The role and importance of social support during recovery following distal radius fracture

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A thesis submitted in partial fulfillment of the requirements for the Master of Science degree in Health and Rehabilitation Sciences

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ABSTRACT

This thesis explored how social support changes with time and differs across genders within 1-year post distal radius fracture (DRF). It also examines the effect of social support on the patient-rated wrist evaluation (PRWE) score and health-related quality of life (HRQoL) of DRF patients at 3 months post-fracture. In this cohort study, patient-reported social support (emotional/informational, tangible, affectionate and positive social interaction) was measured using the Medical Outcomes Study (MOS) social support survey, and HRQoL was measured using the 36-Item Short-Form Survey (SF-36). Social support significantly decreased at 3 months in comparison to baseline, 6 months and 1 year (with small effect sizes <=0.1); with exception of tangible support. No gender difference was observed. Subscales of social support were not independently predictive of the PRWE and the different domains of HRQoL at 3 months post-fracture.

Keywords: Distal radius fracture, social support, Patient rated wrist evaluation (PRWE), Medical Outcomes Study (MOS) social support survey, health outcomes, Short Form Survey 36 (SF-36)
Distal radius fracture (DRF) is a wrist fracture that occurs mainly due to a fall on an outstretched hand, and the occurrence of this fracture is accompanied by factors such as pain, reduced grip strength, and limitation in the function of the injured hand, that may affect a patient’s health and general functionality. Social support has been previously established to improve functional outcomes in fractures like hip fractures, but how social support changes with time and the gender difference in the support received in patients with DRF is yet to be established. Previous studies have also examined the influence of social support on health outcomes of patients with DRF in the later stage (1-year post-fracture) of the fracture, but no study has focused on the acute/early phase of the fracture. The 1st study (chapter 2) investigated how social support changes with time within 1 year of the fracture and how this support differs by gender. While the 2nd study explored the influence of social support on health outcomes of patients with DRF at 3 months post-fracture. We found that at 3 months, there was a decline in the perceived social support received, no gender difference was observed, and social support was not independently predictive of health outcomes during the acute stage of recovery. These findings can be used during DRF rehabilitation to inform clinicians and therapists of the gap between patients’ perceived needs for social support and the support received from their social network during the acute stage of DRF recovery.
The thesis format and research question were developed with the assistance and supervision of Dr. Joy Christine MacDermid. Data collection had previously been done by research assistants at the Roth/McFarlane Hand and Upper Limb Centre of the St. Joseph’s Hospital located in London, Ontario, Canada.

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Chapter 3: Influence of social support on health-quality of life at 3 months in patients with distal radius fracture
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ACKNOWLEDGEMENTS

I would like to thank God almighty for all the help he sent my way for the past two years and for his faithfulness over my life and family.

I would like to thank my supervisor Dr. Joy C. MacDermid for her unending support, guidance, and patience throughout this program. Thank you for always taking out the time to explain every little detail for me in the past two years.

A big thank you to my advisory committee members: Dr. Tatiana Pontes and Dr. Ruby Grewal. Thank you for your advice, time, patience, guidance, and intellectual feedbacks.

Special thanks to all my family members, friends, and DFC family, for all the love and support in the last two years. You all have been a blessing and have added value to my life in this past two years and I am extremely grateful for that.
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CHAPTER 1: Introduction

1.1 Epidemiology of Distal Radius Fracture

Distal radius fractures are the most common upper extremity fractures (Ermutlu et al., 2020) and typically result from low-energy trauma, such as a fall from standing height (Nellans, Kowalski & Chung, 2012). Distal radius fractures occur more frequently in women than men, with a 3:1 ratio (Wong et al., 2020), and increases the susceptibility to other fractures, such as hip fractures, by two to four percent (Shin et al., 2020). Distal radius fracture accounts for 26%-46% of all skeletal fractures observed in the primary care setting as well as one-sixth of emergency department visits (Maclntyre & Dewan, 2016). The functional recovery process of distal fractures is influenced by a series of demographic, psychological, and social factors (Jayakumar et al., 2020), necessitating an understanding of these factors/variables and their possible effect on the healing trajectory.

In 2001, the World Health Organization (WHO) published an International Classification of Functioning, Disability and Health (ICF) to classify the impact of health at both an individual and population level. This classification system was grouped into components, namely body structure/function and activity and participation, both of which are under the umbrella term “functioning”; this term “denotes the positive aspects of the interaction between an individual (with a health condition) and that individual’s environmental and personal context.” The World Health Organization Disability Assessment Schedule (WHODAS 2.0) developed from the ICF and contained six domains of functioning: cognition, such as understanding and communicating; mobility; getting along; life activities, such as work, school, and domestic responsibilities; self-care; and participation (Leonardi, 2010).
The qualifiers for the various components of the domains of functioning include performance (what individuals do in their current environment) and capacity (individuals’ ability to execute tasks or actions (Granlund et. al., 2012). An alteration, whether qualitative or qualitative, results in limitations/problems in the domains. Distal radius fracture possesses the ability to reduce activity level and decrease performance level and may limit one’s capacity to execute basic daily tasks. With a distal radius fracture, a certain degree of pain is prevalent (Moore, & Leonardi-Bee, 2008), which may result in reduced function on the injured hand and, in turn, reduce occupational performance in daily activities (Porter, 2013).

In a 2012 observational study of Danish women following distal radius fracture, at baseline a high level of pain was observed and, at 12 months, 62% of the women still experienced some degree of pain and 72% still had performance problems (Nielsen, & Dekkers, 2013).

Social support can affect performance and functioning, so understanding the gender distinctions of social support related to distal radius fracture recovery is critical, as it may help mitigate the effects of the fracture. In a 2021 study on children following upper extremity fractures, it was indicated that social deprivation contributed to perceived diminished function and increased pain at baseline and conclusion (Evans, Okoroafor, & Calfee, 2021).

1.2 Normal Course of DRF Recovery

The recovery from distal radius fracture will differ with each patient based on the treatment intervention. Older studies focused on the impairments, such as range of motion, grip strength, or anatomical abnormalities to determine the outcome of treatments, but these characteristics do not account for the pain and disability experienced by the patient due to the fracture. Currently, there is no reliable objective tool for the measurement of pain, as it is a subjective experience that can only be described by the patient (Caraceni, et al., 2002). But
outcome scales such as the Short form 36 (SF-36), Disability of Arm, Shoulder and Hand Questionnaire (DASH), and Patient-rated Wrist Evaluation (PRWE) Questionnaire, have been developed to help patients evaluate their own level of pain and disability (Kasapinova, & Kamiloski, 2009). The responsiveness of these outcome scales in detecting clinical changes has been tested on distal radius fracture patients, and the PRWE questionnaire was most responsive and specific to this fracture; the effectiveness of this questionnaire was followed by DASH and then SF-36, over both the period of 0 to 3 months and 0 to 6 months (MacDermid, Richards, Donner, Bellamy, & Roth, 2000).

Observations from the PRWE questionnaire indicate that from baseline to the first two months, the majority of patients experienced severe high levels of pain when lifting, mild pain during repeated movement, and minimal pain at rest (Kasapinova, & Kamiloski, 2009). Within this time frame, patients experienced difficulties with performing functional activities that they previously engaged in prior to the fracture (MacDermind, Roth, & Richards, 2003). With the normal course of recovery, the majority of recovery occurred within six months and, after six months, most patients experienced minimal pain and disability.

1.3 Management of Distal Radius Fracture

Rehabilitation patterns differ in distal radius fracture patients. Some patients may require additional help to regain wrist function and range of motion, therefore requiring physiotherapy, while others may regain grip strength and wrist function through frequent use of the injured wrist during regular daily activities (Kay, McMahon, & Stiller, 2008). There are phases in managing and rehabilitating distal radius fracture patients with the aim of regaining range of motion, grip strength, and wrist function with minimal pain.

The first phase of DRF management is called the immobilization/splinting phase, which occurs at the fracture onset when most patients experience severe pain and less
motion. The wrist is placed in a cast for a period of 5 weeks without regular movement to limit injury to the soft tissues (Quadlbauer, et al., 2020). This phase focuses on controlling edema, performing range-of-motion (ROM) exercises to restore digital function, and managing patients’ pain levels, (Michlovitz, LaStayo, Alzner, & Watson, 2001). Edema is the accumulation of excess fluid in the extra and intracellular spaces within the body, thereby resulting in approximately two weeks of swelling that, if not managed, can progress to a chronic state of major concern (Knygsand-Roenhoej, & Maribo, 2011). Ways to control edema during this phase include elevation of the injured wrists, retrograde massage, and compressive wraps to reduce the swelling (Michlovitz, LaStayo, Alzner, & Watson, 2001). In addition to edema control, preventing the stiffness of fingers, elbows, wrists, and forearms is accomplished by initiating passive (assisted) and active range-of-motion exercises (Ikpeze, Smith, Lee, & Elfar, 2016). Of course, pain management is monitored throughout these processes.

The next phase of DRF management is the mobilization phase. This phase aims to improve functional abilities by minimizing pain, decreasing edema, and improving the range of motion of the hand, wrist and forearm with passive exercises and heat (Michlovitz, LaStayo, Alzner, & Watson, 2001). In current literature, some researchers have argued the benefits of early introduction of the mobilization phase to the injured hand at two weeks of icing rather than the recommended six weeks. With the early intervention of this phase some studies have found no difference in the patient-reported pain score of patients (Andrade-Silva, 2019) and no improvements in the health status of the injured arm (Lozano-Calderón, Souer, Mudgal, Jupiter, & Ring, 2008).

The last phase is the strengthening phase in which the focus is to ensure that patients return to their daily activities, and patients are designed and assigned home programs
(Ikpeze, Smith, Lee, & Elfar, 2016). In this phase, social support from a physiotherapist and a social network (family, friends, etc.), is recommended, as it may affirm a patient’s decision to adhere to the designed home program.

