What is the Patient’s Experience of Pain after a Fragility Fracture?

by

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Institute of Health Policy, Management and Evaluation
University of Toronto

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ABSTRACT

With the exception of pain after a vertebral fracture, there is little research on long-term pain after a fragility fracture. Most relevant research focuses on physiological healing within the first six months of fracture. In this secondary analysis of three qualitative studies, I explored the experience of long-term post-fracture pain in men and women. Data from 29 individuals (51–89 years old) were re-analyzed using qualitative description (Sandelowski 2000; 2010). Twenty-four (83%) participants had sustained a fragility fracture at least one year previously (range: 1–13 years). Only seven individuals had sustained vertebral fractures. I developed three themes examining patients’ description of pain and its impact, their perceived shortcomings of health care providers, and their responses to the pain. My findings enable a better understanding of long-term pain after a fracture and call for individualized treatment planning that includes effective analgesia and continued physiotherapy.
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1) Participants described longstanding pain beyond typical fracture healing times, generally unrelieved by analgesics, which impacted their mobility, functional activity, independence, sleep and energy.

   Experience of pain within one year of fracture

   Experience of pain beyond one year of the fracture

The Impact of Pain on Daily Routine

   Mobility

   Functional activities

   Independence

   Sleep and energy

2) Health care providers under-estimated expected timelines regarding the decrease of post-fracture pain and were perceived to not manage that pain.

   Under-estimated timelines

   Perception that health care providers were not managing post-fracture pain

3) Participants responded to inadequate pain management by employing several strategies. These strategies included accepting the pain, reporting their decisions to refuse pain medication despite having pain, or describing other non-pharmacological coping strategies.

   Accepting the pain

   Refusing to take pain medication

   Non-pharmacological coping strategies

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CHAPTER 1
BACKGROUND AND PURPOSE

Overview of Literature Review and Objectives

Fragility fractures can be life-altering events impacting all areas of a person’s life. Findings of studies in the literature indicate that patients report pain immediately after a fragility fracture and for as long as one-year post-fracture. Most countries rely on academic and institutional guidelines for the clinical management of fragility fractures, which include the use of various classes of pain medication, body-part immobilization, physiotherapy and surgical procedures. Although several clinical options for treating and managing fragility fractures exist, patients have reported that they continue to have constant pain related to the sustained injury. Few studies have explored the experience of long-term pain following a fragility fracture and how individuals describe its impact on daily activities.

Our research question was:

What is the patient’s experience of pain after a fragility fracture?

Among patients who have experienced a fragility fracture, our objectives were to:

1) Examine the patient’s experience of pain following a fragility fracture.
2) Compare the pain experience based on the patient’s age.

I conducted a literature review in order to better understand the existing knowledge on fragility fracture pain, its implications on people’s daily lives, and the clinical guidelines for its management. Qualitative and quantitative studies were examined in this literature review. Many relevant qualitative studies were conducted 10 or more years ago; few qualitative publications were found that examined the descriptions of pain after a fracture had been sustained. Quantitative studies and systematic reviews included in this literature review examined the pain and quality of life after a fragility fracture, while comparing outcomes of various treatment choices. Although we predominantly reviewed
studies that examined pain after *fragility* fractures, one qualitative study was included that explored the patient experience at an average of 6.8 years (range: 2.3-12 years) following a high-trauma (not a fragility fracture) lower limb fracture (Shauver, Aravind, & Chung, 2011). The descriptions of pain after a high-trauma fracture found in this study were compared with people’s accounts from other studies where a low-trauma fracture had been sustained. There were many similarities in the descriptions of pain following both high-trauma and low-trauma fractures, such as constant pain unrelieved by analgesics (Griffiths & Jordan, 1998; Shauver et al., 2011), reduced mobility (Shauver et al., 2011; Taylor, Barelli, & Harding, 2010), and lifestyle modifications to accommodate longstanding post-fracture pain (Paier, 1996; Shauver et al., 2011). The scarcity of studies on fragility fracture pain after six months post-injury suggests that there may be an under-estimation of its long-term impact on people’s everyday life. I searched the MEDLINE, PubMed, Cochrane, and UpToDate (a database that focuses exclusively on information that supports clinical decision making) databases using the search terms, “pain AND fracture AND osteoporosis,” “pain AND fracture AND fragility,” “experience AND pain AND fracture,” “fragility fracture treatment,” and “osteoporosis treatment.” The last search was conducted in January, 2016, but no lower date limits were set with the searches in any of the databases.

**Background**

Bone fractures can be significant life-changing experiences (Griffiths & Jordan, 1998; Shauver et al., 2011; Taylor et al., 2010). The incidence of fragility fractures increases exponentially with age and with lower levels of bone mineral density (BMD) (Das & Crockett, 2013; Gerdhem, 2013; Poole et al., 2012). The majority of fractures sustained by patients with low BMD result from falls from standing height or lower, known as “fragility fractures,” or “low-trauma” fractures (National Osteoporosis Society, 2009). Most fragility fractures actually occur before BMD test scores fall below the $-2.5$ T-score level, which represents the threshold used to determine the clinical diagnosis of osteoporosis (Das & Crockett, 2013; Pappaioannou et al., 2004; Poole et al., 2012; WHO, 2004). A T-score of $-2.5$ indicates that a given person’s BMD is two and a half
standard deviations lower than the average BMD in young adults, matched by sex (Das & Crockett, 2013; Mayo Clinic Staff, 2014).

In a review of the pharmacological prevention and treatment of osteoporosis, Das and Crockett (2013) recognized that any type of fragility fracture sustained constitutes a precursor to significantly higher morbidity rates. The most serious type of fracture is at the hip, which constitutes a major determinant of health in older adults due to an approximately 30% mortality rate one year after a hip fracture (Keene, Parker & Pryor, 1993; March et al., 2000). According to an epidemiological study in a prospective cohort, mortality rates increased five- to eight-fold in the three months following fragility fractures of the hip (Magaziner et al., 1990). Moreover, a four-fold increase in the incidence of hip fractures is expected by 2050 (Aubrun, 2011; Poole et al., 2012). Although most studies highlight the impact of hip or vertebral fractures, fragility fractures at other anatomical locations result in a similar magnitude of negative effects on pain and quality of life (Hagino, 2013). Hagino (2013) measured pain and quality of life using the Short-Form 36 (SF-36) and EuroQOL Five Dimensions (EQ-5D) questionnaires.

Several qualitative studies demonstrate that fragility fracture patients report persistent pain even one year post-fracture, which is more than sufficient time for the fracture to physically heal (Das & Crockett, 2013; Frost, 1998; Gold, 1996; Paier, 1996). Post-fracture pain adds to the complexity of medical attention that patients require, especially as older adults are more likely to have pre-existing multiple health conditions (Drummond, 2012; Konrad, 2012; Taylor et al., 2010).

**Clinical Standards and Recommendations for Treatment after a Fragility Fracture**

The standard conservative treatment after a fragility fracture consists of optimal pain management achieved by analgesics, as well as surgery when needed (Beaupre et al., 2013; Cherubino et al., 2012; Gerdhem, 2013; Rousing et al., 2009). According to the relevant guidelines, pain medications are categorized by their potency and mechanism of action, and should be administered based on the reported pain.
Acetaminophen (paracetamol), a non-opioid analgesic, is the first pharmaceutical choice (Cherubino et al., 2012; Gerdhem, 2013). Non-steroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen, naproxen, and cyclooxygenase-2 (Cox-2) inhibitors, are the next choices in pharmacological pain management and can be used in addition to acetaminophen if the pain relief is transient (Cherubino et al., 2012; Gerdhem, 2013). However, the prescription of NSAIDs to older people is not advised, given the gastrointestinal (Cherubino et al., 2012; Elder, Danhers, & Weinhold, 2001; Gerdhem, 2013; Masso Gonzalez, Patrignani, Tacconelli, & Garcia Rodriguez, 2010; Vuolteenaho, Moilanen, & Moilanen, 2008), cardio-vascular (FDA, 2008; Kearney et al., 2006; McGettigan & Henry, 2011; McGettigan & Henry, 2013; Trelle et al., 2011; Vuolteenaho et al., 2008), and blood-clotting inhibitory adverse effects of this class of drugs (Koester & Spindler, 2006).

Furthermore, the anti-inflammatory mechanism of action of NSAIDs, which inhibits the Cox-1 and Cox-2 enzymatic activity (Aspenberg, 2005), has been linked to a higher risk of low-trauma fractures and metabolic bone disruptions in adults after long-term regular administration (Griffin, 1998; Harder & An, 2003; Mandell, 1999). Physiologically, the inactivation of the Cox-1 and Cox-2 enzymes directly inhibits the production of prostaglandins, which are hormone-like lipid compounds that support bone development (Jee & Ma, 1997; Ma et al., 1995; Lipsky, 1999; Pountos, Georgouli, Blokhuis, Pape, & Giannoudis, 2008). After a fracture, there is a localized surge in the homeostatic release of prostaglandins, followed by a sharp increase in their production (Dekel, Lenthall, & Francis, 1981; Einhorn, 1998; Norrdin, Jee, & High, 1990; Pountos et al., 2008). In animal studies, the use of NSAIDs after a fracture had been induced in the animal was strongly associated with delayed and inhibited bone healing (Bo, Sudmann, & Marton, 1976; Boursinos, Karachalios, Poultsides, & Mazilos, 2009; Pountos et al., 2008; Vuolteenaho et al., 2008). Researchers found that this class of drugs inhibits the production of prostaglandins (Aspenberg, 2005; Harder & An, 2003; High, Brusse, & Factor, 1989; Vuolteenaho et al., 2008), which has been correlated with impaired physiological bone healing in animals (Beck et al., 2003; Brown, Saunders, Kirsch, Donahue, & Reid, 2004; Endo et al., 2005; High et al., 1989; Gerstenfeld et al., 2003;
Davis & Ackroyd, 1988; Pountos et al., 2008; Reikeraas & Engebretsen, 1998). It has been suggested that NSAIDs lead to inhibitory activity on the growth and lifespan of human in-vitro osteoblasts, thereby depleting the amount of bone creating cells (Chang et al., 2009; Chang, Wang, Tsai, & Ho, 2005; Evans & Butcher, 2004; Ho, Chang, Chuang, Hsu, & Wang, 1999; Pountos, Georgouli, Calori, & Giannoudis, 2012; Sell et al., 1999; Wang et al., 2004). Although scientists have not reached a consensus on the timeline of inhibitory effects of NSAIDs on the healing of bone post-fracture, findings from experimental animal studies indicate that the most harmful actions on the Cox enzymes and prostaglandins occur in the preliminary homeostatic phases (Simon, Manigrasso, & O’Connor, 2002) and are visible as early as three weeks following the start of NSAIDs administration (Boursinos et al., 2009; Endo et al., 2002; Endo et al., 2005). Several clinical scientists argue that in spite of the clear evidence from animal research, a change in current medical practice is not warranted because there have been very few human randomized controlled trials and experimental studies that examined the bone-healing inhibitory effects of NSAIDs (Vuolteenaho et al., 2008).

Despite some evidence from retrospective studies in humans where there was an association between NSAIDs, impaired fracture healing (Butcher & Marsh, 1996) and bone non-union (Burd, Hughes, & Anglen, 2003; Giannoudis, MacDonald, & Matthews, 2000; Glassman et al., 1998), NSAIDs have still been widely used as analgesics in the clinical setting, particularly for individuals who have sustained a fracture (Cherubino et al., 2012; Gerdhem, 2013; Harder & An, 2003; Hogan, Campbell, Crutcher, Jennett, & MacLeod, 1994; Yates, Shah, & Blackwell, 2011).

If moderate pain persists after the administration of NSAIDs, weaker opioid analgesics are considered next-in-line, such as codeine and tramadol (Cherubino et al., 2012; Gerdhem, 2013). For intense pain, stronger opioids are advised, such as morphine, oxycodone, and hydromorphone (Cherubino et al., 2012; Gerdhem, 2013).

Immobilization of the affected body part may be recommended to stabilize the fracture and prevent increased deformities during the bone-healing phase (Gerdhem, 2013;
Rousing et al., 2009). Most vertebral fragility fracture patients are successfully managed with non-invasive, conservative treatments (Gerdhem, 2013; Lee et al., 2012). Because of probable adverse effects, invasive procedures for vertebral fragility fractures, such as vertebroplasty and kyphoplasty, are only recommended for patients who report incapacitating pain that is unresponsive to oral opioids (AAOS, 2014; Gerdhem, 2013).

According to a Cochrane review by Parker & Gurusamy (2006), two surgical procedures are clinically recommended in cases of hip fragility fractures: open reduction–internal fixation (ORIF), wherein the bone fragments are realigned using metal plates and screws, and arthroplasty, wherein the femoral head is replaced with an artificial hip joint. When the hip fracture permits a clinical choice between these two procedures, arthroplasty is recommended, due to a shorter healing time and a 30% lower re-operative rate compared to ORIF (Parker & Gurusamy, 2006). A surgical procedure to realign the bone fragments is always advised after a hip fragility fracture (Beaupre et al., 2013), unless patients are older than 70 years and present with extremely poor health as an operative contra-indication (Hansen, 1994; Raaymakers & Marti, 1991).

The next recommended step in the clinical treatment of fractures is physiotherapy, whether in the hospital or in the community (Agulnek, O’Leary, & Edwards, 2009). It is considered an essential factor in the management of post-fracture pain after six months have passed since the injury, although it is contingent on the patient’s ability to regain mobility (Beaupre et al., 2013; Rousing et al., 2009).

Finally, although not aimed at treating pain, the Canadian guidelines recommend antiresorptive medication for patients who are at high risk for future fractures (Papaioannou et al. 2010). Osteoporosis is the result of an imbalance in the rate of bone remodeling, wherein the rate of bone resorption becomes much higher than the rate of new bone formation (Das & Crockett, 2013). Osteoclast cells induce bone resorption while osteoblast cells induce the formation of new bone (Clarke, 2008; Das & Crockett, 2013; Follin & Hansen, 2003). Antiresorptive pharmacological agents decrease the activity of osteoclasts through induced apoptosis, which is the process of
programmed death of the bone resorption cells (Das & Crockett, 2013; Follin & Hansen, 2003). However, they have no effect on modulating the function of osteoblasts (Das & Crockett, 2013; Follin & Hansen, 2003; Stepan, Alenfeld, Boivin, Feyen, & Lakatos, 2003). Nevertheless, treatment with antiresorptive medication is the only current clinical option that regulates the rate of bone remodeling, facilitates the repair of micro-damages in the bone matrix, and ultimately increases bone strength (Stepan et al., 2003). In fact, one class of antiresorptive medication, bisphosphonates, are regarded as potent drugs in significantly reducing the risk of initial (Black et al., 2000) and subsequent fragility fractures (Black et al., 1996; Cummings et al., 1998; Follin & Hansen, 2003; Harris et al., 1999). Through randomized controlled trials, authors have concluded that this type of antiresorptive drug effectively lowers the risk of both vertebral (Black et al., 1996; Harris et al., 1999) and non-vertebral fractures (Cummings et al., 1998; Harris et al., 1999). More recent studies have demonstrated that two newer types of bisphosphonate agents, zoledronate (Greiner et al., 2008; Jansen, Bergman, Huels, & Olson, 2009) and denosumab (Freemantle et al., 2013), may be even more effective than conventional bisphosphonates in preventing vertebral and non-vertebral fragility fractures.

**Pain after a Fragility Fracture**

In general, people have reported experiencing pain after a fragility fracture, whether they have described it to be uncomfortable or incapacitating (Griffiths & Jordan, 1998; Gold, 1996; Paier, 1996; Taylor et al., 2010). Participants in one qualitative study reported their pain shortly following a fragility fracture as the “worst pain ... ever experienced” (Paier, 1996). In this study, pain was described to be a major health concern after a fracture had been sustained, affecting all aspects of participants’ lives (Paier, 1996).

**Timeline of studies**

Most of the published literature on the experience of pain following a fragility fracture examined patients’ experiences in the first six months post-fracture (Chandler, 2001; Frost, 1998; Griffiths & Jordan, 1998; Taylor et al., 2010). The remaining studies
examined participants’ experiences beyond six months after a fragility (low-trauma) fracture (Frost, 1998; Gold, 1996; Paier 1996), while Shauver and colleagues (2011) examined patients’ experiences after at least two years following a high-trauma fracture.

In two qualitative studies, researchers considered vertebral fractures to be physiologically healed after four (Gold, 1996) to ten weeks (Frost, 1998) post-injury. Gold (1996) based her bone-healing timeline estimation on interpretations of other studies dating five to twelve years previously, while Frost (1998) invoked his clinical expertise as an orthopedic surgeon. In a quantitative study, attending clinicians determined wrist fractures to be healed at six weeks post-injury solely based on radiological interpretations (Hollevoet & Verdonk, 2003). However, Das and Crockett (2013) suggest that the physiological completion of one cycle of bone remodeling in healthy adults lasts much longer, from four to six months.

Gold (1996) and Frost (1998) categorized the pain after a fragility fracture in two different phases: acute and chronic. The acute phase refers to the first three to four weeks immediately following a fragility fracture, when extreme pain is reported and is localized to the fracture region (Gerdhem, 2013; Gold, 1996; Frost, 1998). The management of acute pain is considered effective through the use of analgesics, which give patients a sense of being able to cope with the pain (Gold, 1996). The pain is classified as chronic after four weeks post-fragility fracture; at this stage, still within the first six months after a fracture, management of pain through pharmacological strategies is believed to be inefficient, although specific participant accounts were not presented (Gold, 1996).

Few publications reported patients’ experience of pain beyond six months of a fragility fracture. Most authors examining pain beyond six months focused on patients with vertebral fractures. In one qualitative study, participants reported back-pain as an ever-present factor, dominating the management of their lifestyle even years after the vertebral fracture (Paier, 1996). Continued pain that persists beyond the expected physiological bone healing process can interfere with normal sleeping patterns,
emotional health, and social interactions (Paier, 1996). Participants with vertebral fractures described the long-lasting pain as an “accepted companion” of their daily life that required constant accommodation (Paier, 1996).

