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Perception of Fatigue in Individuals Diagnosed with Head and Neck Cancer

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ABSTRACT

Head and neck cancer (HNCa) presents numerous challenges secondary to treatment. While there is substantial clinical awareness to the range of challenges demonstrated in this population, information on the impact of fatigue in recovery and rehabilitation is limited. This study investigated the degree of perceived fatigue in those treated for HNCa. The study was a cross-sectional, self-report, survey design. Adult participants (n=55) completed a series of four validated questionnaires. Two validated measures specific to fatigue (FSI and MFI-20) and two quality of life measures (EORTC-QLQ-C30 and EORTC-QLQ-H&N35) were administered. Correlational analysis revealed an inverse relationship between fatigue and measures of QOL implying that as fatigue increases, one’s perceived QOL decreases. These data suggest that efforts to proactively index fatigue and seek anticipatory interventions may benefit both short- and long-term QOL outcomes.

Keywords: fatigue, quality of life, head and neck cancer
DEDICATION

This work is dedicated to the memory of Margaret Geraldine Parker.
ACKNOWLEDGEMENTS

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<tr>
<td>QOL</td>
<td>Quality of Life</td>
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<td>ADLs</td>
<td>Activities of Daily Living</td>
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<td>HNCa</td>
<td>Head and Neck Cancer</td>
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<td>HNSCC</td>
<td>Head and Neck Squamous Cell Carcinoma</td>
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<td>OSCC</td>
<td>Oropharyngeal Squamous Cell Carcinoma</td>
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CHAPTER 1

Introduction and Review of the Literature

Overview

Over the past decades and as an outgrowth of modern advances in medicine, there have been marked improvements in cancer screening, as well as its diagnosis and treatment. Adult survivorship, that is the number of survivors, is increasing across many cancer types and sites, with notable increases in colorectal, breast, and testicular cancer groups (Bradley, 2002; Pryce, 2007). In this case, survivorship is considered as the phase of the cancer care trajectory that follows primary treatment and lasts until cancer recurrence or end of life (Grunfeld, 2006; Stovall, Greenfield, & Hewitt, 2005). Individuals returning to life post-cancer treatment implicates the need for research into broad aspects of quality of life (QOL) after cancer with an emphasis on improving our understanding of the broader effects of cancer on post-treatment functioning. Research efforts must seek to understand the unique medical and psychosocial needs of survivors. Many survivors, despite being cancer free from a medical (biological) perspective, face the permanent consequences of long-term physical and psychological side effects of cancer and its associated treatments (Siegel, 2012). Common physical side effects due to cancer and/or its treatment include pain, nausea and vomiting, fatigue, anemia, lymphedema, and fertility issues, as well as many others (American Cancer Society, 2015).

In addition to the physical effects that may develop following a course of cancer treatment, an abundance of emotional and psychosocial consequences emerge (Deimling, 2002). Cella and Tross (1986) indicate that there is a compelling rationale for expecting psychological late-effects, including general anxiety, avoidance, and death anxiety. The
psychological effects accompanying the cancer diagnosis and its treatment may not be ameliorated in the same manner as that associated with the cancer. More directly, new worries and anxieties related to one’s return to their life post-cancer may develop. At some point, up to one quarter of cancer survivors experience clinical levels of depression (Deimling, 2002). Just as many of the physical symptoms and sequelae to the illness and its treatment may persist, so too can these psychological effects (Deimling, 2002). Similarly, physical changes that are observed by the individual may serve as a constant reminder of the trauma of the cancer, thus, may act as a constant stressor throughout the course of survivorship.

Cancer rehabilitation must be multifaceted to accommodate both the physical and psychological side-effects, implicating the need to use a biopsychosocial lens to assess the potential challenges that an individual with cancer may face (Engel, 1977; WHO, 2007). Some side-effects are common to a variety of subtypes of cancer, though certain side-effects or challenges are site-specific. For instance, cancers of the head and neck may require careful consideration when one contemplates the potentially visible exposure of the treatment area to others and the strong association of this anatomical region to fundamental activities of daily living (ADLs) (e.g., eating, swallowing, and speech). The head and neck cancer (HNCa) site is unique in this respect. Associated treatments of the head and neck area vary greatly and frequently impact a wide array of activities imperative to one’s life. These activities are not limited to communication, swallowing, and breathing and may directly influence social functioning and participation. It is for these reasons that additional information specific to HNCa is addressed within the following section.
Head and Neck Cancer

Cancers of the head and neck refer to an extensive array of diverse tumour types that arise from various anatomic sites located within this region (Pai & Westra, 2009). Oral squamous cell carcinoma and oropharyngeal squamous cell carcinoma (OPSCC) remain the most common sites of HNCa (Chai, Lambie, Verma, & Punyadeera, 2015). Structures in this area include the lips, tongue, gums, lining of the cheeks, floor of mouth, hard/soft palate, and tonsils (Pai & Westra, 2009). Head and neck squamous cell carcinoma is the sixth most common malignancy with an estimated annual incidence of ~633,000 and 355,000 deaths worldwide (Chai et al., 2015; Ferlay et al., 2010). Within Canada, HNCa (including thyroid cancer) is the fifth most common cancer type (Canadian Cancer Society, 2014). Recent statistics project that 11,350 new cases of HNCa (approximately 5,140 males and 6170 females, a ratio of 1.2:1 for females-to-males) will be diagnosed in Canada in 2014 (Canadian Cancer Society, 2014). This is largely due to the large number of females being diagnosed with thyroid cancer, with approximately 4600 new cases occurring yearly (Canadian Cancer Society, 2014). When oral cancer and cancer of the larynx are considered together, approximately 3790 males and 1570 females are diagnosed each year, comprising a ratio of 2.4:1 for males-to-females (Canadian Cancer Society, 2014). Approximately 15 years ago, statistics would have been substantially different with the overall male:female ratio ranging from approximately 10:1 to 15:1 cases of HNCa (Woodard, Oplateck, & Petruzzelli, 2007). This increasing number of women needs careful consideration. This change in ratio at a minimum suggests the need to study the impact of gender on both treatment and rehabilitation in those diagnosed with HNCa.
Etiology

Regardless of gender, a major risk factor of HNSCC is smoking with ~80% of cases attributed to tobacco use and exposure (Chai et al., 2015; Sturgis & Cinciripini, 2007). In addition, the consumption of alcohol has been found to act synergistically with tobacco use to increase the risk of HNSCC (Hashibe et al., 2007; Kabat, Chang, & Wynder, 1994; Pelucchi, Gallus, Garavello, Bosetti, & La Vecchia, 2008; Wynder, Mushinski, & Spivak, 1977). Wynder et al. (1977) were the first to report on these synergistic effects when they stated that although heavy alcohol consumption predisposes certain sites to tumorigenesis, generally it is in conjunction with tobacco usage. Blot et al. (1998) reported that additive effects of smoking and alcohol increased the risk of oropharyngeal cancer by more than 35-fold among those who consumed two or more packs of cigarettes and more than four alcoholic drinks/day (Blot et al., 1988).

Given the known risk factors associated with smoking, a reduction of tobacco use in the developed world has contributed to the decrease in the overall incidence of HNSCC (Chai et al., 2011). Despite this reduction, however, there is an increase in the incidence of OPSCC. This increase is largely in part due to a third risk factor for HNCa disease, human papilloma virus (HPV) infection (Chaturvedi, Engels, & Pfeiffer et al., 2011; Chai et al., 2015). Tobacco-related HNSCC and HPV-associated OPSCC have distinct presentations. Unlike tobacco-related HNSCC, those individuals diagnosed with HPV-associated OPSCC are usually less likely to have any history of excess tobacco or alcohol consumption (Chai et al., 2015). Of the those diagnosed with OPSCC, about 60% are positive for HPV, in particular the 16 subtype (Chai et al., 2015; Marur, D'Souza, Westra, & Forastiere, 2010). With either etiology, treatment for OPSCC may consist of surgical excision, radiotherapy,
chemotherapy, or a combination of these approaches (Semple, Sullivan, Dunwoody, & Kernohan, 2004). Because this area of the body is so vital to ADLs, treatment of this area may include dramatic side effects and carry substantial lifestyle and social implications.

Consequences of HNCa

The diagnosis of HNCa carries with it a unique set of challenges that potentially exceed those associated with other sites of cancer (Doyle, 1994; Semple et al., 2004). Irrespective of treatment modality, individuals diagnosed with HNCa face a distinct set of treatment-related challenges. This includes changes related to communication, emotional expression, social interaction, and/or physical function and these losses may create real and significant impediments to recovery and rehabilitation. Many functions related to survival (breathing and nutrition/hydration intake) are dependent on anatomical integrity, as well as quintessential human activity of verbal communication. For example, speaking, swallowing and breathing are three of the many activities that are reliant on the physiologic and functional integrity of this region. Further, the head and face have a specific role within areas of social and emotional expression and communication. Changes in anatomy or function can have devastating consequences (Vickery, Latchford, Hewison, Bellew, & Feber, 2003). This population may also deal with amplified issues of disfigurement in comparison to other cancer types, thus, impacting the collective negative manifestation of this condition (Doyle & Keith, 2005). Side effects may include substantial changes to one’s physical appearance and the ability to verbally communicate, both of which may be noticeable to others. This may result in changes to perceived body image, self-esteem and self-concept (Eadie & Doyle, 2005). Specific to HNCa treatment, physical
effects may include problems with mucus, mouth/throat sores, tasting food, difficulty with chewing or swallowing, dry mouth, pain, and fatigue (Rosenthal et al., 2007). However, fatigue is the most commonly cited side effect across all cancer types (Stasi, Abriani, Beccaglia, Terzoli, & Amadori, 2003). Because of the additional physical problems associated with HNCa and the increasing potential for the individual to experience of fatigue secondary to nutritional challenges, fatigue may be amplified. Consequently, the ability to gain further insights into the presence of fatigue and its degree of impact on those with HNCa is warranted.

**Fatigue**

*Defining Fatigue*

Fatigue as a consequence of cancer, or more directly as a side-effect of treatment, is well documented in the extended clinical oncology literature (Bower, 2005; Curt et al., 2000; Stasi et al., 2003; Stone, Richards, & Hardy, 1998; Visser & Smets, 1998; Weis & Horneber, 2014; Winningham et al., 1994). Yet in many ways fatigue may serve as a composite term that cannot be easily ascribed to a single underlying cause. The literature presents a variety of descriptions of this condition (Stasi et al., 2003). Medical Subject Headings describe fatigue as, “the state of weariness after a period of exertion, mental or physical, characterized by a decreased capacity for work and reduced efficiency to respond to stimuli” (Medical Subject Headings, 2015). By definition, this type of fatigue is proportional to recent activity and may be alleviated with rest. However, cancer-related fatigue (CRF) differs. CRF is not proportional to recent activity and cannot simply be alleviated with rest. The National Comprehensive Cancer Network (p. FT1, 2003) acknowledges these deviations from other manifestations of fatigue with their definition of
CRF, "a common, persistent, and subjective sense of tiredness related to cancer or to treatment for cancer that interferes with usual functioning" (Mock et al., 2000; NCCN, 2003). Thus, CRF clearly differs from the general fatigue of everyday life, and more importantly, it is not a temporary condition (Stasi et al., 2003).

Fatigue as a clinical entity also represents a multidimensional phenomenon. At face value, fatigue as a symptom entity may often be interpreted as a physical issue. This physical issue or the physical changes that may be experienced have been shown to have a strong link to symptoms that are logically related to it. Such associated physical issues include loss of appetite, dysphagia, and weight loss (Petruson, Silander, & Hammerlid, 2005). Associating fatigue with a physical issue that is easier to objectively measure may alleviate challenges with measurement and documentation. Unfortunately, however, this approach may not accurately represent one’s perceived level of fatigue or its impact on one’s functioning. This association is logically related to nutrition and the impact a deficit in nutrition may have on one’s energy levels. Fatigue itself is often described as part of such symptom clusters. Due to the suspicion that fatigue has such close ties with other physical symptoms, it can be challenging to tease out one’s specific experience of fatigue. In addition, these associated symptoms may have synergistic effects on one another, thus, creating even greater levels of challenge.