1.4 Conceptual Model

From the mid-1970s to the early 1980s, social support was examined in the context of interactions with individuals or within familial relationships (Vaux, 1992). Initially, a theoretical model called the provider model, which involves the provision of helpful support from provider to recipient was used in an attempt to examine the concept of social support (Hupcey, 1998). This model, however, had limitations because it did not consider the dynamic nature of social support and that all providers and recipients of support are unique.

Social support is multifaceted and, as a result, has been divided into three categories of dimensions: functional, structural, and perceptual (Chak, 1996). The functional dimension of social support involves the quality of supportive behaviours and the social exchange of functions. This support includes emotional, instrumental/tangible, and informational (Chronister, Chou, Frain, & da Silva Cardoso, 2008). Another category of social support is the structural dimension that involves one’s connection with his/her personal network, which includes the quantity and composition of social ties (Chronister, Johnson, & Berven, 2006). The last category is the perceptual dimension that deals with the subjective evaluation and judgement regarding the availability of social support in one’s social network (Lakey, & Scoboria, 2005).

These dimensions are all integral to the holistic view of social support, as they all contribute to one’s functionality and health. According to the International Classification of Functioning, disability, and health (ICF), one’s health can be influenced by the interaction between environmental and personal factors. In the context of social support, environmental
factors that can influence one’s health include availability or absence of vital services, policies, informational and tangible aid (functional dimension of social support), presence or absence of quality relationships and support ties (structural dimension of social support), and, lastly, negative or positive attitudes that sometimes stem from previous experience (perceptual dimension of social support).

1.4.1 The Stress Buffering Model

Cohen & Wills (1995) first discovered the buffering model in an attempt to investigate whether the effect of social support on wellbeing is generalized or particular to individuals in stressful situations. The stress-buffering model hypothesis posits that the effect of stress on health and adjustment may be moderated by social support; this hypothesis indicates that a higher level of social support may mitigate the association between stress and negative health outcomes, thereby promoting health and wellbeing (Bowen, et al., 2014). This model focuses on eliminating or reducing the effects of stressful experiences by interpreting negative events in a less threatening way (Cohen, 2004). Evidence indicates that social support buffers stress levels and contributes to health by altering an individual’s appraisal of the stressor, problem-solving behaviours, the pattern of coping, or the perceptions of one’s self-efficacy (Rogers, Anthony, & Lyass, 2004).

The buffering hypothesis has been validated and applied to various demographics. In a 2013 Mexican study conducted on university applicants experiencing high levels of stress, results indicated that social support buffered the association between stress and depressive symptoms (negative health outcome) for all three measures of analysis (Raffaelli, et al., 2013). Another study validating the stress-buffering hypothesis indicates that social support moderated the effect of life events and poverty stressors on health, even though this effect may be limited due to the scant resources in poor urban environments (Moskowitz, D.,...
Vittinghoff, & Schmidt, 2013). A limitation of this model is that it is only applicable when stress is present. The buffering hypothesis explains the impact of social support on health by moderating stress; this relationship is necessary for this current study because social support can help buffer any potential stressor that may arise from distal radius fracture, thereby reducing any potential negative health outcome and promoting functioning.

1.4.2 The Main effect model

The main effect model posits that social support and social undermining have a direct relationship with psychological wellbeing, independent of the presence or absence of stress (Rodriguez, et al., 2019). Social support has immediate, positive, and domain-specific effects on one’s psychological wellbeing, while social undermining has a crossover effect that is long-lasting and can be negative on one’s psychological wellbeing (Oetzel, et al., 2014). The main effect model works by encouraging and enhancing positive psychological states, such as self-worth and identity, that, in turn, induce health-promoting physiological responses independent of stress (Cohen, 2004). This model is used across multiple studies, as it is highly replicable on perceived social support and mental health (Lakey, & Orehek, 2011). A strong positive effect was found when the main effect model was used to understand the impact of perceived social support and socially influenced interactions on health (Lakey, Vander Molen, Fles, & Andrews, 2016).

1.5 Epidemiology of Social Support

Social support is defined as information that is shared and causes the subject to believe that he/she is cared for, loved, esteemed, and a member of a network of mutual obligations (Cobb, 1976). A positive correlation has been established between social support and physical and mental health, as well as expedited recovery from illness (Holahan, Moos, Holahan & Brennan, 1997). Moreover, social support can help minimize anxiety, depression,
and other psychological problems of patients and their caregivers during rehabilitation (Chen, Mei, & Zhang 2020). In previous studies, higher levels of social support have been reputedly linked to lower rates of morbidity and mortality in patients with cardiovascular diseases, such as myocardial infarction (Frasure-Smith et al., 2000), and coronary heart disease (Orth-Gomér, Rosengren, & Wilhelmsen, 1993; Rutledge et al., 2004). Previous studies established a connection among the factors of sex, depressive symptoms, and received social support: in a study on depression, women who possess depressive symptoms had significantly lower chances of receiving emotional or financial support, while men with depressive symptoms had significantly lower chances of receiving physical support (Jennings, Ralston & Schatz, 2020).

Studies have investigated the effect of social supports on patients with fractures, specifically. In one study, diminished social contact and support pre-hip fracture surgery was associated with poorer survival 2 years post-surgery (Mortimore et al., 2008). Another study indicated that, though patients recovering from a hip fracture often suffered from negative thoughts and feelings, the majority of them were able to cope as a result of social support from family and friends, which resulted in a moderate level of a health-related quality-of-life post-surgery (Hlaing, Thosingha, & Chanruangvanich, 2020). In a separate study, patients who received social support demonstrated better postoperative functional results 1 year after total knee arthroplasty (Sveikata et al., 2017). Among older women recovering from hip fractures, social support in the form of prescribed physiotherapy resulted in a positive correlation with outcome expectations (Casado et al., 2009). Social support not only has a positive effect on physical functional recovery post-hip fracture (Auais et al., 2019) but also reduces depressive feelings or anxiety, which could be a barrier to patients’ functional outcomes (Schefferes-Barnhoorn et al., 2017). People with strong social support, either from
in-person interaction or the online world, have reported a higher quality of life than those lacking social support (Leung, & Lee, 2005).

1.6 Gender Differences in Social Support

The general difference in social support received by women and men is widely studied and indicates that the structure of this support is significantly different for each group. Women have a multifaceted social network that consists of a large group of people serving various functions, while the social network of men is more limited, even singular, with their spouse performing the greatest function (Antonucci & Akiyama, 1987). These distinctions may be a direct outcome of gendered social networks.

In a bid to understand the different aspects/scales of social support, including gender differences, many research models have emerged, including questionnaires. Some pivotal questionnaires investigating social support include a 14-item self-administered, multidimensional, functional social support questionnaire called the Duke-UNC functional social support questionnaire, based on 401 patients attending a family medicine clinic (Broadhead, Gehibach, De Gruy & Kaplan, 1988). Another study is a 6-item questionnaire called the social support questionnaire-short form examining the social support of college students (Sarason, Sarason, Shearin & Pierce, 1987). A four 12-item subscale called the interpersonal support evaluation list was also utilized to measure the four functions (tangible, belonging, self-esteem, and appraisal) of social support (Cohen & Hoberman, 1983). Most recently, a tool was developed called the Medical Outcome Study (MOS) social support survey, a 19-item self-administered scale that is categorized into four dimension/subscales (emotional/informational; affectionate; tangible; and positive social interaction) and an overall/additional item subscale (Sherbourne, Stewart, 1991).
1.6.1 Emotional/Informational Support

The first of the four dimensions/subscales, emotional support, address psychological aspects, such as emotional and cognitive needs that involve love, care, and empathy (Beutel et al., 2017), with informational support offering advice, information, or guidance (Sherbourne, Stewart, 1991). An increase in emotional support has been found to directly improve cognitive performance (Ellwardt, Aartsen, Deeg & Steverink, 2013); furthermore, in distal radius fracture, lower emotional/informational social support adds significantly to the variability of the patient-reported pain and disability outcome (Symonette, MacDermid, & Grewal, 2013). In a Taiwanese study on hip fracture in post-hospital patients, higher levels of emotional support predicted a better health-related quality of life and the performance of crucial activities of daily living (Shyu, Tang, Tsai, Liang, & Chen, 2006).

A 2021 study on multiple sclerosis patients indicated that emotional support had a link to improved quality of life and better subjective cognitive functioning, and lower levels of stress and better motor performance in women (Kever, Buyukturkoglu, Riley, De Jager, & Leavitt, 2021). In terms of providing social support, men have been found to offer less emotional support than women (MacGeorge, Gillihan, Samter, & Clark, 2003). This difference may be because women are more willing and likely to seek support themselves and, as such, give others the sensitive emotion-focused, encouraging messages that they themselves seek; this dynamic, then, helps women to maintain their interpersonal relationships (Kunkel & Burleson, 1999).

Receiving emotional support is as equally important as giving it, and, as a result of their broader social network, women receive emotional support mainly from their friends, relatives, and children, while men receive it primarily from their spouse (Gurung, Taylor & Seeman, 2003); these individuals are mainly women, who, as previously mentioned, provide
more emotional support than men. Accordingly, men receive more emotional support than
women as evidenced by a study in which women initially received the same level of
emotional support as men did up until six months post-surgery, at which time the level of
support received by women declined in comparison to that of the men (Luszczynska,

1.6.2 Tangible Support

Tangible support, also known as instrumental support (Sherbourne, Stewart, 1991),
involves providing tangible goods, services, and aids. Tangible aids include transportation to
medical appointments and accompaniment to doctor’s offices (Coffman, 2008) and
assistance with household chores, unfinished responsibilities at work, and medical regimes
(Boutin-Foster, 2005). This type of support plays a very important role in the daily life of
individuals, as it reduces physiological symptoms of illness, emotional distress, and
facilitates individuals’ self-esteem and sense of belonging by directly reducing the demands
of stressful situations and the anticipation of perceived future burdens (Thoits, 2011).