In one quantitative study in patients with vertebral fragility fractures, the authors found that pain persisted for three months to one year after the fracture (Suzuki, Ogikubo, & Hansson, 2008). In another quantitative study that examined 107 vertebral fracture patients, long-term pain was reported at one year following the injury, irrespective of whether participants had sustained previous fragility fractures or not (Suzuki et al., 2010). The von Korff scale was used in both studies to measure reported pain (Suzuki et al., 2008; Suzuki et al., 2010). Due to functional and social restrictions, other findings indicated that pain was a major factor in reducing quality of life beyond one year post-fracture, particularly after fractures of the vertebrae (Borgstrom et al., 2006; Gerdhem, 2013; Hallberg et al., 2004) and hip (Borgstrom et al., 2006; Hallberg et al., 2004). The EQ-5D (Borgstrom et al., 2006) and SF-36 questionnaires (Hallberg et al., 2004) were used to measure quality of life in these quantitative studies. Suzuki and colleagues (2010) reported that pain levels one year and longer after a vertebral fracture were significantly higher when participants had a history of previous fractures. In addition to pain, participants who had sustained at least one previous fracture also reported significantly lower quality of life scores compared to people with no previous fracture history, measured on the EQ-5D questionnaire (Suzuki et al., 2010).

In qualitative studies where participants reported pain beyond six months after a fragility fracture, findings were not presented in relation to the time elapsed since the fracture. In contrast, in the quantitative studies included in this literature review, people’s reports of longstanding pain were presented in association with the respective timeline after the fracture. However, the authors of the quantitative studies only examined whether pain was still present at various time frames post-fracture and did not further investigate the description of pain and its impact on participants’ lives. In both qualitative and quantitative studies, authors did not examine whether demographic variables such as age were important to patients’ reports of pain after a fracture.
Hospitalized patients compared to patients receiving care in the community

One qualitative study examined the experiences of pain after a fragility fracture in participants receiving inpatient rehabilitation compared to those receiving outpatient rehabilitation (Taylor et al., 2010). Patients receiving hospitalized rehabilitation reported experiencing more effective pain management, more optimism of regaining pre-fracture ability, and less anxiety than patients undergoing rehabilitation in their communities (Taylor et al., 2010). The pain within the first six months after a fragility fracture was found to be one of the main factors causing anxiety and uncertainty, regardless of whether or not participants were receiving inpatient or outpatient rehabilitation (Griffiths & Jordan, 1998). Compared with participants who underwent inpatient rehabilitation, those who received rehabilitation in the community found it more difficult to interact socially, because of the constant pain and lowered mobility (Taylor et al., 2010).

The development of osteoarthritis in regions where a fracture had been sustained

Osteoarthritis is an osteochondral disease where the cartilage and bone materials at a joint wear out with the passage of time (NIAMS, 2014). The pain associated with osteoarthritis becomes greater as less cartilaginous material exists between two adjoined bones (NIAMS, 2014). Due to increased wear and tear, particularly for overweight and physically active people, joints repeatedly stressed relatively more than others become more affected (NIAMS, 2014). The United States’ National Institute of Arthritis and Musculoskeletal and Skin Diseases presented that osteoarthritis is most commonly diagnosed in the older population and that “sometimes,” younger individuals who had sustained a joint injury may develop osteoarthritis (NIAMS, 2014). This choice of words in presenting risk factors can lead to the perception that the probability of developing osteoarthritis after a joint injury may be low and not worrisome (NIAMS, 2014). However, studies have shown that there is a significant statistical correlation that osteoarthritis is likely to develop at previously injured joints (Catalano et al., 1997; Fernandez, Gruen, & Herndon, 1997).

Significant development of the signs and symptoms of osteoarthritis was found at joints displaced even in the slightest following a fracture (Catalano et al., 1997; Fernandez,
Gruen, & Herndon, 1997). In order to establish a valid association between fractures and osteoarthritis development, researchers studied the physiological evolution of fracture-affected joints in younger participants who did not have osteoarthritis prior to the fracture. Catalano and colleagues (1997) examined 26 participants younger than 45 years who did not show any signs of osteoarthritis at the start of the study period. The average age of the sample participants at the time of fracture was 30 years (Catalano et al., 1997). After an average of approximately seven years post-fracture, 76% of the young adults in the sample were diagnosed with osteoarthritis at the fracture-affected wrist (Catalano et al., 1997). The authors found that the development of osteoarthritis was strongly correlated statistically (p < 0.01) with a previously sustained intra-articular fracture and lower range of motion (Catalano et al., 1997). Authors of another similar study reported that after only two and a half years following an intra-articular wrist fracture, 50 males and females averaging 50 years old had developed osteoarthritis at the affected joint (Fernandez et al., 1997). The incidence of osteoarthritis, and lower physical and mental scores, were significantly correlated (p < 0.01) with longstanding lower range of motion and with a joint displacement post-fracture, irrespective of its magnitude (Fernandez et al., 1997). It is concerning that all wrist fractures in the study conducted by Fernandez and colleagues (1997) had been clinically considered healed with no further need for treatment, despite the diagnosis of osteoarthritis in young participants and their significantly reduced quality of life indicators (Fernandez et al., 1997).

In one other study examining 40 older females, with a mean age of 64 years, Hollevoet and Verdonk (2003) reported that all wrist fractures had been clinically considered healed six weeks following the injury. At an average follow-up time of 28 months, the investigators found that longstanding pain and lowered range of motion were significantly correlated (p = 0.02) with a displacement of the wrist joint at the time of fracture (Hollevoet & Verdonk, 2003). Although the incidence of osteoarthritis at the affected joint was not measured in this study, the findings by Hollevoet & Verdonk (2003) strengthen the argument that fracture patients who have longstanding lowered
range of motion related to the injury are under-treated (Catalano et al., 1997; Fernandez et al., 1997).

**The Effects of Pain**

*Reducing mobility*

Compared to the time prior to the fragility fracture, people reported having a less active lifestyle in the first six months after the injury, due to ongoing fracture pain (Taylor et al., 2010). It was reported that less than half of the hip fracture patients returned to their pre-fracture level of walking (Taylor et al., 2010). Paier and colleagues (1996) found that the ongoing pain after a vertebral fracture directly impacted individuals’ ability to participate in physical activities (Paier, 1996).

*Emotional and psychological health*

After sustaining one fragility fracture, people reported anxiety about the possibility of sustaining another fracture (Gold, 1996; Taylor et al., 2010), depression and low self-esteem (Gold, 1996). The experience of unrelieved pain markedly increased anxiety levels in the first six months following the injury (Griffiths & Jordan, 2010). Participants reported that they did not consider their lives to be normal any longer, given the physical restrictions and the everyday psychological consequences of the related pain (Griffiths & Jordan, 2010; Paier, 1996). The authors of these studies (Griffiths & Jordan, 2010; Paier, 1996) did not provide explicit information on the time elapsed since the fracture.

*Participation in social activities*

In one qualitative study conducted seven weeks to six years post-fracture, participants reported that the pain from their fragility fracture severely restricted their routine social activities (Paier, 1996). Patients experienced difficulties in accommodating the ensuing pain, anxiety, and lowered mobility in their daily social activities, and reported negative consequences on their interactions with family and friends (Gold, 1996; Paier, 1996).
In the studies above, the importance of age with relation to the effects of pain on mobility, emotional and psychological health, and participation in social activities was not examined.

**Studies Examining Pain Medication as a Management Strategy**

People who had sustained a fragility fracture found it a struggle to balance the tradeoff between pain relief on the one hand and the adverse side effects of the prescribed analgesia on the other (Griffiths & Jordan, 1998; Paier, 1996). Participants had to choose whether to take less than the prescribed amount of analgesics, because the medication itself produced side effects such as giddiness, nausea, vomiting, dizziness, fatigue, or insomnia (Griffiths & Jordan, 1998; Ringe et al., 2002). Some of these side effects, such as giddiness and dizziness, could have been perceived by individuals to put them at risk for future fracture because of the likelihood of falling.

In addition to experiencing adverse effects, patients receiving inpatient care were afraid of growing dependent on the prescribed pain medication (Griffiths & Jordan, 1998; Paier, 1996). However, Paier (1996) noted that neither patients nor members of their medical team brought up the fear of analgesics dependency in clinical discussions. According to one qualitative study, all participants reported unrelieved pain at some stage after a fragility fracture, and the pain caused lack of sleep (Griffiths & Jordan, 1998). The majority of people receiving inpatient care post-fracture said that the analgesia received in the hospital did not adequately relieve pain (Griffiths & Jordan, 1998).

**Non-pharmacological Pain Management Strategies Reported by Patients**

Patients with a vertebral fragility fracture who were able to regain their pre-fracture mobility levels reported that physical exercise lowered pain during the chronic stage (Gold, 1996). A Cochrane review of randomized controlled trial studies found that patients with a vertebral fracture who were able to exercise following the injury reported reduced use of analgesics and improved quality of life; however, these findings were not consistent across all reviewed publications (Giangregorio et al., 2013). A limitation of
some studies was the presence of confounding variables, such as pre-existing muscle mass or the rate of adherence to the exercise program (Giangregorio et al., 2013). Therefore, it is unclear whether the reduced use of analgesics and improved quality of life were associated more strongly to these confounding variables than to the exercise program itself (Giangregorio et al., 2013).

In one qualitative study, patients with lower limb fragility fractures reported less anxiety by adopting self-planned coping strategies, such as avoiding activities associated with the perception of pain (Griffiths & Jordan, 1998). However, these participants reported no effect on the fracture-related pain after engaging in the self-planned coping strategies (Griffiths & Jordan, 1998). Similarly, in fractures sustained after high-trauma scenarios, one qualitative study found that adaptive coping strategies, such as learning new ways to complete daily tasks and implementing home and vehicle modifications, led to reduced stress, but did not lessen the related pain (Shauver et al., 2010). In particular, adopting a stoic attitude to pain did not prove to be an adequate pain-relieving strategy, regardless whether people had sustained a fracture after a low-trauma (Griffiths & Jordan, 1998) or high-trauma incident (Shauver et al., 2010).

**Interventional Treatment Studies**

A health intervention refers to a treatment or action taken in medicine to prevent or treat an illness (National Cancer Institute, 2014). Invasive treatments are medical procedures where the body is entered (invaded), whether by cutting, skin puncturing, or inserting instruments into the body (National Cancer Institute, 2014). In contrast, non-invasive treatments are medical procedures where no instruments are inserted into a body opening or through the skin (National Cancer Institute, 2014).

*Invasive interventions and their effect on pain*

Two quantitative studies evaluated pain levels of vertebral fragility fracture patients who underwent invasive vertebroplasty procedures. In those studies, the integrity of the fractured vertebra(e) was physically corrected and patients were compared to patients who underwent conservative, non-invasive procedures (Anselmetti et al., 2005; Rousing
et al., 2010). Participants experienced significantly less pain immediately afterwards and up to one month following invasive procedures, compared to those who received non-invasive treatments (Anselmetti et al., 2005; Rousing et al., 2010). In one meta-analysis, 70-90% of vertebral fracture patients who underwent vertebroplasty reported more effective pain relief in the days immediately following the procedure, compared to patients who received conservative non-invasive treatments (Anderson, Froyshteter, & Tontz, 2013).

However, authors of one randomized controlled trial, which was not included in the previously mentioned meta-analysis, found no significant difference in the reported pain levels at two weeks following either invasive vertebroplasty or non-invasive pharmaceutical treatment (Voormolen et al., 2007). There is more consensus in the literature that no significant difference was found in reported pain for the three months to one year period following either invasive vertebroplasty or non-invasive procedures for vertebral fractures (Anselmetti et al., 2005; Blasco et al., 2012; Rousing et al., 2009; Rousing et al., 2010). This suggests that patients reported immediate pain relief following invasive procedures, but that pain levels beyond the first three months post-fracture become comparable, regardless of whether patients undergo an invasive or a conservative fracture treatment. The authors of these experimental studies used the Visual Analog Scale to measure pain (Blasco et al., 2012; Rousing et al., 2009; Rousing et al., 2010; Voormolen et al., 2007).

Other authors also examined the effect on post-fracture pain between conservative treatments, such as stand-alone analgesia, and invasive treatments, such as the gray ramus communications nerve block (Chandler, 2001; Ringe et al., 2002). Unless patients presented with a hip fracture, invasive treatment was delivered only if the reported pain was incapacitating and unresolved by oral opioid medication (AAOS, 2014; Beaupre et al., 2013; Gerdhem, 2013; Lee et al., 2012). Invasive procedures to treat patients’ perceived pain were found to be largely effective in lowering pain levels immediately after the procedure, as well as lowering the prescribed analgesia dosage, in approximately half (42%) of fragility fracture patients (Chandler, 2001). However, this
suggests that more than half of the participants in the study conducted by Chandler (2001) still reported a very high level of pain, even after they had undergone specialized invasive procedures aimed to reduce severe pain.

No further studies were found that compared post-fracture pain after invasive versus non-invasive treatment strategies.

*Non-invasive interventions and their effect on pain*

The majority of fragility fracture patients in one study who underwent a non-invasive, conservative fracture treatment (analgesic medication) reported significantly reduced pain and improved overall quality of life compared to the time prior to the treatment (Ringe et al., 2002). Ringe and colleagues (2002) measured participants’ reported pain using a 0-11 numerical rating scale. Quality of life was measured using a 1-5 numerical rating scale for each of the following three categories: quality of sleep at night, impairment of daily living activities as a result of pain, and impairment of social activities as a result of pain (Ringe et al., 2002). However, approximately 20% of the participants in this study reported that the intended benefits of fentanyl patch analgesia were outweighed by its side effects – nausea, vomiting, dizziness, constipation, sedation, epigastric pressure, headache, diarrhea, lack of appetite, and/or sleep disorder (Ringe et al., 2002).
Purpose and Clinical Significance

Fragility fracture healing is considered to be complete after physiological bone-healing is clinically achieved. However, in quantitative and qualitative studies, people who have moved past the bone-healing stage continue to report post-fracture pain, which impacts their mobility and functional activities.

The purpose of this study was to explore and gain insight into the patient’s experience of pain after a fragility fracture, as well as into the effects that post-fracture pain might have on the everyday life of participants. We were particularly interested in pain that occurred beyond the typical fracture healing time. Little is currently known about the influence of age on post-fracture pain. Therefore, this qualitative research study aims to also compare the descriptions of pain after a fragility fracture across age groups.

The implications of our findings will help clinicians better understand issues related to the experience of pain after a fragility fracture, make recommendations for clinical practice, and provide insight into any differences in the post-fracture pain for older and younger people.
CHAPTER 2
METHODOLOGY

This was a qualitative secondary analysis conducted on data previously collected by my thesis supervisor, Dr. Joanna Sale. While I was not involved in the primary studies, all of which were phenomenological studies, I analyzed and discussed the data from these studies in close collaboration with my thesis committee. Phenomenology, with roots in philosophy, is considered to be one of the main traditions in qualitative research. It involves collecting and describing “the meaning for several individuals of their lived experiences of a concept or a phenomenon” (Creswell, 2007), for instance, sustaining a fragility fracture. Respondents are asked to share their experiences in detail (Polkinghorne, 1989), customarily in semi-structured interviews (Giorgi, 1997).

We were interested in conducting a supplementary analysis of the data with long-term pain as the focus. Heaton (2008) regards this form of data sharing as informal, where previously- and newly-involved researchers collaboratively conduct additional investigation into previously unexamined details. This study was designed with careful considerations of the data sets and the methodologies used in the primary studies. Data collection for the primary studies was driven by a particular focus into the patient’s experience after a fragility fracture. Researchers conducting secondary analyses must be aware of potential methodological tensions, such as whether the primary collected data appropriately fits the focus of investigation in the secondary study, considering factors of depth, coverage and usability of the data sets (Heaton, 2008).

We were guided by qualitative description for this secondary analysis using elements of descriptive phenomenology. Qualitative description offers the greatest palette of theoretical and philosophical underpinnings, allowing qualitative studies to incorporate characteristics of other methodologies (Sandelowski, 2000; Sandelowski, 2010). Despite popular misconception, descriptive methodology is not devoid of interpretation; in fact, no description is free of interpretation (Sandelowski, 2000; Sandelowski, 2010).
Findings developed from qualitative description analysis have a higher potential to result in “easier consensus among researchers” and thus faster clinical implementation, compared with other qualitative methodologies (Sandelowski, p. 335, 2000; Sandelowski, 2010).

The lack of existing literature on the experience of pain after bone healing is considered complete poses a barrier for health care professionals who treat fracture patients with this pain. This barrier has important clinical ramifications. Outside of a short period of time following the physiological bone healing phase, attending health care providers must rely on their own clinical experiences and opinions due to the absence of sufficient research evidence that could help them plan more effective clinical care options. Although no studies were found with explicit recommendations that clinical management should end past the bone healing phase, research into patients’ pain experiences after more than one year post-fracture has been limited and/or absent. Given these knowledge gaps in the academic literature and clinical practice, we believed it was useful to examine the experience of longstanding pain from a qualitative perspective in order to gain insights into this topic area. Thus, our research question was best addressed by an in-depth qualitative exploration into the phenomenon of longstanding post-fracture pain, using data from informants who had lived that experience (Polkinghorne, 1989).

Methods

Sampling and Recruitment
This study combined three phenomenological data sets on patients who had sustained a fragility fracture. Each of the projects underwent a Research Ethics Board approval process:

1) REB #07-059 – So how was it? Patient opinions on osteoporosis education in the fracture clinic setting
2) REB #08-157 – Bridging the gap between identified need and adherence to osteoporosis care after a fragility fracture
3) REB #10-371 – How can Canadian Osteoporosis Patient Network members inform post-fracture intervention research?

