EXPLORING THE RELATIONSHIPS BETWEEN SHIFT-WORK AND DEPRESSIVE SYMPTOMS IN FEMALE NURSES

by

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Abstract

Evidence is accumulating that the imposed lifestyle associated with shift-work can adversely affect many aspects of nurses’ mental health. The 2005 National Survey of the Work and Health of Nurses stated depression is more common in nurses than in the general population. Minimal research has focused on depression as a direct outcome of shift-work for registered nurses. The purpose of this study was to examine the relationship between shift-work and depressive symptoms in female nurses. This study was a discrete analysis of data collected from 151 registered nurses enrolled in the primary study entitled “Work and health: Optimizing nurses’ physical health in hospital work environments” (Tranmer, McGillis-Hall, Katzmarzyk, Parry, et al, 2007). A descriptive correlational design was utilized to describe the relationships between shift-work and depressive symptoms. Shift work was categorized as participants working 8 hours, 12 hours, or a combination of both 8 and 12 hour shifts. Depressive symptoms were measured with the Centre for Epidemiological Studies Depression Scale (CES-D). Bivariate analysis showed no statistical significant correlations between CES-D scores and shift-work. However, correlational analysis between individual CES-D questions showed a positive association between shift-work and lack of concentration, decreased motivation to complete tasks, feeling depressed and difficulty sleeping as adverse effects. Fifty-two percent of these shift workers identified problems with keeping focus on the tasks they were performing, 40% described an alteration in motivation, 31% felt depressed and 69% reported sleep disturbances. This study found no direct association between shift-work and depression but found that individual symptoms of depression
were related to the shift-work schedule. Studies addressing the effects of shift-work on mental health need to explore options to decrease depressive symptoms, such as impaired cognition and motivation, that were shown to impact upon the worker’s quality of life and quality of care provided.
Acknowledgements

This study was only possible with the support and contributions of several individuals. I would like to express my sincere gratitude to my thesis supervisor, Dr. Diane Buchanan, Queen’s University School of Nursing. You have provided me such support, encouragement and guidance. I appreciate your patience and willingness to guide me through this process. I would also like to acknowledge the assistance of the Queen’s Graduate Award that provided funding toward my research.

I would also like to thank my thesis committee members, Dr. Joan Tranmer and Dr. Elizabeth Van Den Kerkhof. A special thanks to Dr. Tranmer and Health Worker Study investigators for the provision of data from the larger cohort study. In addition, I would like to thank Wilma Hopman for being such a wonderful statistics guru and patient teacher.

I wish to also thank my husband and children who gave me strength, encouragement and support in my pursuit of professional education. Glenn, you are the inspiration and foundation for all that I am. To my children, Kaitlyn, Kelsey and Aiden – you have brought me such happiness and joy. Thank you for your patience and understanding. Always remember, anything is possible …. all you have to do is try.

This thesis is dedicated to my father, Robert Campney. He was a leader, mentor, teacher, supporter and an inspiration. He stood by me through all of my life challenges
and continues to live in my memories. This amazing man served as an outstanding example of strength and brilliance. I hope to truly be my father’s daughter.
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Chapter 1
Introduction

A recent national survey has raised concern about the prevalence of depression in nurses. The Statistics Canada (2005) National Survey of the Work and Health of Nurses reported that the prevalence of depression was 9% in nurses, a prevalence rate 2% higher than the general population. Given that depression seems to be higher in nurses there is a need to determine factors that may be contributing to higher levels of depression, and in particular work-related factors. Therefore, the focus of this thesis study is on increasing our understanding about the potential relationships between shift-work, an important hospital work characteristic, and depressive symptoms.

Shift-work is becoming more prevalent as a working schedule in the general public (Admi, 2008; Perry-Jenkins, 2007). The College of Nurses of Ontario membership statistics for 2008 reported 109,823 registered nurses (RN) in Ontario with 87% that reported presently being employed in nursing (see Table 1). Approximately 65% of RN’s were employed in the hospital setting, 19% in the community, and 8% in long-term care. Job categories included 68% as staff nurses, 3.9% as visiting nurses, 3.5% as case managers, 3.3% as middle managers, and 2.9% as public health nurses.
Table 1 - Statistics of Registered Nurses Employed In and Outside of Ontario, Canada

<table>
<thead>
<tr>
<th></th>
<th>2004 n</th>
<th>2005 n</th>
<th>2006 n</th>
<th>2007 n</th>
<th>2008 n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed in</td>
<td>91,072</td>
<td>93,682</td>
<td>93,870</td>
<td>93,941</td>
<td>95,569</td>
</tr>
<tr>
<td>Nursing (86.1%)</td>
<td>(86.0%)</td>
<td>(86.1%)</td>
<td>(86.3%)</td>
<td>(87.0%)</td>
<td></td>
</tr>
<tr>
<td>In Ontario</td>
<td>84,288</td>
<td>86,829</td>
<td>87,343</td>
<td>87,568</td>
<td>89,436</td>
</tr>
<tr>
<td>Outside Ontario</td>
<td>6,005</td>
<td>5,955</td>
<td>5,845</td>
<td>5,559</td>
<td>5,238</td>
</tr>
</tbody>
</table>

Source: College of Nurses of Ontario – Membership Statistics Report 2008

Shift-work tends to be an essential schedule for the majority of nurses and creates a unique work practice environment. This work environment influences the health of both the patient and the nurse. Aiken, Clarke, and Sloane (2002) conducted a study of nurses spanning five countries. This multisite study of medical and surgical nurses (N=10,319) examined the effects of nurse staffing and organizational support for nursing care on nurses’ dissatisfaction with their jobs, nurse burnout, and nurse reports of quality of patient care. The conclusions of the study exposed nursing staffing and the practice environment as key components for both improved quality of care and improved mental health and decreased nursing despondency and burnout that could be linked to depression.

Shift-work is a scheduling system by which nurses are required to work a combination of day, evening, and night shifts. It is defined as “non-standard schedules requiring that at least 50% of the work be done at a time other than between 8am and 4pm” (Jaffe and Smolensky, 1996). Studies have shown that about 25% of the North
American population are shift-workers, and an estimated 20% of people cannot tolerate shift-work (Costa, 1996; Gordon, Cleary, Parker and Czeisler, 1986; Learhart, 2000) due to physical health decline, increased stress, decreased sleep, and cognitive impairments.

Shift-work can have many physical, psychological, and social effects on the worker. The problems occur from working in opposition to the body’s normal circadian sleep-wake schedule. Kiviamki, Virtanen, and Elovainio (2001) found that along with physical health problems, shift-work may lead to poorer health habits such as increased consumption of alcohol and tobacco and reduced physical activity. Alcohol use and reduced activity are often linked with depression. Learhar (2000) concluded that working a combination of day and night shifts affected workers by causing fatigue, sleepiness, lethargy, insomnia, digestive problems, depression and anxiety.

Hospital work environments have become chaotic and stressful environments during the last decade as health care reform has led to restructuring and downsizing. To provide even basic health care, hospitals must be staffed 24 hours a day, 365 days a year. In a nurses study, recovery from working night shifts can take up to 2 days (Totterdell, Spelten, Smith, Barton, and Forkard, 1995). This study also found that alertness and reaction time decreased with each consecutively worked night shift. Alertness was affected most significantly on the second night shift. This considerably impacts the quality of care the nurse can provide and patient safety; the body is constantly being forced to change and adapt to new schedules producing both physical and psychological stress.
Night shifts tend to produce more significant health impairments. Due to circadian rhythm requirements, many nurses rest or sleep during break periods. This leads to a well-documented phenomenon of sleep inertia, defined as impairments in alertness and performance immediately upon waking from sleep. Jewett et al. (1999) found that subjective alertness and cognitive performance could be impaired for more than two hours after awakening, even in participants who were not sleep deprived and who were sleeping at the habitual times. Both subjective alertness and cognitive scores were significantly lower when participants first awoke than two to four hours later in the day. Reduced decision making performance also became significant for at least 30 minutes upon waking (Bruck and Pisani, 1999). Sleep difficulties and cognitive changes are key symptoms linked to depression.

*Conceptual framework*

The theoretical basis of this study is a model developed by the author based upon the literature reviewed. The Shift-Work Psychological Outcomes Model (Figure 1) suggests that the most prevalent adverse effects of shift-work include impaired mental well-being, decreased energy, decreased job satisfaction, and impaired cognition all of which are common symptoms linked to depression. The model postulates that these adverse psychological outcomes may result in impaired functioning and impaired work efficiency that ultimately threatens patient safety.