In addition to the physical correlates, fatigue impacts one’s psychological being. Holistically, fatigue can be described in terms of changes in one’s perceived energy, mental capacity, and psychological status (Cella, Peterman, Passik, Jacobsen, & Breitbart, 1998; Curt et al., 2000). Many studies that have addressed fatigue typically investigate both somatic and psychological factors (Visser & Smets, 1998). A psychological factor that
attracts a relatively a good deal attention in this respect is depression (Fuhrer & Wessely, 1995; Pick, Molloy, Hinds, Pearce, & Salmon, 1994). The interpretation of the relationship between fatigue and depression in those who are somatically ill is complex. One factor pertaining to this complexity is that fatigue is not only a symptom of many somatic illnesses, but is also one of the key symptoms of depression (Visser & Smets, 1998). Based on this observation, there is certainly a complex interplay between the correlates of fatigue. This interplay undoubtedly influences the rating of fatigue as one of the most distressing, both during and after treatment (Hofman et al., 2007).

*Impact of Fatigue*

Fatigue has been found to greatly influence the physical and psychosocial well-being of a person with cancer (Curt et al., 2000; Stasi et al., 2003; Vogelzang et al., 1997). Visser and Smets (1998) demonstrated the relationship between depression, fatigue and QOL but concluded that there was no strong evidence for a cause and effect relationship between depression and fatigue. Despite this lack of a clear cause, Visser and Smets (1998) did report that both symptoms influenced a person's perception of worsening QOL during radiotherapy treatment. Romito et al. (2008) echoed the impact of fatigue on QOL by reporting that fatigue impairs QOL by affecting social activities, leisure time, work and responsibilities; thus, the negative effects of fatigue cross multiple areas of functioning. The impact of CRF on the ability to perform ADLs is indeed profound. In a study of 379 individuals with cancer and a history of chemotherapy, almost all participants with fatigue (91%) felt that it prevented a “normal” life and 88% felt that their fatigue had changed their daily routine (Curt et al., 2000). These impairments are likely to be a direct result of the impact of fatigue on the participant’s physical functioning. Beyond the physical and
psychological impact of fatigue lies the economic impact. Curt et al. (2000) reported that, of 177 participants currently employed, 77% lost at least one day at work as a result of fatigue, with over 75% forced to change their conditions of employment as a result of the fatigue they experienced post cancer treatment. The cumulative physical, psychological and economic impacts of fatigue are beyond quantification. CRF profoundly affects ones’ abilities to perform ADLs and limits their personal and social roles within their family and community. With so many correlates and such great impacts, defining the phenomenon of fatigue is not without its challenges.

Stasi et al. (2003) reviewed the literature related to the definition, prevalence, causes, and means of managing CRF. Their review highlighted the prevalence of fatigue, its marked impact on QOL, emotional, psychological, and social impacts (Stasi et al., 2003). Stasi et al. echo the sentiments of earlier work by Curt et al. (2000) who reported the substantial adverse physical, psychosocial, and economic consequences for both the individual with cancer and associated caregivers that may result from fatigue. Given the potential impact of fatigue on a variety of functional domains, routine assessment should be considered in the care of persons with cancer (Curt et al., 2000).

Fatigue is widely reported in oncology. Fatigue in general has been identified as the most commonly reported symptom by people with cancer (Stasi et al., 2003). Consensus on a specific time course of such fatigue has not been reached, although literature does suggest a temporal relationship between radiation therapy (RT) and fatigue in those treated for HNCa (Jereczek-Fossa et al., 2007; Rogers et al., 2008). It has been suggested that CRF peaks in week 6 of RT (Jereczek-Fossa et al., 2007). This evolution of fatigue within the context of RT has also been shown across other cancer sites (Greenberg et al.,
1992; Irvine et al., 1994; Smets et al., 1998; Wratten et al., 2004). The incidence and severity of CRF also appear to be influenced by personal characteristics (Aistars, 1987; Blesch et al., 1991; Stone et al., 1998), primary malignancy, and type/intensity of treatment (Curt et al., 2000). For example, higher average levels of fatigue have been associated with younger age, gastrostomy at time of surgery, history of RT, a more recent cancer diagnosis, depression, higher symptom index, sleep dysfunction and lower cognitive function (Rogers et al., 2008). Several studies have confirmed the paradigm that multiple factors (i.e., age, sleep, depression, symptoms, and treatment type) contribute to changes in fatigue and/or sleep (Aistars, 1987; Ancoli-Israel et al., 2001; Fuhrer & Wessely, 1995; Berger et al., 2005; Mortimer et al., 2010; Rogers et al., 2008; Spratt et al., 2012).

Issues with Measurement

Because fatigue may emerge from multiple factors, attempts to accurately quantify it can be challenging. The wide variety of side effects that may be experienced also may or may not have direct physical correlates. This may cause fatigue to be viewed as the sequential result of other widely reported side effects such as nausea, vomiting, reduced hydration, and inadequate nutrition (Jager-Wittenaar et al., 2011). That is, fatigue may be viewed as a consequence of something else. Seo et al. (2010) sought to describe the dynamic causal relationships between fatigue and its associated factors in individuals with cancer. Their proposed model consisted of fatigue that could emerge as physical distress, psychological distress, sleep-related, physiologic, physical performance, and exercise factors (Seo, Oh, & Seo, 2010). Though the physical manifestations of fatigue may be most easily identified, fatigue is not solely just a physical phenomenon. The impact of fatigue
clearly extends beyond the physical self to potentially influence one’s emotional and cognitive well-being. Cancer treatment will almost always result in physical changes (e.g., excision of tissue, weight loss, and hair loss) (American Cancer Society, 2015), but it is also well recognized that cancer also bears significant psychological challenges to the individual. Individuals with cancer may experience a range of emotional responses to its diagnosis, including denial, distress, anxiety, worry, anger, depression, helplessness, uncertainty, and fear (Grandstaff, 1976; Mor, 1994; Vinokur, 1989). Types of emotional challenges and the individual’s response to them may create subsequent perceptions of fatigue. Regardless of its underlying cause, the perception of fatigue has very unique overlays to the larger construct of QOL. Thus, the relationship between body and mind may not be easily partitioned when the term “fatigue” is used clinically. Psychological consequences of a cancer diagnosis and its treatment as one component of symptoms and the burden symptoms create (Rosenthal et al., 2007) cannot be disregarded in the larger conceptualization of QOL. As such, in quantifying fatigue, one must acknowledge that it is a composite assessment that ultimately represents one’s perceived functional capacity at the most global level in the context of cancer and its broadly defined consequences.

Fatigue as a feature of importance in cancer care has certainly been widely considered in many efforts to clinically identify and measure perceived QOL. It has even been suggested that the effect of fatigue on an individual’s QOL is both more profound and more prolonged than the more commonly occurring effects of nausea, depression, or pain (Curt et al., 2000), though these factors may substantially influence or contribute to CRF (Weis & Horneber, 2014). Such contributing symptoms may also include sleep disorders, medication, activity level, nutritional disorders, anemia, emotional distress, and anxiety.
Younger age, previous radiation, a more recent cancer diagnosis, depression, and more severe symptoms may be associated with fatigue, sleep, and/or cognitive dysfunction (Rogers et al., 2008). Despite the recognition of fatigue as an important concern in oncology (particularly in larger subgroups of cancer sites), detailed information that is specifically related to fatigue in those identified with HNCa is lacking. Information about fatigue in this population has begun to emerge, but it is less commonly addressed in a comprehensive, integrated manner. One of the limited reports of fatigue in HNCa was reported by Leung et al. (2011) who assessed QOL in 640 HNCa survivors and found fatigue as the most prevalent symptom; this was followed by reports of financial problems and insomnia.

This lack of consideration of fatigue as an important clinical factor may simply be due to the relatively small population of HNCa individuals when compared to the larger groups of breast, lung and colon cancers. Additionally, this deficit may also relate to challenges with assessment. That is, because fatigue is primarily a subjectively experienced cluster of symptoms, the assessment of fatigue must rely on self-report measures (Weis & Horneber, 2014). But, while multidimensional questionnaires allow for a comprehensive assessment of one’s perceived fatigue, these measures also may be time consuming and burdensome for the participant (Weis & Horneber, 2014) which may in itself create burden that can lead to fatigue. Although information on fatigue is often gathered as part of QOL assessments, more pressing symptom needs in those with HNCa (e.g., pain) understandably may garner more immediate attention and action by health care specialists. As such, when fatigue data have been reported, it has typically been done in the larger context of indexing an array of symptomology and its severity. Therefore, it is not uncommon for such
complaints to be considered as an outgrowth from the process of active treatment. Given this, a desire to better understand the degree and wide range and variety of problems that emerge in association with treatment is essential.

Specific to HNCa, efforts directed at measuring the frequency and intensity of fatigue have been pursued, but information on the incidence and frequency of this phenomenon and the broader impact of fatigue on the individual is less well understood (Rogers et al., 2008). Further, the presence of fatigue also may lead to increasing levels of distress (Bornbaum et al., 2012) with its own negative consequences on both the individual with the disease and his/her caregiver. Because fatigue transcends the partition between body and mind, the impact of fatigue on one’s QOL cannot be underestimated.

**Quality of Life**

*Defining Quality of Life*

Quality of life may be defined as “the perception of individuals of their position in life, in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns” (WHO, 1998, p. 17). QOL by definition is a multidimensional construct that emerges from a variety of domains including physical and occupational functioning, somatic sensation (e.g., treatment- and disease- related symptoms), psychological status, and social interaction (Murphy, Ridner, Wells, & Dietrich, 2007). QOL measures also seek to evaluate broad domains of function and concern including emotional, physical, functional, social, financial and spiritual well-being (Murphy et al., 2007). As a result, QOL as a clinical entity has become an increasingly important outcome measure for individual’s undergoing treatment for a wide array of illnesses including cancer (Murphy et al., 2007). Individuals with cancer frequently report QOL
concerns related to physical, psychological, social, and spiritual issues. With these concerns there is often an emphasis on disruptions to psychological well-being including increased levels of distress (Parker, Baile, de Moor, & Cohen, 2003).