Participants were originally recruited using a purposeful sampling approach, in order to only include individuals who had previously sustained a fragility fracture and could articulate their experiences. They were recruited from patients attending the Fracture Clinic at St. Michael’s Hospital in Toronto, Ontario, or they were individuals with a history of fractures who were part of a national patient group in Canada (Canadian Osteoporosis Patient Network). Sixty-seven interview transcripts from the three data sets were considered for this study, comprising of English-speaking males and females, 47 to 89 years old, who had sustained at least one fragility fracture. The majority of the participants considered were females (n = 59, 81%). Patients presented with fractures sustained at the vertebrae and hip, as well as at a variety of other locations of the axial and appendicular skeleton. Since medical health records were not collected for this study, and respondents sometimes referred to vertebral fractures as back-breaks, we did not know whether vertebral fracture participants had sustained one or multiple breaks. Many vertebral fractures are discovered incidentally, during examinations for other health conditions (Woo, Mansoubi, & Alyas, 2008), and having had a single previous vertebral fracture increases the patient’s risk of sustaining subsequent fractures from five to twelve times (Alexandru & So, 2012). Therefore, we used the term “fractures of the vertebrae” in our analysis to encompass both single and multiple vertebral fractures. Individuals who exhibited cognitive impairment, as determined by the study coordinator, were excluded from the recruitment pertaining to the primary studies. A summary of the demographics in each of the three data sets is presented in Appendix A.

Data Collection
No further data in addition to the three data sets were collected for this study. Consistent with phenomenology, original data were collected through one-on-one semi-structured interviews (Giorgi, 1997), each having lasted approximately 60-90 minutes. The interviews for two of the primary studies were conducted either in participants’
homes, or at a downtown location. The interviews for the study on a national patient group were conducted by telephone as participants in that study resided across Canada.

In the original studies, participants were asked to recount their experiences following the fragility fracture. They reported a description of how the fracture had occurred and the status of the fracture at the time of the interview. While post-fracture pain was not the main focus in any of the three data sets, participants discussed this pain in varying levels of detail. Only the transcripts from respondents who talked about their experiences of pain after a fragility fracture were included in the data analysis.

**Data Preparation**

The interview data considered for this secondary analysis were transcribed verbatim and stripped of all identifying information. All data were downloaded to NVivo, a software program that allows for the organization of data.

For the secondary analysis on pain that is the focus of this thesis, the codes “fracture,” “pain” and “recovery” were searched across all studies. These codes had been developed by the researchers of the primary studies. The code “fracture” referred to anything pertinent to the fragility fracture, including discussions about rehabilitation, healing, pain, and ongoing functional difficulties. The code “pain” referred to any discussions about pain, regardless of whether it referred to the fracture or not. The code “recovery” referred to any information about the status of the fracture over time. The word “pain” was also searched across all transcripts to ensure that no additional data about pain were overlooked. When a discussion of pain was identified in a transcript, it was extracted and included in our analysis along with its preceding and following paragraphs, to ensure that we captured the applicable context. Only the pain related to the fragility fracture was examined by this manual search and for the secondary analysis. Data on pain related to other circumstances or health conditions, such as potential osteoarthritis at other anatomical locations than where a fracture had been sustained, were excluded from our analysis.
The computer software suite Microsoft Office 2011® was used to organize and manage the secondary analysis data. Instances of each code (fracture, pain, recovery) as well as additional data on the word “pain” across all the original studies were downloaded into a Microsoft Word document. The identification of respondents in this study occurred using the approach shown in Table 1. Data sets were assigned a letter in ascending order, determined by the REB codes. For example, a data set from study #07-059 was assigned the letter “A”, while a data set from study #08-157 was assigned the letter “B”. A unique number preceded by the corresponding data set letter identified each individual respondent. For example, the fifth transcript from the data set of study #07-059 was identified as “A5”, while the third transcript from the data set of study #08-157 was identified as “B3.” Each of the three phenomenological data sets contained 21 to 28 participants who were considered for this study.

Table 1

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One of the elements of the pain experience that we examined were the participants’ perceptions of the messages received from the attending health care providers regarding pain. Similar to a study by Sale and colleagues (2015), we considered these perceived messages to include any of the information participants had received throughout their interactions with health care professionals.

In order to compare the experience of pain by age, we chose to compare those aged 69 years and younger with those aged 70 years and older. The literature on osteoporosis
and fragility fractures did not help us in identifying an appropriate age cut off between age categories in our sample. For example, the studies pertinent to bone health only reported that the incidence of low bone mineral density and associated fractures increases exponentially with age (Das & Crockett, 2013; Gerdhem, 2013; Poole et al., 2012), with the steepest increase between 50 to 80 years (Kanis et al., 2000). No studies were found where age comparisons were conducted within the osteoporotic population. The American Geriatrics Society (2002) advises that although “elderly” persons are commonly identified in society as those aged 65 and over, in health care settings patients are considered “elderly” according to the frailty of their health. By the age of 75, many patients present in a considerably frail health condition, while those aged over 75 are at the highest risk of morbidity and mortality (AGS, 2002; Ferrell, 1996). Despite the absence of comparison by age among previous studies where osteoporosis and associated fractures were examined, our rationale for considering the age group cut off between 69 and 70 years is founded on research findings from other areas of health care. The United States’ National Institute for Neurological Disorders and Stroke advised that an age cut off between 69 and 70 years is more appropriate for comparing younger and older adults with cardiac conditions (NINDS, 2012). In addition, it was reported in one quantitative study that patients aged 70 years and over faced a significantly higher risk of mortality in the 30 days following a lung transplant, compared to those 69 years and under (Barclay, 2009). Lastly, authors of one quantitative study published in the American Journal of Emergency Medicine reported that among persons who had sustained traumatic injuries, those aged 70 to 74 years were associated with a significantly higher rate of mortality than younger adults (Caterino, Valasek, & Werman, 2010). Furthermore, in the same article on traumatic injuries, it was reported that no significant difference was found in the rate of mortality in patients aged 60 to 64 years, compared to those aged 65 to 69 years (Caterino et al., 2010). Therefore, guided by previous findings reported in other health care studies, we believed that the age categories ≤69 and 70+ were the most appropriate for comparing the experience of post-fracture pain in our sample.
**Data Analysis**

To analyze our data, we followed a qualitative descriptive approach with underlying hues of phenomenology (Sandelowski, 2000; Sandelowski, 2010). The process of imaginative variation, where multiple thematic possibilities are considered (Giorgi, 2008; Wertz, 2005), occurred throughout the analysis via thesis committee meetings between me and my thesis committee. I recoded the data and devised the following ten codes pertaining to post-fracture pain: “great pain,” “chronic pain at the injury location,” “mobility,” “activity,” “pain exceeding time estimated by health care providers,” “shortcomings in the clinical management of pain,” “ineffective prescribed pain medication,” “expectation and acceptance of pain,” “refusing to take pain medication,” and “non-pharmaceutical coping strategies.” I developed three themes by relating the ten codes to each other (Giorgi, 1997; Sandelowski, 1995; Sandelowski, 2000; Sandelowski, 2010). The focus of the first theme was on the participants’ descriptions of the experience of longstanding post-fracture pain, in which I combined the first four codes (great pain, chronic pain at the injury location, mobility, activity). The second theme encompassed the data related to the clinical messages perceived by respondents from their interactions with health care professionals, comprised of two distinct codes (pain exceeding time estimated by health care providers, shortcomings in the clinical management of pain). The third theme, in which I incorporated data from the remaining four codes (ineffective prescribed pain medication, expectation and acceptance of pain, refusing to take pain medication, non-pharmaceutical coping strategies), described the decisions made by participants in response to longstanding post-fracture pain, which was unrelieved by analgesics. Direct quotations accompanied by the relevant de-identified demographics were used throughout the presentation of findings in order to give participants a voice in illustrating their lived experience (Corden & Sainsbury, 2006; Sandelowski, 1994).
Methodological Rigour

All researchers have the responsibility to ensure they design a study following critical appraisal guidelines that apply to their chosen methodology, in order to add high-quality knowledge to the existing body of literature (Norlyk & Harder, 2010). We undertook a qualitative descriptive approach drawing on phenomenology’s emphasis on the lived experience as the conceptual foundation for our study. As there are no guidelines for combining qualitative description with phenomenology, we ensured that our theoretical commitment to both these approaches guided our attendance to rigour.

In a systematic review of the rigour applied in nursing phenomenological studies, researchers were warned that a phenomenological design is not appropriately rigorous if the phenomenon of interest is not explicitly described (Norlyk & Harder, 2010). Examples of vague study phenomenon explanations include solitary statements, such as that “multiple phenomena” were examined, or that the “building blocks of human science” were examined (Norlyk & Harder, 2010). Throughout our secondary study, we explicitly identified that our phenomenon of interest was participants’ experience of pain after a fragility fracture.

We established the sample for our secondary analysis purposively in order to access rich, in-depth descriptions of individuals’ experiences of pain. The goal of sampling in phenomenological research is to recruit participants who are experts in the experience of interest, and therefore qualified to provide in-depth descriptions in the interviews (Dahlberg, Dahlberg, & Nystrom, 2008; Giorgi & Giorgi, 2003; Norlyk & Harder, 2010; Polkinghorne, 1989; Todres, 2005). Therefore the original transcripts from which we selected our sample provided rich descriptions of the phenomenon in which we were interested, an important criteria for quality in secondary analysis.

The appropriate size of the sample is determined by the richness of the collected data pertaining to the experience of interest (Milne & Oberle, 2005; Norlyk & Harder, 2010; Polkinghorne, 1989). There are no sample size recommendations for secondary analysis or qualitative description, however, researchers are advised to use saturation
as the indication of a sufficient sample size (Milne & Oberle, 2005; Morse, 1989; Morse, 1994; Morse & Singleton, 2001). We were unable to follow the conventional method of sampling to saturation since the data were already collected but we considered saturation and also followed the guideline of a sample size of 25-50 (Polkinghorne, 1989), which has been proposed for phenomenological studies.

All the data considered for our study was originally collected in one-to-one interviews that were semi-structured. This approach is also an essential element of rigour in qualitative description (Milne & Oberle, 2005) and phenomenology (Norlyk & Harder, 2010). In semi-structured interviews, respondents are empowered to decide what elements of their experience are important without influence from pre-existing assumptions of the researchers (Milne & Oberle, 2005; Whitemore, Chase, & Mandle, 2001). The participants in our sample were asked to describe their experience after the fracture; we believed that those individuals who decided that post-fracture pain was an important element in their experience voluntarily talked about it. The interviewer then followed up with further probing into the discussion of pain in order to further capture respondents’ experiences while remaining within the contexts of the primary studies. Rigour in the authenticity of data was also maintained in our study through the use of interviews being transcribed verbatim (Mason, 1998; Milne & Oberle, 2005).

For the secondary analysis we also maintained consistency as a key element of methodological rigour. At all times when decisions were made pertaining to data preparation, coding, and theme development, our research team (AG, JS, FW) discussed potential impacts on our findings. Furthermore, I presented rationale for all decisions regarding the handling of data, such as the age cut off between 69 and 70 years that was used in comparing the experiences of post-fracture pain between younger and older respondents. Constant critical appraisal of decisions made throughout the study is a key element of rigour in qualitative research, particularly in the data handling and analysis phases (Milne & Oberle, 2005; Whitemore, Chase, & Mandle, 2001). Moreover, in our presentation of the results, we included direct quotes from participants to support our claims and maintain the original voice of the
respondents. Quotations and descriptions of the data were balanced so that readers could see how our claims were supported by the raw data (Dixon-Woods, Shaw, Agarwal, & Smith, 2004).

**Reflexivity**

Researcher self-reflection is a critical component of qualitative research (Frank, 1997) and it is important that it is practiced throughout all phases of a study (Giorgi, 1997; Norlyk & Harder, 2010). Additionally, since in my professional roles I am both a researcher and a radiological technologist, self-reflection into my past clinical experiences throughout the study was a critical component of applying methodological rigour in our study. The process of reflection on preconceived expectations is an important element in both qualitative description (Milne & Oberle, 2005) and in phenomenology (Giorgi, 1997; Norlyk & Harder, 2010).

In addition to the existing personal knowledge of the studied phenomenon (Giorgi, 1997), phenomenological researches are also advised to consciously reflect (bracket) on the information they had read from the literature and on their past personal clinical experiences (Norlyk & Harder, 2010). In qualitative description, researchers are advised to reflect on existing multiple professional roles (Milne & Oberle, 2005). Self-reflection is particularly essential when people have the dual-role of researchers and health care providers, in order to recognize participants as experts of their own experiences (Milne & Oberle, 2005).

My interest in the patient’s experience of pain after a fragility fracture stemmed from the combination of my own clinical experience as a radiographer and my previous research in cancer patient’s experiences. As a practicing diagnostic medical imaging technologist, I regularly obtain radiographic images for patients who might have sustained a fracture. Based on my previous work with cancer patients, I became more interested in the experiences of patients with a fracture and how it might impact their everyday life. I researched the topic of pain after a fragility fracture and realized there was a knowledge gap in both qualitative and quantitative research in the post-fracture
period beyond six months. Very few studies examined the patient’s pain after this time had passed.

Theoretical Framework
The conceptual framework of a qualitative project guides the development of the research design (Sandelowski, 1993). Therefore, a successful qualitative study must be carefully situated within theoretical frameworks that resonate with the researcher’s perspective and interest. As Sandelowski (1993) has noted, theory can enter the research study at different time points.

This analysis adopted a constructivist position theoretically which aligned with the original design of the interviews. According to constructivist theory, reality and “the truth” are subjective concepts, variable on one’s past experiences and subconscious beliefs (Giacomini, 2010). Therefore it became important for me to understand my own subject position in relation to my research question. For example, in my clinical role as a radiological technologist, and therefore embedded within a biomedical model, I had readily accepted the notion that pain medication would offer fracture patients the pain relief they sought. Through dialogue and close readings of the text, I became aware of my own preconceptions, past experiences, and how they might impact my interpretation of participants’ narratives.

The diversity of experience recounted by participants also provided new insight into each person’s differing rationalizations of their own experience. For example, some participants told us that the pain shortly after a fracture had not been severe and therefore, they did not even take painkillers. I found myself perplexed when some participants also described in the same interview that due to the fracture-related pain, they have been unable to engage in functional activities that they had been performing on a daily basis prior to the injury. What did it mean for these participants to have “severe” pain? Did they experience pain as being separate from mobility? This led me to further understand the importance of the social meanings participants constructed of their pain and its impact on their daily life.
Ethical Considerations

Ethical approval was obtained from the Research Ethics Boards (REB) of St. Michael's Hospital and the University of Toronto. Only data already collected in the three data sets were used for this secondary analysis. The goal of the original studies was consistent with the goal of the secondary analysis and therefore we did not need to seek additional consent from participants for this study. Respondents were not contacted regarding any additional data collection. The transcripts in the three data sets were already de-identified of any information pertaining to patients' names and personal health records. Demographic information such as age, sex and fracture location were noted in a separate secured document and were only referred to when the sample was described as a whole, and when it was helpful to lend meaning to a particular participant's experience when the data were reported as direct quotations. After the successful defense of this thesis, the de-identified data will be retained securely on the premises of St. Michael's Hospital and only accessible by my supervisor for the period of ten years.

We did not foresee that any risk existed to the participants in this study, since all data were already collected and we did not follow up with patients.

Funding

The projects which yielded the three data sets were funded by the Ontario Ministry of Long-Term Care and by two grants from the Canadian Institutes of Health Research held by my supervisor. No further funding was required for this study.
CHAPTER 3
RESULTS

Description of the Sample
Sixty-seven interviews with participants who had experienced a fragility fracture were considered for this study. Twenty-nine participants spoke about post-fracture pain without specifically being asked about pain and thus, were included in the secondary analysis. I believed that saturation was reached, in that there appeared to be sufficient data to support the themes relevant to the research question that I developed and I had no analytic questions of the data that I believed warranted additional data collection. Further, our final sample size exceeded recommendations for phenomenological studies (Creswell, 2008; Polkinghorne, 1989). The transcripts excluded from the analysis contained patients’ reports of general experiences after the fragility fracture, as well as their reports of pain unrelated to the fracture they had sustained. This process is presented visually in Appendix B.

The demographics of the 29 participants, of which three were male (10%), are presented in Appendix C. Eight (28%) individuals were aged 69 and younger. Twenty-four respondents (83%) reported that they had sustained a fragility fracture one year or longer prior to the interview. A time frame of equal to, or greater than, one year generally exceeds the time frame identified in the literature for pain after vertebral fractures to decrease. Pain levels from vertebral fractures have taken from four to six weeks (Harvard Health Publications, 2008), 23 weeks (Frost, 1998), and up to 12 to 18 months (Rajzbaum et al., 2014) to decrease.

The age range of individuals whose transcripts were included in the analysis was 51-89 years. The majority of fragility fractures reported by participants in our study were of the vertebrae (n=7, 24%). The next most common locations of fragility fractures were at the hip (n=4, 14%), humerus (n=4, 14%), and shoulder (n=4, 14%). Fracture locations of other participants were at the pelvis (n=2, 7%), wrist (n=2, 7%), ankle (n=1, 3%), arm
(n=1, 3%), and knee (n=1, 3%). The final three (10%) respondents reported they had sustained more than one fragility fracture in their lifetime, for example, at the arm, jaw, and vertebrae.

We used unique study ID codes to protect the confidentiality of the participants. Their sex and age were noted in the analysis to put the experience of post-fracture pain in context. The experiences reported by the participants were analyzed by age in two categories, adults aged 69 years and younger, and those aged 70 years and older. The rationale for selecting this age cut-off was presented in the methods chapter. No studies were found where osteoporotic patients were compared by age, however, findings from research in other health care areas of people aged 50 and over suggest there are significant health outcomes between those younger than 69 years old, compared to those 70 years and older (Barclay, 2009; Caterino et al., 2010; NINDS, 2012).

Three interconnected themes were developed from participants’ reports on the experience of pain after the fragility fracture. Appendix D presents an extensive table of the themes and respective participant quotes:

1) **Patients described longstanding pain beyond typical fracture healing times, generally unrelieved by analgesics, which impacted their mobility, functional activity, independence, sleep and energy;**

2) **Health care providers under-estimated expected timelines regarding the decrease of post-fracture pain and were perceived to not manage that pain;**

3) **Participants responded to inadequate pain management by employing several strategies. These strategies included accepting the pain, reporting their decisions to refuse pain medication despite having pain, or describing other non-pharmaceutical coping strategies.**
1) Participants described longstanding pain beyond typical fracture healing times, generally unrelieved by analgesics, which impacted their mobility, functional activity, independence, sleep and energy.