This conceptual model for this thesis study is an adapted version of the process model proposed by Knutsson and Boggild (2000) linking shift work to disease. In the
Knutsson and Boggild (2000) model, three pathways are proposed in relation to disturbed (a) circadian rhythms, (b) behavioural pathways, and (c) social-temporal pathways. In this study, the hypothesis is that shift-work may work through similar pathways, leading to depressive symptoms. According to Knutsson and Boggild (2000), as the worker is exposed to shifts, disruptions in the natural circadian rhythm occur, and the sleep cycle is interrupted and potentially weakened. The reviewers suggested that without adequate sleep and rest, energy levels and motivation diminish while critical thinking and cognition become impaired. Given the link between depression and sleep, energy, motivation and cognition, there is the potential that as the worker tries to adjust to an unnatural work schedule and the demands of the nursing job that satisfaction and quality of care may decrease.
Shift-work

Depressive Symptoms

- Impaired mental well-being
- Decreased energy
- Impaired cognition
- Decreased motivation

Impaired work efficiency

Patient Safety

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Thesis objectives

The aim of this thesis study was to determine the associations between shift-work and depressive symptoms in female registered nurses. Specific research objective were:

1. To determine the associations between shift-work and depressive symptoms in female registered nurses who work in an acute care hospital setting.
2. To describe the associations between shift-work and aspects of depressive symptoms as measured by the Centre for Epidemiology Depression Scale (CES-D).
Chapter 2

Literature Review

Evidence is accumulating that the imposed lifestyle associated with shift-work can adversely affect many aspects of nurses’ mental health (Costa, 1993). According to the National Survey of the Work and Health of Nurses (2005), 9 out of 10 staff nurses were employed in positions that involved direct patient care and 6 out of 10 of these nurses worked within the hospital setting. Thus, the majority of nurses will be exposed to shift-work during their career. How the structure of shift-work influences the health of nurses needs further exploration if we are to enhance the quality of health within the workforce. This literature review will describe the current evidence in regard to our understanding of the relationships between shift-work and depressive symptoms.

Depression is becoming more prevalent within our population with approximately 4% of workers aged 25 to 64 experiencing depression (Gilmore and Patten, 2007). Nurses and other health care professionals are exposed to alternative work schedules that may impact upon their mental health. It is imperative to understand the impact of depression and identify populations at risk in order to develop interventions to lessen depressive symptoms.

**Health care issue: depressive symptoms**

According to the DSM-IV-TR (APA, 2000), depression is defined as a mental state characterized by feelings of sadness, loneliness, despair, low self-esteem, and self-reproach (see Table 2 for diagnostic criteria). In 2005, Statistics Canada reported that
depression is Canada’s fastest rising diagnosis. Eight percent of Canadians will experience major depression at some point in their lives and 5% will experience major depression in a given year. In the Global Burden of Disease study prepared by the World Health Organization (WHO, 1999), outcomes indicated that depression is the leading cause of years lived with disability. Symptoms of depression include a depressed mood, loss of interest or pleasure in activities, feelings of guilt, lowered self-worth, disrupted or altered sleep patterns, decreased appetite, low energy and impaired concentration. These symptoms can be of long duration in times of crisis, recurrent or chronic, and often result in an impaired ability of the individual to perform daily activities. At the extreme, depression can lead to suicide.

Depression affects many facets of the individual’s life including work. Kessler, Greenberg and Mickelson (2001) postulated that the impact of depression on job performance is much stronger than that of other chronic conditions such as hypertension, diabetes, arthritis, and back injuries. Symptoms of depression impact upon the worker’s ability to perform the normal activities of their job. These symptoms include fatigue or lack of energy, loss of interest, diminished ability to think or concentrate, and feeling sad, discouraged or hopeless. A number of crucial elements of job performance are particularly vulnerable including time management, concentration, teamwork, and overall output (Burton et al., 2004).

Findings from the National Population Health Survey (Statistics Canada, 2006) suggested that depression is associated with missed work time and with reduced work activity. Workers who had a depressive episode in the previous year had more than twice the odds of reduced work activity, and the association between depression and reduced
work activities occurred in workers who regularly worked evenings or nights rather than days (Gilmour and Patten, 2007).
**Table 2 - DSM-IV-TR Criteria for Depression Categories**

<table>
<thead>
<tr>
<th>Depression category</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor depression (situational depression)</td>
<td>Two to four depressive symptoms including:</td>
</tr>
<tr>
<td></td>
<td>- Depressed mood or anhedonia</td>
</tr>
<tr>
<td></td>
<td>- Significant impairment in social, occupational, or other important areas of functioning including:</td>
</tr>
<tr>
<td></td>
<td>- Poor appetite or overeating</td>
</tr>
<tr>
<td></td>
<td>- Insomnia or hypersomnia</td>
</tr>
<tr>
<td></td>
<td>- Low energy</td>
</tr>
<tr>
<td></td>
<td>- Low self-esteem</td>
</tr>
<tr>
<td></td>
<td>- Poor concentration or indecisiveness</td>
</tr>
<tr>
<td></td>
<td>- Hopelessness</td>
</tr>
<tr>
<td>Dysthymia (chronic depression)</td>
<td>Depressed mood for most of the day during a 2-year period, presence of depressed mood.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Symptoms cause clinically significant distress in social, occupational, and other important areas of functioning.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Presence of two or more of the following:</td>
</tr>
<tr>
<td></td>
<td>- Decreased or increased appetite</td>
</tr>
<tr>
<td></td>
<td>- Insomnia or hypersomnia</td>
</tr>
<tr>
<td></td>
<td>- Anergia or chronic fatigue</td>
</tr>
<tr>
<td></td>
<td>- Anhedonia</td>
</tr>
<tr>
<td></td>
<td>- Poor concentration or difficulty making decisions</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The symptoms are not related to a major depressive episode, a bipolar disorder, a psychotic disorder, the physiologic effects of any substances, or general medical condition.</td>
</tr>
</tbody>
</table>

Table continued
<table>
<thead>
<tr>
<th>Depression category</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criteria for Major Depressive Episode</td>
<td>Represents a change in previous functions. Symptoms cause clinically significant distress or impaired social, occupational, or other important areas of functioning. Five or more of the following occur nearly every day for most waking hours during the same 2-week period. At least one of the symptoms is either a (i) depressed mood or (ii) loss of interest or pleasure (anhedonia).</td>
</tr>
</tbody>
</table>
| | - Depressed mood  
| | - Anhedonia  
| | - Significant weight loss or gain (more than 5% of body weight in 1 month)  
| | - Insomnia or hypersomnia nearly every day  
| | - Increased or decreased motor activity  
| | - Anergia (fatigue or loss of energy)  
| | - Feelings of worthlessness or inappropriate guilt (might be delusional)  
| | - Decreased concentration, indecisiveness, or inability to think clearly  
| | - Recurrent thoughts of death or suicidal ideation (with or without pain)  
| | Symptoms are not due to: (i) psychologic effects of substance, (ii) a general medical condition, or (iii) recent bereavement. |

Factors associated with depressive symptoms

While depression may impact upon individuals at any time, there are several physical and situational factors that may be associated with an increased risk of depression such as chronic health problems (Harpole, Williams, Olsen, et al., 2005; Katon and Schulber, 1992; Kessler, Greenberg, Mickelson, et al., 2001), sleep pattern (Jaffe and Smolensky, 1996; Kripe, 1998), stress (McVicar, 2003; Tennant, 2001), job satisfaction (Parkes, 2003; Ruggiero, 2005), age (Totterdell, Spelten, Smith, Barton and Folkart, 1995), gender (Tambay and Catlin, 2008), marital status (Scott, Monk and Brink, 1997), and work status (Knutsson, 2003; Learthart, 2000; Scott, Monk, and Brick, 1997; Van der Hulst and Geurts, 2001). The focus of this study is on a related factor, specifically shift-work.

As there will always be a requirement for nurses to provide care 24-hours a day, it is important for health researchers to examine the impact of shift-work on the health of workers. Looking at the effect of shift-work on health, Tambay and Caitlin (1995) suggested that depressive symptoms augment the impact of other health problems that are associated with shift-work. Long and diverse work hours and increased patient loads associated with the nursing profession can create an environment of emotional stress, strain, and burnout. An increase in stress can lead to behavioural, physical, and personal changes, such as depression (Dugan et al., 1996).

Depression and nursing

Within the nursing population, nurses “generally have psychological morbidity rates higher than the general population” (Tennant, 2001, p. 699). Tennant, examined
data from a large National Health Study survey in the UK (N=11,000) which assessed the prevalence of psychiatric disorders and found the relative risk of nurses having a minor mental health disorder was 1.5 times higher than with the general population especially when the nurse was female and involved in direct care staff. According to Statistics Canada’s (2005) National Survey of the Work and Health of Nurses (N=18,348), depression is more common in nurses than in the general population. Nine percent of nurses reported experiencing depression in 2004 compared to 7% of the employed population. Nurses who worked evening shifts had a higher prevalence of “poor or fair” mental health compared to nurses who usually worked the day shift.

Shift-work and depression

Scott, Monk, and Brink’s (1997) study explored the link between exposure to shift-work and the prevalence of major depressive disorder during and after being employed on a shift-work schedule. Ninety-eight participants were randomly selected (male n=67; female n=31) both current and former shift-workers from various populations. Two standardized psychiatric assessment tools were administered via telephone interview. The Centre for Epidemiology Depression Scale (CES-D) was utilized to evaluate current depressive symptoms and the SCID (Structured Clinical Interview for DSM-IV) determined the lifetime incidence of major depressive disorder. An unexpectedly high prevalence of major depressive disorder was found to occur during and after shift-work, with a higher rate for women than for men. In addition, the study provided evidence that increased exposure to shift-work (up to 20 years) was associated
with an increased lifetime risk of Major Depressive Disorder. A limitation of the study was the disproportionate number of male participants compared to female participants which is reflective of the general nursing population.

