nurses' Health Study which was performed in 1988. Cases of colorectal cancer were identified through the nurse's self report questionnaires and confirmed with a double-blind review of their medical records. 103,614 nurses returned the 1988 questionnaire, of this 85,162 completed the question on shift work and after excluding those who did not meet the vastly detailed inclusion criteria, 78,586 remained to form the baseline population for the research. 602 cases of colorectal cancer were documented, with nurses who had worked shift work for 1-14 years providing a multivariate relative risk of 1.00 and those who had worked shifts for 15 or more years had a multivariate relative risk of 1.35 when compared to those who had never worked shift work. It was therefore concluded that a larger extent of night shift work was modestly associated with an elevated risk of colorectal cancer, of which the reduced melatonin secretion at night due to increased environmental lighting while at work could explain the increased risk observed. Utilising data that was collected in 1988 might indicate poor research design, however this was necessary to identify which participants contracted colorectal cancer after their shift working careers were finished. The study from which the data was collected had a sufficiently large sample size and the current study used both qualitative and quantitative methods to validate their data. The research was written in great detail which indicates that the researchers were meticulous in their design and planning. This has added credibility and reliability to their results which appear to be pioneering in this field.

Breast cancer is reported by Schernhammer et al. (2001, p. 1563) to be "the most common cancer among women in the United States." Observational studies, such as that performed by Hansen (as cited in Schernhammer et al., 2001) are compatible with

melatonin having an effect on breast cancer risk, with reports of a meaningful increase in breast cancer among post-menopausal women exposed to shift work. The aim of the research conducted by Schernhammer et al. (2001) was to evaluate the relationship between night work and breast cancer risk in a large prospective cohort of pre- and post-menopausal women. 78,562 women formed the sample baseline population and 2441 cases of breast cancer were diagnosed over a 10 year period. Night shift workers were found to be older and therefore more likely to be post menopausal than those who had never worked on a rotating night shift. Prolonged periods of working shift work was demonstrated as being modestly associated with an increased breast cancer risk and women who had worked 30 or more years on rotating night shift had a 36% increased risk of breast cancer when compared to those who had never performed night shift and this was shown to be statistically significant through multivariate analyses. Those pre-menopausal women who had worked 1-14 years exhibited a 14% increase, however statistical tests on this trend showed it was not statistically significant. It is thought that rotating shift workers continue to have an overall greater risk due to the fact that they cannot entrain their bodies to the frequently changing circadian shift rhythm and as a result, exhibit the lowest melatonin levels. Unfortunately the data provided by this research did not incorporate information on the intensity of the light exposure during night shift and so a dose-response calculation cannot be made. Although this study is pioneering in its field, the fact that many confounding factors were potentially uncontrolled and self-report data pertaining to duration of shift work was not validated, the results must be considered with caution.

Despite the studies presented, it is generally accepted in the literature that there is currently no conclusive evidence to prove or disprove the evidence linking shift work and cancer (Reid & Dawson, 2001; Twarog, 2005; Knutsson, 2003).

### **Adverse Lifestyle Behaviours**

Reid et al. (1997, p. 446) state that “shift workers suffer a greater incidence of lifestyle illnesses” and this may occur as a consequence of shift work related stress, poor shift working conditions or shift schedule, or the belief that an unhealthy lifestyle is acceptable providing that shift work continues to pay well (Reid et al., 1997; Boggild & Knutsson,

1999; Knutsson, 2003; Atkinson et al., 2008). Caruso et al. (as cited in Berger & Hobbs, 2006, p. 467) report that “common unhealthy behaviours among workers who do not tolerate shift work include increased intake of caffeine, alcohol, sleeping medications and over-the-counter medications for gastric acid secretion reduction and/or bowel problems.”

Physical exercise and activity helps to alleviate some of the effects associated with shift work (Harrington, 2001), and Atkinson et al. (2008) note that workers who are generally more determined and driven to undertake physical exercise during shift work often cope better and have an improved tolerance to shift work than those who do not partake in physical exercise. It is well recognised that shift work can interfere with the opportunity to perform physical activity, by restricting the opportunity for participation in sports activities and interfering biologically with the normal physiological responses to a session of physical activity (Atkinson et al., 2008; Zhao & Turner, 2008). Atkinson et al. (2008, p. 671) comment that “for those shift workers who are able to exercise, subjective and biological responses can be altered if the exercise is performed at unusual times of the day and/or if the shift worker is sleep deprived,” however they add that physical exercise may assist by improving sleep quality.

The studies included in the literature review of Boggild and Knutsson (1999) on meal patterns and nutrition demonstrated only a few differences between shift and day workers with regard to overall nutritional intake, although the changes in meal frequency, composition and the timing of meal intake differed significantly. This is supported by the work of Atkinson et al. (2008). The change in meal distribution is reportedly caused by unavailability of preferred foods, lack of time and decreased desire to eat during some shifts, particularly the night shift and these changes are associated with alterations in cholesterol levels which are seen as a result of desynchronised circadian rhythms of nutritional uptake and metabolism (Atkinson et al., 2008; Boggild & Knutsson, 1999).

### **Sickness Absence, Mortality and Healthy Worker Effect**

It is expected that shift workers with poor sleep patterns and sleep deprivation will likely be absent from work more than non-shift workers or those shift workers with established

sleep patterns, however there appears to be some argument in the literature as to the actual impact of this issue (Nakata et al., 2004). DOL (1998) and Reid et al. (1997) are united in their belief that shift workers, in particular those performing rotating shifts, have a higher incidence of sick leave, although the belief of Glazner (1991) that absences in shift workers are found to be less when compared to day workers contradicts this.

Nakata et al. (2004) aimed to evaluate the contribution of daily sleep habits and depressive symptoms to the sickness absence of Japanese shift workers. Their sample worked at an electronic manufacturing company and after exclusions, only 522 of the 2420 returned questionnaires were analysed, which results in a 20% return rate and brings the reliability and bias of the findings into question. For unknown reasons it took the researchers seven years to publish the findings of their research. Premature early morning awakening almost every day was analysed by multivariate logistic regression and reported as being significantly associated with both short and long term sickness absences in shift workers. Difficulty maintaining sleep, sleeping poorly at night and experiencing depressive symptoms were linked with long term sickness absence which may have implications for employee health, safety and long term business productivity. The impact of poor sleep on sickness absence rates was stronger than that of depressive symptoms, although both are clearly documented as consequences of shift work and its associated circadian rhythm disruption. As only male workers from an electric equipment manufacturing company were included in this study the results may not be representative of female workers and may not apply to shift workers in the medical profession.

As part of the literature review to their research, Knutsson, Hammar and Karlsson (2004) reported a 1972 study performed by Taylor and Pocock on mortality in relation to shift workers. From the 8,603 male manual workers included, it was concluded that shift work appeared to have no adverse effect on mortality. Knutsson et al. (2004) then set about reappraising the previous published data on the mortality of male shift workers presented by Taylor and Pocock. Limited data collection and analysis information is documented for Taylor and Pocock's study, therefore it is difficult to decipher what Knutsson et al. did differently. The reappraised study found that the relative mortality rate was 3%

higher for current shift workers than non-shift workers, which increased to 5% if current and former shift workers were combined and compared to day workers, although the differences were not statistically significant. Former shift workers were found to have an increased mortality risk when compared with day workers and in age-specific analyses, an increased mortality rate was observed in shift workers in the 45-54 year group when compared to day workers of the same age. In opposition to the conclusions drawn by Taylor and Pocock, Knutsson et al. (2004, p. 1052) suggest “a more cautious interpretation, meaning that the data might indicate an increased relative mortality risk in ex-shift workers.” They did not discuss the limitations of this initial 1972 research, nor did they comment on their motive to reappraise a somewhat dated study, as opposed to conducting their own research with participants who are more representative of today’s society. Therefore although very interesting, the results should be considered with prudence.

The phenomenon known as the ‘healthy worker’ or ‘survivor’ effect is a “selection process that leads to a workforce of shift workers that is healthier than day workers” (Knutsson, 2004, p. 1040). This selection phenomenon first occurs when people select a profession and then apply for a job within their chosen profession because those that do not feel they are able to meet the requirements and demands of the job do not apply, resulting in the recruitment of individuals who are typically “healthier than the general population,” thus the term ‘healthy worker effect’ (Knutsson, 2004, p. 1040). In the long term it is possible that a demanding shift schedule and its associated effects will affect a shift worker to the point where they will change jobs to remove themselves from shift work when a suitable opportunity arises and thus the process continues as a ‘survivor’ effect as those than can adapt to, and tolerate, shift work stay, while those that cannot or choose not to, quit (Glazner, 1991; Knutsson, 2004).

#### **SOCIAL AND FAMILY EFFECTS**

Working outside the normal Monday-Friday, 9-5pm routine of society can create many challenges, as shift work can have a huge impact on a worker’s social and family lives (Perkins, 2001; Phillips & Houghton, 2007). According to Knauth (as cited in Demerouti, Geurts, Bakker and Euwema, 2004, p. 988) “the actual amount of spare time a shift



worker has may be equal or even greater than a non-shift worker,” however Demerouti et al. (2004, p. 988) add that “the *positioning* and therefore the utilization potential of spare time may be less favourable.” Shift workers experience real challenges amalgamating their work schedule with their domestic responsibilities and social activities because shift times dictate when a worker can see family and friends. Due to most social and family events happening during the evening or on weekends, shift workers are often excluded (Canadian Centre for Occupational Health & Safety, 1999; Rosa & Colligan, 1997).

Working and living with shift work schedules often demands expending extra energy in order to manage personal and social demands (Poissonnet & Veron, 2000). As a result of this, shift workers often experience fewer degrees of freedom, increased stress levels, altered mood, motivation and sleeping patterns, difficulty adjusting their attitudes towards home and work life and increased difficulty managing their time, all of which can have indirect adverse consequences for performance and safety (Wilson, 2002; Reid et al., 1997). A shift work schedule affects not only the worker, but also their entire family and network of friends (Rosa & Colligan; 1997; Grosswold, 2004).

### **Impact of Shift Work on Family Life**

Wilson (2002, p. 216) reports that “several studies have shown that shift workers often feel isolated from their family and friends and less able to fill their domestic roles. This is seen to manifest itself in low self-esteem, anxiety and irritability,” however they do not reference the research. While this likely affects both male and female shift workers, Reid et al. (1997) comments that female shift workers are often under additional pressure to juggle domestic duties and raise any children they may have, all while juggling their shift work schedule. This impact then has the potential to have a negative influence on family and social relationships (Blachowicz & Letizia, 2006). Shift work can lead to increased work-family conflict because marital responsibilities and family activities can be severely disrupted due to the shift worker being out of alignment with the routines of their family (Wilson, 2002; Harrington, 2001; Grosswold, 2004).

Parents who perform shift work might not see their children during the week because they are at work or at home sleeping when their children return home from school and

this may result in strained relationships between shift working parents and their children (Rosa & Colligan, 1997; Grosswold, 2004). Children of shift workers are noted to have a more difficult time at school and do not succeed as well as children of non-shift working families, highlighting that shift work can result in stressful situations not only for the shift worker, but also for their family (Phillips & Houghton, 2007; Haalebos, 1998; Rosa & Colligan, 1997). For all its disadvantages, shift work can be advantageous to the family situation in a financial capacity in that it allows for one parent to be at home with the children while the other parent is working, meaning money is not spent on childcare and there is more interaction with the children (Grosswold, 2004).

Shift work can also lead to dissatisfaction and dysfunction within marriages, as continually leaving a spouse alone at night or for prolonged periods of time, or failing to provide them with undivided attention can produce conflict and increased tension levels; this can lead to marital and sexual problems which ultimately results in shift workers having an increased divorce rate (Society of Radiographers, n.d.; Grosswold, 2004; Cohn, 2007; Harrington, 2001). For many, the responsibilities of home life and the desire to spend more time with family members often take precedence over obtaining sleep, which is sacrificed in order to spend every available opportunity fulfilling family duties (Rosa & Colligan, 1997; Wilson, 2002).

The survey performed by Grosswold (2004) examined the impact of shift work on the family relationships of shift workers. The professions of those 2,429 people included in the sample were not stated, and therefore it is not possible to know if the results are representative of a health care profession. The results of this study indicated that evening and night shift workers were significantly less likely to report family satisfaction than those working permanent day shifts, in comparison to permanent day shift workers who recorded 71% family satisfaction. The reported overall family satisfaction of shift workers was 69%, with the evening shift reporting 63%, rotating shift 59% and night shift reporting family satisfaction to be 54%. The type of occupation, amount of job autonomy, level of education and the number of work hours per week had no impact on family satisfaction. Those who worked in an environment which had a family-friendly culture were more likely to report family satisfaction and positively impact employee

wellbeing, indicating the importance of involving the family in training and education opportunities. This study was limited by the potential for multiple interpretations of the family satisfaction measure and the need to combine the four Likert scales into two to allow logistic regression to occur, which would have resulted in some loss of data. However the large sample size and overall well designed methodology of the study suggests that the results should be taken seriously.

In contradiction to these results, the study performed by Skipper et al. (1990) found that shift work did not influence family relationships to any significant degree for the nurses in the study. However, this result should be considered with caution given that the study was conducted in 1990 with a sample size of 463 nurses and with the primary aim of examining the relationship between the physical health and mental depression of shift workers.

### **Impact of Shift Work on Social Activities**

Workers who engage in shift work can experience considerable disruption to social activities because many of these rhythms of the general population are orientated around the typical working day (Wilson, 2002; Harrington, 2001). According to Twarog (2005, p. 7), the impact of this often results in “increased social difficulties including irritability, impatience, anxiety and depression.” It is reported in the literature that shift workers may have dissimilar social lives to those who work a normal dayshift schedule and thus shift work can lead to social marginalisation (Phillips & Houghton, 2007; Harrington, 2001; Society of Radiographers, n.d.). This isolation of the worker from their traditional community, religious, cultural and social support systems can lead to thoughts of segregation or an ‘us against them’ perception (Blachowicz & Letizia, 2006; Lindsey, 2007).

Shift work can be advantageous to those workers who enjoy activities that are not on a strict timetable and are comparatively solitary pursuits, as it provides them greater opportunities to partake in these activities in their non-working time (Society of Radiographers, n.d.; Harrington, 2001). However shift work interferes with strictly scheduled activities such as clubs or sports teams and night shift workers in particular

may miss the many social events which occur during the evening and partaking in these social activities may be postponed or cancelled altogether (Rosa & Colligan, 1997; Haalebos, 1998).

A survey performed by Skipper et al.(1990) showed that nurses scheduled to work afternoons participated least in voluntary organisations and spent the majority of their non-work time performing solitary activities (Fitzpatrick, While & Roberts, 1999). Shift workers reportedly have fewer friends, of whom most will be fellow shift workers, reduced social interactions with conversations often focusing on the shift worker's lack of sleep and they are less likely to be members of social organisations or clubs (Haalebos, 1998; Perkins, 2001; Phillips & Houghton, 2007). Female shift workers who also juggle family responsibilities are often too fatigued to participate in social activities or would prefer to spend the available time with their families (Skipper et al., 1990). However, Whale (1993) comments that there appears to be no evidence that shift work has any impact on social isolation between colleagues at this stage, with professional isolation where workers have little perceived professional support appearing to be more problematic.

#### **PERFORMANCE AND IMPAIRMENT**

One serious consequence of shift work that is widely reported in the literature is performance impairment and the correlation between shift work and medical errors is beginning to gain widespread public attention (Scott, 2007). Admi et al. (2008, p. 251) report that “there is growing concern about the ability of individuals to maintain adequate levels of performance over long work shifts, particularly when these shifts span night-time hours.” As a result of the fatigue and sleep deprivation associated with shift work and being required to work in opposition to many circadian rhythms, alertness and performance can potentially decrease, with the possibility of errors and incidents which may compromise patient and staff health and safety (Peate, 2007; Reid & Dawson, 2001; Garabino et al., 2002).

## **Causes of Performance Impairment**

Folkard and Tucker (2003, p. 99) comment that “people’s efficiency at performing various tasks is not constant, but varies over the course of the normal waking day.” The reduction in performance is thought to reflect individual underlying factors such as biological and psychosocial issues, impaired health, disturbed or unsatisfying social life, reduced duration and quality of sleep and disrupted circadian rhythms (Fitzpatrick et al., 1999; Folkard & Tucker, 2003). Reid and Dawson (2001) report that the ability to adapt to shift work is thought to be more complicated for those who are aged approximately 40 years due to older shift workers finding it difficult to obtain the necessary amount of quality and uninterrupted sleep, decreasing the ability of their circadian rhythms to realign with the ever changing shift schedules (ibid). Considering the inflated number of older workers currently employed in the health care profession and the forecast that this will increase in the future as the retirement age increases, the effects of ageing on performance are of considerable importance (Folkard, 2008).

A study performed by Reid and Dawson (2001) aimed to simulate a 12 hour shift rotation and measure the difference in performance between older and younger subjects. Thirty two participants were divided into two groups, one with an average age of 21.2 years and the other 43.9 years, both containing equivalent numbers of males and females. All participants underwent an interview, completed a general health questionnaire, kept a sleep diary for two weeks and carried out simple clerical tasks and a series of performance tests during work times. There was a significant difference in performance between the two groups at baseline testing with the older group measuring substantially lower performance than the younger group. The performance of the younger group remained relatively stable across the shifts with the only significant deviation occurring across the first night shift, however the performance in the older group altered significantly across both the day and night shift, suggesting that older shift workers are less able to maintain their performance. This could potentially be due to them being more sensitive to the effects of circadian disruption or to the increased sleep loss that was observed during the daylight hours prior to the night shifts which may manifest as fatigue. The study was conducted in a methodical fashion with precise and rigorous data collection methods and while the authors note that performance may differ in real world

conditions, the results of this study indicate that age can be an important factor for influencing performance.

### **Components of Performance that may be Impaired**

Many components of performance are impaired as a result of shift work and Lindsey (2007) cites a study which suggests that some dimensions of the workplace most susceptible to the effects of shift work include the inability to comprehend complex situations, manage events and improve strategies, perform risk assessment, think laterally and be innovative, monitor personal performance, control mood and behaviour and effective communication.

#### *Decision Making Ability*

Burgess (2007, p. 88) notes that “in an emergency situation, public health and emergency management workers may be called on to make judgments and decisions that could significantly impact the health and safety of the public. The unique physiological demands of rotating shift work and night shift work have the potential to negatively impact decision making ability.” Lack of sleep resulting in sleep deprivation and increased levels of fatigue which are often associated with shift work, in conjunction with inadequate recovery periods, may reduce alertness and jeopardise clinical decisions, potentially resulting in medical errors which affect the health and safety of the worker and the patients under their care (Peate, 2007).

#### *Alertness*

Peate (2007) comments that maintaining alertness during shifts, particularly the evening or night shift can be especially challenging for health care professionals. They note that it is especially challenging when workers are required and expected to make crucial and important decisions regarding the well-being and treatment of their patients and reduced alertness can lead to clinical errors which can compromise patient care and safety.

Dingley (1996) conducted a study on 20 female nurses which tested their normal working environment at the start and end of their shift. The results of the subjective element found that the nurses felt more alert at the beginning than at the end of a night shift and at

the beginning of a span of consecutive night shifts than at the end. Results from the objective element of the study were in stark contrast to the subjective element as it was found that performance was markedly worse at the start of a shift than at its end, while also being worse at the beginning of a span of consecutive night shifts, improving to a peak around the fourth shift and then reaching a plateau towards the end of the span. The authors note that the results are interesting because they contradict their belief that performance would decrease across a shift or span of shifts. They offer the explanation that the nurses involved became used to the tests after the first few attempts and so their performance peaked around day four, or alternatively suggest that it takes three or four days to re-familiarise with working nights again after having some time off.

### **Degree of Performance Impairment**

Rouch, Wild, Ansiau and Marquie (2005) aimed to examine the relationship between shift work and cognitive efficiency and to assess the hypothetical mediating role of sleep quality in this relationship. The initial sample was composed of 3237 participants who were drawn at random but were exactly 32, 42, 52 and 62 years of age for reasons which are not explained, with the final participation rate an acceptable 72%. Data were collected by an occupational doctor during an annual medical examination which any salaried worker is entitled to in France. Two questionnaires regarding working conditions and non-occupational factors were self-administered and then validated in an interview with the doctor. The results showed that current male shift workers tended to portray lower levels of cognitive performance than workers who were never exposed to shift work; however this was statistically significant for speed only. No clear statistical relationship was identified among the female participants. Former shift workers showed a higher cognitive performance than current workers. The authors comment that the results highlight that performance impairment is linked with shift work, but that the effects may be reversible under some conditions, such as type of cognitive performance, gender or other variables related to gender. This study was well designed and the data collection was thought through with many variables considered and minimised and so despite not knowing whether the research was conducted in the medical field, the results can be considered valid and credible.

### *Risk Rates Across Shifts*

In 2003, Folkard and Tucker published a review of epidemiological studies on shift work and safety. When considering risk rates across different shifts, they summed the incidents of five data sets and concluded that when the 'a priori' risk is homogenous across the morning, afternoon and night shifts, the relative risk of incidents tended to be higher on an afternoon shift than morning or day shift and highest on a night shift. The risk over the course of a night shift was calculated in a similar fashion with data drawn from seven studies. The risk increased by approximately 20% from the first to second hour, but then decreased in a linear fashion by a total of 50% to reach a minimum at the end of the shift. When considering the risk over consecutive shifts, the authors identified seven published studies and after summing the frequency of the incidents, concluded that on average the risk of an incident was 6% higher on the second shift, 17% higher on the third and 36% higher on the fourth shift. As these results are limited to the night shift, the risk rates across the day and evening shifts remain undetermined and the impact of fatigue cannot be calculated. These statistics are widely cited in the literature (for example, Burgess, 2007; Folkard, Lombardi & Tucker, 2005; Scott, 2007), despite the small sample population from which the data was drawn. It is important to note that these risk rates are only as accurate and valid as the incident reporting procedures of the places they originated from, of which the authors make no mention. The authors do not believe that their results are in any way related to the effects of the desynchronised circadian rhythms on fatigue or alertness as the wider literature would suggest, yet they make little attempt to provide an alternative plausible explanation.

While the results of the study performed by Lamond et al. (2004) conflict with those of the meta-analysis performed by Folkard and Tucker (2003), their experimental design appears thorough and well constructed, with many of the variables eliminated so that direct comparisons can be made, ensuring valid and reliable results. Lamond et al. (2004) aimed to provide a comparative index of the performance impairment associated with fatigue levels experienced by night shift workers. Fifteen participants aged 18-27 years were monitored over seven consecutive nightshifts and the results of two psychomotor vigilance tasks (PVT), reaction time and lapse frequency, were recorded. The first nightshift revealed the greatest degree of performance impairment of both PVT



components, the second and third shifts also displayed impairment, albeit to a lesser degree and performance improved significantly over the four remaining shifts, although it never returned to the levels which were measured when the participants were unaffected by shift work. The authors comment that the results are not surprising when it is considered that the amount of prior wakefulness on the first nightshift was approximately 14 hours when beginning the first night shift and in excess of 20 hours at the conclusion of the shift, and in general these periods of extended wakefulness prior to shifts is a common occurrence for shift workers, particularly when beginning a period of nightshifts. The authors explain the observed performance impairment as reflecting a combination of extended prior wakefulness on the first shift and the desynchronisation of underlying circadian rhythms due to the shift in the sleep-wake cycle. Despite differing opinions regarding when the greatest level of impairment occurs, the work of Folkard and Tucker (2003) and Lamond et al. (2004) are united with the wider literature in showcasing the type and extent of performance impairment that exists as a result of shift work.

#### *Blood Alcohol Concentration (BAC) Equivalent*

Dawson and Reid (1997) conducted their study with the aim of equating the performance impairment caused by fatigue with that due to alcohol intoxication in attempt to show that moderate levels of fatigue produce higher levels of impairment than the prescribed level of alcohol intoxication. The sample consisted of 40 participants were kept awake for 28 hours in one experiment and in the second experiment, consumed alcohol at 30 minute intervals until their BAC registered 0.1%. No control tests are mentioned. Cognitive psychomotor performance tests were performed at half hourly intervals using a computer administered test. The results revealed that overall performance decreased significantly in both conditions, with a linear correlation identified between performance and hours of wakefulness and between BAC and performance. For every 0.01% in BAC, performance was calculated to decrease by 1.16%. After 17 hours of wakefulness, cognitive performance diminished to a level equivalent to the performance impairment observed at a BAC of 0.05% and this deficit diminished further to equal a BAC of 0.1% after 24 hours of wakefulness. It is clear from these results that the effects of moderate sleep deprivation on performance is equivalent to the effects of moderate intoxication, however as there is no mention of the profession of the participants, nor the activities they were

engaged in between measurement intervals when sleep deprived or intoxicated, and because it is possible that familiarisation with computer games gave the younger participants an advantage when conducting the performance tests, these results should be considered prudently.

In a more recent study, Williamson and Feyer (2000) aimed to compare the change in performance due to alcohol consumption at concentrations accepted to be hazardous, with the same behaviour after sleep deprivation in attempt to assess the amount of sleep deprivation at which equivalent performance deficits would occur. They examined 39 subjects who worked for a large road transport company or the transport corps of the Australian Army. Two variables were tested within the group, an alcohol consumption test and a sleep deprivation test, both utilising baseline performance tests and further testing as intoxication or sleep deprivation progressed. The results for the blood alcohol component showed that at a BAC of 0.05%, performance decreased by approximately 8-15% and at a BAC of 0.1%, performance was poorer across all measured variables. The sleep deprivation component yielded similar results, with performance impairment increasing as the degree of sleep deprivation increased. On average it was found that the performance associated with a 0.05% BAC was equivalent to being awake for approximately 16.91-18.55 hours and the performance associated with a 0.1% BAC was observed after 17.74-19.65 hours of wakefulness. This meant that at the end of a period of wakefulness of 17-19 hours, performance levels are low enough to be accepted in many countries as in excess of the legal BAC for driving a motor vehicle. This study had sound data collection methods and was rigorous in its calculations, however the small sample number and proportion of males to females, in addition to being conducted solely during the day shift and not within the medical field means the results should be considered cautiously when being related to the performance of health care professionals in a medical setting. Despite their shortcomings, the results of Dawson and Reid (1997) and Williamson and Feyer (2000) are aligned and clearly show that the effect of sleep deprivation or fatigue on performance is indeed similar to that of alcohol intoxication.

## **Impact of Performance Impairment**

### *Patient Care and Safety*

It is widely accepted in the literature that, regardless of its exact causes, the performance impairment associated with shift work is deleterious to patient care and safety, and may also impact worker safety (Shen et al., 2006; Berger & Hobbs, 2006). Workplace accidents and errors can potentially have a direct and critical sway on the outcome of a patient's treatment or prognosis (Suzuki, Ohida, Kaneita, Yokoyama & Uchiyama, 2005). Berger and Hobbs (2006, p. 467) note that safety is most likely to be impaired as shift workers resist sleepiness and attempt to maintain wakefulness and alertness and this is "typically more challenging during the second half of the shift, especially at night." Performance impairment and subsequent errors may endanger the safety of the patient, individual worker, or that of the wider public, and human error may result in significant personal and economic cost (Van Dongen, 2006; Reid et al., 1997).

### *Errors and Accidents*

Health care professionals who perform work in the late evening or early morning hours are at an increased risk of making medical errors, with the greatest amount of fatigue thought to occur between 2am and 6am, peaking around 4am and corresponding with an increase in errors or near miss incidents (Scott, 2007; Society of Radiographers, n.d.). The cause of occupational accidents is reportedly complex, but the majority of the literature links an increase in sleepiness and fatigue with a decrease in performance, subsequently resulting in a marked rise in errors and incidents and increasing the likelihood of catastrophic incidents, such as the catastrophes associated with the American space programme, Chernobyl nuclear incident in 1986 and the sinking of the Titanic (Reid & Dawson, 2001; Harrington, 2001; Twarog, 2005; Occupational Safety & Health, 1998a). In contrast to this evidence that the decreased performance associated with shift work is associated with an increase in errors, Kawada and Suzuki (2002) found that while rotating shift work negatively affected the amount of sleep a worker obtained, it was not found to affect the rate of errors made among the shift workers rotating through the day, evening and night shifts in their study.

Performance impairment is a detrimental effect related to shift work and there are many causes for it. Various aspects of performance such as decision making ability and alertness during a shift may be impaired. The degree of impairment is related to the individual worker; however appears to be worst with consecutive and long shifts, to the point where a worker may be performing at a level that exceeds that of a Blood Alcohol Equivalent. Impaired performance impacts on patient health and safety, and often leads to errors and accidents which impacts on a worker's professional capacity.

## **PROFESSIONAL EFFECTS**

### **Professional Environment**

It is noted that shift workers may end up feeling isolated or different from their non-shift or shift working colleagues as there is a reported barrier between these staff (Rosa & Colligan, 1997; Oxtoby, 2003). In fact Whale (1993) reports that there may be a 'them and us' divide between night and day staff. This could make for a fractious work environment and difficult communication (Rosa & Colligan, 1997). Identification of the shift worker with their work colleagues and within the team reportedly plays a role in shift work tolerance and has significant indirect effects on the wellbeing of psychological and physical health (Pisarski et al., 2006). One of the greatest fears for the shift working nurses that spoke to Oxtoby (2003) was working alone and not having the support of their colleagues in times of need. According to research performed by Pisarski and Bohle (2001) a shift worker that received co-worker support became empowered and more able to cope, resolve the conflicts that arose at work and obtain an increased sense of self-worth, confidence, productivity and greater interest for going to work.

In contrast to this, Whale (1993) reports that many nurses believed rotating shift work actually improved the often tense relationships between non-shift and shift working staff because they were all able to see the roles and working environment of one another. This is supported by Cohn (2007) who comments that although some workers find shift work isolating, many workers experience the contrary and they affirm a relationship and unique solidarity with their shift working colleagues. Oxtoby (2003) found that the nurses she interviewed believed shift work allowed them more occasions to build close working

associations with their colleagues and found this teamwork and camaraderie to be an advantage.

### *Professional Isolation and Development*

Oxtoby (2003) reports that night staff are often regarded by their non-shift working colleagues as having poorer skills and she notes that it was a concern of the night shift workers she interviewed that they would become de-skilled as a result. Some shift work staff also report the need for more input into their education requirements as they often miss educational events that happen during the day or weekend, with some staff feeling forced to move to day shifts simply to receive the extra training they feel they required (Whale, 1993, Oxtoby, 2003). An MRT's continuing professional development programme is formal, with the credits option being attendance based meaning that similar links may exist. Oxtoby (2003) interviewed many nurses about their experience of shift work, although the specific number is not identified, and they commented that working shifts made them self-reliant because they were forced to rely on their judgment, while the wide range of cases boosted their skill level, positively impacting their experience and confidence.