In a previous study, tangible social support was significantly correlated with a
reduced risk of suicide death, indicating that the direct effect of this support is important for
suicide death prevention (Otsuka et al., 2019). Poorer instrumental support and functioning
have been associated with pain at 1 year in nondemented older adults recovering from hip
fracture (Williams, Tinetti, Kasl, & Peduzzi, 2006). In a study, the most significant predictor
of stressors in HIV-positive women was perceived tangible/instrumental social support
(Hudson, Lee, Miramontes & Portillo, 2001). Most studies conducted on this type of social
support focused on the effect of the support received and have yet to consider the gender
difference in the instrumental support received.
1.6.3 Positive Social Interaction

Positive social interaction is a subscale of social support that incorporates the exchange of physical and emotional energy and this creates a positive emotional state that leads to generating the physiological adaption need for growth, healing, relaxation, and digestion (Uvnäs-Moberg, 1998). Social interactions occur when one participates and engages with their environment and social network, these interactions are highly beneficial to the human physiological system (Heaphy, & Dutton, 2008). Having these types of interactions with health care providers has the possibility to help HIV-positive women attain adaptive outcomes even when they possess unfulfilling social interactions with their family and friends (Hudson, Lee, Miramontes & Portillo, 2001).

The presence of positive social interactions is associated with an increase in self-efficacy, positive health outcomes, reducing stress and improving mental health (Zhang, Edwards, Yates, Guo & Li, 2013), and improved mental health is correlated with higher patient-reported functional outcomes post carpal tunnel release (Maempel, Jenkins & McEachan, 2020). In older adults, high social participation and interaction are reported to enhance the maintenance of functional ability with lower levels of disability measured by activities of daily living across gender (Avlund, Lund, Holstein, & Due, 2004).

Understanding the gender difference of positive social interaction on health may be challenging because women are said to have wider social networks thereby predicting better health behaviours. Some studies suggest that social engagements and relationships are more beneficial for men, but some studies argue that men are less likely to take advantage of the resources provided in their social interaction thus may not benefit as much in their cognitive and physical health (Thomas, 2011).
1.6.4 Affectionate Support

Affectionate social support involves expressing love and affection and is beneficial to health outcomes of chronic illness even though emphasis has not been made on it in literature as a distinct type of social support (Sherbourne, Stewart, 1991). This type of social support is very important because affection is a fundamental human need and the lack of it has been associated with social, physical, mental and phycological problems (MacLean, 2003). A theory called the affection exchange theory proposes that affectionate interaction is a mechanism that can alleviate the negative outcomes associated with stressful events (Floyd, 2006). A high level of stress can result in negative health outcomes and affectionate support from one’s spouse has been reported to regulate hormonal stress levels thereby promoting health (Floyd, & Riforgiate, 2008). Men tend to experience more levels of affection deprivation in comparison to women (Floyd, 2014). Making the possibility of receiving affectionate social support higher for women than men.

1.7 Distal Radius Fracture and Social Support

Social support plays an important role in distal fracture. At 1 year following distal radius fracture in a 2013 study, irrespective of demographic factors like; age and gender, baseline emotional/informational social support was reported to contribute to 4.7% variability of the pain and disability outcome score (Symonette, MacDermid, & Grewal, 2013). Some distal radius patients are readmitted within 30 days to the hospital for reasons such as poor social support or postoperative infection (Curtin, & Hernandez-Boussard, 2014).

Distal radius fracture is characterized by some level of pain and disability, and pain has been found to have a strong correlation with stress. As previously established, the stress that results from the pain experienced due to the fracture can be moderated/buffered by social support, thereby promoting positive health outcomes and enhancing coping ability.
Therefore, understanding how social support can change over time is necessary to maximize its effect on the recovery of functional ability post-fracture.

1.8 Research Goal and Questions

Goal: The overarching research question was to better understand the importance and role of social support during recovery following DRF.

Specific research questions:

Manuscript 1 (Chapter 2)

1. How does social support change over time within the first year of distal radius fracture in men and women?
2. Are there gender differences in the social support received during the recovery from distal radius fracture in a 1-year timeframe?

Study Design: Cohort study

Manuscript 2 (Chapter 3)

1. What is the change in Patient-Rated Wrist Evaluation (PRWE), and health-related quality of life (HRQoL) from baseline to 3 months?
2. What is the effect of social support on the PRWE and HRQoL of patients with DRF at 3 months post-fracture?

Study Design: Cohort and cross-sectional study
1.9 References


https://doi.org/10.12114/j.issn.1007-9572.2020.00.106


https://doi.org/10.1016/j.ijotn.2020.100752


https://doi.org/10.1037/0022-3514.72.4.918


https://doi.org/10.1111/j.1532-5415.2008.01706.x


CHAPTER 2: Change in social support and the gender difference in the perceived social support received within one year following distal radius

2.1 Abstract

Background: Distal Radius Fractures (DRF) are common upper extremity fractures that can cause impairments and disability. Social support may contribute to the functional outcome and recovery trajectory of the fracture and may behave differently across genders.

Methods: 196 distal radius fracture patients who had completed the Medical Outcomes Study (MOS) social support survey at baseline and with a record of at least one follow-up were included in this study. Differences over time (baseline, 3-, 6-, and 12-months post-fracture) and between men and women were examined using generalized linear modelling for each of the 4 subscales and total score.

Results: There was a significant ($< 0.05$) difference (decline) between 3 months of fracture and other timeframes (baseline, 6 months, and 1 year) for emotional/informational support, affectionate support, and positive social interaction with small effect sizes $\leq 0.1$. While a non-significant time difference was predicted for tangible support. Men experienced a decline at 3 months, followed by an increase at 6 months, and this pattern of support received was consistent for the 4 subscales of social support, while for women the pattern of support received at different time points varied based on the subscale of social support. The significance value for the difference in the 4 subscales of social support received by men and women at different time points was greater than 0.05 alpha level.

Conclusion: There was no statistically significant change over time for tangible support, but for the other subscales of social support, at 3 months a significant difference was observed. There is no statistical significance between the perceived social support received for men and women within 1 year following distal radius fracture.
Keywords: distal radius fracture, social support, perceived support, emotional/informational support, tangible support, positive social interaction
2.2 Introduction

Distal Radius Fractures (DRF) are upper extremity fractures that occur due to a fall on an outstretched hand. Although they and can occur at any age (Nellans et al., 2012), other factors such as sex, lifestyle, health, one’s environment, and behaviour can contribute to the risk (Maclntyre and Dewan, 2016). In people over 50 years of age, this fracture occurs more frequently in women, which is partially explained by the increased incidence of fragility fractures in people with osteopenia or osteoporosis (Wong et al., 2020). In young adults (age 19 to 49), distal radius fractures occur more frequently in men and are associated with higher energy injuries such as motor vehicle accidents or sports-related injuries (Porrino Jr et al., 2014). Environmental factors such as slippery floors; barriers along a pathway; the presence of ice/snow, and behavioural factors such as wearing slippery or poorly fitting shoes; climbing on a chair; running down a hill in the snow; also contribute to increasing the risk of DRF (Philip et al., 2019). Understanding the population and demographics of the people most likely to sustain this fracture and examining other contributing factors is important to improve outcome measures. Environmental factors such as social support can contribute to the outcome recovery of DRF (Symonette et al., 2013).

Social support is the provision of material and psychological resources by one’s social network in order to enhance one’s coping ability (Cohen, 2004), and can exist in a variety of subtypes including tangible/instrumental supports and emotional/psychological supports. Social support works by a mechanism that includes motivation, self-efficacy, coping, or overall psychological wellbeing (Ali et al., 2018). Research has demonstrated that social support contributes to the health outcomes of patients who experience depressive symptoms (Schefferes-Barnhoorn et al., 2017), cardiovascular disease such as myocardial infarction (Frasure-Smith et al., 2000), and coronary artery disease (Rutledge et al., 2004).
Improved health-related quality of life and functional outcomes in patients post-hip fracture (Auais et al., 2019) and post total knee arthroplasty (Sveikata et al., 2017) have also been associated with the presence of social support. In DRF, any form of social support at the time of fracture has been significantly associated with better patient-reported pain and disability outcomes at one year post-fracture (Symonette et al., 2013).

Patients with depression or anxiety are more likely to be readmitted or have unscheduled health care contact within 30 days of DRF occurrence, frequently due to pain (Sumner et al., 2020). Pain is a prevalent characteristic of DRF that can lead to functional disability (Mehta et al., 2015), and the presence of pain can be perceived as a stressor. However, social support is evident to buffer stress levels and contribute to health by altering an individual’s appraisal of the stressor, pattern of coping, or the perceptions of one’s self-efficacy (Rogers et al., 2004). Patients who are motivated, psychologically stable, and possess a healthy self-efficacy have been shown to do well regardless of the severity of a hand injury (Dewan et al., 2013).

Social support can also help minimize anxiety, depression, and other psychological problems of patients during rehabilitation (Chen et al., 2020), thereby increasing the effectiveness of DRF treatment, and reducing the rate of readmission. Since, the presence of depressive symptoms and other psychological distress could result in poorer patient-reported outcomes and pose a barrier to recovery from upper extremity injuries (Degen, et al., 2016). Great emphasis is placed on reducing the readmission rate of patients in the health care system, as hospitals are penalized for excessive readmission of patients (Cox et al., 2017), and one of the reasons for readmission of DRF patients include poor social support (Curtin and Hernandez-Boussard, 2014).
To maximize the effect of social support on DRF patients, it is necessary to understand how social support can change over time and the gender difference in the perceived support received following DRF. Gender differences have been observed in the structure of perceived social support due to gendered social roles and experiences (Matud et al., 2003). A 2005 study on social support indicated that men and women differ in the timing of support received; on days where a greater level of stress is experienced, men tend to receive better support from their wives, while women received both support and negativity from their husbands (Neff and Karney, 2005). In cancer patients, men have been evidenced to receive greater levels of emotional support than women post-surgery (Luszczynska et al., 2007). In DRF, though the impact of social support on the patient report pain and disability outcome have been investigated, however, studies are yet to be conducted on the gender differences in the patient-reported perceived social support received following DRF. This study aims to address this gap and investigate how social support changes over time in DRF patients and the gender differences in the perceived support received.