Many registered nurses are obligated by their shift-work schedules to deviate from the traditional sleep-activity cycle. Raine (2004), in a national population study focusing on the determinants and impact of obesity, maintained that in addition to weight gain, depression, decreased physical activity, alcohol consumption and smoking were further adverse health effects of working the long hours. Ruggiero’s (2005) research study assessed health, work variability and job satisfaction among shift-working critical care nurses \( (N=247) \). As a contributor to job satisfaction, depression was assessed. Forty-one percent of the sample met the criteria for clinical depression at the time of the data collection. The results indicated that depression had a small to moderate negative relationship with job satisfaction and suggested that depression was a significant effect of nurses working shifts.

There had been minimal research reported on shift-work specific to the nurse population prior to 2000. However, there were studies on shift-work with other populations. In a literature review of the possible adverse health effects of shift-worker in the general population, Learthart (2000) concluded that working a combination of day and night shifts affected workers by causing psychological disturbances of depression and anxiety. Gordon, Cleary, Parker and Czeisler (1986) performed a secondary analysis using data obtained from the National Center for Health Statistics National Survey of Personal Health Practices and Consequences (NSPHPC). They examined the extent to
which variable shift-work was related to various depressive symptoms such as average length of sleep, social network scores, and stress. The findings suggested that day work schedules were more compatible with circadian rhythms that ultimately led to improved psychological and physical health, reduced stress, and increased job satisfaction. Although this study was conducted in 1986, the results were comparable to data collected by Statistics Canada in the Survey of the Work and Health of Nurses (2005).

**Shift work and depressive symptoms**

According to the National Survey of the Work and Health of Nurses (2005), there were various interpersonal or psychosocial factors within the occupation that were associated with mental health conditions. In addition to shift-work, other determinants of depression and anxiety for nurses were high job strain, low supervisor support, low co-worker support, low autonomy, poor nurse-physician working relations, lack of respect from supervisors, and high role overload.

Studies have reported that night shift-workers have a higher rate of negative health outcomes overall in comparison to day shift-workers (Frank and Ovens; 2002, Glazer, 2005; McVicar, 2003). Studies that have examined the impact of shift-work on nurses have primarily focused on job performance, fatigue and job satisfaction variables. There has been less focus on the health issues of depression. Relatively little research has focused on depression as a direct consequence of shift-work scheduling for nurses.

As previously stated, the mechanistic pathways linking shift work to depressive symptoms are likely physiological, behavioural and social.
Circadian disruption.

There have been multiple studies that assessed the impact of disruption to the 24-hour circadian rhythm on physical and psychological health (Costa, 2003; Folkard and Tucker, 2003; Learhart, 2000; Moore, 1996; Schernhammer, et al, 2001). Shift-work places the nurse in a continual cycle of circadian dysrhythmia. Circadian rhythms are fundamental to our adaptation to the environment with disruption within the sleep-wake cycle potentially impacting upon the mental health of the individual. In mammals, the circadian rhythms or sleep/wake cycles are generated and regulated by a circadian timing system comprised of “entrainment pathways, pacemakers, and pacemaker output to effector systems that are under circadian control” (Moore, 1997, p.253). Circadian timing is one of the key physiological determinants for alertness and performance as it drives a circadian pacemaker in humans with an intrinsic period averaging 24 hours. During night shifts, the exposure to light is increased and melatonin levels decrease, resulting in circadian disruption which contributes to behavioural changes and related health problems (Schernhammer, et al., 2001).

Behavioural changes. Altered sleep/wake disruption may lead to behavioral changes, such as sleeping patterns, which have been associated with depressive symptoms. Seasonal affective disorder has been linked to the seasonal variation in light with increased depressive symptoms associated with increased exposure to darkness. Evening and particularly night shift-workers are exposed to a disproportionate amount of time awake during darkness and minimal exposure to light as they need sleep during
daylight hours. Light therapy offered to patients suffering from depression has been shown to be an effective treatment modality that helps alleviate the depressive symptoms. There is a prevalence of consistent evidence that bright light treatment produces statistically significant net reductions in depressive symptoms in the range of 12-35% (Kripke, 1998).

Shift-workers often receive less sleep than their day time counterparts. Axelsson, Akerstedt, Kecklund and Lowden (2004) studied male and female factory shift workers (N=56), and assessed patterns of sleep. Using the Karolinska Sleep Diary as a measurement tool, results showed that shift workers manage to get between 53-68% of the mean sleep need (mean sleep need for workers – 8.0 hours) between the night shift and the afternoon shift, and between 65-80% between the afternoon and the morning shift with women tending to have even less sufficient sleep. Attempts to sleep that are counteractive during inappropriate phases of the circadian rhythm will usually result in shorter sleep episodes and more awakenings. In general, sleep loss due to shift-work scheduling may predispose the worker to depression (Riemann and Voderholzer, 2003; Tsuno, Besset and Ritchie, 2005; Van den Berg, et al., 2005) and variability in performance, slowed physical and mental reaction time, increased errors, decreased vigilance, impaired memory, and reduced motivation and carelessness (Hart, et al., 2006). Sleep disturbance is strongly related to depression with 40-90% of individuals diagnosed with depression complaining of poor sleep quality (Van de Berg, et al, 2005). Depression strongly increases the risk of poor sleep quality and poor sleep quality is a predictor of future depressive episodes (Riemann and Voderholzer, 2003). Thus there is a potential
cycle of sleep disturbance leading to depressive symptoms, and depressive symptoms
contributing to sleep disturbances.

*Potential impact of depressive symptoms*

*Cognition.* Efficiency and safety while the nurse is working is relevant to both the
nurse and the patient. Within the CES-D, questions related to cognition are assessed as
impaired cognition is a recognized symptom of depression. Kumar, Jorn, Parslow and
Sachdev (2006) studied cognitive impairment and depression in men (*N*=2551) and found
mild cognitive impairment to be associated with both symptoms of depression and also a
DSM-IV diagnosis of minor depression.

*Productivity.* Adler, et al. (2006) studied 572 participants diagnosed with mild,
moderate and major depression disorders. All participants were employed and working
at least 15 hours per week. Job performance was measured using the Work Limitations
Questionnaire. Results indicated that depression was significantly correlated with
impaired job performance including impaired mental-interpersonal tasks, time
management tasks, output (eg. handling workload, finishing work on time) and physical
tasks.

When analyzing performance efficiency over a 24 hour period, Folkard and Tucker
(2003) found job performance decreased during the night shift with performance levels
plunging at 0300 hours. Score measurement fell below average levels by 2300 hours and
did not stabilize within normal range until after 0600 hours.

*Somatic Concerns.* Somatization, the process by which psychological distress is
expressed as physical symptoms, has been well documented as one way in which
depression presents. Van der Hulst, et al. (2001) studied Dutch postal workers and the combined effects of pressure to work extended hours (>8 hours) and rewards of pay, job security and career opportunities. They found that high pressure to work extended hours with low rewards was associated with 3-fold increase in psychological somatic health concerns, poor recovery, burnout, and negative work-home interference. It has been documented that various psychosomatic and psychoneurotic concerns are more common among shift-workers. Shift-workers talk more frequently about depression, helplessness, and stress. Healy et al, (1993) proposed that the psychosocial disruptions causing depression may produce a state of circadian disrhythmia that leads to a form of helplessness cognition as a result of disturbances in neurovegetative functions. Costa (1996) found that 72% of the male textile workers who resigned from the shift-work position did so as a result of anxious problems. These anxiety disorders were 16 times more likely to occur in permanent night workers than in day workers (Costa, 2003).

Stress. Nursing is a complex profession that often creates an optimum environment for stress as it is bound by an enclosed atmosphere, time pressures, extraneous noise, sudden shifts from routine to intense tasks, and an intense pressure to perform at an optimal functioning level despite long hours. These factors produce a level of job stress that is harmful emotionally and physically. When under stress, our body responds by excreting adrenaline, cholesterol, and sugar into the bloodstream. This impacts upon the physical and psychological health of the individual as short term effects include increased anxiety, headaches, gastrointestinal upset, and tachycardia. With prolonged exposure to a certain amount of stress, symptoms of depression may occur or
increase. The Yasukouchi, et al (1995) study supported the mental burden of shift-workers as their study incorporated data obtained by graduate nurses whose mental stress increased significantly after night work. They suggested that shift-work produces mental stress, and psychological or cognitive dysfunction which are linked to depression.

The Shift-work Psychological Outcomes Model (see Appendix A) was developed as a result of the literature reviewed and integrates key findings of these studies. The model predicts that the most adverse effects of shift-work include depressive symptoms of impaired mental well-being, decreased energy, decreased job satisfaction, and impaired cognition that ultimately create an environment that threatens patient safety.

Conclusion

Health promotion is one of the many roles of a nurse and this should include the nurse’s health as well as that of their patients. Similar to health promotion, mental health promotion involves activities that assist individuals in adopting and maintaining healthy lifestyles and fosters an environment that supports health. Studies addressing the effects of shift-work on mental health need to explore options to enhance the quality of life and quality of care provided by the workers. When the work environment focuses on the health of its workers, retention will be enhanced.