### **Job Satisfaction**

Ruggiero (2000, p. 254) comments that “job satisfaction is a multidimensional phenomenon” and may be “influenced by stress, work load, shift schedules, depression, age and family issues” (p. 255). Rotating shift workers often experience decreased job satisfaction and are more likely to leave the profession, meaning that job dissatisfaction critically affects staff recruitment and retention (Poissonnet & Veron, 2000; Ruggiero, 2005; Bohle & Tilley, 1998).

The purpose of the study conducted by Ruggiero (2005) was to explore the relationships and relative contributions of selected work, health and demographic variables to job satisfaction in a sample of critical care nurses. Two hundred and forty seven nurses consented to participate and returned their questionnaires, yielding a return rate of 49%. The average job satisfaction score was 22.66 on a scale of 1 being very satisfied and 35 very unsatisfied, indicating that participants were not very satisfied with their jobs. 41%

of the sample met the criteria for clinical depression, 13% for mild to moderate depression and 1% met the criteria for severe depression, noted by the researchers as a striking and unexpected finding, which suggests that depression may be an omnipresent problem amongst this population of nurses, although the possibility of a self-selection factor must be considered. Sleep quality, depression, physical and mental workload and emotional stress were all negatively related to job satisfaction for this sample of nurses, however the impact of physical and mental workload was not statistically significant. Control over shift schedule, number of weekends off per month, age and the number of individuals needing care by the worker after work were not significantly related to job satisfaction, some aspects of which contradict the findings of Pisarski, Bohle and Callan (1998, 2002) who found them to be either directly or indirectly linked in their research on nurses and ambulance workers. This research was well designed and many confounding variables were considered, however including a larger number of men into the sample and obtaining data over several periods of time to reveal any varying patterns to job satisfaction would have strengthened the results and increased the validity and reliability of the findings.

### **Work/Life Balance**

Pisarski et al. (1998, p. 141) comment that “structural work/non-work conflict occurs when the *time* available to partake in social and domestic activities is limited by work requirements. It is a particular problem for shift workers required to work on evening, night, or weekend shifts.” Pisarski et al. (1998) believed that this phenomenon was not well understood so they conducted research that aimed to explore the relationship between structural work/non-work conflict and health in rotating shift work and examined the effect that social support and coping had on these outcomes. Questionnaires and an introductory letter were distributed, although no information is given as to whether follow up reminder letters were sent, which may have increased the low return rate, nor was any information supplied on the length of time allowed for data collection. The final sample consisted of 172 registered nurses who worked in a fulltime capacity on a rotating eight hour shift schedule. Regrettably the authors did not mention the initial number of questionnaires sent out and so return rates could not be calculated, which may have an impact on how relevant the findings are to the wider sample and

leaves questions regarding potential bias. The results demonstrate that complex effects of social support, structural work/non-work conflict and coping strategies all have an influence, either directly or indirectly, on the health and wellbeing of shift workers. Social support from co-workers and family had direct effects on psychological and physical symptoms and it was found that the effect of supervisor support on work/non-work conflict was mediated by the control that shift workers felt they could exert over shift allocations. The authors believe that this highlights the importance of allowing workers sufficient control over their shift schedule to increase their ability to cope with their working hours and reduce the conflict between work and home environments. Wilson (2002) comments that shift workers who achieve a balance between their preferred and actual schedule are more likely to be satisfied with their jobs, which aligns with this finding.

The research conducted by Pisarski et al. (2002) was an extension of the earlier 1998 study as they examined the relationships between social support, control over shift allocations, coping strategies, work/non-work conflict and psychological and physical symptoms amongst ambulance workers performing extended shifts of 10-14 hours duration. Similar questionnaires to the ones in the earlier study were utilised, and 52 male and 8 female ambulance workers returned their questionnaires, resulting in a return rate of 37%. A direct positive relationship between supervisor support, control of shift allocation and work/non-work conflict was identified, which aligns with the finding of Pisarski et al. (1998) and supports the proposal by Johnson and Hall (as cited in Pisarski et al., 2002) that high job demands may not be as stressful if the job also provides high levels of support. Social support from family did not exhibit a direct positive or negative effect on work/non-work conflict, however a positive relationship was mediated by control of shifts, suggesting that a supportive family environment can reduce work/non-work conflict by allowing shift workers to arrange their family time and shift schedules more successfully. Overall this research was very thorough and well constructed, however it would have been beneficial if further discussion had been conducted with regards to the effect of the extended shift duration, as this was the main apparent difference of this study from that of Pisarski et al. (1998).

Demerouti et al. (2004) conducted a study with the aim of establishing whether working fixed or rotating shifts during weekends, evenings or days related to higher work-home conflict, elevated levels of burnout and negative job attitudes as well as to impaired general health and absenteeism. A questionnaire was sent to all employees of the Dutch Military Police Force with 2863 men and 259 women returning a completed questionnaire, resulting in the acceptable return rate of 61%. Despite not being conducted in the medical field, the sample was well chosen because the day workers and shift workers were working in jobs with identical or comparable tasks and working conditions, which allows for increased validity and reliability of the results. Four target shifts were identified within the population, those that performed fixed day work (n=897), fixed non-day work including weekends (n=396), rotating shift work not involving weekends (n=34) and rotating shift work with weekends (n=1557). The study found that aspects of the shift work schedule have an extensive effect on the amount of work-home conflict, job attitudes and health experienced.

#### **SUMMARY**

The effects associated with shift work are many and varied and their impact on workers is dependent on the individual. Shift work disrupts a worker's circadian rhythms and they often find that their sleep patterns are disrupted, meaning they can experience a decreased quality or quantity of sleep, which can result in sleep deprivation and increased levels of fatigue. Shift workers may experience a raft of complex health issues, such as gastrointestinal disruption, cardiovascular disease, adverse lifestyle behaviours, such as decreased physical exercise and altered nutritional patterns, altered reproductive systems in females and the potential of developing breast or colon cancer or a depleted mental health status. Performance impairment such as decreased cognitive skills, reduced psychomotor skills, delayed reaction times and diminished mental capacity can also occur, along with varying professional effects. Social effects include isolation from society and reduced ability to socialise, along with family effects which include loss of time spent with family and the need to balance family commitments with work requirements.

With education and training many of these effects can be moderated, however for this to occur and be successful, it is essential that the specific effects related to MRTs are



identified, evaluated and discussed. This will potentially empower: the individual workers to be proactive and make any necessary changes to improve their current situation; radiology departments to reflect on areas where they approach shift work well and areas that would benefit from further refining; and the profession to identify any trends and evaluate their position in relation to other professions that also partake in shift work. Therefore, this research project will investigate the main effects of shift work as identified by shift working MRTs in New Zealand, explore the impact of these effects and determine whether the perception of shift work aligns with the actual reality of working shifts. It will propose recommendations as to the management of those effects identified so that they can be managed accordingly.

## **CHAPTER IV: RESEARCH PROCEDURES**

### **RESEARCH METHODOLOGY**

To ensure my study yields the appropriate data to satisfy its aims and objectives, I have used a case study research method with a qualitative approach which is informed through an interpretive paradigm.

The research process requires a methodological approach to planning and logical reasoning in order to gather and interpret new information and knowledge regarding a chosen phenomenon (Beanland, Schneider, Lo Biondo-Wood & Harper, 1999). This philosophical stance, thought of as a paradigm, provides this environment through which individual theories and they permit the researcher to consider the best framework on which to formulate their research study (Burns & Grove, 2001; Beanland et al., 1999; Davidson & Tolich, 2001). German scholar Max Weber (1864-1920) was especially prominent in developing methodological approaches that highlighted the importance of the interpretation that individuals put on their actions; and on the actions and reactions of others, as is the case with the interpretive paradigm. In the past two decades, this paradigm has gained a reputation as being a suitable approach for exploring intensity, value and complexity of a phenomenon (Gillis & Jackson, 2002).

The interpretive practice seeks an understanding of the world through the perspective of people who have lived a particular experience, or who have a particular way of being in the world (Borbasi, Jackson, & Langford, 2008). Individuals act and interact on the basis of symbols that have meaning for them and this paradigm focuses on the way individuals make sense of their reality by examining how they define their situation and how their individuality develops as they interact with others and attach meaning to it, in an attempt to understand a chosen phenomenon from their point of view, with the belief that this is as important as explaining, predicting and controlling the phenomenon (Gillis & Jackson, 2002; Myers, 1997; Holloway & Wheeler, 2002). The interpretive paradigm is a process of developing broader generalisations regarding a specific phenomenon from specific observations through inductive reasoning (Beanland et al., 1999; Davidson & Tolich, 2001; Polit & Beck, 2004).

Interpretive research often initially begins with the researcher having a strong personal interest in a phenomenon, as I do with shift work and MRTs, exploring and inspecting individual cases related to that phenomenon, with data collection growing from and revealing concepts or ideas which lead to the development of formal theory (Davidson & Tolich, 2001, Borbasi et al., 2008; Greenfield, 1996). In this manner, interpretive research starts from a specific occurrence or observation and moves to a general pattern of combined occurrences, so is built from the ground up, to enable larger statements about the nature of the phenomenon being investigated (Beanland et al., 1999; Roberts & Taylor, 1998). Interpretive reasoning underlies a qualitative approach to inquiry (Beanland et al., 1999) and Morse and Richards (2002) believe it is the most beneficial method when the purpose of the study is to learn from participants in their natural context in order to understand a phenomenon in detail where current knowledge is limited. I am therefore employing a qualitative approach to my study as I investigate and evaluate the main effects of shift work and their impact on MRTs in New Zealand.

Qualitative investigation is a form of social inquiry that focuses on the way people interpret and make sense of their experiences and the context in which they are set, by providing insight, meaning and understanding of what lies at the root of their experiences (Massey, 1995; Holloway & Wheeler, 2002). The qualitative approach is based on a holistic world view where there is not a single reality, but one formed on perceptions which are fluid and different for each individual and where knowledge has meaning only within a particular context and at a particular time (Burns & Grove 2001). Each individual constructs meaning from, or allocates meaning to their experiences and events and it is the aim of qualitative research to facilitate this process by exploring the depth, richness and intricacies linked to these experiences (Krauss, 2005; Burns & Grove 2001).

Qualitative researchers immerse themselves in the natural context of their participants and gather rich, narrative data with the purpose being to describe and explore a phenomenon in a holistic and in-depth manner by identifying the important processes, themes or patterns which emerge (Polit & Beck, 2004; Davidson & Tolich, 2001; Holloway & Wheeler, 2002; Burns & Grove, 2001). According to Streubert and

carpenter (1995), qualitative researchers are dedicated to conducting their inquiry and utilising an approach to understanding that will support the phenomena under study without disrupting its natural context, committed to the participant's view point while acknowledging their own input and reporting their findings in a manner interlaced with the participants' commentary. Although findings are distinctive to the particular phenomenon, they can be considered to be representative of the people within this specific context or setting and so the understanding surrounding the meaning of the phenomenon is useful for understanding similar phenomenon in similar contexts (Borbasi et al., 2008; Burns & Grove, 2001). This will permit limited generalisations about the effects and impact of shift work to be made across the MRT profession in New Zealand.

Case study was chosen as the research method because it is an intensively exploratory, detailed investigation which utilises an open approach, is informed through an interpretive paradigm and allows data on a single phenomenon relevant to a select group to be gathered and analysed comprehensively (Massey, 1995; Myers, 1997; Holloway & Wheeler, 2002; Roberts & Taylor, 1998; Burns & Grove, 2001). Yin (1984) describes a case study as an "empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly defined; and in which multiple sources of evidence are utilized" (p. 23).

Burns and Grove (2001) believe that a well-designed and conducted case study will produce a rich source of descriptive information which can be employed as evidence to generate, prove or disprove theories and this is believed by Polit and Beck (2004) to be its greatest strength, given the limited number of participants under investigation. The intensive probing feature of a case study research makes it a powerful tool for gaining insight into little known issues, expanding the understanding of the phenomenon under investigation and revealing important findings that can produce new hypotheses or recommend directions for further action, all achieved as a result of the case study's ability to utilise multiple data collection methods (Polit & Beck, 2004; Burns & Grove, 2001; Wilson, 1993).

As case study research provides a focused and in-depth description of the fundamental elements and processes of the phenomenon under study, data collection relates to an individual's present state, including their past experiences and any situational factors that are pertinent to the phenomenon (Beanland et al., 1999; Polit & Beck, 2004). Although the number of participants in a case study tends to be small, the number of variables involved to ensure an exhaustive investigation is potentially wide-ranging, meaning that large amounts of data are often obtained and this is something I managed in a methodical manner to ensure it did not hinder data analysis (Burns & Grove, 2001; Zucker, 2001). The process of collecting and analysing data is recursive with the inquiry focusing on emerging theoretical issues as the research progresses (Massey, 1995; Polit & Beck, 2004), meaning the resulting theory is an explanation of the categories, their properties and the relationships between them (Calloway, n.d.). As anticipated, this recursive relationship is apparent in my research.

The specific design of the case study is altered to suit the conditions of each case (Burns & Grove, 2001) and for the purpose of my research the case study was constructed to utilise interview data from shift working MRTs and data collected from questionnaires completed by Charge MRTs and shift working MRTs. Document analysis was also conducted where Charge MRTs volunteered documents or department material relevant to shift work specific to their department.

#### **DATA COLLECTION METHODOLOGY**

It is noted in the literature that in-depth interviews and questionnaires are the most common and widely used data collection methods in qualitative research (Holloway & Wheeler, 2002). These appear to be the most appropriate methods for the case study and I therefore selected both these methods for this research project.

#### **Questionnaires for Charge MRTs/Managers**

Before conducting any interviews, I mailed out questionnaires to the Charge MRTs of each selected department with the intention of gathering background information regarding shift work conditions specific to the working environment where participating shift working MRTs are employed. Questionnaires are utilised to gather facts about the

phenomenon under investigation by posing questions to the participant whose answers determine their beliefs, attitudes, opinions, feelings, knowledge or intentions as they relate to the phenomenon (Borbasi et al., 2008; Burns & Grove, 2001).

Questionnaires are relatively easy to administer and are effective when seeking uncomplicated information about a set of facts and are easy to administer over a wide geographical area confidentially and anonymously, which was important to my study (Burns & Grove, 2001; Lo Biondo-Wood & Harper, 1998). The questionnaire respondents were identifiable to me which was unavoidable as this information was primarily used to give me a better understanding of shift work specific to each department when conducting the interviews with their shift working MRTs. However any opinion or comments given by the Charge MRT or Manager were kept strictly anonymous to the interview participants and in the write up of the thesis with any identifiable characteristics such as department size or services provided not reported. Questionnaire data can be considered valid and reliable because it is presented in a consistent manner, so there is less opportunity for bias than many other data collection tools, a large and diverse participant sample can be obtained, although poorly constructed questions may be biased or leading there is no interviewer bias, the responses are more likely to be candid and it is possible that responses and information will be expressed that may not be if a third person was included in the data collection process (Burns & Grove, 2002; Lo Biondo-Wood & Harper, 1998, Roberts & Taylor, 1998).

I used written questionnaires which were designed to gather reliable data from the Charge MRTs in a robust manner, reasonably cheaply and simply within a short timeframe (Burns & Grove, 2001; Roberts & Taylor, 1998; Borbasi et al., 2008). I accepted that this data often has less depth than that obtained through interviews as participants are unable to expand on their responses or seek clarification of the questions (Burns & Grove, 2001), however as I took this into consideration when constructing the questionnaire, I did not believe it would hinder this component of research.

As effective questionnaires can be complex and challenging to design, I researched numerous literature sources for assistance. Prior to posting the questionnaires, I

conducted a pilot study to determine the usefulness of the data collection tool in its ability to gather the desired information (Burns & Grove, 2001). The questionnaire was piloted on both MRTs and non-MRTs with management backgrounds and who would not be included in the intended participant sample. In conducting this pilot, I received data regarding overall layout, effectiveness of instructions, question clarity, completeness of topics and response sets and time required to complete and as a result, the questionnaire was modified to incorporate this feedback from the pilot participants before being sent out to Charge MRTs. The cover letter was not piloted by this group, although doing so may have been beneficial. Modifications included some of the wording being changed to make the meaning more clear, some questions being divided in two so as to be less ambiguous and a couple of questions were removed. The layout was also altered slightly to make the questionnaire more user-friendly and easier for the participant to follow. The questionnaires were posted with an information letter and pre-paid, return, self-addressed envelope. The Charge MRTs had one month with which to complete the questionnaire and follow up reminder letters were sent to them within one week of the closing date in attempt to maximise the return rate of completed questionnaires.

### **Document Analysis**

When returning the questionnaires some Charge MRTs volunteered documents or department material about shift work in their department which enabled me to perform document analysis as a further method of triangulation. This information was very useful in helping me to facilitate and understand the shift working conditions when conducting the interviews with the nine shift working MRTs.

### **MRT Interviews**

An interview is a conversation with, or questioning of a person that has structure and purpose, used in order to obtain information relevant to a specific topic (*Collins Concise Dictionary*, 2005; Kvale, 1996; Berry, 1999). An interview involves communication between the researcher and the participant, during which information is provided to the researcher, allowing them access into another person's world (Latimer, 2003; Burns & Grove, 2001). It is an excellent source of data as it is used to help understand a phenomenon from the participant's perspective, by discovering their feelings, insights

and thoughts which are explained in their own words and not those of the researcher; they may also elicit information that helps generate concepts or uncover problems (Morse & Richards, 2002; Kvale, 1996; Holloway and Wheeler, 2002; Modell, 2007). These characteristics strongly align with the purpose of my research and what I hoped it would achieve

Interviews for research purposes differ to interviews used for other functions because of the methodological awareness, interpersonal dynamic between the interviewer and participant and critical attention to what is said (Kvale, 1996). Varying styles of research interview can be utilised to produce the most effective data for satisfying the research question and as I want to get an honest and real gauge of what shift work means to MRTs, I selected the semi-structured interview as it is a useful research technique when little is known about the topic (Borbasi et al., 2008; Davidson & Tolich, 2001). An unstructured interview could also have been utilised in this situation and it is noted that some sources of literature may express the two in similar terms (Holloway & Wheeler, 2002; Roberts & Taylor, 1998), however as I had minimal experience conducting interviews, I believed that a semi-structured approach would allow me to conduct the interviews in a systematic manner while still allowing rich and pertinent data to be gathered.

The semi-structured interview format is widely used in qualitative and descriptive studies and allows the interviewer to have a general guide and outline of the topics to be covered which were a mix of personal knowledge and those reported in the literature, while leaving them free to vary the structure of the interview, explore, probe and ask questions (Morse & Richards, 2002; Burns & Grove, 2001; Davies, 2005; Davidson & Tolich, 2001; Berry, 1999). With this method, the researcher generally knows enough about the phenomena and focus of inquiry to develop open-ended questions in advance, in conjunction with prepared prompts, although unplanned questions and prompts may be used (Morse & Richards, 2002). This interview approach offers more methodical and complete data than an unstructured interview, but allows the interview to remain organised, informal and conversational and allows the researcher to use pre-planned questions but present them to the participants in a manner that will extract answers (Morse & Richards, 2002; Patton, 1990). This approach also allows rapport and trust to



be established. To ensure my prompts would not bias the responses, I constructed a list of open conversation starters which would generate discussion from the participant, but would not lead them towards taking a positive or negative siding on a particular issue. The topics to be covered were based on the main effects which emerged from a review of the literature and were only used as prompts when required. I established my personal views on shift work prior to gathering any data and this allowed me to be aware of my own bias which allowed me to be more effective at avoiding this during the data collection, particularly in the interviews, however I did use some of my personal examples when clarifying or expanding on a question to ensure the question was clear to the interviewee.

Although Holloway and Wheeler (2002) note that pilot studies are not routinely conducted in qualitative research, Borbasi et al. (2008) comment that qualitative interviewing requires considerable skill. As I had no previous experience at conducting interviews for research purposes, I decided to conduct pilot interviews in attempt to practice my technique and gain some confidence before interviewing my participants. I piloted the interviews on three MRTs who I knew personally and who met the inclusion criteria and with their permission, their responses were included in the final data analysis. This pilot was invaluable as it allowed me to refine my interview technique and edit my prepared questions and prompts in response to the feedback I received (Burns & Grove, 2001; Berry, 1999). As a result of the pilot I learnt not to talk over top of the participants because it meant they could not be heard on the Dictaphone and I learnt to nod rather than saying 'yes' because it allowed conversation to flow better and made transcribing the interviews much easier. I experimented with different ways of asking the questions to ensure they were asked in a neutral manner and this process also meant I became more comfortable with my role as interviewer. As I became more familiar with the interview schedule I did not need to look at the question guide as much, meaning I could concentrate on the interviewee. The pilot process also allowed me to practice recording the interview and I experimented with the best place to locate the Dictaphone to ensure we were both heard clearly. Transcribing the short pilot interviews gave me an idea of how long it would take to transcribe the actual interviews, while also allowing me to begin thinking in detail about the best way to order and analyse the data. The interview

process was iterative as I added questions over subsequent interviews each time I interviewed an MRT and they raised an interesting issue or I thought up better questions. It was for this reason that I included the use of a 20 minute telephone interview at a different time after the in-depth interviews to be able to ask the MRTs anything we had not discussed, but that I had with other MRTs so that all had similar chances to discuss their opinion on a similar range of topics.

Participants were asked to volunteer a location for the interview to be conducted and this was mutually agreeable and these included their place of work. As each interview was conducted, I collected the data with the use of a note-taking recorder device (Burns & Grove, 2001) and I also took some notes pertaining to body language during the interview to validate verbal responses, however I was careful to ensure neither method distracted the participant (Davies, 2005; Burns & Grove, 2001). I had intended to transcribe the interview in verbatim within 24 hours of it occurring so that it was fresh in my mind and I could add the notes I had made during the interviews, ensuring that no important details were lost during the transcription process which would be required for data analysis and where possible I did do this, however it was not always possible.

If, after the in-depth interview had been transcribed I felt that some aspect of it required further clarification, or if I had other questions to ask on topics discussed in other interviews, I conducted a follow-up telephone interview with each participant as required. Although inherently challenging to build a rapport over the telephone, I had already established this connection from the initial interview process. Telephone interviews were advantageous in this context, as they are an effective way of obtaining data, do not require any travel and are more cost-effective than face to face interviewing, which are all important factors in my study (Greenfield, 1996; Holloway & Wheeler, 2002). Telephone interviews are short and specific and this was to my advantage as I sought to elicit information on a specific topic as identified by other interview participants as part of the iterative process, or clarify or extend an area where data had already been gathered. I had pre-determined questions based on these areas and this method enabled me to gain clarification reasonably quickly and efficiently (Polit & Beck, 2004). Participants were asked to member-check the transcribed interviews to verify that they were a

representative and accurate account of the interview. No changes to responses occurred as a result, but some new information was sought and previous responses were clarified or explained in more detail as required.

I believe my chosen approach to interviews as a data collection method also increased the reliability and validity of the research as the same format and guidelines were used across all the interviews, making data collection more consistent and according to Greenfield (1996) it also facilitated the analysis, validity checks and triangulation of the self-report data.

### **Questionnaire of MRTs**

Whilst conducting the interviews, I also conducted a questionnaire of MRTs to evaluate the main effects of shift work and their impact. This was done to ensure I obtained the geographic coverage of responses which my interview sample lacked, in order to be able to accurately analyse the overall impact of shift work on MRTs in New Zealand and ensure the final results were representative of the entire population of shift working MRTs in New Zealand. Eight hospitals were selected on the basis of size of their geographic location and their relative location to one another. Three of the initial six departments were included meaning that some MRTs could possibly have been included in both the questionnaire and interview, however this was of no relevance to the final data collected.

The questionnaire was aimed at shift working MRTs, however ex-shift working MRTs were also permitted to complete them, allowing data to be gathered on why they left shift work. This is very valuable information that I would not have otherwise been able to gather had I not conducted this questionnaire and this aspect alone has important positive implications on the validity, reliability and credibility of my research and its overall findings. Ex-shift workers were not included in the interview sample as my aim was to evaluate the main effects of shift work and their impact on current shift working MRTs and not investigate the reasons why MRTs left shift work, however I included it in the questionnaire to get a small insight as to what ex-shift working MRTs thought about shift work.

The process of designing and modifying the questionnaires was identical to that used when conducting Charge MRTs questionnaire. Each questionnaire included a separate information letter, and each batch of questionnaires was posted to the Charge MRT of the selected department with an information letter and pre-paid, return, self-addressed envelope. Bags of sweets were also included for the MRTs as a sign of goodwill for completing the questionnaire. As three of the hospitals were included in the interview sample, the Charge MRTs or Managers from these departments had previously completed a questionnaire which stated how many shift working staff were in their department and this gave me an accurate idea of how many questionnaires to send to these departments. I then related this information to the other five departments to gauge the number of staff they would have and thus how many questionnaires to send them. It is possible that I under or overestimated the exact number required for full coverage, however in majority of cases unused questionnaires were returned with the completed copies indicating that an acceptable number were supplied. I accepted that the questionnaires would be made available to all MRTs who met the inclusion criteria as stated on each questionnaire and that they would be completed on a 'first in, first serve' basis with no expectation that the Charge MRT or Manager would specifically select staff to complete the questionnaire. MRTs had one month to complete the questionnaires and follow up reminder letters were sent to the Charge MRTs within one week of the closing date in attempt to maximise the return rate of completed questionnaires.

The questionnaire yielded an overall return rate of 42% which is acceptable when considered in conjunction with the data acquired from the interviews. McNabb (2002) notes that it is not unusual to receive a return rate of 10% or less in a mailed questionnaire although it is more typical to achieve a rate closer to 25-40% and this is supported by Wimmer and Dominick (2006) who comment that a typical survey will achieve a return rate anywhere between 5-40%, and so although not outstanding, my return rate of 42% would appear to be within acceptable limits for this form of data collection. I can only surmise why 58% of the questionnaires were not returned and reasons for this may have included that MRTs did not have the time required to complete the questionnaire, did not feel shift work was an issue worthy of their time or that I

simply overestimated the number of MRTs in each department and sent too many questionnaires.

## **PARTICIPANTS**

The sample of participants was divided into two groups incorporating shift working MRTs and Charge MRTs or Managers from six radiology departments, selected on the basis of size, services provided, location (incorporating both major cities and smaller towns spread across New Zealand and the presence of shift work. Before recruiting any participants, written permission was sought from each Charge MRT (an MRT who overlooks the running of the department/MRTs) or Manager and this was given by all six sites.

Six Charge MRTs or Managers, one from each of the selected radiology departments, were sent an information letter and invited to complete a questionnaire on shift work in their department. This was necessary in order to gather background information on the shift work conditions specific to the working environment where participating shift working MRTs were employed to assist with the analysis of their responses and facilitate the use of triangulation to enhance the reliability and validity of the research.

Shift working MRTs were recruited from the six selected sites and inclusion criteria to voluntarily provide information on the effects of shift work and their impact, and also to assist with a comparison between the MRTs' perceived reality with the actual experience of working shift work. The inclusion criteria were developed according to the definition of shift work and the purpose of my research (Burns & Grove, 2001). MRTs were eligible to participate in the research if they currently worked full-time shift work (10 days per fortnight) which included days shifts and either one, or a combination of night shifts, afternoon or evening shifts, weekends or on-call and had done so on a regular basis for at least six months to ensure they had sufficient experience of shift work over a period of time for depth. It was important that the right mix of MRTs were included in this recruitment process in order to increase the representativeness of the results.

All MRTs of selected radiology departments were informed of my study and openly invited to participate by way of a flyer which outlined the study, inclusion criteria and contact information and was distributed through their department by their Charge MRT or Manager. The MRTs were required to make initial contact with me via telephone or e-mail by a set date if they were interested in participating. Before recruiting participants, I had planned that if more than 12 participants acknowledged an interest in being involved in the study, the final group would be selected on the basis of age, gender, nationality, marital status, geographical location and experience to ensure that participants represented all age groups, genders, nationalities, marital and family situations and reflected a range of experience based on number of years qualified with shift work experience.

At the close of the one month long invitation to participate in my research, only eight MRTs from two of the selected six departments had contacted me wishing to take part, which fell short of the intended sample of 12 MRTs. Some weeks after the closing date, one additional MRT from a third hospital approached me to also be included in the interview process, bringing the final sample to nine, but only covering three of the six hospitals included. As I received no correspondence from these three departments, I can only postulate as to the reasons why their MRTs did not wish to participate, but this lack of participation is potentially associated with a risk of bias being introduced into the research. Despite all departments providing me written permission for their MRTs to be invited, I possibly did not have the complete support or buy-in from the Charge MRTs and as they were advertising the research on my behalf, this may have had an effect. I suspect that short staffing was an issue as MRTs may have already felt overworked and unable to take on any extra commitments. The fact that an MRT approached me once I sent out the questionnaires makes me think that if MRTs could not contact me from their workplace, they may have intended to once they got home, but may have forgotten about my study in the meantime. Also, for many MRTs, their spare time is too valuable and for some, the issue of shift work may just not be that important.

Despite the lack of geographic coverage, the final sample population does meet all the intended selection criteria and does incorporate MRTs from a range of ages, gender,

nationalities, marital status and experience. This breadth of selection was important to give variation to the responses and ensure widespread coverage of the all potential effects of shift work and this information required for selection purposes was gathered from them when they initially contacted me. The MRTs were informed that their participation was required and it was at this time that an interview date was set and information letters and consent forms sent to participating MRTs. The participants included six females and 3 males who all claimed to be in excellent health. Four were aged 20-25 years of age, one 30-35, two 40-45 and two 45-50. They ranged in experience from 7 months to 24 years with a collaborative experience of 49 years. Each participant has been given a pseudonym which they have been referred to throughout the research.

My case study included nine shift working MRTs which allowed me to collect a broad range of ideas and responses, but meant I did not get endless amounts of data which was beyond the scope of the research. Polit and Beck (2004) note that such small sample groups are acceptable in qualitative research when in-depth interviewing is being used as the data collection method and this number also meant that the validity was increased as the MRTs from the same hospitals could authenticate each other's responses with respect to aspects of shift work specific to their department.

As the interview sample lacked geographic coverage with MRTs from only three of the six selected departments wishing to participate, I conducted a survey of MRTs from eight different hospitals across New Zealand, utilising a questionnaire (see Appendix Two). This tool evaluated the opinion of MRTs with respect to shift work across the entire country and this then added to the validity and credibility of the research and corresponds with the information obtained from the interviews. The eight departments were sampled on the basis of geographical location across New Zealand and the chosen departments ensured a range of major hospitals and those from smaller towns were included, all offering varying levels of service and offering different modalities. All costs associated with travel, resources or postage were met by myself. There were no inducements for participating in my study.