2.3 Objective

The aim of this study was to investigate the following: How does social support change over time within the first year of distal radius fracture in men and women? Are there gender differences in the social support received during the recovery from distal radius fracture in a 1-year timeframe?

2.4 Methods

Study design

The present study was a prospective cohort study designed to evaluate the impact of social support on distal radius fracture outcomes. The primary outcome was measured using the Medical Outcomes Study (MOS) social support survey, in which the baseline measure of
interest and demographics (age, gender, occupation, and time, etc.) was considered. The MOS social support survey is a 19-item self-administered scale that is categorized into four dimensions/subscales: emotional/informational, affectionate, tangible, and positive social interaction and incorporates an overall/additional item subscale (Sherbourne and Stewart, 1991). This survey is a reliable and valid tool that was developed for patients in medical outcome studies to measure the frequency of the self-reported social support received by patients on different subscales of social support (Anderson et al., 2005).

This current study focused on the analysis of the patient’s response to the survey to determine the possibility of a difference in the social support received at different timeframes and the gender of the patients. Responses to the survey on the frequency of subscales of social support received by the patient are rated on a scale ranging from 1 to 5, in which 1 = none of the time, 2 = a little of the time, 3 = some of the time, 4 = most of the time, 5 = all of the time. The total means of each question contained in the subscales of social support at the different time points was computed and used for analyses.

Participants

Skeletally mature patients with distal radius fracture were recruited from the Hand and Upper Limb Centre, during their baseline visit to the hand clinic where the MOS social support survey was made available to the patients. Written informed consent was obtained from participants who were willing to fill out the survey for research purposes. At baseline visit, the scores for the MOS social support survey, and other patient demographic data such as age and gender were recorded. The social support survey was also made available during patient’s 3, 6, and 12 months follow-up visits. The inclusion criteria for this study required participants to be patients with distal radius fracture, 18 years and above, and a baseline of at
least one follow-up data recorded for the MOS social support survey. The total participants in this study included 33 men and 163 women within the age range of 18 to 84 years.

Statistical analysis

All statistically analysis was conducted with IBM® SPSS® Statistics, version 27. A frequency table was run on patient’s response for each of the subscales of social support and missing values were identified. The mean, range, standard deviation (SD), and median for sex and age was calculated. Over 5 percent of missing data was identified for the emotional/informational, affectionate, tangible, and positive social interaction sub scales of social support, at baseline, 3months, 6months and 1year. The pattern for the missing data was identified to be random. When data is Missing at Random (MAR), it indicates that the observed data are independent of the missing data, therefore indicating an unbiased representation of the intended population (Kenward and Carpenter, 2007).

Every subscale of social support was missing over 5 percent of the data, indicating a small proportion of missingness in the data. The missing data were treated using multiple imputations, which is a process of replacing missing values by creating several estimates for each missing value while accounting for uncertainty (Black, 2018). This was chosen because, for a large proportion of data missing at random (up to 90%), multiple imputations have been evidence to generate unbiased results in a simulation study (Madley-Dowd et al., 2019). A limitation with using multiple imputations is that it may affect both the coefficient estimate for the missing and non-missing variables (Pedersen, et al., 2017).

In the present study, the method for the imputation was set at automatic and SPSS chose to go with the fully conditional specification method based on Markov Chain Monte Carlo (MCMC) with 10 maximum iterations that are best suited for data with an arbitrary pattern of missing values. Where the number of imputations was set at 5, the maximum case
draw at 1000 and the max parameter draw at 20. The estimated means (pool) of each individual for the 5 imputations was then used to create a single data and further analysis was done using this data set. The dataset was analyzed and tested with a multivariate analysis general linear model (GLM) to evaluate the impact of gender on social support, and with repeated measures to analyze the subscales of social support received at 4 different time points (baseline, 3 months, 6 months, 1 year). The significance level was set at $\alpha = 0.05$

2.5 Results

Change over time

Overall, 196 participants with DRF completed the MOS social survey score for baseline and at least one follow-up either 3 months, 6 months or 1 year, were included. The mean age was 61.2 (SD +/- 11.3; range = 19 - 79) with 16.8% (33) of men and 83.2% (163) of women. The result of the GLM repeated-measure ANOVA test for the subscales of social support was observed, and the post hoc pairwise comparisons result for change in social support over time were recorded. As shown in table 1, the result indicates a significant difference between 3 months and other timepoints for E/IS, AS and PSI while no significant difference was observed for TS received at different time points. The sphericity assumed and greenhouse-geisser test of within-subject effect for time, indicated that F-value $= 3.81$ (p-value $= 0.01 < 0.05$ alpha level) for E/IS, F-value $= 1.53$ (p-value $= 0.21 > 0.05$ alpha level) for TS, F-value $= 3.66$ (p-value $= 0.25 > 0.05$ alpha level) for PSI, and F-value $= 3.66$ (p-value $= 0.01 < 0.05$ alpha level) for AS.
Table 2.1
Pairwise Comparison of change in social support over time at 3 months in comparison to other timepoints (baseline, 6 months, and 1 year)

<table>
<thead>
<tr>
<th>Mean difference of social support received at 3 months (significance) in comparison to:</th>
<th>Emotional/Informational Support</th>
<th>Tangible Support</th>
<th>Positive Social Interaction</th>
<th>Affectionate Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>-0.2* (0.05)</td>
<td>-0.1 (0.05)</td>
<td>-0.1 (0.16)</td>
<td>-0.2* (0.01)</td>
</tr>
<tr>
<td>6 months</td>
<td>-0.2* (0.02)</td>
<td>-0.1 (0.08)</td>
<td>-0.2* (0.03)</td>
<td>-0.2* (0.02)</td>
</tr>
<tr>
<td>1 year</td>
<td>-0.2* (0.02)</td>
<td>-0.1 (0.17)</td>
<td>-0.2* (0.01)</td>
<td>-0.2* (0.03)</td>
</tr>
</tbody>
</table>

* The mean difference is significant at the 0.05 alpha level.

Gender difference in the subscales of social support:

Table 2.2
Total mean of the perceived social support received by men and women within 1 year following DRF

<table>
<thead>
<tr>
<th>Mean</th>
<th>Baseline</th>
<th>3 months</th>
<th>6 months</th>
<th>1 year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>Emotional/Informational support</td>
<td>4.1</td>
<td>4.3</td>
<td>3.9</td>
<td>4.1</td>
</tr>
<tr>
<td>Tangible support</td>
<td>4.3</td>
<td>4.2</td>
<td>4.2</td>
<td>4.1</td>
</tr>
<tr>
<td>Positive Social Interaction</td>
<td>4.4</td>
<td>4.3</td>
<td>4.2</td>
<td>4.3</td>
</tr>
<tr>
<td>Affectionate support</td>
<td>4.5</td>
<td>4.4</td>
<td>4.2</td>
<td>4.1</td>
</tr>
</tbody>
</table>

The results for E/IS indicated that overall, women had a higher estimated marginal mean than men, and at 3 months both women and men experienced a decrease in the perceived support received, and increase at 6 months, followed by a decrease of E/IS at 1 year following distal radius fracture. Ultimately, the pattern of this support was observed to be similar for men and women. A significance level of 0.417 which is greater than 0.05 alpha level was observed, indicating a non-statistically significant gender difference for E/IS in patients with DRF.
For tangible support, the results show that at baseline men had a higher estimated marginal mean than women, and at 3 months both men and women had a decrease in the perceived support received, but men experienced an increase at 6 months and a decline at 1 year, while the women experienced a decrease followed by a decline of TS at 1 year following distal radius fracture. A 0.338 significance that is greater than 0.05 alpha level was observed for the between subject effect, indicating a non-statistical gender difference in patients with DRF.
The results for positive social interaction increased progressively for women from baseline to 1 year following distal radius fracture. While men started with a higher estimated mean, but experience a decline at 3 months, an increase at 6 months, and a subsequent decline at 1 year following distal radius fracture. A 0.689 significance value that is greater than 0.05 alpha level was observed for the between subject effect, indicating a non-statistically significant gender difference in patients with DRF.
The results for affectionate support show that at baseline men patients had a higher estimated marginal mean than women, and at 3 months both men (mean = 4.2) and women (mean = 4.2) had a similar level of support. But at 6 months men experienced an increase and a decline at 1 year, while women experienced an increase at 6 months and 1 year following distal radius fracture. A 0.301 significance level that is greater than 0.05 alpha level was observed for the between-subject effect, which indicates a non-statistically significant gender difference.
2.6 Discussion

The perceived social support received was different over time but at 3 months, patients with DRF received the lowest amount of social support within the 1 year of recovery. In general, at 3 months a decline was experienced by men and women for all subscales of social support except for the positive social interaction experienced by women. This decline may be because, at baseline, the injury is recent, and the cast is a visible reminder to others about the injury. This may facilitate greater social support from the patient’s social network. However, by 3 months this network may no longer expect the patient to need help or may have exhausted their ability to provide help. Conversely, shortly after the removal of the immobilization, patients still have substantial deficits in strength, range of motion and pain which limit their function. This may be the time where the most
disconnect between externally perceived need and patient-perceived needs occurs. This disconnect would result in patients perceiving insufficient social support.