In the review of the literature relevant to this study, the research to date suggested that shift-work has a negative impact upon the overall health and depressive symptoms of the nurse. Changes in sleep patterns, increased stress and impaired cognition of the nurse greatly impacts upon the health and safety of the nurse and of the patients left in her
charge. In response to this, our study assessed the relationship of shift-work to depressive symptoms in female shift-working registered nurses.

Rationale for study

Jobs within the nursing profession often require long hours and heavy work-loads due to administrative attempts to manage costs and offset nursing shortages (Trinkoff, Rong, Geiger-Brown and Lipscomb, 2007). The purpose of this study was to determine the associations between shift-work and depressive symptoms in female nurses.

Thesis Objectives

The aims of this thesis were to examine the depressive symptoms for shift-working female registered nurses. Specific goals included:

1. Identify the relationship between shift-work and depressive symptoms in female registered nurses within the acute care setting.

2. Determine the relationship of shift-work to specific depressive symptoms measured within the Centre for Epidemiology Depression Scale (CES-D).
Chapter 3
Methods

To address the stated objectives, a cross-sectional study embedded in a larger study “Work and health: Optimizing nurses’ physical health in hospital work environments” (Tranmer, McGillis-Hall, Katzmarzyk, Rivoire and Parry, et al., 2007) was used. A secondary data analysis was performed on the data obtained in the larger study. This descriptive study explored the relationship between shift-work and depressive symptoms.

Primary Study

The “Work and Health Study” was a cross-sectional study that investigated the relationship between work and cardiovascular risk and self-reported physical and emotional well-being in female health care workers. The study recruited participants from two acute care hospitals in South Eastern Ontario.

The primary study “Work and health: Optimizing nurses’ physical health in hospital work environments” (Tranmer, McGillis-Hall, Katzmarzyk, Rivoire and Parry, et al., 2007) recruited 544 participants to be enrolled in the study. Participants recruited for the study included registered nurses, patient care assistants, laboratory and diagnostic services and support services (ie. housekeeping and administration). Of these participants, 220 were registered nurses and thus were included within this study.
Outcomes of interest in the primary study included metabolic syndrome, and the physical and emotional well being of the worker. The latter outcome utilized measurements of the Health Related Quality of Life and the Center for Epidemiology Studies Depression Scale questionnaires.

Current study

From this study, selected components of interest were examined within the current study: data specific to female registered nurses was analyzed to determine the extent to which symptoms or variables were associated with depression.

Participants

For the purpose of this study, inclusion criteria identified 159 participants who completed the Centre of Epidemiology Depression Scale (CES-D) questionnaire, the tool utilized to identify the depressive symptoms. Seven participants were excluded from this study as data was incomplete. Therefore, based on the defining criteria of this study and the population studied, a total of 152 participants were included in this present study. Depressive categories were classified using the symptomology defined by the Diagnostic and Statistical Manual of Mental Disorders – 4th Edition – Text Revision (DSM-IV-TR). With a sample size of 152, we would be able to identify a point prevalence of depressive symptoms between 7-10% (CI 95%), if it existed.

Data collection and procedure.

The following data collection procedures were used in the Work and Health Study (2007).
1. All nurses employed in either a full-time or part-time position for at least one year prior to the study were informed about its purpose and their role within the research.

2. All staff meeting the eligibility criteria were invited to participate in the study.

3. Written informed consent was obtained from each participant that clearly indicated that the study would involve the researcher obtaining a copy of the participant’s work record that was reported and retained in a confidential and anonymous manner.

4. A brief 10-minute study session was conducted to explain the purpose of the study and outline the expectations of the participant. Additional relevant demographic data collected included age, education level, marital status, job position, and economic status.

5. Participants were provided with a questionnaire package that they completed during the session or on their own time.

6. Individual reports of health concern (depression) will be shared solely with the participants. Suggestions for follow-up by occupational health and/or physician will be encouraged.

**Measures**

*Primary Outcome (Depression).* Screening is of central importance in health related problems, including psychopathology. The main purpose is to identify from a
population, those who have an increased probability of having the disorder in question. The secondary analysis evaluated depressive symptoms along several scales: intensity, duration, and impact on daily functioning using the Center for Epidemiologic Studies Depression Scale (CES-D) (Radloff, 1977) – Appendix C. Screening tests similar to the CES-D are primarily used at the first stage of a two-stage process. Those who are identified at risk with this tool were invited to participate in a diagnostic interview that would confirm or rule out the diagnosis.

The Centre for Epidemiology Depression Scale is a widely used 20-item self-reporting questionnaire developed by researchers at the National Institute of Mental Health, to measure current levels of depressive symptoms in the general population (Gotlib and Cane, 1989). The CES-D evaluates both physical and cognitive symptoms of depression. All items begin with the phrase, “During the past week ….” Symptoms include depressed mood, feelings of helplessness and hopelessness, loss of appetite, sleep disturbances, and psychomotor retardation that can be clustered into four dimensions: 1) depressed affect, 2) positive affect, 3) somatic-retarded activity, and 4) interpersonal relations (Radloff, 1977). An example of an item that assesses physical symptoms is: “I could not get going”. An example of an item that assesses cognitive symptoms is: “I had trouble keeping my mind on what I was doing”. Items are rated on a 4-point scale ranging from 0 (Rarely or none of the time) to 3 (Most or all of the time). Four of the items must be reverse-scored and scores are summed to obtain a total score of depressive symptoms.
Within these elements, symptoms can range from mild situational depression, to dysthymia or chronic mild to moderate depression to major depression (see Tables 2.1, 2.2, and 2.3). Determinations of depressive symptoms were assessed in the work-life study using the CES-D. Internal consistency reliability scores for this tool are >.80 in a variety of populations (aged, African-Americans). Results from a nonclinical sample indicated a sensitivity of 63% and a specificity of 94% for major depressive disorders (Radloff, 1977). The Weissman et al. (1977) findings revealed sensitivities of 74% to 99% and specificities of 56% to 86% when the CES-D was administered to adult patients with a variety of psychiatric disorders. The CES-D is widely used in research on the epidemiology of depression and scores on the instrument have been shown to decrease with treatment of depression (Radloff, 1977; Radloff and Locke, 1986).

The range of scores on the CES-D is 0-60, with a suggested cutoff point score of ≥ 16 used to identify clinically significant levels of depressive symptoms (Radloff, 1977). For the research reported in this study, the CES-D score was categorized into:

a) a primary outcome of depression (CES-D ≥ 15)
   versus no depressive symptoms (CES-D ≤ 14)

b) a three depression category classification
   i) no depression (CES-D score 1-14)
   ii) mild to moderate depression (CES-D score 15-21)
   iii) major depression (CES-D score >21)
The CES-D scale is a valid tool to identify high risk groups and to study the relationship between depressive symptoms and many other variables (Radloff, 1977; Turvey, Wallace and Herzog, 1999; Cole, Kawachi, Maller, and Berkman, 2000).

**Exposure variables.** Shift-work is defined as an arrangement of working hours that utilize two or more shifts of workers in order to extend the hours of productivity of the work environment beyond the conventional office hours of 0800h to 1700h (Shen et al, 2006). The number of hours of shift-work can vary between 8 hours and 12 hours. The varieties of shift-work include rotating shift-work in which the individual is normally required to work more than one shift, changing from one shift to another and fixed shifts in which the individual normally works one shift including night work. The effect of this alternative work schedule on the worker has been studied by multiple researchers (Admi, Tzischinsky, Epstein, Herer, and Lavie, 2008; Akerstedt, et al., 2002; Axelsson, Akerstdt, Kecklund, and Lowden, 2004; Coffey, Skipper and Jung, 1988; Costa, 2003; Folkard and Tucker, 2003).

The traditional work week schedule is typically an 8-hour day and 5-day week with employees not working weekends. This definition was used for the secondary analysis to determine alternative work schedules that would be classified as shift-work. Registered nurses on shift-work are often required to work outside the parameter of traditional work schedules. Shifts may divide a 24-hour day into two or three shifts. Those working rotating shifts are required to work on different shifts while those on a fixed schedule remain on the same schedule (e.g., permanent nights). For the purposes of
this study, shift-work was defined as those hours worked outside the traditional hours of Monday to Friday from 0900-1700 hours. Twelve hour day shifts were defined between the hours of 0700-1900 and inversely, twelve hour night shifts were defined as between 1900-0700. Eight hour day shifts were defined as hours worked between 0700-2300 and night shift between 2300-0700. Evening eight hour shifts were not specifically identified.

The distribution of years worked within current position by participants, were arranged in five year increments. The data collected only included years worked in current position but did not stipulate total years working shift-work. All information was obtained through a participant self-reported questionnaire (see Appendix A).

**Demographic and workplace variables.** Additional data was collected that included variables that potentially may have influenced the outcome of the CES-D. These included age, income level, highest educational level attained (high school, diploma or degree), marital status, nursing unit and nursing care area (ie. direct patient care versus non-direct care). Direct care included nursing, material management and housekeeping while non-direct care comprised of participants from administrative support (ie. finances, payroll and medical records).

**Data Management**

All data were entered into a secure validated relational data system maintained by the Clinical Research Centre at the Kingston General Hospital. Errors or suspicious data entry was checked and validated by a second reviewer and data input errors were
corrected. In the primary study, individual reports were shared solely with participants in a format that presented individual results in comparison to normative data. Suggestions for follow-up by occupational health and/or physician were encouraged. All data was linked by study number only.