Regardless of its physical site, the occurrence of cancer brings with it both foreseen and unforeseen physical changes to the body, changes that are often related to treatment itself (i.e., surgery, RT, chemotherapy). The manner in which one learns to adapt or cope with these distressing changes may significantly influence their perceived QOL (Bornbaum et al., 2012). With the potential for such dramatic side effects, especially those so closely tied to ADLs, it is intuitive that there may be drastic implications to one’s perceived QOL across multiple domains. These dramatic side effects are also likely to be amplified by the presence of fatigue. In addition, these physical changes are almost always accompanied by psychological, emotional, and social changes as well. Psychological responses to traumatic events such as cancer diagnosis have been shown to be highly variable in previous research. Reports primarily based out of breast cancer literature suggest that clinically significant traumatic stress symptoms are relatively common (Alter et al., 1996; Butler, Koopman, Classen, & Spiegel, 1999; Koopman et al., 2002). Further, fatigue has been shown to be an outcome of such traumatic stressors (Newham et al., 1983). The impact that fatigue and these physical, psychological, social and emotional changes have on one another warrants attention. The relationship between these changes may negatively impact the post-treatment rehabilitative phase of recovery and ultimately the longer term post-treatment outcome. In this regard, aspects of what constitutes “survivorship” becomes increasingly important over the entire period following the completion of treatment.
Survivorship

Medical advances in oncology have resulted in increased survivorship across many cancer types and sites. This has shifted the progression of cancer as a disease to one that is viewed to be more chronic than acute, implicating the need to address QOL concerns related to cancer diagnosis, treatment and rehabilitation in this population. With potential to impact such varied areas of one’s life, fatigue would qualify as a important QOL concern to monitor in oncology. Additionally, the ability to better understand the psychological influence of both cancer and CRF may provide critical information specific to documenting outcomes. As survival rates have improved with advances in medical care, the importance of psychiatric interventions (such as mindfulness based stress reduction, yoga and cognitive behavioural therapy) that are designed to assist individuals with cancer in dealing with their diagnosis and treatment also has increased (Cohen, Cullen, & Martin, 1982; Fawzy, Fawzy, Arndt, & Pasnau, 1995; Fawzy et al., 1993). Previous research indicates the positive effect of psychosocial interventions on emotional adjustment, functional adjustment, and treatment- and disease-related symptoms in adults with cancer (Meyer & Mark, 1995). This supports the growing body of evidence that psychosocial intervention improves the wellbeing of individuals with cancer. It is nevertheless yet to be proven whether such psychosocial interventions may improve perceived fatigue levels in the oncology population. Future efforts should be conducted in or to further understand the potential influence of such interventions on fatigue.

There are three general reasons investigators are interested in measuring QOL in a person with cancer. Due to the implicit relationship between QOL and fatigue, these same three reasons apply to fatigue as well. These reasons focus on a desire: (1) to assess
rehabilitation needs, (2) provide a potential end-point in evaluating treatment outcome; and (3) as a predictor of response to future treatment (Cella & Tulsky, 2009). With evidence supporting the significant impact that fatigue may have on overall QOL and functioning (Weis & Horneber, 2014), continuous monitoring to assess rehabilitation needs of those with cancer-related fatigue may be critical to the well-being of all individuals with cancer.

**Conclusions**

Fatigue may exist as a critical, yet frequently neglected factor that directly influences QOL in those treated for HNCa. Losing the ability to complete ADLs diminish QOL including socializing, the ability to enjoy life and emotional well-being. (Curt et al., 2000; Hjermstad et al., 2006; Nail & Jones, 1995; Vogelzang et al., 1997). When one considers the potential impact of fatigue on general physical functioning, fatigue emerges as a critical factor relative to outcome. This impact on functional activities may limit both personal and social roles in one’s community (Hofman et al., 2007). With the potential for such detrimental outcomes, fatigue needs careful consideration in the future of HNCa rehabilitation.

**Statement of the Problem**

Given what we know about the relationship between fatigue and QOL, it is essential to improve our understanding of this phenomenon in the HNCa population. The early identification of fatigue would appear to be a critical factor as one seeks to document the extent and degree of the problem, optimize treatment, and potentially serve as a means to develop and monitor outcomes from rehabilitation efforts. While fatigue may exist as a generalized entity in those with cancer, HNCa may pose unique challenges. More
specifically, it is difficult to sort out a complaint of fatigue in the presence of other concerns such as pain, mucositis, xerostomia and the serial consequence of reduced nutrition due to such treatment complications. Rather, fatigue frequently presents as part of such a larger symptom cluster. Other elements of such clusters (i.e., pain, depression, anemia) may further contribute to and exacerbate the experience of fatigue (Weis & Horneber, 2014) with substantial functional limitations. Consequently, fatigue due to cancer and its treatment poses a real and significant potential to impact daily functioning and the individual’s subsequent perception of QOL. Thus, the ability to more fully understand the individual nature of fatigue as a clinical symptom, describe and quantify its presence, and to better understand the true heterogeneity of the experience of fatigue may have substantial clinical value with direct benefit to those who experience fatigue. At the very least, increased knowledge of fatigue, perhaps related to its incidence, variability, and course may provide a valuable information resource to those with HNCa, as well as their caregivers, at varied points in their cancer trajectory.

Based on existing literature, the ability to gather additional information that seeks to identify potential links between the self-perception of fatigue by those treated for HNCa and more distinct subcomponents related to QOL assessments is imperative. This information would offer new insights into the potential impact of fatigue on the individual. Information of this type also might serve as a means of providing more comprehensive levels of education and counseling to those diagnosed with HNCa with the goal of reducing symptom burden both short- and long-term post-treatment period. Consequently, the present study was designed to address the following questions:
1. What is the overall presence of fatigue in a sample of individuals diagnosed with HNCa?

2. What is the relationship between level of fatigue and overall QOL among individuals diagnosed with HNCa?

3. Does gender influence perceived QOL and/or level of fatigue among individuals with HNCa?

4. How does the perception of fatigue evolve throughout rehabilitation?
CHAPTER 2

Method

Participants

Individuals who served as participants for this investigation were 55 adults (40 males, 15 females). Participants ranged from 28 to 79 years of age (mean = 60.8); male participants were slightly older with a (mean age = 64.48, range 46 to 79) when compared to the females (mean age = 51.13, range 28 to 72). All participants had received a diagnosis of HNCa within the 24 months prior to their participation in the study.

In total, 110 individuals were identified as potential participants for this investigation. Of the 110 potential participants identified, 107 consented to participate. The 3 participants who chose not to participate did so because they indicated that they were either too busy or not interested. Potential participants were first identified by their otolaryngologists at the Head and Neck Surgery Clinic and/or the Head and Neck Multidisciplinary Tumor Board at London Regional Cancer Program (LRCP) at the London Health Sciences Centre, Victoria Campus, London, Ontario. This sample, therefore, may be considered as a sample of convenience based on the willingness of individuals to participate following a request by their physician and subsequent follow up by the primary investigator. Prior to undertaking this study, the Ethics Review Board at The University of Western Ontario approved this protocol; REB Approval # 104504 (see Appendix A).

Inclusion Criteria. In order to be considered for inclusion in this study, participants had to be between 20 and 80 years of age. They also must have received a confirmed diagnosis for a primary malignancy of the head and neck region excluding skin cancer (i.e., basal cell carcinoma, squamous cell carcinoma or melanoma). At the time of participation
individuals were required to be within zero (i.e., point of diagnosis) and 24 months post-diagnosis. All individuals were required to be native English speakers.

Exclusion Criteria. Individuals who were younger than 20 years of age or greater than 80 years of age were excluded from consideration. Similarly, individuals with recurrences of their HNCa, distant metastasis, or with a new primary cancer in any other anatomical site(s) beyond the head and neck region were excluded since these factors may have influenced their current perceptions of fatigue and/or QOL. If individuals were unable to read and speak English or were unable to visually see the questionnaires they were excluded since the tasks involved in this study required participants to read and understand the questionnaires in English.

Measurement Instruments

Four validated, self-report, scaled response questionnaires were used in this study. Two of the questionnaires were designed to address perceived QOL: the European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) and the EORTC site specific HNCa module (QLQ-H&N35) (Aaronson et al., 1993). The EORTC-QLQ-C30 is the core questionnaire consisting of 30 items, five associated functional scales (physical, role, emotional, cognitive, and social functioning), three symptom scales (pain, fatigue, and nausea/vomiting) and a measure of global health status (Aaronson et al., 1993). Responses for items are recorded on a 4-point Likert scale ranging from 1 (not at all) to 4 (very much). The core instrument has been validated in diverse samples of oncology populations within North America and Western Europe (Aaronson et
al., 1993; Bjordal & Kaasa, 1992; Hjermstad, Fossa, Bjordal, & Kaasa, 1995; King, Dobson, & Harnett, 1996; Sherman et al., 2000). Overall, the core measure has demonstrated strong psychometric properties including reliability, validity and sensitivity to change (Bjordal & Kaasa, 1992; Sherman et al., 2000). Specifically, evaluations of test validity and reliability have determined that all scales consistently show Cronbach’s alpha coefficients of > 0.70 (Bjordal & Kaasa, 1992). Consequently, the EORTC-QLQ-C30 is a suitable measurement instrument for use in the current research project.

The EORTC site specific module (QLQ-H&N35) was administered alongside the core questionnaire in order to provide a comprehensive assessment of the individual’s difficulties (Sherman et al., 2000). The EORTC-QLQ-H&N35 contains 35 items further divided into seven subscales (pain, swallowing, senses (taste and smell), speech, social contact, social eating, and issues pertaining to sexuality). Completion of both the core questionnaire and the HNCa module are anticipated to take less than 20 minutes (Bjordal & Kaasa, 1992).

Overall, the EORTC-QLQ-H&N35 module has demonstrated strong psychometric properties including reliability, validity and sensitivity to change (Bjordal & Kaasa, 1992) (Sherman et al., 2000). Specifically, evaluations of test validity and reliability have determined that all scales consistently show Cronbach’s alpha coefficients of > 0.70 (values ranged from 0.75 to 0.95), with the exception of the senses scale which demonstrated a coefficient of 0.54 in one study (Sherman et al., 2000) and 0.68 in another (Bjordal & Kaasa, 1992).

The two fatigue measures used were the Fatigue Symptom Inventory (FSI) (Hann et al., 1998) and the Multidimensional Fatigue Inventory (MFI-20) (Smets, Garssen, Bonke, &
The FSI is a 13 item self-report measure designed to measure the intensity and duration of fatigue and its impact on QOL (Hann et al., 1998). This questionnaire was originally validated with a group of women undergoing treatment for breast cancer, completed treatment for breast cancer and health controls, where it was found to be a valid and reliable measure of fatigue in individuals with cancer and healthy individuals (Hann et al., 1998). The MFI-20 is a 20-item self-report instrument designed to measure fatigue. It covers the following dimensions: General Fatigue, Physical Fatigue, Mental Fatigue, Reduced Motivation and Reduced Activity (Smets et al., 1995). The instrument was found to have good internal consistency, with an average Cronbach’s alpha coefficient of 0.84 (Smets et al., 1995). Each of these fatigue measures were selected for their multidimensional lens, as they both identify the non-physical components of fatigue.

Procedure

Potential participants were initially identified by their otolaryngologists either during initial consult or follow up appointment and in accordance with the inclusion/exclusion criteria. Once participants were identified, the otolaryngologist introduced the study to the potential participant and asked if the individual would be interested in hearing more about the study from the researcher. Interested parties were presented with a letter of information including a brief description of the study. If participants remained interested, they were presented with the pre-addressed/pre-stamped mail return package of questionnaires. All participants provided informed consent in accordance with the Research Ethics Board guidelines at our institution.
Packages containing a demographic questionnaire, EORTC general QOL assessment tool (EORTC-QLQ-C30), EORTC HNCa specific tool (EORTC-QLQ-H&N35), fatigue symptom inventory (FSI), and the multidimensional fatigue inventory (MFI-20) were given to individuals. Participants were given the option of completing the surveys onsite or at home with return by mail via a provided pre-addressed/pre-stamped envelope. This package was accompanied with a formal letter of information as per ethical guidelines. The letter of information informed the participant of the general purpose of the study, the risks and benefits associated with participating in the study, and also that their willingness to participate would not influence the outcome of their medical treatment. If an individual agreed to participate in the study, they were assigned a coded participant number (i.e., F001) at the outset and were assured that they would not be personally identified in any way other than by the primary researcher and her supervisor. This participant code would then be recoded into an encrypted file only accessible by the research team.

Consecutive selection was utilized and 107 participants initially provided consent and received packages. Fifty-five individuals returned completed surveys resulting in a 51% return rate.