## **DATA ANALYSIS**

Data collection and analysis often occur simultaneously in qualitative research and my study was no exception. In line with the design of my research methodology, and considering the aims and objectives of my research, I performed interpretive, thematic content analysis on the data that I gathered from both the questionnaires and the interviews (Streubert & Carpenter, 1995; Burns & Grove, 2001; Polit & Beck, 2004; Roberts & Taylor, 1998).

Analysing the data from the questionnaires was a relatively straightforward process given that they were already organised into questions which could then be easily arranged into themes based on the literature review. Statistics were gathered on each question as some questions were displayed in quantitative format while the remaining questions were expressed in qualitative format. Overall, both the open and closed questionnaire questions were comprehensively answered and the information gained was useful to help me improve my understanding of the shift work conditions specific to each department and to enable me to evaluate the main effects of shift work and the impact of these on shift working MRTs in New Zealand. In the second instance, the themes identified from the analysis of the questionnaires were matched with any corresponding themes that emerged from the analysis of the interview data and this also allowed for increased understanding of the interview information.

Analysis in interpretive, qualitative research involves examining words, descriptions and processes, with the flow of analysis progressing from concrete data to abstract ideas in order to facilitate the development of theoretical explanations (Borbasi et al., 2008; Burns & Grove, 2001). Polit and Beck (2004) suggest four stages of data analysis which align with this framework, beginning with data comprehension, moving to data synthesis, theorising and finally re-contextualising the emerging abstract concepts. This mirrored my approach to the analysis of the interview data, although as Greenfield (1996) notes, this was a time consuming process.

The comprehension stage occurred first where the data was understood and this allowed a first impression of what was going on. This impression was captured on paper as the



theme or thought became apparent and from each of these being documented, a visual representation of the data emerged, allowing me to comprehend and understand it at a superficial level in the first instance. I became immersed in the data gathered from each interview as I transcribed it from the voice recordings and I also read the entire printed transcription of each interview through twice to improve my comprehension of the data as a set. This also allowed me to familiarise myself with the mood, tone and emphasis behind the data, before proceeding to the next stage of analysis (Borbasi et al., 2008).

I familiarised myself with the data and the synthesis stage was where pieces of information were moved around and linked together, providing a sense of what was typical for the phenomenon. In the theorising stage I deconstructed the interview by identifying and extracting significant statements and applying pertinent codes to each (Streubert & Carpenter, 1995). The coding stage facilitated a transition from the data to more abstract ideas or themes and also allowed me trace back to where particular ideas originated from which later enabled me to justify and account for my interpretation of the emerging concepts (Morse & Richards, 2002). Theorising was logical organising of the data where it was coded into themes and this occurred after I had completed coding each interview separately. I found that multiple themes ran through my data and once I identified these, I became aware that more segments of the coded interview were relevant to these themes, as Morse and Richards (2002) notes can occur. The themes were then re-contextualised and developed further and applied to the context. This enabled me to construct more general, abstract concepts and build a framework of relationships which aligned with the actual context (Streubert & Carpenter, 1995).

The interview participants received a précis of the main themes/findings from the interviews as a thank you for participating in the research and they were invited to comment on the accuracy of these interpretations as they related to their experience. Overall the response was very positive with the interpretations appearing largely representative. This approach permitted a comprehensive analysis of the data, ensuring that the findings and emerging concepts were reliable, credible and valid.

## EVALUATION OF METHODS

Triangulation is the process of examining the chosen phenomena from different perspectives by utilising a combination of research methods in order to validate the results, enrich diversity, enhance understanding and accomplish the objectives of the research (Beanland et al., 1999; Holloway & Wheeler, 2002; Roberts & Taylor, 1998). I utilised methodological triangulation by conducting interviews of shift working MRTs and gathering background information on shift work through questionnaires completed by Charge MRTs. Utilising two data collection methods to investigate the same phenomena increased the validity of the study because it allowed me to develop a thorough understanding of shift work, while reducing the degree of investigator bias and corroborating the results and thus increasing their significance and importance (Borbasi et al., 2008; Burns & Grove, 2001; Roberts & Taylor, 1998; Polit & Beck, 2004). Participants were also asked to member-check the transcribed interviews to verify that they were a representative and accurate account and this enhanced the credibility of the research, as did my ongoing and extended interaction with the subject matter as the researcher (Streubert & Carpenter, 1995).

Rigour is important in qualitative research because it is associated with the value of the research outcomes and is demonstrated through the researcher's awareness, honesty, adherence to the philosophical paradigm and evidence of information discovery as they interact with those that are at the centre of the phenomenon and collect and consider the data (Burns & Grove, 2001). In this research, rigour has been achieved through well developed research methods, adequate time spent collecting data, careful deliberation and reflection of all the data obtained leading to sufficient and considered theory developing from the data (Burns & Grove, 2001). I have performed an external rigour check by sending the interview participants a précis of my interpretation of the overall interview results and asked them to give feedback on them, not based on their fit to the individual's situation, but as to how well they think they fit and align within the overall impact on shift working MRTs in their department, as although they are aware of their own opinions and experiences, they are also aware of the impact on other MRTs within their department which was also evident in the interviews. I decided to perform external rigour checks in this way because I felt that the best people to ascertain whether my

inferences were not only accurate to the interview data but also valid to the wider population was to get those involved in it to give feedback as they the ones who are at the root of my research and therefore the best people to ensure validity of my interpretations based on their data. I ensured I was reflexive as a researcher and I initially identified, owned and bracketed my personal opinions and experiences of shift work before conducting the interviews and again before I interpreted the collected data and this has also ensured my results have rigour. Performing triangulation between the interview data and the data obtained from the questionnaires and cross-checking that my interpretations fit both sets of data is another way I have ensured that my results are valid.

By utilising an overall sample which reflected varying ages, gender, nationalities, marital status', geographical locations and experience, conducting a pilot both the questionnaires and interview format, performing all interviews with the use of a semi-structured technique and providing an audit trail which, through justification of my statements, illustrated the evidence and thought processes that lead to my conclusions, I ensured rigor, validity and reliability of the research method and subsequent results (Burns & Grove, 2001; Streubert & Carpenter, 1995; Polit & Beck, 2004). Although I did not confirm whether participants actually met the inclusion criteria, I did gather information through the questionnaire from each Charge MRT which provided background information and validated the type of shift work undertaken at each department, and by including MRTs from the same department they were able to authenticate each other's responses with respect to aspects of shift work specific to their department and from this the interview and questionnaire responses were deemed to be credible (Burns & Grove, 2001).

Validity relates to the extent that the findings can be generalized over the entire participant population and triangulation is an important strategy to establish such validity as it increases confidence in the results by allowing the validation of the data collection instruments and methods through multiple perspectives (Holloway & Wheeler, 2002; Roberts & Taylor, 1998; Polit & Beck, 2004). Research is more likely to be valid if it is based on more than one data collection method because less researcher bias is able to encroach (Roberts & Taylor, 1998) and so utilising in-depth interviews, two

questionnaires and document analysis has increased the validity of my study and its findings.

The interviews of shift working MRTs primarily gathered qualitative data while the questionnaires aimed at shift working MRTs gathered both qualitative and quantitative data, with both open and closed questions being utilized. This allowed the data to be presented in statistical and expressive formats, adding to the value of the triangulation performed. The questionnaire and interviews yielded valuable information, despite some of it reflecting political decisions and staffing issues within the different departments around New Zealand at that point in time. Despite this, I feel the interviews were conducted in a good timeframe and in acceptable locations and so I believe it would be impossible to conduct this research without some external political or departmental opinions encroaching so in light of this, the data collected was highly representative of the MRTs at the time of data collection and thus valid and credible.

#### **ETHICS**

In designing my research I considered many ethical principles and believe it upholds high ethical and moral standards. All participants involved in my research were treated fairly, all participation was voluntary and with full informed consent and the anonymity of all participants and the departments with which they work has been preserved within the sample group (Burns & Grove, 2001; Davidson & Tolich, 2001). These factors were explained to the participants in the explanatory information letter which they received prior to data collection.

Informed and voluntary consent was assured as a participant information letter was sent to all participants prior to their interview explaining the essential points of my research and what would be expected of them, allowing them ample opportunity to peruse and reflect before giving their consent (see Appendix One). Written consent was obtained using a consent form which incorporated all the required information and details including consent to audiotape the interview. All participants were provided with a copy of the information letter and consent form for their records. The return of a completed

questionnaire from a Charge MRT or Manager was taken as consent since it was voluntary.

Respect for rights and confidentiality was upheld as access to raw data has been restricted solely to my supervisors and I, and all features potentially identifying participants or their employers was removed during transcription of the interview. The semi-structured nature of the interview was designed to ensure the privacy of the participant was not invaded as it was intended to be a guide to allow participant's to comment only on topics they felt comfortable discussing and at a depth they controlled. No direct questions were asked or discussion entered into on topics that might have been considered sensitive and outside the scope of the research aims and objectives. Any response from the participant that fell outside the scope of the research, such as examples of poor practice which had no bearing on the research, was not explored in further detail. There was the theoretical chance that emotional distress might have arisen as a participant recalled a difficult event that was linked with shift work and whilst I was prepared for this, no such situation occurred. No particular ethnic or cultural group was the subject of my research and unless mentioned by the participant as having relevance to the meaning of shift work and its effects, issues regarding cultural safety were not discussed during the interview.

Deception was limited in a myriad of ways. My research has been represented honestly and faithfully with the purpose and objectives of my research freely available and stated in the participant information sheet. The interview method utilised a semi-structured format which allowed participants the freedom to discuss all aspects of the effects of shift work and their impact, while allowing me to prompt and guide the participant if required to ensure their response was clarified and intent was correct. I have treated all interview responses confidentially, with respect and dignity and research data was utilised only for the purpose stated in the research proposal and outlined in the participant information letter. I have ensured the interviews were transcribed accurately and the participants were asked to verify transcriptions of their interview to ensure this occurred; data was then analysed truthfully and faithfully and in accordance with the methods detailed in the research proposal (Burns & Grove, 2001; Davidson & Tolich, 2001). All research data including audiotapes, interview transcripts and consent forms are securely stored and

will be kept as such for a five year period. There were no inducements for participating in my study, however participants received a précis of the results.

Participants were within their rights to withdraw from the study, however due to the interview schedule and travel required, any shift working MRT wishing to withdraw was required to do so at least one week prior to their interview or one week following their interview. Charge MRTs were able to request to have their questionnaire data withdrawn from the study up until one week after the return date. If they wished to withdraw prior to this time it was expected they would not complete or return the questionnaire. Withdrawal information was detailed on the information letters all the participants received.

Ethics approval was granted by the Unitec Ethics Committee on 12<sup>th</sup> May, 2009, approval number 2009 – 957 and is valid for one year until 27<sup>th</sup> May 2010.

#### **RESEARCHER'S ROLE**

Credibility is linked with the confidence in the truth of the data and interpretations of them and I believe that my own experience of shift work was advantageous here. My personal experience also enhanced my ability to build rapport with the interview participants. Patton (2002) suggests that any personal or professional information regarding the researcher that may have impacted the data collection and analysis should be stated in the report which I have done by including an open and honest statement of my background in a short biography at the beginning of the thesis.

To ensure I was reflexive and acknowledged the impact my background as a shift working MRT might have on my research, I initially reflected on my own values and beliefs, views, assumptions, prejudices, feelings and behaviour toward the research topic which I documented in my reflexive journal and was then able to put aside or 'bracket'. This process allowed me to remain open-minded to the participant's responses and ensure my understanding and interpretation of them were not altered or misconstrued (Burns & Grove, 2001; Jootun & McGhee, 2009).

Throughout my study I maintained a research journal where I recorded information about personal thoughts and feelings that occurred during the research process, my decisions, insights, experiences and emotions to help me identify and acknowledge my own beliefs so I could separate them from those of the participants, thus enhancing my self-awareness and providing a transparent audit trail throughout my study. (Borbasi et al., 2008; Smith, 2006; McBrien, 2008). I continued this reflexive practice throughout my study as Holloway and Wheeler (2002) note that reflexivity is ongoing through data collection, analysis, interpretation and construction of the written report and this will enhance the rigour of my research.

The possibility existed that I might be considered a friend or colleague of any given participant due to the fact that I have worked with many MRTs and established a wide network of contacts as a result however this would have no bearing on the final results. All participation was voluntary and as participants were required to make the initial contact I had no input into this. Any personal friendship was initially built on a professional relationship and there is no reason that this has interfered or conflicted with the conduct or results of my study in any way.

In summary, my research will use a case study research method with a qualitative approach which is informed through an interpretive paradigm. Questionnaires have been used to collect data from shift-working MRTs across New Zealand and in-depth interviews were used to gather data from nine participating MRTs. Interpretive, thematic content analysis was performed on the data. A myriad of methods, including triangulation, have been utilised to ensure high levels of validity, rigour and credibility. The research was also considered from many angles to ensure it was ethical and had for participants and their rights at its core.

## **CHAPTER V: INITIAL PERCEPTIONS AND OVERALL OPINIONS**

This chapter will explore the MRTs' initial stance on shift work based on their realisation that shift work was part of the profession, including when they initially realised, what they thought at the time of realisation and their perception of shift work as a result. The actual reality of performing shift work and how this compared with the initial perception will also be discussed. The MRTs overall opinions of shift work with respect to shift work as a long term option, the role of individual attitude, the suitability for shift work, the evolution of shift work and society's perception and treatment of shift workers are also mentioned. The main effects of shift work identified by the research were professional effects, performance and impairment, educational issues, social and family effects and health effects.

### **REALISATION THAT SHIFT WORK WAS PART OF THE PROFESSION**

The majority of participants did realise that shift work was part of the profession prior to commencing their training and these were mainly the older participants who were starting their second career, or those who had family/friends working in the profession. Whilst often unsure of their first realisation, these participants recall being told, either during an observation visit, because they specifically asked about the possibility of performing shift work or being told by a family member or friend. Those who did not realise that shift work was generally involved in the role as an MRT were the younger school leavers and they typically did not become aware of the existence of shift work until well into their first year of training or in Bradley's case, second year of training. He comments that he did not really notice what staff did when he was a first year student. It could be that this demographic were naïve and did not research the profession in-depth, however this would seem a little unfair because, as Claire comments "you can't blame someone from being uninformed going into a job if they haven't had the experience with it and if it's not made blatantly clear to them." Katie comments that she does not recall ever being told by the tertiary provider she applied to and thinks it would have been a good idea for them to provide some information about shift work, which would highlight the role they play in advertising some of the aspects of the profession, as opposed to simply the qualification they provide, as being crucial.



Those that did know about shift work acknowledge that there is a difference between knowing that shift work exists and understanding what it means in practice and whilst some knew that shift work was an expectation, they had little understanding as to what it actually meant in practice. Claire comments that “I never had anyone around me doing shift work, so even though you know shift work exists, the implications of it are still a mystery.” Alicia supports this by stating that she did know that shift work would be part of the job, but “had no concept of how it was going to be or what it meant” and it was not until she began working in a hospital that this became evident. Unless a prospective MRT had prior experience of shift work, it would be extremely difficult to allow them experience of shift work prior to commencing their training, however it does highlight the importance of students undertaking a proportion of their training outside of the usual Monday-Friday, 8-5pm work hours to give them some experience of shift work before they are expected to perform it as a qualified MRT. It also showcases the benefits of the observation visit that students are often required to make as part of their application to a Tertiary provider, as this gives them the opportunity to ask any questions they may have and for the topic of shift work to come to their attention if it has not done so previously. Medical professionals should be adequately informed and prepared for shift work to enable them to identify if they are suited to shift work, and if they are, to reduce the potential difficulties (Peate, 2007; Whale, 1993; Perkins, 2001).

#### **INITIAL PERCEPTION OF SHIFT WORK**

When he first realised about shift work being part of the role as an MRT, Greg found it “was not a driving factor one way or the other,” Lynda found it “did not put me off because if everyone else can do it, I can too,” while Lauren figured that there are some jobs within the profession where you do not have to do shift work and so at the time she did not really mind, while Timothy “just took it as being part of the job.” However when Bradley found out he “was gutted. All I had heard was negative things about shift work” and he admits to being disappointed, but it was too late to pull out because he was already half way through his training. He believes that knowing about shift work up front before starting his training would not have made a difference because he thinks he would have

just “taken it as part of the job,” but he can see that for someone who did not like shift work, it could be a problem. Claire supports his thinking and believes that students are coming through that do not know about shift work which is a real oversight by the tertiary provider. This demonstrates how important it is that participants are aware of the prospect of potentially having to conduct shift work prior to commencing training as an MRT, and while it may not be so different for single people to adjust, if they have a family or strong dislike of shift work the results could be devastating. Dorothy thinks “if people knew what shift work was like [from the outset] I don’t know how many people would come into the career” and so from this point of view it could possibly be advantageous to the recruitment of MRTs if prospective students do not find out until it’s too late, although it could bring the retention of these professionals into question.

Greg, Bradley, Lynda and Katie had no perception of shift work because they had no idea what to expect or did not consider what it would be like. Their outlooks are also represented in 20% of questionnaire respondents. Greg states that he did not really consider what working shift work as a radiographer would be like, “it just happened,” while Bradley mentions that many people had said to him that with shift work “you miss out on your weekends and you don’t get your social life.” Rather than forming a negative perception based on this information, he remained open to the idea and decided that it would be different for him. Like Bradley, Lynda also had no perception of what shift work would be like, “it didn’t really occur to me.” She notes that she did have some knowledge but “it was more about what the shifts were, but I didn’t think about the effects at all.” One comment from a questionnaire respondent also reflects Lynda’s situation, noting that “I realised it would involve day and night and weekend shifts, but I did not think about how tired I could get, or missing social things.” Responses from the questionnaire also show that most people either “did not think much about it;” “had no idea what impact it would have on myself and my life;” “had no expectations and did not reflect over that fact at all,” with one respondent commenting that “I did not see that it was going to be an issue until I actually worked it” and another mentioning that they “did not really contemplate what it would be like but I wanted to do this job so it was something that came with it.” Bradley makes a very important comment that in hindsight,

“your perception of it really affects how you take it” and this stresses how crucial knowledge of shift work and the ability to create an accurate perception of shift work is if the worker is going to have an enjoyable experience of shift work with minimal impact on their lives.

Sarah considered that shift work might have a professional impact and, although she was dreading the night shift, she thought it would be fun doing shifts and working weekends. However she does not know if she really thought about how shift work might affect her personal life, and was probably more worried about how shift work would impact the professional side of the job, not how it would affect her personally. As a newly qualified MRT this would seem a fair observation due to the apprehension about working alone and ‘unsupervised.’ It is plausible that as a result of this, the impact of shift work could be considered more important on a professional level as opposed to its effect at a personal level.

The remaining interview participants either felt that their previous experience of shift work stood them in good stead for shift work as an MRT, with this thinking mirrored by 11% of questionnaire respondents, or held mixed perceptions about shift work as did 69% of questionnaire respondents. Dorothy was generally excited and looking forward to something different, albeit a little nervous and Alicia thought it would be “fun working different hours, different challenges, different times of the day or night, different presentations of patients and ability to think more on your own.” These positive perceptions were reflected by 33% of questionnaire respondents, with comments such as “I thought it would be nice to work different shifts every day or week – to stop me getting bored with the same thing all the time;” “not too hard to adapt too and easy to recover from;” “I looked forward to it;” “exciting, fun, wide variety of patients and examinations” and “lucrative.” Lauren contemplated that it would be “really tiring and didn’t look forward to it and Timothy was “a little bit worried” although he “wasn’t too scared about it,” but recognised that when you start working by yourself for the first time, it could be a little bit scary. These negative perceptions were replicated in 36% of questionnaire respondents, with some commenting on the impact on their social lives, with examples

such as “doing the shifts is ok, it’s the effect on my outside life that was hard” and “hard on my social life and outside work interests.” Some found it “difficult to get into a routine,” while others thought it would be “scary,” “busy” and “stressful” and many shared the view that they perceived that shift work would be “very tiring.”

Bradley makes the observation that “I got into this job thinking that you x-rayed broken wrists. I don’t know why I actually chose it knowing so little about it.” This comment would suggest that there are a number of perception issues pertaining to the profession, and that this issue includes, but is not limited solely to shift work. The importance of a mismatched perception cannot be downplayed as it is the platform on which the individual’s career as a shift working MRT will be built and largely determines the successfulness and suitability of the individual to this role.

#### **THE REALITY OF SHIFT WORK**

When the interview and questionnaire participants were asked if the actual reality of performing shift work differed from their initial perceptions of it, the responses were mixed. Many interview participants and 18% of questionnaire respondents felt they could not comment on this as they had no initial perception about what shift work would be like and so had nothing to compare the actual reality to. Lynda comments that “I had no idea it would be like that. My perception of it and what it actually is was completely different,” while Bradley points out that without having too much of an expectation about what it was going to be like, it is hard to know if it turned out to be what he expected. This situation, whilst not ideal, could be advantageous as these MRTs would likely have taken a more neutral outlook with shift work and therefore been more open-minded to the effects associated with it. However, it does mean that an alliance between perception and reality can never be met and as there is the breadth of knowledge and information available about shift work and its effects, it hardly seems fair to expect these MRTs to identify and cope with the impact of any of the effects of shift work they experience in a blind and uninformed manner.

Thirty eight percent of questionnaire respondents and three interview participants felt that there was no, or very little, difference between the actual reality they experienced and their initial perception, supporting congruence between the two, with comments from Claire, who felt quite neutral, Sarah who noted that “it is what it is” and Christopher who thought that shift work did turn out to be what he expected, proving that it is possible to align perception with actual reality. Comments from the questionnaire respondents were minimal as the majority simply answered the question without justifying their answer, however the comments that are provided are similar to those of the interview participants, and include “no one ever lied to me about it, it is what it is,” and “both my parents did shift work so I saw the effects on them before I started the job.” These comments are supportive of the notion that this is the ideal scenario, mainly due to the fact that if MRTs are aware of the existence of shift work, and well informed as to the implications of it, even if they have not experienced the effects for themselves, the knowledge and insight alone can assist with ensuring their initial perception and actual reality is aligned so there are no surprises, as Lynda noted she would have preferred.

Four interview participants and 44% of questionnaire respondents stated that their perception of shift work and the actual reality they experienced were not aligned and quite different. This proportion of MRTs might appear high, however it must be considered that the actual reality they experienced may have differed because it was either better or worse than their initial perception and so limited inferences can be drawn from this result in isolation. Twelve percent of questionnaire respondents in this category supplied no comment or their comments could not be catalogued as justifying an experience that was better or worse than their perception, while for 29% of questionnaire respondents, their actual reality was better than they had initially perceived. Comments from the respondents included “I am better able to sleep than I thought;” “night shift is a bit easier than I expected;” “more interesting and independence, good fun at times due to camaraderie;” “not really that tiring, do not mind it at all in moderation” and “it was not as bad as I thought it was.” Two interview participants also experienced that their reality exceeded their perception, with Lauren finding that it turned out better and Tiffany noting that shift work was fun, “I loved all the trauma and after hours work...in some respects it

was a novelty because I hadn't done it before." Whilst it is pleasing that these MRTs have experienced a reality that surpassed their perception, it seems that their perceptions were lowered as opposed to the reality of shift work being high which is unfortunate, although as Bradley points out "low expectations are easy to please."

Two interview participants felt that their actual reality was worse than they perceived, with Dorothy not aware of the impact shift work would have on her and Timothy mentioning that it did not turn out to be what he expected, "no...it caught me out with a few little surprises...it hasn't all been plain sailing." These thoughts were represented in 59% of questionnaire respondents in this category. Comments from this group of MRTs included "it is harder and more tiring than expected," "I did not realise it would be so exhausting;" "it is a lot harder than I imagined it ever would be, I stopped doing it as soon as I could;" "did not expect to feel so tired and I've aged" "reality is way more disruptive" and "the effects of shift work are greater than I actually perceived." This misalignment has potentially occurred for one of two reasons, either the initial perceptions of these MRTs were unrealistically high, or alternatively their perceptions were realistic but the impact of the effects associated with shift work were simply too immense. Neither scenario is ideal and improvements must be implemented to ensure that the initial perceptions of shift work are informed and realistic or the impact of the effects of shift work must be minimised or eliminated.

It has been identified that an MRT's overall attitude towards shift work is constantly evolving depending on their personal and professional situation, and the alignment between perception and actual reality must also be considered in the same light. These remarks and trends are simply a snapshot in time and are subject to change because, as their experience of shift work expands over a period of time, the actual reality will alter meaning that at any given time it may or may not align with the initial perception. This occurrence further highlights the importance that MRTs have initial perceptions that are honest, realistic and based on fact because these views are the foundations that their actual reality will be built upon. If each MRT is informed and prepared for the changes

in the reality they will experience, they will be better adept to cope with them in a positive fashion, meaning their overall experience of shift work will be more favourable.

#### **OVERALL OPINIONS OF SHIFT WORK**

One surprising finding was the large number of participants who said they liked shift work. Along a continuum between 'love' and 'hate' shift work, Bradley and Sarah loved it, Lynda, Christopher, Claire, Lauren, Timothy liked it, Katie and Greg do not mind it, while Dorothy dislikes it the older she gets, Alicia does not like it as she finds it a struggle and Tiffany found picking a place along the continuum really difficult. Most justified their position by stating the different advantages and disadvantages that were important to them. At the conclusion of the interview most maintained their initial opinion of shift work, however Christopher commented that "the interview has given me a lot of insight into it and I'm thinking maybe I don't like shift work as much as I used to," although after much deliberation he maintained his original position. These results are supported by those of the questionnaire which show a similar trend with 21% reported that they loved or really enjoyed it, 61% liked it and 18% hated or strongly disliked it. Many reasons were given in justification of the rating, with most centered around the various advantages or disadvantages important to the individual, but with an underlining thread that it is "part of our job so just get on with it and do it." The literature reports that approximately 10% of shift workers enjoy it, while the rest endure it but typically complain about their shift work schedule and varying levels of intolerance (Garabino et al., 2002; Perkins, 2001), which is generally supported by these research findings.

This predominantly positive opinion of shift work is surprising because each participant could state the disadvantages and negative effects associated with shift work, which typically received a large amount of criticism overall. Lynda sums it up when she says "as much as I complain about it, I don't think I mind it all that much" and this finding would indicate that the advantages, regardless of how few there are, would appear to be sufficient enough to counteract the disadvantages and ensure the overall opinion of shift work is favourable. It is likely that the negative aspects are accepted as part of the job, highlighting the advantages and so a favourable opinion is based around this. The

potential exists that once they cease to perform shift work and reflect on this time, the opinion they held of it may not align with their reflections of it, meaning it is after they have ceased performing shift work that they form an accurate opinion of it. This can be supported by a response supplied in the questionnaire stating that “it was not until recently when I came off shift work that I realise how much it interrupted my life and made it difficult.” The reminiscent study cited by Spurgeon (2003) supports this as it considers that most professionals are not aware just how bad things are at the time and this would indicate that some form of intervention is necessary to improve the working conditions for shift working medical professionals.

Alicia commented that if someone asked her 20 years ago what her opinion was of shift work, she would have said it was fun and she loved it. She puts her change in opinion over time down to reaching saturation, having a family and other commitments that she did not have at the beginning, increasing tiredness and the impact of ageing. Greg also stated that while he likes shift work now, he is only new into his career and he acknowledged that if asked again in 10 years he would probably have a different view of shifts. Dorothy loved shift work when she first started, but now finds she can't function afterwards and so she dislikes it. She attributes her change in opinion to a mixture of ageing and her personal life situation changing: “Life becomes more complicated and more involved, relationships develop and your priorities change, whereas when I had just started, it was just me.” From this, it would seem clear that people's opinions of shift work are not static, but evolve over time depending on their health status and tiredness, family circumstances, age and length of time performing shift work and so it is important the workers themselves and the departments within which they work, are aware of this possibility so that suitable measures can be put in place to allow for this fluid nature of opinion regarding shift work.

### **Role of Tertiary Providers**

Many of the issues associated with shift work and how workers cope with them originate from the initial realisation that shift work is a large part of the profession. The issue of when prospective MRTs are aware of this would appear to be crucial to their ability to



cope with it. There was a mix of those who knew about shift work (largely the older participants in their second career) and those that did not (mainly school leavers or young adults beginning in the workforce). This could be put down to sheer naivety on the part of the individual, however Tiffany's experience would seem to highlight the root of the problem. Tiffany trained as an MRT when it was still a Diploma and she explained that shift work, and the possibility of performing it, was spelt out in all the brochures, information and application forms about the course so she was very aware of its existence and the potential that she would conduct it when she qualified.

In contrast to this, Bradley, Dorothy and Sarah all comment they did not realise shift work was part of the profession until well into their first year of training, if not into their second year. This could be attributed to the fact that the training had changed to a degree programme offered by a large tertiary provider when they began their study. The perception is that this change has potentially meant that the information regarding the profession has disappeared from the advertising, because, instead of advertising the profession and career as was the case in Tiffany's situation, the Tertiary provider may be focused on providing the qualification and so some of the information regarding the profession may have been lost in this transition. The majority of interview and questionnaire participants comment that at no time during their training did they receive any information regarding shift work from any of the Tertiary providers where they gained their qualification. This highlights the potential that if the provider does not portray this information, and indeed it may not be their responsibility, it remains a vital piece of information that must be portrayed to potential students from another avenue.

### **Shift Work in the Longer Term**

It is reported that approximately 15 - 20% of shift workers abandon shift work because they cannot tolerate the disruption and associated effects and are never able to suitably adjust (Garabino et al., 2002, Harrington, 2001). However, the results of this research show a very even split of participants that consider themselves performing shift work into the longer term and those that would like to stop immediately or within five years. Bradley sees it as more a short term thing while he's single; Alicia does not see herself

doing shift work for much longer and would “like to stop now,” while Tiffany really enjoyed it at the start but is at the stage where she could give it up. Sarah comments that it’s good to have variation, but she does not see herself working night shift in the long term, especially once she starts to have a family. Of the opposing view, Lynda does not know if she’ll be doing it when she’s 50 years old, but for the foreseeable future she will definitely be doing it, Christopher is “quite happy for it to go on” as long as he is in good health and enjoying the advantages associated with it and Timothy sees himself being fulltime on the shift roster “for another 10-15 years.”