Statistical Analysis

The SPSS statistical package (version 16.0; SPSS, Chicago, Illinois) was used for analysis and modeling of the data. The two tailed p value of 0.05 was considered to be significant.

Univariate analysis began with descriptive statistical analysis of demographic and workplace variables. Means and standard deviation were utilized for continuous variables; frequencies and percentages were applied to categorical variables. The main outcome variable, depressive symptoms, was graphically displayed using a histogram that tabulated frequencies to show what proportion of participants fell into each category and to determine if the data is normally distributed.

The Kolmogorov-Smirnov test was conducted to assess the distribution of the CES-D score. The CES-D score result was found to be not normally distributed therefore non-parametric tests were conducted.

Bivariate analysis was conducted using chi squared tests that compared the CES-D scores to demographic data (ie age, shift-work[y/n], shift category, years worked in current position and pre-taxable income). The chi squared test was also used to compare each CES-D question and whether the participant worked shift-work.
Multivariate analysis utilized logistic regression and results were expressed as odds ratios and 95% confidence intervals.

*Ethics Approval*

Ethics approval was obtained from Queen’s University Health Science Research Ethics Board for the primary study Work and health: Optimizing nurses’ physical health in hospital work environments. The present study also was granted ethics approval from Queen’s University School of Nursing and Queen’s University Health Science Research Ethics Board.
Chapter 4  
Results  

Background  

The relationship of shift-work to depressive symptoms in female shift-working registered nurses is presented in this chapter. The primary goal of this study was to determine if there was a relationship between shift-work and the prevalence of depressive symptoms in registered nurses. The secondary question determined the relationship of shift-work to specific depressive symptoms measured within the CES-D.  

Characteristics of Sample  

Two hundred and twenty individuals met the eligibility criteria of registered nurses for inclusion in the primary study. One hundred and fifty-nine of these participants completed the Centre for Epidemiology Depression Scale (CES-D) but only 152 of the study participants answered all the questions in the CES-D and were thus included in this study. The mean age of participants was 45 years. Participants between the ages of 40-49 (33.1%, \( n=51 \)) then 50-59 (31.2%, \( n=48 \)) were most common. Further demographic analysis showed that participants were predominately married (68.8%, \( n=106 \)), and employed full-time (57.8%, \( n=89 \)). Thirty-four percent had a total household income of between \$100,000 – 150,000. Sixty-three percent had achieved a diploma in nursing and 76.6% (\( n=118 \)) were involved in direct patient care (Table 3).  

Work environment variables included work domain, shift-work employment, shift duration, work status and years worked in current position. The work domain comprised
of 104 (71.7%) in direct care and 41 (28.3%) in non-direct care. Eighty-nine (57.8%) participants were employed in full-time positions while part-time was 58 (37.7%). The mean years worked in their current position was 9.14 years. The majority of the study population had worked in their current position less than 10 years. Those employed less than 6 years consisted of 69 (44.8%) participants and those employed between 6-10 years was 40 (26%).
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N</th>
<th>%</th>
<th>mean</th>
<th>SD</th>
</tr>
</thead>
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<td>Age (years)</td>
<td></td>
<td></td>
<td>45.47</td>
<td>10.13</td>
</tr>
<tr>
<td>20 – 29</td>
<td>15</td>
<td>9.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 – 39</td>
<td>24</td>
<td>15.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 – 49</td>
<td>51</td>
<td>33.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 – 59</td>
<td>48</td>
<td>31.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 – 69</td>
<td>11</td>
<td>7.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
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<tr>
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<td>68.8</td>
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<tr>
<td>Common-law</td>
<td>13</td>
<td>8.4</td>
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<td>Widowed/separated/divorced</td>
<td>19</td>
<td>12.3</td>
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<tr>
<td>Single, never married</td>
<td>14</td>
<td>9.1</td>
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</tr>
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<td></td>
</tr>
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<td>45</td>
<td>29.1</td>
<td></td>
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</tr>
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<td>75,000 – 99,000</td>
<td>39</td>
<td>25.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100,000 – 150,000</td>
<td>52</td>
<td>33.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;150,000</td>
<td>16</td>
<td>10.4</td>
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</tr>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Diploma</td>
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<td>63.0</td>
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</tr>
<tr>
<td>Degree</td>
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<td>35.7</td>
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</tr>
<tr>
<td>Work Domain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct care</td>
<td>104</td>
<td>71.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-direct care</td>
<td>41</td>
<td>28.3</td>
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</tr>
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<td>Working Shifts</td>
<td></td>
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<tr>
<td>Yes</td>
<td>71</td>
<td>46.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>81</td>
<td>52.6</td>
<td></td>
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</tr>
<tr>
<td>Shift Worked</td>
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</tr>
<tr>
<td>8 hour</td>
<td>81</td>
<td>52.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 hour</td>
<td>51</td>
<td>33.1</td>
<td></td>
<td></td>
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<tr>
<td>Mixed</td>
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<td>12.9</td>
<td></td>
<td></td>
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<tr>
<td>Work Status</td>
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</tr>
<tr>
<td>Full time</td>
<td>89</td>
<td>57.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part time</td>
<td>58</td>
<td>37.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years Worked In Current Position</td>
<td></td>
<td></td>
<td>9.14</td>
<td>9.92</td>
</tr>
<tr>
<td>0-5 years</td>
<td>69</td>
<td>44.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-10 years</td>
<td>40</td>
<td>26.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-15 years</td>
<td>5</td>
<td>3.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16-20 years</td>
<td>10</td>
<td>6.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21-55 years</td>
<td>21</td>
<td>13.6</td>
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<td></td>
</tr>
</tbody>
</table>

Note: Missing data in some categories due to non-response.
The Centre for Epidemiology Depression Scale

The CES-D ranged from a score of 1 to 47 with a mean score of 8 and a median score of 7. Mild to severe symptoms of depression were reported by 17% of the study population and of these, 7.9% reported symptoms of major depression. Baseline data collected revealed 13 (8.4%) of participants had a prior diagnosis of depression. More detailed information related to medication use was not obtained in the primary study.

As noted in Table 4, the results indicated that 126 (82.9%) participants had a CES-D score <15 placing them in the category of no depression. Within the category of mild to moderate depression, 14 (9.2%) of the sample population were identified; and within the category of major depression, 12 (7.9%) were identified. The overall findings placed n=26 or 17.1% of the sample population within the category of mild to severe depression.

As noted in Graph 1, the CES-D depression scores ranged from 1 to 47 with the mean score of 8.58 and the standard deviation of 8.017.
<table>
<thead>
<tr>
<th>CES-D</th>
<th>N</th>
<th>%</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Depression Score</strong></td>
<td></td>
<td></td>
<td>8.58</td>
<td>8.01</td>
</tr>
<tr>
<td>Depression - 3 Categories (score range)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No depression (0-14)</td>
<td>126</td>
<td>82.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild to moderate depression (15-21)</td>
<td>14</td>
<td>9.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major depression (&gt;21)</td>
<td>12</td>
<td>7.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression - 2 Categories</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No depression (0-14)</td>
<td>126</td>
<td>82.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild to severe depression (15+)</td>
<td>26</td>
<td>17.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Graph 1 – Histogram of CES-D Score Ranges

- Mean = 8.58
- Std. Dev. = 8.017
- N = 152

Frequency

CES-D Depression Score
Bivariate analysis revealed that only age was associated with the CES-D score (Table 5), specifically those participants aged 30-39 had the highest number of participant’s experiencing depressive symptoms (39.1%, \( n=9 \)). Only 13.3% (\( n=2 \)) participants between the ages of 20-29 experienced depressive symptoms. Age was the only demographic predictor of depressive category but when age was included in a multivariable analysis of the sub-questions within the CES-D, it was not associated with the outcome.

Fourteen (20%) of participants who worked shift-work reported depressive symptoms compared to 12 (14.8%) of non-shift workers. Relating to shifts worked, depressive symptoms were identified by 28% of the participants who worked 12 hour shifts and 15% of the participants who worked 8 hour shifts. Depressive symptoms were identified by 26.5% of participants who earned a household net income of between $50,000 - $74,999. The symptoms of depression decreased as household income increased. Only 6.3% of participants whose household income was more than $150,000 were identified as experiencing depressive symptoms. None of the shift-work variables were significantly associated with overall depressive symptoms using bivariate analysis therefore a multivariate analysis was not conducted for the primary outcome of depressive symptoms.