Participants also were followed at 3, 6, and 9 months relative to the time of enrolment. At each of these time points participants were sent a follow-up letter, the four measurement instruments and a pre-prepaid, pre-addressed envelope for return; 39/55 participants (71%) returned packages at 3-months time, 25/34 at 6 months (74%), and 14/17 at 9 months (74%). As part of the design, an arbitrary cut-off point was established, after which time data collection ceased. Therefore, the changing denominator at each of the
time periods noted above is indicative of the number of participants eligible (remained disease free and an appropriate time had elapsed post enrolment) at the cut-off time point.

Data Analysis

Each participant’s scores were calculated according to the recommended guidelines for each of the measures. Global QOL, fatigue and five functioning scales were assessed from the EORTC QLQ-C30. Symptom scores were also assessed from the EORTC-H&N35. Additionally, a single fatigue score from the FSI and 5 sub-scores of fatigue from the MFI-20 were assessed. Raw data from the current study were analyzed using SPSS 16.0 for Windows (SPSS Inc., 2008). All scores were submitted to correlational analysis to determine potential relationships across the measures obtained (FSI overall measure of fatigue, MFI-20 subdimensions of fatigue, EORTC-QLQ-C30 overall QOL measure). A Mann-Whitney test was performed to compare males and females. As a non-parametric test, the Mann-Whitney does not require that the groups under analysis be the same size (Portney & Watkins, 2000). Because the final male/female distribution in this study was unbalanced (40/15), the Mann-Whitney served as an alternative to the t-test. A Kruskal-Wallace was used to compare the various time-points (i.e., initial assessment, 3-month, 6-month and 9-month groups). Descriptive statistics were calculated for the demographic data, individual items, and the global and specific domains of each questionnaire (i.e., FSI, MFI-20, EORTC-QLQ-C30, EORTC-QLQ- H&N35). Associations between these outcome measures and participant characteristics (i.e., cancer site, time since diagnosis and treatment modality) also were assessed.
The presence of fatigue was assessed directly using the overall score from the FSI. A cutoff of >39 was used to identify clinically meaningful fatigue. This cutoff score was initially established by Donovan et al. (2008) in a study comparing the sensitivity and specificity of the FSI to the previously established cutoff using the Medical Outcomes Study: 36-Item Short Form Survey Instrument (SF-36) vitality scale (Ware et al., 2000). Donovan et al. found a mean score of >3 to identify clinically meaningful fatigue using the FSI (Donovan et al, 2008).
CHAPTER 3

Results

In the sections to follow, results will be presented in sequential fashion for the FSI overall score, EORTC Global QOL, and the five subdomains of the MFI-20 (general, physical, reduced activity, reduced motivation and mental). Initially, observational comparisons were evaluated for with consideration of participant age, time since diagnosis, cancer site and treatment modality. Secondly, Mann-Whitney U-tests, comparing genders, were completed for the FSI overall score and the EORTC Global QOL. Thirdly, a Kruskal-Wallace test was used to assess the 4 time-point subgroups (initial assessment, 3-month, 6-month and 9-month follow up). Finally, correlation analysis was completed among all scores considered to be relevant to the topic (all fatigue and QOL scores).

Response Rates

In total, 110 individuals were identified as potential participants for this investigation. Of the 110 potential participants identified, 107 consented to participate. The 3 participants who chose not to participate did so because they indicated that they were either too busy or not interested. The 52 individuals that consented to participate, but did not return the study package consisted of 39 males and 15 females. Fifty-five individuals (40 males, 15 females) returned the completed questionnaire package. The overall response rate was 51%. Comprehensive demographic data on all participants including age, time (in months) since diagnosis, cancer site, and marital status for these participants are presented in Table 2.
Demographic Information

**Gender.** In total, the 40 male (mean age = 64.48, range = 46-79) and 15 female (mean age = 51.13, range = 28-72) adults served as participants and this resulted in a male-to-female ratio of 2.6:1. Unfortunately, this ratio was not reflective of the current incidence rates of HNCa in Canada (Canadian Cancer Society, 2014).

**Time since diagnosis.** The length of time since participants had received their diagnosis ranged from 0 to 24 months (mean = 11.2). Comprehensive data pertaining to the distribution of time since diagnosis for participants can be found in Figure 1.

**Cancer site.** Distribution of HNCa sites was variable in the current participant sample. However, this variability is characteristic of a sample of convenience drawn from a large regional cancer centre as was the case in the present investigation. The majority of participants (25) were diagnosed with oral cancer, further divided into oral cavity (n = 14), tongue (n = 10) and lip (n = 1); other sites included the larynx (n = 11), oropharynx (n = 6), thyroid (n = 5), and other sites (n = 8). For sites that were classified as “other”, the participants presented with malignancies of the parotid gland (n = 3), neck (n = 4) and ethmoid sinus (n = 1). More specific data segmented by sex are outlined in Table 2.

**Marital status.** The majority of participants (n = 36) reported that they were married. Other responses were variable with participants indicating that they were divorced (n = 4), separated (n = 1) widowed (n = 3), single (n = 2) or in a common-law relationship (n = 9). Once again, these data segmented by sex are presented in Table 2.
Presence of Fatigue

From the sample of 55 participants, 30 reported elevated levels of fatigue based on an FSI score \( \geq 39 \). In addition, 11 of the 15 females (73%) and 19 of the 30 males (63%) reported experiencing fatigue as assessed by the FSI. The FSI categorizes fatigue into several categories (i.e., Mild, Moderate, and Severe) and this categorization is based on the overall score generated. Sixteen participants (11 males, 5 females) reported mild fatigue, 7 (3 males, 4 females) reported moderate fatigue and 7 (5 males, 2 females) reported severe levels of fatigue. For the 30 individuals that expressed a clinically significant level of fatigue as indicated by a FSI score \( \geq 39 \), the mean score was 66.8 (reflective of moderate fatigue). Specifically, the mean FSI score for females was 70.9 (moderate fatigue) and the mean FSI score for males was 64.4 (mild fatigue).

When specific HNCa sites are isolated in the present dataset, there was some variability in scores obtained. Cancer sites were divided into the following five groups: larynx, oral cavity, oropharynx, thyroid and other. Using the cutoff score established by Donovan et al. (2008) our study identified 5/11 (46%) participants with laryngeal cancer, 12/25 (50%) with an oral cavity cancer, 4/6 (66%) with a cancer of the oropharynx, 5/5 (100%) of those with thyroid cancer, and finally 4/8 (50%) with a HNCa that did not fall into one of the previous 4 categories as having clinically significant levels of fatigue. When sub-sites were grouped together, 30/55 (55%) exhibited clinically meaningful fatigue. These results are presented in Figure 3.

Effects of Gender

When the independent variable (gender) and the dependent variable (fatigue as
assessed using the FSI) were evaluated, the effect of gender on fatigue was not found to be statistically significant (U = 226, \( p \leq .162 \)). Furthermore, when gender and QOL (as assessed with the EORTC - global QOL score) were evaluated, it was also found that results sorted by gender was not statistically different (U = 228.5, \( p \leq .171 \)). Both calculated U-values exceeded the critical value of 70 and as a result, gender did not significantly affect the participants self-assessments of fatigue or global QOL. Hence, for all further data analyses, male and female data were pooled.

**Correlational Assessment of Measures**

Relationships between the dependent variables of overall fatigue, subdomains of fatigue (including general, physical, reduced activity, reduced motivation and mental fatigue as measured by the MFI-20) and global QOL were assessed using correlational assessment. A significant correlation was found between overall fatigue and global QOL (\( r = -.714, p \leq .01 \)) and significant correlations were detected between QOL and each of the specific domains of fatigue (e.g., general, physical, reduced activity, reduced motivation and mental). According to Cohen's measure, the domains of general fatigue (\( r = -.650, p \leq .01 \)), physical fatigue (\( r = -.708, p \leq .01 \)), reduced activity (\( r = -.534, p \leq .01 \)), reduced motivation (\( r = -.480, p \leq .01 \)) and mental fatigue (\( r = -.569, p \leq .01 \)) all demonstrated large effects. The negative correlations that were identified (all scores of fatigue against QOL) indicate that there is an inverse relationship between fatigue and measures of QOL implying that as fatigue increases, one's perceived QOL decreases. Comprehensive data pertaining to the correlations between fatigue and QOL scores among participants are presented in Table 3.
Follow-up Results

Participants were followed at 3-month intervals (3, 6, and 9 months). 39 participants returned packages at 3-months, 25 at 6 months, and 14 at 9 months. A Kruskal-Wallace test was conducted to explore the impact of elapsed follow up time on overall fatigue (as measured by the FSI). Participants were assessed according to follow up time point (Group 1: initial assessment/point of contact, Group 2: 3-month follow up, Group 3: 6 month follow up, Group 4: 9 month follow up). No statistically significant difference was revealed in reported levels of fatigue across the four time points (Group 1, n = 55, Group 2, n = 37, Group 3, n = 27, Group 4, n = 14), χ2 (3, n = 133) = 4.11, p = .250. The median scores on the FSI overall fatigue measure of the four groups were 45, 33, 18 and 26.5, respectively.

Descriptive Statistics

The results from the EORTC-H&N35 revealed speech (symptom score (S.S.) = 32.1), less sexuality (S.S. = 33.3), dry mouth (S.S. = 40.53), sticky saliva (S.S. = 35) and coughing (S.S. = 35.1) to be the 5 most commonly reported symptoms. These five symptoms also had the highest symptoms scores, with a higher score indicating an increasing level of symptomology/problems. The results from the EORTC-H&N35 are presented in Figure 2.
Table 2: Demographic Information of Participants

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<th>Women (n)</th>
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<tr>
<td>Age (years)</td>
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<td>Mean 51.13 (Range: 28-72)</td>
<td>Mean 60.8 (Range: 28-79)</td>
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<td>Mean 8.58 (Range: 0-21)</td>
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<td>25</td>
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<tr>
<td><em>(14), tongue (10), lip (1)</em></td>
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Table 3: Correlations Between Fatigue and QOL

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<th>MFIRM</th>
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<th>FSI</th>
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*p<0.01 level (2-tailed)

MFIG = General fatigue (MFI-20)
MFIP = Physical fatigue (MFI-20)
MFIRA = Reduced Activity (MFI-20)
MFIRM = Reduced Motivation (MFI-20)
MFIM = Mental fatigue (MFI-20)
FSI = Fatigue Symptom Inventory
QOL = Quality of Life (EORTC-QLQ-C30)
Figure 1: Heterogeneous distribution of the time since diagnosis of participants.

Figure 2: Results from the EORTC-H&N35
Summary

The sample used in this study was one of convenience and proved to be heterogeneous with respect to gender, cancer site, and time since diagnosis. There was not a statistically significant difference in the perception of fatigue or QOL between men and women. Further, there was not a statistically significant difference between the initial assessment, 3-month, 6-month, and 9-month follow up groups in their perception of fatigue. There did prove to be a strong correlation between fatigue and QOL, such that as one’s fatigue increased, one’s coinciding QOL rating decreased.
CHAPTER 4

Discussion

The present study was designed to address four questions specific to fatigue in individuals diagnosed with HNCa. Those specific questions were:

(1) What is the overall presence of fatigue in a sample of individuals diagnosed with HNCa;

(2) What is the relationship between level of fatigue and overall QOL among individuals diagnosed with HNCa;

(3) Does gender influence perceived fatigue and/or QOL among individuals with HNCa; and

(4) How does the perception of fatigue evolve over a three month interval follow-up.