In our study, the gender differences observed varied based on the type of support received within the 1 year of recovery following DRF. For E/IS women had received a higher level of support than men, which is consistent with a previous study that indicates that women provide more emotional support to both men and women; also, they are more likely to seek support, hence they receive more emotional support (Klauer and Winkeler, 2002). Though, a non-statistical significance for the gender difference in E/IS was observed when tested, which could be the result of low power which is a result of the low proportions of men to women. Ultimately, the pattern of this support was observed to be similar for men and women, which is consistent with the finding of another study that indicates that there was no statistically significant mean difference in the perceptions of emotional support received by men and women (Patrick et al., 2001). For tangible support, men received a higher level of support than women. This difference is understandable, as men are more prone to accept solutions for a problem than discussing the problem (Basow and Rubenfeld, 2003). Men receiving greater levels of tangible support; could mean that men perceive that they have less need for this support, hence any help offered them may seem sufficient. Men generally pursue the “masculine” option of self-sufficiency and independence that can limit their perception of their need for instrumental aids around physical activities. (McKenzie et al., 2018). However, in our study, a non-statistically significant gender difference was observed in the tangible support received. For positive social interaction, the overall support received was inconsistent but higher in men, however, women experienced a slight but consistent increase in the support received. Women experiencing an increase in PSI however small, over the 1-year timeframe, may be because they are more traditionally focused on
maintaining interpersonal relationships hence, they consistently strive to strike positive conversations and create a more empathetic environment when compared to men (Muscanell and Guadagno, 2012). For affectionate support, men received a higher level of support than women. One explanation for this finding is that men have a less diversified social network, with their spouses in most cases women, performing the greatest function (Antonucci, 2001), and women are more affectionate than men (Floyd, 2018). Indeed, expressing affection for women is a gender-affirming behaviour while, for men, it is gender-disaffirming (Floyd and Morman, 1998). Women’s lower level of affectionate support than men maybe because they express affection more, hence they expect a similar type and level of support. However, in our study, the gender difference in the affectionate support received was not statistically significant.

The information gained from the current study is valuable in the rehabilitation process for DRF patients. Previous studies on DRF have investigated either one type of social support or social support but at a one-time point, but this study was able to examine the four different subscales of social support at four different time points. Which made it easy to identify little changes in the perceived social support received however small. A general limitation of this study was the low power which is a result of the low proportions of men to women in the sample, but this was expected as distal radius fracture is more prevalent in women than men. Social support seems to drop off at around 3 months when patients are still in the acute recovery stage, but others in the patient’s social network may perceive that they have recovered, for this reason, clinicians may need to revisit the patients’ needs and how to communicate with family, friends, or coworkers etc. about continued but changing needs for support.
2.7 Conclusion

Findings of this study indicate that social support varies over the one-year recovery following a DRF, and at 3 months patients perceive the slowest level of social support which may indicate a disconnect between external perceptions of the need for support and actual needs during the early rehabilitative phase of recovery. We did not find evidence of differences between men and women in terms of perceived social support.
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https://doi.org/10.1111/hsc.12830


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CHAPTER 3: Influence of social support on the health-related quality of life at 3 months in patients with distal radius fracture

3.1 Abstract

Background: Distal Radius Fractures (DRF) are common upper extremity fractures that can cause impairment and disability. The purpose of this study was to compare the effect size of recovery across different domains of health from baseline to 3-months post-DRF, and to determine the relationship between different types of social support and wrist-related pain and disability and in the health-related quality of life (HRQoL).

Methods: The Medical Outcomes Study (MOS) social support survey, 36-Item Short Form survey (SF-36), and Patient-Rated Wrist Evaluation (PRWE) were administered to 185 patients with DRF at 3 months following a DRF. Pearson correlation was performed to identify the relationship between the 4 components of social support and health outcomes, followed by regression analyses that were to identify independent variables associated with the 8 subscales in 2 summary scores of the SF-36.

Results: The largest changes in health were observed for wrist-related pain/disability PRWE scores effect size (ES)= 2.0, bodily pain ES= -0.8, social function ES= -0.8 and overall physical health (ES= -0.6). Aside from the general health scale, a significant increase was observed in the other scales of the SF-36 survey from baseline to 3 months. Social support subscales were not significantly correlated with the physical health domain of the SF-36. Positive social interactions were not correlated with any of the physical or mental health outcomes. Weak correlations (r = 0.1 - 0.2; p<0.05) were found between emotional/informational, affectionate support, and tangible support with emotional role functioning; or between emotional/informational and affectionate support with overall mental health. The 4 subscales of social support, age, and gender at 3 months were predictive of the
domains of the SF-36 except for role physical and mental health. It also explained 2.1% of the variance in PRWE score and 4.1% of the variance in PCS. Age explains 8.9% of the variability in physical functioning and 4.8% of the variability in PCS.

**Conclusion:** A relationship exists between social support, MCS, and the role emotional scale of HRQoL. The 4 subscales of social support are not independently predictive of the different domains of health-related quality of life.

**Keywords:** distal radius fracture, social support, health-related quality of life, patient-reported wrist evaluation, 36-Item Short Form survey (SF-36), emotional/informational support, tangible support, positive social interaction,
3.2 Introduction

Distal Radius Fractures (DRF) being the earliest and most common fragility fracture, usually occurs due to a fall on an outstretched hand (Dewan, MacDermid, Grewal, & Beattie, 2018). The occurrence of this fracture is characterized by decreased grip strength, reduced arm functions, and pain, typically reported in the first few weeks post-fracture (Rohde et al., 2009). This fracture may require patients to wear a cast for 4 to 6 weeks, to immobilize the injured arm and aid recovery (Mehta, 2015). However, immediately after the cast removal, pain and physical loss of function are still present and it can influence a patient’s social and emotional function, resulting in a decrease in the overall health-related quality of life (HRQoL) (Tomaszewski, et al., 2015). HRQoL is a multidimensional construct that includes major categories such as physical, functional, social, and emotional wellbeing (Ivorra, et al., 2019). HRQoL is defined as patients’ perspective and evaluation of the physical, psychological, and social aspect of their well-being (Van Son, De Vries, Roukema, & Den Oudsten, 2013). HRQoL is not likely to be a primary efficacy measure, although excluding HRQoL measures may lead to an underestimation of treatment effects. However, the HRQoL of all patients of range of health issues can be influence by series of factors. For the scope of the study the influencing factors will be streamlined towards just one major factor which is social support.

Social support is primarily defined by Cobb as “information leading one to believe that he/she is cared for, loved, esteemed, and a member of a network communication and mutual obligation” (Cobb, 1976). Social support has been evident to clinically influence the HRQoL in patients with breast cancer (Leung, Pachana, & McLaughlin, 2014), head and neck cancer (Zheng, et. al., 2007), systemic lupus erythematosus (Ivorra, et al., 2019). The presence of a high level of social support may enable an individual to perceive their HRQoL
as better (Gallicchio, Hoffman, & Helzlsouer, 2007), by influencing the individual’s attitude about their post-treatment functioning (Zheng, et. al., 2007). In a 2019 study, investigating the mental health of university students, social support was found to be a strong predictor of the psychological and social domain of quality of life (Alsubaie, Stain, Webster, & Wadman, 2019).

As the relationship between HRQoL and social support has been established in other fractures, this study investigates the effect of social support on the HRQoL of DRF patients. What is the relative change in the different aspects of health between 0 to 3 months in people with DRF? What is the change in wrist-related function in general health, dimensions of wrist-related function general health? How do social support influence wrist function and health-related quality of life post-fracture?

3.3 Objective

The aim of this study was to examine the following: What is the change in Patient-Rated Wrist Evaluation (PRWE), and health-related quality of life (HRQoL) from baseline to 3 months? What is the effect of social support on the PRWE and HRQoL of patients with DRF at 3 months post-fracture?

3.4 Method

Patient/participants

The inclusion criteria included individuals 18 years or older, with DRF. Exclusion criteria included patients who had not completed the Medical Outcomes Study (MOS) social support survey, 36-Item Short Form survey (SF-36), and Patient-Rated Wrist Evaluation (PRWE) at 3 months post-fracture. At the baseline visit, patient demographic data such as age and gender were recorded. Patients were recruited from the practices of fellowship-trained hand surgeons in London, Ontario, Canada. Patients were required to read and sign a
written consent form and the collection of data was approved by the health science research board.

**Outcome Variable**

HRQoL was assessed using the SF-36 questionnaire. The SF-36 is vastly used when examining general health/quality of life, and it comprises of 8 subscales for domains of health and 2 summary scores (MacDermid, et. al., 2000). The 8 subscales represent various domains of health/quality of life that includes: physical function (PF), physical role (RP), bodily pain (BP), vitality (VT), general health perception (GH), emotional role (RE), mental health (MH), and social function (SF) (Dubberley et. al., 2006). These subscales are scored out of a maximum score of 100, and the higher the score the better the individual's health. The scores from the 8 subscales were computed into two summary scores, which are the physical component summary (PCS) and mental component summary (MCS) scores (Zheng, et. al., 2007).

Patient-reported outcome measures (PROMs) were explored making much emphasis on Patient-Rated Wrist Evaluation (PRWE) for the purpose of the study. The PRWE allowed patients to rate their levels of wrist pain and disability from 0 to 10 and consists of 2 subscales (Angst et al., 2005). These subscales include the pain subscale and function subscale which is sub-divided into specific activities and usual activities. The PRWE is considered a reliable PROM in assessing function and disability in patients (Kleinlugtenbelt et al., 2018). While originally developed and tested in individuals with distal radius fracture, subsequent research has established its use across different pathologies, such as osteoarthritis involving the wrist/hand joints, corpectomy (Kwon et al., 2009), and wrist pain resulting from different pathologies. Previous reviews have summarized the comparative advantages
of using the PRWE versus other PROs for assessing wrist/hand function (Changulani, Okonkwo, Keswani, & Kalai-rajah, 2018)

Social support assessment: Social support was assessed by administering the Medical Outcomes Study (MOS) social support survey to patients with DRF. The MOS social support survey is a 19-item self-administered and multidimensional tool that addresses the four scales of functional support (emotional/informational, tangible, affectionate, and positive social interaction) and an attentional item (Symonette, MacDermid, & Grewal, 2013).

