The Effectiveness of an Educational Intervention on Pain Management and Post–Operative Outcomes of Chinese Patients with Fracture Limb

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PREFACE

Abstract

Background

Fracture limb and undergoing surgery is the common problem after injury. It is the most common source of pain and anxiety and research continues to demonstrate a high prevalence of unrelieved pain in injured patients who have undergone surgery. Patient's belief in pain is the major barrier in pain management. Strategies directed to have appropriate educational interventions are urgently needed to improve patient outcomes for those suffering acute pain after surgery for traumatic limb fracture.

Aim

The overall aims of this study were to develop a tailor-made educational intervention and to examine its effectiveness on short- and longer-term outcomes among Chinese patients with traumatic limb fractures who had undergone surgery.

Method

The study was conducted in the orthopaedic wards of two regional hospitals in Hong Kong and comprised two phases. In phase one, qualitative interviews were conducted with twenty-six Chinese patients who had traumatic limb fractures and were undergoing surgery regarding their experiences of and beliefs about pain management. Ten orthopaedic nurses were also interviewed about their perceived pain management practices and the barriers that prevented better pain control among patients. The findings from these qualitative interviews were used to develop a cognitive behavioural approach educational intervention (C-BEI). C-BEI was used to enhance knowledge of pain, modify their beliefs about pain management and promote positive coping thoughts and behaviour.

The C-BEI consisted of two sessions. The first was a 30-minute session comprised a combination of patient education and breathing relaxation exercise and conducted at T0 (1 day before surgery). A 30-minute reinforcement session was conducted at day 7 after surgery (T3).

The main study was conducted in phase II which consisted of outcomes and process evaluation. A quasi-experimental design of two groups' pre-test and post-test between subjects was employed for the outcomes evaluation. All participants in the experimental group received the C-BEI and usual care, whereas those in the control group received usual care only. The short-term outcomes were treated as primary outcomes and evaluated in terms of the participants' pain barrier score, pain level (Visual Analogue Pain Scale: VAS , anxiety level (State-Trait Anxiety Inventory:STAI), sleep satisfaction, self-efficacy in pain management (General Self Efficacy Scale: GSE), and frequency of analgesic use. All of which were measured at T0, T1 (day 2), T2 (day 4), and T3 (day 7) after surgery. The total length of stay in hospital of the two groups was also compared. Longer-term outcomes were further evaluated over three months at T4 (1 month) and T5 (3 months), and included the VAS pain level, STAI, sleep satisfaction, GSE and health-related quality of life (SF36).The intention-to-treat method was adopted. The process evaluation involved a qualitative study using telephone interviews.

Results

A total of 125 participants completed the study, with 62 in the experimental group and 63 in the control group. The participants were homogenous in terms of demographic data ($P > 0.05$) and baseline clinical characteristics ($p > 0.05$). The short-term outcomes

(from T0 to T3) for the participants in the experimental group were a statistically significant with lower pain barrier ($p = .003$), lower level of pain ($p = .003$), lower level of anxiety ($p < .001$), and better sleep satisfaction ($p = .001$) than the control group. The experimental group had a significantly higher frequency of analgesic use at T2 ($p < .001$) and better self-efficacy in pain management at T3 ($p = .011$) than the control group. There were no statistically significant differences in the total length of stay in hospital, although the mean length of stay was shorter in the experimental group than in the control group (8.1 day VS 10.1 days). For longer-term effects, the C-BEI was effective at the post-operative stage in anxiety reduction ($p = .002$) and sleep satisfaction improvement ($p = .002$). There were no statistically significant differences for the VAS pain level, GSE scores, physical health summary component (PCS) and mental health summary component (MCS) of the SF36 between two groups over three months, although the experimental group had better scores in the mental health dimension. Findings of the process evaluation showed that most participants perceived the C-BEI as effective in enhancing their knowledge on pain management and the use of analgesics, and helping them to cope with pain, the could sleep better and regain self -control.

Conclusion

The C-BEI was effective in terms of reducing the pain barrier, providing post-operative pain relief, reducing anxiety, and improving sleep satisfaction in patients with fractured limbs during their first week of hospitalization after surgery. This study has generated evidence supporting the use of a C-BEI in acute pain management.

研究簡介

背景

病人遭遇創傷性骨折及接受有關手術後，經常出現痛苦及緊張焦慮的情緒。醫學研究不斷致力改善此常見問題，但未見重大進展。文獻顯示，患者對痛楚、痛楚處理的看法及誤解被視爲最大的障礙。爲了協助病人減輕手術後的疼痛及舒緩緊張情緒，極其需要一個有效的健康指導模式，引進干預。

研究目的

本研究目的是開發制定一套教育模式，引進干預，並審查它的短期(住院首星期) 及長期(手術後至三個月) 的有效性。

方法

研究包括兩個階段：首階段爲質性研究，第二階段爲結果評估研究。此研究分別在兩間醫院的骨科病房進行。首階段是採用質性研究的方法，研究有關病人在骨折受傷及手術後的經歷，他們對疼痛及痛楚處理的觀點及看法。除此之外，十名駐病房護士也接受採訪，訪問內容是關於他們對疼痛處理的看法，及在日常工作上對於疼痛處理的障礙，這些質性研究結果被用於開發以「認知行爲」爲藍本的教育干預(C-BE1) 。

在第二階段，研究包括結果評估研究和另一個質性研究。結果評估研究包括一個實驗性研究，包括「實驗」和「一般」二組，比較二組對止痛障礙、疼痛、緊張情緒指數、睡眠滿意狀況、對疼痛的自理信心、鎮痛藥物的採用情況及住院日數的比較。研究測量指標分別在短期【手術前一天(基礎測量)，手術後二天、四天及七天】進行，長期測量指標定爲手術後一月及三月進行。

長期測量指標包括鎮痛障礙評分、疼痛指數、睡眠狀況、疼痛自理信心及生活素質指數等。研究對象包括患者年齡≧18、受傷前能走動、是次診斷爲骨折及需手術治理。統計推斷檢驗，包括重複測量的方差分析(ANOVA)，X 方檢驗，T 測驗，Mann-Whitney U 檢驗等等。

研究結果

是次研究共有一百二十五人參加及完成，包括 62 位在實驗性小組和 63 位在一般組。參加者在人口統計數據與基礎臨床特徵均無分別($p > 0.05$)。短期結果以手術前一天至七天(T0-T3) 爲藍本。

短期結果顯示，實驗性小組有較低的鎮痛障礙 ($p = .003$)，較低的疼痛指數 VAS ($p = .003$)，及緊張情緒指數($p < .001$) 和較佳的睡眠滿意度($p = .001$)。除此之外，實驗性小組比一般組較接受鎮痛藥 [(手術後第二天) $p < .001$] ， 出院後且有較高的自理信心水平。

長期結果以手術後三個月爲期。雖然實驗性小組有較佳的精神健康維度，但二組的生活素質指數(SF36) 對身體健康概畧組分(PCS)或精神概畧組分(MCS)，均無分

別。二組的自理信心水平和疼痛指數均無分別。總括而言，實驗性小組比一般組爲佳，主要表現在緊張情緒指數和睡眠滿意度。
其他方面，質性研究在手術後一月進行，並以電話訪問形式探究。十五名受訪者表示，C-BEI 是有效提供病人對疼痛處理、使用鎮痛藥、睡眠和疼痛自理信心均有幫助。

研究結論

C-BEI 能有效改善病人對疼痛的誤解，有短期效益。在手術後一星期住院期間，對減痛、舒緩緊張情緒和睡眠均有好處。是項研究以 C-BEI 模式爲基礎，對急性疼痛及手術後疼痛處理的有效性有確實支持。

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PUBLICATIONS AND PRESENTATION

The following original articles arose from the research reported in the thesis

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Wong, E .M. & Chan, S (2009). The pain experience and beliefs of Chinese patients who have sustained a traumatic limb fracture, Journal of Orthopaedic Nursing (In press)

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Inc and International Conference on Community Health Nursing Research (ICCHNR). Adelaide, Australia.

Wong, Eliza M.L., Chan, S. & Chair, SY. (2009). The effectiveness of an educational intervention on pain belief and post-operative pain relief for Chinese patients with musculoskeletal trauma . P*roceeding of the 3rd Hong Kong Nursing Forum*, The University of Hong Kong

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CHAPTER ONE INTRODUCTION

Background of the Study

Overview of Patients with Fractured Limbs

A bone fracture is a break in the continuity of a bone. Any displacement of the fragment will result in the loss of normal anatomy and function, either of the limb or of the patient as a whole (Maher, Salmond, & Pellino, 2002). Many traumatic fractures are the result of high-force impact caused by accidents such as falls or motor-vehicle accidents, and by sports or violence. Bone fractures can also occur as a result of certain medical conditions that weaken the bones, such as osteoporosis. Injuries or fractures may also affect muscle, bone, tendon, ligament, articular cartilage, periosteum, or synovium (Esser & MaRae, 2002). In orthopedic medicine, fractures are classified as closed or open (compound). Closed fractures are those in which the skin is intact, while open (compound) fractures are those in which a wound is in continuity with the fracture and may expose the bone to contamination. In hospitals, fractures are diagnosed by the clinical feature of deformity, swelling, and confirmed by taking an X-ray (Esser & MaRae, 2002).

Fracture treatment aims to ensure the best possible function of the injured part after healing. Bone fractures are typically treated by restoring the fractured pieces of the bone to their natural positions by reduction (if necessary) and maintaining those positions while the bone heals. In the case of a simple and minor break in continuity of the bone, a fractured limb is usually immobilized with a plaster or fiberglass cast, which holds the bones in position and immobilizes the joints above and below the fracture. Patients with a cast or plaster are normally discharged to their homes and follow-up takes place in a clinic. For complicated and long bone

fractures, orthopedic surgery with internal fixation of surgical nails, screws, plates, or wires is used to hold the fractured bone together more directly (Lau, Cooper, Fung, Lam, & Tsang, 1999; Esser & MaRae, 2002). Normal healing of a long bone fracture takes from 8 to 12 weeks, depending on internal factors (severity of the fracture, co-existing illness, and age) and external factors (nutrition, operation type, and related skill). When a joint surface is damaged by a fracture, surgery is also commonly recommended to make an accurate anatomical reduction and restore the smoothness of the joint (Esser & MaRae, 2002; Maher et al.,2002).

In the USA, nearly 60 million people suffer accidental injuries each year, and limb fractures account for a high percentage of traumatic injuries (Maher et al., 2002). In Hong Kong, traumatic limb fracture was reported as one of the ten major causes of admission to general hospitals (HA, 2008). The two main causes of such limb injuries were motor-vehicle accidents and those involving falls (Ho & Chan, 2003; HA, 20078). Lau et al.(1999) also reported that the rate of hip fracture was 11/1100 in women and 5/1000 in men of 70-years-old or more, and that the rate would increase substantially in the future as a result of the aging Hong Kong population. In fact, with aging of the global population, it is estimated that there will be a substantial increase in femoral fractures over the next two decades (Simpson, 2002; HA, 2008).

Scope of the Clinical Problem: Impact of Pain Management on Post-Operative Outcomes

Limb fracture is a stressful and painful experience after an accident and after the subsequent surgery (Archibald, 2003; Ponzer, Bergman, Brismar, & Johansson, 1996). Importantly, the literature supports the notion that adequate pain management is essential for recovery. With good pain control, patients after orthopedic surgery have a significantly shorter length of stay in the hospital, better physical outcomes (Sherwood, McNeill, Starck, & Disnard,2003; Shaw, McColl, & Bond, 2003), and better psychological outcomes (Scaf-Klomp, Sanderman, Ormel, & Kempen, 2003).

Despite advancements in pain management technology and a consensus on improving pain management, research continues to demonstrate a high prevalence of unrelieved pain among patients who have undergone surgery (Chung & Lui 2003; Klofenstein, Hermann, & Manie, 2000). For example, Tsui et al. (1999) and Chung and Lui (2003) found that over 80% of post-operative surgical patients complained of various degrees of pain in the first week despite the fact that pain medication was prescribed.

Pain is an individual and subjective experience; patients' misconceptions and concerns about the use of opioids and their reluctance to report pain have been identified as important barriers to effective pain management (Redmond, 1997; McCaffery & Pasero, 1999; Chung & Lui, 2003; Carr, 2007). Chung, French, and Chan (1999) and Wong, Chair, Rainer, and Chan (2007) also showed that Hong Kong Chinese patients' beliefs about pain are among the major barriers to adequate pain management in palliative care and emergency care settings. For example, most patients believe that analgesics should only be used as a last resort

as the effect of drugs is not good for the health, and some patients were even reported to have refused to take analgesics although they were suffering from pain after sustaining an injury (Wong et al., 2007).

Scope of Pre-operative Educational Intervention on Post-operative Outcomes

Substantial evidence suggests that preoperative education is useful to improve patient outcomes, including pain control and anxiety reduction after surgery (Johansson et al., 2005). Some educational interventions, such as the provision of health information and/or skill training on breathing, have been implemented to improve pain control and reduce anxiety (Sjolingm, Nordahl, Olofson, & Asplund, 2003). With good pain control, orthopedic surgery patients have a significantly shorter time in the hospital, less pain (Sjoling et al.,2003) and anxiety, as well as better coping skills (Shaw, McColl, & Bond, 2003; LaMontagne, Hepworth, Salisbury, & Cohen, 2003). Other studies (Calvin & Lane, 1999; Mitchell, 2003; Carr, Thomas, & Wilson-Barnet, 2005) also show that there is a strong association between pain control and physical and psychological outcomes.

In evaluating the effectiveness of various approaches of preoperative education on pain relief, studies generally support the notion that a cognitive-behavioral approach based on an education program is an effective way to change a person's cognition and behavior, resulting in better pain management for chronic orthopedic problems (Morley, Eccleston, & Williams, 1999; Sinclair, 2001; Ersek, Turner, McCurry, Gibbons, & Kraybill, 2003). For example, if patients start to believe that pain is a positive phenomenon, a signal of tissue damage threat due to injury or surgery, and taking analgesics or other measures such as relaxation exercises should be adopted to cope with it, they will accept analgesics or adopt

other coping tactics. Eventually, patients may demonstrate positive coping behaviors with less perceived pain (Jordan, Lumley, & Leisen, 1998; Morley, et al., 1999), less perceived stress (Eccleston et al., 2003; LaMontagne et al., 2003), and less complication as reflected by a shorter hospital length of stay (Lorig et al., 1999; Turner et al., 2006).

Knowledge Gap

The literature clearly highlights the need for a well–designed, tailor-made pre-operative educational intervention to achieve the very best post-operative outcome from patient education. However, the reported outcomes of education interventions seem to vary given the fact that many studies were descriptive in nature; few were carried out under experimental conditions (Johansson et al., 2005). Although interventions had various components in different studies, there was limited theoretical support to underpin the reported educational interventions and therefore the findings could not explain clearly which components of the intervention produced an effect on patients (Johansson et al., 2005). In addition, only a limited number of studies have measured outcomes systematically, especially during the first seven days after surgery. Another largely ignored aspect was sleep satisfaction, which very few studies measured as an outcome, although it is an important component of recovery. Not only is satisfactory sleep restorative, it is also fundamental to well-being and essential to the maintenance of mental integrity (Griffiths, 2005). In addition, most studies were confined to chronic orthopedic problems, while a focus on the therapeutic effect of a cognitive-behavioral approach on Chinese post-operative outcomes after orthopedic surgery was missing.

Given the evidence supporting the usefulness of a cognitive-behavioral education intervention to chronic pain management and a lack of significant research on such an approach to acute pain management, there is a need for a study to examine its effects in acute care settings (Morley et al., 1999; Ersek et al., 2003; Turner et al., 2006).