Katie has really struggled with the effects of shift work and when asked if shift work was at the point where she might consider changing the way that her career is structured she replied “I think I’ll look at going elsewhere...maybe private,” however when asked later in the interview about doing shift work into the longer term, she commented “yeah, I’ll give it another 5 years.” Greg does not think he would like a 9-5pm job, and Lynda also comments that if a Monday to Friday, 9-5pm position came up, she does not think she would be keen on it. If she actually had the opportunity, she does not think she would take it because she prefers it the way it is. This shows that no matter how bad shift work is for some, when it comes to the crunch of actually doing something about it, no action is taken and the reason for this almost seems to be one of fear of the unknown, that there is some security in what is known and experienced. Despite the negative view of some MRTs towards shift work, they like the advantages and are afraid they would miss out by no longer doing it. As a result, they do not think they will like the alternative and so remain in the shift work cycle. This thinking could indicate that shift work becomes ingrained in who you are, what you do and how you live your life.

### **Attitude Towards Shift Work**

Tattam (1995) states that the attitude with which an individual approaches shift work immensely influences the degree of impact it has. A clear trend from the interviews indicated that an individual’s attitude was important in determining how successfully shift work can be integrated into their career and their life. Bradley was “pretty adaptable to things and just take it as it comes” and it was clear that his attitude had helped him

cope with shift work. He comments, “just make it work for you and if you decide shift work is bad then you’re going to hate it and you’ll look for the worst points, but if you decide that there’s good points in it you can look for that.” He credits his positive and open attitude as being the reason why he has enjoyed shift work from the outset. Dorothy’s belief, that it is all about the attitude that you approach it with his thinking supports his thinking. She notes “I think you can wind yourself up too much...it all comes back to your attitude.” Christopher also mirrors these opinions and he believes that having an open mind and positive attitude going into shift work set him up well for the first year and how it actually turned out to be. He continually strives to turn each issue into a positive and finds that that outlook works for him. Timothy and Claire also believe that attitude plays a huge part and Claire comments that “if you come into it expecting to get what you want or demand what you want, you will maybe be not so pleasantly surprised.” These views could suggest that the attitude with which shift work is approached has a very strong link with the overall opinion and successfulness of shift work. Keeping an open mind, being adaptable and accepting to any issue that arises, whilst actively striving to find the positives associated with shift work, clearly seems to build a solid platform upon which to base a career in shift work.

### **Suitability for Shift Work**

A small number of interview participants acknowledged that they felt that some individuals are simply not suited to shift work, or that there are some personal characteristics that made a select group of individuals more suited to shift work. Alicia thinks that there might be some people who possibly just are not suited to shift work at all, while Katie goes a step further by stating that “I’m probably the personality that just does not work well, I do not tend towards shift work. Some people it suits them well, some people it does not and I’m sort of in the middle of the rail, I can take it or leave it. I would rather not do it and have a better quality of life and a better quality of sleep.” Admi et al. (2008) defined a person who cannot adapt to shift work as someone who complains of difficulty falling asleep after shifts and who awakens multiple times during their daytime sleep following a period of night shifts, which would fit with the difficulties Katie has had as a result of shift work interfering with her sleeping patterns.

Harrington (2001) argues that personality plays a significant part in the ability to tolerate shift work. Claire's comments support this, maintaining you have to be the right kind of person to be an MRT. She thinks that "it's not a job you'd be very good at doing if you hated it because of the call and the people and the hours, you'd be miserable...and yes, they are horrible to work with." Claire's comments highlight the fact that it may not be a matter of simply being suited to shift work or not, but more that shift work is part of the profession and that there are some characteristics that are more desirable for individuals to possess if they are considering coming into the profession. This provides a further reason to support the importance of prospective students being aware of a wide range of aspects pertaining to the profession and not solely the qualification they will gain. Phillips and Houghton (2007) report that extensive tests have been conducted in order to determine whether a certain personality group would be more suited to partaking in shift work, however these tests have been unable to accurately predict which individuals are best matched to tolerate or cope with shift work and its effects. The individual factors that predispose a person to shift work intolerance are not yet fully understood and thus too little is known to draw any definite conclusions as to who will or will not be able to best tolerate shift work (Reid et al., 1997; Scott, 2000; Glazner, 1991).

The number of participants in this study that had some previous experience of shift work before starting in the profession indicated that they knew they could cope with shift work and its associated effects. Based on the number of participants who were unaware that shift work was part of the profession when they joined, it is not clear whether the decision to join was consciously based on shift work or not. However, it does indicate that the more people who realise shift work is a factor going into the profession, will mean those that apply are better suited and therefore more able to tolerate the effects. Christopher is quite clear when he comments that "this is the work environment you volunteered to go into, no one's forced you into it, so you either accept it or you don't accept it and if you don't accept it then you find another job." The importance of ensuring that the majority of a group of shift workers are suited to their role as an MRT, including the shift work aspect is highlighted by Crowley, Lee, Tswng, Fogg and Eastman (2004) as they believe

that good shift work adaptors have been found to have significantly better daytime sleep, fewer social and family disruptions and increased alertness during their shifts than poor shift work adaptors.

### **Evolution of Shift Work**

A few participants commented that there have been many changes to the profession over recent times and yet they felt that shift work has been one area that has not evolved to keep up with the changes. Alicia commented that “the workload over the years has definitely increased,” meaning the approach to how she works is different to how it used to be. She gives an example of a hospital she used to work where “you’d come in [on-call] and do a CT, then you’d go and do an ED x-ray and you did a bit of everything, but there’s no way in the world that could happen now.” She believes that there have been lots of changes to the profession, equipment and services, but shift work is the only thing that has not kept up, everything has changed around it. Claire mirrors this view and in her opinion feels that workloads are getting larger and the technology and services offered are expanding, yet shift work is something that has stayed the same. Reasons for this might include the fact that it is too difficult to the department to change what may be currently working, regardless of how well, or there may be no idea within management that changes are required if shift workers are not prepared to bring light to the issue and suggest alternative solutions. Lauren comments that years ago, the majority of the nurses performing shift work lived in nursing homes and she can see that “that would not be as bad an environment because you literally crawl from the nurse’s hostel on the hospital grounds, or close to the grounds, to work and crawl back home again.” She regards this as being less detrimental to the individual because “you could have been asleep until 10 minutes before your shift started, whereas people living further and further away from their place of work, which is just one of those things, it means you do have to be awake longer than just the shift.” This highlights that it is not just the profession which has evolved, but also the way people are leading their lifestyles and the fact that their job is no longer the centre of their existence. This must also be considered when applying the principles of shift work today in practice.

### **Shift Work as an Excuse**

Seven participants report using shift work as an excuse, either to avoid partaking in an activity or to justify an action. Bradley comments that he has used shift work as an excuse to get out of an event or social function, but is more likely to use it as justification for sleeping-in as a treat or justifying some other personal luxury. Lynda has also used it to avoid a social event, while Alicia adds that she would probably use shift work as an excuse to avoid doing something as opposed to justifying an action. Sarah has picked up a shift before as a way of avoiding a day rostered to the Barium suite while Katie often justifies “buying or eating treats and sweets when on shift by the fact that I’m on shift and so I do deserve them!” Claire comments that sometimes shift work gives her an excuse as opposed to being entirely the reason and as a procrastinator, shift work gives her the perfect out for not doing things but she suspects that a chunk of that is her using shift work as an excuse but she “could be pleasantly surprised to find that everyone does that!” As a result of these findings it would appear that Claire is not alone in this factor and that shift work is often used to the advantage of MRTs as a way of avoiding an activity or justifying an action.

### **Thinking about Shift Work is Worse than Performing Shift Work**

A number of interview participants believe that the thought of shift work is worse than actually working the shift and Bradley comments that there is a stigma or mindset attached to shift work which, once broken, means that working shifts is not a big deal. He maintains that: “for me, the thought of night shift is worse than any of the other shifts, but when I actually get to work I find the night shift is really awesome and I enjoy it.” The thought of night shift would appear to be the biggest culprit, with Dorothy, Alicia, Christopher, Tiffany, Sarah and Katie all singling out night shift as the main offender. For Sarah the thought of night shift starts to play on her mind three to four days before and Alicia also finds the build-up probably starts a few days before the shifts start. The reason for this misalignment may be explained by the fact that everyone else is at home or socialising and the worker cannot join them as they have to go to work. Once at work however, they are no longer the ‘odd ones out’ as everyone else at work is in the same situation and so can settle into their work and find it quite enjoyable as a result. Timothy

comments that a feeling of foreboding could also be due to “fear of the unknown,” particularly for the younger ones with less experience because of the sporadic and unknown nature of the workflow and lack of experience to call from when faced with new situations. Whereas he had experienced colleagues that made him feel comfortable and gave him confidence in his abilities as a new graduate, with a large number of new graduates on the shift roster currently, he feels “they are probably just feeding off each other’s insecurities.”

### **Society’s Perception of Shift Workers**

Many of the interview participants felt that they were treated or viewed differently by society when they were making use of their free time in the public arena as the perception of society in general is that they should be at work during these times, leaving society to presume why they are not. The majority of those that did not admitted to not having thought about it before or simply not being bothered by it. Alicia and Timothy comment that they do not feel they are perceived any differently by society when they are out and about, or if they do it does not bother them. However they are both older participants and Alicia wonders if maybe it would be more of an issue if she was younger or for other younger shift workers. Katie, also a more mature participant, comments that “people I know and who know me know that I do shift work” and so she does not consider it a problem at all. Sarah, a younger participant, comments that while she hasn’t really thought about society’s perception, she feels she has noticed it on occasion.

Claire notes that “the world assumes that you work 9-5pm...society pretty much assumes that if you’re in bed at 11am, you’re just a lazy ass or you don’t have a job.” She finds that trying to make appointments and do jobs like go to the bank can be “weird and unusual” but has found that if she goes in her uniform “everyone just assumes you’re a nurse and they’re a bit more understanding.” Claire recalls an experience where she felt she was judged by society when she went to a “bottle store one morning about 10am to get a bunch of stuff because a couple of us had just come off night shift and we were going to be having some drinks at 11am and from that point of view we were judged by society, heavily, heavily judged...the general public do look at you oddly when you’re

getting takeaways at odd times of the day.” When she does explain to them about shift work, she finds that they have no idea what she means. During her time doing shift work, she has found that “shift work is easier having access to stuff in big cities; if you’re doing shift work in a small town it can be unusual.” Christopher feels society’s perception more intensely being a male as they are considered to be the main breadwinners. When he is having time off during the week, he finds he voluntarily tells people that he does shift work and is having some time off, and he feels that that is his way of subconsciously dealing with the judgments or perceptions of society. He comments that a lot of jobs today include shift work and people who job share, so society’s perception was probably more applicable 30-40 years ago and may be not so relevant nowadays; however he still finds it exists.

Dorothy avoids spontaneous trips to the supermarket whenever possible, but admits that when she is out during the day she does not “dress like a bum so I’m not looking like I’m not having a job,” but goes out of her way to look nice because she thinks that if you go out “in rags or whatever you could throw on, you could get a negative look because you look young and you’re not at work when you should be.” Dorothy finds that when she explains to people that she does shift work they think it is great that she gets time off during the day to do activities, but they do not understand that it means she has to work until late at night. Lynda believes that society judges her when she is enjoying her free time in the public arena and when she explains to society that she does shift work, they do not understand the implication of it: “They probably get that you do shift work, but they probably don’t realise how that affects everything else.” She definitely believes that there is a lack of awareness in society about shift work and shift workers.

Bradley has not ever really noticed society’s perception of him as a shift worker but when he is in the public eye he wonders about the other people and why they are in town and not at work. This is a sentiment mirrored by other participants. Christopher is aware that he judges society when the roles are reversed and wonders what sort of jobs men have when they are out and about during the week, while Dorothy knows that when she sees people who look scruffy in town when they should be at work, she wonders why they are



not there and goes to extra effort to ensure people do not think the same of her when the roles are reversed. Lynda used to work in a supermarket and often found she was judgmental of people coming in “really late at night...and now I appreciate why they were there.”

This perception of society show that it is human nature to judge others, as the participants have found and admitted. However it seems unfair that workers who perform crucial jobs outside of ‘normal’ working hours should feel uncomfortable about spending their free time in the public arena because of how they will be perceived by society. It is often for the benefit of society that they conduct their job and improving the awareness of society may improve the experience of shift workers. No relevant literature regarding this effect of shift work could be located with which these results could be compared.

### **Shift Working MRTs are Their Own Worst Enemy**

From the results of this research it would seem fair to suggest that shift working MRTs are their own worst enemies. This fact has been identified by Dorothy who commented that “I’m my own worst enemy because I want to do everything.” This was also noted in the responses supplied in the questionnaire completed by Charge MRTs with the comment that “MRTs are their own worst enemies, they will pick up extra shifts without considering the negative impacts and will consistently not use their rostered days off wisely.” Often, one advantage associated with performing shift work, such as more money or free time, can be sufficiently enticing that a shift working MRT will consciously choose to compromise aspects of their life such as sleep, their health, family or social life. Greg, Dorothy, Lynda , Tiffany and Timothy have acknowledged that at some stage they have deliberately put themselves in this position.

These MRTs are potentially the most prone to burn-out and losing the balance between professional and personal life, both of which may lead to decreased physical or mental health status, reduced long-term desire to perform shift work or decreased performance and, although they may be flexible and do not mind doing more than their fair share of shifts, they must be monitored strictly. As they get further ensconced into the cycle of

such an imbalance, these MRTs may not be able to recognise when the impact of the negative effects of shift work have become too great and so their Manager must be able to assist them to draw the line when a limit has been reached, even if it makes the task of filling shifts or other aspects of shift work more difficult. Increased education on behalf of the individual MRT which helps them to learn their boundaries would also assist in ensuring that, while enjoying the positive aspects of shift work, MRTs are not their own worst enemies and have the courage to say no when their limit has been reached, despite the advantages such opportunities may provide them.

Alicia remarked that “when you’re still young you’re also trying to build your career as well as have your family and it’s quite difficult to work the two, but you can do it and shift work does help you to do it in a way...but you can’t have them both comfortably.” These comments would serve to further prove the point that MRTs want it all, often at the detriment of themselves. If they were working a Monday to Friday, nine to five job, it would just not be possible for them to work full-time and personally care for their children, either in the pre-school years or during the school holidays and they would be required to choose whether their children attend care on a full-time basis or whether they take a break from their full-time employment. The reality for many parents working these so-called ‘normal’ hours is that they have to make some concessions for life to run smoothly and happily. However, due to the flexibility and free time associated with shift work, shift working parents get a hint of the possibility that they can do both, that is personally care for their children while also holding down a full-time job as an MRT. As Alicia pointed out, this is possible but not easy and often it is achieved at the detriment to the shift working parents who continually compromise themselves in attempt to satisfy all factors of their life.

### **Lack of Awareness of what Constitutes Shift Work**

The results of this research have exposed an apparent threefold lack of awareness around the phenomenon of shift work. Firstly amongst workers’ families and society with respect to the role of an MRT, which the participating MRTs commented has spin-off effects for them on how well their performing shift work is received and tolerated.

Secondly, amongst MRTs and their managers as a profession, as there seems to be the misguided confusion that night shift and shift work are synonymous. Therefore if a department does not perform night shift then they do not believe that they perform shift work. Finally, the general understanding amongst workers' families and society of shift work, what it means and the implications it has for the worker.

As was commented in the literature review, there is no agreement in the literature on a definition of shift work. It involves more than just night shift, and by definition, a night shift does not have to be present for shift work to occur. This means that any radiology departments within New Zealand that do not currently perform night shift might still potentially be performing shift work. Throughout the process of this research, many MRTs have commented that they do not perform shift work, and one Charge MRT's questionnaire response stated that "I don't think it has an overly bad effect but we do not do shift work per se!" because their department did not undertake night shift. These comments show that many MRTs and their managers are misguided in their definition of shift work, which may potentially lead to the effects of shift work and their impact being underestimated. Despite the definition of shift work not being unanimous in the literature, no explanation was found that said shift work equated to night shift. Through communication and education this issue can be remedied and these MRTs can be secure in the knowledge that they are legitimately performing shift work and any effects that are experienced can be acknowledged and dealt with accordingly.

#### **MAIN EFFECTS OF SHIFT WORK**

The advantageous effects of shift work were considered by the interview and questionnaire participants to include the following:

*Sleep* – the ability to sleep-in, not having to rise early in the morning to start at 8am.

*Variation of work* – more trauma and diversity; changing and challenging; recognition that you get the kind of work you like doing and that when working shifts is when that type of work occurs; variety of hours; changes from normal routine are refreshing.

*Flexibility* – able to change shifts to work when it suits; opportunities for long weekends without taking annual leave.

*Free time during day* – to do mix of chores and personal leisure activities, more daylight hours to enjoy.

*Professional* – work with different people, improves time management, communication and problem solving skills, working alone means more challenges, away from department politics, more responsibility and autonomy in managing workflow and workload, experience in different working conditions.

*Money* – getting paid a lot more is advantageous for most people, some put chance to earn more money ahead of family, social life and sleep while others do not.

*Family* – more family time and more flexibility of working job in with family, saves money on childcare.

*Social* – ability to be more flexible with time and commitments.

The negative effects of shift work were considered by the interview and questionnaire participants to include the following:

*Sleep* – Increased tiredness, disrupts sleep patterns because no routine to sleep, quantity of sleep decreased, use of sleeping tablets often required, sleep deprivation, disrupts body clock.

*Fatigue* – Increased lethargy, increased mental fatigue leads to more mistakes, shifts can be exhausting and draining, decreased energy.

*Lack of routine* – lifestyle is not as routine which is annoying, incorporates home life, sleeping patterns, at work when place where initially rostered changes, causes disorientation regarding days of week, not able to plan ahead.

*Free time* – can be lonely and boring, not enjoyable because do jobs; cannot meet with friends if they are at work, do chores to pass the time, shift work becomes focus of free time for most.

*Shift work is focus of free time* – use free time to prepare for work, do not do fun activities during day in case they take too long or does do them but feels rushed and stressed, work hangs over your head so never really switch off/wind down during free time, worst when first start but improves with time.

*Overdo it with free time activities* – doing chores and activities in free time so exhausted by time starts work, done a day's work before actually going to work, sometimes start at 8am and finish at midnight!

*Professional* – difficulty having regular weekly meetings so do not know changes going on in dept, miss out on updates and CPD sessions, decreased quality of work if tired and grumpy, working alone, workload can be too much with minimal staff, decreased motivation.

*Health* – feel ill after night shifts, disrupts eating patterns, aging faster than normal, get run down, hard emotionally.

*Money* – poor rates of pay for anti-social hours.

*Family* – do not see family when on shift, disruptive to family when coming and going, not good for kids, hard on partner because have to deal with lots of things alone, have to work family around work, decreased routine of home life and commitments, partner unable to comprehend if not a shift worker which can cause stress.

*Social* – miss out on social activities because working, have to swap shifts to go to things which can be difficult, hard playing sport or committing to a team, can't commit to night courses or continue education, rely on help of others, do not see workmates socially.

This summation of effects highlight not only the fact that different MRTs have varying opinions on the effects of shift work and whether they are considered to be an advantage or a disadvantage, but also that MRTs themselves are full of contradictions. For many effects that they considered to be advantageous, they also considered that same effect to be a disadvantage of shift work and there are many examples of this within the interview participants. Lynda dislikes the increased tiredness she feels, but likes the chance to sleep-in and she also likes the variety that working shifts provides, yet finds the lack of routine annoying. Tiffany also finds the flexibility quite good and likes being able to change her shifts to suit, yet she too dislikes the loss of the routine of home life. Greg stated that the main advantage for him was being able to do personal activities in his free time during the day, yet he finds it can be lonely being home alone and sometimes really boring. Dorothy also finds the free time during the day an advantage because she can

achieve a lot such as washing, grocery shopping, tidying and study, however she comments that it's a disadvantage because all she does is chores because no-one else is available to socialise with and so she does chores to pass the time. The majority of the interview participants stated that the free time associated with shift work was advantageous, however due to the fact that impending shifts became the focus of their free time and that they often overdid it with the activities they performed, it was also disadvantageous. Alicia found that shift work allowed her to spend more time with her family and liked the flexibility of being able to organise her work around home life, however she also disliked it as she said it was not good for her children and her tiredness and irritability affected her whole family. Christopher also found shift work allowed him to be with his family and children more, but yet noted that it also imposed on this time. These contradictions are likely just part of normal human nature, however they may make hard in the future to minimise the disadvantageous effects of shift work as these inadvertently affect the advantages associated with shift work.

The effects of shift work are thought to stem from the fact that the basic needs of sleep, food, comfort, safety and socialisation are often lacking for shift workers (Cooper, 2003). It is accepted in the literature that shift work is linked with adverse physiological and psychological effects (Admi et al., 2008), although it is not thought to be the shift work per se that causes this, but from the "subjective strain that develops within an individual who is trying to cope with the disturbed pattern of sleep and activity that the job requires" (Wilson, 2002, p. 215). It is generally agreed in the literature that shift work is necessary and inherent in the healthcare profession. However it has been shown to cause a myriad of effects, possibly linked to the associated disruption of the worker's natural inherent circadian rhythms, but with the potential of affecting patient care and worker safety and satisfaction (ACC, 2006). The observation and degree of these effects is not homogeneous among shift workers and some will suffer the effects to a far greater extent than their peers, potentially due to differing personality characteristics and suitability to shift work and this will then be reflected in the attitude of the worker towards shift work (Axelsson et al., 2004).

Once identified in the literature, the advantageous and disadvantageous effects associated with shift work were organised under the headings of Shift Schedule, Sleep Patterns and Deprivation, Health Effects, Performance and Impairment, Social and Family Effects and Professional Effects and these were then discussed in further detail with the interview participants and throughout the questionnaire to provide a clearer view of the impact they have for shift working MRTs in New Zealand.

## **CHAPTER VI: PROFESSIONAL EFFECTS AND EDUCATION ISSUES**

This chapter will discuss the main professional effects of shift work as outlined by shift working MRTs in New Zealand. These include isolation from the radiology department, having to work alone and the ability to attend professional events. The shift schedule that MRTs work, of which there are many varieties, is also an issue for many MRTs. It was identified that shift work impacted on performance, with a subsequent impairment experienced by some. The availability of education and training with respect to shift work will also be discussed.

### **PROFESSIONAL EFFECTS**

#### **Isolation from Department**

Rosa and Colligan (1997) report that workers may end up feeling isolated from the rest of their colleagues as a result of shift work and the majority of interview participants would tend to agree. Lauren explains that you do feel a bit isolated, “a bit out on the edge” of the department when working a number of shifts, and it must be thought that this would be particularly evident when re-joining the day routine of the department, as any voids in communication or information that have occurred during the shift period would become obvious. Christopher feels that he is missing out on something when he works a period of shifts, while Claire comments that “if you do happen to be doing a whole lot, you do find yourself sort of stuck out in the corner missing out on a whole lot of stuff that’s going on.” Greg too feels a bit “out of the loop” and he explains that when returning to days after doing a period of shifts, his colleagues think he’s been on holiday and Lauren also reiterates this occurrence. It is mentioned in the literature that shift changeover times are vulnerable times for the incidence of errors and accidents and so quick changeovers should be avoided, instead allowing adequate handover time between each shift to allow in-depth briefing between workers (Sveinsdottir, 2006; Spurgeon, 2003; ACC, 2006). Although it is not common practice, if MRTs undertook a ‘handover’ when changing shifts, this may give an opportunity to verbally pass on important information, such as any problems or changes that have occurred. It would also be a good forum to pass on any other trivial details about what has been happening during the previous shifts so that each worker does not feel excluded from the workings of the wider department,



particularly if they are performing their shift alone. If each MRT ensures they remain up to date with meeting minutes and make a point of being alert to department notices and activities, and if all MRTs ensure they are supportive of one another, then this feeling of exclusion can potentially be reduced.

### **Working Independently**

One of the greatest fears for the shift working nurses, as reported by Oxtoby (2003), was working alone and not having the support of their colleagues in times of need. This factor was also identified by the interviewed MRTs as a professional effect of performing shift work. For most of these MRTs, their shifts were usually worked in pairs, excluding night shift which was a sole position, however despite this, many often found themselves working alone due to the roles and responsibilities associated with each shift, which meant they or their colleague was often in theatre or performing duties elsewhere. Working independently was met with mixed views, with some believing it had a positive impact while the others were more cautious. Greg noted that he found it difficult when first starting to work shifts independently, however he is of the opinion that it is good to be “put on the spot” because it helps you develop your skills and he notes that “it makes you a better MRT.” Bradley also feels that working alone or with one colleague helped him as a junior MRT due to being “chucked in the deep end” and he believes that was a useful part of shift work. Working independently on shift was also thought to be positively related to being more autonomous. Bradley noted that the increased autonomy allowed him to organise the workflow and workload and be in charge of his actions, while Greg commented that “you’re it, you’re there on your own, you’re management, you’re MRT, you’re problem solver, you’re everything” and he liked this fact. Christopher believes he is more situationally aware as a result because he has to prioritise for himself and does not have management organising things for him.

Despite acknowledging the advantages of working alone, Bradley comments that he does prefer to have someone to work with and points out that a downside of working independently is that “you really get less of learning the tricks and techniques from other colleagues.” Alicia is more cautious when it comes to working independently and

highlights that as much as working alone teaches autonomy and independence, it can also harbour poor technical and decision making skills, a view that Greg also acknowledges. She finds that she worries about the junior staff because she thinks it's pretty hard for them as they are not used to coping or thinking quickly 'on their feet'. Lauren believes that working alone is a great way to learn in a pressure environment because you are it, but on the other hand, if you are learning it wrong, there is no one to pick up on it." Despite having many years of experience to call on, Alicia also thinks there are times when another MRT's advice is required, "it's not that you can't do the job, but you just need somebody else's say so to give you that confidence." Sarah would also prefer to work in a team as she is used to getting feedback from other people and asking their opinion of her images, although she does explain that working alone and making the decisions for herself has made her more confident. Lauren identifies that working in pairs potentially reduces the number of mistakes made overall, because when working together, MRTs can pick up on each other's mistakes which might otherwise go undetected if an MRT is working alone. She also makes an interesting point that because MRTs revert to 'autopilot' when on shift, particularly night shift, if they are tired or under the influence of the effects of shift work, she questions whether junior MRTs should be placed in the position of working independently as they do not have the skill or experience base to draw from when working on autopilot.

### **Availability of Management**

Greg and Lynda commented that they have experienced difficulties communicating with management due to the timing of their shifts and the hours worked by management, however no other interview participants discussed this as an issue, meaning it either was not an issue for them or if it was, they neglected to mention it. Greg noted that he found it was sometimes difficult to talk to the Charge MRT about various issues including annual leave if he was on shift and commented that "sometimes it's tricky to juggle shifts with talking to management because you hardly see them." Lynda reiterated this difficulty and explained that "sometimes you want to see or speak to the Charge MRT but your shifts do not coincide for a few days...you send them an e-mail but the reply is 'see me when you're here next' and it's kind of hard because that might be a few days later

and sometimes you just can't wait that long and have to see them earlier." In order to get around the problem she has come into work earlier to see them before they go home and has also put off seeing them if the issue is not urgent. While both Alicia and Timothy commented on this issue, neither had experienced any difficulties as Timothy thinks it's just about finding other lines of communication such as e-mail or leaving a note on their desk. It is possible that their being more mature and experienced members of the department compared to Greg and Lynda has an impact.

### **Ability to Attend Professional Events**

The ability to attend professional events such as departmental or hospital meetings, official hospital training sessions and Continuing Professional Development (CPD) events can be challenging when performing shift work, mainly due to a clash of timetables. The majority of the interview participants reported missing the regular department meetings, either because they were on shift or on days off, with Christopher claiming that he feels like he's missing out on something as a result. If they had a desire to have an input into these meetings but could not be in attendance, most explained that they would leave the Charge MRT a note or get a colleague to mention the item on their behalf and Timothy believes that he does not ever feel he lacks the opportunity to have input in staff meetings. While the majority of MRTs explained that the most popular and accepted methods for catching up on information discussed in the meetings was to read the documented meeting minutes or ask a colleague who was in attendance, Christopher said that "you can spend half an hour a day finding out where things have changed, rather than just being told...I do not feel I should have to go reading through books to find out." Claire identifies that there can be a communication breakdown in the relaying of this information and notes that "it does happen inevitably, but it shouldn't." Timothy makes an interesting point that when he is not around during the day, he finds that some decisions directly affecting shift workers are made by day staff, simply because they are in attendance, while the shift workers are not and he believes this "affects us in quite a big way." Lauren also adds that "things are dictated to you rather than you being involved in the decision...if you're not there to put your two cents in, well you're going to be stuck with what they've decided." These views correspond with the view of Whale

(1993), who states that many staff also report feeling excluded from the decision making processes that are important to the development of their profession.

Being unable to attend official hospital training sessions and CPD events was also considered to be caused by the impact of shift work. Sarah commented that she had missed some department tutorials and Claire expressed the difficulty she had with scheduling a suitable time to attend her Cardiopulmonary Resuscitation workshop and Health and Safety training and then finally having to attend the morning after a horrendous night of call and four hours sleep, simply because she could not bear the thought of having to re-negotiate another time. Sixty eight percent of questionnaire respondents did not find that shift work impacted on their ability to complete their CPD and most interview participants found they were able to attend in-house CPD sessions if they were at work. However, some interview participants and 32% of questionnaire respondents commented that they had to come in on their days off to attend study days, further reducing their free time and so while it was not impossible to attend these events, some sacrifices were required. Some MRTs reported using quiet times on shift to complete their CPD requirements, while others found this too difficult as they were not in the right headspace, or were too tired and not sufficiently alert to concentrate, which is ironic considering these characteristics are required to successfully x-ray patients. The presence of this effect appeared to have been identified within the departments where processes were implemented to counter these professional effects associated with shift work. These include the availability of documented meeting minutes, the presence of in-house communication books and the self-directed points option available for CPD, however MRTs must buy-in to these solutions in order for them to be successful and the effect to be minimised.

### **Colleague Interaction**

Mixed views were reported as to the effect shift work had on colleague interaction, with 58% of questionnaire respondents reporting no effect, 8% reporting a positive effect and 34% a negative effect. These varied views were also represented by the interview participants. Understanding and supportive workmates was generally the reason that no

effect was reported, as all MRT are in the same situation and so they allow one another more respect and tolerance, however many questionnaire participants in this group did not provide any justification for their decision. Lynda does not think shift work impacts on her interaction with colleagues as she feels she probably acts the same on shift as during the day, while Sarah notes there is little impact due to the amount of time she works alone when on shift, however does find that she has to work harder at maintaining the same level of interaction with colleagues from other departments and this is something that Katie also emphasises.