In addition to osteoporosis, participants reported they were living with other diagnosed health conditions, such as anxiety, Crohn's disease, degenerative disc disease, depression, diabetes, heart complications, irritable bowel syndrome, and multiple sclerosis. They talked about the pain after the fragility fracture as a discrete health condition. The respondents in our study discussed their experience and management of post-fracture pain and the other diagnosed co-morbidities in comparable detail and gravity.

*Experience of pain within one year of fracture*

Several participants told the interviewer about the pain they experienced shortly after they had sustained their fracture. They described this pain with words that were indicative of great discomfort. One 89-year old female who had fractured her vertebrae 13 years and four months previously recalled that she had “terrible [and] dreadful” back pain for several weeks post-fracture (C-11). Two other respondents with vertebral fractures, a 76-year old female (C-2) and a 72-year old female (C-10), described the back pain that they had experienced three years, and two years and five months prior to the interview respectively, as debilitating and causing “horrendous” (C-10) muscle spasms.

Five participants (17%) in our study had sustained a fracture less than one year before the interview. The closest time to the interview that a respondent had sustained a fracture was seven months previously, when one 83-year old female had fractured a wrist (C-14). She told us in the interview that she continued to have pain in the area she had fractured (C-14). A similar respondent, an 84-year old female who had sustained a wrist fracture eight months prior to the interview, told us that she continued to have pain in her affected arm, with accompanying numbness (B-15). One 71-year old female who had fractured a hip eleven months prior to the interview said that she still had frequent
throbbing pain when she would bear weight on the affected leg (B-21). Without the pain medication she was taking, she said that she would end up “crying” from the pain (B-21).

**Experience of pain beyond one year of the fracture**

Eighteen of the 24 participants (75%) who had sustained a fracture at least one year prior to the interview told us that they still experienced longstanding pain in the area of the fracture. On average, these individuals had sustained a fragility fracture approximately three years and one month (36.7 months) prior to the interview. The median time since these respondents had sustained a fracture before the interview was 22.5 months. One 89-year old female reported that longstanding back pain was still regularly disrupting her daily routine, even though thirteen years and four months had elapsed since she had sustained vertebral fractures (C-11). The longstanding pain had led her to visit her family physician several times, a “pain doctor” specialist, and a neurologist over the previous seven years (C-11). Some of the participants who had sustained a fracture at least one year before the interview, and who reported longstanding pain, also told us that they continued to observe swelling and numbness in the affected areas, after regular activity routines. For example, a 53-year old female, who had fractured both ankles four years previously, and a wrist eighteen months previously, told us that although she had cut back her daily working hours at a store, “By the end of the day they [both ankles] hurt, they swell … and the [affected] wrist swells too” (C-8). Two other younger females in our sample, one 54-year old who had fractured a shoulder 18 months previously (A-12) and one 57-year old who had fractured a humerus 16 months previously (A-7), also reported continued pain when they were engaged in their daily routines.

Three respondents reported that in addition to the daily longstanding pain, they had greater discomfort in the morning and evening hours. For example, one 70-year old female who had fractured a humerus 16 months before the interview told the interviewer that she regularly had greater pain and stiffness in the affected extremity when she was waking up (B-13). A 72-year old female who had sustained vertebral fractures two years
and five months before the interview told us that the ensuing post-fracture back pain continued to regularly bother her, “particularly at the end of the day” (C-10). Another female, 73-years old, who had fractured her vertebrae four years previously, similarly reported greater back pain in the evening hours, more commonly when she was preparing dinner (C-28).

The three male participants in our study (B-17, B-19, C-19) all had sustained a fracture at least one year prior to the interview. One 60-year old male who reported that he had sustained vertebral fractures over one year before said that he still had considerable back pain at the time of the interview, even though the pain had slightly lessened compared to the time shortly after the fracture (C-19). Another male, 82-years old, who had fractured a shoulder one year prior to the interview, similarly told us that although the pain lessened over time, he continued to have painful discomfort in the affected area (B-19). The third male participant, 79-years old, had fractured a hip 18 months prior to the interview (B-17). He reported that he had longstanding pain on a daily basis in the area that he had fractured.

Some female participants reported that they were taking pain medication, prescribed opioids and over-the-counter drugs as advised by attending health care providers, in order to lessen the pain they had while they were engaged in daily routines. One 88-year old respondent who had fractured her vertebrae told us that she still could not endure the longstanding back pain unless she was taking the opioid analgesic (hydromorphone) that had been prescribed to her, as well as an over-the-counter pain medication (Tylenol) that she additionally took by her own decision (C-24). A 53-year old participant, who had fractured both ankles four years previously, and a wrist eighteen months previously, reported that the NSAIDs (Aleve and Ibuprofen) she was taking daily, as advised by her attending practitioner, were not effective in lessening the pain in the affected extremities (C-8). She told the interviewer that she achieved pain relief only by taking stronger pain medication (Tylenol 3 and Oxycontin), which she happened to have in her house due to a prescription from previous illnesses or one that had been written for other family members. One other female, who had fractured her
sacrum two years before the interview, reported that although she was following her clinician’s indication to take pain medication on a daily basis, she did not observe any pain relief (C-25). She did not tell us the type of pain medication that she was taking daily.

Whether participants had sustained a fracture of the axial skeleton (i.e.: vertebrae [C-10, C-11, C-19, C-24, C-28], pelvis [A-8, C-26], sacrum [C-25]), a fracture that involved a joint connecting the axial skeleton with an extremity (i.e.: shoulder [A-1, A-5, B-19], hip [B-9, B-17]), or an extremity fracture (i.e.: arm [A-13], humerus [A-7, B-13], wrist [C-8], knee [C-9], ankle [C-8]), they reported similar longstanding pain extending beyond one year post-fracture.

**The Impact of Pain on Daily Routine**

Fourteen participants (48%) reported that the post-fracture pain impacted their mobility, functional activity, independence, sleep, and energy. Twelve of the eighteen participants (67%) who talked about longstanding pain and had sustained a fracture at least one year prior to the interview reported that the lasting post-fracture discomfort was impacting their daily routine. Compared to the time prior to the fracture, respondents said the pain forced them to develop increased awareness for some of the most basic body motions and functional activities. Many said that they could not regain previous abilities such as maintaining various body postures or driving a car.

**Mobility**

Participants told us that they had difficulty returning to pre-fracture mobility and maintaining their balance because of the pain. Some respondents told us that they had been very active physically before they had sustained a fracture, but at the time of the interview they could only engage in walking activities, at much lower intensity and endurance than they preferred. For example, one 60-year old male with vertebral fractures, which he had sustained over one year prior to the interview, told us, “I used to be able to walk quite far. I used to be able to walk five kilometers in an hour, five or six times a week. I can’t do that anymore but I do get out and walk” (C-19). Respondents
who had sustained fractures in other regions than the axial skeleton, such as a 75-year-old female who had fractured a shoulder 21 months previously (A-5), or a 57-year-old female who had fractured a humerus 16 months previously (A-7), likewise reported that despite having been very physically active prior to the fracture, they were unable to return to pre-fracture activities due to the longstanding pain.

Other participants, such as a 72-year-old female who had sustained vertebral fractures two years and five months prior to the interview (C-10), reported that they could not engage in any physical activity anymore as a result of the restrictive post-fracture pain. A 79-year-old male, who had sustained a hip fracture 18 months before the interview, told us that the impacts and limitations of the post-fracture pain on his daily activities had slowed the overall pace of his life (B-17). In the interview, he said, "[My lifestyle] actually changed without measuring it. You slow down. There are things you will not do. You do not do. I don’t [drive and sit] as much [as I used to]" (B-17). One 53-year-old female, who had fractured both ankles four years previously and a wrist 18 months previously, told the interviewer that due to the limitations imposed on her lifestyle by the post-fracture pain, she considered herself living as if she was much older than her actual age (C-8). In the interview, she said, "I feel like I’m 80 [years old], not 53. I don’t do anything now [because of the pain]. I used to be unbelievably active [before the fractures had been sustained]" (C-8).

Several participants said that they had lost the ability to balance themselves after their vertebral fractures and they self-assessed themselves to be at great risk of falling and re-fracture. For example, in trying to follow recommendations from his physician to walk more, one 60-year-old male with vertebral fractures that he had sustained over one year prior to the interview said, "I’ve been trying to [walk] as much as possible … but I [only] walk with a cane [because of] my back [pain] and my [loss of] balance [after the fracture]" (C-19). One 73-year-old female reported that after she had sustained vertebral fractures four years previously, she kept "losing [her] balance" when she engaged in mild mobility activities, such as walking out in the back-yard garden (C-28).
Functional activities

Nine participants (31%) reported that the post-fracture pain was a powerful and dominating force, which dictated the functional activities that they were able to engage in. Functional activities were defined as daily activities unrelated to physical activity, for example, posture, personal care, social involvement, and household chores identified by participants as routine. In particular, seven males and females among these nine respondents (78%), aged between 57-79 and who had sustained a fracture ranging from eleven months to nine years previously, told us that the pain they had on any given day determined their ability to carry out certain daily functions (A-5, A-7, A-13, B-17), their decisions to leave the house that day (C-26), and their decision to cease any household activity and rest in bed (B-21, C-10). The fractures that these adults had sustained were not limited to the axial skeleton, but also included fractures of the appendicular skeleton and fractures at joints connecting extremities with the axial skeleton. Participants reported the dominance of post-fracture pain in their lives irrespective of the location where they had sustained a fracture. For example, two females, a 71-year old who had fractured a hip relatively more recently, eleven months before the interview (B-21), and a 72-year old who had sustained vertebral fractures two years and five months previously (C-10), told us that when the pain in the affected region surpassed their pain tolerance threshold, they had to cease all activities and lie down in bed, waiting for approximately thirty minutes for the pain to lessen. One 68-year old female, who had sustained a pelvic fracture nine years previously, reported that she would plan her daily activities according to the pain in the morning hours (C-26). One 57-year old female who had fractured a humerus 16 months previously (A-7), and one 79-year old male who had fractured a hip 18 months previously (B-17), reported that the longstanding pain would remind them that “some very simple things [could not be done]” (A-7) and that “there are things … you do not do” (B-17). The 57-year old female described that the longstanding pain dictated her range of motion (A-7). She said that she would “often … get very sharp jolts of pain and [would] drop things that [she] was holding” if she was raising the affected arm to certain positions (A-7). One 64-year old female who had fractured an arm 21 months prior to the interview summarized the
limitations due to the longstanding post-fracture pain by telling us that she “would be reminded … [by] the pain [that she] shouldn’t be doing something” (A-13).

Two of the nine participants who talked about post-fracture pain as the main factor restricting functional activity told us that they had made considerable efforts to be active (A-1, C-8). However, in spite of their efforts, the fracture-related pain was eventually still restricting them from remaining engaged in their activities. For example, the second youngest respondent in our study, a 53-year old female who had fractured both ankles four years before the interview, and a wrist eighteen months before the interview, told us that she desired to return to work and that she had responded to the longstanding pain with certain lifestyle changes (C-8). She said that she was forced to work fewer hours at her store, where she also had to be less involved in activities with physical requirements. Despite her efforts to accommodate the impact of pain on her daily activities, she reported that she frequently had exhaustive days when the pain was unbearable. This respondent told us, “I’ve had to cut my hours [of work] way back … my hours at the store are 11:00 to 16:00 … by 16:00 [hours] I’m dead. I’m done. It’s all I can do some days, to drive home … the pain is so bad” (C-8). She also said that the fracture-related pain and swelling in the affected extremities restricted her from carrying out many household chores, such as “washing the dishes” and “hanging laundry” (C-8). Another participant in the younger age group, a 56-year old female who had sustained a shoulder fracture 18 months previously, similarly reported that when the longstanding post-fracture pain became greater than her personal threshold of tolerance, she would have to shut down her involvement in all activities until the pain slowly lessened (A-1). It was evident that the post-fracture pain greatly limited her functional activity when she told the interviewer, “Oh God, I can’t do anything!” (A-1).

*Independence*

Participants largely identified independence as the ability to live at home, and to carry out household and community daily activities without assistance. They associated their independence after the fracture with obtaining pain relief in order to be able to perform certain activities. For example, one 73-year old female reported that if no attempts had
been made for relieving the ensuing pain shortly after she sustained vertebral fractures four years previously, her ability to live independently in the community would have been restricted (C-28). She told us, “[After the vertebral fractures, I went] to see a spinal surgeon and [he put] me on pain killers of course to make it possible to be able to live at home” (C-28).

Participants associated their independence with the ability to successfully carry out activities in their home, which continued to be restrained by post-fracture pain at the time of the interview. For example, a 53-year old female told us that she could not complete activities around the house without frequent help from her spouse (C-8). She said, “Because of the wrist [fractured 18 months previously,] I can’t change the sheets on the bed and stuff like that” (C-8). Even after more than one year had elapsed since the fracture, respondents said they were worried about their independence because they could not carry out activities on their own unless the analgesics provided sufficient pain relief. The youngest participant in our study, a 51-year old female who had fractured a knee 15 months prior to the interview, said she was worried that she might not be able to survive on her own by saying, “I’m experiencing a lot of pain, I can’t do the things I normally do … I just can’t … how am I going to survive?” (C-9).

**Sleep and energy**

The post-fracture pain had an impact on participants’ sleeping and energy levels, whether or not more than one year had passed since the fracture. They reported difficulty falling asleep and woke up much earlier than they would have preferred due to the pain. For example, one 71-year old female who had fractured a hip 11 months prior to the interview said that when she had intolerable pain, which was nonresponsive to analgesics, she would not be able to fall asleep until the early morning hours (B-21). She told us, “Some nights, I don’t go to sleep until six o’clock in the morning [because of the] pain” (B-21). Meanwhile, one 70-year old female, who had fractured a humerus 16 months previously, reported that the pain in the fracture-affected region was regularly waking her up in the early morning hours (B-13). She told us that she would take the prescribed opioid medication when waking up too early, which eventually would give her
sufficient pain relief to return to sleep for one to three additional hours (B-13). One 57-year old female told us that since she had fractured a humerus 16 months prior to the interview, she was unable to sleep on the side of the affected arm, because the pain in the fracture region would wake her up and prevent her from returning to sleep (A-7). She said, “If I sleep on my left-hand side accidentally [since the fracture], I’d wish to heck I hadn’t because I have quite severe pain after I’ve slept on that side laying on my arm” (A-7).

Participants described being more fatigued throughout the day compared to the time prior to the fragility fracture, due to the sleep disruptions caused by post-fracture pain. For example, the 71-year old female who had fractured a hip 11 months prior to the interview told us that the disruptions in her resting routine were making her increasingly fatigued (B-21). She said, “I am in more pain now than I’ve ever been [and] I am [more] tired. I am very, very tired” (B-21). One 60-year old male, who had sustained vertebral fractures over one year prior to the interview, said that the fracture-associated pain he had when he was moving was making him more tired than he would have been prior to the fracture (C-19).

There did not appear to be any differences between the two age groups in the descriptions of pain after the fragility fracture and its impact on their daily lives regarding mobility, functional activities, independence, and sleep and energy. Six respondents in the older age group (28%) reported that the only physical exercise they were able to engage in was walking slowly and for very short distances. Participants in the younger age category (88%) reported that they were able return to work after the fracture, but only after they had made modifications in their daily routines to accommodate the impact of pain on their functional abilities.
2) Health care providers under-estimated expected timelines regarding the decrease of post-fracture pain and were perceived to not manage that pain

*Under-estimated timelines*

Five participants (17%), all females, reported that the post-fracture pain took much longer to decrease than the estimated time they had received from the attending health care providers. The age range of these respondents was from 54 years to 75 years and the time post-fracture ranged from eleven months to nine years. Many participants perceived that they had received clinical indications of the expected timeline for the post-fracture pain to decrease. For example, a 54-year old female who had sustained a shoulder fracture 18 months previously reported that it took “six to eight months” for the pain to considerably lessen, although her attending health care providers estimated a period of “six weeks” (A-12). One 75-year old female, who had fractured a hip 14 months prior to the interview, told us, “The pain took much longer to get better [than the health care provider predicted]” (B-16). Moreover, a 71-year old female who had fractured a hip eleven months previously (B-21) reported that the post-fracture pain and its associated perceived restrictive impact had actually become greater with the passage of time.

*Perception that health care providers were not managing post-fracture pain*

In addition to the under-estimated timeline for the pain to decrease, nine participants (31%) explicitly reported their dissatisfaction that the painkillers they were taking did not help them to effectively reduce the post-fracture pain. Their ages ranged from 70 to 89 years, and the range of time since they had sustained a fracture prior to the interview was eleven months to thirteen years and four months. Generally, participants said they were frustrated because the painkillers they were taking did not relieve the pain, whether they had received prescriptions for medication, such as opioids, or had been advised to only take over-the-counter medication, such as non-opioid analgesics (acetaminophen) and nonsteroidal anti-inflammatory drugs (NSAIDs; e.g., ibuprofen, naproxen). For example, one 88-year old female with vertebral fractures that she had sustained seven years previously said, “I’m on hydromorphone for pain, which doesn’t
really help very much [to lessen the pain]” (C-24). One 79-year old female who had fractured her sacrum two years before the interview said with respect to the analgesics, “Unfortunately, no matter what pain I have, nothing, absolutely nothing helps me” (C-25). Some participants indicated in their interviews that they had begun to lose hope that appropriate pain relief through pharmacotherapy could be achieved. For example, a 51-year old female with a knee fracture that she had sustained 15 months prior to the interview told us, “I have a lot of pain … I need to help make my pain go away … I think I’m a recovered fracture patient who doesn't have 100% [function] and is mad” (C-9).