Clinical Practice Gap

Although post-operative pain management remains to be one of the greatest concerns for healthcare professionals, clinical studies indicate that such pain is not well relieved in most patients (Bucknall, Manias, & Botti, 2001; Chung et al., 2003). The literature identifies reasons for poor pain management among hospitalized patients such as low doses of opioids prescribed by physicians owing to fear of addiction by the patients, nurses' lack of knowledge leading to inadequate pain assessment, and patients' reluctance to report pain and to take analgesics (Field, 1996; Klofenstein et al., 2000; Bucknall et al., 2001; Chung & Lui, 2003). Studies also suggested that patients' misconceptions and concerns about the use of opioids and their reluctance to report pain have been identified as important barriers to effective pain management (Jordan et al., 1998; Wills & Wotton, 1999; Turner, Jensen, & Romano, 2000). Pain is, after all, an individual and subjective experience, and healthcare professionals can do nothing if a patient refuses pain management or does not report any pain.

Given the fact that fractured limbs account for a high percentage of hospital admissions of orthopedic patients, inadequate pain management is frequently reported; inconsistent modes of educational intervention seem to be delivered in different settings and with uncertain effectiveness. There is thus an obvious need

for the development of a well-structured educational program specifically for patients with traumatic limb fractures and who are undergoing surgery.

Significance and aims of the Study

Patients with traumatic limb fractures and who are undergoing surgery are stressed with pain but inadequate pain management is frequently reported. Existing research shows that patient's reluctance of reporting pain and accepting analgesics are one of the major barriers of effective pain management in Chinese patients. Such behaviour is related to the belief in pain and the use of analgesic . Thus there is a need of developing a tailor –made, safe and feasible approach of educational intervention to reduce the pain barrier, and to improve pain management in these patients.

Majority of previous work of educational interventions on acute pain management did not have strong theoretical base and it is difficult to follow or replicate it in clinical setting. With a clear understanding of the reasons of applying educational intervention, the process underlying its effect, the researchers or clinicians can identify and interpret the intervention input and the results. There is a need to develop a theoretical based educational intervention.

In addition, existing research does not provide conclusive evidence of using cognitive behavioural approach educational intervention(C-BEI) on acute pain management since much evidence have been focused on chronic pain.The C-BEI has potential to be applied to acute management. However, whether C-BEI is effective in helping fractured limb patients to cope with their pain, is not clear. There is no published study that has evaluate the effcts of C-BEI on Chinese patients with fracture limb and undergoing surgery. The effects of C-BEI on post-

operative outcomes and the exact mechanism of how these intervention work have not been clearly identified.

To address the above gaps and provide new knowledge about an effective educational intervention for Chinese patients with limb fractures and who are undergoing surgery, the aims of this study is to develop and evaluate the effectiveness of an educational intervention in terms of certain outcomes: pain barriers, pain, anxiety, sleep satisfaction, self-efficacy, and quality of life among Chinese patients presented with traumatic limb fractures and who are undergoing surgery. Two work phases were adopted for the study: Phase one of the study was conducted to facilitate the development of an appropriate educational intervention for Chinese patients presented with traumatic limb fractures and who are undergoing surgery; this is followed by Phase two of the main study, which was to determine the effectiveness of the educational interverntion on post-operative outcomes. In the main study, a quasi-experimental design was employed for the evaluation of post-operative outcomes. The educational intervention being tested was a cognitive-behavioral approach educational intervention (C-BEI) involving a combination of patient education and breathing relaxation skill training. Since acute pain management is the main focus of this study, short-term outcomes, such as pain barrier, pain, anxiety, and sleep satisfaction, during hospitalization were regarded as primary outcomes. The secondary outcome measures were longer-term outcomes across three months such as quality of life and self-efficacy of pain management.

Besides the outcomes evaluation, a process evaluation was conducted to investigate patients' perceptions of the benefits and limitations of the educational intervention. This involved a qualitative study using telephone interviews, which

was conducted on a purposive sample of 15 patients from the experimental group one month after their surgery.

Overview of the thesis

The study described in this thesis is divided into two phases: (1) to develop a tailor–made educational intervention; (2) to evaluate the effectiveness of an intervention involving breathing and relaxation training and education on pain management among patients with traumatic limb fractures undergoing surgery. The thesis is composed of nine chapters. Chapter 1 introduces the clinical problem and justifies the significance of the study. Chapter 2 reviews the literature relevant to fractures and their care, and post-operative outcomes in terms of pain, anxiety, quality of life and outcomes. Chapter 3 reviews the literature of the conceptual framework of pain theory, cognitive behavioural theory and the cognitive behaviour approach to health education. The rationale of choosing a certain framework is also discussed. Chapter 4 describes the phase-one work - a qualitative study and the details of the development of the cognitive behavioural based educational intervention. The methodology and findings of the qualitative study are presented .The results of piloting the intervention on four patients are also presented here. Chapter 5 describes the methodology of the phase-two main study which consists of outcomes evaluation and process evaluation. Outcomes evaluation includes research objectives, hypothesis, design, measures data collection and data analysis. Process evaluation includes methodology of a qualitative study using telephone interview. Chapter 6 reports the results of the outcomes evaluation of the main study. Chapter 7 reports the result of the process evaluation of the phase-two study. Chapter 8 discusses the effectiveness of the

outcomes in the phase-two study. Chapter 9 then examines the strengths and weaknesses of the whole study, and highlights its implications for practice, education and research. The final chapter concludes the study with a summary of its potential contribution to knowledge and clinical practice in the nursing discipline.

CHAPTER TWO LITERATURE REVIEW

Introduction

Traumatic limb fracture is a common serious condition in the West as it is in Hong Kong (Van Balen, Essink-Bot, Steyerberg, Cools & Habbema, 2003). Post-operative outcomes such as physical functioning, pain, and anxiety have been the focus of research over the last two decades. Poor pain control may hinder the recovery of physical functions, leading to loss of independence and consequently causing anxiety or negative feelings. Ultimately, the process of recovery and quality of life may be affected.

This present study investigates the effectiveness of an educational intervention on post-operative outcomes among Hong Kong Chinese patients with limb fractures. In this chapter, the general response of patients with traumatic limb fracture undergoing surgery will be discussed and followed by general post-operative outcomes—pain, pain barrier and pain management, anxiety, sleep, and quality of life perceived by the patients after surgery. The use and effect of educational intervention on post-operative outcomes will likewise be discussed.

A literature search was undertaken utilizing the following database: British Nursing Index, CINAHL, EBM Reviews (Cochrane DSR, ACP Journal Club, DARE, CCTR, CMR, HTA, and NHSEED), EMBASE, Journals@Ovid Full Text,

Ovid Medline, and PsycINFO; EBSCOhost; ProQuest Dissertations and Theses; and Digital Dissertation Consortium. The search covered literature from 1980 to 2008. The key words include "pain," "pain barrier," "anxiety," "sleep disturbance," "sleep satisfaction," "quality of life," "outcomes," "limb fracture," "musculoskeletal trauma", "orthopaedic trauma," "injury," "orthopaedic surgery," "post-operative outcomes," "education," "educational intervention," and "Chinese." Literature written in English and Chinese was included in the search, and primary studies relating to educational intervention affecting post-operative outcomes were chosen as the priority for review. The following are the review results.

General Response of Patients with Traumatic Limb Fracture Undergoing Surgery

Traumatic limb fracture is a sub-category of orthopedic trauma, which has been defined as the state in which an individual sustains accidental tissue injury such as a wound, burn, or fracture (Carpenito, 2008). Traumatic injuries vary in degree of severity from simple soft-tissue injury to complicated injuries to the nerves, tendons, blood vessels, bones, and organs. Fractures, dislocations, and sprains cause pain through a variety of interrelated and independent mechanisms which act locally and systematically to generate and mediate the sensation of pain: fine nerve endings in the cancellous bone and periosteal lining are triggered by the physical disruption of

the bone and the tearing and stretching of the periosteum, and nerve endings in the surrounding muscle and soft tissue. Soft tissue may be damaged directly or stretched by the displaced fracture fragments or the expanding haematoma; inflamed muscle may spasm, producing pain and further tissue distortion. These produce further tissue damage and deformity as well as uncontrolled pain (Melzack & Wall, 2003), and may even lead to life-threatening haemorrhage and systemic shock among patients with multiple fractures (Chapman, 1977, Maher, 2002).

Patients with severe limb fractures resulting from unexpected accidents experience physical and psychological difficulties such as pain and anxiety (Byrne & Heyman, 1997a, b; Gustafsson, 2000; Archibald, 2003). Although a moderate injury such as a single limb fracture or joint dislocation is not life threatening, it remains to be painful and stressful (McCaffery, 1999; McRae & Esser, 2002; Kennedy et al., 2004). Studying the experience of hip fracture, Archibald (2003) identified four major themes of experience from injury to recovery: the injury itself, pain, recovery, and disability. He found that the patients experienced pain, anxiety, and stress during the early period after injury, so both family and professional support were essential during rehabilitation and recovery. Managing pain, meeting psychological and physical needs for nursing care, planning for discharge, and ensuring a reasonable quality of life were areas for development in nursing care. In

comparison, the current study is a qualitative one which is anchored on a phenomenological methodology with five hip-fracture patients. Its findings highlighted the patients' experience of hip fracture and the importance of intervention and support from healthcare professionals in the process of rehabilitation and recovery. Its limitations included a relatively small sample size (four females and one male) and a principal focus on hip-fracture female patients aged over 65. However, the study's findings may not be applicable to other ethnic populations receiving different cultural and environmental support.

Pain

Overview of Pain

Pain is defined as an unpleasant sensory and emotional experience associated with actual and potential tissue damage. McCaffery (1999) proposes that pain is a subjective experience, and patients are the judges of whether or not pain management is effective. There are two types of pain: acute and chronic. Acute pain is defined as continually changing and transient; it is accompanied by high levels of emotional and autonomic nervous system arousal and is usually associated with tissue injury or surgery (Melzack & Wall, 2003; America Pain Society, 2003). Chronic pain, meanwhile, refers to pain that persists for an extended period of time,

which can last for months or years, and accompanies a disease process; it may be associated with a bodily injury that has not been resolved over time (International Association for the Study of Pain or IASP, 1994).

Pain can be divided into two broad categories: nociceptive and neuropathic. Neuropathic pain is a neurological disorder resulting from damage to nerves, while nociceptive pain is fairly common; the latter is further divided into somatic or visceral pain. Somatic pain is caused by the activation of pain receptors on the surface of the body such as the skin (cutaneous tissue), or on tissues that are deeper such as muscles (musculoskeletal tissue). Patients with musculoskeletal injury usually experience deep somatic pain, usually described as "dull" or "aching," but localized. However, surgical patients usually complain of surface somatic pain which has a sharper, burning, and pricking quality. Visceral pain is much more vaguely localized than somatic pain. Visceral pain originates from body's viscera, or organs. Visceral nociceptors are located within body organs and internal cavities. Visceral pain is not well localized and is usually described as "pressure-like, deep, and squeezing." Pain may be referred to another area and often associated with nausea, vomiting and sickening feeling Examples of visceral pain include pain related to cancer, bone fractures, or bone cancer.

With musculoskeletal injury and surgery, a patient experiences both somatic

pain (dull and aching) and visceral pain (pressure-like, deep, and squeezing). Severe pain may cause muscle spasm, impaired muscle function, fatigue and immobility (McCaffery & Pasero, 1999).

Post-operative Pain management

The problem of under-managed surgical pain is universal despite of advancements in pain management technology (Sherwood, McNeill, Starck & Dsnard, 2003). In acute pain management, there is increasing recognition of using pain guideline to improve pain care, reduce incidence of postoperative morbidity and facilitate earlier discharge and prevent the incidence of chronic pain (APS, 2003; Macintyre, 2007). The guideline developed at 2007 agreed that patient attitude and beliefs have been shown to modify pain perceptions and analgesic requirements, and patient educational intervention can positively influence the outcome of acute pain management (Macintyre, 2007). In addition, a recent systematic review of surgical patient education on post-operative outcomes showed that most of the studies recorded a beneficial effect on pain relief (Johansson et al. 2005). This led to recommendations that a short session of pre-operative educational intervention reinforced by booklets or audio-visual material could be used to achieve positive outcomes. Post-operative pain is likewise a complex sensory and emotional

experience, which is influenced by physiological, sensory, affective, cognitive, socio-cultural, and behavioral factors (Melzack & Wall, 2003; Loeser & Melzack, 1999; Hsu, Somma, Hung, Tsai,Yang & Chen, 2005; APS:SE, 2007).

Effective pain relief may improve patient satisfaction and reduce post-operative complications and even the length of stay (Kehlet & Holte, 2001). Previous studies have indicated that several factors may predict the level of post-operative pain, including age, gender, anxiety, pre-operative pain, and type of surgery (Kalkman, Visser, Moen et al., 2003; Lynch, Lazor, Gellis et al., 2003; Hsu, Soma, Yu et al., 2005). Hsu (2005) investigated the factors predicting post-operative pain through a visual analogue scale and the state-trait Anxiety Inventory, and identified a significantly strong correlation of anxiety and pain level in the 24 hours immediately after surgery (P<0.001, r=-.052). Patients with acute pain often display higher-than-normal levels of anxiety, but their anxiety subsides as their condition improves and the pain decreases. However, the study was biased by reason of its small sample size (n=40) and variability of analgesic dosage (patient-controlled analgesia morphine doses). In addition Seers and Carroll (2001); Kristine, Kwekkeboom and Gretarsdottir (2006) supported the view that the use of non-pharmacological approaches coupled with analgesics could enhance

post-operative pain management. The adjunctive approach can help patients feel a sense of control over pain.

Analgesic Use for Musculoskeletal Pain

The administration of analgesic drugs is a common method of pain relief. The various drugs employed include non-narcotic analgesics, non-steroidal anti-inflammatory drugs (NSAID), narcotics, and local anaesthetic agents. The World Health Organization's "ladder of analgesia" effectively guides the use of medication (WHO, 1996). NSAID and narcotic pain medications are common analgesics used progressively until pain relief is achieved in patients with musculoskeletal injury or surgery.

Pethidine is a commonly used narcotic drug. It is a powerful analgesic for the relief of moderate to severe pain. It is beneficial for the treatment of renal and biliary colic, labor pains, and musculoskeletal pain as it reduces muscle spasm. The common dose is 50 to 100 mg, administered intramuscularly. The onset of its effect is rapid and generally lasts for 2-3 hours, and may trigger less respiratory depression as compared to morphine. Adverse effects include allergic reaction, dizziness, weakness and euphoria, and headache (Wilson, Shannon, Shields & Stang, 2007).

NSAIDs act on peripheral nerve endings and minimize pain by interfering

with prostaglandin synthesis. Examples are Aspirin, Ibuprofen, and Dologesic. NSAIDs have anti-inflammatory, analgesic, and antipyretic actions. They are the treatment of choice for mild to moderate pain and continue to be effective when combined with narcotics for moderate to severe pain.

Barriers to Pain Management

Despite the advances in pain management technology and a consensus to improve pain management, research continues to demonstrate a high prevalence of unrelieved pain in patients who have undergone surgery (Tsui et al., 1999; Chung & Lui, 2003; Klofenstein et al., 2000; Carr, 2007). For example, Chung and Lui (2003) and Tsui et al. (1999) discovered that over 80% of post-operative surgical patients complained of various degrees of pain in the first week despite an analgesic prescription.

Studies have identified gaps that might account for inadequate pain management among hospitalized patients, such as low doses of opioids prescribed by doctors (Janto, 1996; Bucknall, 2001; Jensen, Chen & Brugger, 2002), and ineffective implementation of pain protocols by healthcare professionals (Field, 1996; Carr, 1997; Bedard et al., 2006). Since pain is subjective, studies have reported that patients' beliefs on ingesting analgesics and their reluctance to report

pain were important barriers to effective pain management (Chung, French & Chan, 1999; Carr, 2000;2007; Meuser et al., 2001; Chung et al., 2003; Leung & Chung, 2008). The literature likewise suggests that an understanding of patients' pain experience in their cultural context is important because patients' beliefs on pain could influence their coping behavior (Wills & Wotton, 1999; Bedard et al., 2006).