Data analysis

Statistical analyses were conducted using SPSS statistical software. The analysis included a paired t-test for PRWE scores and SF-36 at baseline and 3 months. Pearson correlation was performed to identify the relationship between social support and HRQoL. Lastly, a comprehensive multivariant regression analysis was carried out to assess the impact of related variables. Effect sizes were calculated for PRWE scores and SF-36 for the first 3 months using Cohen’s (1992) benchmark, where an effect size of 0.20 is “small”, 0.50 is “medium” and 0.80 is “large”.

3.5 Result

Change in health from baseline to 3 months

One hundred and eighty-five patients met the eligibility criteria and was included in the study. Of the 185 participants (56.6+/−14.6), 149 were women and 36 were men. The mean scores of the eight SF-36 subscales as well as the PCS and MCS of DRF patients at baseline and 3 months, were analyzed and are reported in Table 3.
Table 3.1 Mean +/- SD scores of Patient Rated Wrist Evaluation (PRWE), the eight SF-36 subscales, PCS, and MSC in patients with DRF

<table>
<thead>
<tr>
<th></th>
<th>Mean +/- SD at baseline</th>
<th>Mean +/- SD at 3 months</th>
<th>Mean difference</th>
<th>Effect size</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRWE score</td>
<td>70.6 ± 18.3</td>
<td>34.6 ± 18.7</td>
<td>36</td>
<td>2.0</td>
<td>0.000</td>
</tr>
<tr>
<td>Physical function</td>
<td>57.1 ± 25.7</td>
<td>73.3 ± 22.3</td>
<td>-16.2</td>
<td>-0.7</td>
<td>0.000</td>
</tr>
<tr>
<td>Role-physical</td>
<td>18.5 ± 35.0</td>
<td>41.2 ± 41.9</td>
<td>-22.7</td>
<td>-0.6</td>
<td>0.000</td>
</tr>
<tr>
<td>Bodily pain</td>
<td>39.4 ± 22.7</td>
<td>57.6 ± 21.6</td>
<td>-18.2</td>
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<tr>
<td>General health</td>
<td>75.8 ± 19.3</td>
<td>75.7 ± 17.4</td>
<td>0.1</td>
<td>0.0</td>
<td>0.945</td>
</tr>
<tr>
<td>Vitality</td>
<td>54.1 ± 20.3</td>
<td>63.4 ± 17.6</td>
<td>-9.3</td>
<td>-0.5</td>
<td>0.000</td>
</tr>
<tr>
<td>Social function</td>
<td>63.0 ± 27.0</td>
<td>82.4 ± 21.1</td>
<td>-19.4</td>
<td>-0.8</td>
<td>0.000</td>
</tr>
<tr>
<td>Role-emotional</td>
<td>64.5 ± 42.4</td>
<td>73.6 ± 38.7</td>
<td>-9.1</td>
<td>-0.2</td>
<td>0.009</td>
</tr>
<tr>
<td>Mental health</td>
<td>72.8 ± 18.6</td>
<td>82.2 ± 61.1</td>
<td>-9.4</td>
<td>-0.2</td>
<td>0.038</td>
</tr>
<tr>
<td>PCS</td>
<td>35.7 ± 9.7</td>
<td>41.8 ± 9.8</td>
<td>-6.1</td>
<td>-0.6</td>
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<tr>
<td>MCS</td>
<td>50.2 ± 11.9</td>
<td>53.3 ± 9.5</td>
<td>-3.1</td>
<td>-0.3</td>
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Relationship between Social Support and HRQoL

The results from the correlation between the 4 subscales of perceived social support and HRQoL indicated that emotional/informational and affectionate support were significantly correlated with role emotional and MCS. Tangible support was also correlated with role-emotional, but positive social interaction and PRWE had no correlation with the subscales and components of health as shown in table 4.

Table 3.2 Pearson correlation between the four MOS SSS subscales in DRF patient and SF-36 survey subscales (measuring HRQoL) at 3 months

<table>
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<tr>
<th></th>
<th>Emotional/Informational</th>
<th>Tangible</th>
<th>Affectionate</th>
<th>Positive social interaction</th>
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<td>PWRE</td>
<td>-0.07 (0.35)</td>
<td>-0.05 (0.52)</td>
<td>-0.08 (0.27)</td>
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<tr>
<td>Physical function</td>
<td>0.10 (0.17)</td>
<td>0.06 (0.39)</td>
<td>0.11 (0.14)</td>
<td>0.08 (0.30)</td>
</tr>
<tr>
<td>Role-physical</td>
<td>0.05 (0.48)</td>
<td>0.04 (0.60)</td>
<td>0.03 (0.73)</td>
<td>0.04 (0.57)</td>
</tr>
<tr>
<td>Bodily pain</td>
<td>0.08 (0.27)</td>
<td>-0.00 (0.10)</td>
<td>0.05 (0.46)</td>
<td>0.02 (0.82)</td>
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<tr>
<td>General health</td>
<td>0.05 (0.47)</td>
<td>0.05 (0.48)</td>
<td>0.06 (0.46)</td>
<td>0.04 (0.61)</td>
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Regression analyses were used to identify independent variables that are predictive of PRWE scores and SF-36 scores, and table 3 shows the result of the analysis. The subscales of social support and other covariant factors such as age and gender at 3 months were found to be predictive of the scores of the SF36. Age was responsible for 8.9% of the variability in physical functioning and 4.8% of the variability in PCS. Affectionate support explained 3.7%, while emotional/informational support significantly explained 3.0% of the variability in the role emotional domain of the SF-36.

<table>
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<tr>
<th>Variable</th>
<th>R squared</th>
<th>Adjusted R squared</th>
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<th>Standardized Coefficients beta</th>
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<table>
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<th>Variable</th>
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3.6 Discussion

The findings of the study indicate large effects for recovery in the first 3 months following a DRF, in wrist-specific pain and disability (PRWE), bodily pain (SF-36), and social function (SF-36) with effect size = 2.0, 0.8, and 0.8 respectively. There was no indication of recovery indicated by the SF-36 general health subscale (effect size = 0.0).

Although we previously showed that social support perceptions change over this period, overall social support subscales were not predictive of health outcomes at 3-months.

The PRWE had the largest magnitude of difference between baseline and 3 months. This may be because the PRWE has the greatest ability to detect a change in wrist function and disability over time compared to SF-36 which is more generalized to overall health and
wellbeing (Amarpal & Kelly 2020). In this study, the PRWE score is significantly lower at 3 months, when compared to baseline, indicating less disability. One explanation for this is that baseline DRF patients are in the immobilization phase and may be required to wear a cast for an average of 6 weeks which may result in limitations in participation (Quadlbauer, et al., 2020). At 3 months cast removal has occurred and there is a little more variability to participate in activities such as usual self-care. Thus, patients are more likely to perceive an improvement in wrist function, therefore resulting in a large size effect size within the first 3 months of the fracture. In an earlier study, a large difference was observed in PRWE scores at baseline and 1-year post DRF (Macdermid, Richards, & Roth, 2001). Also, in a recent study, PRWE had a medium effect size of 0.55 between baseline and six weeks post DRF (Ziebart, Nazari, & Macdermid, 2019), which is somewhat different from the results of our study where large effect sizes were observed over 3 months. To examine the change in health, SF-36 was used to measure HRQoL, and our findings indicate a significant (<0.05) effect size for all the domains except the general health domain. The domains of SF-36 with the largest significant effect size between baseline and 3 months were bodily pain (-0.8), social function (-0.8) and physical function (-0.7). With regards to the SF-36, DRF patients had the greatest change in health, in the bodily pain domain which is expected since severe pain at baseline is a major characteristic of DRF. This level of pain usually persists with movement during the first two months of the fracture but begins to subside from the third month to the sixth month following DRF, when the majority of recovery takes place (MacDermid, Roth, & Richards, 2003). Our findings indicate that the physical function domain had the second-largest effect with regards to SF-36. A reason for this may be because even though DRF may cause patients to take more time performing routine activities, patients may not necessarily be bothered by it, hence may perceive their HRQoL physical function...
domain to be very different at 3 months in comparison to the onset of the fracture (Van Son et al., 2013). Overall, a significantly greater effect of change in health was observed in the physical component summary (effect size = 0.6) in comparison to the mental component summary (effect size = 0.3) that had a small but significant effect. This is understandable since the occurrence of DRF is characterized by some physical limitations that include decreased grip strength, decreased range of motion for an injured arm, severe pain, resulting in functional impairment of the injured hand (Brogren, et al., 2011; MacDermid, Roth, & Richards, 2003; McKay, MacDermid, Roth, & Richards, 2001).

This study found out that certain aspects of social support such as emotional/informational, tangible, and affectionate support were significantly correlated with MCS, and the role-emotional domain of health. Contrary to our findings, previous studies have shown that the physical component of the SF-36 is associated with social support, specifically, emotional, and tangible support have been evident to show a buffering effect on the physical dimension of quality of life (Tilburgs, Nijkamp, Bakker, & van der Hoeven, 2015). In a previous study conducted on patients with coronary heart disease (CHD), MCS had a significant correlation with the four subscales of social support. However, in the same study, PCS also had a significant correlation with affectionate support and positive social interaction (Wang et al., 2014), which is inconsistent with the findings from our study. Furthermore, another study also found out that MCS and PCS had a significant relationship with tangible support (AbuRuz et al., 2016).