While it appeared that some clinicians simply did not prescribe post-fracture pain-relieving opioids, or the prescribed opioid doses may have been too low to exhibit their intended results, some participants said their physicians refused to provide any painkillers other than over-the-counter drugs. For example, one 86-year old female, who had fractured a hip 18 months previously, reported that her attending physician refused to provide her with any prescription painkillers, even immediately after the fracture-reduction surgery (B-9). She told us:

After he [the doctor] cut me [to surgically realign the fracture], he said, “no” [to stronger painkillers and] he said, “just take the Tylenol.” So I told him about [the pain] yesterday (i.e., 18 months after the fracture)… it was so sore. He said, “no, just take an extra Tylenol.” (B-9)

Participants also reported that several attending providers had said there was nothing further that could be done to attempt relief of the longstanding pain. For example, one 88-year old female who had sustained vertebral fractures seven years before said that every time she complained of unrelieved post-fracture pain, her physicians replied that no alternative treatment options were available other than the pharmacotherapy already explored (C-24). She told us, “they [the attending doctors] said that my spine is in pretty bad shape and ‘there’s nothing we can do for you.’ That was mostly the answer I got” (C-24). One 73-year old female who had sustained vertebral fractures over six years prior to the interview reported that she was dissatisfied with the indifferent attitude she perceived from her physician when she sought clinical help for her longstanding post-
fracture pain (C-27). She told us that her clinician suggested it was not surprising that she had increasing fracture-related back pain over time. She said, "I did go to [my doctor] a while back because I seemed to be experiencing more pain [as time passed], and I found about the same attitude, 'Well you know it is pain there' " (C-27).

Two respondents perceived there were shortcomings in their post-fracture management regarding the cessation of physiotherapy. One 72-year old female, who had sustained vertebral fractures two years and five months prior to the interview, told us that her physiotherapist had advised her to simply refrain from exercising if she had pain (C-10). The respondent said that she wished the health care professional had advised an alternative non-pharmaceutical pain management strategy after halting the physiotherapy program (C-10). In another example, a 57-year old female, who had fractured a humerus 16 months prior to the interview, reported that her physician stopped the physiotherapy program based on radiographic assessments, without additional clinical consideration of the ongoing pain (A-7). She told us, "I had an X-ray that [the doctor] said it looked like the fracture had healed pretty well and we could stop the physio[therapy]. But I wasn’t happy about stopping the physio[therapy] … I was still in considerable pain" (A-7).

Two females of the nine participants who identified shortcomings in the clinical management of their pain also reported instances when health care professionals had advised that the post-fracture pain should be expected. One participant, a 73-year old female with vertebral fractures sustained over six years before the interview, had perceived that the attending physician advised her to accept the pain as a lifelong companion (C-27). She said her doctor implied that the pain at the fracture location was unsurprising and not a new health issue (C-27). The other participant, a 51-year old female who had sustained a knee fracture 15 months earlier, reported that after she had seen her attending physician, who she perceived would not prescribe any analgesics, she asked the clinic nurse for help in the management of the post-fracture pain (C-9). She said that the nurse had advised her to start accepting more frequent pain after the fracture, since she was an aging patient. The 51-year old respondent told us that the
nurse’s attitude and response had angered her at the time, since she did not consider herself “old” even at the time of the interview. From the perspective of the age of the fragility fracture population, this respondent was indeed closer to the younger end of the age range. In fact, she was the youngest participant in our study. In the interview, she told us that:

I said to the nurse, I’m experiencing a lot of pain, I can’t do the things I normally do, what are we going to do about this [to relieve some of the pain?] … The first thing she [the nurse] said was ‘well, none of us are getting any younger, you know?’ – which pissed me right off. She said, ‘you have to just accept your aches and pains because you’re getting older.’ That pissed me off doubly, and pardon the use of the word. (C-9)

Fifteen participants (52%), including the nine individuals who explicitly reported unrelieved pain, talked to us about the types of pain medications that they were taking after interactions with attending clinicians. Four of these respondents (27%) told us that they had received prescriptions for opioid analgesics. One 71-year old female among these four, who had fractured a hip eleven months prior to the interview, reported that none of the opioid painkillers she took over the course of time relieved the post-fracture pain (B-21). One other respondent of these four, an 82-year old male who had sustained a shoulder fracture one year before the interview, reported that he still had longstanding discomfort in the affected region (B-19). The two other respondents, a 73-year old female who had fractured a humerus eight months before (B-18) and a 60-year old male who had sustained vertebral fractures over one year before the interview (C-19), told us that they chose to stop taking their prescribed opioid medications, despite having continued pain.

Three participants of the fifteen who talked about the painkillers they had received (20%) reported that they were simultaneously taking opioids and over-the-counter pain medication. These three respondents had received opioid prescriptions from their attending clinicians and took additional painkillers as needed. In fact, one 70-year old female, who had fractured a humerus 16 months prior to the interview, said that she
was taking two opioids, Statex and Tylenol-3, in addition to an over-the-counter non-opioid analgesic, Tylenol (B-13). She reported that the combination of these medications lessened her longstanding pain considerably during the daytime, but that she would still be awoken by pain in the nighttime hours (B-13). The other two of these participants, an 88-year old female who had sustained vertebral fractures seven years before (C-24) and an 89-year old female who had fractured her vertebrae over 13 years prior to the interview (C-11), reported that despite taking one opioid drug simultaneously with over-the-counter painkillers, their longstanding post-fracture pain remained unrelieved.

Six of the fifteen respondents (40%) told us that their attending health care professionals refused to provide them with opioid prescriptions and advised them to only take over-the-counter painkillers, which included NSAIDs. Five of these participants, all of whom had sustained a fracture at least 15 months prior to the interview (B-9, B-16, B-17, C-9, C-28), reported that they were only taking non-prescription pain medication as they had been advised, but the longstanding pain continued to restrict their daily activities. One of these, a 75-year old female, said that she followed her physician’s advice to only take an over-the-counter painkiller since she had fractured a hip 14 months before the interview (B-16). After she complained of unrelieved pain, her physician advised the change from Tylenol, an over-the-counter non-opioid analgesic, to Advil, an over-the-counter NSAID (B-16). Despite the change in medication, this 75-year old female continued to have post-fracture pain, observing only slight relief from the NSAID. Her physician did not consider pharmacotherapy pain management through opioid analgesics (B-16).

Another female, 51 years old, who had sustained a knee fracture 15 months prior to the interview, told us that an attending nurse had advised her on behalf of the medical team that the only three painkillers she could choose from were over-the-counter medications; i.e., “either Tylenol, Advil, or Motrin” (C-9). Although in follow-up visits she complained of longstanding disruptive post-fracture pain, the attending orthopedic specialist and clinic nurse did not consider prescription analgesics (C-9). A 79-year old
male, who had fractured a hip 18 months before the interview, also reported unrelieved longstanding pain at the time of the interview (B-17). He told us that despite never having had adverse effects with a previously prescribed codeine opioid, his attending physician decided to stop that prescription, which was previously efficient in relieving the post-fracture pain. He said, “[I now take Tylenol as needed] for pain. I was taking codeine, but … [the doctor] said to not take anything with codeine in it because codeine can cause a lot of problems … so I stopped taking it” (B-17).

One participant of the six who had been advised by a clinician to only take over-the-counter painkillers to manage the post-fracture pain, a 53-year old female who had fractured both ankles four years previously and a wrist eighteen months previously, reported a unique case in our study of simultaneously using NSAIDs and opioids (C-8). She said that despite never having received prescription analgesics from her doctor and because the NSAIDs (Aleve and Ibuprofen) gave her no relief from the pain, she resorted to taking two opioid drugs that she came across in her house, Tylenol-3 and Oxycontin (C-8). She told us that she finally achieved acceptable pain relief when taking the two opioid analgesics, although she said she was aware that taking narcotics without medical supervision was not a good practice.

The remaining two of the fifteen participants (13%) who said that they had either received prescription analgesics or had been advised to take over-the-counter painkillers did not disclose which type of pain medication they were taking at the time of interview. One of these two individuals, a 72-year old female who had fractured her vertebrae two years and five months previously, reported that she had initially taken over-the-counter painkillers simultaneously with an opioid, Oxycontin (C-10). However, she said that she chose to discontinue the opioid analgesic, even though she had observed considerable and successful pain relief when she was taking it as prescribed (C-10). The other one of these two respondents, a 79-year old female who had fractured her sacrum two years prior to the interview, said that she continued to have no pain relief, although her physician informed her that all options to lessen the post-fracture pain had been explored (C-25). She said that one other doctor, who had also
been involved in managing her post-fracture pain, similarly told her that all options to relieve pain had already been attempted, yet he advised against trying morphine (C-25). At the time of the interview, this 79-year old female reported she was still searching for an effective treatment to help her manage the longstanding post-fracture pain (C-25). She told us:

Unfortunately, no matter [how much post-fracture] pain I had, nothing, absolutely nothing helps me [for that pain]. No, nothing helps me. And, actually, one doctor, a very nice gentleman, very nice guy, got so exasperated with me and I with him because I kept saying, “There’s got to be something to help me with this pain.” And then he said, “We’ve tried everything except morphine, I don’t think I want to put you on morphine.” And I said, “No, absolutely not, I don’t want to.” So, I finally left him and I went to the [current fracture clinic but] by this time I knew nothing could help me with the pain … It’s just that if I find some pain relief, that would be great! … I still think, if somebody could help me with the pain, that would be something, but they don’t seem to be interested in it, or even if they’ve prescribed things that don’t work they get sort of, “Oh, well, I can’t do anything more about it.” (C-25)

There were no differences based on age between the five participants who reported that the pain following the fracture took much longer to decrease than the attending health care providers had estimated. There also appeared to be no differences by age among the individuals who reported shortcomings in the clinical management of pain after they had sustained a fracture. Likewise, no differences were found between younger and older adults regarding the prescribed or advised type of analgesics and the reported ineffectiveness of the painkillers. However, proportion-wise, data on ineffective analgesia originated from twelve of the twenty-one older respondents (57%), compared to only three of the eight younger individuals (38%).
3) Participants responded to inadequate pain management by employing several strategies. These strategies included accepting the pain, reporting their decisions to refuse pain medication despite having pain, or describing other non-pharmaceutical coping strategies

Accepting the pain
Participants described a myriad of strategies they used to deal with the inadequate clinical management of pain. Eight participants (28%) told the interviewer that they accepted the pain and expected it to last for a long time after their fracture. Some individuals conveyed they decided to accept the pain following the fracture because they had also previously experienced other types of painful discomforts throughout their lives. They consequently regarded pain to be an anticipated manifestation after they had sustained a fragility fracture. For example, a 51-year old female who had fractured her knee 15 months before the interview reported that she perceived the longstanding pain as “just a fact of life [after the fracture]” (C-9). One 73-year old female with vertebral fractures told us that she considered the post-fracture pain associated with her routine activities to be an unsurprising consequence of the fractures she had sustained four years before the interview (C-28). Some participants further reported that as their age increased, they expected various pains originating from other sources to evolve as well. For example, one 86-year old female with a hip fracture that she had sustained 18 months previously told us, “Well, you see the thing is that, I always had a lot of aches and pains … [it is] the old standard [to have pain at some points in life]” (B-9). One 71-year old female with vertebral fractures sustained two years prior to the interview reported that as she advanced in age, she expected to have more pain, regardless of whether or not it would be related to the fracture (C-1). Over time, she developed other health conditions that also caused her pain and therefore she told the interviewer she accepted the unrelieved post-fracture pain, since “[she was] certainly not young” (C-1).

Some participants said that by the time of the interview, they had begun to accept that the pain after the fragility fracture would remain with them for the rest of their life. For example, a 71-year old female who had sustained a hip fracture 11 months prior to the
interview told us, “[The pain is] just something I’m living through” (B-21). One 79-year old male with a fractured hip that he had sustained 18 months previously said, “No medication that I’m taking up to today will just take [the pain] away … I just try to get along” (B-17).

Refusing to take pain medication
Despite their ongoing pain, some participants also talked about refusing to take pain medication. Eight participants (28%), four of whom also said that they accepted the pain after the fracture, reported they chose to take fewer painkillers and to endure the pain (B-18, B-19, B-21, C-9). All four participants who reported they accepted the post-fracture pain and refused to take painkillers, either partly or fully, had sustained a fracture relatively close to the interview, compared to other respondents in our study. For these four individuals, the least time elapsed since a fracture had been sustained was eight months (B-18), and the longest time since a fracture had been sustained was fifteen months (C-9). Three of these four respondents told us that one reason for not taking the painkillers as directed was that they disliked the idea of taking any type of medication. One 73-year old female told us that immediately following the humerus fracture she had sustained eight months before the interview, she had been taking Tylenol-3 opioid medication as prescribed by her attending clinician for a short while (B-18). However, as time passed, she decided to stop taking the prescription analgesics, because she considered painkillers to be analogous to crutches. Since the post-fracture pain had not been relieved with the passage of time, she now said that she preferred to endure the pain, rather than take the inefficient prescribed medication. She told us:

[The doctor] said after examining me, … ‘A mild painkiller is like penicillin. You don’t grab it when you are climbing the wall of pain. You take it so it goes into your bloodstream.’ … I didn’t like it [the Tylenol-3] too much, but for a while I did [take it regularly], then I stopped it. It’s just [my] nature, [I] don’t like medication … I [don’t want to] be a pill popper … I was the most unhappy person [when I took] Tylenol-3 [shortly after] I had my shoulder broken, because I consider that a crutch. Pain killer is a crutch, and I don’t necessarily like to be on a crutch. (B-18)
Two participants of the four, who also said they accepted the longstanding post-fracture pain, reported that they completely refused to take any of the prescribed analgesics. Unlike other respondents, these two individuals (B-19, C-9) told us that their pain following the fracture was not bothersome enough to warrant them to take pain medication. However, these two respondents also said that the pain was restricting their everyday activities. For example, one 82-year old male said that he did not take any of the analgesics prescribed after he had fractured a shoulder one year prior to the interview (B-19). He said that the pain was tolerable without any painkillers. However, this individual also told us that for three weeks following the fracture, he was unable to perform his regular household chores and grocery shopping and relied on constant help from friends and relatives (B-19). During his interview, the 82-year old male told us:

No, [I’ve never taken prescription analgesics,] when I came home from the hospital I had prescriptions for three painkillers. Twenty-five dollars at the drug store and they’re still sitting on my coffee table. I never opened them … because I didn’t feel that the pain was something I couldn’t handle. It wasn’t all that painful really … I got along for three weeks on my own at home [by getting] help with shopping and things like that from friends and relatives. (B-19)

The other participant, a 51-year old female, said that she refused to take painkillers and accepted the post-fracture pain, despite having unrelieved pain after she had fractured a knee 15 months previously (C-9). Her reported perseverance in asking the attending health care professionals for alternatives in managing the post-fracture pain was indicative that the “Tylenol, Advil, or Motrin,” which she had been advised to take, might not have had the intended analgesic effects (C-9). However, she also told us that she was “anti drug taking … and [would] go to any lengths to not take them” (C-9). In fact, she reported that even on the day when she had sustained the fracture, she “was in so much pain” but had absolutely refused to take any painkillers (C-9). She said that she had told her children, “No, I don’t want to [take any painkillers,] no, I don’t want to, it’s pain, I’m not dying here” (C-9). Notwithstanding her decision to refuse taking any painkillers, she reported that she was angry for having longstanding pain after the knee fracture (C-9). One other respondent also said she accepted the pain. She told us that
since she had sustained a hip fracture eleven months previously, she chose to take only half-dose of the prescribed opioid, and to take the other half-dose only when the post-fracture pain worsened (B-21). This 71-year old female said that her reason for choosing to take less analgesic dosages was that she was afraid of potentially becoming addicted to the medication. She told us, “I don’t want to get addicted to anything, and those pain pills, you can get addicted to” (B-21).

The remaining four participants of the eight who refused to follow the clinical advice for taking pain medication had sustained vertebral fractures at least two years and five months prior to the interview (C-10, C-11, C-19, C-24). They told us that they were only taking a portion of the prescribed analgesics on a daily basis, but that also they chose to endure some of the pain (C-10, C-11, C-19, C-24). For example, one 89-year old female who had fractured her vertebrae thirteen years and four months earlier, told us that she chose to take less analgesics than directed and only took the rest of them when the pain surpassed her threshold of tolerance (C-11). She said, “If I’m not [leaving the house,] I don’t take [Tylenol.] I put up with the pain because I don’t like taking pills. The same with morphine, I’d rather suffer a bit [than take the full dose as directed]” (C-11).

Three of the four respondents who refused analgesia did not accept post-fracture pain as an expected long-lasting consequence (C-10, C-11, C-19). They told us their reason for resisting painkillers was a general dislike for any type of pills (C-10, C-11, C-19). For instance, one 72-year old female, who had sustained vertebral fractures two years and five months previously, reported that in spite of daily fracture-related pain, she would “avoid taking pain medication,” and would first attempt to lessen the pain by applying a back-brace or “[lying] down flat for [thirty minutes]” (C-10). In addition, the participant’s family feared that prescribed opioids might cause side effects, “[The] Oxycontin horrified my children” (C-10). One other respondent of these four, an 88-year old female who had sustained vertebral fractures seven years before the interview, told us that she refused to take over-the-counter pain medication (Tylenol) as directed because she feared its potential side effects (C-24). She reported that the prescribed dose of an opioid (hydromorphone) she was taking daily was not sufficient to considerably relieve her
pain, unless she also took additional painkillers (C-24). However, this participant said that she feared only the adverse effects from the over-the-counter painkiller, but not from the opioid (C-24). She told us that in the event of any organ damage induced by the painkillers, she would blame herself for not enduring more of the back-pain in the fracture region (C-24). In the interview, she said, “Then it [would be] my own fault for taking the [pain] medication” (C-24).