In the sections to follow, information on a variety of issues emerging from the study will be addressed. Discussion will commence by addressing the outcome of the each of the four research objectives. This will be followed by a discussion on the response rates and participant demographics (e.g., time since diagnosis, marital status, occupational status). Next, a discussion of the results of statistical analysis tests (i.e., presence of fatigue, effects of gender, correlational assessment of measures). Factors that influence fatigue in the HNCa population and the clinical implications related to the identification of heightened fatigue will also be explored. Finally, the limitations of the present study will be outlined and followed by directions for future research and overall conclusions.
Findings Specific to Research Objectives

With respect to the first question, clinically meaningful fatigue as defined by a score of 3 or more on the FSI scale was identified in 55% (n=30) of the 55 participants. Stasi et al. (2003) report fatigue as the most commonly reported symptom by individuals with cancer and found fatigue to be present in 50-75% of individuals at time of diagnosis, with the highest reported levels of fatigue (80-96%) in those undergoing chemotherapy. The participants in this study are heterogeneous in their time since diagnosis, cancer site, and treatment course. The discovery of clinically significant fatigue in over half of the participants in the present study would appear to be within the 50-75% range defined in the literature (Stasi et al., 2003). The present study was based on a sample of convenience for those with a diagnosis of HNCa, however; the sample group would appear to be characteristic of a sample of convenience drawn from a large regional cancer centre.

Relative to the second research objective that explored the relationship between fatigue and overall QOL, it was determined that there is a significant inverse relationship between fatigue scores and global QOL scores. All subdomains of fatigue (general, physical, reduced activity, reduced motivation and mental) were found to have a strong correlation with perceived QOL. It was found that as the fatigue level of an individual increases, the perceived QOL of the same individual decreases. CRF has been acknowledged as having more of a negative impact on individuals’ ADLs and QOL than other cancer-related symptoms, including pain, depression, and nausea (Curt et al., 2000; Stone et al., 2000; Vogelzang et al., 1997). Furthermore, Curt et al. (2000) found that fatigue had an additional emotional effect on individuals, with the majority (90%) reporting the sense of a loss of emotional control, 74% reporting feelings of isolation and solitude, and 72% reporting
feelings of dejection. There are clearly multiple ways in which fatigue interacts with and potentially causes a deterioration of one’s overall QOL.

The third research question assessed whether the gender influences one’s perceived fatigue and/or QOL. It was determined that gender did not appear to have significant effect on either global QOL or fatigue. However, the lack of detectable difference may be due to the limited sample size of the present study. Therefore, the external validity of the present data must be considered.

Relative to the fourth and final research question that addressed how fatigue may evolve over time, it was determined that there was not a statistical significance between the mean levels of fatigue from the four assessment points. These four assessment points included initial assessment of fatigue, occurring when the participant originally enrolled in the study. At the time of enrollment, a participant could be anywhere in the first 24 months post diagnosis. The three following assessment points occurred at 3, 6 and 9 months post enrollment. The lack of significant different between the four assessment points speaks to the persistence of the symptom.

**Participant Demographics**

Participants in this study included both men and women between the ages of 28 and 80 who had received a diagnosis of HNCa within the previous 24 months. This group was chosen because it contains those in early and late adulthood, excluding those under 18 as they may have additional, separate concerns. Based on these inclusionary/exclusionary guidelines, the population accrued was considered to be one of convenience. Such a sample was deemed most appropriate given the dearth of information on those with HNCa. Thus,
the present data serve as a relatively representative sample of those who fall within the broad diagnostic category (i.e., those with HNCa).

*Time since diagnosis.* Mean length of time post-diagnosis was 11 months, however, values ranged from 0 to 24 months. The within 24-months of diagnosis timeline criterion was selected because it enveloped the period of diagnosis, treatment and rehabilitation. It is during this period that individuals may be faced with myriad challenges as they attempt to cope with their diagnosis, active treatment, and the subsequent challenges that follow (Mehanna et al., 2008). Additionally, a number of studies in the HNCa literature have demonstrated that along the continuum of illness, individuals’ QOL declines significantly during treatment and begins to increase again around the period of three to six months post-diagnosis (Mehanna et al., 2008; Morton, 2003; Nordgren et al., 2006). At the three to six month time point post-diagnosis, the majority of treatment may be finished and one may begin to regain some normalcy in routine. Including this entire time period in our assessment may reveal the specific intricacies of fatigue throughout cancer diagnosis, treatment and rehabilitation.

*Cancer site.* Distribution of HNCa sites was variable in the current participant sample. However, this variability is characteristic of a sample of convenience drawn from a large regional cancer centre as was the case in the present investigation. The majority of participants (45%) had cancers arising from the oral cavity (i.e., tongue, palate, lip). Other sites included larynx (20%), oropharynx (11%), thyroid (9%) and other (15%). A similar level of heterogeneity in participant demographics, fatigue scores, and QOL ratings were discovered across all groups; additionally, fatigue was identified across all sites assessed.
Marital status. Regarding marital status, the majority of participants in the present study reported that they were currently married. The importance of the marital status of participants is related to the contribution of a potentially supportive relationship to levels of perceived and actual social support. Married individuals have been found to report less distress and show better overall adjustment when compared to unmarried individuals (Kugaya et al., 2000). In considering the relationship between distress, fatigue and QOL (Seo et al., 2010), it could be hypothesized that this level of personal support may also interact with one’s perceived fatigue. This finding is not definitive, and further exploration with larger populations is warranted and encouraged.

Occupational status. With respect to occupational status, most participants indicated that they were presently retired. The mean age of participants was 61, making the finding of retirement unsurprising. Several studies have found that a diagnosis of cancer prior to or shortly after retirement brings with it added burden (Ganz et al., 2002; Relic, Mazemda, Arena, Koller & Glanz, 2001). The interplay of retirement and the diagnosis/treatment of cancer is not entirely known. For example, one report in the HNCa literature found retirement to have no effect on the treatment of an individual (Rogers, Hanna, Lowe & Magennis, 1999). Therefore this burden may be related to unanticipated financial costs incurred with treatment, such as those associated with transportation, uninsured pharmaceuticals, and peripheral comfort items, among others.

Presence of Fatigue

Overall, fatigue was detected in 55% of those who participated in the current study. Previous research in oncology has identified CRF to be present in 76-99% of cancer
survivors (Curt et al., 2000; Vogelzang et al., 1997). In considering this percentage, fatigue levels identified in the present study may be either underreported or underrepresented. Due to the subjective nature of fatigue and the variability in assessment measures used, it is difficult to compare this incidence to a greater population. Despite the heterogeneity in participant demographics of the present study, these results may not be generalizable to the greater HNCa population. Further, the constraints on inclusion criteria (such as the exclusion of those with a previous cancer diagnosis) may limit the external validity of this study.

When specific HNCa sites are isolated in the present dataset, there was some variability. Using the cutoff score established by Donovan et al. (2008) our study identified 5/11 (46%) with laryngeal cancer, 12/25 (50%) with an oral cavity cancer, 4/6 (66%) with a cancer of the oropharynx, 5/5 (100%) of those with thyroid cancer, and final 4/8 (50%) with a HNCa outside the previous 4 categories as having clinically significant levels of fatigue. With the exception of the thyroid cancer subgroup, all other sites had consistent fatigue results, with about half of each group reporting fatigue. The amplified fatigue in the thyroid cancer group is likely due to the additive impact of potential hormone imbalance. Studies on withdrawal of thyroid hormone therapy withdrawal have revealed detrimental to QOL and fatigue. For example Meier et al. found that 94% of individuals with thyroid cancer experienced increased fatigue and 89% reported decreased vigor and activity after T3 withdrawal. Regardless of the etiology of the heightened fatigue in the thyroid cancer subgroup, this result may be influenced by the small sample size of this subgroup. The thyroid cancer subgroup was the smallest of the cancer site groups assessed. The other
cancer site subgroups showed consistent results between themselves (all around the 50% mark) and also consistency with the overall presence of fatigue found (55%).

*Effects of Gender*

Relative to the third research objective, which assessed whether the gender of an individual influenced their perceived fatigue, the present study found that gender did not appear to significantly influence either fatigue or QOL. This study had a male-to-female ratio of 2.6:1. This is not representative of the current HNCa ratio. Even if all 107 interested participants had returned the study package, the male-to-female ratio would have remained above the current Canadian statistic at an inflated ratio of 2.8:1. The current Canadian male-to-female ratio in HNCa is 1.2:1. With a larger representation of females, in line with current cancer statistics, perhaps a detectable difference in fatigue scores would be revealed. It also may be the case that men and women perceive fatigue differently. 

Hofman et al. (2007) report on the impact of fatigue on both family and societal roles. Men and women arguably perceive themselves to have different and unique family and societal roles. For instance, women may experience changes in physical abilities that may impede their capacity to work, function independently, care for family members, complete household tasks, etc. (Eadie, Doyle, Beaudin, White, & Myers, 2004). With this in mind, it could be hypothesized that men and women may handle these familial and societal impacts procured by fatigue differently. These familial and societal impacts are not only related to gender, but also age and family status. For example, a single 25-year old woman would likely consider to have different societal and familial responsibilities than a married 40
year old woman with children. The present study did not show any significant differences between genders.

The demographic results of the present study revealed heterogeneity in cancer site, time since diagnosis, occupational status, age and gender. These results are consistent with a sample of convenience drawn at a large tertiary centre. With the exception of the thyroid cancer sub-site, the cancer site, time since diagnosis, nor gender appeared to be a strong determinant of one’s perceived fatigue. It is critical to assess the interplay between these demographic variables as they may frame the statistical analysis to follow.

Correlational Assessment of Measures

Correlations between overall fatigue, the specific domains of fatigue (e.g., general, physical, reduced activity, reduced motivation, and mental) and global QOL, were found to have significant correlations. That is, according to Cohen’s rule of thumb with effect sizes, all subdomains of fatigue were found to have a large effect on QOL.

The inverse relationship between fatigue and QOL highlights the parallels drawn between the two concepts earlier in this paper. That is, both fatigue and QOL are individual and subjective evaluations that are dynamic in nature and, consequently, likely to change over time in response to a variety of factors. Both QOL and fatigue represent multidimensional constructs that incorporate physical, psychological and social domains. Further, these physical, psychological and social domains are ultimately overlapped and complementary for both fatigue and perceptions of QOL. The present study showed a significant negative correlation with a large effect size for fatigue and general QOL (as measured by the EORTC-QLQ-C30). Specifically, as one’s fatigue increased, their coinciding
QOL scores decreased. This finding supports the relationship between fatigue and QOL in the literature. Fatigue can directly impact one's ability to complete ADLs. The lack of ability to complete ADLs can in turn diminish QOL including socializing, the ability to enjoy life and emotional well-being. (Curt et al., 2000; Hjermstad et al., 2006; Nail & Jones, 1995; Vogelzang et al., 1997).

The present study revealed a direct negative correlation between fatigue and QOL. The finding echoes the sentiments of previous findings in the literature (Curt et al., 2000; Hjermstad et al., 2006; Nail & Jones, 1995; Vogelzang et al., 1997). Not only was overall fatigue negatively correlated with QOL, but each of the subdimensions of fatigue (as measured by the MFI-20) were also negatively correlated with QOL. This relationship may be the product of the physical effects of fatigue on ADLs and the supplemental impact of diminished ability to perform ADLs on one’s QOL. However, there may be additional bidirectional pathways involved in the relationship between fatigue and QOL. The EORTC H&N35 site-specific QOL module may aid in revealing the interplay between fatigue and QOL. For example, in the present study, the H&N35 module revealed dry mouth and sticky saliva as two of the most commonly cited concerns. This may implicate challenges with nutrition and subsequent lethargy and physical fatigue.