Dorothy comments that when on shift, she never sees many other MRTs and feels as though she does not work with anyone from her own department for extended periods. Bradley notes that for him, this can lead to a “stranger feeling” when he hasn’t worked with certain colleagues for a long time which he points out is not ideal. Lauren extends this point and comments that when on shift, “you’re not seen in the department so people don’t know on a personal level what you’ve been up to and because you’re out of sight it’s almost out of mind too.” This could have quite an impact given that most MRTs are also friendly on a personal level, meaning that the shift MRT is isolated from not only professional, but also personal support. Confirming the findings of Whale (1993), Katie comments that in her department, not all the MRTs are on the shift roster and some may only perform a selection of shifts which can often create a “them and us” attitude between staff. She thinks this attitude derives more from the older ones like her because “we’re slugging our guts out and you do not have to do the night shifts and stuff.” Many participating MRTs felt that increased tiredness levels were to blame as this lead to decreased tolerance between MRTs and so when irritable, attitudes were exposed, the MRTs involved were less able to react in an appropriate manner. As Katie highlights, this can also extend to an MRT’s interaction with students, potentially impacting the supportive learning environment required.

Shift work was also believed to have a positive impact on colleague interaction, largely due to the feeling of belonging to this distinct group and sharing the same experiences, which supports the findings of Cohn (2007) and Oxtoby (2003). Christopher believes the

reason for this is that “you want to be there to support each other” so staff are more bonded and he also thinks that there might be more understanding of each other’s jobs as well. Lynda comments that teamwork is more effective on shifts and the distribution of workload is more even between the few MRTs working together, a point that Christopher also emphasises. Katie adds that if her shift is not busy, she will go to the Emergency Department and socialise with the staff there, which is something she would not be able to do during the day, but has enabled her to form a close working relationship and rapport with those staff.

Due to the amount of free time outside of work potentially spent alone, in conjunction with the decreased amount of family time and interactions, it is essential that MRTs receive the support of their colleagues, as they may spend the most amount of their time with these people. The results of this research illustrate that it is possible for shift work to have a positive effect on the interaction between colleagues, however this may require each individual MRT to consciously make positive colleague interactions a priority, even if it requires expending extra effort, however it is definitely necessary in order to ensure that the work environment is fun and supportive for all involved.

### **Patient Care**

According to Raedkir, Janben, Schomann and Nachreiner (2006), all health practitioners should act in the patient’s best interests at all times, providing quality patient care, however 51% of questionnaire respondents reported that shift work negatively impacted their level of care provided to the patient, with the remaining 49% commenting that their levels of patient care were equivalent regardless of whether on shift or not. The results from the interview participants were representative of this finding, with the exception of Lynda and Bradley who also identified that shift work could positively impact the care provided to the patient due to decreased waiting times and the possibility of more tailored care with the examination conducted in a less rushed manner if the shift was not busy.

Of those MRTs that reported shift work having no effect on patient care, the majority emphasised that the patient is fundamental to the services they provide and so patient care

is paramount, with the remainder simply commenting that they did not feel their levels of patient care differed in any way when on shift as compared to working days. Dorothy provides an insight of the majority view that “when I’m with the patient, no matter what time of the day it is I’m trying to give them the same 100% that I would at any time.” This subjective perception would, however, need to be objectively measured by the patient who is receiving the treatment to be validated. Many MRTs gave no insight into the reasoning behind their belief that shift work had no impact on their level of patient care.

There were many reasons provided in explanation of why patient care levels were decreased as a result of shift work, with the majority attributable to increased tiredness levels on behalf of the individual MRT leading to difficulties with communication and an attitude of intolerance, impatience and general irritability. Greg recognised that different patients utilise medical care in the evening and early morning as compared to during the day, bringing with them different challenges. Some questionnaire responses highlight that “my tolerance for uncooperative, drunk patients at the small hours of the morning is not high;” “when you’re tired you do not have the same patience with demanding patients” and “my tolerance for patients who could help themselves but do not, decreases.” The busy nature of a shift means that MRTs often feel obliged to rush to get through the workload and this was also reported to have an impact, with Christopher commenting that if the shift is really busy, he finds that he has less time for patients and so is more likely to just get the images done and get the patient back, meaning his patient care is impacted more by workload than by how shift work personally affects him. The questionnaire comments and those of Alicia and Lynda would suggest that he is not alone in this view. Often MRTs felt that while they were not rude or nasty; they were concentrating on the technical aspect of obtaining the images and so not concentrating on the patient’s welfare, or were not as likely to go the extra mile for their patients or pay attention to the smaller things such as providing a blanket, as they would do during the day.

The patient is the main focus for an MRT and their actions; they are to act as their patient's advocate and their roles and responsibilities are centered on ensuring the best possible service to patients (MRTB, 2004a). With this in mind, it is surprising that the experience for those patients that require assistance from 50% of the population of MRTs while they are on shift can differ so widely to those patients who require the same services during daylight hours, as is shown by the results of this research. When a decrease in an MRT's performance and subsequent acceptance of sub-standard of images is also considered, the service these patients receive appears bleak. While the reasons for this may be understandable, under no circumstances can these variable levels of patient care be deemed acceptable practice. Each individual MRT and radiology department should be considered responsible for ensuring that this practice is improved. It should be reiterated to all MRTs that the patient and their experience is of utmost importance and this current practice is not appropriate. A handful of MRTs may need to consciously make the patient more of a priority in their delivery of service, while others may simply need more tools by way of education to reduce the effects of shift work that have caused this situation to occur. Prior to the implementation of any measure, the patient's experience should be investigated and measured in an attempt to solidify the findings of this research and provide some insight as to the best direction for the education and proactive measures to be instigated.

### **Job Satisfaction**

Job satisfaction is pivotal to staff retention and as shift work composes such a large part of an MRT's role, it was important to identify the relationship this has with the worker's job satisfaction. Eighty eight percent of questionnaire respondents reported being content, happy and satisfied in their job, while the 12% that claimed they were not, cited reasons such as shift work, tiredness, staffing levels, being on-call, decreased family time and no support or understanding. Each of these reasons have been shown to be related to shift work in some form and this may indicate that shift work, while only one factor associated with being an MRT, can have a crucial impact on a worker's job satisfaction. A number of questionnaire respondents reported either leaving the profession, reducing their hours or transferring to a position with no shift work as a result of their experience.



The interview respondents reported similar opinions. Christopher believes that “you’ve got to be happy in your job for a start; if you’re not happy in your job then if something comes along out of the blue then you’re going to look at it as derogatory towards your work.” This would imply that if MRTs enjoy the core of their role in isolation from performing shift work, then when shift work is added to the mix, they are better able to deal with it without the negative effects, however for most MRTs the two phenomena are entwined. The remaining MRTs believed shift work had no impact on job satisfaction or was a positive factor. Timothy believes that he has got more control over his workload and workflow when he is on shift, which he finds satisfying, although he does comment that his job satisfaction is impacted not solely by shift work but by the entire work environment. Lynda notes that “I do not mind the actual job, it’s just the other thing associated with it that annoy me” highlighting that it is possible to still enjoy being an MRT, whilst disliking the shift work aspect.

#### **SHIFT SCHEDULE**

The issue of rostering constitutes an important variable when examining the influence shift work has on employees (Fitzpatrick, While & Roberts, 1999). The type of roster schedules differed between the participants and included rotating rosters that remained identical throughout each cycle, rosters that had some consistency but were largely re-written every time and those with no set pattern that were re-written every time. Most interview participants were happy with the shift roster they were currently performing, however some were disgruntled. These MRTs tended to be working rosters that were re-written each time. Katie notes that “our rosters are fairly random and they don’t follow any pattern to a certain degree. One week you’ll be doing something and the next week it’ll be totally different. I don’t think there’s any consistency...It doesn’t lend to the welfare of the staff who are working it.” She continues with an example, “I’m on night shift this weekend so I had Saturday, Sunday and Monday off, Wednesday I had an early morning shift, Thursday I had a late evening shift and now I’m on night shift.” There was however, typically an acceptance across all participants that writing a shift roster was

difficult and Dorothy comments that “the person that writes the roster does an exceptional job because it’s just such a hard one to do.”

When adjusting shift schedules, inviting the participation of the shift workers in designing the new shift schedule is recommended. It is important to take into account all aspects of a worker’s professional and personal life and consider the impact the change will generate (Spurgeon, 2003; Brogmus & Maynard, 2006). This is because poor control over work hours and shift schedules is a major contributing factor to the adverse effects of shift work and work characteristics and conditions are considered to be the primary source of job related stress (Wilson, 2002; Morshead, 2000). In the case of both Timothy and Claire, while they have little control over their work hours they do report having some input into the shift schedule in their respective departments. Timothy notes that his department has had problems in the past sorting out the shift roster, but staff did have input into its design and he now finds the shift roster “actually quite manageable.” Lauren acknowledges Timothy’s point but adds that “even when we’ve designed our own shift roster there’s been no input from somebody, an expert with experience, to look at the roster and give advice. There’s been no advice with anybody who has studied it or knows about it to know what’s the best way,” which she feels would have ensured an even better shift roster. Christopher believes the shift roster he works with has been devised to be worker friendly and he realises that a lot of “opinion has gone into it, changes have gone into it, trial and error as well and where things have been tried and failed, they’ve been improved.” Claire believes that a little bit of self-experimentation does go on when trialing new roster ideas, but “I don’t think there’s any other way to do it.” She notes that staff at her department do have input into the shift roster and have the chance to say that it is not working and needs to be changed. The successfulness of this uncontrolled trial and error style of rostering must be considered, with potential negative impacts likely for the MRT, their patients and the department on a whole. The question must be asked whether a radiology department would implement other such professional measures with as little tested information or without the input of expert advice and so it must be pondered as to why this approach is considered appropriate.

Bradley has no complaints about the current shift roster he works with as he thinks it works well, however he likes that fact that he “has a roster at least a month in advance, often two months, maybe longer so you can plan ahead to some degree so you know what you’re going to be doing.” Blachowicz and Letizia (2006) comment that it is recommended that the workers are provided with a copy of their roster well in advance in order to help reduce feelings of social isolation and to enable shift workers to plan their family and social activities in advance. Christopher also likes the fact that the roster is set, with stipulated start and finish times that do not change because a truck breaks or the weather is bad, as was the case with his previous experience of shift work; “I find that because the hours of work are written down, that helps get your head around it.” Claire makes an interesting point that “I think I’d be hard pressed to do 25% of the shifts I’m actually given come the end of the month.” She adds that this is not because she dislikes the roster that she is given, in most cases the roster is good, however “then someone will want to take leave or someone will be sick and your shifts get swapped around quite a lot.”

### **Structure of Shifts**

Lauren acknowledges that there are many different ways to structure a shift roster;

“...other professions do shift work and they all deal with it slightly differently. Like the nurses have a permanent person on shift, they treat it like a day shift but it’s at night and maybe because they’ve then got a regular sleep pattern, maybe that would be better, maybe doing a month of the same shift, but the thought of that would be so daunting, especially if you were stuck on a bad shift. Or maybe you do longer days and then have days off, like the Doctors do, work 10-12 hour shifts, maybe you do a couple of them and then have the rest of the week off, maybe that would be better. I’m sure there’s research out there.”

The general opinion in the literature with respect to the ‘best’ shift schedule is largely mixed, with strong, justified arguments available for all scenarios offered. The type of shift schedule is however important as it has many related effects and the type of shift roster worked by nurses in the study conducted by Pisarski et al. (2006) was shown to relate to turnover intention, control over work environment, health symptoms and degree

of work/life conflict. The perfect shift schedule that reduces the effects of shift work for all employees does not exist and despite many attempts and much effort probably never will. This is largely because the individual's preferences dictate the degree of disruption associated with shift work and the usefulness of the free time it provides (Demerouti et al., 2004; Taylor et al., 1997).

Claire finds that the shifts she works are "quite sporadic" and because of the continual changes,

"you don't get into a rhythm where your body catches up properly"... "I'm loathe to say the way to make the impact of the effects of shift work better is to do a great big block of it in the hope that your body gets more of a chance to get into a rhythm, because I'd hate to do big blocks, but I do think that short stints is what tips your body off, it does not get its rhythms going and its sort of all over the place and you're coping rather than doing well and they are quite different things."

Katie also finds that there are inconsistencies in the shift roster she works with and wonders if perhaps they could be refined because she feels that "you're chopping and changing quite a bit and for your psyche and for your well being, I don't think it necessarily works well for that." She too would prefer working blocks of the same shift and suggests having the blocks structured to form some kind of sequential pattern and based on Bradley's positive experience, there is likely merit to her thinking. Bradley comments that he likes doing the block of shifts, particularly the night shift which he does in groups of three one week and four a few weeks later, and he finds having three late evening starts, followed by an early evening start, an afternoon shift and then a day shift a great way to perform all the shifts with minimal disruption. There is some disagreement in the literature as to the optimum speed of shift rotation to best minimise the effects of shift work as Harrington (2001) and Sveinsdottir (2006) believe that rapid shift rotation, where a shift is worked for no longer than a few days is favourable, as it produces the least interference with the worker's circadian rhythm. However Brogmus and Maynard (2006) disagree, believing that a slow shift rotation where a shift is worked for a few weeks is ideal as it allows time for a workers circadian rhythm to undergo re-entrainment and adapt to the new schedule, causing the least intrusion. The literature is

more united with regards to the optimum direction of shift rotation, with forward or clockwise shift rotation (i.e. morning, evening, night) preferable (Wilson, 2002; Harrington, 2001; Spurgeon, 2003; Sveinsdottir, 2006) over an anti-clockwise direction (i.e. night, evening, morning) as it is more compatible with normal sleep patterns (Brogmus & Maynard, 2006).

### **Breaks**

Claire comments that when she worked in a previous radiology department, “you thought you were lucky if you got two days off in a row.” She comments that during one day off she might have had a sleep-in and got her washing done, but notes that “it’s not actually really time off when you have a single day off by itself” and states that “consecutive days off make a huge difference, not just days off.” The Department of Labour (2007a) agree with her and comment that every seven days it is recommended that shift work staffing have at least two consecutive full night sleeps with a rest day in-between to allow their performance to return to normal levels.

Bradley does not find it a problem that he does not get an official break during the eight hour long night shift, “because with the nature of the nights you don’t often get four full nights and even though you have to be alert, if I’m watching movies I do feel like I’ve had a break so at times I kind of feel like I’m getting a break and getting paid for not having one so it’s a win-win.” The literature does not however agree with Bradley’s point of view and it is stated that ideally there should be frequent rest breaks during the shift to allow the worker to obtain refreshments, restore physical and mental capabilities and maintain or restore alertness (Department of Labour, 2007a, 2007b; Brogmus & Maynard, 2006). These breaks should not necessarily occur at set times as performance may have already suffered as a consequence of fatigue, therefore providing only temporary relief and are thus more effective if they occur when workers recognise that they are becoming fatigued (Department of Labour, 2007a).

Lauren finds that the travel home, in conjunction with the necessary time to unwind, cuts into the minimum nine hour break that her department observes as mandatory prior to

commencing the next shift. She explains that this is a problem “because you can’t just go back to sleep, you can’t just go back to bed and go to sleep, you need time to unwind, but that’s not recognised at all, be it if you got called out or if you have been doing a shift.” Home and extracurricular activities take the same amount of time each day, meaning workers must sacrifice rest and sleep time after a shift if the duration of the break between shifts is not sufficient, highlighting the importance of rest breaks during the shift and between consecutive shifts (Rosa & Colligan, 1997). Working at night has a greater impact than working the same length of hours during the day and sometimes there is literally not enough time between shifts for workers to commute home, have some family interaction and sleep adequately before going back to work (Department of Labour, 2007b; Caruso, 2008; Muecke, 2005). A minimum of 11 hours rest between each shift is considered ideal to allow for the recommended eight hour sleep requirement and time spent getting ready and traveling to and from work, eating and socialising (ACC, 2006; Brogmus & Maynard, 2006; Blachowicz & Letizia, 2006; Department of Labour, 2007a).

### **Flexibility**

Bradley believes that the reason he finds shift work quite good is due to the flexibility that staff have with changing shifts. He notes that he has spoken with MRTs in other departments where they are not as flexible and he is unsure if it would be as enjoyable, but “with the way that our roster is set up, you can make it work for you and that’s great.” Tiffany also concurs with Bradley’s comments and adds that the flexibility of being able to change her shifts to suit was advantageous, especially because her partner also did shift work so they could have the days off together and synchronise their shifts to maximise the time they spent together. Claire also supports the views of Bradley and Tiffany, commenting that

“it’s nice to have the flexibility because it means that if someone asks you to do something and you’ve got the wrong shift, that it’s not set in stone and there’s a way around it, so that’s quite nice...I think you’d really feel it was impacting on your life if you did not feel you had the ability to change shifts and most of our colleagues are pretty good. You know if you’re trying to give away a night shift on a Friday or Saturday that it might be a bit tricky but most people are pretty flexible and if you’ve got a reason to want to change, most people are pretty helpful.”

When it comes to picking up the shifts however, some MRTs are a little more cautious. While Bradley admits he gets a buzz from working shifts which is what drives him to pick up so many, he notes that he never feels forced to pick up extra shifts, and does so “only on my terms,” Lauren found that shift work was not really tiring until she began picking up more shifts than were hers. Sarah will pick up shifts only if someone is desperate for her to do so, otherwise she does not go out of her way to do this because she knows it will impact on her social and family life, but unlike Bradley, she does feel the pressure to pick up more shifts when the department is short staffed. Timothy accepts that he probably works too many extra shifts, but is motivated to do so by the extra free time off during the day it provides him, in addition to the extra money. He admits to sometimes doing this for monetary reasons at the expense of family and social time, but “sometimes when you’ve got big bills coming up you think ‘I need to get some extra shifts to help’.” For some, the primary incentive and advantage of shift work is financial, with a pleasant sum to be made from the penal and overtime rates associated with shift work in addition to the base rate, however the strong desire for most shift workers to obtain attractive overtime payments, night rates or time off in lieu may lead to unsafe work practices as staff seek to perform an inflated number of shifts (Occupational Safety & Health, 1998a, Scott, 2007;McMenamin, 2007; Tattam, 1995; Cohn, 2007). Timothy does not believe that picking up an abundance of extra shifts impacts on his ability to cope with them and if it was affecting him, “I’d be the first to put up my hand and say no more.”

### **Favourite and Most Disliked Shifts**

For the interview participants, the afternoon shift was typically favoured, with Bradley, Lynda and Sarah all selecting this shift. The reasons they gave to justify their choice centered around increased free time during the day, particularly sunshine hours, for the purposes of personal recreation or home-making responsibilities such as banking, shopping or attending personal appointments. These reasons are supported by Jay (n.d), Rosa and Colligan (1997) and Scott (2007). Better synchronisation with family routines and preference for the type of workload that this shift offers were also mentioned. Alicia

preferred the early morning shift because it coordinated with the routines of her family and Katie preferred the day shift, while Dorothy, Christopher and Timothy do not currently have a favourite shift.

The most disliked shift, as judged by the interview participants was more varied, with early evenings, early mornings, late day shifts, afternoons and all of the others being noted, but the overall most disliked shift was the night shift, with five participants selecting this shift. Reasons for the dislike of night shift incorporated the extent of prior awake hours, the physical toll they have on your body and the impact they have on your lifestyle, the fact that the MRT is working alone during these shifts and the disruption they have on sleeping patterns. It is noted by Wedderburn, (as cited in Bohle & Tilley, 1998) that attitudes towards particular shifts are not thought to be absolute assessments, but may partially reflect comparisons with other shifts. For example, night shift appears to be an important reference for such comparisons as there is evidence that overall satisfaction with shift work is more strongly related to satisfaction with night shift than with any of the other shifts. Night shift appears to cause a large amount of problems and thus it is recommended that the amount of night shift worked by each shift worker should be reduced to the bare minimum in attempt to counteract these consequences, certainly night shift which is performed continuously by the same workers should be done so with great caution (Harrington, 2001; Caruso, 2008). As this is not always possible, limiting the number of consecutive night shifts to four followed by at least two consecutive days off, with scheduled rest breaks during the night shift are particularly important (Brogmus & Maynard, 2006; ACC, 2006).

### **Call versus Shift**

The majority of the interview participants had some experience of being on-call, whether it was performed prior to the introduction of a continuous shift system or was worked in conjunction with shifts, where a shift was worked during the day and an on-call service was provided overnight. Call and shift were therefore compared to provide insight into the impact that being on-call had on MRTs. The opinions of being on-call varied across the participants, with some preferring a balance of call and shifts, some preferring to



work shifts in lieu of being on-call due to its intrusive impact and others preferring to be on-call. Greg disliked being on-call because he found that it impacted on his life because “you’re always glued to your cellphone and it’s a real pain. Call is a real pain, it’s a real hassle, but you get paid heaps for doing it over the weekend, it’s awesome.” He continues to note that “you just can’t really do much...it does have an impact on the quality of your life.” Lynda notes that “with on-call its annoying that you have to come and go all night, you’re asleep for a second then they ring you up and that’s really annoying” however she mirrors the sentiments of Greg that “you get better pay for call so you’re getting paid for the disturbance...When you’re on-call you can’t sleep properly because you’re waiting for the phone to ring,” and this a view shared by Katie and Timothy. Katie finds being on-call more tiring due to not being able to switch off and relax “whereas at least with night shift you go, do your shift then go home to bed.” Timothy also prefers to work night shift as opposed to be on-call because “you’re there and you just get on with it.”

Those that preferred to be on-call did so largely for the monetary advantage, but also because they did a single night of call per week or fortnight as opposed to a block of shifts, and found it good being in the comfort of their environment and only going into work for urgent cases. Dorothy states that “on-call you make money, night shift you don’t and for me it all boils down to the financial thing.” She notes that when on-call she can sleep whereas on night shift she is not meant to and she suggests that if night shift was like call where you only did one night “it would be good,” a view that Katie supports. Alicia finds that being on-call is easier “because at least you know if you’re coming in to do a patient that you’re in and out” and when on-call for her modality she notes that “in some cases you can fit the workload into your pattern as well, unless it’s a trauma, a lot of the time you can work it to suit.” Tiffany points out that when on-call it is mainly for urgent cases only whereas with night shift the workload is higher due to the non-urgent nature of the work.

Despite the advantages and disadvantages to being on-call, for the most part the MRTs that were currently working both shift and on-call enjoyed the balance of the two. Lynda

thinks it's probably a good thing that her department does a mix of on-call and shifts, "the fact is that you have to work in the night anyway and if that has to be the case then I think I prefer it how it is now with a mix of on-call and shift." She does however think that there could be some confusion for other departments within the hospital as to when they are working a shift and when they are on-call and feels that it would make each shift and call a bit easier if the communication was better. Dorothy notes she probably prefers night shift for some situations and on-call for others, but "the balance of night shift and call at the moment is quite good and I am quite happy with it the way that it is."

### **PERFORMANCE AND IMPAIRMENT**

Mixed views exist within the interview and questionnaire participants as to whether shift work impacts on their performance and to what degree. Half of the interview participants and 35% of questionnaire respondents believe that shift work does not impact on their performance in any way, let alone impair it, while the remaining interview participants and 65% of the questionnaire respondents hold a contrasting opinion, with a small percentage reporting that shift work has a positive impact on their performance.

#### **Positive Impact**

Christopher commented that the overall impact of shift work can be conducive to good habits in some situations, while also impairing performance in others. He explains that shift work can "enhance your performance...more the night shift when you're on your own and you might have a bit more time...If the patient backload is not too great and you've got time with the patient, I think you can develop your own techniques...work out what works for you...adapting your techniques and learning different ways of doing things" which he thinks can be quite enhancing. Christopher's thinking is supported by 9% of those questionnaire respondents who reported that the impact of shift work on their performance was of a positive nature as they commented "it improves my fluency in trauma work;" "can gain good experienced on shifts, out of hours;" "get more experience in acute work;" "improves my skills and confidence" and "it affects my performance in a positive way, I am a better MRT for doing shift work."

## **No Impact**

Bradley does not find that shift work impacts his performance, particularly where his speed or standard of images are concerned and this is an outlook shared by Lynda, Alicia, Katie and Timothy. Lynda does not believe her clinical performance, decision making skills or the standard of her images is affected by shift work and if a repeat image is justified she will perform it and does not think she is more lenient when tired. Lynda comments that she would always perform an additional x-ray if clinically indicated, such as a lateral chest x-ray, even if she feels she cannot be bothered due to the impact of the effects associated with shift work. An interesting point, Lynda notes that she feels subconsciously she has to work harder to maintain this consistent level of performance and has to think harder to make sure she has got everything right. A questionnaire respondent supports this view, noting that “you still have to provide a good service but you just have to concentrate and work harder to achieve this.” Vries-Griever and Meijman (as cited in Fitzpatrick et al., 1999) support this and explain that the reduced performance capacity which results from shift work may be compensated for by the investment of increased effort on the part of the individual, however they note that some impaired performance may still persist.

Katie believes she always does a good job and gets the views required because she feels her technical skills come naturally, almost like being on autopilot. She does not think it takes her longer to adapt from her routine practice if a situation arises where modified views and thinking are required, adding that “thinking like that on my feet and stuff is not a problem.” Very few questionnaire respondents in this category supplied any justification as to why they felt that their performance was not affected by shift work, however some comments included “the job’s too easy to be affected,” “I work the same way at all times,” and I “have always managed to maintain performance.” Alicia does not personally feel that shift work has impacted her performance in any way, however does acknowledge that “the presence of, or degree of performance impairment as a result of shift work is very dependent on the type of person you are.”

## **Negative Impact**

The remaining interview participants and 91% of those questionnaire respondents that believe shift work does impact on their performance, felt that their performance was impaired as a result. This impairment was represented in a multitude of forms, each specific to the individual concerned, however some trends were observed. The most persistent trend was that performance was decreased due to a large number of images of a sub-standard or borderline quality not being repeated, even if the MRT identified this need at the time, underpinned by the thinking that “any image will do...too much effort to repeat if you are knackered” as one questionnaire respondent notes. Another explains that “you seem to put images through that you would normally repeat” and this was typically attributed to increased tiredness on shift resulting in a lack of motivation. Dorothy finds it hard to get the perfect result at night, however individual MRTs must consider the ethics and morality of accepting substandard images which may impact on a patient’s treatment simply because of the way they are impacted by the effects associated with shift work.

## **Manifestations of Performance Impairment**

Speed was claimed to decrease as a result of shift work, with speed of thought processes declining in addition to the speed of performing the views required and making necessary decisions. Sarah finds that it takes her longer to make a decision, especially with a borderline image but “you’ve just got to decide and it does take longer,” while Claire mentions that “your performance level goes down in the speed of which you can get through things.” Not only does the speed for decision making decrease, but the ability to make good decisions would also appear to be diminished, with a questionnaire respondents commenting “there is an obvious reduction in alertness and good decision making,” which would appear to be as a consequence of the reduced concentration levels that many MRTs reported was harder to maintain as a result of shift work. Sarah feels that she has to concentrate harder when on shift and results from the questionnaire show that she is not alone, with 30% of respondents reporting no, or minimal impact of shift work on their levels of concentration, 53% reporting a small to moderate impact and 17% reporting an extreme impact. Some MRTs also found that they struggled to adapt their

technique to suit the needs of the patient and Dorothy finds that if she gets a really difficult patient it is harder to adapt, whereas if it was during the day she feels she would have been able to work out the technique required more quickly and effectively. The number of mistakes or near-miss incidents made on shift appears to be inflated and these range from incorrect or absent use of lead letters, not having a cassette in the Bucky prior to exposing, errors completing paper and computer work, selecting the incorrect Bucky on the console prior to exposing, errors performing QA and x-raying the wrong side of the patient were all reported by MRTs as frequent mistakes made when on shift.

These examples fit with those reported in the literature as response mechanisms may be reduced in those shift workers that are sleep deprived. This can lead to performance impairment and the diminished ability to function adequately, both of which can be detrimental to the health care professional and their patients (Williamson & Feyer, 2000). Decreased cognitive skills, slower thinking, reduced psychomotor skills, delayed reaction times, diminished co-ordination, giving false responses and failing to respond at the correct time are all potentially affected by shift work and lead to an overall impairment in performance (Berger & Hobbs, 2006; Reid et al., 1997) which was experienced by the MRTs in this research. Admi et al. (2008, p. 251) report a “growing concern about the ability of individuals to maintain adequate levels of performance over long work shifts” and the findings of this research would indicate that they have just cause for this apprehension.

### **Cause of Performance Impairment**

Increased levels of tiredness and fatigue were largely reported by MRTs as the reason that their performance was impaired as a result of shift work and this is supported by the literature which reports that fatigue in addition to working in opposition to circadian rhythms may result in decreased cognitive skills, reduced psychomotor skills, delayed reaction times and diminished mental capacity, all of which potentially compromises patient and staff safety (ACC, 2006; Peate, 2007).

An interesting finding was that many MRTs identified that when influenced by fatigue and tiredness on shift they reverted to operating in an 'autopilot' state during this time which also influenced their level of performance. Claire comments that "when you get a bit fatigued you get more on autopilot but you kind of get more slow with it and I don't think you're really as thorough." Lauren recognises that there are problems with operating in an autopilot manner, such that if something happens that extends past your normal routine, not only might you not recognise it but you also may not know how to fix it. It then takes twice as long to get back into a methodical approach. This state potentially makes paying attention to smaller details challenging, meaning they could be missed. It may also mean that adapting routine practices to meet the specific needs of each patient may not be possible. Tiffany comments that "you work in a zombie way and so you can forget to do things" and this suggests the existence of an impairment.

Huemer (as cited in Rochfort, 2007, p. 2) advises shift workers on the best way to cope with shift work in Australia and he states that "What the fatigue tends to affect is the routine decisions, so doctors and nurses will get the prescriptions right and get the procedures right, but what they'll forget to do is check on somebody down the hall later." This supports the reported impact of MRTs working on autopilot, because the innate processes and procedures at the core of their practice remain intact, however paying attention to smaller details and actions required outside of the norm are often negatively affected. When professionals use implicit knowledge and 'routinised' behaviour in this manner, it may lead to mistakes. The observation of MRTs working on autopilot can be related to the concept of 'mindlessness' as proposed by Langer in 1992. She explains mindlessness as being habitual, inflexible functioning or undertaking actions automatically, with little or no conscious awareness. Rajaratnam and Arendt (2001) note that as a general rule, complex performance tasks appear to be more susceptible than those tasks that are not as difficult. This contradicts the thinking of Huemer (as cited in Rochfort, 2007), however the most likely outcome is that they are both correct. This can be seen in any procedure, complex or otherwise, that is not performed on a frequent basis and so has not yet become implicit knowledge and so may be negatively affected by shift work.