To further explore the effects of shift-work related to specific symptoms of depression, a sub-analysis of the specific questions within the CES-D were analyzed. Of the twenty questions, shift-work was associated with three sub-questions (Appendix D).
Although our study showed no significant relationship between the participants' perception of an impaired appetite, the results were worth noting. This study showed that 15.5% of shift-workers reported some or little decrease in appetite compared to 5% of non shift-workers reporting similar changes in appetite.
<table>
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<th>Demographic</th>
<th>Depression</th>
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<th></th>
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<th>x^2</th>
<th>p-value</th>
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<tr>
<td></td>
<td>Yes n (%)</td>
<td>No n (%)</td>
<td>Total</td>
<td></td>
<td></td>
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</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>20-29</td>
<td>2 (13.3)</td>
<td>13 (87.7)</td>
<td>15</td>
<td>12.31</td>
<td>.02</td>
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<td>30-39</td>
<td>9 (39.1)</td>
<td>14 (60.1)</td>
<td>23</td>
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<tr>
<td>40-49</td>
<td>8 (15.7)</td>
<td>43 (84.3)</td>
<td>51</td>
<td>12.31</td>
<td>.02</td>
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<td>50+</td>
<td>5 (10.4)</td>
<td>54 (91.5)</td>
<td>59</td>
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<td>x^2</td>
<td>p-value</td>
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<td>14 (20.0)</td>
<td>56 (80.0)</td>
<td>70</td>
<td>.71</td>
<td>.40</td>
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<td>No</td>
<td>12 (14.8)</td>
<td>69 (85.2)</td>
<td>81</td>
<td>2.81</td>
<td>.42</td>
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<td>Shift-Work</td>
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<tr>
<td>8 hour</td>
<td>12 (14.8)</td>
<td>69 (85.2)</td>
<td>81</td>
<td>2.81</td>
<td>.42</td>
<td></td>
</tr>
<tr>
<td>12 hour</td>
<td>12 (24.0)</td>
<td>38 (76.0)</td>
<td>50</td>
<td>2.81</td>
<td>.42</td>
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<tr>
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<td>18 (90.0)</td>
<td>20</td>
<td>2.0</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5</td>
<td>12 (17.4)</td>
<td>57 (82.6)</td>
<td>69</td>
<td>2.0</td>
<td>.37</td>
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<td>6-10</td>
<td>9 (23.1)</td>
<td>30 (76.9)</td>
<td>39</td>
<td>2.0</td>
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<tr>
<td>&gt; 11</td>
<td>5 (11.4)</td>
<td>39 (88.6)</td>
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<td>15,000 – 49,999</td>
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<td>11 (100)</td>
<td>11</td>
<td>5.72</td>
<td>.46</td>
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<td>50,000 – 74,999</td>
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<td>25 (73.5)</td>
<td>34</td>
<td>5.72</td>
<td>.46</td>
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<tr>
<td>75,000 – 99,999</td>
<td>7 (18.4)</td>
<td>31 (81.6)</td>
<td>38</td>
<td>5.72</td>
<td>.46</td>
<td></td>
</tr>
<tr>
<td>100,000 – 150,000</td>
<td>9 (17.3)</td>
<td>43 (82.7)</td>
<td>52</td>
<td>5.72</td>
<td>.46</td>
<td></td>
</tr>
<tr>
<td>&gt; 150,000</td>
<td>1 ( 6.3)</td>
<td>15 (93.7)</td>
<td>16</td>
<td>5.72</td>
<td>.46</td>
<td></td>
</tr>
</tbody>
</table>
**CES-D sub-questions and shift-work association**

Further analysis was completed to determine if shift-work affected the depressive symptoms assessed within the body of the CES-D. Although there was no significant correlation between the CES-D Score in totality, further analysis was made to determine if the individual depressive symptoms were associated with shift-work. Study participants only showed shift-work impacting upon the sub-questions of “feeling depressed”, “can’t get going” and “difficulty concentrating”. Both shift and nonshift-workers reported that they felt hopeful for the future (95.8%) and felt that they enjoyed their life (94.4%).

Of the participants who self-reported working shift-work, 55% were identified as experiencing episodes where they “can’t get going” as opposed to 29.6% who don’t work shift-work. Shift-workers were 2.9 times more likely to say that they “can’t get going”. Sixty-two percent of shift-workers reported trouble concentrating. This depressive symptom was 2.14 times more likely within shift-workers. In addition, 31% of shift-workers also complained of “feeling depressed”. The participants working shift-work were 2.15 times likely to “feel depressed”.
Table 6 - Bivariate Analysis of Shift-Work to Depressive Symptoms

<table>
<thead>
<tr>
<th>Variable</th>
<th>Depression</th>
<th></th>
<th>x^2</th>
<th>p-value</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No (n%)</td>
<td>Yes (n%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can’t get going Shift-work</td>
<td>57 (70.4)</td>
<td>24 (29.6)</td>
<td>9.98</td>
<td>&lt;.01</td>
<td>2.9</td>
<td>1.5 – 5.6</td>
</tr>
<tr>
<td></td>
<td>32 (45.1)</td>
<td>39 (54.9)</td>
<td></td>
<td></td>
<td>2.9</td>
<td>1.5 – 5.6</td>
</tr>
<tr>
<td>I had trouble concentrating</td>
<td>46 (56.8)</td>
<td>35 (43.2)</td>
<td>5.34</td>
<td>.02</td>
<td>2.1</td>
<td>1.1 – 4.1</td>
</tr>
<tr>
<td></td>
<td>27 (38.0)</td>
<td>44 (62.0)</td>
<td></td>
<td></td>
<td>2.1</td>
<td>1.1 – 4.1</td>
</tr>
<tr>
<td>Feeling depressed Shift-work</td>
<td>67 (82.7)</td>
<td>14 (17.3)</td>
<td>3.93</td>
<td>.47</td>
<td>2.15</td>
<td>1.0 – 4.6</td>
</tr>
<tr>
<td></td>
<td>49 (69.0)</td>
<td>22 (31.0)</td>
<td></td>
<td></td>
<td>2.15</td>
<td>1.0 – 4.6</td>
</tr>
</tbody>
</table>
Chapter 5
Discussion

There are few published empirical studies that have attempted to map the relationship between factors thought to contribute significantly to depressive symptoms. Using shift-work as the environmental context, the results of this study showed a relationship between shift-work and specific perceived symptoms of depression such as cognition, motivation and feeling depressed. Statistics Canada conducts the General Social Survey (GSS) and Survey of Labour and Income Dynamics (SLID), both of which gather information regarding shift-work. In 2005, the GSS reported that 28% of employed Canadians, 4.1 million workers, were shift-workers with 82% working full-time or working greater than 30 hours per week (Williams, 2008). A number of job-related factors – occupation, hours of work, shift-work and work stress have been associated with depression (Gilmore and Patten, 2007; Shield, 2002).

The effects of shift-work on depressive symptoms were assessed using the CES-D Depression Scale. Although the effect of shift-work has been studied within various populations, very little is known about the effects of shift-work on depressive symptoms for female registered nurses. Shift-work and its effects on depressive symptoms, years worked in shift-work, cognition and motivation, and appetite all have the potential to impact upon the quality of nurses’ health.
Shift-work and CES-D score

The lack of results indicating that shift-work increased the risk of depressive symptoms according to the CES-D was a finding that was not predicted. However, in this study, over one quarter of those working 12 hour shifts displayed depressive symptoms. In reviewing the larger data set of both shift-workers and non-shift-workers, there was no statistical significance in the scores between shift and non shift-workers in questions related to feelings of depression, sadness and loneliness. Various studies have shown conflicting results when studying depression and shift-workers.

As the study was advertised to explore the effects of physical health for shift-workers, those experiencing symptoms of depression may not have been motivated to join this study. An alternative explanation, however, is that the CES-D is a self-identified questionnaire. Depression symptomology was measured by a questionnaire that relied on the perception of the participant. Another unexpected outcome of the CES-D questionnaire involved the participant’s perception of potential changes in appetite.

In addition, within the primary study, 220 of the participants were registered nurses and met the eligibility criteria for this study. From these 220 participants, only 152 completed the CES-D questionnaire. This may be explained by participant’s fear of self-identifying personal information related to their mental health status. Participants may also have failed to complete the CES-D as they felt it was not applicable to assessing the effects of shift-work on cardiovascular risk factors.
Shift-work and depressive symptoms

The initial objective was to determine if shift-work impacted upon the depressive symptoms for female registered nurses. The CES-D findings from this study show that there is no significant relationship between shift-work and mild-severe depressive symptoms, according to the self-reported CES-D depression scale. CES-D outcomes were measured using the criteria of mild to moderate depressive symptoms (CES-D 15-21) or severe depressive symptoms (CES-D greater than or equal to 21). However, in this cohort of female nurses, 20% of those working shift-work identified mild to severe symptoms of depression compared to 14.8% of those working day shifts. These results are higher than national statistics indicate. The 2005 National Survey of the Work and Health of Nurses, revealed 9% of nurses reported experiencing depression in 2004 compared to 7% of the employed population.

Years of shift-work and depression

Study results indicated that the longer time spent in shift-work was found to be associated with lower CES-D scores and participants working between 6 – 10 years in their current position were found to have the highest depressive symptoms scores (23.1%). The particular difficulties with shift-work perceived by nurses who worked the least amount of years within their current position suggested that they may require greater support during their introduction into a shift-work scheduling pattern. Such support related to coping with shift-work might have long-term value. Nurses experiencing depressive symptoms since becoming employed within an alternative work schedule may
have been motivated to leave nursing positions that require shift-work and therefore producing a ‘healthy worker’ effect in those working for longer periods of time.

Several aspects of the CES-D were further analyzed to try to identify components of depression that might be associated with shift-work. Symptoms such as cognition, motivation and feeling depressed were found to be significantly associated with shift-work for female hospital employed registered nurses.