Culture is defined as a shared system of values, beliefs, and learned patterns of behavior (Low, 1984). Research supports the view that people's cultural beliefs can yield a significant impact on their pain experience (DeGood & Shutty, 1992; Leung & Chung, 2008). Better pain management could be achieved when patients believe they have certain control over their pain, that medical services are helpful, and that they are not severely disabled by their pain (Jensen & Karoly, 1992; Heye, Foster, Bartlett & Adkin, 2002). Turk (1996) maintained that understanding an individual's beliefs on pain can be beneficial in helping the patient. In Chinese medicine, health is viewed as s harmony between the forces of 'yin' and 'yang' within the body, and between the body and its environment. The force of yin and yang is called 'qi', meaning 'vital energy'. A fracture is seen as an imbalance or disequilibrium of these powerful forces of yin and yang. Chinese medicine views pain as a 'blocked' qi, to electrical resistance (Chen, 2001). In response to pain, Chinese patients have been reported to be stoical and less vocal in their expression

of pain (Todd, Samaroo & Hoffman, 1993). For example, Chinese patients' reluctance to use pain medication after surgery because of the fear of side effects was evidenced in a large-scale study of 1,233 Chinese patients in Hong Kong (Tsui et al., 1996). Brooks-Brunn and Kelser (2000) reported the presence of gender differences in self-reported post-opertive pain. Leung and Chung (2008) further posited that gender difference was a factor influencing pain-related behavior such as accepting treatment.

In summary, pain is an individual, subjective experience with multiple dimensions. The high prevalence of unrelieved pain, especially after surgery, is a major challenge for healthcare professionals. Patients' beliefs and concerns regarding the use of analgesics and their reluctance to report pain have been identified as two of the most crucial barriers to effective pain management (Ward & Gatwood, 1994; Jordan, Lumley & Leisen, 1998; Wills & Wotton, 1999; Meuser et al., 2001).

Anxiety

Overview of Anxiety

Anxiety is commonly associated with acute and chronic states of pain (McCaffery & Pasero, 1999; Mitchell, 2003; Carr, 2005). Anxiety is defined as "a palpable but transitory emotional state or condition characterised by feelings of tension, apprehension and heightened autonomic system activity" (Spielberger, 1972, p24). Anxiety and metabolic, neurohormonal, and immune system changes are implicated in the stress response, and such changes have been reported in patients undergoing surgery or those in pain (Thomas et al., 1998; Bourdarne, Legros & Timsit-Berthier, 2002; Mitchell, 2003; Sari & Sevinc, 2004). Pre-operative anxiety can predict post-operative pain ratings and severity (Thomas et al., 1998) or patients with painful joints (Smith & Zaura, 2003).

Lazarus and Anerill (1972) and Lazarus and Folkmans (1984) suggested that anxiety reflects tension created by a reduced cognitive ability to assign full meaning to stressful events. Based on these definitions and criteria, it is easy to understand why the threatening and painful experience of a fractured limb and the ensuing surgery can trigger the occurrence of anxiety.

Anxiety provoked by injuries is frequently unexpected and beyond the patient's control, causing sudden change, worry, and both physical and

psychological instability (Byrne, 1997). Several studies (Holbrook et al,1998; Mayou & Bryant, 2001, 2002) have confirmed that anxiety is a common consequence of traffic accidents or major trauma affecting victims' recovery, specifically in studies of elderly people with hip fractures (Ponsford et al., 1995; Scaf-Klomp et al., 2003) and trauma victims of motor-vehicle accidents. Anxiety may be related to fears of engaging in activities that precipitate pain. As a result, the patient may be inclined to avoid activity, physiotherapy, and even self-care. This may lead to muscle wasting, reconditioning, and physical weakness with reduced physical endurance and a delayed rehabilitation process (Mitchell, 2003; Ilya & Yoram, 2007).

Degree of Anxiety

According to Lazarus and Folkmans (1984), anxiety is a highly personal experience, and it can lead to responses that range from mild anxiety to panic. A mild anxiety reaction is manifested in a heightened sensitivity to environmental stimuli. Moderate anxiety reactions can lead to decreased attentiveness and physical signs such as sweating, restlessness, insomnia, and loss of appetite. Severe anxiety can distort thought processes and reduce the ability to reason and formulate decisions. In the case of panic, an individual may exhibit a wide range of anxiety reactions such as dizziness, palpitations, and feelings of unreality. Anxiety may be

accompanied by depression. There exists a similarity in the manifestations of depression and anxiety. For example, sleep disturbance, fatigue, and loss of appetite are common among patients with either condition (Calvin & Lane1999; Edell-Gustafsson & Hetta, 1999; Kain & Caldwell, 2003; Ilya & Yoram, 2007). Anxiety is a major problem commonly expressed and experienced by patients suffering from any unexpected injury or major trauma (Byrne & Heyman; Joy, Probert, Bisson & Shepherd, 2000). Patients with traumatic limb fracture facing a forthcoming surgery experience a disruption in their state of equilibrium both physically and psychologically, resulting in pain and anxiety (Calvin & Lane, 1999; Bergh et al, 2005).

Relationship among Sleep Disturbance, Pain, and Anxiety during Hospitalization

Sleep satisfaction is fundamental to well-being and is essential to the maintenance of mental integrity (Griffiths, 2005). However, evidence points out that sleep disturbance is a common problem for hospitalized patients, especially after surgery (Kain & Caldwell, 2003; Gabor, 2003). The former study measured patients' amount of sleep two days before and two days after a surgery. It was discovered that 23% of the patients reported clinically significant sleep disruption characterized by wakefulness, pain, and less energy. The reasons for sleep disruption may be noise,

lighting, or routine care. Consistent with this, Gabor (2003) reported that environmental noise and nursing activities contributed to the patients' sleep disturbance in the intensive care unit (ICU). In addition, sleep satisfaction and sleep disturbance are closely interlinked. Other studies (Simpson, 1996; Edell-Gustafsson & Hetta, 2001; Raymond, 2002) likewise examined factors related to sleep disturbance among hospitalized patients, wherein participants reported that pain was moderately disturbing, and pain relief was perceived as an extremely important measure in promoting sleep.

In addition, sleep disturbance has been associated with co-existing illnesses such as headaches or fibromyalgia (Burckhardt et al., 1997; Perlis et al., 1997), rheumatoid arthritis and low back pain (Ingemarsson, Sivik & Nordholm, 1996). However, the causal relationship remains unknown.

Lack of sleep has been associated with fatigue, anxiety, and depression (Dinges, 1997; Burckhardt, 1997; Edell-Gustafsson & Hetta, 2001). The National Sleep Foundation conducted telephone interviews with 1,506 adults aged 55 to 84 and concluded that sleep complaints among older adults were frequently secondary to co-morbid conditions (Foley, 2004). These co-morbid problems placed older adults at risk of sleep disruption, which might be a further risk factor associated with health problems and quality of life (Foley, 2004; Cole & Richards, 2007). However,

little is known regarding sleep satisfaction among young hospitalized adults.

Interventions to reduce anxiety

There is increasing recognition that effective anxiety control is necessary for good psychological care. Studies have reported that patients with better anxiety control experience significantly better levels of satisfaction with the care they receive, as well as better physical and psychological outcomes (Mitchell, 2003; Carr & Wilson-Barnet, 2005; Ilya & Yoram, 2007). Carr et al. (2005) reported that pre-operative anxiety was discovered to be predictive of post-operative anxiety and pain, and the importance of provision of pre-operative intervention was highlighted.

Anxiety-reducing interventions may be administered individually or in combination with psychological intervention. They include pharmacological treatment, patient education, and a cognitive-behavioral approach. Pharmacological treatment plays an important role in reducing anxiety, especially for patients before surgery. Pre-operative patient education is commonly conducted to reduce post-operative anxiety (Giraudet-Le, Janine, Coste, Vastel, Pacault et al., 2003; Johansson et al., 2005). Various studies have likewise described nurses providing educational interventions to reduce patients' anxiety and enhance the physical health of those with orthopedic trauma (Lin & Wang, 2005; Johansson et al., 2005).

Furthermore, patients tend to present a less complicated clinical picture and appear to be less resistant to treatment (Devine & Cook, 1986; Pellino, Tluczek, Collins, Trimborn & Norwick et al., 1998; Giraudet-Le et al., 2003; McCarthy, MacKenzie, Edwin, Bosse & Castillo et al., 2003). Hence, it is essential to provide an appropriate, structured, systematic, and evidence-based psychological intervention for patients with psychological distress after orthopedic trauma.

A cognitive behavioral approach to educational intervention is increasingly recognized as an effective educational approach for patient education (Otis, 2007; Katja et al., 2008). It may be simultaneously invoked to help patients achieve an understanding of the problem and develop effective coping strategies. Specific relaxation techniques such as meditation, breathing relaxation, and progressive muscle relaxation, coupled with educational intervention have yielded positive effects in anxiety reduction in various studies (Seers & Carroll, 2001; Barnason et al., 1995; Leardi, Pietroletti, Angeloni, Necozione, Ranalletta et al., 2007). Breathing relaxation is a common method effective in enhancing patients' self-control during hospitalization. When a patient experiences anxiety after a traumatic event or before an operation or invasive procedure, it is a common practice for nurses to instruct the patient to take deep breaths. The scientific theory behind this is that the heart rate of an individual with psychological distress

accelerates, and breathing becomes shallow and irregular, resulting in a decrease in oxygenated blood; low oxygenated blood in turn contributes to lethargy and psychological distress (Lemone & Burke, 2004). Slow and deep breathing relaxation can increase the oxygen level in circulating blood and decrease anxiety.

Anxiety is reported as the major negative feeling experienced after injury and hospitalization. Anxiety and other negative emotions impede recovery. Educational intervention coupled with relaxation techniques play a vital role in reducing anxiety among patients who are undergoing surgery following an injury. In Chapter 3, the literature review on the theory underpinning the use of cognitive behavioral educational intervention will be discussed in detail.

Quality of Life after Limb Fracture

Traumatic limb fracture is the leading cause of functional limitations in adults, and the study of both short- and long-term outcomes in this patient population has become an increasingly important focus of injury research (Holbrook, 1998; Mayou & Bryant, 2001; Bergh, Jakobsson, Sjöström & Steen, 2005).

The Concept of Health-related Quality of Life (HRQOL)

The World Health Organization (WHO) defines QOL as individuals' perceptions of their position in life in the context of the culture and value system in which they live, and in relation to their goals, expectations, standards, and concerns. QOL is generally accepted as a broad-ranging concept that consists of four domains or elements: physical health, psychological state, social relationships, and relationship to the environment's salient features (World Health Organization Quality of Life Group or WHOQOL, 1998). WHO's definition underscored the importance of a multidimensional aspect in QOL, and individuals' perceived reaction to their health and health condition varied.

QOL is a multidimensional concept comprising of a number of domains (physical, psychological, and social functioning), which in turn possess elements that share common properties of the domain (Grant & Riveram, 1998; Bowling, 2001). Brown, Rawlinson, and Hilles (1981) suggested that individual domains of QOL could be interrelated, and integration of these domains and their elements could determine the QOL for a particular individual. As a result, QOL is a multidimensional construct that is best measured from the patient's perspective, and is mediated by personal and cultural beliefs and life experience (Brown, Rawlinson & Hilles, 1981; Bowling, 2003).

In relation to health, Barrett and Teare (2002) associated quality of life with the impact of disease or injury on daily activities, as well as wider socioeconomic issues. Ritsner et al. (2000) indicated that HRQOL is a multidimensional concept related to a person's satisfaction with various aspects of life such as physical, social and mental-health functioning, and general health perceptions. This suggests that patients' reactions to their health and illness are determined by their own perception of health conditions and the treatment they receive.

One of the most acceptable operational definitions of HRQOL is "representing the functional effect of an illness and its consequent therapy upon a patient, as perceived by the patient" (Schipper, Clinch & Olweny, 1996, p18). Moreover, patients' own values, beliefs, customs, and culture may influence their own perceptions of the impact of their health/illness on their quality of life. HRQoOL as a supplement to objective clinical indicators is widely gaining popularity in measuring health outcomes or the effectiveness of health interventions (Bowling, 2001).

In general, HRQOL instruments consist of two major types: generic or disease specific. The MOS 36-item Short-Form Health Survey (SF36) is the most popular HRQOL tool that has been translated and validated for Chinese adults in Hong Kong (Lam et al., 2002, 2003). The SF-36 has eight scales measuring eight

domains: physical functioning (PF); role-physical (RP) or limitation in daily role functioning due to physical problems; role-emotional (RE) or limitation in daily role functioning due to emotional problems; bodily pain (BP); general health perception (GH); vitality (VT); social functioning (SF); and mental health perception (MH).

To conclude, HRQOL is a multidimensional construct that is best measured from the patients' perspective, and is mediated by their personal and cultural values and beliefs, self concepts, goals, and life experiences (Bowling, 2001).

Impact on HRQOL of Patients with Limb Fractures

Examining the HRQOL of patients with fractured limbs, several studies (MacKenzie, 1996, 1993; Jurkovich, 1995; Butcher, 1996) have identified the significant independent association of serious hip fracture with long-term functional outcomes and HRQOL, especially among elderly trauma patients. Jurkovich et al. (1995) reported that 25% of survivors still suffered from moderate or severe disabilities that caused an impact on their HRQOL even 12 months after their injury. Consistent with these findings, Grossman et al. (2003) and Seekamp et al. (1996) likewise reported that severe lower-extremity injury, including open leg or hip fracture, was a dominant factor in predicting long-term disability among patients with multiple injuries.

Van Balen et al. (2001) studied hip fracture among elderly patients in the Netherlands with respect to functional outcome, quality of life, and type of residence. They interviewed 102 consecutive patients over 65 one week, one month, and four months after injury. They discovered that the patients' quality of life had been reduced overall, being especially severe during the fourth month. The main reason for the decreased QOL was social isolation, followed by decreasing physical mobility (60% could not reach the same level of walking ability as before the injury) and pain, although those patients with family and social support reported better QOL despite limitations to their physical mobility. However, the study might be biased by its small sample size (102 participants with 20% mortality rate at four months) and by the selection procedure, as the mean age of the participants was 83. The findings may not be applicable to a younger population.

Scaf-Klompm et al. (2003) and Standerman, Ormel, and Kempen (2003) conducted a study to examine the changes in emotion among older people with fall-related injuries and the effects on depression of an incomplete recovery of physical function after injury. They discovered that poor recovery of physical functions concerned with carrying out activities of daily living (ADLs) might lead to loss of independence and negative mental functioning such as depression, worry, and anxiety. They likewise found no significant differences between hip fracture

patterns and patients with other serious injuries. The study possessed the strength of access to patients' pre-injury data in order to ensure that elevated post-injury depression rates were a reaction to the event and not merely the extension of a chronic state of depression. However, the study was limited by a high attrition rate (38%).

The review provides evidence of the psychosocial factors influencing the rehabilitation process for patients with limb fractures. However, little is known regarding the psychosocial outcomes of Chinese limb-fracture patients or younger adults as majority of research has been confined to older adults with hip fractures. The review likewise highlights the need for an educational intervention to promote the psychological outcomes in a Chinese limb-fracture population, and further research is needed to examine its effectiveness.

Effects of Educational Intervention on Post-operative Outcomes

There is consistent evidence from the literature of the positive impact of educational intervention programs on patient outcomes. In the past few decades, a large number of studies evaluating educational intervention (EI) in patients undergoing surgery have been conducted. In the literature search, under the key word "education," "educational intervention," "pre-operative education," "surgery,"

"orthopedic," and "limb fracture" were likewise concerned. Twenty-five relevant studies including systematic review, meta-analysis, and various studies were identified. The knowledge gaps and lessons learned from previous studies were identified as well.

Outcomes of an Educational Intervention (EI)

The literature generally supports the view that pre-operative education is helpful in allowing patients to cope after surgery. Devine and Cook (1986) defined pre-operative educational intervention as providing the patient with health-related information, psychosocial support, and certain coping skills prior to the forthcoming surgery. Devine and Cook's review (1986) of 102 studies discussed the efficacy of EI in terms of cost-effectiveness and length of stay in hospital. The average duration of nursing time for EI was 42 minutes, and the authors concluded that extending EI to patients undergoing surgery was feasible. Although the systematic review was conducted in 1986, the meta-analysis confirmed the generally beneficial effects for all forms of preparation of educational intervention, but found that content to address patients' psychological well-being provided widespread benefit in post-operative recovery.