## **Awareness**

A remarkable finding was that many of those interview participants who felt that shift work did not impact on their level of performance reported making the same mistakes when working on shift as those who identified a performance impairment, bringing into question their level of awareness as to the impact shift work has on their performance. Greg, Dorothy, Timothy and Tiffany all believe that they have been aware of their mistakes at the time they have occurred and were able to reflect on their causes, which they largely attribute to tiredness. However of more concern is that Bradley, Lynda and Sarah either were not able to identify when they were making these mistakes, or if they did, dealt with them without reflecting on why the mistakes occurred. Bradley believes that he was not really aware of why it happened, he just dealt with it and moved on, while Lynda reports that she is not aware of any mistakes that she may have been making and Sarah states that it is “hard to tell” when your performance is affected as a result of shift work. It must also be considered whether the subjective feelings of ‘good’ performance and objective measurements of this performance would be aligned in this group, as they may believe their performance is adequate but may not realise that they are actually producing work that is at a substandard level. This is supported by the literature, which explains that inconsistencies between an individual’s appraisal of their ability to perform and the actual level of performance they reveal may be present (Reid et al., 1997). This lack of awareness and accountability could lead to the fostering of bad habits within the practice of these MRTs and may have disastrous consequences for the patient and individual MRTs.

## **EDUCATION**

### **Education Received**

The interview or questionnaire participants were generally not educated about shift work, with all interview participants and 77% of the interview respondents commenting that they had not received education of any form, either from their employer or tertiary provider. Tiffany believes that information about the detrimental effects of shift work or tips to help you look after yourself are severely lacking. Lauren said that “you’re not told

much before you start, no-one sits you down and says, ‘this is shift work, this is what’s going to happen to you, these are some of the things you can do to help you cope’. There’s none of that and there’s no risks or benefits told to you.” She comments that “it’s not deemed a hazard, there’s no training on it, like even in our training it’s not mentioned and pretty much every radiographer at some stage or another will be a shift MRT, and it’s not mentioned at all.” Comments from the questionnaire respondents were limited as most simply answered ‘no’ with no further discussion. This apparent lack of education pertaining to shift work and its effects could prove to be the cause of any misalignment between perception and reality and the impact of the effects experienced by MRTs and their families as a result of shift work. Rajaratnam and Arendt (2001) believe that due to the lack of education and awareness of shift workers with regards to the effects of shift work, they are effectively performing uncontrolled experiments on themselves, which is necessary for them to cope as best they can with the limited knowledge and resources they have to hand, yet the ethics of functioning in that manner must be queried.

The questionnaire responses from the Charge MRTs regarding how their staff are educated about shift work were mixed, with comments ranging from “they are not;” “Union does some education;” “leaflets from Occupational Health;” “information from health workshop left for their viewing;” “although staff are well versed with the contractual aspects of shift work, there is a dearth in educational opportunities around shift work,” and one Charge MRT believed their staff were educated “during their training,” which the results of the research clearly show is not the case. When asked what aspects in particular their staff were informed about, the Charge MRTs responses included “what time to turn up and when to leave, we have no education/training regarding shift work,” “contractual obligations, informal work/life balance conversations with peers and senior staff” and “they do several shifts in their final year (of training).” When combining the responses of both the MRTs and management, there would seem to be a very obvious trend that education pertaining to shift work and its effects is generally not offered, either as part of an MRT’s education or their employment, and there would even seem to be some confusion as to whose responsibility it is to train MRTs on the phenomenon of shift work, which could potentially be the cause of this oversight.



### **Benefits of education**

When asked if education on the effects of shift work would be beneficial, 68% of questionnaire respondents agreed, 28% disagreed and 4% were unsure, compared with the 75% of interview participants who agreed, 8% who disagreed and 17% who were unsure, demonstrating the preference of MRTs for receiving information or education regarding the effects of shift work. Sarah feels that it's a hard one "because you do not know what it's like until you do it." She does not think that anything can prepare you for shift work because "it's something you just have to do and find out what it's like." The main reasons given from the 23% of questionnaire respondents who did not believe education would be beneficial were that it would not change anything, the effects of shift work were already known, shift work is something that each individual adapts to personally and they should deal with it as such.

Many of these comments appear to be based on the assumption that MRTs are fully informed on the effects of shift work, however as this research exposes, this may not be the case. Many workers are reported to be unaware of the long and short term effects associated with shift work. Learning to cope starts by understanding the associated effects and knowing the methods that best counteract the consequences of working while the remainder of society is asleep (Cooper, 2003; Scott, 2007). It is also essential to the health and wellbeing of the workers themselves and the patients in their care that deliberate measures are taken to ensure understanding and awareness regarding the main effects of shift work (Peate, 2007; Scott, 2007). The Institute of Medicine (as cited in Hughes & Stone, 2004) recently stated that there was no evidence to suggest that any amount of training, motivation or professionalism would overcome the performance deficits associated with sleep loss, fatigue and circadian rhythms, however while this may be so, the implementation of such programmes can be of no harm and as there is high level of support for such programmes reported in the literature, it is thought that doing something in attempt to control or minimise the effects associated with shift work, is by far advantageous to doing nothing. The Department of Labour (2007a) supports this, yet

they recognise that although education and training are a crucial part of a shift work management approach, they are never a complete solution.

The main reasons given by the 77% of questionnaire respondents who believed education about shift work would be advantageous were that it would be beneficial for new graduates and that it was important to know what to expect, to have a more thorough understanding: “shift work impacts our lives in many different ways, we need to be aware if it is affecting us negatively.” Christopher thinks that “you do need to have more insight into doing shift work because there’s new research always going on and new developments” and Tiffany believes that education would “help you to actually feel like you’re in control because you’re doing something about it” which is important for “just bringing awareness to the forefront from the back of your mind.”

There is growing agreement in the literature that appropriate information programmes are necessary for people who perform shift work and researchers are now campaigning for educational programs be established for all shift work employees (Occupational Safety & Health, 1998a; Taylor et al., 1997). To ensure shift workers work as effectively and efficiently as possible during their shift while maintaining their overall welfare, preparation in the form of education and training is vital as it can help to improve performance, prevent fatigue and reduce the effects of sleep deprivation (Peate, 2007; Fitzpatrick et al., 1999). Increasing shift workers’ awareness and repertoire of coping strategies and skills will enhance adaptation and tolerance to shift work and allow them to better manage their work routines and patterns, prevent incidents or accidents from occurring and promote and enhance well-being, safety and productivity (Berger & Hobbs, 2006; Rajaratnam & Arendt, 2001; Learthart, 2000; Taylor et al., 1997; Van Dongen, 2006; Morshead, 2000; Blachowicz & Letizia, 2006; Colten & Altevogt, 2006). This will ultimately permit a positive impact on the health and safety of their patients, while also helping to reduce staff turnover as it acts to improve job satisfaction by increasing employee involvement and morale (Burgess, 2007; Learthart, 2000; Pisarski et al., 2006; Westfall-Lake, 1997).

While Alicia, Timothy and Claire all agree that education would have benefits, their comments come with some associated doubt. Alicia comments that education about shift work and its effects and ways to moderate effects might be helpful, “but at the end of the day you’ve still got to do it,” Claire believes that there would be benefits to having education and training about shift work in the workplace, but comments that “everyone’s so different as to how they deal with it best” and while she has some interest in the phenomenon of shift work, she does not know if everyone is as interested. Timothy reiterates Claire’s point and comments that “everyone’s different and their needs are different,” but also questions the timing of such education. He does think that some education and techniques on shift work to help prepare him a little right at the start may have made it easier. Timothy also has doubts over what aspects of shift work information should be provided about. Bradley and Greg were unsure as to the benefits of shift work, with Greg stating that “then you’d get half the people moaning and groaning about more about shifts and the effects of shifts because as soon as people are educated they’ll say ‘oh but we shouldn’t have to do this because this is what we’ve been told will happen’” and he does not know if this is a good thing or not.

The questionnaire respondents who were unsure provided limited justification for their decision, but one respondent commented that they were “not convinced it would help but would not hurt either.” There will always be people that want to be educated and those that do not and it is for this reason that the results of the ‘unsure’ group of participants are the most interesting. This group typically agrees that education would be beneficial, but question the timing, ability of the delivery of education to be diverse enough to meet all individual needs, topics to be covered and whether informing MRTs might cause more problems than it solves. If education were to be implemented as the majority of the interview and questionnaire participants have made clear they would like, the hesitations of those who are unsure must be considered and measures incorporated to ensure that the education provided is as useful as possible.

## **Family Involvement**

Despite 23% of questionnaire respondents being educated about shift work, at no time were their families formally included in this, despite the view of the interview participants that including their families would be advantageous and should be conducted on a more frequent and deliberate basis. Bradley thinks that if his family knew a bit more about some of the effects of shift work it would make it easier for them to understand how shift work affects him, although he says that he has always been vocal with them about the effects of shift work. Lynda believes that it would definitely be easier for her family and partner if they got some education about shift work because “they’d get a way better insight.” Alicia thinks it would be great if there was education for families about shift work, “it would be fantastic to include them...so they know what you have to put up with, why you get so tired and how they can help you.” She states that it is not something she would discuss with her family, yet believes it would be good if the department would. When questioned on why she feels it’s the department’s responsibility to inform her family when she does not, she replied that it’s “mainly because its coming from a different perspective and angle. It’s actually coming from your job, it’s not coming from me, whereas they could think, ‘oh, Mum’s just going on again’, it’s actually coming from the role that you’re in.” Christopher believes there is a benefit to extending education about shift work to families, particularly younger children, while Timothy feels that education aimed at family and children probably would have helped a bit, initially and an on-going basis to help iron out any issues that arise, however it would seem prudent to implement education and training for MRTs in the first instance before planning to extend this to incorporate family members.

## **Role of Education**

As the results of this research has shown, formal education regarding shift work and its effects is typically not provided to MRTs within New Zealand, either by employers or tertiary providers, yet its importance and benefit is largely undisputed. The research participants also highlighted some areas requiring further attention prior to implementation of such a measure.

### *Timing of Education*

Many interview participants and questionnaire responses commented that education would be most beneficial for new graduate MRTs as they enter the profession, but suggestions were also made that on-going education would be good to cover topics where effects may arise or change over time, depending on the roster structure of the department. This approach would also mirror the constantly evolving opinions about shift work and could adapt to suit the changing effects that may occur. Ideally shift work education should be provided during employee orientation and induction programmes before an employee begins shift work, with on-going supplementary education and support offered through staff meetings and departmental education sessions (Thurston et al., 2000; Department of Labour, 2007a; Blachowicz & Letizia, 2006). Ongoing surveillance of the shift workers' knowledge regarding the effects and impact of shift work that are associated with job dissatisfaction may indicate where improvements can be instigated and as the focus of future education and training sessions (Axelsson et al., 2004). Colten and Altevogt (2006) comments that some of the education regarding shift work should be included in the curricula of the relevant baccalaureate and graduate educational programmes and suggests that the relevant accrediting bodies and licensing boards should be responsible for defining the expectations for knowledge and competency. Coffey et al. (1988) believe that education regarding the effects and impact of shift work should be included in training programmes for health care professionals, however they express their frustration and outrage that this does not appear to happen for Doctors or Nurses, let alone incorporate other hospital personnel which they believe is not ideal. It is important to extend the invitation for education and training about shift work to the family of shift workers to enable them to know what to expect (Rosa & Colligan, 1997).

### *Responsibility for Being Educated*

Taylor et al. (1997) notes that there is a difficult ethical debate regarding who is responsible for job related well-being, the employer or the employee? Caruso (2008, p. 107) states that it is possible to reduce the detrimental effects associated with shift work, however minimising the risks requires "joint responsibility between the employer and the worker." Rajaratnam and Arendt (2001) believe that the burden is on employers to

ensure the risks to health and safety as a result of shift work are prevented, while Thurston et al. (2000) believe that the responsibility should be shared and rests with management staff of the hospital, union leaders and the shift workers themselves. The Department of Labour (2007b) insists that both the employer and employee have responsibilities regarding education and training and state that it is the employers' responsibility to support shift working staff as much as possible and that employees should have input into the best methods of fulfilling this responsibility.

### *Topics to be Covered*

The interview participants and questionnaire respondents provided many suggestions as to the topics they would like to be educated about in the future. The questionnaire respondents requested education pertaining to tips and techniques to handle the effects associated with shift work and combat any problems, specifically:

- Signs of burnout, exhaustion and fatigue, ways to maintain energy levels
- The best sleeping patterns, a plan of how to deal with changes in these patterns, how to schedule and achieve sleep during the day time
- Associated health effects and how to stay healthy
- Relaxation techniques
- Dietary information, such as what kind of food is suggested to eat for the different shifts
- How to deal with sleep deprivation and stress
- How to be better organised so they can spend quality time with their family and friends
- Rules on how to write rosters, information about call and shift changes and the best way to manage them, especially short changes, education on how much shift work it is safe to perform
- Information to help them understand how the body deals with shift work, recognise effects on circadian rhythms
- Information for families
- Information from the latest research and studies relating to shift work
- Information about what to expect when doing shift work

These suggestions for education topics were typically supported by the interview participants, with some other suggestions recommended. Bradley would like to see education on diet provided “because someone said that apples help keep you awake which was interesting to know.” Lynda would like to see “education about fatigue and what you can do when you’re really fatigued to stop it happening,” while Dorothy and Lynda would like information on sleeping patterns and techniques like how to get to sleep. Greg thought it would be a good idea to have an education session on how to deal with different types of people at night, or on coping with situations that arise, multi-tasking skills and organisational skills which you need when you are by yourself but often do not come out during a day shift because you’re just in one place and Christopher would like to know what some of the indications of being affected by shift work are. Tiffany requested suggestions of what to do before a shift to make it easier to cope with, “information on how to look after ourselves while doing shift work,” plus some “ideas on how to combat some of the effects of shift work.” Claire suggested education about “what your brain does when it’s tired or how you can pre-empt it.” Lauren would like “tips and techniques on sleep” and also information about effective roster design and Sarah thought that any tips and techniques would be helpful, “especially if it was related to night shift.” Katie suggested some education about routines, fatigue and sleep deprivation and also about “how to recognise when you’re overtired, some people just do not recognise the fact because you become so used to being tired that it becomes a part of who you are that some people may not necessarily recognise that this is going on.”

The suggested topics between the two groups of participants are very similar and clearly specify the areas that they would like to be educated about, and now that they have been identified it is imperative that action is taken to ensure formal education is implemented in these areas. The Department of Labour (2007a) states that shift workers need reliable, basic information to make informed choices about shift work and its effects from the outset. Multiple strategies can be utilised in order to improve shift work tolerance and enhance safety (Berger & Hobbs, 2006). Hospitals should provide specific education and training on the hazards related to shift work including the establishment of guidelines

pertaining to how to best minimise the physical effects of these shifts (Twarog, 2005). It is suggested that specific education regarding the impact on daily biological rhythms and circadian disruption, health habits and adverse health outcomes, guidance on sleep management, nutrition, stimulant use and exercise, understanding how the body reacts to sleep deprivation and fatigue and the impact on performance impairment and effects on social and domestic factors be provided to shift workers (Berger & Hobbs, 2006; Zhao & Turner, 2008; Harrington, 2001; Peate, 2007; Thurston et al., 2000). The overall focus should embrace a lifestyle approach and the relationship between work and domestic responsibilities (Thurston et al., 2000).

OSH encourages employers to not only provide an appropriate induction orientation that supplies general information and advice about shift work, but also to implement extensive and on-going education and training (Department of Labour, 2008). As part of this education, the Department of Labour (2007b) proposes that employees are informed about diet and nutrition, effective use of rest and recovery time, sleeping patterns that facilitate good sleep and how to recognise fatigue. Under the HSE Act, employees have a responsibility to attend these education sessions and report when they believe the effects of fatigue are resulting in unsafe practice (Department of Labour, 1998). However, the Department of Labour (2007a) believes that good education facilitates understanding and allows appropriate workplace-specific solutions to be put into place.

### *Informal Education*

The majority of interview participants discussed, with mixed views, the role of informal education by way of focused discussions with other MRTs regarding shift work. Greg does not think there would be any value in it, although he thinks it would be interesting to see the effects shift work has on other MRTs. He comments that “there’s no value in me telling you that, ‘oh, I also feel nauseated after night shift’, what’s the value in that? What can you do about it, nothing?” Although he does consider that there may potentially be value in knowing that you are not alone and how you are feeling is normal.” Lynda notes that she talks to other MRTs about shift work, however their discussion mainly focuses on tiredness and sleeping patterns and they would not normally



talk about the other effects of shift work they might experience. She feels that talking about experiences with others is important because it is the only way you can find out whether something is normal or not, especially when first starting. Dorothy states that she also informally discusses shift work with other MRTs, but mainly about the shift roster, “we talk about ways that we think shifts would be better if we could change things.” Alicia feels that there are benefits to MRTs within a department informally talking about their experiences of shift work and what they do to cope because different people cope in different ways and “some people have different ideas that might help you.” Like Greg, she also believes that these discussions can help to “make you realise how you’re feeling is the same as everybody else so you do not feel quite as much of an odd-bod.” Tiffany’s responses also support this view, stating that it “would help you to realise that you’re not the only one going through it and will learn that the things you are feeling can be a natural response with shift work.” Claire believes that it could be helpful to get everyone together to informally discuss how they are feeling about shift work, how certain shifts affect them and what they do about it, while Timothy thinks there would be benefit to informal discussions in a group because “someone may come out with an issue that has been sitting in the back of your mind but you haven’t brought it forward because you did not really think it was too important.”

Despite this group of MRTs stating the advantages of informal education, there would also appear to be some challenges which would need to be overcome before encouraging such a measure. Greg thinks that “there could be lots of times when we just do not talk about it because it’s not seen as the ‘done’ thing” and also points out that while some MRTs may be happy to discuss the effects of shift work and the impact they have, others may be “staunch” and not likely to admit to anything. Timothy is an example of this as he comments that he thinks it would normalise how everyone was feeling but he would never have said anything to anyone “unless someone else said something first.” Dorothy points out that there is a fine line between having objective, informal discussions and being seen to moan about it because some people just moan too much. “Sometimes it comes across as a competition as to who is the most tired person.” She believes that these discussions about shift work might be hindered by the fact that “we all do it and I

think we all get sick of hearing about it...some people just go on about how tired they are...you don't want to hear it anymore.” Alicia comments that one of the problems with this type of informal education is that you do not pick up on the discussions when you are on shift because you work alone or with one other person, and that is when you really need it!

Informal education such as impromptu in-house discussions between MRTs has many advantages and is an effective way for MRTs to support one another and help their peers cope with the effects of shift work, however it is clear that some boundaries and guidelines need to be established prior to such meetings. In lieu of formal, organised education provided by the employer or tertiary provider, MRTs should be encouraged to partake in such sessions, and every opportunity should be provided to them if they wish to do so. This would ensure that the phenomenon of shift work is more openly discussed, leading to an increased awareness of its effects and their impact. The process of open and honest dialogue and the sharing of ideas between colleagues would also help those new to shift work, or alternatively provide some tools for those struggling to tolerate the associated effects, and generally ensure that no MRT felt isolated or alone in their experience of shift work.

## **CHAPTER VII: HEALTH, SOCIAL AND FAMILY EFFECTS**

This chapter will discuss the relevant health effects as identified by the MRTs. The sleep patterns of MRTs while on shift are investigated, and the subsequent impact of shift work on these patterns, namely sleep deprivation and fatigue will be discussed. The effect of shift work on social and family effects and the ways MRTs deal with these will also be mentioned.

### **HEALTH EFFECTS**

Shift work was thought by some interview participants to have an impact on health, while others, mainly the males, either thought there was no impact or it was negligible. Bradley does not think shift work impacts on health at all and comments, “I feel fine, it hasn’t affected me at all” and while Christopher believes his previous experience of shift work in another profession was not conducive to good health and he does not feel that the shift work associated with being an MRT has had any effect on his health, and if it has, “definitely not as bad.” Timothy also supports these views, noting that it “hasn’t affected me health wise yet I hope, time will tell.”

However, the female participants had a slightly different view. Alicia stated that “you get yourself run down so you’re susceptible to picking things up” and she also highlights that there are many bugs and germs within a hospital environment which are easy to catch if your immune system is run down or compromised. When Dorothy first started shift work, she became unwell and attributed this to a new environment and her immune system not being used to patient contact, however as time has progressed it is likely that her body has either built up a natural defense or she has learnt effective ways to cope and minimise this effect as the impact now is not as great as previously. Her partner now finds he gets sick which he believes is due to her, to which she responds “it might be, I don’t know if I bring germs home.” Katie believes you build up immunity over a period of time, but also thinks it depends on how well you look after yourself, “if you eat well and exercise, wash your hands, personal hygiene and things like that.” In contrast, Dorothy points out that personal hygiene is intense when working in a hospital environment which means she is always hand-washing and showering and so it could be plausible that her body’s natural

defense mechanisms are weakened by this sterility and cleanliness, leaving her susceptible to germs.

Lynda believes shift work probably does have some impact on health, while Claire feels there is a definite relationship and states that “if you are coming down with something and you have a weekend on-call or a couple of night shifts coming up, that is always going to bring it on rather than make it go away.” Katie shares these sentiments and adds that it is worse “if you’re doing nine days straight and you get to the end of the nine days and start to get a little snuffle because you’ve done those long blocks.” Sarah and Claire believe that tiredness is a factor, with Claire commenting that “I think your body’s response to being tired lowers your immune system.” There are many reasons which could account for the differences between the male and female outlooks. This could be due to females sacrificing their sleep and health in order to continue upholding their family and household responsibilities in addition to undertaking shift work. Similarly, it could be that females are more susceptible to the impact of shift work on health when compared to males, for biological and physiological reasons. Alternatively, it could be due to the fact that females are more aware of their bodies and notice when they are not feeling right whereas men may not be as in-tune with their bodies and are not aware.

### **Awareness of Health Effects**

When the questionnaire respondents were asked to identify the health effects associated with shift work, the effects recognised in the literature were generally well represented, with some of the list overlapping with other effects associated with shift work such as fatigue, tiredness and sleep deprivation. Effects on mental health, stress, gastrointestinal, cardiovascular and immune systems, nutrition and physical exercise were all recognised as being altered for the worse. Premature ageing, decreased life expectancy, and breast cancer were also noted, as was the physical impact and strain of manually handling patients when working alone. This list supports the literature, which states that shift work affects the worker’s health, imposing both short and long-term consequences on their cardiovascular, gastrointestinal, respiratory and reproductive systems manifesting as numerous diverse health effects or causing physical and psychological disorders, while also aggravating existing health conditions or interfering with ongoing medications and

nutritional routines (Zhao & Turner, 2008; Wilson, 2002; Learthart, 2000). Shift workers may also experience more common colds and influenza than day workers and may be more susceptible to viral and bacterial infections due to the immunological response of the body being weakened in proportion to the amount of sleep deprivation accumulated, all of which fits with the MRT reports (Scott, 2007; Learthart, 2000; Poissonnet & Veron, 2000; Harrington, 2001; Perkins, 2001).

Collectively, the MRTs identified a comprehensive list of the effect of shift work, demonstrating that as a professional group, MRTs are aware of the effects and their impact, however the fact that no individual MRT was able to identify all of these effects, and that some comments such as “I’m not really aware of any that are directly related,” were generated, could illustrate that the awareness and knowledge at an individual level is poor. This may be due to MRTs only being concerned about the effects they personally experience, and not wanting to find out about other effects which may never become a personal issue, alternatively these may be attributable to a lack of education and information. Timothy believes it would be good to know what the potential health effects were when going into shift work, but he noted that it would not be on the top of his list of information to find out.

### **Illness Rate**

This research has shown that the impact shift work has on the illness rate of an MRT is debatable. Many interview participants report that their sick leave is less than five days annually and has been utilised for colds, influenza or diarrhoea and vomiting, although Katie does report taking a “me day” occasionally. Claire believes that shift work does affect the illness rate in her department due to increased tiredness levels among staff, while Sarah points out her heightened sense of awareness for the range of illnesses that exist, “you do think about those more,” which might imply that MRTs are potentially overly cautious when it comes to their health and utilising sick leave. Alicia believes that the sickness rate in her department is very high, which she also attributes to tiredness. Her previous workplace was in the United Kingdom where there they do not appear to have separate annual and sick leave as is current practice in New Zealand, which may impact her view on the amount of sick leave taken. The average amount of sick leave

used in the past year as reported by the questionnaire respondents was calculated to be 4.5 days, with a range of 0 days to eight weeks. Reasons for taking sick leave included 17 cases of mental exhaustion and 13 cases of physical exhaustion, 26 cases of tiredness and 10 cases of stress. An illness where a doctor was visited occurred in 30 cases, while an illness where a doctor was not visited occurred in 52 cases. Other reasons stated included sick children, diarrhoea and vomiting, pregnancy issues, migraines, chronic depression, influenza, back strain from moving patients, Norovirus, Swine flu, toothache, muscle injury and wagging, that is, exaggerated illness. Fifteen percent of all cases were considered to be directly attributable to shift work and in 52% of all cases the employer was reported to be aware of the reasons for sick leave. Shift workers are reported in the literature to have a higher incidence of sick leave and the associated health effects are often reported by workers as the main reason they leave shift work or change jobs within their profession (Occupational Safety & Health, 1998a; Rosa & Colligan, 1997). The results of this research build an impression of a relatively low illness rate amongst MRTs in this study, although this may represent an underestimation when the amount of MRTs that work their shift when they are ill is considered, as the illness rate would be higher if they remained at home.

All of the interview participants claim that at some stage they have gone to work when they were feeling ill and believe they should have been at home recuperating. The motivator behind this practice is generally centered on the knowledge that shifts are hard to fill at the last minute and they did not want to let their colleagues down, with many also feeling obliged to be present due to the pressure of the department being short staffed. Night shift appears to be particularly problematic with both Greg and Bradley reporting an obligation to come in when unwell due to potential problems filling the shift at short notice. Lynda comments that “you can’t be off like you’re supposed to until you’ve got no symptoms or anything like that, you’d like to but you can’t do it because you feel the pressure of the department being low on staff and they need you to be at work so you go.” Claire supports this comment and notes that “there’s that whole thing where you’re not meant to come to work sick because you spread it to the patients and the staff, but I think that’s a little bit idealistic and impractical but possibly should be followed a bit more than I do.” Alicia has also put herself in the position where she goes to work when ill,

knowing that calling in sick would mean leaving her colleagues on their own and Timothy also holds the opinion that “I don’t want to let people down.” Tiffany feels that staff are all part of a team and are stretched as it is without enough staff on the floor “if you call in sick when you might be able to actually manage the day, or if you can supervise a student who can kind of do your workload for you in some respect, you’re still managing to help out so therefore you come to work.” Lynda states that while she has only called in sick once when working a shift, she felt terrible doing it and Sarah adds that she thinks twice before calling in sick. The safety of these practices must be considered, not only for the worker but for their patients and fellow colleagues, particularly students if the practice of supervising students when ill is common, however MRTs should not feel any pressure to attend work when legitimately ill, regardless of the shift they are rostered to.

### **Nutrition**

Research suggests that shift workers experience more upset stomachs and general gastric discomfort, heartburn, dyspepsia, constipation, flatulence, stomach ulcers and bowel disease than day workers (Rosa & Colligan, 1997; Blachowicz & Letizia, 2006; Reid et al., 1997; Society of Radiographers, n.d.). The cause of this is likely to incorporate dietary factors such as quality of food consumed and the timing of its consumption, as the GI system’s circadian rhythm is not designed for a nocturnal intake of energy and nutrients (Harrington, 2001; Scott, 2000; Atkinson et al., 2008; Garabino et al., 2002; Spurgeon, 2003). The majority of the interview and questionnaire participants report that the type of food they consumed was altered and the timing of their food intake was also distorted, with most eating occurring at unusual times and others missing meals altogether. These effects correspond with the wider literature.

The types of foods consumed as a result of shift work are reportedly of decreased quality than what would typically be consumed normally, with MRTs opting for ready-made meals of convenience or sugary foods to provide sustenance for their waning energy levels. To ensure the quality of their meals is not reduced too much, Lynda, Dorothy, Christopher and Katie all report making their own meals and eating them when on shift, however they do acknowledge that the preparation for such meals occurs during their free

time when they could be spending that time doing other activities. Many questionnaire participants reported overeating as a result of shift work, while some interview participants reported that while they were prone to eat more frequently, they consumed a smaller amount per sitting and so felt they probably consumed the same overall amount on any given day. The remainder of interview participants reported skipping meals but having larger serves, again obtaining an unchanged overall quantity. It is possible that the decreased quality of the foods consumed made the workers feel as though they had overeaten, when actually it was just their body's response to digesting a different composition of foods as opposed to the actual amount they consumed.

The most profound impact of shift work on nutritional intake for the majority of the MRTs was the altered timing of meals, resulting in a less structured eating pattern which was necessary to accommodate their work and sleep schedules. During a shift, meal times are generally dictated by staffing levels or workload and may be earlier or later than what is typical for the worker, while meals following the completion of an evening or night shift may be consumed later to accommodate the worker's sleep pattern. Claire notes that "it's not uncommon for me not to eat until two pm if I'm doing a weekend of call... I'm sort of not hungry and then there's not really an appropriate meal time" which also highlights the impact that the standard 'normal' mealtimes have on a worker's physiology. Dorothy also finds this thinking impacts her ability to eat on night shift because, as she explains, "it's probably just a mental thing as to why would you eat at that time, because I've never done it before!" Katie also highlights that she snacks more on shifts that are quiet because "I'm bored, I sit there and I just pick."

### **Physical Exercise**

A number of MRTs reported in the questionnaire and interviews that their physical exercise has been negatively altered as a consequence of shift work, while for the remaining respondents there has either been no change or they do not actively perform physical exercise of any nature. Lynda reports "I'm not really a physical kind of person" and Sarah mirrors this view. Bradley believes shift work has not had a huge impact for him because "sometimes you come home from work and you don't feel like doing exercise and sometimes you do," however the majority of MRTs report exercising less as



a result of shift work, which fits with the findings of the wider literature. A myriad of reasons were reported as the source of this effect.

It was reported that lack of routine made it difficult to exercise, with Claire noting that “it’s very easy when you work shifts to find it difficult to get to the gym, unless you’re very organised,” which suggests that prior organisation and planning could act to counter the effects of shift work on physical exercise if it is a sufficiently high priority for the worker. Difficulty committing to a sports team due to the timing of practices and games also makes it difficult for the shift worker to partake in team sports. Alicia often finds she is too tired and therefore not motivated to exercise when she is working shifts and Katie admits this can be an issue for her, however she often makes herself do some physical activity because “that normally tires me out better and makes me feel better because it gives me a few natural endorphins and makes me a bit more happier.” Free time is precious to the shift worker, particularly if it occurs when their family is home or when social opportunities are possible and so exercising during these times, although possible, may not be a sufficient priority due to the other tasks they must perform to uphold their personal and social obligations. Timothy comments that he has “got other things to do around the house” and so is not motivated to perform physical exercise because it is not a high priority for him.