Follow-up Results

Participants were followed at 3-month intervals (3, 6, and 9 months). 39 participants returned packages at 3-months, 25 at 6 months, and 14 at 9 months. A Kruskal-Wallace test was conducted to explore the impact of elapsed follow up time on overall fatigue (as measured by the FSI). Participants were assessed according to follow up
time point (Group 1: initial assessment, Group 2: 3-month follow up, Group 3: 6 month follow up, Group 4: 9 month follow up). No statistically significant difference was revealed in level of fatigue across the four time points ($p = .250$). That is, fatigue may not differ appreciably regardless of the passage of time. The 9-month follow-up assessment group had participants ranging from 11-27 months post diagnosis. Now years out from their diagnosis and treatment, individuals still reported feeling fatigued. This aligns with previous work suggesting that CRF has been reported throughout the course of malignant disease. The findings of the present study revealed that participants expressed symptoms of fatigue into the period substantially beyond termination of treatment. Specifically, CRF has been documented at point of diagnosis, during therapy and up to years post completion of treatment (Curran et al., 2004; Swartz et al., 2000). At the present time, the majority of longitudinal research on the persistent effects of fatigue has been conducted in the realm of breast cancer. This research hypothesized that some type of chronic inflammatory processes may contribute to the persistent fatigue experienced by survivors of breast cancer (Bower et al., 2003). Specifically, it was found that a T-cell mediated inflammatory process is driving fatigue (Bower et al., 2003). In simpler terms, a delayed viral infection related to treatment may be the driver behind cancer-related fatigue (Bower et al., 2003). This hypothesis may extend across cancer types/sites and may explain the cancer-related fatigue found in the present study with individuals with HNCa.

**Descriptive Statistics**

The results from the EORTC-H&N35 revealed speech, less sexuality, dry mouth, sticky saliva and coughing to be the 5 most affected symptoms. These five symptoms had
the highest symptoms scores, with a higher score indicating a high level of symptomology/problems. All five of these symptoms are in someway related to the functional and anatomical integrity of the mouth region. Because many of one's functions related to survival (breathing and nutrition/hydration intake) are dependent on anatomical integrity, as well as quintessential human activity of verbal communication, it is not surprising that these areas proved to be cumbersome for participants.

Measurement Instruments

The EORTC-QLQ-C30 was used as the QOL measure for the present study. The core instrument has been validated in diverse samples of oncology populations within North America and Western Europe (Aaronson et al., 1993; Bjordal & Kaasa, 1992; Hjermstad, Fossa, Bjordal, & Kaasa, 1995; King, Dobson, & Harnett, 1996; Sherman et al., 2000). Overall, the core measure has demonstrated strong psychometric properties including reliability, validity and sensitivity to change (Bjordal et al., 2000; Sherman et al., 2000). Specifically, evaluations of test validity and reliability have determined that all scales consistently show Cronbach’s alpha measures of > 0.70 (Bjordal et al., 2000). Therefore, this measure is quite suitable for a project of this nature.

While it is important to address general QOL issues that may be relevant to most individuals diagnosed with cancer, there are a number of disease-specific issues that arise and need to be addressed. This is particularly significant when assessing QOL issues among those with HNCa. With this in mind, the creators of the EORTC-QLQ-C30 stipulated that the core instrument was intended to be used in conjunction with an accompanying site-specific module, in order to provide a more comprehensive assessment of individual's difficulties
Studies confirm that both general and site-specific measures each contribute unique and important information regarding QOL (D’Antonio, Zimmerman, Cella & Long, 1996; Gliklich, Goldsmith, & Funk, 1997). D’Antonio et al. (1996) found that a general QOL measure (FACT-G) and disease-specific instruments each contributed unique information. Further, this study acknowledged that the site-specific measure of functional status pertaining to speech and recreation/entertainment for the participants in this study would not have been appreciated if these scores had not been interpreted in the larger context of the participants’ general QOL (D’Antonio et al., 1996). Gliklich et al. (1997) echoed these sentiments and agreed that unique aspects of head and neck illness are not adequately assessed by a general health measure. This conclusion was based on a lack of correlation between subscale results with the general measure, as well as the inadequate assessment of eating/swallowing and speech/communication on the general QOL assessment instrument (Gliklich et al., 1997).

The EORTC-QLQ-H&N35 (Aaronson et al., 1993) was designed for this purpose as a site-specific module for HNCa. It has been one of the most widely tested disease-specific QOL measures for oncology populations (Bjordal et al., 2000). A recent methodological review by Singer et al. (2013) highlighted the worldwide use of this site-specific module as well as the broad cross-cultural acceptance. In total, the head and neck module contains 35 items divided into seven multi-item scales that assess pain, swallowing, senses (taste and smell), speech, social contact, social eating, and issues pertaining to sexuality (Aaronson et al., 1993).
The two fatigue measures used in this study were the Fatigue Symptom Inventory (FSI) (Hann et al., 1998) and the Multidimensional Fatigue Inventory (MFI-20) (Smets, Garssen, Bonke, & de Haes, 1995).

**Fatigue in the Head and Neck Cancer Population**

The diagnosis of HNCA carries with it a unique set of challenges that potentially exceed those associated with other sites of cancer (Semple, Sullivan, Dunwoody, & Kernohan, 2004). Irrespective of treatment modality, individuals diagnosed with HNCA face a distinct set of treatment-related challenges related to communication, emotional expression, social interaction, and/or physical function. Further, individuals treated for HNCA may experience significant changes to their appearance and functional capacity of this anatomical region. Changes in one’s anatomy or subsequent functioning can have devastating consequences (Vickery, Latchford, Hewison, Bellew, & Feber, 2003). In addition, these significant changes may have a lifelong impact. These changes are not limited to changes with oral mucus, mouth/throat sores, tasting food, difficulty with chewing or swallowing, dry mouth, pain, and fatigue (Rosenthal et al., 2007). HNCA brings with it added challenges in attaining proper daily nutrition and hydration levels. These nutrition challenges may act synergistically fatigue, causing a greater detriment to the individual. Gaining an understanding of the associated morbidities of HNCA is imperative to develop targeted treatment and rehabilitation.

With knowledge of the scope, significance and interaction of fatigue with the various morbidities of HNCA and its treatment, targeted rehabilitation may be possible. As both a frequently reported symptom and a critical element in many symptom clusters, fatigue may serve as a marker of symptom burden for those with HNCA. Fatigue-correlated symptoms
may be addressed alongside fatigue. Considering these fatigue associated symptom clusters, the concurrent effects of alleviating one’s fatigue is significant. Considering this and its close tie to QOL, the impact of fatigue cannot be underestimated.

In summary, fatigue may exist as a critical factor relative to QOL in the HNCa population. At this point, fatigue is frequently assessed as part of general QOL measures, but less frequently isolated in oncology research. In further implementing fatigue specific screening into HNCa rehabilitation, a better sense of the scope, significance and interaction of fatigue with the various morbidities of HNCa may be established. This information would be vital in facilitating more positive rehabilitation outcomes for individuals with HNCa regardless of their point in the post-diagnosis trajectory.

*Limitations to the Present Study*

First, as with any research project, certain limitations must be considered. The sample size was composed of 40 men and 15 women, thus, the ratio of men-to-women was not representative of current Canadian statistic related to the incidence rates of HNCa. Given the small sample size, it is unknown whether these results are generalizable to the greater head and neck population in Canada. However, despite this limitation it is important to acknowledge that the current data do suggest that fatigue is an important issue for those with head and neck cancer. Consequently, the present data would appear to support the suggestion that active clinical efforts to gather information on the potential presence of fatigue may be of benefit. In such instances, intervention may occur in a timely fashion with the resultant likelihood of reducing the overall impact of fatigue on perceived QOL.
Second, this sample was drawn as one of convenience. As such, sampling is inherently simply defined by the characteristics of the volunteer respondents that comprise the convenience sample of this institution. These volunteer respondents may possess intrinsic differences as compared to those that did not volunteer for such a study. For example, those who volunteered may have felt better, possessed a greater amount of optimism for the future or received a better prognosis as compared to those who did not. As a mail return study, there may also be intrinsic differences in those that chose to return the package as compared to those individuals that did not.

**Implications for Clinical Practice**

This study has theorized and statistically supported the dynamic relationship between fatigue and QOL in individuals diagnosed with HNCa. The relationship was theoretically depicted by Curt et al. (2000), specifically acknowledging fatigue limiting ADL’s and subsequently QOL. Additionally, the relationship between fatigue and QOL was highlighted with the large effect negative correlations in the present study.

The measures selected (FSI, MFI-20, and EORTC-QLQC30/H&N35) proved to be efficient and effective screening tools for a busy clinic environment. Any one could be used in sequence or in isolation in another otolaryngology clinic setting. This notion could be generalizable to other tertiary, secondary and primary care centres.

In order to respond to the consequences of fatigue among individuals with HNCa, it is imperative to first and foremost recognize its presence. Screening for fatigue at point to diagnosis (baseline) and throughout cancer treatment and rehabilitation may reveal important information about the individual’s recovery. Considering its appearance in
various symptom clusters, fatigue may emerge as an important symptom marker. If an objective metric of fatigue could be established, the link between fatigue and its correlates (pain, depression, anxiety) could be further solidified. It can be thought of as both complex and often multidirectional interplay between fatigue and fatigue-causing correlates (Hofman, 2007). Because of this significant overlay between fatigue, pain, depression, anxiety, and QOL, identification of causal relationships can be exceedingly difficult. Fatigue may bring with it a group of challenges and symptoms which in turn may amplify one’s perceived level of fatigue. It is hard to disentangle a phenomenon like fatigue from its correlates, and it may be that research on fatigue actually requires a more complex approach to better understand such a complex phenomenon. In targeting fatigue, perhaps other associated symptoms may also be impacted (i.e., pain, distress, depression, etc.). A greater understanding of the interplay between these associated symptoms would appear to be essential in developing targeted therapies to improve QOL and well-being of the HNCa population.

*Directions for Future Research*

The present study demonstrated that there is a relationship between fatigue and QOL. In addition, the study recognized that an individual’s psychological functioning (e.g., emotional and cognitive functioning) represents the facet of QOL that is most significantly and negatively influenced by fatigue among individuals with HNCa. Based on existing knowledge of the impact of fatigue on one’s QOL (Hofman et al., 2007), the ability to identify fatigue is essential within the context of clinical care for those with HNCa. With increased survivorship, it becomes exceedingly important to address QOL throughout cancer rehabilitation. Based on the present findings, the relationship between fatigue and
QOL may prove to be an important target in efforts to enhance the well-being of cancer survivors.

The early identification of fatigue would appear to be a critical factor as one seeks to optimize treatment and rehabilitation efforts. When considering the widespread scope of fatigue and its relationship to QOL as identified in the present study, it would appear that effective interventions are urgently needed. Considering the impact of fatigue on ADLs and accompaniment of other associated symptoms (i.e., depression, nausea, pain), fatigue would appear to pose a real and significant impact daily functioning and the individual’s subsequent perception of QOL. Because CRF can affect functional activities, limit one’s societal involvement and participation, and decrease QOL (Weis & Horneber, 2014) investigating its mechanism is not only warranted but imperative. Continued efforts to increase the knowledge of fatigue, association with other symptoms and alleviating factors would provide valuable insight to cancer care. The first step in this expansion of knowledge may in fact be developing a standardized definition that broadly encompasses all facets of fatigue (physical, emotional, cognitive, etc). Standardized screening measures (such as the FSI or MFI-20) and a validation of diagnostic criteria would appear to be a valuable starting point for future interventions.

Summary and Conclusions

This research project was designed to investigate and describe levels of fatigue and its relationship to QOL in individuals diagnosed with HNCa. Statistical evaluation of the present data from 55 adult participants living with HNCa data were conducted. Each participant completed a demographic questionnaire in addition to two validated measures.
of fatigue (FSI and MFI-20), a global QOL questionnaire (EORTC-QLQ-C30), and head and neck cancer-specific QOL questionnaire (EORTC-QLQ-H&N35).