Substantial evidence likewise suggests that pre-operative educational intervention is beneficial to the improvement of patient outcomes, including pain control and anxiety reduction after surgery (Hathaway, 1986; Butler al., 1996; Gammon & Mulholland, 1996; Shuldham, 1999; Lin & Wang, 2005; Carr et al., 2005). The methods employed in pre-operative educational intervention vary widely.

With regard to the format of educational intervention, various methods were adopted such as pre-operative face-to-face education (Giraudet-Le et al., 2003); written patient education material (Butler, 1996; Johansson, Salanterä, Katajisto & Leino-Kilpi, 2004); audio-taped slide information and relaxation training (Daltroy, 1998), and one recently internet-based education (Katja, Leino-Kilpi, Nummela, Kaljonen & Salantera,2008). However, most of the studies were focused on older patients with planned surgery such as hip joint replacement or knee surgery . Specific educational intervention for patients with traumatic fracture limb is lacking . The literature generally support that the provision of health information and psychological support is the most common method and appears to have a significant impact on patients' knowledge, pain levels, and anxiety reduction (Giraudet-Le et al., 2003; Johansson et al., 2005).

Relating to theoretical framework underpinned the study, although most of the studies showed the positive effect on outcomes, most of the studies did not report any theory underpinned their study (Katja et al, 2008; Prouty et al., 2006). There were two common theories being used for the orthopaedic patients: empowerment and self efficacy theory. Empowering patients through education can be divided into the following area: biophysiological (identification of the symptoms and signs), functional (activities daily living), cognitive (receiving enough information and the ability to utilize it), social (social support), experimental (feeling of appreciation) (Leino-Kilpi, 2005; Johansson et al., 2005). Johansson commented that empowerment are particularly important for planned orthopaedic surgery as the patients need to be prepared both for the surgery and the recovery period. In this study, this empowerment was not suitable for the patients who had suffered from unexpected injury and surgery. The application of empowerment on stressful patients were difficult. (Johansson et al., 2005).

Self efficacy theory was another common theory to support the educational intervention for the orthopaedic patients (Johansson et al., 2005). Surgical patients undergo many physically and psychologically stressful and compromising events (Gammon & Mulholland, 1996) and educational intervention using self efficacy theory could help patients to cope with this stressful event and reduce their anxiety

as well as strengthening their commitment to postoperative exercise (Gammon & Mulholland, 1996; Pellino, 1998). Most of the educational content for orthopaedic education focused on information about possible complication, exercise, rehabilitation (Johansson et al., 2004; 2005). Summaries of the relevant educational intervention on orthopaedic surgery are shown in Appendix 1

Ponzer et al. (2000) demonstrated the impact of a psychosocial support program on outcomes among orthopedic injury patients. This was a randomized control study of 150 patients to investigate whether psychosocial support wielded a beneficial effect on outcomes. The inclusion criteria covered hospitalized patients with orthopedic injury, aged 15 to 65. They were randomly divided into an intervention group and a control group. The former was offered a psychosocial support program during the early phase of rehabilitation. It was discovered that the patients in the control group reported a poorer HRQOL and had an excess risk of suffering from psychiatric complaints compared with those in the intervention group, with an odd ratio of 2.7 (Ponzer et al., 1996). Although the above mentioned studies provided important evidence on the psychosocial factors in relation to recovery from orthopedic trauma, there is a lack of information on the nature of the support program and the theory that underpinned the intervention. The program's application is difficult because of the unclear component mediating the effect on

outcomes. There was considerable confusion over the variety of meaning of psychiatric complaints such as depression and anxiety. Further research with a clear theoretical framework and clear definition of psychosocial outcomes may therefore be required.

A number of studies have emphasized the importance of psychosocial factors on outcomes. Dai, Huang, Yang Tsauo, and Yang (2002) supported the importance of the social support extended by health professionals to hip-fracture patients. They identified the effectiveness of an in-hospital multidisciplinary rehabilitation program which had a continuous positive effect on the recovery of hip-fracture patients in Taiwan. The intervention group possessed a lower incidence of functional decline in daily living activity and mobility as compared to the control group. However, the study may be biased because of non-random sampling and a single follow-up interview following the patient's discharge.

In evaluating the effects of a pre-operative educational intervention on outcomes, it was discovered that the methodological quality of intervention and outcomes varied. Certain educational interventions exhibited various components such as Multidisciplinary approach education which last for half day (Ponzer et al., 1996; Dai et al., 2002;Giraudet-Le, 2003); Pre-operative education using audiotaped slide information and Post-operative care and relaxation training (Daltroy, 1998). It

was therefore difficult to explain which components of the intervention produced an effect on patients (Johansson, Nuutila, Virtanen et al., 2005;Lewis et al., 2002). In addition, many educational interventions did not possess theoretical support to underpin the intervention, and it was difficult to interpret the findings and applied for the future study. While many authors recommend the application of EI, such interventions vary widely in nature and quality, and evidence for their effectiveness is not conclusive. In view of the above literature and the consideration of the stressful and painful condition of the patients, an educational intervention using self efficacy theories might be well applied for these patients after injury and undergoing surgery. In chapter 3, a focus on choosing the appropriate theories and formulate the framework of the educational intervention would be further described and discussed.

Summary

The literature concludes that pain management, anxiety reduction, post-operative outcomes, and QOL have been increasingly recognized as important elements for people recovering from severe limb fractures. Pain and anxiety are generally regarded as predictors of poor physical and psychological functional outcomes and poor HRQOL (Johansson, 2004; Carr, 2000; 2005; Ilya & Yoram, 2007). However, the relationship between outcomes and QOL after limb fracture

remains to be poorly understood because of variation in the study population, interview time, and QOL instrument.

Educational interventions by healthcare professionals were generally found to be important in the process of recovery for patients with limb fractures (Brenneman et al., 1995; Ponzer et al., 1996; Scaf-Klompm et al., 2003). In Hong Kong, research on orthopedic trauma or fractures has received relatively little attention, and there are limited studies available concerning the post-operative outcomes and HRQOL of Chinese traumatic limb-fracture patients during hospitalization and after discharge. Understanding post-operative outcomes is important if clinical and policy decisions were to be formulated regarding effective care that maximizes quality.

In the next chapter, a further literature review of EI and related theories underpinning the study will be explored and discussed. The information gained from the literature review has informed the development of a theoretical framework underlying the proposed educational intervention.

Definition of terms

Pain: McCaffery (1999) puts forward the notion that pain is a subjective experience, however and whenever the patient says it is, and the patient is the

judge of effective or ineffective pain management. In this study, it is used to refer to the state in which a person experiences and reports the presence of severe discomfort or an uncomfortable sensation.

Traumatic limb fracture: a loss of continuity in the substance of a bone after sustaining injury; in this study, the patient concerned is one who has sustained injury, been admitted via the accident and emergency department and been categorized as of the traumatic type in the trauma registry, an X ray of the limb revealing a fracture as medical diagnosis on either upper or lower extremities (McRae & Esser, 2002).

Surgery: patient who has undergone general anesthesia, with internal fixation of the fracture site performed using orthopedic devices such as pin, nail, wire, screw or plate (McRae & Esser, 2002).

Anxiety: a multi-dimensional concept, defined by Carpentitio (2008) as a state in which the individual experiences feelings of apprehension, where the autonomous nervous system is activated in response to a threat, and an event consisting of physiological, emotional and cognitive components. Spielberger et al

(1983) further classifies anxiety into two distinct concepts: state and trait anxiety. The term 'anxiety' as used in this study to describe emotions reported by patients such as feeling worried, upset or nervous when confronted with pain.

'State anxiety' refers to a transitory emotional reaction characterized by subjective perceived feelings of apprehension, tension and worry that vary in intensity from time to time (Spielberger et al, 1983).

Educational intervention: any educational programme that provides the patient with health-related information, psychological support and some coping skills after surgery (Johansson, Nuutila, Virtanen, Katajisto, 2005).

Outcomes: Outcomes refers to the effects of intervention or treatments, manifested by changes in any dimension of health or resolution of the presenting problem for which the intervention or treatment is given (Sidani & Braden, 1998). Outcomes have been used as a reflection of care because variations in clinical practice are associated with differences in patient outcomes and the use of resources. Outcomes research could be used to develop new knowledge about healthcare policy and interventions (Sidani & Braden, 1998).

CHAPTER 3: CONCEPTUAL FRAMEWORK FOR EDUCATIONAL INTERVENTION

Introduction

A sound research study usually integrates findings into an orderly, coherent system. It involves linking new research and existing knowledge through a thorough review of prior work on a topic and by identifying an appropriate conceptual or theoretical framework (Polit & Beck, 2008). The intervention theory guides the development, design, and delivery of the intervention and the design of an effectiveness study; improves the validity of findings; and enhances the clinical applicability of the intervention. The intervention theory can be acquired from various sources, according to the extent of knowledge available within the topic area (Sidani & Braden, 1998).

With a need to enhance patients' coping ability or tolerance levels, pain management has become a major challenge for healthcare professionals. Pain tolerance refers to the amount of pain a person can endure before outwardly responding to it. The ability to tolerate pain may be decreased by repeated episodes of pain, fatigue, anger, anxiety, and sleep deprivation (McCaffery, 1999; Lemone & Burke, 2004). An intervention to enhance acute pain management is not yet available in the local market.

This chapter discusses the intervention theory, which includes the gate control theory of pain, the cognitive-behavioral fear-avoidance model of pain management, and the self-efficacy theory. Based on these theories, a framework is developed to study the development of a cognitive-behavioral educational intervention (C-BEI) and outcome measures for acute pain management in patients with fractured limbs (Lipsey & Pollard, 1990; Mitchell, 1993; Morley et al., 1999).

Theory to guide the intervention

A well-defined intervention theory, which guides the design and delivery of the intervention, has many advantages. With a clear understanding of the problem presented, reasons for applying the treatment, and the process underlying its effects, professionals can identify the intervention's input (Sidani and Braden, 1998). Theory is the basis for informed choices on research methods (Lipsey & Pollard, 1989). In an intervention study, theories aid in formulating the problem and intervention, identifying the target population, selecting the sample of participants, and identifying the study variables and appropriate outcome measures.

According to Mitchell (2003), the effect of an intervention is mediated by the characteristics of the client and system (or environment), with no direct independent effect of the intervention on outcomes. It is suggested that the

intervention, patient and system characteristics, and the dynamic relationships among the variables all need to be considered. The intervention theory provides for a causal explanation of the observed intervention effects. With an adequate understanding of the process linking the intervention to the outcomes and of the factors that facilitate or hinder this process, it becomes significantly easier to generalize the results for other populations, treatments, and settings (Conrad & Conrad, 1994).

In the same manner, Lipsey (1990) reported that the result of a theory-driven effectiveness study provides knowledge on the specific components of the intervention, dosage, and conditions, which yield results for a specific client population. Such knowledge consolidates the theoretical basis for clinical practice that is leveraged by the clinician to provide and improve the quality of care. The following outlines the theories that form the framework of this study which include the Gate control Theory, Biopsychological Model of pain, Cognitive-Behavioural Fear- avoidance Model and Self Efficacy Theory.

Models of Pain

Pain is currently defined as an unpleasant sensory and emotional experience associated with actual and potential tissue damage. McCaffery (1999) suggested

that pain is a subjective experience, whatever and whenever the patients say it is, and that patients are the judges of effective or ineffective pain management. Acute pain is defined as pain with a sudden onset that is continually changing, transient, and localized. The sudden onset usually results from tissue injury resulting from trauma, surgery, or inflammation. It is accompanied by a high level of emotional and autonomic nervous system arousal, and is usually associated with tissue pathology or surgery (Melzack & Wall, 2003; American Pain Society, 2003). Various models have been developed to explain the experience of pain and pain behaviors. Some commonly used theories and models are discussed as follows.

The Gate Control Theory

The gate control theory, which was initially described in 1965 by Melzack and Wall (1965), suggests that the pain experience is not simply the result of the interpretation of nerve impulses sent directly from sensory neurons to the brain. They argue that a pain signal is controlled by a hypothetical gate, which might inhibit or facilitate transmission of nerve impulses from the body to the brain. For example, the impulse pathway might be modulated by other incoming stimuli before reaching the brain. The gate opens and closes depending on the feedback from other nerve fibers in the body, including descending neural impulses from the

brain, such as those related to an individual's thoughts or mood (e.g., anxiety or depression). When the gate is open, more sensory information concerning pain is allowed to be transmitted to the brain; however, when the gate is closed, less information is transmitted. Therefore, psychological factors can have important roles in the pain experience. Melzack and Casey (1968) further explained that pain is not simply a sensation transmitted by the nerves to the pain center; it also provides a conceptual framework for the integration of the sensory, emotional, and behavioral dimension of pain.

It is well documented that cognitive or higher central system processes, such as attention, anxiety, anticipation, and past experience can open the gate, whereas medication, counterstimulation, relaxation, and concentration on other stimuli besides pain can close it, leading to a reduction of pain sensation (Melzack & Wall, 2003). The gate control theory integrates psychology into a traditional biomedical model of pain. Apart from describing a role for physiological causes and interventions, it likewise allows for psychological causes and interventions. The gate control theory has implications for the development of pain treatment using a combination of physical and psychological therapy.

Catastrophising model

Catastrophizing has been broadly conceived as an exaggerated negative "mental set" brought to bear during actual or anticipated pain experience. In the literature that has emerged during the past 2 decades, catastrophizing has risen to the status of one of the most important psychological predictors of pain experience (Sullivan et al, 2001). A growing amount of literature shows that the tendency to "catastrophize" during painful stimulation contributes to more intense pain and increased emotional distress (Keefe et al., 1989; Sullivan & Bishops, 1995; Sullivan et al, 2001). Catastrophizing has been associated with a wide range of pain behaviour. Pain behaviour refers to the different motor and verbal responses to the experience of pain. In chronic pain management, intensive cognitive-behavioral interventions can lead to reductions in catastrophizing, which are in turn associated with better adjustment to chronic pain (Parker, 1989; Keefe et al., 1991)

Although findings have been consistent in showing a relation between catastrophizing and pain, research in this area has proceeded in the relative absence of a guiding theoretical framework. More research regarding the degree to which catastrophizing to pain-related outcomes have yet to be examined.

Biopsychological Model of Pain

Consistent with the foregoing, biopsychological models (Kerns, Otis & Wise, 2002) likewise suggest that pain is not merely a biological process involving the transmission of sensory information on tissue damage to the brain, but is also the product of interaction among biological, psychological, and social factors. Pain involves multiple sensory input, memories of past experiences, personal and social expectations, gender, aging, and stress patterns. Melzack and Wall (2003) underscored that the individualized response to pain is shaped by multiple and interacting factors, including age, sociocultural influences, emotional state, past experience of pain, and its source and meaning. All of these factors have an impact on a person's present pain experience, including its intensity, duration, and consequences. For example, when pain persists over time, people may develop negative beliefs about their pain, such as "I can't deal with this pain," or negative thoughts about themselves, such as "I'm worthless because I can't work." As pain persists, a person may avoid participating in activities, such as exercise, for fear of further injury or exacerbating the pain. As the person withdraws and becomes less active, the muscles may weaken and physical condition may decline (Kerns et al., 2002). This would have an impact on the rehabilitation process in patients with

fractured limbs. Thus, it is important to deal with the persons' beliefs and negative thoughts related to pain management.