Dorothy runs annual marathons so is dedicated to training and gets frustrated at the effect shift work has on her ability to perform the amount of training required. While she would still go running if she felt very tired as a consequence of shift work, she will not put herself in danger and go out after her shift if it is dark, thus restricting the opportunities for her to train. While he would not come home from an evening shift and go out for a run for the same reason, Bradley points out that there is “nothing stopping you the next day going for a run if you wanted to” and Timothy adds that “if you make your mind up to go exercising you will do it.” These comments again indicate that the effect can be minimised if exercise is a priority. Maintaining a level of physical exercise is important to ensure general wellbeing and a decrease in physical exercise can lead to an increase in body weight, which was reported by some MRTs as being an issue. This can have negative spin-off effects on their health status.

## **SLEEP PATTERNS AND DEPRIVATION**

### **Impact on Tiredness**

The effect of shift work on tiredness was reported as having a significant impact and it was the one effect that appeared to impact the greatest proportion of MRTs. Despite this, 14% of questionnaire respondents and Bradley reported they were not tired as a result of shifts and utilising sleep-ins and afternoon naps was reported as the reason behind this. The questionnaire participants cited sourcing extra sleep if they felt it necessary while Bradley notes that he can sleep whenever he closes his eyes regardless of whether he is tired or not and he attributes the minimal impact to this characteristic.

Forty one percent of questionnaire respondents felt their tiredness levels were affected by shift work to a small to moderate degree which is supported by Sarah, Lauren, Alicia and Lynda, who all report feeling increasingly tired during or immediately after a period of shifts, however the impact of this is relieved by obtaining sleep which then nullifies or adequately reduces the feeling of tiredness. For Lynda, tiredness is typically associated with being on night shift and although some nights she feels awake and alert, other times she just wants to sleep. Lauren also comments that her increased tiredness is as a result of night shift, while Sarah differentiates between tiredness and fatigue as she feels tired during the shifts but notices that the fatigue catches up with her after the tiredness has resolved. Alicia believes that shift work definitely makes sleep deprivation and tiredness worse because it does not allow for enough time to recover. She notes that in addition to this, the quality and quantity of her sleep are affected as a result of a lot of short turnarounds in her shift schedule and she finds this challenging.

Forty five percent of questionnaire respondents and Greg, Dorothy and Katie all report feeling extremely tired as a result of shift work, which is not relieved after sleep and the impact creeps into their personal lives. Greg comments that “you’re just tired from when you get up,” while Katie explains that “my sleeping is stuffed, I’m always tired” and she finds she maintains a general level of tiredness because she does not recover after sleeping. During her free time, she will make herself do something constructive and active regardless of how tired she feels, not only because she does not believe that being

tired is her body's signal that it needs rest and recuperation, but also because she does not feel that lying on the couch during the day is acceptable. She thinks this might be her psyche saying "it's lazy to lie on the couch" and notes that it has always been instilled in her not to sleep during the day because she will not sleep well at night. Dorothy attributes her tiredness to working shifts sporadically, which does not provide any consistency or allow her to get her sleeping patterns sorted, meaning she never fully recovers from feeling tired. She also adds that she has other things happening in her life, such as studying for a modality, which decreases the amount of time she can sleep. She admits to being her own worst enemy in this respect because she wants to do everything else and she sleeps less to achieve this.

The interview participants did not extend their comments to include the impact these levels of tiredness have on them in a personal and professional sense, however the questionnaire participants supplied many examples. Professionally, increased tiredness levels can lead to performance impairment with inflation of the number of mistakes that creep into practice, more shortcuts utilised and decreased standards when accepting images. The literature comments that increased tiredness is often associated with delayed reaction times and reduced psychomotor co-ordination, information processing, decision making capabilities and limited judgment or competence (Garabino et al., 2002; Lindsey, 2007) which fits with the experience of these MRTs. Many MRTs reported lacking motivation and discipline, with decision making skills and speed also affected. Increased irritability and frustration levels were a consequence of feeling tired, and in conjunction with grumpiness this leads to reduced tolerance with both patients and colleagues. These altered personal characteristics also have an impact personally, with children, partners and extended family bearing the brunt. Often social activity and time spent with family is reduced, either because this free time is spent sleeping or because the worker does not have the energy levels required for such events. Decreased energy levels can also lead to the consumption of sugary foods and overeating was reported, which when considered with the decreased desire to exercise can lead to adverse health effects. Migraines and mental depression are two such health effects which are reported to occur as a result of increased tiredness levels and these also have an impact on the illness rate of each individual MRT. Rosa and Colligan (1997) and Reid et al. (1997) report that increasing

tiredness occurs as a consequence of sleep deprivation and can affect a worker's performance both on and off the job.

### **Impact on Sleep Patterns**

Sixty eight percent of questionnaire respondents report that when working a period of dayshifts or having time off they have a stable sleep pattern that is sustainable and allows them a sufficient amount of sleep, while the remaining 32% disagree. Interestingly, when performing shift work, 33% believe they have a stable sleep pattern that is sustainable and allows them a sufficient amount of sleep, while 66% disagree. When asked in a separate question if they felt shift work affected their sleep patterns, 69% of questionnaire respondents agreed, while 31% claimed it had no impact, an almost identical finding and further validating the effect that shift work has on sleep patterns. Results from the interview participants are similar to the questionnaire respondents, however despite this, the findings must be viewed with some caution as Labyak (2002) believes that many individuals accept their desynchronised sleeping patterns as different but normal, and adjust their lives and livelihood accordingly, meaning that these findings may be under reported.

During a period of dayshifts or when having time off, the questionnaire respondents reported that the biggest problem with their sleep was that they wake often during the night. This was followed by trouble getting to sleep; restless broken sleep resulting in poor sleep quality and trouble obtaining sleep for a suitable length of time, which on average was calculated to be 7.65 hours of total sleep actually obtained. When performing shift work, the biggest problem reported was restless broken sleep resulting in poor sleep quality. This was followed by trouble obtaining sleep for a suitable length of time, which on average was calculated to be 6.48 hours in total. Other problems were waking often during the night; trouble initially getting to sleep and difficulty staying awake during shifts. Ruggiero (2005) claims that shift work reduces the quantity of sleep by up to two hours per day and the results of research performed by Akerstedt et al. (2008) found that there were significant differences between the sleep obtained when working night shift compared to day shift, and the findings of this research are supportive of the aforementioned results.

### *Quantity*

Glazner (1991) reports that shift workers sleep less, although there is no note as to whether this is on a one-off basis or is an overall occurrence; however the findings of this research support the claims of Glazner, that shift workers do sleep less over a period of shifts at the rate of approximately one hour per shift. Bradley thinks he sleeps less when on shifts, with his sleep quantity reduced by up to three hours which he comments “takes its toll.” Lynda has also noticed that she sleeps less when doing shifts, primarily because she goes to bed later but her body clock persists and wakes her up at her ‘normal’ time, breaking her sleep and reducing her chances of a sleep-in. This was found to be a widespread problem, particularly with those MRTs who do not perform consistent blocks of shifts because of the inherently slow nature of circadian rhythms to re-entrain (Berger & Hobbs, 2006). This means that even though they go to bed late, they wake up early; however if they go to bed early, they still fall asleep late and this acts to reduce the quantity of sleep obtained. Wind-down time cuts into sleeping time, particularly during a short change of shift schedules and many of the MRTs commented that this was an area of their sleep patterns, as the longer they needed to wind-down, the less time they had to sleep. Sarah comments that when she gets home from work after a shift, she finds it difficult offloading work and while her body could go to sleep instantly, her brain is not ready and needs a chance to relax. Alicia comments that it usually takes her a while to wind-down after a shift and notes that methods of doing so also differ because “I can’t sit in bed and read my book because it will annoy or wake up my partner,” so instead she finds herself lying in bed for prolonged periods in anticipation of sleep. Christopher finds that after a shift it’s not possible to “put your pajamas on and go to bed to go to sleep” and he listens to music through headphones when lying in bed to ensure he is relaxed before falling asleep.

### *Quality*

Due to the typically restless, broken nature of the sleep that the MRTs report following a period of shifts, the quality of any sleep obtained during this time is significantly impaired. It is stated by Phillips and Houghton (2006) and Jay (n.d.) that it is crucial to obtain uninterrupted sleep for long periods of time because each time a period of

consecutive sleep is broken, the sleep cycle is reset to Stages One and Two of the Non-REM cycle, which are the periods where the lightest sleep is achieved, resulting in less overall replenishment for the body and mind. The ability to wind-down was also reported to affect the quality of an MRTs' sleep, because the more effectively that they are able to wind-down and relax, the more restful and deep is the sleep that follows and Katie's experience reiterated this. She is a light sleeper and feels she often cannot dissociate from her environment and so is still alert to her surroundings when asleep. She comments that living with a flatmate who is also a shift worker is difficult because she is interrupted by the comings and goings of her flatmate and as a result finds that sometimes "I end up doing her shifts as well!" As a result of poor quality sleep, Lynda comments that she feels less refreshed after a period of sleep, while Katie finds herself in a continual state of tiredness, with both occurrences widely reported in the questionnaire responses. Sarah claims that the root of her success with shift work thus far is that she has established, sustainable sleeping habits and it is only when these are broken that she notices the impact associated with shift work, highlighting the importance of obtaining good quality sleep of adequate quantities when performing shift work.

### **Prior Wakefulness**

The amount of wakeful hours prior to commencing a shift, particularly night shifts, was identified by many interview participants as being an issue that affected not only their tiredness and fatigue levels, but also their ability to be alert and maintain performance at acceptable levels during the shift. Christopher reports being awake for 24 hours at the conclusion of his first night shift and this occurrence has also been experienced by Tiffany, Claire, Sarah and Katie. Excluding the usual evening's sleep, additional sleeping prior to beginning the first night shift is reported to be difficult because it is considered to be hard to sleep in advance when the body does not feel it is required. Tiffany explains that having a sleep before starting night shifts is difficult because her mindset is that she had a free day off prior to her first shift and she adds that very rarely would she try and have a sleep during this time. Claire finds she sleeps in longer on the morning of her last evening sleep prior to commencing night shifts, however still reports that by the time she has finished her first nightshift "I've gone quite some time without

any sleep.” Katie adds that on her first night shift “I in fact go from Friday morning right through to Saturday morning with no sleep, no proper sleep, which is quite dangerous.”

The research of Lamond et al. (2004) supports Katie’s statement that prior awakening can be dangerous and have negative consequences as their results highlight that the degree of performance impairment on night shift can be directly attributed to the amount of prior wakefulness. Lamond et al. (2004) identified that the greatest performance impairment occurred on the first nightshift, with the second and third shifts also displaying impairment, but to a lesser degree. While performance improved significantly over the four remaining shifts, it never returned to the levels which were measured when the participants were unaffected by shift work. They comment that the results are not surprising when it is considered that the amount of prior wakefulness on the first nightshift was approximately 14 hours at the beginning of the shift and in excess of 20 hours at the conclusion of the first shift. This relates to the amount of prior wakefulness expressed by the interview participants. This finding also suggests the possibility for circadian rhythms to re-entrain over a block of consistent shifts and thus supports the argument for performing blocks of consistent shifts as opposed to a sporadic shift schedule.

Katie extends her comments regarding prior wakefulness to include shifts other than night shift and she adds that the way the rosters in her department are structured, “they are increasing your periods of wakefulness a lot longer and it’s not really conducive to sleep.” She gives the example that “you do the early morning shift during the day so you’re up at say 6am and then you’re expected to be on-call that night with the chance that you might not get any sleep.” She feels that performing a shift with a later start would be more appropriate before doing a night on-call “so it just makes your wakeful time before you go on-call a little less,” however while plausible, this scenario was not considered by Lamond et al. (2004), nor mentioned by any other participants.

### **Ability to Sleep During the Day**

The majority of the interview participants report difficulties with sleeping during the day when on shift, which has a negative impact on their tiredness levels. While Greg does

not report problems falling asleep initially, he comments that if there is background noise he will wake up and then will not be able to go back to sleep, reducing the quantity of available sleep. Claire also finds the background noise a problem and explains that “no-one gets up at 2am to mow their lawns, but you can’t stop them on a Sunday morning, you’d like to but you can’t and it’s not considered appropriate to yell at kids playing under your window.” She believes that if she has control of her sleeping environment during the day, making it dark and quiet then she does not find it too bad, however notes that “it’s harder to control your environment” during the day compared to the night. Tiffany reports utilising sleeping tablets to help her overcome the difficulties with sleeping during the day and Katie also reports resorting to such measures to help her sleep. Both attribute their diurnal sleeping difficulties to their biological body clock being unsynchronized and so preferring to be awake as a result. The internal circadian body clock adapts very slowly as the day/night cycle and remainder of society do not change to meet the needs of the shift worker. This may mean attempting to sleep when the body wishes to be awake and trying to work when the body is at its least functional stage, resulting in lack of sleep and increased fatigue levels (Jay, n.d.; Cohn, 2007).

An interesting finding was the ability of the seasons of the year to impact on the ability of MRTs to sleep during the day. The interview participants typically agreed that the winter months promoted sleep during the day, while the summer months discouraged the ability to sleep. Winter supported the ability to sleep because the lower temperatures and brightness levels were more conducive to providing an appropriate sleeping environment, while the wet, windy conditions reduced the MRTs’ desire to perform outdoor activities and so they were more likely to remain in bed for longer periods of time. The increased amount of daylight hours during the summer mean that not only is the atmosphere brighter and warmer making the physical conditions for sleep challenging, but as soon as an MRT wakes up and notices the lovely weather, their desire to perform outdoor activities such as gardening or going to the beach is greater than their apparent need for sleep and so the quantity of sleep obtained is reduced. While there is little that can be done to prevent the change of seasons, there are many solutions and techniques which can be implemented to reduce the other stated problems associated with sleeping during the day. As this appears to be a widespread issue it would seem logical to collectively



educate staff. Firstly on the importance of obtaining adequate amounts of sleep, as Colten and Altevogt (2006) report that sleep deprivation and tiredness are often accepted as an inevitable part of the professional role as a shift worker and thus undervalued; and secondly, techniques to enhance their ability to sleep during the day should be provided. Education in this manner will mean a better quality and quantity of sleep and reduced tiredness levels during shifts.

### **Partner's Routine**

A number of the interview participants reported that it was not just their sleeping patterns that were disrupted as a result of shift work, but their partner's routines were also consequently disturbed. Lynda feels bad when she is on-call and the phone rings meaning she has to get up and go to work because she makes a big "kafuffle" when she turns on the lights which disturbs her partner, not only when she leaves but also on her return. "You're breaking their sleep as well...and you really can't do it quietly!" When doing night shifts, Lauren would make a point of going to work much earlier than her start time specifically so her partner could go to bed and not have his sleep patterns disrupted by her work schedule. She comments that while it did make her shifts a couple of hours longer than everyone else's, it was a necessary compromise. Sarah comments that her partner is a very light sleeper and so she disturbs him with her work schedule and she believes he is probably more tired since she began doing shift work simply as a result of the disruption it causes to his sleep patterns. She mentions that "he didn't buy into that when I started shift work, he didn't know at all!" Greg notes that his wife "gets a bit sleep deprived more than I do" as a result of his shifts and he mentions that his evening shifts "really kill her" because he wakes her up when he comes home late and she then has to get up early for work. These experiences highlight that being informed and extending this knowledge to include the immediate families of shift workers is vital because their lives are also directly affected as a result.

Christopher and Dorothy note that their partners are the exception to this and do not appear to be affected, typically due to their ability to achieve deep sleep in any situation. Dorothy comments that her coming and going, particularly when on-call, does not upset her partner's routine because "he sleeps like the dead" and would not know when she had

left or returned. Christopher explains that his wife is the type of person who can fall asleep quickly in the right conditions, which he notes is an advantage for them both. However he does add that she tends to stay up later to see him when he's finished his shift because it is potentially the only opportunity they get to communicate during the day and so rather than having disrupted sleep, she has a reduced quantity of sleep as a result of his performing shift work.

## **FATIGUE**

Fatigue was mentioned by many MRTs in both the interview and questionnaire responses as being considered an effect of shift work with a mainly negative impact. Fatigue is defined by Occupational Safety and Health (1998a, p. 7) as “the temporary inability, or decrease in ability, or strong disinclination to respond to a situation, because of previous over-activity, either mental, emotional or physical; while sleepiness is reported by Knutsson (2004, p. 1039) as “difficulty staying awake even when wakefulness is required.” Reports of fatigue are a common complaint among those working abnormal hours and as such, may often be overlooked (Harrington, 2001; Lindsey, 2007). This oversight could mean this result is an under-representation, however the majority of the interview participants believed that fatigue was a factor and had a negative impact on both their professional and personal lives. Only a small number reported no effect. Bradley commented that he “hasn’t experienced fatigue thus far in my career” and Timothy also felt that shift work did not have any impact on his level of fatigue, stating that “a change is like a holiday.” He attributed this absence of fatigue to the shift schedule he works, commenting that “the way the roster is, you work four shifts then you are either on day shifts after that or have days off before starting your next lot of shifts so you have plenty of time for recuperating.”

Lynda believes she is not as affected by fatigue now when compared to her initial experience of starting shift work, as she reports that due to the department being short staffed at the time, she was required to do shifts, particularly night shifts, more often and had lots of shift changes so she “really noticed it then...It wasn’t like being tired, just drained and exhausted.” She felt that she worked in the same way as for day shifts, but just had no energy and reports that when she felt fatigued she did not do anything

different to try and counter the effects of fatigue, except sleep more. Lynda had just started shift work and notes that at the time, she thought it was normal and just went with it and “wasn’t used to the shift work and all the changes associated with it”. In hindsight, when she stopped working so many night shifts she could see that it was not normal. Knutsson (2004) believes that fatigue is not relieved by sleep, however in contrast to this, it was widely reported by other MRTs in this research that sourcing additional sleep was their preferred method of coping with fatigue. The Department of Labour (2007a) disagrees with Knutsson (2004), stating that sleep is the only cure for fatigue which ACC (2009) support with their claim that adequate sleep is essential for maintaining and restoring full physical and mental functioning and is the only way of providing recovery from fatigue, particularly for the brain and this information fits with the experience of MRTs in this scenario.

Alicia finds that shift work impacts on her fatigue levels because “it takes me longer to recover from shifts, especially from night shift because it takes me three days to get my energy levels back,” while Dorothy believes that “you get fatigue from any job I reckon. Shift work does not help my fatigue levels but sometimes I’m my own worst enemy so I probably don’t help it either.” Claire comments that she becomes a lot more lethargic because of the disruption to her circadian rhythms and “you’re just blobbing out in your non-shift time.” She believes that you “start to have mental fatigue” due to sleep loss, “physically you’re ok... but you’re not as mentally sharp.” Professionally she thinks it does affect her accuracy, as she is more inclined to make, “not necessarily errors, but be imperfect...You’re just sort of doing things out of habit without being quite so acutely aware of everything going on around you.” Claire believes she is now aware of when she’s in a fatigued state, but thinks that “when you’re quite new out and doing it you don’t [know when you are feeling fatigued]”. Sarah notices she gets fatigued when doing night shift and because she has never felt anything like it before she links it with shift work. She finds that she feels tired during the shifts, but the fatigue catches up with her a bit later on, “when you actually stop doing the work and you have a day off you notice it more. It hits you once you actually get a chance to breathe.” She believes overall she probably feels more fatigued than tired because it’s not solely a feeling of tiredness, while Katie agrees that tiredness does lend itself to fatigue and is one of the causes of her

fatigue levels. She knows when she's fatigued because she gets a twitchy nose, muscle spasms and ringing in the ears and comments that "with fatigue, you're just tired all the time, you just feel like you've had the life sucked out of you." Like Sarah, Katie also finds that fatigue catches up on her afterwards, noting that "the effects of fatigue normally occur two days from finishing a stretch of shift. She comments that "you just work through it. You don't have any other choice."

Fourteen percent of questionnaire respondents indicated that they did not feel fatigued after a period of shifts or call, 43 % of respondents reported feeling a little fatigued while those feeling extremely fatigued also measured 43%. When asked to comment on how this level of fatigue affected them, either personally or professionally, the responses illustrated an impact that was multifaceted and intrusive. Comments on the personal impact included "feel that I am too tired to exercise;" "tired and grumpy, unmotivated to do other things;" "eat more;" "house becomes messy and do not make any social plans;" "no energy, unable to focus;" "no desire to socialise, can be impatient with family;" "tired when I get home and just want to blob out for ages;" "forgetful;" "still do everything the same but just feel shattered and this causes ears to hurt;" "more lazy and moody and want to sleep;" "I feel almost drunk and extremely tired;" "can feel physically sick I am so tired;" "effects my performance in playing sport outside of work" and "being tired affects my quality of life."

Comments relating to the professional impact incorporated "less tolerant with patients at work, standards are lower;" "work quality decreases, more likely to put through sub-standard images;" "mistakes and shortcuts happen more often;" "get grumpy and have low tolerance of others;" "do not make good decisions;" "find it hard to concentrate;" "lower energy results in lower production;" "makes me work slower;" "I start to lack enthusiasm towards work;" "clouds your judgment, it makes you less patient with patients, you just want to get the shift over and done with" and "being tired affects my ability to do my job well."

Overall, the results indicate that fatigue is an effect of shift work with a primarily negative impact, of which there are many signs and symptoms specific to the individual.

This fits with the Canadian Centre for Occupational Health and Safety (1999) who comment that the signs and symptoms of fatigue vary and are explicit to the individual and their extent of fatigue or sleep deprivation. The impact of being fatigued incorporates many personal and professional aspects and Occupational Safety and Health, (1998a, 1998b) state that the effects of fatigue can be either local or general, acute or chronic in nature, but if severe or prolonged, can lead to unsafe behaviour. Decreased effort and lack of motivation, vague communication, lethargic thinking processes and impaired memory, decreased alertness and concentration, a reduced attention span, inability to process large amounts of information or perform mental and physical tasks under pressure, less creative problem solving and cutting corners to get the job completed all result in decreased productivity (Department of Labour, 2007b; ACC, 2009; Occupational Safety & Health, 1998a; Blachowicz & Letizia, 2006; Lindsey, 2007; Canadian Centre for Occupational Health and Safety, 1999). These are supported by the findings of this research.

The clear trend emerging from the interview participants was that shift work creates tiredness, which is experienced acutely, but then transforms into fatigue which occurs after a small delay following the completion of a period of shifts. Despite some confusion between the issues of tiredness and fatigue, this group was typically able to make a clear distinction between the two states. Twenty six percent of questionnaire respondents were unable to make the differentiation and gave answers that were identical to those given in response to the question regarding tiredness, with many new answers making reference to tiredness, despite definitions being supplied for both terms to ensure each were recognised as a distinct topic. While the impact of fatigue on this group appears to be similar to that of the interview participants, suggesting either that they were in fact fatigued or that the impact of fatigue and tiredness were identical, this group generally struggled with making any distinction between the two issues. As to why the trend of the interview responses differed from that of the questionnaire results when the same definition was given in both scenarios, a definitive answer cannot be provided. It can however be surmised that the conversational nature of the interview may have ensured that participants could not confuse tiredness and fatigue as probing questions were used, or alternatively, some of the questionnaire respondents may not have fully

understood the question or been able to differentiate between the two separate definitions and simply answered the question as best they could without any further clarification. As a consequence of fatigue interfering with the ability to think clearly, the individual experiencing fatigue may not be fully aware of it at the time, thus leaving them unable to recognise their own level of impairment or be aware that they are not functioning at their best (Blachowicz & Letizia, 2006; ACC, 2009), making it imperative that individual MRTs are aware of fatigue as a stand-alone issue and can recognise when they are being affected by it.

This discrepancy could highlight the need for increased awareness of fatigue, in conjunction with the introduction of education to reduce the misunderstanding of fatigue and tiredness as separate issues, which currently causes MRT confusion as to when they are feeling tired as opposed to feeling fatigued. The Department of Labour (2007a) explains that under the HSE Act, employers have a legal obligation to identify and assess fatigue hazards, particularly when it threatens workplace health and safety, including any situations that are associated with working shift work and provide education and training. However, improving the understanding and awareness of fatigue is a responsibility not solely for the employer, but also the employee and both must enter into a partnership if improvements are to be made in this area.

#### **SOCIAL AND FAMILY EFFECTS**

Shift work has a large impact on the worker's social life and family contentment as they struggle to amalgamate their work patterns with social and domestic activities, however, some find it advantageous and choose to perform shift work to fit with social and family commitments (Phillips & Houghton, 2007; Occupational Safety & Health, 1998a). Due to most social and family events occurring during the evening or on weekends, shift workers are often excluded (Canadian Centre for Occupational Health & Safety, 1999; Rosa & Colligan, 1997). Working and living with shift work schedules often demands expending extra energy in order to manage personal and social demands (Poissonnet & Veron, 2000) to ensure shift workers are included wherever possible.

## **Social Effect**

Eighty nine percent of questionnaire respondents believed shift work impacted on their social lives, while 11% stated they experienced no impact as a result of shift work. Of those respondents where an impact was felt, 91.4% found that it had a negative impact, 5.4% a positive impact and 3.2% either gave no comments or their comment could not be analysed as being either positive or negative. The reasons supplied for the 11% who felt no impact included that with planning and organisation, it is possible to maintain a social life so “you do not miss out altogether.” The ability to swap shifts with other MRTs also facilitated attending social gatherings, on the proviso that free time is managed closely; “I organise my social life around my shifts as I know the weeks in advance that I’ll be working. As opposed to actually demonstrating that shift work has no impact on social life these results essentially appear to suggest that an effect does exist but can be easily negated by organisation, prior planning and the flexibility within the shift roster to swap shifts with other MRTs when required.

A number of reasons were supplied to justify why shift work has a negative impact on social life and some obvious trends, predominantly limitations, were extracted. Generally it is accepted that when working shifts, it is impossible to attend social functions, however this seems to be a vague statement, as it is noted by both interview and questionnaire participants that they usually have the flexibility to swap out of their shifts to suit, despite difficulties in doing so occasionally arising. The statement therefore more likely implies that making spontaneous social plans is challenging and attending social functions at short notice is difficult, which Dorothy supports in her belief that having an organized social life is essential. She informs her friends that “if you have something you need me to be at, you need to tell me at least four to eight weeks in advance so I can sort it out.” This demonstrates that it is possible to attend social functions with prior organisation and planning, but also highlights the importance for MRTs to know their shift roster some time in advance. As Lauren points out, prior to accepting a social invitation “you’ve constantly got to have your diary with you to know what you’re doing from one day to the next and you have to write everything down or else you’ll forget it.”

Shift work is also reported to negatively impact on the ability to attend an organization held at routine times, such as attending church or a club where the meetings are held at predetermined times. This trend continues into sports and recreational events that have a chosen day for games or practices and it makes attending regular night classes on a specific weeknight difficult. Lynda is currently learning a language and finds it annoying because shift work makes it impossible for her to attend every Wednesday night lesson; however Timothy mainly partakes in individual activity pursuits and so does not find the same issues exist for him. According to Wilson (2002) and Rosa and Colligan (1997), shift workers are deemed to be out of synch with the rest of the community as most social events occur in the evenings or weekends when shift work is being performed. Social isolation is a major disadvantage of shift work (Wilson, 2002) and may occur when workers have free time during the week while their acquaintances are at work, forcing them to spend this time alone. Alternatively, the shift worker may be required to work during the weekend when friends are holding social events that they cannot attend. The imposing impact of fatigue and tiredness sometimes means that even if attending a social function, sports event or education opportunity is possible, MRTs might not feel up to it and often will leave early as a result. Although appearing to be a good compromise means that their social lives have still been affected as a result of shift work, the acceptable degree of which can only be decided by each individual MRT.

Socialising with work colleagues was also shown to be challenging and Claire comments that “most of my friends are radiographers and to make things worse, most of my friends are also in CT and so you can never organise something, like if you’re trying to organise getting together with a bunch of radiographers, there’s always someone going to be on-call or on shift.” Lynda supports this and adds that “we’re all really good friends at work but with shift work, it is pretty rare that a group of us can do anything. We have to book something ages away and we might say we should do something this weekend but in reality its six weeks away. Even if it’s just two of you, you have to wait maybe three weeks before you can catch up.”



## **Family Effects**

Seventeen percent of questionnaire respondents believed that shift work did not have an impact on their family situation, while 82% did report an impact, with 92% of these respondents claiming that their family situation was negatively impacted as a result of shift work, 3% feeling the impact was positive and analysis for the remaining 5% was not possible. The main trends emerging showed an impact on children, impact on the partner of the shift worker and an impact on the overall family routine. Many of those who indicated that shift work had no impact on their family explained that they had no family, which was interpreted as meaning that they had no local immediate family who were affected.

### *Impact on Children*

The impact of shift work on children appeared to manifest in many ways. Organising childcare was reported to be problematic when outside of the typical day shift hours, however was advantageous in school holidays as shifts could be swapped to suit, meaning that children could often be looked after by their shift working parent as opposed to being cared for externally. This meant the shift working parent could spend more time with their children as Timothy confirms: “I think I spend more time with my family doing shift work than I did prior.” Christopher also believes that shift work (performed in another profession) allowed him to be with his children while they were growing up. He saw them go to school, was able to pick them up after school and shared activities such as sports and school functions which he said was invaluable. Timothy comments that issues such as being able to attend his children’s sports and hobbies had been a problem in the past, as has ensuring transport is available to take them to and from these events when he is working. Despite the many advantages shift work allowed him and his family, Christopher acknowledges that there were times where shift work imposed on time with the children. Many questionnaire responses support this noting that “I hardly see my children if I do a whole week of evenings,” which often results in parents becoming out of touch with their children. This may have occurred because often the shift working parent is often not there for the family’s evening meal or the child’s bedtime, which are both richly valuable times for communication and the sharing of attention and affection. It is noted that the children often miss out on their social lives or

experience restrictions because, as Alicia comments, “they can’t have friends around because I’m not here” and if transport issues arise they also may be unable to play at their friend’s place or attend other social functions.

Alicia comments that when her children were smaller, “they would frequently ask why I had to go into work... it’s gut wrenching,” despite her taking them to work with her and showing them what she did there. A questionnaire response notes that “they hate me working stat holidays as they feel I should be spending the day with them.” Timothy also adds that he has “had a few grizzles” from his children, but when he started shift work, the impact of it on him or them was never something they discussed as a family, they have just been tolerant of it and accepted it. This occasional reaction would seem justified given the reported effects on the children who did not buy into the effects of shift work but are forced to tolerate them because of their parent’s job. Alicia also comments that shift work and its impact is not something she has ever discussed with her children, “because that’s my job and that’s just the way it is,” however it is hard to believe that this approach encourages tolerance and acceptance for children of shift working parents, particularly given the very imposing impact shift work has on them, yet this research yielded no examples of any alternative approach for comparison.