**Non-pharmacological coping strategies**

Two individuals (7%) reported using other non-pharmaceutical coping strategies in their efforts to mask the experience of pain after the fragility fracture (B-5, C-10). Only one of these participants, a 72-year old female who had sustained vertebral fractures two years and five months prior to the interview, also reported that she chose to refuse taking painkillers as directed by her attending health care professionals (C-10). In addition to bed-rest and applying a back-brace, this participant said that she had tried to manage her fracture pain by focusing on positive aspects of life. She told us, “Lots of things in life have happened to me … I generally have a pretty good outlook on life … ‘Get into a positive frame of mind,’ which I’ve always had” (C-10). One 73-year old female, who had sustained an ankle fracture eleven months prior to the interview, said that she had attempted to mask the post-fracture pain by refraining to tell others about her discomfort (B-5). Nevertheless, she reported that coping by not verbalizing the pain was not effective in lessening the pain (B-5). She told us in the interview, “Now, I didn’t say I was in pain to anyone but I was in pain, yeah” (B-5).

There were no differences based on age among the participants who either accepted the pain, refused pain medication, or described other non-pharmaceutical personal coping strategies to manage pain after a fracture.
Summary of the Results

Participants in this secondary analysis described longstanding pain after they had sustained a fragility fracture, which in most participants took place many years prior to the interview. Only five individuals (17%) had sustained a fracture less than one year before the interview. The participants in our study told us that the lasting post-fracture pain lessened their mobility and limited their engagement in daily activities that they considered to be routine. They said the pain on any given day was a dominating factor that determined their ability to be involved in various activities, for example, doing laundry and grocery shopping. Respondents also reported that the longstanding pain impacted their sleeping and resting routine, making them more fatigued. Five participants (17%), of whom three were 70 years old and above, reported that the post-fracture pain far exceeded health care providers’ estimates of the time needed for the pain to considerably lessen. The remaining participants did not report whether health care providers had provided any estimations of pain-free time frames. Nine participants (31%) reported that they perceived shortcomings in the post-fracture pain management care received from health care professionals. Respondents said that the analgesia, which had been prescribed or advised to them by physicians, was not successful in relieving the lasting fracture pain. Individuals also told us they had been unable to find physicians who were interested in helping them manage the post-fracture pain. Eight participants (28%) reported that they accepted the pain as an expected consequence of the fracture they had sustained. Eight participants (28%), four of whom had also accepted the post-fracture pain, and only two of whom also said that they did not observe pain relief from analgesics, reported at the time of the interview that they had chosen to endure pain, rather than take painkillers prescribed by health professionals. Six of these eight adults (75%) were aged 70 years and above. Two participants (7%) described non-pharmaceutical coping strategies that they have been using in unsuccessful attempts to mask the post-fracture pain.
CHAPTER 4
DISCUSSION, IMPLICATIONS, AND CONCLUSION

The purpose of this study was to explore patients’ experiences of pain after a fragility fracture. This discussion summarizes the three themes of our study and links them to other studies’ findings, outlines the implications of our results, and explores the strengths and limitations of our project.

Summary of Findings and Their Relation to the Literature

Participants in the current study reported longstanding pain in the region of the fracture location, and described that this pain was distressing and impacted their daily activities. Twenty-four respondents (83%) in our study had sustained a fracture one year or longer prior to the interview. Other relevant qualitative studies investigated people’s experience of pain within six months after a fragility fracture. Griffiths and Jordan (1998) conducted most of the interviews with their respondents six weeks after the fracture had been sustained. Wong and Chan (2008) did not report a timeline, but said that they had captured participants’ descriptions of post-fracture pain shortly before the patients were discharged from a hospital’s orthopedic ward. Other qualitative studies in the literature did not report the participants’ experiences of pain after more than five months had passed since a fracture (Frost, 1998; Gold, 1996; Paier, 1996). Most quantitative studies investigated whether pain was still present up to 18 months post-fracture, but did not explore the respondents’ descriptions of the pain; participants reported post-fracture pain only by self-assessment through various measurement tools: a 0-11 numerical rating scale (Ringe et al., 2002), a customized adaptation of an existing pain scoring scale (Hollevoet & Verdonk, 2003), the EQ-5D (Borgstrom et al., 2006) and Short Form 36 (Hallberg et al., 2004) questionnaires, the Short Musculoskeletal Functional Assessment (Egol et al., 2014), the von Korff scale (Suzuki et al., 2008; Suzuki et al., 2010), and a Visual Analog Scale (Blasco et al., 2012; Rousing et al.,
2009; Rousing et al., 2010; Voormolen et al., 2007). In one epidemiological study (Cooper, 1997), the scale used to measure pain was not described. However, the author reported that mobility and daily activities were limited beyond one year after a hip fragility fracture.

Participants in our study complained of longstanding daily pain in the region of the fragility fracture, which continued to impact their lives long after they were told that the physiological bone matrix had healed. Respondents did not describe the measures used by their physicians to determine whether a fracture had healed. Authors of a randomized controlled trial (66 participants, average age: 56.8 years, age range: 18 to 81 years, high- and low-trauma minimally-displaced wrist fracture) concluded that treatment could be considered complete six weeks post-fracture based on medical imaging assessments indicative that a fracture had healed, even though on average participants in both trial groups still had restrictions on movement and activity (O’Connor et al., 2003). Paier (1996) suggested in a phenomenological study that the dominating pain after a vertebral fracture might last for many years. However, in Paier’s study (1996), the pain reported by participants who had sustained a fracture eight weeks previously was not presented separately from those who had sustained a fracture one year or longer prior to the interview. Five women with vertebral fractures had been interviewed in that study; the time since the fracture was not disclosed for one participant, three participants had sustained a fracture between seven weeks to one year previously, and only one participant had sustained a fracture six years prior to the interview (Paier, 1996). Findings in other qualitative studies examining the experience of fragility fracture patients support the presence of persistent pain at and around the location of the fracture, at various timelines after the fracture had been sustained but for most participants, it was only up to one year post-fracture (Frost, 1998; Gold, 1996; Griffiths & Jordan, 1998). Griffiths and Jordan (1998) interviewed patients only four to eight weeks after bone realignment surgery. Frost (1998) and Gold (1996) did not assess the persistence of pain beyond five months post-vertebral fracture.
The findings of several studies confirm that patients who have sustained vertebral fractures are more likely to report pain for longer than one year afterwards, compared to those who have had fractures in other locations (Borgstrom et al., 2006; Frost, 1998; Gerdhem, 2013; Gold, 1996; Hallberg et al., 2004; Nevitt, 1998; Paier, 1996; Zbigniew & Saracen, 2011). Frost (1998) explained that the most likely process that associates vertebral fractures with chronic lower back pain is the result of an amalgamation of ensuing physiological factors: increased thoracic spine kyphosis after the fracture and, as a result of inactivity, loss of muscle strength supporting the lumbar spine. Thus, studies exploring pain relatively long-term after a fracture have been focused only on the experiences of vertebral fracture patients. Our current findings challenge the notion that non-vertebral fractures do not result in longstanding pain. The majority of fractures sustained in our study (n=22) were not vertebral fractures. We found that only seven of the 24 participants (29%) who reported longstanding pain one year or longer post-fracture had sustained vertebral fractures. Eight (33%) had fractured a shoulder, a humerus, or an arm. Six (25%) had fractured a hip, the pelvis, or the sacrum, and two (8%) had fractured a knee or an ankle.

Participants in our current study perceived the pain after the fragility fracture as a discrete health condition. In addition to the post-fracture pain, individuals in the current study reported they were also living with a wide range of co-morbidities. This is consistent with findings in the literature. Many fragility fracture patients have at least one other health condition in addition to having sustained a fragility fracture (Cooper, 1997; Taylor et al., 2010).

Participants in our study reported that the pain after a fracture impacted their ability to return to their previous mobility and functional activity capabilities. Participants who had been very active prior to their fragility fracture said that they had not been able to achieve similar endurance and intensity levels of physical activity. Respondents who reported that they had regained some functional ability said they were unable to engage in physical activity other than walking for short distances. They told the interviewer that after the fracture, they had begun to frequently lose their balance and regarded
themselves to be at a higher risk of falling in and around the house. Some respondents said that they could not get out of bed in the morning due to the fracture-related pain. Individuals stated that the pain at the beginning of each day forced them to plan their daily travels in detail and that the pain throughout their routine daily activities forced them to take frequent rests. These results are congruent with other findings in the literature, even though comparisons are based on studies conducted at shorter post-fracture timelines. For example, authors reported that fragility fracture participants who were experiencing pain had lower mobility levels than they had enjoyed previously (Paier, 1996; Taylor et al., 2010). Adults reported their mobility was impacted throughout their daily activities (Gold, 1996; Taylor et al., 2010). Irrespective of whether patients had sustained a fragility fracture recently or many years previously, they reported that the post-fracture pain was a daily dominant force which affected their mobility negatively (Paier, 1996). Agulnek and colleagues (2009) collected data shortly after a vertebral fracture had been sustained, while the participants were still admitted in a hospital. Respondents in that study identified post-fracture pain as the most likely factor that limited mobility (Agulnek et al., 2009). According to existing qualitative studies, many fragility fracture patients could not return to pre-fracture levels of walking in the house or its vicinity (Paier, 1996; Taylor et al., 2010). One epidemiological study found that almost half of the adults in the sample (40%) were unable to walk independently more than a year after they had sustained a fragility fracture of the hip (Cooper, 1997). For up to four months after the fracture (Taylor et al., 2010), as well as when the timeline since a fracture was not disclosed (Gold, 1996; Paier, 1996), the fear of falling was identified as one of the common factors that prevented patients from pushing themselves to their maximum potential in the attempt to return to their pre-fracture mobility.

The participants in our study reported that the post-fracture pain restricted them from driving a vehicle again. Participants in one other qualitative study also reported that they had lost the ability to drive a vehicle as much as they had been driving prior to the fragility fracture (Taylor et al., 2010). In an epidemiological study, Cooper (1997)
reported that up to 80% of people who had fractured a hip could not regain their driving ability after more than one year had passed since the fracture.

Individuals in the current project reported that the post-fracture pain restricted them from engaging in basic household chores and from returning to their usual number of working hours. This finding confirms what other researchers have found. Several authors have reported that adults over 50-years old had difficulty performing routine activities in the home four to twelve months after they had sustained a hip fracture (Taylor et al. 2010; Cooper, 1997). Cooper (1997) indicated in one epidemiological study that more than half (60%) of the adults over 50-years old who had fractured a hip one year earlier had challenges engaging in essential routine activities inside their houses.

Participants in our study reported that the longstanding post-fracture pain impacted their sleeping and resting routine. In turn, this may explain why adults in our study also reported considerable daily fatigue. They also said that they were anxious and troubled by their longstanding post-fracture pain. Other results in the literature have indicated that disturbances in sleeping patterns and the resultant fatigue were strongly associated with pain after a vertebral fracture (Paier, 1996). The American Geriatric Society acknowledges that anxiety from long-lasting pain has negative physical and psychosocial impacts on patients (AGS, 2002).

Participants in our study reported that the duration of post-fracture pain exceeded the estimated time period that they had perceived from their health care providers. According to studies in the literature, post-fracture pain should have decreased considerably sooner than respondents in our study reported. Frost (1998) reported that most of the pain after a vertebral fragility fracture, which presents one of the lengthiest bone healing processes, should decrease considerably by 13 weeks post-injury. More recent findings have drawn attention to a common misconception that fragility fractures are conditions that only require acute treatment until the physiological bone healing is achieved at approximately six weeks post fracture (Fiatarone, 2014). In fact, it has been suggested by others that individualized treatments should continue far past the
estimated bone healing time, until patients’ complex challenges after the fracture, including pain, are addressed effectively (Fiatarone, 2014).

Individuals in our study perceived that their health care providers had indicated that no further pharmaceutical alternatives were available to manage the longstanding post-fracture pain. In some instances, participants said that in response to their complaints of unrelieved pain, attending physicians had advised for the continuation of over-the-counter painkillers, including nonsteroidal anti-inflammatory drugs (NSAIDs), and were unwilling to prescribe stronger analgesics. The patients in our current study reported frustration that the pain medication prescribed by their physicians was ineffective in reducing post-fracture pain. We found that participants reported unrelieved post-fracture pain, irrespective of whether they were taking over-the-counter analgesics or prescription opioids. Some qualitative literature has identified many scenarios where the prescribed analgesia had little to no effect on reducing post-fracture pain (Paier, 1996; Wong & Chan, 2008). However, unlike our study where 24 of the participants (83%) had sustained a fracture more than one year prior to the interview, only two participants (6%) in the two referenced studies had sustained their fracture more than one year previously (Paier, 1996; Wong & Chan, 2008). Ineffective clinical pain management is perhaps consistent with findings that physicians typically overestimate pain relief induced by the prescribed analgesia, even shortly after post-operative interventions, as well as in patients who are returned to their communities (Klopfenstein, Herrmann, Mamie, Van Gessel, & Forster, 2000).

Four of the nine participants in our study who reported that they had perceived shortcomings in their received medical care said that their attending physicians refused to prescribe pain medication stronger than NSAIDs, either immediately after the fracture-reduction surgery, or at much later times. This prescribing practice fails to meet clinical recommendations on managing the osteoporotic and post-fracture pain, which directs health care practitioners to prescribe opioids over NSAIDs in increasing dosages until pain relief is obtained (Cherubino et al., 2012; Gerdhem, 2013). It may be that fear of potential drug addiction prevented health care practitioners from prescribing and
administering the appropriate types and dosages of analgesia (Cartwright, 1985; Twycross, 1994; Weis et al., 1983). Guidelines and evidence published more recently have shown that the fear of addiction to more potent types of pain medication such as opioids is unfounded and unjustifiable, and therefore post-fracture patients should be prescribed analgesia in increasing strength and dosage until the patients' desired pain relief is reached (AGS, 2002; AGS Ethics Committee, 1995; Cherubino et al., 2012; Gerdhem, 2013).

Participants in the current study reported that they were not undergoing physiotherapy at the time of the interview. Post-fracture management guidelines recommend physiotherapy treatment following fracture-reduction interventions, in addition to any prescribed analgesia (Agulnek et al., 2009). Physical exercise is well known to increase the bone matrix and its biological strength (Gerdhem, 2013; Gregg, Cauley, Seeley, Ensrud, & Bauer, 1998; Howe et al., 2011), as well as to increase the related muscle strength (Beaupre et al., 2013; Fiatarone, 2014; Giangregorio et al., 2013; Howe, Rochester, Jackson, Banks, & Blair, 2007). In a quantitative study, Cameron and colleagues (2010) found that physiotherapy and supervised physical exercise programs were correlated with increased balance and decreased risk of falling. Therefore, physiotherapists should be included as key players in the patient-centered inter-professional care team, since they are the most knowledgeable specialists in helping fracture patients regain muscle strength, mobility levels, and achieve less post-fracture pain (Gold, 1996). Several studies have endorsed physiotherapy to be essential in lowering long-term pain after a fragility fracture (Beaupre et al., 2013; Gold, 1996; Rousing et al., 2009). In a qualitative study, Gold (1996) reported that ongoing physiotherapy is very important after vertebral fractures; in its absence, it was suggested that analgesia does not induce relief of fracture-related back pain. Many studies support that exercise and physiotherapy play a key role in the clinical management of post-fracture pain. For example, regaining the ability to exercise after a fracture has been correlated with lower pain reported after five weeks of exercise, and increased quality of life after four to twelve months of exercise (Giangregorio et al., 2013). However, data on the effects of exercise on post-fracture pain are scarce. In a
Cochrane systematic review, which assessed longstanding post-fracture pain during exercise programs, Giangregorio and colleagues (2013) did not find any studies meeting the inclusion criteria that were conducted one year or more after the fracture had been sustained.

A subset of the participants in our study reported that they chose to endure pain, rather than take their prescribed analgesia. They did not take prescribed analgesics because of a dislike for ingesting pills in general. However, the majority of these participants reported that they continued to have persistent pain. This is congruent with findings from other qualitative research on patients who had sustained fragility fractures. Several studies (Griffiths & Jordan, 1998; Wong & Chan, 2008) have found that patients refused to take the appropriate amount of prescribed analgesics after their fracture, despite experiencing constant and debilitating pain. However, these studies were conducted within six months of the fracture (Griffiths & Jordan, 1998; Wong & Chan, 2008). No studies beyond six months post-fracture were found where participants reported a refusal to take prescribed analgesia.

Some participants in our current study who refused to take their prescribed dosage of analgesia also reported that they feared the potential side effects of medication and/or they feared that they might become addicted to the prescribed narcotics. However, no one in our study reported that they had experienced any adverse events from their prescribed pain medication. It was not clear whether their reported fear of side effects from analgesics was something relayed to them by their health care practitioners, or whether it was a personal belief. Paier (1996) found that many fragility fracture patients were afraid of developing an addiction to prescribed pain medication. The American Geriatric Society (2002) reported that patients who feared developing a drug dependence decided against taking their analgesia by self-assessing the potential adverse risks, rather than following their practitioners’ advice. Authors of other studies in the literature found that both physicians (Meuser et al., 2001) and fracture patients (Wong & Chan, 2008) overestimated the potential risk for side effects of opioid analgesia.
In our study, two individuals (7%) reported that they had adopted personally-developed non-pharmaceutical coping strategies in their attempt to mask the impact of the post-fracture pain, such as refraining from verbalizing the pain and focusing on the positive aspects of life. Our findings, consistent with the existing literature, suggest that these personal coping strategies to mask post-fracture pain were not effective in reducing the impact of the pain, either shortly after the fracture, or many months later. In other qualitative studies, authors likewise found that some individuals had tried to distract their attention from the post-fracture pain by focusing on positive aspects of life, often without success; however, these studies were conducted within the first six months after the fracture (Griffiths & Jordan, 1998; Wong & Chan, 2008). No studies were found beyond six months post-fracture that reported participants using non-pharmaceutical coping strategies to mask the related longstanding pain.

There are many similarities between the experience of longstanding pain following a fragility fracture reported in this study and the experience of chronic pain associated with other areas of health care, such as joint replacement surgery, and osteoarthritis. Total knee and total hip replacements are the most common joint replacement surgeries in North America (American Academy of Orthopaedic Surgeons, 2014). However, a qualitative and systematic review found that patients who underwent total knee replacement, compared to total hip replacement, were less likely to return to pre-operative mobility and functional activity (Ethgen, Bruyere, Ricky, Dardennes, & Reginster, 2004). Osteoarthritis is one of the leading health conditions that are associated with mobility disruptive pain, and highest use of health care services (Gignac et al., 2006).