Cognitive-Behavioral Fear-avoidance Model

To explain the role of fear and avoidance behaviors in the development and maintenance of chronic pain and related functional limitations, Vlaeyen and Linton (2000) proposed a cognitive-behavioral fear-avoidance model of chronic pain. According to this model, there may be two opposing responses to pain. Patients may consider pain to be non-threatening and consequently engage in adaptive behavior, such as performing exercise actively even when they are in pain. The behaviors promote the restoration of function. In contrast, pain may be viewed as threatening, a process called catastrophizing, which contributes to a fear of pain and may lead to avoidance of activities or immobility. Eventually, a patient becomes further depressed and inactive, the cycles of pain are fueled, and fear and avoidance are increased. Previous studies (Asmundson & Taylor, 1996; Crombez, Vlaeyen, Heuts & Lysens, 1999) support a relationship among fear avoidance, passive coping, and chronic pain, and propose that these behaviors contribute to negative mood, thereby increasing pain and disability. However, little is known

regarding this model's application in understanding acute pain. Further research is thus clearly needed.

Self-efficacy Theory

Self-efficacy refers to people's sense of confidence in their ability to perform a set of actions; the stronger their confidence, the more likely that they will initiate and persist in the particular activity. Bandura (1986) based his concept of behavioral change on two central theories: self-efficacy and outcome expectations. The underlying assumption of this theory suggests that behavioral change and the maintenance of that behavior are a function of expectation of one's ability to perform a certain behavior (self-efficacy) and expectations of the outcomes. Both self-efficacy and outcome expectations play a role in the adoption of health behaviors, the modification of unhealthy habits, and the maintenance of change (Bandura, 1997).

The self efficacy theory is a commonly used theory that underpinned the educational intervention for orthopedic patients (Pellino et al. 1998; Heye et al. 2002; Yeh et al. 2005). Enhancing appropriate knowledge to the clients may provide them knowledge and skill to cope with the upcoming problems (pain from tissue injury and surgery) and decrease their anxiety. For example, Heye et al.

(2005) incorporated self efficacy theory into the development of multimedia CD for the patients with hip replacement surgery. The study reported that patients receiving educational intervention demonstrated better self efficacy score and perform better in mobility.

Shaw, McColl, and Bond (2003) investigated the relationship of perceived control and outcomes among older women undergoing surgery for fractured femur. They discovered that patients who possessed improved self-efficacy positively changed their knowledge, beliefs, attitudes, behavior, and eventually the outcome of treatment (Shaw et al., 2003). Pellino et al. (1998) likewise confirmed the merits of educational intervention in enhancing orthopedic patients' self-efficacy, leading to improved patient outcomes after surgery.

An individual's self-efficacy and outcome expectations, however, may be inconsistent on different occasions. To gain a sense of confidence and certainty regarding one's knowledge and skill, it is important for patients to adopt an active role in the learning process despite the similarity of educational content. Inconsistency may result from inadequate knowledge and skills in relation to each specific type of behavior.

Bandura (1997) argued that people's behavior may be based on beliefs rather than objective assessments. For example, belief in the positive consequence of a particular behavior may be fairly important compared to what a person is actually capable of accomplishing. This helps to explain why people's behavior may differ widely even when they possess similar knowledge and skills.

The Cognitive-Behavioral (C-B) Approach to Pain Management

Cognitive behavior (C-B) therapy has been a common psychological approach in managing chronic pain in the recent decade. The application of the C-B approach to the treatment of chronic pain is characterized by being present, active, time-limited, and structured. The therapists who adhere to this approach serve as educators, coaches, and trainers who are 'present' and who serve as the client's partners in achieving a mutually agreed upon goal. The patient should be an 'active' participant. The educational intervention content should be structured, brief, and limited by time. The C-B approach to pain management is designed to help patients in identifying maladaptive thought and help them practice adaptive ways of coping.

According to Melzack and Wall (2003), there are few assumptions in the cognitive-behavioral approach intervention. Individuals are active processors of information and not passive reactors. Thoughts such as appraisal, expectations, and

beliefs can elicit and influence mood, which in turn can affect physiological processes. These serve as impetus for behavior. Conversely, mood, physiology, and behavior can influence the nature and content of thought processes. Behavior is reciprocally determined by both individual and environmental factors.

Environmental factors refer to the environment that supports a person, such as home, work, and hospital environment. For example, an unfamiliar environment such as a hospital may trigger a negative emotion, which affects the thought process. Individuals can learn adaptive ways of thinking, feeling, and behaving, and can be active collaborative agents in changing their maladaptive thoughts, feelings, and behavior.

Cognitive-behavioral intervention helps patients in managing pain by changing cognitive factors such as thoughts, beliefs, expectations, perceived meaning, and memories, and negative emotion and behavioral factors, such as anxiety and depression. This leads to a change in behavior, such as a reduced level of activity or refusal to ingest analgesics, which can aggravate the pain experience (Turk, Rudy, Kubinski, Zaki, and Grecom 1996; Keefe, 2000; Freeman and Freeman, 2005).

The Application of the Cognitive-Behavioral Approach Intervention in Clinical Practice

A C-B approach to educational intervention has been used in many clinical areas with evidences supporting its effectiveness. Examples of these areas are mental healthcare (Chan, 2003), management of chronic medical illnesses (Van der Ven et al., 2005; Nozaki, Oka & Chaboyer, 2005), and palliative care (Morley, 1999).

With regard to pain management, C-B approach interventions were identified as efficacious treatments for several pain conditions, such as rheumatic disease, chronic pain syndrome, chronic low back pain, and irritable bowel syndrome (Sinclair, Wallston, & Dwyer, 1998; Keefe, 2000; White, 2001). Studies conducted among Chinese populations supported that the C-B approach can be effectively applied in the fields of mental health (Chan & Leung, 2002) and chronic illness (Chan et al., 2005).

A meta-analysis of 25 randomized controlled trials of C-B approach intervention for chronic pain concluded that C-B approach intervention was effective in improving pain control, enhancing cognitive coping and appraisal, and reducing behavioral expressions of pain when compared with alternative active treatments (Morley et al., 1999; Eccleston et al, 2003). The majority of studies

used level of pain, anxiety and self-efficacy, physical health, and mental health as outcome measures.

Other studies likewise support the view that patients who received C-B approach intervention reported better pain management and perceived less pain (Morley et al., 1999; Turner, McCurry, Gibbons & Kraybill, 2000; Ersek et al., 2003; Eccleston et al. 2003). Participants in various studies on C-B approach intervention likewise experienced less stress (Eccleston et al., 2003; Malleson, Clinch, Connell & Sourbut, 2003; LaMontagne et al., 2003), and yielded better physical outcomes (Ersek et al., 2003; Eccleston et al., 2003; Turner et al., 2006). Furthermore, they displayed better self-efficacy and believed they could manage their pain (Pellino, 1998; Lefort, Gray& Rowat, 1998; Morley et al , 1999; Sinclair & Wallston. 2001; White, 2001).

Turner et al. (2006) conducted a four-session cognitive behavioral intervention for temporo-mandibular disorder pain, which yielded significantly greater improvement in outcomes and beliefs, and a wider implementation of relaxation techniques to cope with pain compared with patients assigned to a control curriculum. Further, in a recent meta-analysis of 22 Randomized controlled trial (RCT) of psychological treatments for non-cancerous chronic low back pain,

C-B approach interventions and self-regulatory treatments were discovered to be efficacious when compared with other interventions (Hoffman, Papas, Chatkoff & Kerns, 2007).

The above mentioned pieces of evidence confirm that a C-B approach to educational intervention is effective in helping clients manage their chronic pain. This approach is useful in helping people alter their perceptions and cognition, thus leading to a change in behavior, such as developing new coping and self-management skills. The theories underpinning this approach are essentially the cognitive-behavioral fear-avoidance model and self-efficacy theory. In this approach, clients become active, knowledgeable, and responsible partners in their own treatment (Bandura, 1997; Sinclair, Wallston & Dwyer, 1998; Sinclair & Wallston,1998; 2001; Pellino et al. 1998; Morley et al, 1999).

Although majority of available evidence demonstrates positive outcomes from education programs, majority of the studies on interventions in orthopedic patients were mainly confined to chronic problems. They were descriptive in nature and were not carried out under experimental conditions (Sinclair, 2001; Johansson et al., 2005; Yeh, Chen & Liu, 2005). A number of interventions lacked a theoretical framework to support their programs, and there was limited understanding of the way the education interventions affected patients' outcomes

(Devine, 1992; Lewis et al., 2002; McDonald, Green & Hetrick, 2004; Yeh et al., 2005).

There is a paucity of studies using the C-B approach to educational intervention in acute pain management for patients with limb fractures. A review of literature found only one study on an educational intervention on patients with spinal surgery. This study demonstrated that patients experienced improved psychological and physical outcomes. The participants in this study, however, were confined to elective spinal surgery and adolescent patients (LaMontagne et al., 2003). More empirical studies on adopting the C-B approach to educational intervention in acute pain management is needed to arrive at a more conclusive evidence.

Since limb fractures are among the major causes of hospitalization in Hong Kong, it is important to help patients in managing their acute pain. The use of a cognitive-behavioral educational intervention may have a potential in enhancing pain management for Chinese patients who undergo surgery because of traumatic limb fractures. There is a need to develop a well-structured, theory-driven, and tailor-made educational intervention for Chinese patients with traumatic limb fractures, and to measure its outcome.

In addition, understanding patients' pain experience and beliefs is fundamental to developing an education intervention for this group of patients. Thus, an inquiry into Chinese beliefs regarding pain is necessary in the local context.

Conceptual Framework for the Educational Intervention

Among the pain theory and pain models, some of them are similar in meaning and support that pain comprised of sensory, cognitive, affective and behavioral components. In this study, acute pain was the focus. Emotionally, patients with injury and fore coming surgery, together with acute pain tend to be more anxious and fearful than the people with chronic pain. The selection of appropriate theories and models to formulate the conceptual framework rely on the principle of suitability and applicability for patients with acute pain and anxiety. The conceptual framework for the educational intervention of the present study is the integration on the gate control theory, Cognitive-Behavioral Fear-avoidance Model, self-efficacy theory, and cognitive-behavioral approach to pain management. The ABC model is the basic concept of the cognitive-behavioral approach, where an activating event "A" leads to emotional or behavioral consequences or "C," with those consequences being mediated by beliefs or "B." Through the ABC model,

the activating event, beliefs, and emotional and behavioral consequences in each client's case will be assessed (Chan & Leung, 2002) (Figure 1).

In pain management, pain is the "activating event," "beliefs" are related to patients' beliefs and knowledge on pain and the use of medication, and "consequences" are the ways by which patients cope with pain. The goal of applying a cognitive-behavioral approach to educational intervention is to help patients identify and modify dysfunctional thoughts or assumptions, clarify the belief in pain and pain management, which lead to changing emotions. In addition, teaching breathing and relaxation techniques is a means to enhance patients' self-management and regain the control of self-efficacy, and ultimately to help them cope more effectively with their pain.

Figure 1. ABC Model of the Cognitive Approach Therapy

Activating event (Pain) **Beliefs** **Consequences**

The cognitive-behavioral educational intervention (C-BEI) aims to break the vicious cycle by enhancing patients' knowledge and clarifying their beliefs. Figure

2 show the vicious cycle of pain belief on pain management. Without any intervention, Chinese patients had a belief of pain management and analgesic that they should bear the pain and not take any analgesic until a last resort. this belief leads to negative emotions such as depression and anxiety. Consequently, patients adopted passive coping strategies such as reduce activity and refuse analgesic . Eventually patients perceived lowered pain threshold and suffered from increased pain and the vicious cycle started again resulted from inadequate pain relief.

Figure 2. Vicious cycle of pain belief on Pain Management

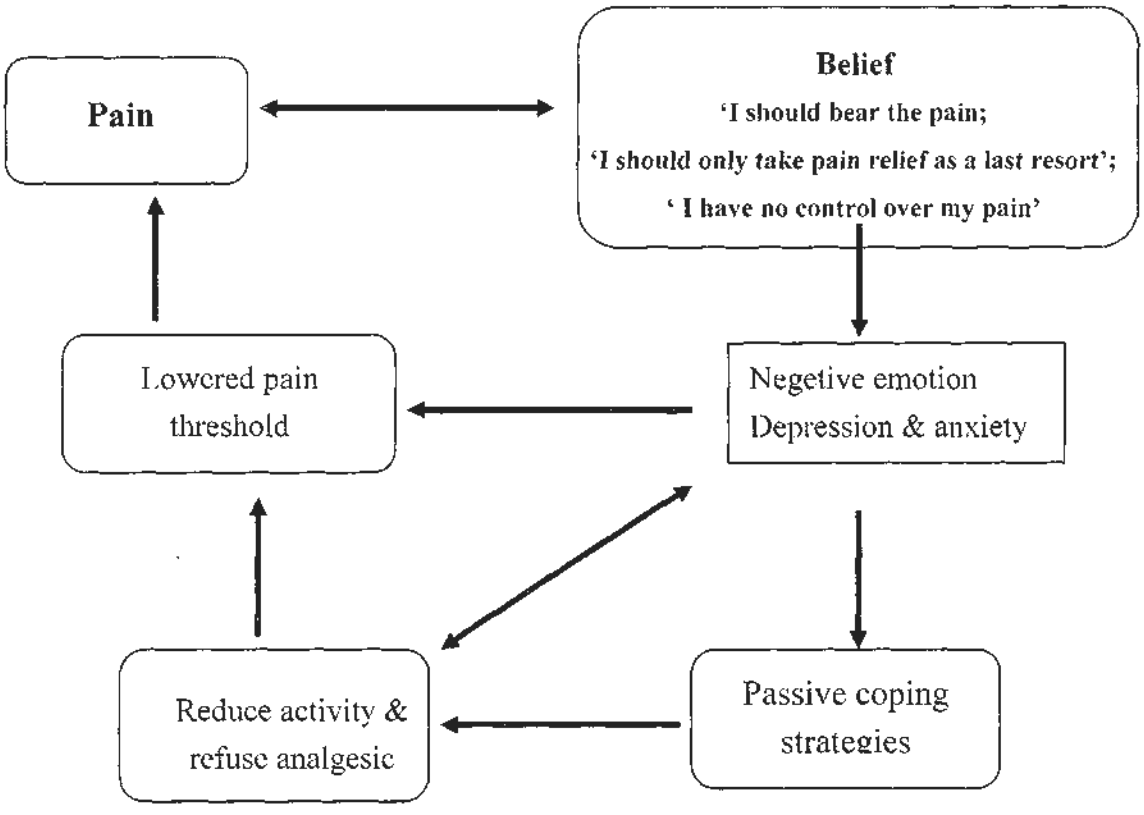


Figure 3 illustrated a conceptual framework of C-BEI on pain management. Through C-BEI, patients acquire knowledge related to their pain and management,

modify their misconceptions, and reduce pain-related negative thoughts, thus leading to a reduced negative emotion. Hopefully, patients will become increasingly active in coping with their pain. They may manage their pain better by changing behavior, such as by accepting pain medication and practicing breathing and relaxation exercises. This eventually improves pain tolerance, causing patients to perceive less pain.