Based on these data, fatigue may exist as a critical, yet frequently neglected factor that may directly influence QOL in those treated for HNC. ADLs, ability to walk, clean, run, diminish QOL including socializing, the ability to enjoy life and emotional well-being. (Curt et al., 2000; Hjermstad et al., 2006; Nail & Jones, 1995; Vogelzang et al., 1997). When one considers the potential impact of fatigue on general physical functioning and the ability to perform ADLs, fatigue is suggested as a critical factor relative to outcome. Consequently, fatigue due to cancer and its treatment poses a real and significant potential to impact daily functioning and the individual’s subsequent perception of QOL. This impact on functional activities may limit both personal and social roles in one’s community (Hofman et al., 2007). With the potential for such detrimental outcomes, fatigue requires careful consideration in the future of HNCa rehabilitation.
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Use of Human Participants - Initial Ethics Approval Notice

Principal Investigator: Dr. Philip Doyle
File Number: 104504
Review Level: Delegated
Protocol Title: Fatigue Screening in Individuals with Head and Neck Cancer
Department & Institution: Health Sciences/Communication Sciences & Disorders, Western University
Sponsor:
Ethics Approval Date: December 06, 2013 Expiry Date: December 31, 2015
Documents Reviewed & Approved & Documents Received for Information:

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This is to notify you that the University of Western Ontario Research Ethics Board for Health Sciences Research involving Human Subjects (HSREB) which is organized and operates according to the Tri-Council Policy Statement: Ethical Conduct of Research Involving Humans and the Health Canada/ICH Good Clinical Practice Practices: Consolidated Guidelines; and the applicable laws and regulations of Ontario has reviewed and granted approval to the above referenced revision(s) or amendment(s) on the approval date noted above. The membership of this REB also complies with the membership requirements for REBs as defined in Division 5 of the Food and Drug Regulations.

The ethics approval for this study shall remain valid until the expiry date noted above assuming timely and acceptable responses to the HSREB’s periodic requests for surveillance and monitoring information. If you require an updated approval notice prior to that time you must request it using the University of Western Ontario Updated Approval Request Form.

Members of the HSREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussion related to, nor vote on, such studies when they are presented to the HSREB.

The Chair of the HSREB is Dr. Joseph Gilbert. The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000940.

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This is an official document. Please retain the original in your files.
Title: Fatigue Screening in Individuals with Head and Neck Cancer

Study Investigators: Dr. Philip Doyle, Ph.D., Grace Scott B.A., M.Sc. (Candidate), Kevin Fung, B.Sc., M.D.

1. Introduction
You are being invited to participate in a research project investigating issues related to perceived fatigue and quality of life among individuals diagnosed with head and neck cancer. We are asking you to take part in this research study because you have been diagnosed with head and neck cancer and we are interested in how this experience may have impacted your quality of life and level of fatigue.

The purpose of this letter is to provide you with the information you require to make an informed decision on participating in this research. This letter contains information to help you decide whether or not to participate in this research study. It is important for you to understand why the study is being conducted and what it will involve. Please take the time to read this carefully and feel free to ask questions if anything is unclear or there are words or phrases you do not understand. You will be given a copy of this letter to keep for your records.

2. Purpose of Study
The purpose of this study is to investigate the impact of head and neck cancer on your perceived quality of life and level of fatigue. We are conducting this study in order to determine how the experience of living with head and neck cancer affects specific areas of your life (e.g., physical side effects, emotional strain, social isolation). We are specifically interested in understanding your perceived level of fatigue and how these areas influence your quality of life. This study will examine areas of concern affecting quality of life in 100 individuals who have been diagnosed with head and neck cancer. The specific questions to be addressed are:

a.) What is the overall presence of fatigue in a sample of individuals diagnosed with head and neck cancer and how does this rate compare to previous findings in the literature?
b) Is there a relationship between fatigue of perceived level and overall quality of life among individuals diagnosed with head and neck cancer?

c) Is there a relationship between fatigue level and specific domains of quality of life (e.g., physical, psychological, social) among individuals diagnosed with head and neck cancer?

This study represents a M.Sc. thesis project for one of the investigators (G.S.).

3. Activities Participants Will Take Part In
If you agree to participate, you will be given a package containing: one (1) page of demographic information (i.e., age, sex, marital status, etc.) to complete and four (4) questionnaires to complete regarding your personal feelings related to your quality of life and fatigue level in relation to your cancer. The questionnaires have been used before in research and include the Fatigue Symptom Inventory (FSI) to measure fatigue, the Multidimensional Fatigue Inventory (MFI-20) to measure fatigue, the European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Questionnaire (EORTC-QLQ-C30), and the EORTC Head and Neck module (EORTC-QLQ-H&N35), which measure your quality of life. The order of these questionnaires will be randomly assigned, and each questionnaire should be filled out according to the enclosed instructions. We anticipate that it will take approximately 15-30 minutes to complete these tasks. This will mark the first assessment of five (5) to be completed. Participants also will be mailed follow-up assessments after 3, 6, 9 and 12 months time. For some assessments, you may complete these at home and mail them to Dr. Doyle at Western University; If you desire to return your information via mail, you will be provided with a pre-paid and pre-addressed envelope for your ease in returning the questionnaires.

On four occasions (3, 6, 9 and 12 months follow up) after our initial meeting and obtaining your written consent during the first visit, participants will be mailed a package containing the same materials that were included in the initial assessment. The order of these questionnaires will once again be randomly assigned, and each questionnaire should be filled out according to the enclosed instructions in a location of your choosing (i.e., your home or private office). Additional pages will be provided for you to include any additional information you would like to share on the given subject.

Once you have completed all tasks, please place all of the completed material in the addressed and pre-paid envelope and place it in the mail to return the package to the investigators.

Please note that you will not be compensated for your participation in this research.

4. Exclusion Criteria
You will be excluded from participating in the study if you are younger than 20 or older than 80 years of age, if you have recurrence of your cancer, if you received your diagnosis more than 24 months ago, if you have cancer in any other areas of your body, if you do not
read/speak English, or if you are unable to see the questionnaires. These criteria are set because the investigators are trying to obtain information regarding the quality of life in individuals who are between 20 and 80 years of age and whose quality of life may have been affected by head and neck cancer, and who are not currently being treated for a recurrence or other cancers (as this may influence one’s current quality of life and/or fatigue level). Requirements regarding the ability to speak and read English as well as the ability to see are necessary, as the tasks involved in this study require participants to read and understand the questionnaires in English. If you are participating in another study at this time, please inform the researchers right away to determine if it is appropriate for you to participate in this study.

5. Possible Risks Involved
There are no foreseeable risks, harms, nor discomforts incurred from the participation in this study. However, you will be asked to complete questionnaires that may delve into sensitive topics affecting your quality of life and distress level and as a result you may experience negative emotions. If this occurs, we would request that you contact your physician, or a member of the research team should you require assistance in managing these negative emotions.

6. Possible Benefits Involved
There are no direct benefits to the research participants as a result of their participation in this study. However, as a result of their participation, participants may gain a better understanding of the different and specific areas affecting their overall QOL and fatigue level.

7. Voluntary Participation
Participation in this study is voluntary. You may refuse to participate, refuse to answer any questions or withdraw from the study at any time with no effect on your current or future medical care. You do not waive any legal rights by signing the consent form.

8. Confidentiality
All data collected will remain confidential. All personal identifying information will be removed from the data and your data will be identified by a code known only to the investigators. All data will be kept in a secure locked location at Western University. If the results are published, your name will not be used and no information that discloses your identity will be released or published without your explicit consent to the disclosure. Please note that representatives of The University of Western Ontario Health Sciences Research Ethics Board may contact you or require access to your study-related records to monitor the conduct of the research.

This letter is for you to keep.
APPENDIX C

Demographic Information Survey

Title: Fatigue Screening in Individuals with Head and Neck Cancer

Study Investigators: Dr. Philip Doyle, Ph.D., Grace Scott B.A., M.Sc. (Candidate), Kevin Fung, B.Sc., M.D.

Please read the following questions carefully and provide answers as accurately as possible. For multiple choice options, please circle all choices that apply to you. If no suitable options exist, please use the space provided to explain.

Sex:  M / F / Other

Age:  ________

Year of Birth: ________  Month of Birth: ________

Number of months since your diagnosis: ________

Are you still receiving treatment? Yes / No
If so, when is it scheduled to be completed? ________

Site of Cancer:

a) Oral cavity (ie. lip, tongue, cheek, tonsil, etc.)
b) Larynx (voice box)
c) Throat (ie. pharynx, hypopharynx, oropharynx)
d) Thyroid
e) Sinuses/Paranasal sinuses
f) Other

If “other”, please specify: ________________________________________________________________

Method of Treatment:

a) Surgery
b) Radiation therapy
c) Chemotherapy
d) Chemoradiation therapy
e) Other
If “other”, please specify: ____________________________________________________________

Marital Status (circle one):

a) Married
b) Separated
c) Divorced
d) Widowed
e) Common-law
f) Engaged
g) Single
h) Other

If “other”, please specify: ____________________________________________________________

Occupational Status:

a) Currently working – full-time
b) Currently working – part-time
c) Volunteer
d) Retired
e) Other

If “other”, please specify: ____________________________________________________________

Highest Level of Education Achieved:

a) Completed High school
b) Completed College
c) Undergraduate University degree
d) Post-graduate University degree
e) Other

If “other”, please specify: ____________________________________________________________

Please feel free to include any additional information that you feel is important specific to this project in the space provided below or on the opposite side of this document. Thank you.

________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
APPENDIX D

THE FATIGUE SYMPTOM INVENTORY

Please select the answers that most accurately reflect your fatigue during the past week.

1. Rate your level of fatigue on the day you felt most fatigued during the past week:
   0 = not fatigued at all  10 = as fatigued as I could be
   0 1 2 3 4 5 6 7 8 9 10

2. Rate your level of fatigue on the day you felt least fatigued during the past week:
   0 1 2 3 4 5 6 7 8 9 10

3. Rate your level of fatigue on the average during the past week:
   0 1 2 3 4 5 6 7 8 9 10

4. Rate your level of fatigue right now:
   0 1 2 3 4 5 6 7 8 9 10

5. Rate how much, in the past week, fatigue interfered with your general level of activity:
   0 = no interference  10 = extreme interference
   0 1 2 3 4 5 6 7 8 9 10

6. Rate how much, in the past week, fatigue interfered with your ability to bathe and dress yourself:
   0 1 2 3 4 5 6 7 8 9 10

7. Rate how much, in the past week, fatigue interfered with your normal work activity (includes both work outside the home and housework):
   0 1 2 3 4 5 6 7 8 9 10

8. Rate how much, in the past week, fatigue interfered with your ability to concentrate:
   0 1 2 3 4 5 6 7 8 9 10

9. Rate how much, in the past week, fatigue interfered with your relations with other people:
   0 1 2 3 4 5 6 7 8 9 10

10. Rate how much, in the past week, fatigue interfered with your enjoyment of life:
    0 1 2 3 4 5 6 7 8 9 10

11. Rate how much, in the past week, fatigue interfered with your mood:
    0 1 2 3 4 5 6 7 8 9 10

12. Indicate how many days, in the past week, you felt fatigued for any part of the day:
    0 1 2 3 4 5 6 7

13. Rate how much of the day, on average, you felt fatigued in the past week:
    0 = none of the day  10 = the entire day
    0 1 2 3 4 5 6 7 8 9 10

14. Indicate which of the following best describes the daily pattern of your fatigue in the past week:
    0 = no fatigue, 1 = mostly morning, 2 = mostly afternoon, 3 = mostly evening, 4 = no pattern
    0 1 2 3 4

0=No fatigue  36=Mild fatigue  65=Moderate fatigue  85=Severe fatigue  110+=Excessive fatigue
APPENDIX E

MFI® MULTIDIMENSIONAL FATIGUE INVENTORY
© E. Smet, B. Garsen, B. Bonke.