Our findings that the post-fracture pain limited participants’ mobility, engagement in functional activities, independence, sleep and energy are supported by studies on pain in other health care areas. One qualitative study explored the experience of chronic pain after at least two years following a total knee replacement surgery (Jeffery, Wylde, Blom, & Horwood, 2011). Participants in that study reported that the post-operative
chronic pain impacted their ability to perform daily functional activities (Jeffery et al., 2011). A mixed methods study on osteoarthritis related pain found that it impacted people’s mobility in the community, household functional activities, sense of control, sleep routine and energy (Gignac et al., 2006). The post-fracture patients in our study perceived that health care professionals were not managing their pain, and suggested that pain should be expected after the fracture and with advancing age. This finding is supported by both studies compared above. Some people perceived that surgeons were reluctant to acknowledge post-total knee replacement pain to be important and refused to investigate it (Jeffery et al., 2011). Jeffery and colleagues (2011) suggested that surgeons should abstain from instilling unrealistically high recovery expectations to patients following total knee replacement. Patients with chronic pain associated with osteoarthritis perceived that health care professionals ignored their pain or advised it was an expected part of aging (Gignac et al., 2006). Participants in our study responded to the longstanding post-fracture pain by accepting it and refusing analgesics despite having pain. Similarly, total knee replacement respondents described an accepting attitude that they expected pain following the surgery and with advancing age (Jeffery et al., 2011). Most of the osteoarthritis participants perceived their pain to be expected with advancing age, and refused analgesics due to fear of side effects (Gignac et al., 2006). We believe that the impact of chronic pain extends beyond a single subset of the patient population. The similarities in the experience of pain across several areas of health care suggest that more clinical emphasis should be placed in recognizing and efficiently addressing long-term pain.

**Implications and Recommendations**

Our study has several implications. Based on interviewees’ accounts, health care professionals appeared to provide generalized treatment plans post-fracture. We found that participants in our study perceived that attending clinicians did not actively seek effective treatment options to address complaints of unresolved pain at later times after the fracture. Twenty-four respondents (83%) in our study reported that they were living with longstanding pain after a year or longer since the fracture. This finding is an important addition to the existing knowledge on post-fracture pain. It is currently
recognized that patients who sustain vertebral fractures may be more likely to report pain more than one year later, compared to adults who have sustained fractures at other locations. However, we found in our current study that out of the 24 respondents who had sustained a fracture one year or longer prior to the interview, only seven (29%) had sustained vertebral fractures. The clinical implications of these findings are that clinicians may in fact under-diagnose and under-treat longstanding post-fracture pain. These findings raise awareness of the serious long-term impact of pain on patients’ lives, not limited only to those who have sustained vertebral fractures. Health care providers may need to adjust their understanding of fragility fracture pain to reflect the patient’s experiences in order to improve the treatment of those people who report this type of pain. Tailored patient-centered pain management treatment plans must be developed to address the needs of fracture patients, rather than a one-size-fits-all treatment (AGS, 2009; Fiatarone, 2014).

Authors of several quantitative studies also identified pain in patients who had sustained a fragility fracture as the chief factor that limited their return to pre-fracture activity and function (Egol, Park, Rosenberg, Peck, & Tejwani, 2014; Hunsaker, Cioffi, Amadio, Wright, & Caughlin, 2002; Martin, Engelberg, Agel, Snapp, & Swiontkowski, 1996). A subset of participants in our study reported they chose to endure pain, rather than take the prescribed analgesia. While patients’ autonomy must be considered, upon inquiry on the presence of pain and the patients’ reasons for foregoing the prescribed pain medication, clinicians should seek the time to explain the benefits of analgesia. Based on our findings, we believe that the long-term implications of pain in people’s lives not only affect mobility and functional recovery but may also affect social interactions, self-esteem, self-efficacy, and overall quality of life. Further research is warranted to assess the impact of fracture-related long-term pain on these aspects of a person’s life.

In our study, the participants did not report any side effects from analgesia. However, the respondents said that physicians did not prescribe stronger types of pain medication, and did not increase dosages of already prescribed weak and strong opioids to those who had complained of unrelieved pain. Participants reported that they
were not undergoing physiotherapy programs at the time of the interview, despite their longstanding pain and the associated lower functional ability. Health care providers attending to patients who complain of longstanding pain more than one year after a fragility fracture must be cognizant of individuals’ tolerance and side effects to prescribed medication, and of their adherence to physiotherapy programs. We believe that increased patient education of the impact of long-term post-fracture pain, and clinician awareness of its presence after the bone healing phase, may aid in developing more effective individualized pain management treatment plans.

**Strengths and Limitations**

**Strengths**

All data for the secondary analysis were collected under the supervision of a single investigator who relied on a phenomenological approach. Thus, theoretical consistency regarding the type of qualitative approaches that were combined was promoted. The participants in this study were not specifically asked about pain in their interview, yet 29 of the 67 individuals (43%) considered for this secondary analysis spoke about post-fracture pain. This led us to believe that longstanding pain after a fragility fracture was an important topic for the participants. The data in the current study were analyzed using a qualitative description approach, which is applicable to topics pertaining to clinical practice (Sandelowski, 1995). Further, qualitative description with hues of phenomenology is a suitable methodology in qualitative research (Sandelowski, 2000; Sandelowski, 2010). The themes were developed after thorough examination of multiple possibilities, through the process of imaginative variation (Giorgi, 2008; Wertz, 2005). Furthermore, in addition to my radiological technology clinical background, the thesis committee members, a clinical epidemiologist and a social scientist, provided an interprofessional perspective to the interpretation of the data. All claims in this study were founded on descriptions by participants and supported with data in the form of direct quotations. The authenticity and credibility of the findings were founded on several elements of rigour in qualitative description, as presented in the methods chapter of this thesis.
**Limitations**

Although the participants' choice to talk about post-fracture pain underlines the importance of this topic in people's lives, in-depth questions about pain were not asked in the original studies because the experience of post-fracture pain was not the main focus of the original studies. Only transcripts from seven (39%), nine (43%), and thirteen (46%) participants of REB #07-059, REB #08-157, and REB #10-371, respectively, contained data on post-fracture pain. Therefore, it was difficult to determine whether respondents might have described other data about pain if the interviewer had specifically asked, and followed up with prompts, about this area of their post-fracture experience. The primary transcript data were already de-identified and we did not have access to conduct follow-up interviews with the participants. Therefore, we could not investigate people's contextual aspects, such as cultural background, socioeconomic status, lifestyle, and previous medical history. More research into these contextual aspects could further the knowledge about the subjective and individual factors that influence fragility fracture patients' pain threshold, perception of quality of care received, and response to pain.

Most participants, 26 of 29 (90%), in this secondary analysis were women, a fact that led us to believe that men may not have readily discussed their pain. Therefore, comparisons on the experience of post-fracture pain between males and females could not be carried out. Since only eight of the 29 participants (28%) that met the inclusion criteria were aged 69 years and younger, we may not have had sufficient data on this group in order to make more substantial comparisons based on age. However, this age distribution resulted from the fact that the majority (n=42, 63%) of those who were considered for this study were aged 70 years and older. Although the number of older adults (n=21) included in this analysis is much higher than the younger ones (n=8), the percentages of the 67 originally considered for this study who reported pain during their interviews were not considerably different between the age groups. Eight of 25 younger respondents (32%) and 21 of 42 older respondents (50%) considered for this secondary analysis brought up discussions about longstanding post-fracture pain.
Conclusion

Participants in the current study reported longstanding pain after they had sustained a fragility fracture. Twenty-four of the 29 respondents (83%) had sustained a fracture from one year to approximately 13 years prior to the interview. There is very little literature on the treatment and experience of pain in patients beyond six months post-fracture. Respondents in our study said that pain impacted their mobility and functional ability, feeling of independence, and energy levels. Individuals told us that they perceived their health care providers to not be actively involved in treating longstanding post-fracture pain. They reported that prescribed analgesia was ineffective for pain relief and ongoing physiotherapy was absent. Inadequate treatment of pain and the absence of long-term physiotherapy are two major shortcomings in fracture management. Some respondents said that they had begun to accept the notion that post-fracture pain would persist for the rest of their lives.

The findings of this study add to the existing knowledge in three ways. First, readers can gain a deeper understanding of the complex, longstanding pain, reported one year and longer after a fragility fracture. Second, the impact of post-fracture pain in the daily lives of fragility fracture patients can be significant. Third, our findings challenge health care practitioners in the Canadian health care system to manage longstanding post-fracture pain more effectively. This suggests the need for individualized treatment plans that include education for patients and health care providers about the nature and potential effects of long-term pain as well as appropriate and effective pain management. It also suggests the need for ongoing physiotherapy programs for patients who experience longstanding post-fracture pain.
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## APPENDICES

### Appendix A

**Participant demographics across the three data sets**

<table>
<thead>
<tr>
<th>Eligibility criteria</th>
<th>DATA SET A*</th>
<th>DATA SET B*</th>
<th>DATA SET C*</th>
</tr>
</thead>
<tbody>
<tr>
<td>English-speaking patients</td>
<td>English-speaking outpatients</td>
<td>English-speaking males and females, residing in Canada</td>
<td></td>
</tr>
<tr>
<td>Sustained a fragility fracture</td>
<td>Sustained a fragility fracture in the last five (5) years</td>
<td>Sustained a fragility fracture</td>
<td></td>
</tr>
<tr>
<td>No minimum age restriction</td>
<td>Aged 65+ years old</td>
<td>Aged 50+ years old</td>
<td></td>
</tr>
<tr>
<td>Screened with the Osteoporosis Exemplary Care Program (OECP) in the previous 3-9 months</td>
<td>Were deemed “high risk” for future fractures based on age, sex, prior fractures and BMD values, and were prescribed osteoporosis medication</td>
<td>Were not on antiresorptive medicine at the time of most recent fracture</td>
<td></td>
</tr>
<tr>
<td>Did not demonstrate any physical or cognitive impairments that</td>
<td>Did not demonstrate any cognitive impairments that would prevent</td>
<td>Did not demonstrate any cognitive impairments that would prevent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>articulating their experiences</td>
<td>articulating their experiences</td>
<td></td>
</tr>
</tbody>
</table>
would prevent them from participating in a focus group | them from articulating their experiences
---|---
**Sample size (n)** | n = 18 | n = 21 | n = 28
**Sex type** | 4 males | 6 males | 2 males | 14 females | 15 females | 26 females
**Age range** | 47 – 80 years | 65 – 88 years | 51 – 89 years
**Study location** | The Fracture Clinic at St. Michael’s Hospital, Toronto, ON, Canada. | A fracture clinic with an osteoporosis program in a university teaching hospital | Members of the Canadian Osteoporosis Patient Network (COPN) across Canada
**Fracture types** | Wrist (n = 9) | Hip (n = 7) | Vertebrae (n = 9) |
Shoulder (n = 5) | Wrist (n = 7) | Wrist (single) (n = 3) |
Hip (n = 2) | Humerus (n = 4) | Wrist (both) (n = 2) |
Arm (n = 1) | Ankle (n = 1) | Ankle, foot (n = 1) |
Pelvis (n = 1) | Patella (n = 1) | Ankle, leg (n = 1) |
| Pelvis (n = 1) | Pelvis (n = 1) | Foot (n = 1) |
| | | Hip (n = 1) |
| | | Knee (n = 1) |
| | | Pelvis (n = 1) |
| | | Shoulder (n = 1) |
| | | Fractures at three or four multiple locations (n = 8) |
### *Study Legend*

<table>
<thead>
<tr>
<th>STUDY A</th>
<th>“So how was it? Patient opinions on osteoporosis education in the fracture clinic setting”</th>
</tr>
</thead>
<tbody>
<tr>
<td>STUDY B</td>
<td>“Bridging the gap between identified need and adherence to osteoporosis care after a fragility fracture”</td>
</tr>
<tr>
<td>STUDY C</td>
<td>“How can Canadian Osteoporosis Patient Network members inform post-fracture intervention research?”</td>
</tr>
</tbody>
</table>
Appendix B

Selection of eligible participants by data set

<table>
<thead>
<tr>
<th></th>
<th>DATA SET A*</th>
<th>DATA SET B*</th>
<th>DATA SET C*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Potentially eligible participants ((n^0))</strong></td>
<td>(n^0 = 18)</td>
<td>(n^0 = 21)</td>
<td>(n^0 = 28)</td>
</tr>
<tr>
<td><strong>Participants eligible for analysis ((n^1))</strong></td>
<td>(n^1 = 7)</td>
<td>(n^1 = 9)</td>
<td>(n^1 = 13)</td>
</tr>
</tbody>
</table>

*Study Legend

<table>
<thead>
<tr>
<th>STUDY</th>
<th>REB #</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>STUDY A</td>
<td>#07-059</td>
<td>“So how was it? Patient opinions on osteoporosis education in the fracture clinic setting”</td>
</tr>
<tr>
<td>STUDY B</td>
<td>#08-157</td>
<td>“Bridging the gap between identified need and adherence to osteoporosis care after a fragility fracture”</td>
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<tr>
<td>STUDY C</td>
<td>#10-371</td>
<td>“How can Canadian Osteoporosis Patient Network members inform post-fracture intervention research?”</td>
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</tbody>
</table>
## Appendix C

### Study demographics

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Number of participants</th>
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<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>3</td>
</tr>
<tr>
<td>Female</td>
<td>26</td>
</tr>
<tr>
<td><strong>Age (years old)</strong></td>
<td></td>
</tr>
<tr>
<td>51-69</td>
<td>8</td>
</tr>
<tr>
<td>70-89</td>
<td>21</td>
</tr>
<tr>
<td><strong>Location of fragility fracture(s)</strong></td>
<td></td>
</tr>
<tr>
<td>Vertebrae</td>
<td>7</td>
</tr>
<tr>
<td>Hip</td>
<td>4</td>
</tr>
<tr>
<td>Humerus</td>
<td>4</td>
</tr>
<tr>
<td>Shoulder</td>
<td>4</td>
</tr>
<tr>
<td>Pelvis</td>
<td>2</td>
</tr>
<tr>
<td>Wrist</td>
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<td>Ankle</td>
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<tr>
<td>Arm</td>
<td>1</td>
</tr>
<tr>
<td>Knee</td>
<td>1</td>
</tr>
<tr>
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</tr>
<tr>
<td>Ankle + Wrist</td>
<td>1</td>
</tr>
<tr>
<td>Arm + Jaw + Vertebrae</td>
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<tr>
<td><strong>Time since most painful fracture</strong></td>
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<tr>
<td>0-5 months</td>
<td>0</td>
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<tr>
<td>6-11 months</td>
<td>5</td>
</tr>
<tr>
<td>12-23 months</td>
<td>12</td>
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<tr>
<td>24-60 months</td>
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<tr>
<td>&gt;60 months</td>
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<tr>
<td>Participant ID</td>
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<tr>
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<td>C-1</td>
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<tr>
<td>C-9</td>
<td>51</td>
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<td>C-10</td>
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<td>C-11</td>
<td>89</td>
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<td>C-14</td>
<td>83</td>
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<td>C-19</td>
<td>60</td>
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<td>C-24</td>
<td>88</td>
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<tr>
<td>C-25</td>
<td>79</td>
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<td>C-26</td>
<td>68</td>
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<td>C-27</td>
<td>73</td>
</tr>
<tr>
<td>C-28</td>
<td>73</td>
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</table>
## Appendix D

Themes and supporting quotations

1) Patients described longstanding pain beyond typical fracture healing times, generally unrelieved by analgesics, which impacted their mobility, functional activity, independence, sleep and energy

<table>
<thead>
<tr>
<th>ID Code</th>
<th>Sex, Age (yrs)</th>
<th>Fracture location, Months since fracture</th>
<th>Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-1</td>
<td>Female 56</td>
<td>Shoulder 12-23</td>
<td>“… oh God, I can't do anything … “</td>
</tr>
<tr>
<td>A-5</td>
<td>Female 75</td>
<td>Shoulder 12-23</td>
<td>“… I was quite good, active before but I’ve noticed that since my arm I can't do many things like getting up and down on the floor for some of the floor exercises. I find it harder than I used to and I think it's because I gave myself all this long rest after I broke my shoulder I hadn’t done really a lot.”</td>
</tr>
<tr>
<td>A-7</td>
<td>Female 57</td>
<td>Humerus 12-23</td>
<td>“I still have pain in here [at the fracture location]…” “… [the doctor] checked all my mobility [and functional ability] and said it looked good and I said, ‘Well, it was pretty good.’ I could swim. I could reach up to do my bra, which was always a problem reaching back there, but I still had a problem raising my arm in a certain direction and that often I’d get very sharp jolts of pain and I’d drop things when I was holding them.”</td>
</tr>
</tbody>
</table>
“And actually since the fall and at that time as well, I’ve not been able to sleep on my left-hand side. If I sleep on my left-hand side accidentally, I’d wish to heck I hadn’t because I have quite severe pain after I’ve slept on that side laying on my arm.”

“… so I really can’t sleep [because of the fracture-related pain].”

<p>| | | | |</p>
<table>
<thead>
<tr>
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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A-9</td>
<td>Female</td>
<td>Shoulder</td>
<td>24-60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-12</td>
<td>Female</td>
<td>Shoulder</td>
<td>12-23</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-13</td>
<td>Female</td>
<td>Arm</td>
<td>12-23</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-13</td>
<td>Female</td>
<td>Humerus</td>
<td>12-23</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-15</td>
<td>Female</td>
<td>Wrist</td>
<td>6-11</td>
</tr>
</tbody>
</table>

“… I was really caught up in the pain of the shoulder …”

“… I was in agony …”

“… I went to work but I couldn’t drive my car …”

“Yeah I would just kind of do whatever. Unfortunately it’s, when I felt the pain I would be reminded I shouldn’t be doing something. When you’re so busy sometimes you forget all these things.”

“… in the morning … I take one Statex for pain because I’m very stiff and sore first thing in the morning.”