**Income and depression**

Participants with a household net income of between $50,000 to $74,999 were found to have the highest number of participants experiencing symptoms of depression (26.5%). Within this study, household income was more related to depression than shift-work. An area of future research would assess whether income is linked to the need to work shift-work.

**Cognition and motivation**

In this study, 62% of shift-working study participants identified perceptions of impaired cognition. However whether this impaired cognition was actual rather than perceived was not measured within this study. Cognitive competence is an important aspect within nursing practice. Even a temporary decrease in cognitive functioning of the nurse may result in errors or incidents that affect the quality of care the nurse can provide and that in turn affects patient safety. This raises concerns within the critical phases of the work processes and/or of nursing activities such as critical thinking, nursing
assessment and interventional care. An area of future research would be to assess the extent of cognitive demands for nurses during evening and night shifts as it relates to day work.

The present study reveals the perceived adverse effect of an atypical work schedule on the cognitive functioning of the employee. As this study shows a relationship between shift-work and the participants' perceived decline in cognitive functioning, an area of future research would be to assess the actual effects of shift-work on the cognitive performance of shift-working nurses. Cognitive testing at various times during all shifts could compare the possible impact of shift-work.

Reid and Dawson’s (2001) study tested the cognitive performance during both 12 hour day shifts and 12 hour night shifts of participants of various ages. The results suggested that workers over the age of 44 had reduced work performance compared to those who were under the age of 22 on simulated 12 hour shift rotations.

Although relevant to many nursing activities, cognitive performances are not the sole measurements of job performance. Job performance is also based on motivation to carry out the tasks of nursing. The findings from this study show that 50% of shift-workers had some to moderate difficulty getting motivated compared to 27% of non-shift-workers. As noted, shift-work was perceived to have induced a certain amount of impaired motivation. There were study indications that the level of physical fitness can impact upon the shift-workers ability to adapt to shift-work. Atkinson and colleagues (1993) had indicated that increased physical fitness or physically active subjects have higher adaptability to shift-work. Youngstedt (2005) studied how physical activity also
improves sleep quality, reduces anxiety, and helps to alleviate depressive symptoms. Nursing motivation may also be linked to impaired sleep and rest patterns. However, both shift-work and non shift-worker participants of this study indicated that their sleeping pattern was not restful. As sleep tends to be a key factor related to depression, the fact that the participants identified this symptom is of interest to further research.

Feeling Blue

As previously shown, participant’s CES-D score did not show a statistically significant relationship between shift-work and depressive symptoms. When further analysis of the specific questions of the CES-D was performed, participants identified a relationship between “feeling depressed” and shift-work. Nurses were 2.15 times more likely to identify feelings of depression when they worked shifts. This result underscores the need for further assessment and evaluation by a mental health professional to determine perceived versus clinical depression. As the primary outcome of depression was assessed based on participant self-identification of symptomology, the discrepancy within feeling depressed and meeting the DSM-IV criteria for depression needs further exploration.

Appetite

There are many factors that influence dietary intake and eating schedules including food supply and availability, hunger, and convenience (Reeves, et. al, 2004). Although our study showed no significant relationship between the participants
perception of an impaired appetite, the results were trending towards significance. These findings may be caused by shift-workers eating more incomplete meals than complete meals and being less likely to eat fruits and vegetables (Lennernas and Anderson, 1999). Shift-workers have described their eating habits as grazing their way through their shift, eating smaller amounts during meals (Reeves, Newling-Ward and Gissane, 2004). Nurses need to be cognisant of the effect of food intake and activity/rest cycles. Night workers sleep through at least one to two daytime meals which alter the caloric intake. Some night workers may try to maintain a daytime meal schedule rather than aligning mealtimes with their work schedule. This may lead to impaired glycemic levels and nutritional intake that is less than body requirements.

Adaptation to shift-work

Researchers have developed several strategies to improve coping thereby enhancing patient safety while working shift-work. Hughes and Stone (2004) suggested working the shift that is tolerated best by the worker. Worker satisfaction, productiveness and nursing retention were enhanced when workers had control over shift selection. Adaptation is optimal for shift-workers when the internal rhythm is adjusted to promote sleep during the daytime sleep period. This is often difficult for female shift-workers due to family responsibilities and commitments that require nurses who work nights to be active during the morning, thus hindering adaptation. Optimal adaptation to shift-work was found when the night worker had better daytime sleep before a night shift.
along with fewer social and family disruptions (Crowley, Lee, Tseng, Fogg, and Eastman, 2004).

*Links to conceptual model*

The conceptual model of this study (Figure 1) outlines that depression is believed to have the potential to impact upon impaired mental well-being, decreased energy, impaired cognition and decreased motivation. The findings of this study have identified a tentative link in particular to impaired cognition and decreased motivation. Furthermore, impaired mental well-being and the presence of depressive symptoms was identified in 28% of the sample population who worked 12 hour shifts. Impaired mental well-being influences the self-concept of the individual and can contribute to further depressive symptoms.

*Limitations of study*

There are limitations in this study that may have altered the outcomes shown by this study. One is that the participants of the primary study were recruited for a study that primarily was assessing the effects of shift-work on cardiovascular risk factors. As depression was not the primary advertised focus of this study, those experiencing depressive symptoms were not targeted. A potential bias within the study was identified as those experiencing depressive symptoms may have lacked the motivation to engage in this study. Due to the influence of the symptomology, individuals who suffer from
depression, especially moderate to severe symptoms, would either not be able to work or would lack the motivation to take part a study of this nature.

This perceived bias could alternately be considered a strength as the result can be generalized to the general population. The real question is, are nurses who work shift-work more or less likely to participate if they have depression than nurses who do not work shifts.

Further limitations include the use of the CES-D questionnaire. The limitations in the use of the scale include that it is not intended as a clinical diagnostic tool. Group averages of depressive categories should be understood in terms of levels of symptoms which accompany depression, not in terms of rates of illness. Appropriate cut-off scores seem to vary with the studies utilizing the CES-D tool, although this study utilized benchmark scores suggested by the CES-D developers. As this tool is a questionnaire, there is the possibility that understanding the questions may be problematic and the current mood of the participant while completing the questionnaire may influence the participant’s answers. To resolve this issue, the participants could complete the questionnaire at various times throughout the week the testing is occurring as opposed to the end of the week. Another limitation of this study is the short-term evaluation and the analysis of symptoms during the past week. Understanding the dynamics involved with depression, factors that increase depressive symptoms such as season, current life stressors, etc., should have been assessed as they could impact upon the outcome of the CES-D tool.
A final limitation must be noted within the analysis of the sub-questions of the CES-D. Depression is diagnosed within a cluster of symptoms and unless multiple symptoms are present, as identified by the DSM-IV-TR for depression, caution should be taken within generalizing results. Although the CES-D sub-questions assess symptoms of depression they could also potentially be symptoms of other mental disorders.

**Strengths of study**

Despite the limitations described above, several major strengths distinguish this study from previous efforts. The most important strength of the current study lies in the opportunity to examine specific symptoms of depression and shift-work. Most studies have utilized depression measurement tools to identify depression within their population. This study was able to examine individual symptoms of depression outlined in the CES-D and determine if there was a significant or trending association with shift-work. Secondly, unlike population surveys, the main study utilized a validated measurement tool of the CES-D to identify depressive symptoms of the participants as opposed to relying of participant self disclosure. Thirdly, although depression was not the primary focus of the main study, it may be presumed that those individuals suffering from depressive symptoms may lack the motivation or desire to engage in a study requiring disclosure of personal information and time commitment. Researchers attempting to recruit participants in studies of depression would find similar issues thereby making our results generalized to the population.
Relevance and contribution to nursing knowledge

There is an increasing staff shortage of Registered Nurses within the Canadian healthcare system as the retention of qualified nurses within the profession is declining. One reason for the retention problems can be attributed to the work pattern in hospitals. The pattern of shift-work is significant since nursing care is required 24 hours, seven days a week and while shift-work might have some advantages for the worker, research has linked this work schedule to both physical and mental health problems. Due to the demands of shift-work, the body is continuously being exposed to stress as it adjusts its circadian rhythm in an attempt to adjust to different working hours. “Sleep quality, depression, physical and mental work load and emotional stress were negatively related to job satisfaction” (Ruggiero, 2005, p.259). Raine (2004) maintained the adverse health effects of working the long hours included depression, weight gain, heart disease, decreased physical activity, diabetes, hypertension, cancer, alcohol consumption and smoking.

Depression can interfere with the ability of a nurse to work due to fatigue, loss of interest, diminished ability to think and concentrate, and feelings of sadness, discouragement and/or hopelessness. The negative impact to job performance may result as nursing requires the enhanced cognitive functioning of time management, concentration, teamwork and critical decision-making.

Antidepressant medication in conjunction with counselling has proven to be an effective treatment for depression. Depression can reliably be diagnosed and treated within the primary care setting. The WHO (1999) suggested that between 60-80% of
those receiving this combined treatment return to their previous functioning capacity. An immediate concern for the health professional is fewer than 25% of those affected receive this treatment. Barriers for nurses obtaining treatment often revolve around the stigma associated with mental disorders and a lack of resources available to them. Caan, Morris, Maria and Brandon (2000) conducted a study of effective treatments utilized by nurses who suffered from depression (n=208). The most utilized form of therapy was informal support of family and friends and not counselling or medication.