#### *Impact on Partner*

Participating MRTs noted that finding time to spend with their partners was difficult, particularly if they also performed shift work. The needs of children were often put ahead of partner’s needs, meaning that any remaining time for communication and maintaining adult relationships was limited. When time is available to spend with their partners, shift workers are often too tired and fatigued and so the time spent together is not reported as being of sufficiently high quality. There were also reports that this can have a negative impact in the marital bedroom with their passing like “ships in the night.” Some partners were reported to have no, or limited understanding of shift work, consequently finding it difficult to adjust and being resentful that the shift worker left them alone, or to care for the children at any hour of the day or night. Greg notes that his wife tries to keep busy while he is doing shift work but if there is nothing to do she gets really bored. While Dorothy and her partner have talked about the impact of shift work

and have come to some agreement and compromise, neither Lynda nor Sarah have discussed the impact of shift work with their partners, leaving the potential for misunderstandings, confusion and bad feelings to exist. Relationships between the worker and their partner are reported to suffer because it appears that work is more important than family. The results of this research suggest improved communication and understanding to ensure the experience for the shift workers partner is more positive and healthy, happy relationships can be established and maintained in the presence of shift work.

### *Impact on Family Routine*

The family routine appears to be very disrupted by the presence of shift work, impacting the shift worker, their partner, children and extended family, which contradict the findings of Skipper et al. (1990) who claimed that, in their research, shift work did not influence family relationships to any significant degree. Shift work reportedly makes it challenging for the family to establish set routines, and any that exist must persist in the presence or absence of the worker, often meaning the sole responsibility of household routines fall to the remaining partner. A questionnaire response noted that “it can sometimes be difficult to meet one’s obligations at home when away on shift,” meaning the worker may often feel they are not around when the family needs them the most. Time spent with families may decrease as the children get older and attend school, as when they and one parent are at home, the worker is at work, and when the worker is at home the children are at school and partner at work. Family meal and bed times are very important times for family communication and togetherness and these times are reported to be often missed by shift workers. Sacrifices such as obtaining sleep are made in order to attend these crucial gatherings (Rosa & Colligan, 1997; Wilson, 2002) and Lauren emphasises this sacrifice in her observation that some people “put their own health and sleep aside at the expense of spending time with family.” Events such as family holidays were reported to be postponed or cancelled as a result of shift work and attendance at family functions and events can be difficult, with planning and organisation required in advance to ensure that the entire family can attend. Time spent seeing or communicating with extended families is often decreased, mainly due to other commitments in the free

time available and extended families were reported to not communicate via telephone for fear of waking the shift worker.

The findings of this research align with those stated in the wider literature, with the advantages of being able to adjust family life around work schedules, flexible childcare options, reduced reliance on paid child care greater adaptability with family schedules allowing the worker to spend more time with their family and greater attendance at family, social and school functions that occur during the day (Rosa and Colligan, 1997; Tattam, 1995; Blachowicz & Letizia, 2006; Jay, n.d.; Perkins, 2001). However, the downside is that parents may feel they get less time to spend with their family and often feel unable to fulfill their family responsibilities (Twarog, 2005; Wilson, 2002). These sentiments are also represented in the results of this research, further emphasising the impact of shift work on social and family activities.

## **CHAPTER VIII: CONCLUSION**

This thesis has investigated the main effects of shift work and their impact on New Zealand MRTs. It has utilised case study for the research method, with questionnaires sent to MRTs and Charge MRTS/Managers across New Zealand and in-depth, semi-structured interviews performed on MRTs from selected hospitals within New Zealand. At the completion of the data collection, a comprehensive data analysis was performed and triangulation of the data ensured the final results were reliable and valid.

### **AIMS AND OBJECTIVES**

The objectives of the research were fourfold, with an aim to:

- investigate what MRTs view as being the main effects of shift work
- investigate the impact of the identified effects
- determine whether the expectations of shift work align with the perceived reality of performing shift work
- propose recommendations as to the management of those effects identified by MRTs as having the most

### **KEY FINDINGS**

A number of effects associated with shift work have been identified by the participating MRTs, with varying degrees of impact of both a positive and negative nature. The type of shift schedule was found to have an impact, with MRTs preferring to work a consistent block of identical shifts as opposed to the sporadic nature of working a different shift every day, however most recognised that there were many varied ways to structure a shift roster and acknowledge that rostering staff is a difficult task. It was felt that the minimum nine hour breaks between shifts were often insufficient when other necessary lifestyle factors were considered and the importance of having at least two consecutive days off was emphasised. Some MRTs were motivated to pick up additional shifts for monetary advantages and it was accepted by some that this was at the expense of other activities such as sleep, or spending time with family or socialising, however most only did so voluntarily on their terms. The flexibility of being able swap shifts with colleagues was seen by the MRTs as an important factor and they contributed this as the reason why shift work was successful for them. Favourite shifts were typically chosen

due to their timing in a 24 hour period, while night shift was the most disliked shift and others were mainly based on the professional activities linked with the shift. It was identified that being on-call had its own specific challenges, with sleep patterns affected and an imposing impact on life in general; however this was typically outweighed by the monetary advantage. Most MRTs enjoyed the status quo with the balance of working shifts and being on-call that they were currently working.

Shift work increased the overall tiredness levels of the MRTs with some shifts having more of an impact than others. For many, this tiredness was reduced after a good sleep; however the remaining MRTs felt they existed in a constant state of tiredness and this consequently affects both their personal and professional lives. Shift work disrupts the sleep patterns of the individual worker with a decreased quantity of sleep as evidenced by a marked sleep loss when on shift, compounded by the intrinsic circadian rhythms resulting in sleep deprivation, and the quality of the sleep obtained is also impacted, with more restless, broken sleep achieved after a period of shifts, largely due to the ability to successfully wind down and relax prior to sleeping. Prior wakefulness when on night shift was an issue, with some MRTs reporting 24 hours of wakefulness at the conclusion of their first night shift, as many found it difficult to sleep in lieu of these shifts. Ability to sleep during the day was also identified as being an issue, although it was thought to be easier in the winter months when the temperature was reduced, as was the desire to perform outdoor activities; however a small proportion of MRTs sought the assistance of sleeping tablets to facilitate this sleep. It was recognised that the root of success for some MRTs was to maintain stable sleep patterns which promoted a sustainable amount of quality sleep.

Fatigue was an effect experienced by a selection of MRTs while the remaining group did not believe it affected them. A relationship between tiredness and fatigue was observed, however the majority of MRTs found it difficult to differentiate between the two phenomena and often referred to fatigue when discussing the tiredness they felt. This served to highlight the lack of awareness that is rife amongst MRTs with respect to fatigue as an isolated issue. It was acknowledged that tiredness often leads to fatigue,

with tiredness being the body's acute response but with the affects of fatigue evident as a delayed reaction some time after the period of shift work ceased to occur.

Tiredness and fatigue were often attributed as the main cause of the health effects associated with shift work, with a wide range of specific health issues identified collectively by the MRTs, but with most individual MRTs reporting the knowledge of very few specific effects. This highlighted the lack of awareness many had with regards to the potential health effects associated with shift work as opposed to the specific few they were personally experiencing. It was felt that in the most part shift work influenced health, but with some of the male interview participants not believing there was any obvious relationship. Most MRTs thought that shift work made them feel rundown which exacerbated illnesses; however the illness rate was not shown to be hugely inflated as a result. This may have been due to underrepresentation of this data when it was exposed that many MRTs did not take sick leave often during a period of illness, due to concerns about departments being short staffed and not wanting to let their colleagues down. Nutritional habits were affected as a direct consequence of shift work, with the timing of food intake hugely altered, in conjunction with the meal composition and portion size consumed. The ability to undertake physical exercise was also reduced, mainly due to lack of organisation, personal motivation and the available time to exercise often compromising the safety of the worker.

Shift work was considered by the majority of MRTs to have a huge effect on their social and family lives. Some found it advantageous to be able to structure their work schedules around these components of their lifestyle and were grateful for the opportunities it allowed them to spend time with their family and friends, however most found shift work to impose on their time with friends and family. It was identified that it took concentrated effort and organisation to arrange a social gathering, particularly with friends who were also shift workers, and attendance at such social functions was limited to the ability to swap shifts or the worker feeling too tired or fatigued to attend. The ability to attend night classes or commit to sports teams was also reported to be reduced, as full attendance to these events could not be guaranteed. Shift work was found to impact not only the worker's partner and children, but cause disruption to the entire

family routine. Family time was decreased, particularly those times rich in affection and communication such as evening meal times and children's bed times. Partners were often left to deal with family issues alone and the worker often struggled to maintain a balance between family and work responsibilities. Family time often occurred at the expense of the worker's sleep, health or desire to socialise and family activities were sometimes reduced, particularly if the worker was on-call, and children often missed out on social occasions with their friends for reasons they often did not understand.

While a large number of MRTs felt that their performance was not affected by the presence of shift work, many reported that shift work impeded their levels of performance during a shift, mainly as a result of increased levels of tiredness which make it harder for them to adapt or modify their practice to obtain the perfect result, slowed the speed with which they functioned which was not as thorough and required many to ponder decisions for prolonged periods of time. A small minority of MRTs recognised that shift work gave them the ability to enhance their performance as quieter shifts allowed them more time to develop and enhance their current practices. Regardless of the actual impact shift work had on their performance it was identified that extra effort and energy was required by the MRT during the shift to maintain their current standards. It was exposed that many MRTs revert to operating in an autopilot manner when impacted by tiredness or fatigue, where they operate in a manner that comes naturally with minimal active thought, however a pitfall of this was that it often meant that small details were missed or that the usually methodical approach to an examination was easily thrown by external factors. The majority of MRTs reported making mistakes when on shift, typically involving the more mundane aspects of the job and largely attributed to tiredness. Some were aware of their mistakes and reflected on the cause of them so were able to alter their practice, while most remain unaware and note that it can be hard to tell when your performance is affected during a shift, particularly when working alone.

MRTs claimed that they often felt isolated and out of the loop with the workings of the wider department as a result of performing shift work and were often incorrectly thought by their colleagues to have been on holiday while performing a period of shifts, further emphasising this feeling of seclusion. Working independently was felt by some MRTs to



be advantageous as it promoted self-reliance and confidence in a sink-or-swim manner, providing more autonomy and allowing the worker to prioritise the workflow and organise their workloads. However many MRTs reported disliking working alone, with the potential for sub-standard practices to go unnoticed and thus be inadvertently encouraged and with the valued feedback and input from colleagues unobtainable. Shift work greatly impacted the ability of MRTs to attend professional events such as departmental meetings, official hospital trainings sessions and formal CPD events, mainly due to a clash of timetables. MRTs were either required to attend these events in their free time or face missing them altogether which was a common occurrence, offset by most departments with the introduction of communication books and documented meeting minutes. Interaction with colleagues was considered to be strained when staff were tired and consequently impatient and easily frustrated, while those who did consider any impact acknowledged a greater awareness and input of energy to maintain acceptable levels of interaction with their colleagues. It was also reported that shift work could enhance working relationships as all were in the same predicament and understood the impact of shift work. Patient care levels were also thought by some to be affected as staff were more focused on obtaining adequate x-rays than providing a high level of service, often reporting less impatience, tolerance and an inability to 'go the extra mile' for the patient as compared to during the day. Some MRTs highlighted that shift work allowed for better levels of patient care, as quiet shifts provided more time for focused patient care and waiting times were often decreased. The impact of shift work on overall job satisfaction was mixed, with some reporting a direct relationship and others able to dissociate the effects of shift work from their roles and responsibilities as an MRT.

Formal education was generally not offered to MRTs, either by their employer or the tertiary provider supplying the official training to be an MRT and any education that was provided was not extended to include the families of the workers, despite a selection of MRTs believing this should be the responsibility of the employer and questioning where the responsibility lies with respect to the training of MRTs on the phenomenon of shift work. The potential benefits of providing education were varied, with some feeling they were fully informed and so would be of no use, others believing that it could do no harm and most searching for this education and knowledge in the form of tips and techniques

that could assist in making the shift work phenomenon more tolerable and positive for all involved.

The expectations of MRTs with regard to shift work were found to be misaligned from the actual reality they experienced when performing shift work. It was exposed that the most overwhelming reason for this occurrence was that a large number of MRTs had no knowledge upon entering the profession of the existence of shift work as a potential component to their role as an MRT in New Zealand. This lack of vital knowledge made it impossible for them to create preconceptions upon which to base the reality of their actual experience and this consequently resulted in the biggest degree of misalignment between perception and perceived reality. A limited selection of those MRTs who had created prior perceptions about shift work found that their perceived reality met their expectations and in some reported cases the actual reality exceeded the pre-conceptualised notions held about shift work. However the majority of MRTs found that their perceived reality of shift work was worse than their initial perceptions of it and an important differentiation was acknowledged between knowing about shift work and actually understanding its implications in practice.

Due to their highly specific nature, the acceptability of the degree of impact experienced for each of the effects associated with shift work can only be determined by the individual shift worker, their families and each individual radiology department. It is however imperative that prospective MRTs enter the profession fully informed about the presence of shift work and have some understanding as to the implications of this in practice. Education and support must be given to MRTs and extended to include their families to ensure that the control of these effects and the degree of their impact remains with those who are directly affected by them. The awareness of shift work as a phenomenon must be raised within the profession, wider society and family arenas to minimise the alienation shift workers report experiencing. These measures will ensure that the perception and perceived reality of shift work are better aligned and guarantee that each individual MRT and radiology department upholds all pertinent legislation and codes of practice. The implementation of such actions, which is the joint responsibility of the employer and MRT, will also act to make certain that MRTs are of suitable

mindset and attitude when commencing shift work, which has shown to be advantageous in assisting the worker to tolerate and cope with the effects of shift work, to ensure they continue to perform it long into the future.

#### **IMPLICATIONS**

For the profession, these results highlight that a vast majority of workers are negatively impacted by the effects of shift work and this effect has been shown to have a derogatory impact on patient care and levels of accepted performance. Some MRTs feel they are poorly prepared about shift work when entering or researching the profession and on-going education or information once in the profession appears to be lacking. The ability to attend continuing professional development sessions was felt limited by some MRTs as a result of shift work and the tiredness levels associated with shift work was felt by some MRTs to have a detrimental effect on their level of performance. Unity throughout a profession in a small country like New Zealand is essential for support networks and ensuring the profession as a whole is prepared for the future, however the staff of some radiology departments felt isolated from their colleagues due to the presence of shift work, and this must be addressed if the profession in a broader sense is in agreement with regards to the future of shift work in radiography. The use of shift work is well accepted as an unavoidable requirement in this field, however the profession must act to ensure the negative impact is as low as reasonably achievable so that MRTs are willing and physically and mentally able to have shift working careers that span many years.

There are also many implications for the individual MRT and their network of family and friends. The effects of shift work and the impact they have is varied, and spans many different aspects of life, both on a personal and professional level. Individual MRTs must ensure they research the profession thoroughly when considering entering their training, they should have realistic expectations of shift work and be prepared to engage in it with an open mind and positive attitude. They must look after themselves by ensuring they obtain adequate amounts of quality sleep, rest if they feel fatigued, and be organised to ensure a balance exists between their professional and personal lives. For a shift working MRT, communication is essential, not only between the worker, their family and friends, but also with one another and the managers of their department. It is imperative that each

MRT has an appropriate awareness of the effects of shift work and the impact of these specific to them, and acts in an appropriate manner when they feel influenced, to guarantee the safety of the patient and the worker,

#### **LIMITATIONS**

A limitation of this study is that it primarily investigated the main effects and impact of shift work for MRTs who were actively performing shift work. For these people, the effects are obviously manageable enough that they have chosen to remain in a shift working position. Had the study included MRTs who had previously performed shift work, but no longer do so, it may have yielded information that gave a more insightful account of the effects of shift work and the impact of these, as they may have been the primary reason for MRTs to remove themselves from a shift roster.

The lack of geographical distribution of the interview participants was unfortunate, however all actions were taken to ensure the study was relevant to the New Zealand population of MRTs and this was done so through the use of a nationwide questionnaire. However, the in-depth data that could have been collected from the semi-structured interviews of MRTs from different geographical areas may have given a more detailed insight into the role of shift work in differing geographical contexts.

It was also a limitation of this research that more MRTs did not volunteer to be a part of the interview process. This was unavoidable and the potential reasons for this have been discussed earlier in this thesis, however the input of a few more MRTs would have further corroborated the data from those involved and given a more accurate and far-reaching account of the effects of shift work and their impact on MRTs in New Zealand.

#### **FURTHER RESEARCH**

Further research is necessary to objectively validate some of the subjective perceptions that this research has highlighted, such as the impact of shift work on patient care, colleague interaction and extent of performance impairment, in order to ensure that the levels the MRTs feel they are upholding actually align with the levels others feel are being upheld.

The impact of education on the effects associated with shift work and the degree of their impact should be further researched, not only to more precisely ascertain the benefit of implementing such a measure, but also to ensure that education is being provided in the avenues where it is most required.

As the effects of shift work on MRTs in New Zealand and the impact they have has now been identified, further research should be performed to ascertain whether the experience of MRTs in New Zealand corresponds with those of similar health professionals in order to establish validate and compare the impact so that shift working health professionals in New Zealand, regardless of profession, have similar experiences and no one profession is at a distinct advantage or disadvantage from their peers.

#### **KEY RECOMMENDATIONS**

A number of recommendations can be proposed as a result of this research.

- Shift work appears to increase the level of tiredness experienced by MRTs and it is crucial that every effort is made by the individual worker to ensure they obtain sleep of an adequate length and acceptable quality on a regular basis
- Fatigue is not well differentiated from tiredness and MRTs should be more aware when they are under the influence of fatigue and know how to act accordingly
- Shift work appears to be linked with a myriad of health effects and had a direct and turbulent effect on nutrition and the ability to perform physical exercise. MRTs who are unwell must take the necessary time off work to convalesce and processes must be implemented to ensure the obligation of attending work ill due to a short-staffed department is reduced
- The impact of shift work on social and family networks is vast and often upsetting. MRTs and their family and friends must ensure they are organised and communicate effectively to obtain an appropriate balance between workers' professional and personal lives
- MRTs and the profession must accept that shift work can, and does have, a negative impact on performance. An increased awareness, in addition to stringent processes should be put in place to ensure the impact on patient care and

performance is minimal, with a view to improving staff safety and maximising the outcomes for the patient.

- Education of some form is desired by shift working MRTs to assist them in best coping with the effects of shift work and the impact they have. Departments and the profession must make this information available to workers and their families and encourage them to be fully informed about all aspects of shift work

#### **SUMMARY**

In summary, this thesis used a case study as the research method informed through an interpretive paradigm, with qualitative data gathered from a number of MRT participants through in-depth interviews and questionnaires and also through data collected by questionnaires from Charge MRTs. The key findings included the fact that the perception of shift work did not align with the actual reality. Many advantages associated with shift work, such as variation of work, flexibility, free time during the day, remuneration and increased family and social time. The disadvantages identified included altered sleep patterns, negative impact on health, decreased family and social opportunities. Some performance impairment was noted as a result of shift work and many professional effects were identified. Some MRTS felt the thought of shift work was worse than actually working the shift, while most found that their attitude towards shift work made a huge impact. Society's perception and treatment of shift workers had an impact, although most MRTs see themselves performing shift work in the longer term. Shift work is a necessary requirement that has been performed for many years, however it is time to face facts and start taking responsibility for making changes that will ensure the impact it has on the profession and practice of an MRT is more positive moving into the future.

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## APPENDIX ONE

### ETHICS APPROVAL DOCUMENT

17 March 2009

Kara Heal  
7 Windsor Terrace  
FEILDING

Dear Kara,

Thank you for submitting your research proposal '*Shift work: an investigation into the main effects and their impact as viewed by New Zealand Medical radiation Technologists*'.

The proposals committee of the Department of Health Sciences is now able to confirm the approval of your proposed research project.

Your principal supervisor is Dr Suzanne Henwood and your associate supervisor is Assoc Prof Jill Yelder.

Please be aware that ethical approval may be required for your research once you have finalised your proposal. To determine the need for ethics application and approval, we recommend that you read the Guidelines for Ethical Approval in the *Research* folder ~~on the Blackboard site~~ *Postgraduate Students Resources*, to identify any ethical issues that may arise. Discussion with your supervisor or the ethics committee (email: [ethics@unitec.ac.nz](mailto:ethics@unitec.ac.nz)) may also assist in this decision process. This will help determine the need, or otherwise, for a full application for ethical approval. Ethics applications and accompanying documents should be submitted as email attachments to the above address.

Please contact us if you have any questions, or if we can assist you in your research, by contacting me on extension number 8642 or email address [rmoran@unitec.ac.nz](mailto:rmoran@unitec.ac.nz).

We wish you every success in completing your research project.

Sincerely,



Rob Moran  
Department of Health Sciences Proposals Committee: Acting Chair

CC:

Principal Supervisor & Programme Director: Dr Suzanne Henwood  
Associate Supervisor: Associate Professor Jill Yelder  
Acting Head of Department: Associate Professor Clive Standen  
Research Office: Lindsay Richdale  
Programme Administrator: Roz Gill  
Postgraduate Academic Administrator: Cynthia Almeida

## **MRTB CODE OF ETHICS**

The Code states that “MRTs will act in such a manner that will justify public trust and confidence... are committed to the provision of the best possible service to patients... are committed to keeping the radiation dose as low as reasonably achievable... will provide services in such a manner that as to show respect for each individual...will protect the patient’s right to privacy and keep all patient information in the strictest confidence...will continually strive to improve their knowledge and skills of their profession...will be respectful of fellow workers and work in a professional and co-operative manner with other health care workers... will be responsible for reporting any unethical conduct, unsafe practice or illegal professional activities ...will be accountable for their clinical decision making” (MRTB, 2004a, p. 1).

## **PARTICIPANT INFORMATION SHEET**

*“Shift work: An evaluation of the main effects and their impact as viewed by New Zealand Medical Radiation Technologists”*

My name is Kara Heal and I am a student at Unitec in Auckland. I am conducting research for my Masters of Science and have selected this topic because, having been a shift working MRT, it personally interests me and is an area that has not been explored.

For my research I am performing a case study on the main effects of shift work and their impact on New Zealand MRTs. The project will examine all the areas of shift work which MRTs highlight as being of importance to them, while also investigating whether their expectations of shift work align with the perceived reality, comparing the expected with the actual experience. It is also hoped that through this study recommendations can be made about the management of those effects identified by MRTs as having the most profound impact on them.

I would like to conduct one in-depth interview of approximately one hour duration at a mutually agreed location agreeable, (although it will not be the participant’s home but may include the participant’s place of work if there is a suitable private place), and if required for clarification purposes, one follow-up telephone interview of approximately 20 minutes duration, with 12 MRTs who currently work shift work which includes night shifts, evening shifts, weekend and weekday work, and have done so for at least six months.

Participation is voluntary and while I would value your input, you are under no obligation to partake. You are within your rights to withdraw from the study, however due to the interview schedule and travel required, any withdrawals must be done at least one week prior to your interview or one week following your interview. With your consent I would like to audiotape and transcribe your interview, removing all features that could identify you or your employer, ensuring that your responses are anonymous and confidential.

If you accept the invitation to participate in my research, please sign the attached consent form and bring it to your interview; a copy of this will be provided for your records. A copy of the interview transcript will be provided for the participant to evaluate its accuracy and a summary of interview findings will be provided if requested. Your participation is greatly appreciated and I hope you will find your involvement interesting.

Please feel free to contact me or my primary supervisor, Dr Suzanne Henwood, if you have any questions or would like to know more.

**Kara Heal**  
7 Windsor Terrace  
FEILDING  
(06) 323 6330  
mackassie5@yahoo.com

**Dr Suzanne Henwood**  
Unitec, Private Bag 92025  
AUCKLAND  
(09) 815 4321  
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UNITEC REGISTRATION NUMBER: 2009-957 This study has been approved by the UNITEC Research Ethics Committee from 27<sup>th</sup> May 2009 to 27<sup>th</sup> May 2010. If you have any complaints or reservations about the ethical conduct of this research, you may contact the Committee through the UREC Secretary (ph: 09 815 4321 extn 6162). Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

## PARTICIPANT CONSENT FORM

*“Shift work: An evaluation of the main effects and their impact as viewed by New Zealand Medical Radiation Technologists”*

I, \_\_\_\_\_ (full name) agree that I:

am fully informed and have read and understood the information sheet I have been given on the research project being conducted by Kara Heal;

have been given the opportunity to ask questions and have them answered;

can freely withdraw one week prior to the interview or two weeks following the interview;

am aware that accepting to participate in this research project will require me to partake in an in-depth interview of approximately one hour duration, and if required by the researcher a follow-up telephone interview of approximately 20 minutes duration for clarification purposes;

understand that my interview will be audiotaped and transcribed, with all features potentially identifying myself or my employer being removed to ensure my responses are anonymous and confidential

realise that all responses will be anonymous and confidential;

have had time to consider everything and give my consent to voluntarily participate in this research project.

Participant Name: \_\_\_\_\_

Participant Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Researcher Signature: \_\_\_\_\_ Date \_\_\_\_\_

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UNITEC REGISTRATION NUMBER: 2009-957 This study has been approved by the UNITEC Research Ethics Committee from 27<sup>th</sup> May 2009 to 27<sup>th</sup> May 2010. If you have any complaints or reservations about the ethical conduct of this research, you may contact the Committee through the UREC Secretary (ph: 09 815 4321 extn 6162). Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

## APPENDIX TWO

### MRT QUESTIONNAIRE

1. Please indicate your gender:  Male  Female

Please state your age as of 01 January 2009 \_\_\_\_\_

Approximately how many years experience do you have working as an MRT? \_\_\_\_\_

2. Please place a tick (✓) beside the components of shift work that you have worked at least 7 times in the past year

- Day shifts
- On-call
- Night shifts
- Evening shifts
- Weekend shifts
- I no longer perform shift work (please continue to answer questions where the number is in **bold** font)
- Other (please explain) \_\_\_\_\_

If you no longer perform shift work, please indicate approximately how many years you worked shift work for and the reasons behind your move away from it

3. Before you began doing shift work, what did you think it would be like?

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4. In your opinion, what are the main positive aspects of shift work?

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7. In your opinion, does shift work impact on your family situation? **Yes/No** (please circle)

Please comment

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In your opinion, does shift work impact on your social activities? **Yes/No** (please circle)

Please comment

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8. Have you ever received any education or training on the effects of shift work?  
**Yes/No** (please circle)

If you answered **Yes**, please give a brief description of the education/training you received

Did you receive this education while working as an MRT? **Yes/No** (please circle)

Was your family included in this education? **Yes/No** (please circle)

If **Yes**, please comment on how they were included

9. Do you believe that education or training on the effects of shift work would be beneficial? **Yes/No** (please circle).

If **No**, please explain why not

If **Yes**, please explain why and suggest what you would like to be included

10. During day shifts or days off, would you say that you have a stable sleep pattern that is sustainable and allows you a sufficient amount of sleep? **Yes/No** (please circle)

Approximately, how many hours do you sleep for per sleep session? \_\_\_\_\_

Please place a tick (✓) beside any of the following statements that describe your general sleep pattern

- Restless, broken sleep resulting in poor quality of sleep
- Wake often during the night
- Trouble obtaining sleep for a suitable length of time
- Trouble initially getting to sleep
- Difficulty staying awake during shifts
- Other (please explain) \_\_\_\_\_

11. During a period of shifts or when on-call, would you say that you have a stable sleep pattern that is sustainable and allows you a sufficient amount of sleep? **Yes/No** (please circle)

Approximately, how many hours do you sleep for per sleep session? \_\_\_\_\_

Please place a tick (✓) beside any of the following statements that describe your general sleep pattern

- Restless, broken sleep resulting in poor quality of sleep
- Wake often during the night
- Trouble obtaining sleep for a suitable length of time
- Trouble initially getting to sleep
- Difficulty staying awake during shifts
- Other (please explain) \_\_\_\_\_

12. Does the sleep you get when on-call or working a period of shifts differ significantly from the sleep you get when you work days or have days off? **Yes/No** (please circle).



Please explain the impact this has on you

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13. On the scale below, please indicate how tired (weariness, depleted of strength or energy) you feel in the days following a period of shifts or on-call

1      2      3      4      5      6      Not tired      Extremely tired

Please comment on how this tiredness affects you, either personally or professionally

14. On the scale below, please indicate how fatigued (physical or mental exhaustion due to exertion) you feel after a period of shifts or on-call

1      2      3      4      5      6      Not fatigued      Extremely fatigued

Please comment on how this fatigue affects you, either personally or professionally



18. Approximately how many days have you had off in the last year on account of illness? \_\_\_\_\_

Please place a tick (✓) beside the following reason(s) that best describe your sick days

- Mental exhaustion
- Physical exhaustion
- Tiredness
- Stress
- An illness you have seen a Doctor for
- An illness you have not seen a Doctor for
- Other (please explain) \_\_\_\_\_

If you have ticked two or more boxes, please indicate next to each approximately how many days off work you had

Please place an asterisk (\*) beside any of the identified reasons that are directly related to shift work

Is/was your employer aware of the reasons for your sick days? **Yes/No** (please circle)

19. Do you think shift work impacts on your nutritional habits? **Yes/No** (please circle)

If **Yes**, please describe how your eating habits change during shift periods

20. Do you think shift work impacts on your exercise habits? (physical activity for at least 20 minutes) **Yes/No** (please circle)

If **Yes**, please describe how your exercise habits change during shift periods

21. Do you feel that shift work affects your clinical performance? **Yes/No** (please circle)

Please explain and give examples in the box provided

22. In your opinion, have your clinical decision making or justification skills ever been affected as a direct result of shift work? **Yes/No** (please circle).

If **Yes**, please explain and give examples indicating the significance of the effect

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23. If you feel shift work affects your concentration, please indicate the degree on the scale below

1      2      3      4      5      6      Minimal      Extremely affected

24. Please place a tick (✓) next to any of the following aspects of clinical performance if you feel your ability has been affected as a direct result of shift work

Ability to:

- Comprehend complex situations
- Manage events that occur
- Perform risk assessment
- Think latterly and be innovative with adaptive technique
- Monitor your personal performance
- Control your mood and behaviour
- Communicate effectively with patients and colleagues
- Other (please explain) \_\_\_\_\_

If you have ticked two or more boxes, please rank them from greatest (1) to least (8) in terms of how often you are affected

25. Do you believe that the care you give to patients has ever been altered as a direct result of your working shift work? **Yes/No** (please circle).

Please explain and give examples

26. Do the effects of shift work that you experience affect the working relationship that you have with your colleagues? **Yes/No** (please circle).

Please explain and give examples

27. In your current situation, do you believe you are easily able to perform Continual Professional Development in order to improve your knowledge and skills through? **Yes/No** (please circle).

Please explain what aspects allow this or prevent it

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