Figure 3: Conceptual Framework of C-BEI on Pain Management

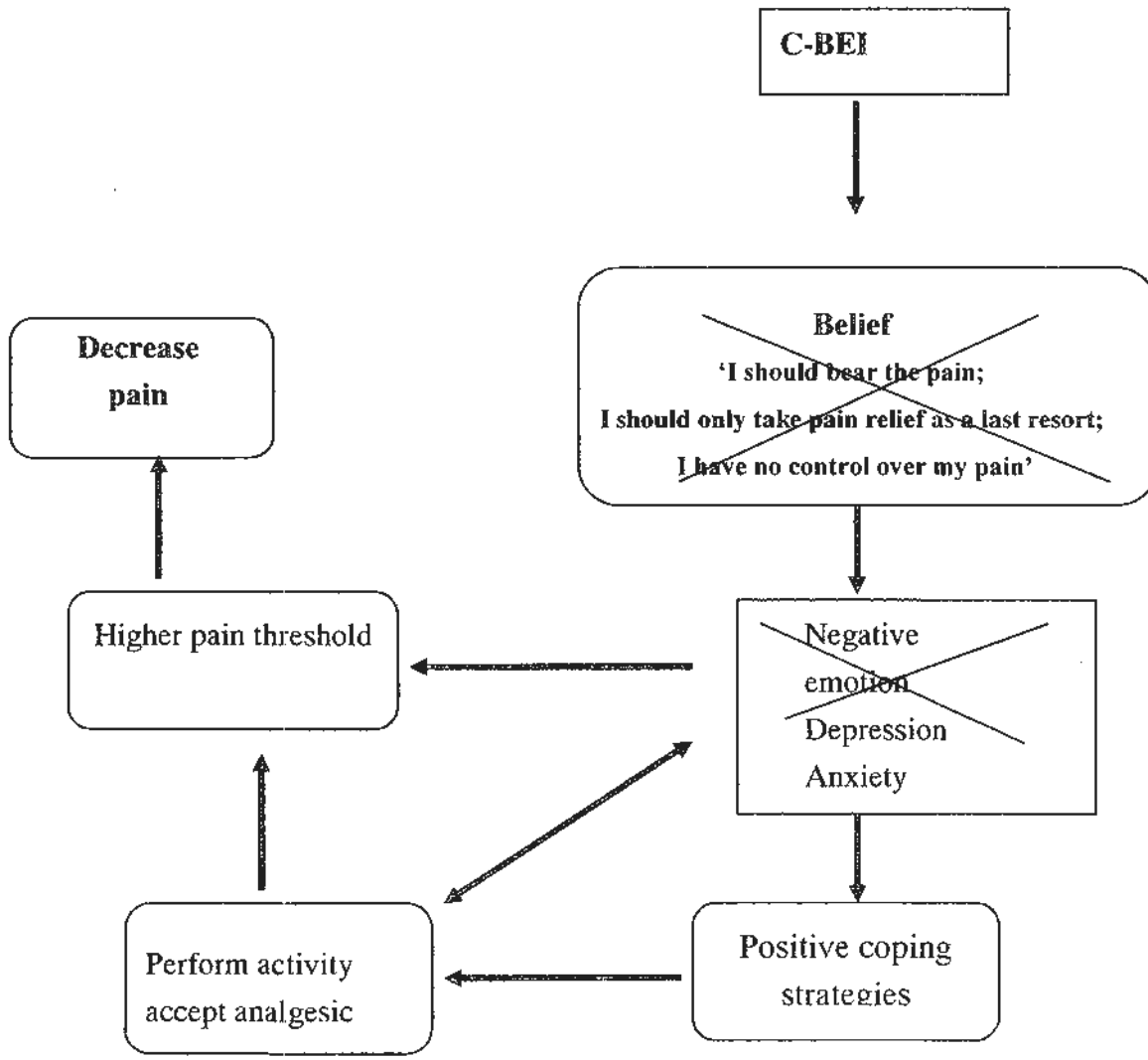
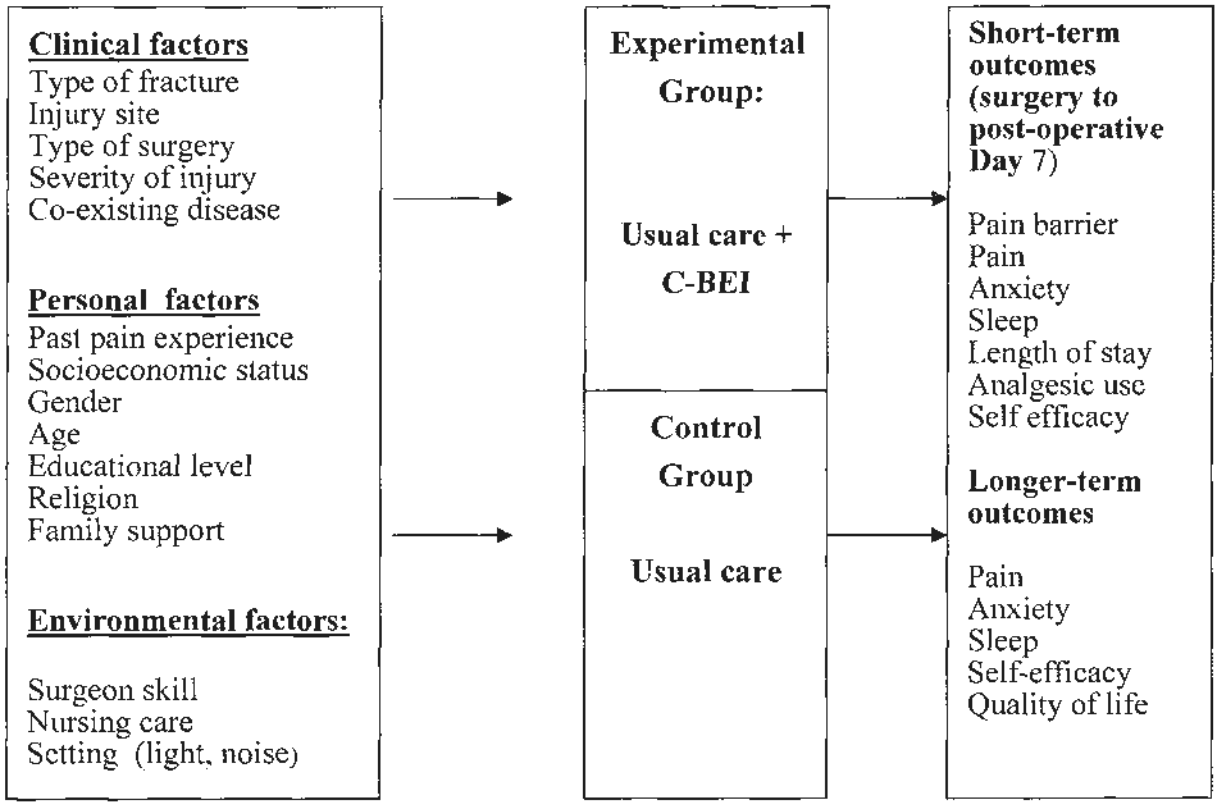


Figure 4 illustrates the relationship among cognitive behavior educational intervention (C-BEI), post-operative outcomes, and demographic, clinical, and environmental factors among patients with limb fractures in this study.

Patients with traumatic limb fractures can suffer physical tissue injury, bone fracture, and physical pain. Because of the unexpected injury and forthcoming surgery, patients experience anxiety and stress. The gate control theory provides information on an individual's varying responses to pain and the potential risk factors and outcomes that mediate the pain response.

C-BEI is the intervention process that is assumed to create a positive impact on selected short- and longer-term outcomes after surgery among patients with traumatic limb fractures; the chosen outcomes were based on the literature review of commonly reported results. The C-BEI may not produce the same results among all patients receiving it, and environmental and patient characteristics may influence the intervention's outcomes as reported in majority of the intervention studies (Sidani & Braden, 1998). The mediating factors to be considered in the study include patient characteristics such as age, gender, socioeconomic and marital status, and clinical factors such as the severity of the fracture and its site, operation types, and any co-existing disease.

Figure 4: C-BEI on Post-operative Outcomes for the Fractured Limb Conceptual Framework



Summary

Specific directions for the present study include tailoring cognitive-behavioral educational intervention for pain management to the needs of Chinese clients with acute pain after limb fracture and surgery. Before building the study's C-BEI framework, the integration of the gate control theory, cognitive-behavioral fear-avoidance model, and self-efficacy theory into such a framework is discussed.

The gate control theory provides the foundation for the researcher to understand that pain is not a simple pathway but an open biological system that comprises multiple sensory input. The gate opens and closes in response to feedback from other nerve fibers in the body, including descending neural impulses from the brain, such as those related to an individual's thoughts or mood (e.g., anxiety or depression). The cognitive-behavioral fear-avoidance model and self-efficacy theory support the view that pain is a subjective experience and that the patient is the judge of pain perception. Together with the ABC model, patients' emotion and behaviour are mediated by a lot of factors such as such as memories of past experience, personal and social expectations, gender, age, and personal beliefs. With intervention to alter patients' belief of pain, it could enhance the

consequence of behavior and outcomes. In summary, the synthesis of these three theories helps to establish the integrated framework for the study. The framework not only enhances understanding of the way patients with limb fractures cope with pain and anxiety, as seen from their own perspective, but likewise facilitates the development of a theory-driven intervention (cognitive-behavioral educational intervention (C-BEI) for the study.

C-BEI was developed according to the three developmental theories, and was a mixed-focus intervention. The intervention was aimed at altering the client`s cognitive beliefs regarding analgesics, dispelling negative thoughts on pain using pain management (fear-avoidance model), and enhancing the self-efficacy of pain control (self efficacy theory). Theory is the basis for informed choices on a research method (Lipsey & Pollard, 1989), helping to identify the target population, method of intervention, and outcome variables. In the C-BEI framework, the relationships of outcomes and other variables are explored and the causal relationships among outcomes are predicted. The framework has been established to guide the inquiry and the interpretation of the proposed study findings.

To conclude, the gate control theory, the cognitive-behavioral fear-avoidance model and self-efficacy theory provide a comprehensive framework for us to understand patient's perception of pain and response. This framework also

provided guideline for researcher to develop a tailor - made C-BEI for this group of patients as well as planning the design of the main study. In addition, the framework support the view that pain is a subjective experience and that the patient is the judge of pain perception. In chapter 4, Chinese patients' pain experience and belief, and pain practice in local setting was explored and reported.

CHAPTER 4. DEVELOPMENT OF A COGNITIVE-BEHAVIORAL EDUCATIONAL INTERVENTION (C-BEI)

This chapter describes the development of a cognitive-behavioral educational intervention (C-BEI), and consists of two sections. The first section reports a qualitative study on the pain experience and beliefs of patients with limb fractures who undergo surgery, and on pain practice and barriers to pain management as perceived by nurses working in the trauma and orthopedic unit. The findings gained from this qualitative study have contributed to the content of an educational intervention to assist patients with fractured limbs in controlling their pain by changing their beliefs and coping methods. The second section describes how a C-BEI has been developed from the findings of the qualitative study, and from the literature review. Further, the validation of the contents of the C-BEI and pilot study are also described in this chapter. Finally, the structure and content of C-BEI as interpreted in the study are established

Phase 1 study: Pain experience and beliefs of Chinese patients with traumatic limb fractures, and the barriers to pain management as perceived by nurses

As mentioned in a previous chapter, traumatic limb fracture is one of the major causes of hospitalization in Hong Kong, with the majority of patients requiring surgery as their treatment (Ho & Chan, 2003). Patients with traumatic limb fractures experience intense pain and, despite advances in pain management technology, research continues to demonstrate a high prevalence of unrelieved pain in patients who have undergone orthopedic surgery (Klofenstein et al., 2000; Chung & Lui, 2003). The barriers to pain relief include gaps in healthcare professionals' assessment and patients' perception of pain, and the evaluation of different kinds of pain management interventions (Klofenstein et al., 2000; Manias et al., 2002). However, pain experience and beliefs from the patient's perspective have not been studied in depth although they are regarded as important for pain management (Archibald, 2003; Van Balen et al.,2003; Bedard et al.,2006). Research investigating the pain experiences of Chinese populations has been minimal. There is a need to understand and gain insight into patients' pain experience in order to deliver culturally sensitive interventions to help them in pain control in the local context. The overall objective of phase 1 is therefore to gain an understanding of the pain experience and the pain beliefs of Chinese patients with

limb fractures who undergo surgery, and to investigate pain management practices and barriers to pain management as perceived by nurses in Hong Kong.

Study design

A descriptive qualitative design with individual interviews is used. Qualitative research is 'a field of inquiry in its own right, and cross cutting disciplines, fields and subject matter' (Denzin & Lincoln, 2005,P.2). A descriptive qualitative study is based on the general premises of naturalistic inquiry and is a good means to inquire and seek answers to questions that emphasize how social experience is created and given meaning (Denzin & Lincoln, 2005; Polit and Beck, 2008). According to Sandelowski (2000), such a study presents comprehensive summaries of a phenomenon or an event and is commonly used in the field. A descriptive qualitative design with individual interviews was therefore adopted in this study to gain a better understanding of the complexity and richness of the human experience of pain, and especially beliefs among Chinese limb-fracture patients undergoing surgery (all from the patients' perspective), and to investigate pain practices in the Hong Kong context and the barriers to pain management as perceived by nurses. Nurse informants were chosen to achieve the objective of understand the pain local practice. This study recruited nurses as informants as

nurses understand clinical pain practice thoroughly which include doctors' drug prescription, pain protocol and physiotherapy practice.

Methods

An individual interview was used to collect data. The interview was open-ended, in-depth and interactive, which encouraged greater involvement from the informants to promote the emergence of new ideas during the interviews (Fontana & Frey, 1998). The interview guidelines were developed to guide the researcher towards conducting the interviews consistently.

The questions in the interview guidelines (Appendix 3b) were derived from the literature dealing with the experience of patients with pain after surgery. Before using the guidelines, a pilot interview with two patients was conducted to assess whether the questions were well understood. The results revealed that the questions were easily understood by informants and that conducting the interviews was feasible. The open-ended questions started with: 'Can you tell me about your accident?' This was followed by other questions such as: 'Can you describe your pain experience from the first injury to the present, i.e. during your stay in hospital?' and 'Please explain your beliefs about pain'. Probing and clarification were used frequently to reach a fuller understanding of the data generated during the interview. For example, the experience was probed until the meaning and

experience of 'pain' ways illuminated and described by the patient informant. In addition, demographic and clinical data were collected. To eliminate errors of memory, all interviews were tape-recorded.

An interview guideline (Appendix 3c) was also developed to elicit from nurses their perceptions of current pain practices, current patients' education concerning pain management and the barriers to pain management. The questions used were derived from the literature on healthcare professionals' perceptions of pain management (Manias et al, 2002)

Study Setting

The study was conducted in trauma and orthopedic wards in a regional hospital in Hong Kong. The hospital provides trauma services to a population of 800,000. Traumatic limb fracture is one of the most common causes of hospitalization, and the majority of such patients require surgical treatment. In the study venue, 30-40 limb-fracture patients monthly received surgical treatment (HA, 2007b). After admission and stabilization in emergency department, the patient normally admits on the orthopedic and trauma unit pending for emergency operation. Related to pain management, analgesia is given via the intramuscular route, four-hourly as required. For example, Pethidine 50-100mg is administered

intramuscularly on request every four hours before and after the surgery. Two tablets of Dologesic four times per day are administered on a regular basis from day three until discharge. Pain assessment is part of routine nursing care. However, the provision of pain relief is mainly based on patients' requests or a doctor's prescription. In recent years, new methods and routes of administration, including patient-controlled analgesia (PCA), are increasingly being used for planned surgery such as hip and knee Arthoplasty. PCA is not available for those patients with traumatic limb fractures pending for emergency operation. The majority of patients still adopt intramuscular injection as their method of pain relief.

Patient Informants

A purposive sample of 26 patients was recruited. Purposive sampling refers to a non- probability sampling method where the researcher selects participants based on personal judgement about which ones will be most representative and informative (Polit & Beck, 2008). Inclusion criteria were: Chinese adults, 18 years old or above, diagnosed as suffering from traumatic limb fracture who had received surgical treatment, and able to communicate in Cantonese. Informants

were excluded if they had an unstable haemodynamic state, a past history of chronic pain problems or cognitive and mental impairment. Subject selection was based on the inclusion criteria, referral from experienced nursing staff and potential informants whose have undergone the experience and whose experience was considered typical , so as to obtain rich experiential data from informants of different gender, educational level and social background (Morse, 1995).

Nurse Informants

A convenience sample of 10 nursing staff of different ranks, such as registered nurses, nurse officers and ward managers, was recruited. The inclusion criterion covered nurses who had been working in the study unit for at least a year. The total number of nurses in the study venue was about 25 during the data collection period. Subject selection was based on different varieties so as to obtain rich experiential data (Morse, 1995). For example, nursing staff of different gender, rank, experience and education level were recruited .

Ethical Considerations

Approval to conduct the study was obtained from the University and Hospital Ethics Committee (Appendix 1 and 2) . All eligible patients were

approached by the researcher, and their consent obtained after a full explanation of the study supplemented by an information sheet in Chinese (Appendix 4) . Ethical considerations were based on the principles of beneficence, respect for human dignity, and confidentiality and the detail is presented in chapter 5, p.138. Confidentiality and the right to withdraw from the study at any time were assured. After obtaining consent, an appointment was made with each informants. Before the interview, the informant's general condition and physical comfort were ensured.