Findings from this study indicate that social support was not predictive of the domains of health. Although, when social support was paired with other covariant factors such as age and gender, at 3 months, it explained 2.1% of the variance in patient reported wrist pain and disability, and 4.1% of the variance in the PCS domain of health. Social
support also had no statistically significant impact on PRWE and the overall HRQoL of patients with distal radius fractures. The four subscales of social support received by DRF patients at 3 months, as well as age and gender were predictive of the PRWE scores and the domains of health, except role physical and the mental health scale of the SF-36 evaluating HRQoL. However, this is inconsistent with previous findings stating that regardless of other covariant factors, emotional/informational support independently contributes significantly to the variability of the PRWE scores of DRF patients at 1 year post-fracture (Symonette, MacDermid, & Grewal, 2013). PRWE generally addresses wrist pain and disability, and some previous studies have established that there is no significant relationship between social support and pain (Khazaeipour et al., 2017). DRF comes with some physical limitations that may reduce patients’ performance and participation, however, in our study, the subscales of social support had no influence on how patients perceived the physical effect of the fracture on their performance of daily activities. Also, subscales of social support not being predictive of mental health in patients with DRF was surprising, being that the relationship between mental health and social support has evidently been established in previous studies. In contrast with our study, social support has been evident to possess a protective or causal effect on mental health (Kawachi, & Berkman, 2001). Though, other demographic factors such as age, gender, geographical location, and socio-economic status can influence the relationship between social support and mental health. Age is the parameter that best correlates with DRF patient’s HRQoL from our study, it explained 8.9% of the variability in physical functioning, and 4.8% of the variability in the physical component summary domain of health in DRF patients. Age also had a statistically significant influence on physical functioning and the physical and mental component summary domain of health. However, in the study by Symonette, MacDermid, & Grewal (2013), independent variables such as age
and gender were not cofounders that influenced the role social support (emotional/informational) played in predicting HRQoL of DRF patients. In our study, for every 1-year increase in age, there is a 0.492 decrease in physical functioning and a 0.174 decrease in the physical component summary domain of health in patients with DRF, indicating that the older the advancement in age, the poorer the physical functioning and PCS. Consistent with our study, advancement in age is evident to negatively affect physical functioning and PCS (Hopma, et al., 2009).

This study helped to examine the possibility and nature of the relationship between social support and the different dimensions of health-related quality of life in DRF patients. The findings from this study are necessary to further establish the importance of social support and the role it plays in the health and wellbeing of DRF patients during recovery and rehabilitation from fracture. A limitation of this study is that factors other than age and gender were not included as predictors of HRQoL post-fracture. For example, taking into consideration socioeconomic status, educational level, and the injured hand (dominant/non-dominant hand) may have influenced the results and established the role of social support in DRF recovery.

3.7 Conclusion

The study examined the association between social support and health-related quality of life 3 months after fracture using the Pearson correlation and a linear regression model. The PRWE and HRQoL of DRF patients improved with time. Emotional/informational, tangible, and affectionate support, out of all the MOS Social subscales studied, was found to be correlated to MCS and role emotional domain HRQoL. The subscales of social support had no impact on health, however, when placed alongside other covariant factors such as age
and gender, had a statistically significant influence on the dimensions of HRQoL with exception to role physical and mental health.

3.8 References


CHAPTER 4: General Discussion

4.1 Overview of thesis

The goal of this thesis was to better understand the importance and role of social support during recovery following DRF including its changes over injury, role as a predictor of outcome and gender differences. This thesis examined the perceived social support received by patients with DRF within the 1-year recovery period post-fracture. The 1st thesis manuscript (chapter 2) was a quantitative method study that examined how social support changes with time and the gender difference in the support received. In the 1st study, social support was found to change over time within 1 year recovery period post-fracture; a significant decline in perceived social support received was observed at 3 months, and no gender difference was detected. To understand how support at 3 months influences health, the 2nd manuscript/study (chapter 3) examined the role of social support as a predictor of health. The major results presented in chapter 3 indicate that social support is not independently predictive of health in patients with DRF.

The structure of social networks has been established to be different across gender, with women having a multifaceted network and men having a limited and singular network (Antonucci & Akiyama, 1987). Hence, there is need to understand the role of gender in the perceived social support received post DRF, to effectively mitigate the effect of the fracture, since social support is associated with improved functional recovery of DRF (Symonette, MacDermid, & Grewal, 2013). To better understand how social support differs among gender, a study that showed how the different subscales of social support changed with time, and how they differ in men and women across different timepoints within 1 year post fracture were conducted. Another study examining the relationship between social support and the
different domains of health was conducted to better understand the effect of social support on the health-related quality of life of patients with DRF.

This 1st study demonstrated that the perceived social support received by DRF patients is different over time and the least amount of support is notably experienced at 3 months within 1-year post-fracture. Although, some observable differences were seen in the social support received by men and women, however, no evidence was found to establish that the social support received by DRF patients differs across gender. In this study social support was assessed at baseline, 3 months, 6 months and 1 year, however, at 3 months both men and women evidently experienced a decline in the subscales of social support received with exception to positive social interaction. We hypothesized that this might be related to the fact that patients are still in recovery and in fact may be in an activation phase where they are experiencing limitations and discomfort although their fracture is healed. From a rehabilitation, perspective is it likely that they are in therapy or have home programs to facilitate recovery. However, to the external world their fracture is healed, and they may be perceived as being recovered. This may create a disconnect between social support needs and what patients are receiving from their networks. This finding was why we explored the health implications of the social support received at 3 months in the 2nd study.

This 2nd study examined the relationship between the subscales of social support, PRWE scores and the different domains of health. The subscales of social support were not independently predictive of PRWE scores and the different domains of health, however, a relationship was found between the subscales of social support, role emotional domain and the mental component summary (MCS) of health. This study established that PRWE and PCS had no correlation with any of the subscales of social support. Emotional/informational and affectionate support correlated with the MCS and role emotional domain of health.
Tangible support had a correlation with the role-emotional domain of health, while positive social interaction had no relationship with PRWE and any of the subscales of social support. The physical component summary (PCS) of health had larger effect size than MCS in DRF patients between baseline and 3 months post DRF. However, PRWE had the overall largest effect size, and the general health domain had the least and non-statistically significant effect size between baseline and 3 months. An important finding from this study was that the subscales of social support were not independently predictive of health but had an influence on health when paired with other covariant factors such as age and gender. This finding implies that although there is a decline in the perceived social support received at 3 months according to the 1st study, the decline may not necessarily affect the health outcomes of patients with DRF. Nevertheless, the changes in the perceived social support received are still significant and could have other effects that are yet to be discovered, since social support is an aspect of health that is changing.
4.2 Lay Summaries

4.2.1 Lay summary of Chapter 2

Change in social support and the gender difference in the perceived social support received within one year following distal radius

We wanted to know: How social support changes within 1 year post distal radius fracture (DRF) and how social support differs amongst gender.

What is the problem?

DRF is a crack or a break of the radius bone at the wrist and it occurs mainly when an unexpected force is applied to the wrist due to a fall. The occurrence of this fracture is accompanied with factors such as pain, reduced grip strength and limitation in the function of the injured hand. Social support has been previously established to improve functional outcomes in fractures like hip fracture, but how social support changes with time and the gender difference in the support received in patients with DRF is yet to be established.

Knowing the progression of how social support changes in men and women post DRF, is important to help health care practitioners gain knowledge on the time that social support is lacking, to maximize the effect/role of social support, thereby improving the functional recovery for both genders.

How did the team study the problem?

This study investigated the change in the perceived social support received by administering a social support survey consisting of four subscales of support to the participating DRF patients at baseline, 3-month, 6-month, and 1-year after the fracture. General linear model was then used to statistically analyze the response from the survey at the different time points for both men and women.

What did the team find?

At 3 months DRF patients experienced a decline in the social support received when compared to other timeframes, but there was no difference in the social support received by men and women. The reason for the decline at 3 months is yet to be discovered, hence the need for further studies to investigate why there is a decline the perceived social support received by both men and women post distal radius fracture.

How can this research be used?

This study was the first step to know that there is a gap in patient’s perceived needs of social support and the support received from their social network during the acute stage of DRF recovery. This can help the external world (patient’s social network) become aware pay more attention to patients’ social support needs during the acute stage of recovery.

Cautions

The majority of the participants were women, thereby limiting the generalizability of our findings to men. Nevertheless, we believe that the power of our sample was sufficient to arrive at the conclusion of our study.
4.2.2 Lay summary of Chapter 3

Influence of social support on the health-related quality of life at 3 months in patient with distal radius fracture.

We wanted to know: What is the relationship between social support and health outcomes at 3 months in patients with DRF

What is the problem?
DRF is a wrist fracture that occurs mainly due to a fall on an outstretched hand and the occurrence of this fracture is accompanied by pain and some functional limitation, that may affect a patient’s health and functionality. Previous study has examined the impact of social support on the patient rated wrist evaluation (PRWE) score of DRF patients in the later stage (1 year post fracture) of the fracture, but no study had focused on the acute/early phase of the fracture. This study focused on the early stage (3 months post fracture) where social support is perceived to be least received and possibly most required.

How did the team study the problem?
This study investigated the correlation between social support and health outcomes, and the effect of social support on the health of DRF patients at 3 months, by administering a social support survey consisting of four subscales of support, a PRWE survey and a short form (36) health survey to each participant. The response from these surveys where then recorded and analyzed using frequency table, correlation, and linear regression.

What did the team find?
There were large effects for recovery in the first 3 month following a DRF in PRWE and some domains of health. The subscales of social support were correlated with the mental component of health and the role emotional domain of health, but overall, the subscales of social support were not independently predictive of health outcomes at 3-months.

How can this research be used?
Given that social support does not seem to have much influence on health outcomes post fracture, this will help clinicians and therapists to narrow their focus on other ways in which the outcomes of distal radius fractures can be improved.