Manager, nurses and occupational health services need to be aware of the potential association between shift-work and depressive symptoms. Therefore, to provide the best clinical outcome for nurses who suffer from depression, early detection and access to counselling and health services needs to be readily accessible.

Potential for Patient Safety

Depressive symptoms associated with shift-work have the potential to impact upon patient care and safety. The main depressive symptoms outlined in this study that impact upon patient safety include levels of motivation and cognition of shift-workers. Shift-work, particularly night work, increases the risk of adverse incidents. Folkard, Lombardi and Tucker (2005) published studies that indicated the risk of an incident at work was 6% higher on the second night, 17% higher on the third night, and 36% higher on the fourth night shift. Rogers, et al (2004) study revealed that work duration, overtime and the number of hours worked had significant effects on medication errors. The likelihood of making an error was found to increase with longer work hours and was
three times higher when nurses worked shifts lasting 12.5 hours or longer. It was
recommended that 12 hour shifts be shortened and overtime eliminated after 12 hour
shifts.

In April 2001, several organizations filed a petition with the Occupational Safety
and Health Administration, alleging that excessive work hours and fatigue harm the
health of health care workers, specifically medical residents (Gaba and Howard, 2002).
The long and unpredictable hours associated with shift-work could pose a threat to
patient safety. Physiological factors such as fatigue, increased work intensity, or a
combination of fatigue and increased work intensity may contribute to the errors and near
errors observed in their study. Rogers, Hwang, Scott, Aiken, and Dinges (2004)
suggested that heavy workloads themselves may increase the risk of making errors.

Conclusion

As health care is a twenty-four hour commitment, nurses must make lifestyle
choices that promote optimal functioning. For health and safety, shift-workers must
know and utilize methods to adapt their circadian rhythms to promote optimal
performance. In addition to proactive lifestyle choices made by nurses to enhance coping
with shift-work, administrators and managers need to implement interventions that will
develop a new dynamic to create a healthy workplace for staff and patients. Nurses want
to work in an environment where they can be fulfilled, energized and motivated to meet
the increasingly complex needs of the patient.
Health promotion is one of the many roles of a nurse and this should include the nurse’s health as well as that of his/her patients. Similar to health promotion, mental health promotion involves activities that assist individuals in adopting and maintaining healthy lifestyles and fosters an environment that supports health. Studies addressing the effects of shift-work on mental health need to explore options to enhance the quality of life and quality of care provided by the workers. When the work environment focuses on the health of its workers, retention will be enhanced.

The diagnosis of depression impacts mental well-being, energy level, cognition, job satisfaction, work efficiency and ultimately patient safety. Solutions to decrease the prevalence of depression must be addressed within a profession that is already facing a critical shortage. Given the health implications of depression to patient safety and job satisfaction, the association of depression for shift-working registered nurses becomes significant and important. Depressive symptoms influence mental well-being, energy level, cognition, work efficiency and ultimately, patient safety. Understanding the relationship between shift-work and depression is the key to enhancing patient safety and the quality of care provided by nurses and ensuring a healthy workplace.
References


Schernhammer, E.S., Laden, F., Speizer, F.E., Willett, W.C. Hunter, D.J., Kawachi, I., &


October 12, 2007 from Canadian Institute for Health Information Web site:


Tambay, J.L. & Catlin, G. Sample design of the national population health survey.


Appendix A

Selected Questions from Primary Study

| 1. What is your marital status? | a. Married  
b. Living common-law  
c. Widowed  
d. Separated  
e. Divorced  
f. Single, never married |
|-------------------------------|--------------------------------------------------|

| 2. What is the highest degree or diploma you have obtained? | a. High School  
b. Post Secondary (certificate/diploma)  
c. University Undergraduate Degree  
d. Graduate Degree (Master’s, Ph.D, etc)  
e. Physician or Resident  
f. Other ______________________ |
|-------------------------------------------------|-----------------------------------------------------------------------------|

WORK ENVIRONMENT

In this section, we are interested in the characteristics of your employment at KGH.

<table>
<thead>
<tr>
<th>1. What is your current position?</th>
<th>________________________________</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>2. In what year did you start working in your current position?</th>
<th>____________________</th>
</tr>
</thead>
</table>

| 3. Is this position permanent, temporary, or casual? | a. Permanent  
b. Temporary  
c. Casual/ on call  
d. Other ______________________ |
|---------------------------------------------------|-------------------|

| 4. Are you working full-time or part-time? | a. Full-time  
b. Part-time |
|-------------------------------------------|------------------|

| 9. Do you usually work? | a. 8-hour shifts  
b. 12-hour shifts  
c. Various shifts  
d. Some other shift ____________ |
|-------------------------|-------------------|
12. Please mark your pre-tax household income for the past year:
   a. less than 15,000
   b. 15,000 to 19,999
   c. 20,000 to 29,999
   d. 30,000 to 39,999
   e. 40,000 to 49,999
   f. 50,000 to 74,999
   g. 75,000 to 99,999
   h. 100,000 to 150,000
   i. >150,000

6. Do you have a long term condition that have lasted or been expected to last 6 months or more, diagnosed by a Health Care Professional?
   a. Allergies
   b. Asthma
   c. Fibromyalgia
   d. Arthritis or osteoporosis (excluding fibromyalgia)
   e. Back problems, excluding fibromyalgia and arthritis
   f. Migraine headaches
   g. Cancer
   h. Stomach or intestinal ulcers
   i. A sleep disorder (such as sleep apnea)
   j. A bowel disorder (such as Crohn’s Disease or colitis)
   k. A thyroid condition
   l. Chronic fatigue syndrome
   m. Neurological disease
   n. Depression
   o. Anxiety or Panic Disorder
   p. Lung Disease
   q. Other _________________________

General Health
The next few questions relate to your general health and well-being.
Appendix B
Process model: Shift-Work to Depressive Symptoms

Process model linking shift-work to depressive symptoms

Adapted from: Conceptual model of disease mechanisms in shift-workers (Knutsson and Boggild, 2000)
Appendix C

CES-D Scale

THE CES-D SCALE: A SELF-REPORT DEPRESSION SCALE FOR RESEARCH IN THE GENERAL POPULATION

INSTRUCTIONS FOR QUESTIONS: Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the past week.

- Rarely or None of the Time (Less than 1 Day)
- Some or Little of the Time (1-2 Days)
- Occasionally or a Moderate Amount of Time (3-4 Days)
- Most or All of the Time (5-7 Days)

During the past week:

1. I was bothered by things that usually don’t bother me.
2. I did not feel like eating; my appetite was poor.
3. I felt that I could not shake off the blues even with help from my family or friends.
4. I felt that I was just as good as other people.
5. I had trouble keeping my mind on what I was doing.
6. I felt depressed.
7. I felt that everything I did was an effort.
8. I felt hopeful about the future.
9. I thought my life had been a failure.
10. I felt fearful.
11. My sleep was restless.
12. I was happy.
13. I talked less than usual.
15. People are unfriendly.
16. I enjoyed life.
17. I had crying spells.
18. I felt sad.
19. I felt that people dislike me.
20. I could not get “going”.

72
Appendix D

Bivariate Analysis

Table 4 Bivariate Analysis – Demographic Data and Shift-Work with Depressive Symptoms

<table>
<thead>
<tr>
<th>CES-D</th>
<th>Shift-work n(%)</th>
<th>Nonshift-work n(%)</th>
<th>$x^2$</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression Category</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-14 no depression</td>
<td>56 (80.0)</td>
<td>69 (82.5)</td>
<td>0.89</td>
<td>0.641</td>
</tr>
<tr>
<td>15-21 mild to moderate depression</td>
<td>7 (10.0)</td>
<td>7 (8.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 21 major depression</td>
<td>7 (10.0)</td>
<td>5 (6.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual Questions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I could not get going</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>39 (54.9)</td>
<td>24 (29.6)</td>
<td>9.98</td>
<td>.002</td>
</tr>
<tr>
<td>No</td>
<td>32 (45.1)</td>
<td>57 (70.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I had trouble concentrating</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>44 (62.0)</td>
<td>35 (43.2)</td>
<td>5.33</td>
<td>.021</td>
</tr>
<tr>
<td>No</td>
<td>27 (38.0)</td>
<td>46 (56.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bothered by things</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>37 (52.1)</td>
<td>40 (49.4)</td>
<td>.113</td>
<td>.737</td>
</tr>
<tr>
<td>No</td>
<td>34 (47.9)</td>
<td>41 (50.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor appetite</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>13 (18.3)</td>
<td>7 (8.6)</td>
<td>3.10</td>
<td>.079</td>
</tr>
<tr>
<td>No</td>
<td>58 (81.7)</td>
<td>74 (91.4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table continued
<table>
<thead>
<tr>
<th>CES-D</th>
<th>Shift-work n(%)</th>
<th>Nonshift-work n(%)</th>
<th>x²</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeling blue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>19 (26.8)</td>
<td>16 (19.8)</td>
<td>1.05</td>
<td>.306</td>
</tr>
<tr>
<td>No</td>
<td>52 (73.2)</td>
<td>65 (80.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feel as good as others</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>65 (92.9)</td>
<td>76 (93.8)</td>
<td>.057</td>
<td>.811</td>
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