Instructions:

By means of the following statements we would like to get an idea of how you have been feeling lately. There is, for example, the statement:
"I feel relaxed"

If you think that this is entirely true, that indeed you have been feeling relaxed lately, please, place an X in the extreme left box; like this:

yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true

The more you disagree with the statement, the more you can place an X in the direction of "no, that is not true". Please do not miss out a statement and place only one X in a box for each statement.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 1 | I feel fit. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 2 | Physically, I feel only able to do a little. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 3 | I feel very active. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 4 | I feel like doing all sorts of nice things. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 5 | I feel tired. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 6 | I think I do a lot in a day. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 7 | When I am doing something, I can keep my thoughts on it. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 8 | Physically I can take on a lot. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 9 | I dread having to do things. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 10 | I think I do very little in a day. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 11 | I can concentrate well. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 12 | I am rested. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 13 | It takes a lot of effort to concentrate on things. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 14 | Physically I feel I am in a bad condition. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 15 | I have a lot of plans. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 16 | I tire easily. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 17 | I get little done. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 18 | I don't feel like doing anything. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 19 | My thoughts easily wander. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
| 20 | Physically I feel I am in an excellent condition. yes, that is true ☒ | ☒ | ☒ | ☒ | ☒ no, that is not true
APPENDIX F

EORTC QLQ-C30 (version 3)

We are interested in some things about you and your health. Please answer all of the questions yourself by circling the number that best applies to you. There are no "right" or "wrong" answers. The information that you provide will remain strictly confidential.

Please fill in your initials: __________
Your birthdate (Day, Month, Year): __________
Today's date (Day, Month, Year): 31 __________

<table>
<thead>
<tr>
<th>Question</th>
<th>Not at All</th>
<th>A Little</th>
<th>Quite a Bit</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do you have any trouble doing strenuous activities,</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>like carrying a heavy shopping bag or a suitcase?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Do you have any trouble taking a long walk?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. Do you have any trouble taking a short walk outside of the house?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. Do you need to stay in bed or a chair during the day?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. Do you need help with eating, dressing, washing yoursel</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>or using the toilet?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

During the past week:

<table>
<thead>
<tr>
<th>Question</th>
<th>Not at All</th>
<th>A Little</th>
<th>Quite a Bit</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Were you limited in doing either your work or other daily activities?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. Were you limited in pursuing your hobbies or other leisure time activities?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. Were you short of breath?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. Have you had pain?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. Did you need to rest?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11. Have you had trouble sleeping?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12. Have you felt weak?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13. Have you lacked appetite?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14. Have you felt nauseated?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15. Have you vomited?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16. Have you been constipated?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Please go on to the next page
During the past week:

17. Have you had diarrhea?  
   Not at All  A Little  Quite a Bit  Very Much  
   1  2  3  4

18. Were you tired?  
   Not at All  A Little  Quite a Bit  Very Much  
   1  2  3  4

19. Did pain interfere with your daily activities?  
   Not at All  A Little  Quite a Bit  Very Much  
   1  2  3  4

20. Have you had difficulty in concentrating on things, like reading a newspaper or watching television?  
   Not at All  A Little  Quite a Bit  Very Much  
   1  2  3  4

21. Did you feel tense?  
   Not at All  A Little  Quite a Bit  Very Much  
   1  2  3  4

22. Did you worry?  
   Not at All  A Little  Quite a Bit  Very Much  
   1  2  3  4

23. Did you feel irritable?  
   Not at All  A Little  Quite a Bit  Very Much  
   1  2  3  4

24. Did you feel depressed?  
   Not at All  A Little  Quite a Bit  Very Much  
   1  2  3  4

25. Have you had difficulty remembering things?  
   Not at All  A Little  Quite a Bit  Very Much  
   1  2  3  4

26. Has your physical condition or medical treatment interfered with your family life?  
   Not at All  A Little  Quite a Bit  Very Much  
   1  2  3  4

27. Has your physical condition or medical treatment interfered with your social activities?  
   Not at All  A Little  Quite a Bit  Very Much  
   1  2  3  4

28. Has your physical condition or medical treatment caused you financial difficulties?  
   Not at All  A Little  Quite a Bit  Very Much  
   1  2  3  4

For the following questions please circle the number between 1 and 7 that best applies to you

29. How would you rate your overall health during the past week?  
   1  2  3  4  5  6  7
   Very poor          Excellent

30. How would you rate your overall quality of life during the past week?  
   1  2  3  4  5  6  7
   Very poor          Excellent

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EORTC QLQ - H&N35

Patients sometimes report that they have the following symptoms or problems. Please indicate the extent to which you have experienced these symptoms or problems during the past week. Please answer by circling the number that best applies to you.

<table>
<thead>
<tr>
<th>During the past week:</th>
<th>Not at all</th>
<th>A little</th>
<th>Quite a bit</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>31. Have you had pain in your mouth?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>32. Have you had pain in your jaw?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>33. Have you had soreness in your mouth?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>34. Have you had a painful throat?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>35. Have you had problems swallowing liquids?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>36. Have you had problems swallowing pureed food?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>37. Have you had problems swallowing solid food?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>38. Have you choked when swallowing?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>39. Have you had problems with your teeth?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>40. Have you had problems opening your mouth wide?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>41. Have you had a dry mouth?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>42. Have you had sticky saliva?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>43. Have you had problems with your sense of smell?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>44. Have you had problems with your sense of taste?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>45. Have you coughed?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>46. Have you been hoarse?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>47. Have you felt ill?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>48. Has your appearance bothered you?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Please go on to the next page
### During the past week:

<table>
<thead>
<tr>
<th>Question</th>
<th>Not at all</th>
<th>A little</th>
<th>Quite a bit</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>49. Have you had trouble eating?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>50. Have you had trouble eating in front of your family?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>51. Have you had trouble eating in front of other people?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>52. Have you had trouble enjoying your meals?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>53. Have you had trouble talking to other people?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>54. Have you had trouble talking on the telephone?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>55. Have you had trouble having social contact with your family?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>56. Have you had trouble having social contact with friends?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>57. Have you had trouble going out in public?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>58. Have you had trouble having physical contact with family or friends?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>59. Have you felt less interest in sex?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>60. Have you felt less sexual enjoyment?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

### During the past week:

<table>
<thead>
<tr>
<th>Question</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>61. Have you used pain-killers?</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>62. Have you taken any nutritional supplements (excluding vitamins)?</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>63. Have you used a feeding tube?</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>64. Have you lost weight?</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>65. Have you gained weight?</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Grace M. Scott

Education
2013-2015 (antic.) Masters of Science in Rehabilitation Sciences
2009-2013 Honours Specialization Bachelor of Arts in Kinesiology

Employment
2015-Present Research Associate
Algoma District Medical Group, Department of Otolaryngology Head & Neck Surgery, Sault Ste. Marie, Ontario
2014-Present Research Assistant
Department of Otolaryngology Head & Neck Surgery, London Health Sciences Centre, London, Ontario
2012-2015 Research Associate
Laboratory for Well-Being and Quality of Life in Oncology, Rehabilitation Sciences, Western University
2015 Research Assistant
8th Annual Halifax Otolaryngology Head and Neck Surgery Review Course
2014 Teaching Assistant
HS9601 – Quantitative Research Methods in Health and Rehabilitation Sciences, Western University
2014 Teaching Assistant
HS1001B – Personal Determinants of Health, Western University
2014 Research Assistant
7th Annual Halifax Otolaryngology Head and Neck Surgery Review Course
2011-2014 Research Assistant
Voice Production and Perception Laboratory, Communication Sciences and Disorders, Western University

Awards and Achievements
2015 Faculty of Health Sciences Graduate Student Conference Travel Award
2014 Western Graduate Research Scholarship ($11,433)
2014 Busch–Leflar Bursary
2014 Health & Rehabilitation Sciences Graduate Student Travel Award (x2)
2013 Western Graduate Research Scholarship ($10,000)
2013 Faculty of Health Sciences Graduate Student Conference Travel Award
2013 Faculty of Health Sciences Dean’s Honor List
2013 Florence and Roy Busch Bursary
2012 Faculty of Health Sciences Dean’s Honor List
2012 Bruce Power Community Scholarship
2012 Florence and Roy Busch Bursary
2009 Silver Duke of Edinburgh Award
2008 Bronze Duke of Edinburgh Award
2008 Hugh O'Brian Youth Leadership Entrance Award

Scholarly and Professional Activities

2014–Present Medical Observer, Otolaryngology Head & Neck Surgery – London Health Sciences Centre
2014–Present Coordinator, Rehabilitation Science Journal Club
2014–Present National Head of Volunteer Operations, Healing & Cancer Foundation
2013–2014 Grant Manager, Healing and Cancer Foundation
2013–2014 Executive Member, Health & Rehabilitation Sciences Research Forum Committee
2013–2014 Student Member, Rehabilitation Sciences Journal Club
2013–2014 Health consultant, Richard Ivey School of Business

Extra-curricular Activities

2013–Present Runner’s Choice Marathon Training Group
2014 Participant, TCS New York City Marathon
2013 Endangered Species Volunteer, Ministry of Natural Resources
2010–2011 Health Sciences Orientation Leader, Western University
2009–2010 Varsity Dance Team, Western University
2008–2009 Student Council President, West Hill Secondary School

Membership of Learned Societies

2014–Present Canadian Society of Otolaryngology Head and Neck Surgery
2013–Present Canadian Association of Psychosocial Oncology (CAPO)
2013–Present Society of Graduate Students, Western University

Research Grants

Sault Ste. Marie Academic Medical Association Scholarly Funding Award
2015-2016 Smoking Cessation in Individuals Diagnosed with Head and Neck Cancer Primary Investigator: Micomonaco, D.C.
Co-Investigators: Scott, G.M., Amooidi, H.
($15,000)

Publications and Presentations

Publications (Peer-reviewed) (1)

Peer-reviewed Oral Presentations (8)

Pulkki, K., Nhan, C., Scott, G., Fung, K., & Nguyen, LHP. Qualitative Study on Patient Perspectives of Poor Otolaryngologist-Patient Interactions in Canada, Canadian Society of Otolaryngology-Head and Neck Surgery 69th Annual Meeting, Winnipeg, MB, Jun 6-9, 2015, Presenting author

Scott, G.M., Hossam, A., & Micomonoaco, D.C. An Exploration of the Relationship Between Marginalization Index and Smoking Cessation in Individuals Diagnosed with Head and Neck Cancer, Northern Health Research Conference, Timmins, ON, Jun 5, 2015, Presenting author


Wong, M.C., Scott, G.M., & Fung, K. Mobile Applications in Otolaryngology Head and Neck Surgery, 4th Canadian Conference on Undergraduate Medical Education in Otolaryngology – Head and Neck Surgery, Montreal, QB, Nov 8, 2014, Presenting author


Peer-reviewed Poster Presentations (14):

Scott, G.M., Roth, K., & Fung, K. Novel High Fidelity Peritonsillar Abscess Simulator, Combined Otolaryngology Spring Meetings, Boston, MA, Apr 22-26, 2015. Presenting author


Scott, G.M. & Salmoni, A. *Falls Prevention Training Videos for Long-term Care Staff*, Technology in Education Symposium at Western, Western University, London, ON, Mar 8, 2013. Presenting author

Scott, G.M. & Salmoni, A. *Falls Prevention Education in Long-term Care Homes*, Ontario Long Term Care Association (OLTCA), Toronto, ON, Feb 13, 2013. Presenting author

**Peer-reviewed Workshops (1)**


**Invited Non-Peer Reviewed Publications (1):**


**Academic Presentations (1):**


Scott, G.M. *An Introduction to Cancer-related Fatigue and its Association to Quality of Life*. Invited presentation at Western University, School of Health Studies, London, ON, Oct 28, 2014.