Cautions
Other factors such as socio-economic status, educational level etc. that are considered relevant predictors of outcomes post DRF were not included in the study as predictors of health.
4.3 Implication of Thesis Findings on Practice and Future Research

Chapter 2 investigated how social support changes with time within 1 year of the fracture, and how these supports received at the various timepoints differ in men and women. Social support is said to have an influence on performance and functioning; therefore, the result of this study is important to inform health practitioners of patients’ perspectives of the timepoint where social support is least received. In this study, 3 months post-fracture was found to be a critical time DRF patients perceived they experienced a decline in the support they received. With this information, programs can be designed to create awareness and educate patients and their social networks of the need for continued social support even after the first two months post-fracture. These programs can be designed with the aim to breach the disconnect between the externally perceived need for support and the patients' perceived need and availability of support, resulting in the facilitation of greater support from DRF patients’ social networks. These programs can explore possible ways for patients with DRF to effectively communicate their social support needs to others in their support system so that these needs can be properly addressed.

Chapter 3 explored the effect of social support on health. Previous studies focusing on social support and health post distal radius fracture majorly focused on the mental and physical component summary of health, but this study explored and analyzed the effect of the subscales of social support on the various domains of health. The results from this study are instrumental in helping health care practitioners gain in-depth knowledge of the specific domain of health that is impacted by the absence or presence of social support when paired with other covariant factors, in patients with DRF. This study will serve as a useful resource for clinicians and therapists to reassure patients with DRF that even when they do not receive
as much social support as needed, it may not have any direct influence on their health. Given that social support does not seem to have much influence on health outcomes post-fracture, this study helps clinicians, researchers and therapists focus their attention on other ways in which they could improve the outcomes of distal radius fracture.

4.4 Limitations

One major limitation of the studies in chapter 2 and 3 was that majority of the participants were women, thereby limiting the generalizability of our findings to men. This however is not surprising since the occurrence of DRF is most prevalent in women than men (Porrino Jr, et al., 2014). Although we believe that our analysis regarding the gender difference in the perceived social support received was not affected and the power of our sample was sufficient to arrive at the conclusion of our study. The study failed to carry out the analyses separately for men and women, in other to arrive at a more gender-specific and generalizable result. The findings from the first study indicated that there was a decline in the social support received at 3 months post-fracture, which lead to the second finding that explored the effect of social support at 3 months post-DRF. Another limitation is that chapter 3 did not investigate the effect of social support on health at baseline or the change in social support between baseline and 3-months to determine if they were more influential predictors of health outcomes or change in health outcomes. Moreover, only age and gender were considered alongside the 4 subscales of social support as predictors of health, post-fracture. Other factors such as social-economic status, educational level etc. were not included as predictors of health-related quality of life following distal radius fracture. This is a limitation since factors like socioeconomic status and educational level are relevant predictors of outcomes (range of motion, grip strength, and pain level) after the occurrence of distal radius fracture (Paksima, Pahk, Romo, & Egol, 2014).
4.5 Reference


Appendix A

Medical Outcome Study (MOS) Social Support Survey
### Emotional/informational support

1. Someone you can count on to listen when you need to talk
2. Someone to give you information to help you understand a situation
3. Someone to give you good advice about a crisis
4. Someone to confide in or talk about yourself or your problems
5. Someone whose advice you really want
6. Someone to share your most private worries and fears with
7. Someone to turn to for suggestions about how to deal with a personal problem
8. Someone who understands your problems

### Tangible Support

1. Someone to help you if you were confined to bed
2. Someone to take you to the doctor if you needed it
3. Someone to prepare your meals if you were unable to do it yourself
4. Someone to help with daily chores if you were sick
5. Someone whose advice you really want
6. Someone to share your most private worries and fears with

### Affectionate Support

1. Someone who shows you love and affection
2. Someone to love you and make you feel wanted
3. Someone who hugs you

### Positive social interaction

1. Someone to have a good time with
2. Someone to get together with for relaxation
3. Someone to do something enjoyable with

### Additional item

1. Someone to do things with to help you get your mind off things
Appendix B: Patient Rated Wrist Evaluation

Name: ____________________________ Date: ____________

**PATIENT RATED WRIST EVALUATION**

The questions below will help us understand how much difficulty you have had with your wrist in the past week. You will be describing your average wrist symptoms over the past week on a scale of 0-10. Please provide an answer for ALL questions. If you did not perform an activity, please ESTIMATE the pain or difficulty you would expect. If you have never performed the activity, you may leave it blank.

1. PAIN

Rate the average amount of pain in your wrist over the past week by circling the number that best describes your pain on a scale from 0-10. A zero (0) means that you did not have any pain and a ten (10) means that you had the worst pain you have ever experienced or that you could not do the activity because of pain.

<table>
<thead>
<tr>
<th>RATE YOUR PAIN: Sample Scale</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>At rest</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>When doing a task with a repeated wrist movement</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>When lifting a heavy object</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>When it is at its worst</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>How often do you have pain?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
</tbody>
</table>

Never | Always

2. FUNCTION

A. SPECIFIC ACTIVITIES

Rate the amount of difficulty you experienced performing each of the items listed below - over the past week, by circling the number that describes your difficulty on a scale of 0-10. A zero (0) means that you did not experience any difficulty and a ten (10) means it was so difficult you were unable to do it at all.

<table>
<thead>
<tr>
<th>SPECIFIC ACTIVITIES</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turn a door knob using my affected hand</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Cut meat using a knife in my affected hand</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Fasten buttons on my shirt</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Use my affected hand to push up from a chair</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Carry a 10lb object in my affected hand</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Use bathroom tissue with my affected hand</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
</tbody>
</table>

B. USUAL ACTIVITIES

Rate the amount of difficulty you experienced performing your usual activities in each of the areas listed below, over the past week, by circling the number that best describes your difficulty on a scale of 0-10. By "usual activities", we mean the activities you performed before you started having a problem with your wrist. A zero (0) means that you did not experience any difficulty and a ten (10) means it was so difficult you were unable to do any of your usual activities.
Appendix C: Short Form 36 Survey

Medical Outcomes Study Questionnaire Short Form 36 Health Survey

This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. Thank you for completing this survey! For each of the following questions, please circle the number that best describes your answer.

<table>
<thead>
<tr>
<th>1. In general, would you say your health is:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>1</td>
</tr>
<tr>
<td>Very good</td>
<td>2</td>
</tr>
<tr>
<td>Good</td>
<td>3</td>
</tr>
<tr>
<td>Fair</td>
<td>4</td>
</tr>
<tr>
<td>Poor</td>
<td>5</td>
</tr>
</tbody>
</table>

| 2. Compared to one year ago,               |
|--------------------------------------------|---|
| Much better now than one year ago          | 1 |
| Somewhat better now than one year ago      | 2 |
| About the same                             | 3 |
| Somewhat worse now than one year ago       | 4 |
| Much worse now than one year ago           | 5 |

3. The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

(Circle One Number on Each Line)

<table>
<thead>
<tr>
<th>a. Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports</th>
<th>Yes, Limited a Lot (1)</th>
<th>Yes, Limited a Little (2)</th>
<th>No, Not limited at All (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
b. **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf

c. Lifting or carrying groceries

d. Climbing **several** flights of stairs

e. Climbing **one** flight of stairs

f. Bending, kneeling, or stooping

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>b.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities as a result of your physical health? (Circle One Number on Each Line)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Yes (1)</th>
<th>No (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Cut down the amount of time you spent on work or other activities</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>b. <strong>Accomplished less</strong> than you would like</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>c. Were limited in the <strong>kind</strong> of work or other activities</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>d. Had <strong>difficulty</strong> performing the work or other activities (for example, it took extra effort)</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

5. During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)? (Circle One Number on Each Line)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Cut down the amount of time you spent on work or other activities</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>b. <strong>Accomplished less</strong> than you would like</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>c. Didn't do work or other activities as <strong>carefully</strong> as usual</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

6. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

<table>
<thead>
<tr>
<th>Extent</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>1</td>
</tr>
<tr>
<td>Slightly</td>
<td>2</td>
</tr>
<tr>
<td>Moderately</td>
<td>3</td>
</tr>
<tr>
<td>Quite a bit</td>
<td>4</td>
</tr>
<tr>
<td>Extremely</td>
<td>5</td>
</tr>
</tbody>
</table>
7. How much bodily pain have you had during the past 4 weeks?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very mild</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very severe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A little bit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderately</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quite a bit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extremely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. (Circle One Number on Each Line)

9. How much of the time during the past 4 weeks...

<table>
<thead>
<tr>
<th></th>
<th>All of the Time</th>
<th>Most of the Time</th>
<th>A Good Bit of the Time</th>
<th>Some of the Time</th>
<th>A Little of the Time</th>
<th>None of the Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Did you feel full of pep?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>b. Have you been a very nervous person?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>c. Have you felt so down in the dumps that nothing could cheer you up?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>d. Have you felt calm and peaceful?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>e. Did you have a lot of energy?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>All of the Time</td>
<td>Most of the Time</td>
<td>A Good Bit of the Time</td>
<td>Some of the Time</td>
<td>A Little of the Time</td>
<td>None of the Time</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>----------------</td>
<td>-----------------</td>
<td>------------------------</td>
<td>------------------</td>
<td>---------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>f. Have you felt downhearted and blue?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>g. Did you feel worn out?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>h. Have you been a happy person?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>i. Did you feel tired?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

10. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)? (Circle One Number)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All of the time</td>
<td>1</td>
</tr>
<tr>
<td>Most of the time</td>
<td>2</td>
</tr>
<tr>
<td>Some of the time</td>
<td>3</td>
</tr>
<tr>
<td>A little of the time</td>
<td>4</td>
</tr>
<tr>
<td>None of the time</td>
<td>5</td>
</tr>
</tbody>
</table>

11. How TRUE or FALSE is each of the following statements for you. (Circle One Number on Each Line)

<table>
<thead>
<tr>
<th></th>
<th>Definitely True</th>
<th>Mostly True</th>
<th>Don't Know</th>
<th>Mostly False</th>
<th>Definitely False</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I seem to get sick a little easier than other people</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>b. I am as healthy as anybody I know</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>c. I expect my health to get worse</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>d. My health is excellent</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Curriculum Vitae

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Central Michigan University
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