Data Collection Procedures with Patient Informants

Data collection period lasted from October 2004 to February 2005. Patients who were admitted to the wards during the study period and who met the inclusion criteria were considered for recruitment, and potential informants referred to the researcher by the ward staff. After explanation and obtaining written consent, demographic data were collected from the informants at this initial contact, which aimed to build up rapport between the informant and the researcher. An appointment was then made with the informant for an interview. Interviews were carried out in a quiet room. The times chosen were mainly in the afternoon before the informant's discharge, as patients' general condition was stable and their

memory of the experience of both injury and surgery was fresh. Each interview lasted for 45 to 60 minutes (or ended when patients believed they had exhausted their descriptions) and was taped on an audio-recorder. Informants were recruited until data reached saturation point. A total of 26 informants participated in and completed the study.

Data Collection Procedure for Nurse Informants

Ten nurses working in the trauma and orthopedic ward of the study hospital were approached. After explanation and obtaining consent forms (Appendix 5), the informants were invited to attend a face-to-face interview, to be carried out in a quiet room. Interview times were mainly in the afternoons, after the nurses had completed the morning shift. During the interviews, their overall views of current pain practices and decisions on analgesia initiation were explored. More specific questions were asked about barriers to pain management according to the interview guidelines (Appendix 3b). Each interview lasted between 45 minutes and one hour and was audio-recorded. The recruitment of informants stopped when data saturation point had been reached. Eventually ten nurses participated in and completed the data collection.

Data Analysis

All interviews were conducted in Cantonese and transcribed immediately afterwards. Data were analyzed concurrently with data collection. The transcription was done by the researcher. Each transcription was double-checked by listening to the audiotape again to ensure accurate transcription. In addition, the researcher had a fresh memory of the interview context and the non-verbal communication during the interview which would facilitate data analysis (Twinn, 1997; Berg, 2007). Each informant was coded with an individual number. Sample of the transcripts for a patient is presented in Appendix 6. Data were analyzed concurrently with data collection, using a form of content analysis, which is a method for categorising the content of narrative communications in a systematic and objective fashion (Sandelowski, 2000). The analysis was guided by Berg (2007) and Sandelowski (2000) and the procedure is summarized as below:

Interviews were transcribed verbatim. The researchers read informants' entire oral transcripts in order to obtain a feel for them. Each transcript was then read line-by-line again. From each transcript, significant statements and phrases or commonalities among the data that directly pertained to the study objectives were extracted and coded. Codes were used to describe the threads and various dimensions of experiences perceived by the informants. Further, the researcher

condensed the codes with similar import into descriptive sub-categories. Similar sub-categories were then condensed into main categories. These described and accounted for the patient's experience of pain and pain beliefs, whereas the main categories from nurse informants were formulated to describe and account for pain practices and barriers to pain management. The extracted quotes of phrases or sentences were all translated into English for reporting purposes. The Chinese and English versions of quotes were compared and discussed with a bilingual supervisor to ensure their equivalence.

Descriptive statistics

Descriptive statistics were used to summarize the frequency and percentage, the mean and the standard deviation to describe demographic and clinical characteristic of the informants.

Issues of trustworthiness of data

The issue of reliability and validity of qualitative data refers to trustworthiness of data and consists of credibility, dependability, confirmability and transferability (Lincoln and Guba, 1985).

Credibility

Credibility of data refers to confidence in the truth of the data and

interpretation of them (Polit and Beck, 2008; Lincoln and Guba, 1985). Credibility of data involves persistent observation, triangulation of data, external checks and member checking. In this study, several measures were adopted. Firstly, an interview guide was used to maintain the consistency of the interview process. Secondly, only the researcher did all the interview. The mesures allowed the researcher's focus on the aspects of a situation that are relevant to the phenomenon being studied and persistant observation was maintained. In addition, credibility of the data was maintained by collecting from patient interviews, nursing staff interviews, field note and audiotape. Fontana & Frey (1998) stated that data collection from a variety of source enhances the checking of consistency and the avoiding of discrepancies in the data.

Dependability

The Dependability of qualitative data refers to data stability over time and over conditions. A useful technique related to dependability is the inquiry skill. An inquiry audit involves a scrutiny of the data and relevant supporting document by an external reviewer. In this study, the researcher and her supervisor who is experienced in qualitative research and content analysis listened to two samples of the audio-tapes and analysed the transcripts independently. Appendix 6 presents the sample of transcription in English. The researcher and supervisor developed a

categorization scheme independently, and then compared sub-categories and main categories. If similar categories and sub-categories were identified, there was a strong possibility that the original categorical system had " credibility" (Lincolin & Guba, 1985). There were minor differences between the two analyses, mainly related to the choice of words. These were discussed and common categories were agreed upon by both parties. The table 1 provides an example to illustrate how codes are condensed to sub-categories and then to a main category of experience of intense pain.

Table 1 Example of merging code to sub-categories and main category

Main category	Sub-category	Codes (units of phrases or sentences)
Expericncing intense pain	Very painful	*The pain level is up to 1000 mark on the day after surgery (P.8)* *The pain was very awful (P3* *The pain is even more compare than the birth of my son (P7)*
	Unbearable	*..the feeling is unbearable (P.8)* *It is unbearable and I don't know how to describe it (P.3)* *The pain is so bad that I cannot stand any more (P.4)*

Confirmability

Confirmability refers to the objectivity or neutrality of the data. Bracketing and audit trail are common methods to enhance confirmability. Bracketing refers to

researcher not identifying and holding any preconceived beliefs and opinions about the phenomenon under study (Polit and Back, 2008). In this study, the researcher did not held any preconceived belief on pain during the data collection and data analysis and neutrality was maintained (Lincolin & Guba, 1985). Inquiry audits can be used to establish both the dependability and confirmability of the data . Audit trail is a common method and a systematic collection of documentation that allow an independent auditor to draw conclusions (Lincolin & Guba, 1985). In this study, audit trial was adopted to make data presented in a systematic way and allowed the supervisor to examine and audit the data.

Transferability

Transferability refer to te extent to which the finding from the data can be transferred to other setting or groups (Lincolin & Guba, 1985). In this study, the researcher confirmed the relevacy of data by reviewing the major points of the interview with each informant at the end of the itnerview and checked that the description truly reflected his or her experience (Fontana & Frey, 1998). In addition, informants' report on pain expereince were also supported with the nurse informants of the study.

The results

Findings from patient informants

A total of 26 patient informants were interviewed. Informants' demographic and clinical data is summarized in Table 1. Fourteen (54%) females and 12 (46%) males were interviewed, with an age range of 20 to 78 (mean = 60, SD = 23). The majority (73%) had sustained the fracture because of a fall, followed by vehicle accidents (15%) and sports injuries (12%). Twenty (77%) had internal fixation and the remainder arthoplasty as their form of treatment. Generally, those whose fractures were due to vehicle accidents or sports injuries were younger than those who sustained limb factures because of falls. Waiting time for surgery ranged from seven to 72 hours. Demographic and clinical characteristics were similar to those of the general run of patients treated for traumatic limb fractures in public hospitals in Hong Kong (Hospital Authority, 2006).

Main categories and subcategories are summarized in table 2 below. Seven main categories were identified to describe informants' experience of pain. The following describes each main category with support from verbatim transcripts, rendered in English.

Table 2. Main categories and sub-categories y of patient informants

Main categories	Sub-categories
Experiencing intense pain	Extremely painful Awful
Lack of control over pain	No control Helplessness
Pain is a negative signal	Increasing pain as a negative sign of health Pain indicate bad thing happening
Worry about "Shan"	Scare of side effect to made me sick "Shan" made me sick
Limited knowledge on pain management	Limited knowledge of analgesic Limited knowledge of options of pain management
Be a good patient	Don't want to disturb the nurses I should bear the pain
Passive coping	Avoid movement Avoid thinking

Experiencing intense pain.

The majority of informants experienced severe pain during hospitalization. They described the pain as intense, endless or unbearable. The most painful

periods were after the injury, before surgery and the first day after surgery. Some patients described their experience as their first encounter with severe pain. The common phrases they used to describe the experience were 'extremely painful' and 'awful '.

Extremely painful

It was my first time I had had so much pain in my life. It was extremely painful. It seemed that it lasted for ever and was endless. I was so painful that my mind was blank...I don't know how to describe my pain level...

(Patient informant 3)

Some informants tended to be more articulate about their pain experience, comparing it with previous experience.

Awful

For me, the experience from injury to surgery was awful, especially the day after the injury... If I compare this pain experience with the delivery of my son...this time was more painful and lasted for a longer period.

(Informant 7)

The pain I had was very intense. If the 100 mark is the maximum level of pain, I can say the pain level was up to 1000 on the day after surgery.

(Informant 8)

Lack of control over pain

The majority of the informants said that they did not have control over their severe pain. They felt nothing could be done to control their pain, even with analgesics. They had a feeling of helplessness.

No control of my pain

I had no control over how to stop my pain when I was in severe pain. When I look back at my acute pain experience, it was awful...something you could not control...I was thinking of a Chinese idiom 'pork on a chopping board', meaning you were totally reliant on how the butcher treated you. All my fate was in the doctor's hands. There was nothing that I could do to relieve my pain. In my working life as a construction worker, I could control the quality and outcome of my work. As a patient, I lost all control, especially when the pain was severe...My mind was completely blank at that time... (Patient Informant P9)

Many of participants always mentioned that they could not perform anything and did not know what to do.

Helplessness

A participant recalled his experience and said:

It was the first time I really felt helplessness and had no idea of how to stop the pain. I remember that I was sweating because of my pain. I was woken by the pain during sleep and I didn't know how to cope and get through...I called the nurse, seeking help and the nurse told me that the needle was not due yet. I closed my eyes and prayed to God. I could not do anything to stop my pain ...the feeling was awful and unbearable. (Informant P8).

Pain is a negative signal.

Increasing pain as a negative indicator of health

Informants felt that the pain was inevitable after injury and surgery. However, they regarded its intensity as a negative indication of their present condition and future health, and were therefore very worried when they experienced intense pain. An informant recalled:

... I think suffering pain is normal as I had a broken bone and had also had surgery. However, I regarded the increasing pain as a sign that I was not well - particularly that there was something wrong with my affected leg.

Just like a month ago, when I had abdominal pain and diarrhea...Pain indicated bad things happening...Pain showed there was something wrong inside my leg this time. (Informant 15)

Pain indicate bad thing happen

Many of the patient informants described their perception to pain. Pain was perceived as a bad thing to their health. A participant stated:

I started to worry more when the pain was increasing. I thought I should be getting better after the operation. However, the pain was even more after the surgery. I started to doubt whether the operation had been successful. But after two days, the pain started to subside, and I felt much better and more confident that I would recover (Informant 12).

Worry about 'Shan'.

Informants believed that analgesics had side effects so that they should be avoided as much as possible. 'Shan' was used by the informants to describe the side effects of analgesics, a term used in traditional Chinese medicine meaning that the drugs would cause dizziness, nausea and vomiting.

Scare of side effect

The informants thought analgesics would cause side effect which was not good for the health. Thus they refused analgesics though they were constantly in pain. An informant said:

I dared not have the analgesic as I thought that it might make me sick and dizzy. I'd heard of my friend's experience... I was afraid of getting the side effect of sick feeling 'Shan', although I was in great pain. (Informant P2)

"Shan "made me sick

Many participants mentioned the word "Shan". Even the informant's family members had a strong belief that pain medication was not good for health. An elderly informant said:

When my son said good-bye to me on admission day, he reminded me to bear the pain as much as possible and try to avoid any pain relief until I really couldn't bear the pain. I agreed. Analgesic is a Western medicine; most of them have the effect of 'Shan'. (Informant P11)

Limited knowledge on pain management

In general, the informants' knowledge about pain and options for pain management was limited. Many believed that pain was inevitable when one had a

fracture; therefore one should bear the pain and should not use analgesics.

Limited knowledge of analgesic

Although most informants reported that nurses had given them some information about pain management, they knew little about the type, route, frequency and side-effects of the medication they were given. Informants expressed a feeling of uncertainty, and a lack of any strategy to manage their pain. As a result, they tried to bear their pain. One informant recalled:

> *The nurses told me that I could call them when I felt pain. However, I had no idea when the most appropriate time was to call them. Would it be doing more harm than good to have analgesics, as I saw that my neighbor vomited after the nurse gave him a needle? I did not know what sort of options I could have. I thought that they (doctors and nurses) should know what they were doing...I tried to bear the pain as much as I could. (patient Informant 6)*

Limited knowledge of pain management options

Many participants mentioned that they lacked of knowledge related to the options of pain management and uncertain of the time of request of the pain options. A participant recalled:

They (nurses) asked me to press the buzzer when I was in pain. They mentioned that some injected analgesic was prescribed by the doctor. However, they didn't explain what sort of analgesic it was, and I knew nothing about the options to stop my pain. . I thought I should not use it if I could bear the pain. (Patient Informant 14).

Be a good patient

Some informants mentioned that they did not want to ask for analgesics because they want to be regarded as good patients. They worried that they might be perceived by nurses as too demanding if they pressed the buzzer all the time.

Don't want to disturb others

Many participants' especially male participants always mentioned that they would like to bear the pain if they could because they did not want to disturb the busy nurses. They kept quiet and tried to bear their pain and wait for the next doctor's or nurse's round. For example, one informant said:

I did not press the buzzer when I was in pain. I didn't want to disturb the nurses as they were busy with other things. My mother always taught me to be a good person and not to disturb others if I could manage things myself.

I wanted to be a good patient that caused no extra trouble to anybody...

(Patient informant 7)

I should bear the pain

Most participants mentioned that they should bear the pain if they could so as to be a good person. An informant said:

We are men and I suppose we can bear some pain. It was only the break of a bone and I have some pin to fix my bone together. I should be able to bear the pain and be a good strong man. Like last time, I slipped and fell in a football match, sprained my ankle and took a rest for 20 minutes, but then resumed playing with a swollen ankle. (Patient Informant P15).

Passive coping

The majority of the informants used passive coping methods for pain control, which included not thinking about the pain, avoiding negative thoughts, stoically tolerating pain, and avoiding any movement of the affected limb.

Avoid movement

Several participants mentioned that they would avoid movement to trigger their pain and a informant said:

I kept still and tried not to move and I felt less pain. The only thing I could do was to avoid movement, sleep if I could, and look at my watch to see when the next nursing or doctor's round would be (Informant P18)

Avoid activities

Despite of avoid movement, the participant tried to cope their pain passively by not thinking and sleeping and one patient recalled us

I try to avoid thinking, kept still most of the time because it was less painful if I did not move the affected limb. I slept most of the time and hoped that I would be better when I woke up (Informant 25).

Findings from Nurse Informants

A total of ten nurses were invited and complete the interview with seven registered nurses, two nursing officers and one ward manager. Eight (80%) females and two (20%) males were interviewed, with an age range of 25 to 40 (median = 33.6). Work experience was quite evenly distributed, 30% with less than five years, 40 % five to nine years and 30% over 10 years. Tables 3 summarize the main categories and sub-categories of the nurse informants.

Table 3. Main categories and sub-categories of nurse informants

Main categories	Sub-categories
High level of pain	
Usual practice	Rely on patient's request Follow the ward routine time
Barriers to pain management	Heavy workload Patients' belief on pain management
The need for tailor-made educational intervention	Change the belief of analgesic use Change the belief that they should not bear the pain Conduct before surgery

High level of pain

All the nursing informants agreed that patients suffered from high levels of pain, especially during the admission period and the first few days after surgery. Two female informants said:

> *The patients suffered from severe pain especially during the admission period before surgery and for the first 24 hours after surgery. When I conducted the pain assessment, most patients reported an 8-9 /10 VAS score (Nurse Informant 1)*

Another nurse said

I think they suffered from pain at a level of 8-9/10 on the visual analogue scale (VAS) after injury and that this then reduced to VAS 3-4/10 for 1-2 hours after analgesic injection. Then patients experienced pain again and started to press the call bell. I can also identify their pain from their facial expression and gestures. (Nurse Informant 5)

Pain practice

The nurses' decision to provide analgesics to patients generally depended heavily on their own request, a doctor's prescription and the routine set by the ward administrator.