[Regarding mobility:] “Walking. That’s it. And occasionally, I’ll stand at the counter and do exercises that were given to me by the physiotherapist at the clinic, like standing on your tip-toes…”

“… I did mention because I had pains … this arm is still numb, quite numb…”
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B-16</strong></td>
<td>Female</td>
<td>Hip</td>
<td>** “…I was in very bad pain, severe.”**</td>
</tr>
<tr>
<td>75</td>
<td>12-23</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| **B-17** | Male | Hip |  ** “… [my lifestyle] actually changed without measuring it [after the fracture]. You slow down. There are things you will**
| 79 | 12-23 | **not do. You do not do. I don’t like driving as much, sitting as much…”** |
|   |   |   |  **“If I just back off what I’m doing maybe for half an hour or so,**
|   |   |   |  **I will feel a bit better.”** |
| **B-21** | Female | Hip |  **“These [painkillers] are helping a little bit anyway, you know.**
| 71 | 6-11 |  **It takes the seriousness out of the pain because I don’t want**
|   |   |   |  **to sit here and cry by myself.”** |
|   |   |   |  **“… I’m really feeling terrible. I’m in so much pain all the**
|   |   |   |  **time.”** |
|   |   |   |  **“… I feel like it’s okay to get up and just walk just to the**
|   |   |   |  **kitchen and back, I’ll do that without the walker but when I’m**
|   |   |   |  **in pain … if I’m laying in bed and I’m resting my body, I**
|   |   |   |  **shouldn’t be having too much pain …”** |
|   |   |   |  **“I am in more pain now than I’ve ever been. I am tired. I am**
|   |   |   |  **very, very tired. Some nights, I don’t go to sleep until six**
|   |   |   |  **o’clock in the morning.**
|   |   |   |  **Interviewer: Oh goodness, because of the pain?**
<p>|   |   |   |  <strong>It’s the pain … as soon as I get on my feet…”</strong> |
| <strong>C-1</strong> | Female | Vertebrae |  ** “… I was still very, very uncomfortable.”** |
| 71 | 24-60 |
|</p>
<table>
<thead>
<tr>
<th>Case</th>
<th>Gender</th>
<th>Age</th>
<th>Location</th>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-2</td>
<td>Female</td>
<td>76</td>
<td>Vertebrae</td>
<td>24-60</td>
<td>“… severe back pain …”</td>
</tr>
</tbody>
</table>
| C-8  | Female | 53  | Ankle+Wrist | 24-60 | “… the [fracture-related] pain is so bad … “  
|      |        |     |          |          | “Well, by the end of the day they hurt, they [the ankles] swell ... and the wrists swell too.”  
|      |        |     |          |          | “I can’t do anything now. I used to be unbelievably active. Now I’ve probably gained about 50/60 pounds … I’ve had to cut my hours [of work] way back … my hours at the store are 11:00 to 16:00, and I find by 16:00 I’m dead. I’m done. It’s all I can do some days, to drive home … the pain is so bad.”  
|      |        |     |          |          | “I can’t bend over. So my husband, thank God, he really helps me out a lot. And because of the wrist, I can’t change the sheets on the bed and stuff like that … I have to go sit down for a few minutes. Every time I do something. Hanging laundry – got to go sit down for about five minutes.” |
| C-9  | Female | 51  | Knee     | 12-23    | “… I’m experiencing a lot of pain, I can’t do the things I normally do … I just can’t… how am I going to survive?” |
| C-10 | Female | 72  | Vertebrae| 24-60    | “… the muscle spasms were still horrendous. There was really that – the spasms that were more debilitating…”  
|      |        |     |          |          | “I was put on some low dose pain killers and I tried everything because I was teaching a full load at the college, George Brown, at the time. And nothing worked. I had home physio who said look I’m not going to treat you because you’re going into spasm too much. So don’t do any exercise.” |
Just rest and move around as much as you can. And then I tried acupuncture. I mean I was pretty desperate. Nothing seemed to really provide relief. And about six weeks later the doctor prescribed Oxycontin, which horrified my children. Ah mercy. I’m no longer taking that."

“The lumbar spine is still bothering me, particularly at the end of the day … and just either put on a brace for half an hour or lie down flat for half an hour, whatever.”

<table>
<thead>
<tr>
<th>C-11</th>
<th>Female 89</th>
<th>Vertebrae &gt;60</th>
<th>“… I had this terrible backache following it [the fracture]. I had this terrible pain … this dreadful, dreadful pain …”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>“I’ve had this pain from the fracture really on and off.”</td>
</tr>
</tbody>
</table>

| C-14  | Female 83  | Wrist 6-11    | “Getting up in the morning is very painful, but then, after I have my coffee, the pain dissipates and it really doesn’t interfere with me during the day.” |

| C-19  | Male 60    | Vertebrae 12-23 | “Interviewer: Are you still experiencing back pain? It’s quite a bit less but it hasn’t gone away. It’s more I would say back fatigue. I get tired when I stand up or walk.” |

|       |            |                | “I used to be able to walk quite far. I used to be able to walk five kilometers in an hour, five or six times a week. I can’t do that anymore but I do get out and walk. The doctor has recommended that I have to get out and walk.” |

<p>|       |            |                | “… I’ve been trying to [walk] as much as possible pretty much everyday but I do walk with a cane [because of] my |</p>
<table>
<thead>
<tr>
<th>C-24</th>
<th>Female 88</th>
<th>Vertebrae &gt;60</th>
<th>“… I was in a lot of pain.”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>“… I cannot manage without the medication.”</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>“[… I have ongoing pain] … I have pain all the time.”</td>
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<tr>
<td>C-25</td>
<td>Female 79</td>
<td>Sacrum 24-60</td>
<td>“… unfortunately, no matter what pain I have, nothing, absolutely nothing helps me.”</td>
</tr>
<tr>
<td>C-26</td>
<td>Female 68</td>
<td>Pelvis &gt;60</td>
<td>“Yeah, I mean I have to balance my resources with how many buses do I have to take to get to it … [depending on] the pain level that day.”</td>
</tr>
<tr>
<td>C-28</td>
<td>Female 73</td>
<td>Vertebrae 24-60</td>
<td>“… I ended up in the hospital so my back must have spasmed or I don’t know what it was but it was just so painful I couldn’t get out of bed.”</td>
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<td>“[After the vertebral fractures, I went] to see a spinal surgeon and [he] had me on pain killers of course to make it possible to be able to live at home.”</td>
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</table>
|       |           |               | “Since the surgery, it took a long time for me to be able to operate normally but now I’m fine, I can do whatever … [I feel pain] only if I stress my back. Cooking dinner in the evening seems to be quite difficult so I seem to irritate it every night. It’s just the walking back and forth in the kitchen, leaning over the counter and leaning over the stove. By the time I’m finished making dinner, my back is usually pretty stressed out and I have to get into my chair and just a
“I kept falling [when trying to walk outside the house], losing my balance out in the garden.”

2) Health care providers under-estimated expected timelines regarding the decrease of post-fracture pain and were perceived to not manage that pain

<table>
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<tr>
<th>ID Code</th>
<th>Sex, Age (yrs)</th>
<th>Fracture location, Months since fracture</th>
<th>Quote</th>
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</thead>
<tbody>
<tr>
<td>A-1</td>
<td>Female 56</td>
<td>Shoulder 12-23</td>
<td>“I did go to [physio]therapy you know after the fracture [but not now at the time of the interview].”</td>
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</tbody>
</table>
| A-7     | Female 57      | Humerus 12-23                           | “I was still in considerable pain [when physiotherapy was stopped]. Although I had mobility that met [the doctor’s] mobility requirements, it didn’t meet my requirements. And some very simple [functional] things I couldn’t do.”

“… I had an X-ray that [the doctor] said it looked like the fracture had healed pretty well and we could stop the physio. But I wasn’t happy about stopping the physio and neither was the physiotherapist – a couple reasons for that. I was still in considerable pain … I still had [limitations on functional activities]”

| A-12    | Female 54      | Shoulder 12-23                          | “And they said it will be about six weeks until it [the fracture-related pain] moves to the next pain level. So I was out of commission for … I would say it was six to eight months |
before I was without pain.”

<table>
<thead>
<tr>
<th>Participant</th>
<th>Sex</th>
<th>Age</th>
<th>Location</th>
<th>Symptoms</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-9</td>
<td>Female</td>
<td>86</td>
<td>Hip</td>
<td>12-23</td>
<td>“And then when I finished them [the prescription painkillers, the doctor] gave me one renewal and then after that he cut me … he said just take the Tylenol. So I told him about it yesterday … it was so sore. He said, no, just take an extra Tylenol.”</td>
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<tr>
<td>B-15</td>
<td>Female</td>
<td>84</td>
<td>Wrist</td>
<td>6-11</td>
<td>“… it’s true about getting pains in your arms and legs, that’s one of the symptoms [from taking a bisphosphonate medication] … but it goes away.”</td>
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<tr>
<td>B-16</td>
<td>Female</td>
<td>75</td>
<td>Hip</td>
<td>12-23</td>
<td>“The pain took much longer to get better [than the health care provider predicted]”</td>
</tr>
<tr>
<td>B-17</td>
<td>Male</td>
<td>79</td>
<td>Hip</td>
<td>12-23</td>
<td>“… [I take Tylenol as needed] just for pain. And I was taking codeine, but I stopped taking that … [the doctor] said to not take anything with codeine in it because codeine can cause a lot of other problems … so I stopped taking it.”</td>
</tr>
<tr>
<td>B-21</td>
<td>Female</td>
<td>71</td>
<td>Hip</td>
<td>6-11</td>
<td>“… the doctor can’t give me anything else [analgesics] because he’s tried but nothing else is working on me.”</td>
</tr>
<tr>
<td>C-8</td>
<td>Female</td>
<td>53</td>
<td>Ankle + Wrist</td>
<td>24-60</td>
<td>“… I’m going to see the doctor tomorrow morning to see if I can get a prescription because Aleve and Ibuprofen [advised by the doctor] just isn’t doing it. And luckily I found some Tylenol 3 here in the house from when I had a tooth problem. I hoard those … And then I found some Oxycontin. And I’m wow, that’s great.”</td>
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</table>
| C-9  | Female | Knee       | “… I have a lot of pain … I don’t need to mask my symptoms, I need to help make my pain go away … I think I’m a recovered fracture patient who doesn’t have 100% [function] and is mad.”
|      | 51     | 12-23      | “… the first thing [the nurse] said was ‘well, none of us are getting any younger you know,’ which pissed me right off. She says, ‘you have to just accept your aches and pains because you’re getting older.’ That pissed me off doubly, and pardon the use of the word.” |

| C-10 | Female | Vertebrae | “I had home physio who said ‘look, I’m not going to treat you because you’re going into spasm too much.’”
|      | 72     | 24-60      | “They kept on up and down with the Morphine because of this dreadful pain …” |

| C-11 | Female | Vertebrae | “I’m on Hydromorphone for pain, which doesn’t really help very much.”
|      | 89     | >60        | “[My fracture-related pain has not been addressed by anyone or managed in a way that works,] no, absolutely not. Other than just by the opiate, the Hydromorphone, and the Tylenol. No, it hasn’t been, not at all.”

|      |        |            | “Mostly what [the doctors] said was that [my] spine is in pretty bad shape and there’s nothing [they] can do for [me]. That was mostly the answer I got.” |

| C-24 | Female | Vertebrae | “I don’t like [a prescribed bisphosphonate medication.] I don’t
like it at all because of the side effects of it. But I realize that I
must do something to try and stop this deterioration of my
bones and of the pain, which is the hardest to bear … I was
looking for some sort of treatment that would not only halt the
[bone] deterioration but would stop the pain. Because when
you have pain all the time you’re not living a quality life, you’re
just in pain all the time."

“I still think, if somebody could help me with the pain, that
would be something, but they don’t seem to be that interested
in it, or even if they’ve prescribed things that don’t work they
get sort of all, well, I can’t do anything more about it.”

“… it’s just that if I find some pain relief, that would be great …
especially around the area of the sacrum …”

“No, nothing helps me. And, actually, one doctor, a very nice
gentleman, very nice guy, but he got so exasperated with me
and I with him because I kept saying, there’s got to be
something to help me with this pain. And then he said, ‘well,
we’ve tried everything except Morphine, I don’t think I want to
put you on Morphine.’ And I said, ‘no, absolutely not, I don’t
want to.’”

Interviewer: “So with the family physicians, did you find that …
in terms of your pain management and acknowledging that,
you didn’t find a lot of satisfaction?
No, actually, I didn’t to be honest.”

“And not being in the habit of taking my aches and pains to my
doctor, I didn’t do too much about that. But I did go to him a
while back because I seemed to be experiencing more pain for the past several months, and I found about the same attitude. ‘Well you know it is pain there …’"

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<tr>
<th>ID Cod</th>
<th>Sex, Age (yrs)</th>
<th>Fracture location, Months since fracture</th>
<th>Quote</th>
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</table>
| C-28   | Female 73     |                                         | Interviewer: "Is your family physician the one who manages your osteoporosis now? No, not anyone really does.
Interviewer: When you say not anyone really does, what do you mean?
Well, if I have a problem, I go to the doctor.
Interviewer: The family physician.
Yes, but as far as the pain is concerned, I have my Ibuprofen or Tylenol and that’s all I use … There’s no monitoring, no one checks to see what’s happening in there."

3) Participants responded to inadequate pain management by accepting the pain, reporting their decisions to refuse pain medication despite having pain, or describing other non-pharmaceutical coping strategies

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<th>Sex, Age (yrs)</th>
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<tbody>
<tr>
<td>B-5</td>
<td>Female 73</td>
<td>Ankle 6-11</td>
<td>“Now, I didn’t say I was in pain to anyone but I was in pain, yeah.”</td>
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<tr>
<td>B-9</td>
<td>Female 86</td>
<td>Hip 12-23</td>
<td>“Well, you see the thing is that, I always had a lot of aches and pains … You know because I would have aches and pains and you know the old standard…”</td>
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<tr>
<td>ID</td>
<td>Gender</td>
<td>Age</td>
<td>Injury</td>
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<tr>
<td>B-17</td>
<td>Male</td>
<td>79</td>
<td>Hip</td>
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<tr>
<td>B-18</td>
<td>Female</td>
<td>73</td>
<td>Humerus</td>
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</table>
| B-19 | Male   | 82  | Shoulder| 12-23    | “It’s healed very well [the fracture] and I’m not really all that uncomfortable.”  
“… I’m not great for taking something if I can manage not to take because I think we’re taking too many pills as it is.” |
| B-21 | Female | 71  | Hip     | 6-11     | “It’s just something I’m living through [the fracture-related pain,] you know, and I don’t know, it’s not nice.”  
“… I am not a pill taker. You know, like every little pain I have, I don’t jump for a pill.” |
"I usually just take one a day but if I have extra pain, you know like it really starts throbbing the whole leg and everything, then [I will take two] … but I won’t take two at once."

“I don’t want to get addicted to anything and those pain pills you can get addicted to.”

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<th>C-1</th>
<th>Female</th>
<th>Vertebrae</th>
<th>24-60</th>
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<tr>
<td></td>
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<td>[Rationalizing longstanding fracture-related pain:] “… I’m certainly not young.”</td>
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<tr>
<th>C-8</th>
<th>Female</th>
<th>Ankle + Wrist</th>
<th>24-60</th>
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<tr>
<td></td>
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<td>“But I only take [an opioid] if [the fracture-related pain] is really, really severe.”</td>
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<thead>
<tr>
<th>C-9</th>
<th>Female</th>
<th>Knee</th>
<th>12-23</th>
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<tr>
<td></td>
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<td>“So I said to the nurse, the doctor didn’t suggest I X-ray my knees, I did learn that this particular fracture increases your risk substantially for osteoarthritis of the knees. My doctor said at the appointment, yeah, your knees are really crunchy, you probably have osteo in those too by now, and I have a family history of osteoarthritis in the knees. So we didn’t decide to X-ray them because that would be dumb, it’s probably just a fact of life and she says yeah, you probably had that, and move on.” &lt;After some more discussion in the interview, the same nurse told the 51-year old participant that she isn’t getting any younger and that she should accept her pain&gt;</td>
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|       |        | “I would have to say I’m anti drug taking in general and will go to any lengths to not take them, and would prefer to do other things … I don’t want to [take Tylenol] it’s pain, I’m not
<table>
<thead>
<tr>
<th>ID</th>
<th>Gender</th>
<th>Age</th>
<th>Vertebrae Range</th>
<th>Statement</th>
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<tbody>
<tr>
<td>C-10</td>
<td>Female</td>
<td>72</td>
<td>24-60</td>
<td>“dying here, so I wouldn’t do that either.”</td>
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<td>“… I avoid taking pain medication like crazy …”</td>
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<td>“Lots of things in life have happened to me. It couldn’t have</td>
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<td>gotten worse. I generally have a pretty good outlook on life and</td>
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<td>that’s also hereditary … get into a positive frame of mind, which I’ve</td>
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<td></td>
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<td>always had …”</td>
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<tr>
<td>C-11</td>
<td>Female</td>
<td>89</td>
<td>&gt;60</td>
<td>“If I'm not going out for my exercise class I don’t take</td>
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<td>[Tylenol], I put up with the pain because I don’t like taking pills. The</td>
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<td>same with Morphine, I’d rather suffer a bit.”</td>
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<tr>
<td>C-24</td>
<td>Female</td>
<td>88</td>
<td>&gt;60</td>
<td>“I am concerned about taking medication from the effect that it might have</td>
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<td>on the liver and the kidneys, particularly with Tylenol, which they are</td>
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<td>now saying you should not take more than six a day. It used to be you</td>
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<td>could take as many as you wanted but now of course they find that it does</td>
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<td>damage to the liver, I think. So I am concerned about that, because I</td>
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<td>feel that if I do have damage to my liver then it’s my own fault for</td>
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<td></td>
<td></td>
<td>taking the medication.”</td>
</tr>
<tr>
<td>C-28</td>
<td>Female</td>
<td>73</td>
<td>24-60</td>
<td>“Of course I’m always feeling pain…”</td>
</tr>
</tbody>
</table>