Rely on patient's request

Many nurses, recalled their pain practice, and always mentioned the importance of patients' own responsibility of pain management and two nurse said:

I think pain practice (management) is not adequate, but most of the time we just follow the pain protocol (Pethidine IMI 4 hourly, on request). Actually, patients themselves play an important role, as they need to initiate the

request...Pain management is regarded as a low priority in the care when we are engaged in some other nursing activities. (Nurse Informant 2)

We usually provide an injection when they press the buzzer. Occasionally, we ask them or when we see they are in pain from some non-verbal cues such as facial expression or gesture when we are carrying out their vital sign observation (Nurse Informant4).

Follow the Ward routine time

Some nurses especially the junior nurse could recall being taught about the pain management practice by the senior nurses that they should adhere to the ward routine and protocol for their practice and a nurse said:

We junior staff always follow the prescription and routine time to perform treatment, and always follow the ward care routine (Nurse Informant N2)

Another nurse said

I reckon the Pethidine dosage is sometimes too conservative. The patients yell again after two hours. However, we need to follow the order. Sometimes, I need to initiate a call to the house-man to change to a stronger dosage....That is what we can do...advise him to increase the dose (Nurse Informant 1)

Barriers to pain management

When asked about barriers to their pain management, both heavy workload, and the patient's beliefs about the use of analgesics were regarded as the major barrier.

Heavy work load

When asked about the major barrier, 'busy working' is a common term in their minds when referring to delaying their pain management. Two nurses said:

Sometimes we are too busy, and the patients need to make more than two requests to remind us. At night, we are busy. We try to group the pain assessment and analgesic administration together at a fixed time. We don't want to disturb the patients so often....However, if a patient makes a request, I will try to answer it as soon as possible. (Nurse Informant 2)

We are so busy, especially at night–time, because of a shortage of manpower. Sometimes the patients themselves need to initiate the request.... (Nurse Informant3)

Patients' pain belief on pain management

When asked about major barriers, despite of the heavy workload, most nurses reported that the patient's beliefs about the use of analgesics were regarded

as the major barrier. One nurse said:

> *Requests of analgesia depend on individual perception (belief). Some patients, especially the males, tend to bear the pain and only use analgesics as a last resort. I had an experience like this yesterday...I reckoned one of my patients was in great pain from his facial expression. When I asked him whether he wanted an analgesic or not, he refused and said 'I am fine, nurse. I still can bear the pain...I will call you if it gets unbearable'...However, he did not make any request in my shift although he was in pain. Some relatives even teach their relatives to bear pain as much as possible as they reckon analgesia is not good for their health. I have always heard that analgesic is 'Shan' and that one should try not to take it... 'Shan' refers to the side-effects of the analgesic (Pethidine) - dizziness, nausea and even vomiting. (Nurse Informant 4)*

The need for tailored-made education intervention

Many nurses stated that their belief of pain and analgesic also changed after nursing training. They also high-lighted the importance of health education to change the patients' belief. Some ideas of important components were suggested to be included to address their pain belief.

A need to change patient's belief of analgesic use

Many nurses stated the routine briefing to the patient was not adequate to meet the need and emphasized the need of a new educational intervention and believed that the patients would be benefited from it. The important of changing the belief of analgesic use was high lighted, and a nurse said:

Actually, before I took up nursing, I also shared the belief that we should take as few drugs as possible, my mother telling me that they were 'Shan' and not good for health. But my beliefs changed after studying nursing. We learned the Western model of medicine and we all knew that pain management was important in care. I understand that some patients, even those in pain, refuse to have analgesics by injection. But sometimes, after our explanation, they'll agree to take them...the point is we don't know how to explain to them effectively. Our general routine briefing is not sufficient at time... To enrich their knowledge and alter their traditional beliefs about analgesics...sometimes it (educational intervention) may works ... (Nurse Informant 5)

Change the belief that they should not bear the pain

Nearly all staff mentioned that education is a good means to persuade

patients to follow advice and accept analgesics. The need for a tailor-made education intervention is clear. The components of such an intervention must include measures to deal with beliefs about analgesic use and pain management, and with negative feelings. Three nurses said:

> *Sometime they will listen to me if I explain that analgesics are not bad for their health but helpful in relieving their pain and anxiety. Although analgesics have some side–effects, they are generally tolerable ... you know some patients feel that analgesia has side-effects and don't want them even they are in severe pain. However, I don't know how to persuade them as the belief is deep-rooted in their minds...It is good to have an education programme to change their beliefs. I reckoned my knowledge is not enough... (Nurse Informant 7)*
>
> *Actually, before I began nursing, I also believed that we should take as few drugs as possible, my parents having taught me that Western medicine was 'Shan' and not good for health. My beliefs changed after studying nursing, as beliefs do when we attain more knowledge. In the same way, patients may change their beliefs with a tailor-made educational intervention... (Nurse Informant 8)*
>
> *Most patients said they were worried about the forthcoming surgery and its*

outcomes, such as whether they would recover and walk as well as before their injuries. If they were suffering pain as well as having these worries, it could affect their mood and trigger anxiety. We always asked them not to worry, but I understood that it was a normal reaction to be worried... If I were them, I would also worry about uncertain outcomes of surgery... It is good to have some education intervention to dispel these negative thoughts and teach them to cope positively with the pain ...you know, if a patient worries and gets too upset, it may delay recovery... (Nurse Informant 9).

Conduct before the surgery

Another nurse said:

....It will be good if they have a structured education intervention. Our present intervention is not well structured, and too general to cover everything at one go; it is usually provided together with the admission procedure... Sometimes I think they may not understand what we tell them (Nurse Informant 10).

Summary of Findings

Content analysis resulted in seven categories describing patient informants' pain experience and beliefs: intense pain, lack of control over pain; pain as a negative signal, worry about 'Shan', limited knowledge of pain management, being a good patient, and coping with pain. Informants experienced intense pain, which they had no control over. They believed that pain was inevitable when one had a limb fracture, and that therefore one should bear the pain. They avoided analgesics as they considered they had serious side-effects. These beliefs shaped their pain coping behavior.

Content analysis resulted in four categories describing nurses' perceptions of the pain experience, pain practices and pain management barriers: high level of pain, usual practice, barriers to pain management and the need of tailor –made educational intervention. They believed that educational intervention would be useful to help the patients cope better with the pain and stress of the coming surgery. Tailor-made educational intervention should be provided for Chinese patients, with the emphasis on altering their beliefs about the use of analgesia, dispelling their negative thoughts about pain, and enhancing their coping skill – all of which should lead to more successful pain management.

Discussion

The majority of the patient informants in this study was in their old age and sustained fractures because of slipping and falling. The young informants' fractures were due to vehicle accidents or sports related. The characteristics were similar to those in previous studies of acute injuries (Shaw, McColl & Bond, 2003; Bergh, Jakobsson, Sjöström & Steen, 2005). The present study found that informants experienced severe pain during their hospitalization, which was also consistent with previous studies (Joy, Probert, Bisson & Shepherd, 2000; Bergh et al, 2005). It also showed that informant' beliefs about pain and analgesics had an impact on their emotions and behavior. The belief that pain indicated something wrong with their body would induce anxiety and would subsequently generate more pain in the individual. All patient informants in this study expressed similar beliefs towards analgesics, that is, that they were harmful to the body because of their side-effects ('Shan') and should be avoided as much as possible. Thus, they refused analgesics even though they were in severe pain. As a consequence, the majority of patients experienced intense pain due to inadequate pain relief. They then perceived the intensity of pain as a sign of deteriorating health condition, which could further aggravate their anxiety and pain. This appeared to be a vicious circle. Consistently, nurse informants had similar beliefs before their nursing

training. The hidden concern about the side-effects of Western medication had influence on their belief despite of the age.

In Chinese medicine, health is viewed as harmony between the forces of 'yin' and 'yang' within the body, and between the body and its environment. The force of yin and yang is called 'qi', meaning 'vital energy'. A fracture is seen as an imbalance or disequilibrium of these powerful forces of yin and yang. Many Chinese also believe that the use of Western medicine, such as an analgesic, will induce an imbalance in their bodies (Chen, 2001), and that the dizziness and vomiting encountered after taking an analgesic might result from the improper flow of qi through the bodily system. Though Hong Kong is a Westernized city and Hong Kong Chinese use Western medicine, beliefs, hidden fear and concern about the side-effects of Western medication still influence patients' acceptance of analgesics, as this study shows.

In a study conducted with a Caucasian population, Griffiths and Jordan (1998) also reported that informants experienced insufficient pain relief post-operatively because of a lack of knowledge about pain control and a failure to understand the severity of tissue damage. As a result, the informants did not adhere to the medication regime. Although the informants' consequent behavior in Griffiths and Jordan's study was the same as in the present study, both groups

refusing analgesics, the underlying reasons for their refusal were different. Cultural factors have to be taken into account in pain assessment and management as culture shapes the values, beliefs and behavior of individuals, including the way a person reacts to pain.

Other studies with Caucasian populations also identified some common beliefs in patients suffering from pain. For example, cancer patients expected to experience pain because they believed that it was normal when one had cancer (Cleeland, Gonin, Baez, Loehrer & Pandya, 1997; Jablonski & Wyatt, 2005). Patients were reluctant to use opioids because of concerns about addiction and the side-effects of the medication (Cleeland et al, 1997). In this study, informants experienced acute pain, but did not mention any concerns about addiction.

Studies also suggest that patients might want to be 'good patients' in the eyes of the healthcare professionals by not complaining about pain (Cleeland et al, 1997, Jablonski & Wyatt, 2005). This study had similar findings, that the informants dared not disturb the nurses, even when they were in great pain. Chinese interpretations of 'good patient' could be different from that in a Caucasian population. Chinese people's emotions are tightly controlled in all social situations in order to achieve harmony. A good Chinese patient means someone who is emotionally stable and under control, possessing an attitude of harmony and

unwilling to disturb others at any cost. An emotionally self-controlled person is manifested through rather reserved and formal verbal and non-verbal communication in public, and keeping arguments, disagreements or demands to a minimum (Holroyd, Cheung, Cheung, Luk & Wong, 1998). For example, demanding analgesics and complaining of pain may be considered signs of weakness as well as disturbing harmony in the ward, and so patients would try to bear the pain. Chinese place great importance on 'saving face' to avoid upsetting others, thus promoting personal harmony in a stressful environment. Alternative ways of emphasizing how to manage pain oneself might be helpful in overcoming this barrier.

This study demonstrates how cultural beliefs influence patient and nurse informants' perception of and responses to pain and how these beliefs influence their pain management in hospital. It highlights the importance of exploring patients' experience of pain and their beliefs about its management, so that culturally sensitive interventions can be planned to help patients control their pain.

Inadequate pain management affects patients' physical and psychological well-being. Efforts should be made to attend to the concerns of patients so as to improve their pain control. Findings from this study could be used to develop an education programme for this group of patients to clarify their concerns about

analgesics. The literature generally supports the view that educational intervention is an effective way to change a person's cognition and behavior, so that the result is better pain management (Bedard et al, 2006). The content of such a programme could focus on enhancing knowledge of pain management, modifying patients' beliefs about the use of analgesics and encouraging them to take appropriate action to achieve self-control. If patients found analgesics an unacceptable choice, as in this study, other alternatives to manage pain, such as relaxation exercises, aromatherapy or guided imagery, could be offered.

Implications for the development of educational interventions

The findings from patient and nurse informants provided culturally sensitive information related to the pain experience of Chinese patients with limb fractures, and to pain management and its barriers, which were used to develop the content of an education intervention for the main study. From the patient's perspective, Chinese patients with fractured limbs undergoing surgery experienced intense pain. However, they refused analgesics as they believed medication would have serious side-effects. The findings showed that patients' cultural beliefs influenced their decision-making and behavior related to pain control during hospitalization. Therefore, there is a need to develop a culturally sensitive

educational intervention which takes into account patients' pain beliefs to enhance their understanding and acceptance of pain management. The tailor-made educational intervention is designed to dispel negative thoughts about the coming surgery (internal fixation of the fractured limb) and pain. Patients should become positive in their attitudes towards coping with pain, leading to better pain relief, less anxiety and a speedy recovery.

The qualitative finding from the nurse interviews also provide insight into the need for developing of tailor-made educational interventions to help patients cope with their pain and anxiety. The findings also confirm that there should be content aimed at altering their beliefs about analgesic use and at positive strategies to cope with pain after surgery. For example, the content should address their beliefs and explain to them how to cope with pain positively when about to undergo surgery.

Summary of findings from patient and nurse informants

The table 4 below illustrates how findings contribute to the content of educational interventions. Based on the findings from patients and nurse informants, some suggestions were high lighted for the development of new educational intervention. The findings support the urgency and strong need to

develop a tailored -made educational for the patients with traumatic limb fracture because patients suffered from intense pain and anxiety. Patient's belief of pain was regarded as major barrier to effective pain management and therefore the tailored -made educational intervention could be designed to clarify their pain belief. In this study, the common belief from the Chinese patients included: 'pain is a negative sign; analgesic had side effect and not good for health, I should bear the pain and I should only take pain relief as a last resort; I have no control over my pain'

Relating to nurses' perspective, the nurses also agreed that the patients were suffered from severe pain. Both heavy workload in their daily work, and the patient's beliefs about the use of analgesics were regarded as the major barrier to the pain management. They all supported to have a tailor –made educational intervention to improve the pain management. The importance of changing patients' belief of analgesic use and correct concept related to pain management. Were high lighted. Table 4 summarize the major categories form patients and nurse and seminaries were merged and informed the development of the educational interventions.

Table 4 Example of merging of data to educational intervention

Patient's main categories	Nurses' main categories	Similarities of patient and nurse categories
1. Intense pain 2. Lack of control over pain 3. Pain as a negative signal 4. Worry about 'Shan', limited knowledge of pain management 5. Being a good patient 6. Passive coping **Pain beliefs** : That pain is inevitable when one has a fracture, and that therefore one should bear the pain. Analgesia is avoided as it is considered to have serious side-effects. **Consequence**: These beliefs shape patients' passive pain coping behaviour.	1. High level of pain 2. Usual pain practice 3. Heavy workload 4. Barriers to pain management - pain beliefs the major factor 5. The need for tailor-made education to correct these pain beliefs	1. Intense pain 2. Patients need educational intervention before surgery 3 Pain belief is one of the barriers to pain management; therefore the content of any educational intervention should be culturally sensitive and modify their belief for Chinese patients

Development of C-BEI educational intervention

C-BEI was developed by the researchers according to the research literature on educational intervention, the theory of the cognitive-behavioral approach as outlined in chapter 3, and the researchers' phase-1 study described above. C-BEI has structured educational content, which includes knowledge of pain and its physical and psychological impacts, the benefit of pain management, the importance of self-pain management and the use of breathing relaxation exercises for pain relief.

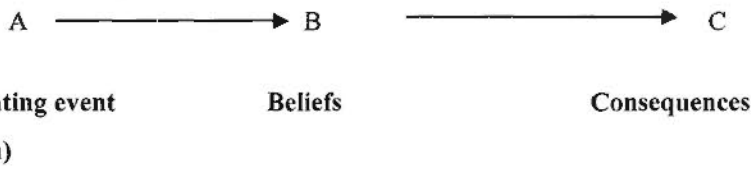
Application of Conceptual Model of C-BEI

The literature review in chapters 2 and 3 established that a cognitive-behavior based educational intervention (C-BEI) was an effective way to change a person's cognition and behavior to achieve better pain management for patients with chronic orthopaedic problems (Devine &Westlake, 1995; Morley et al, 1999; Sinclair & Wallston, 2001;Eccleston et al, 2003; Ersek et al., 2003).

Based on the phase-I study and literature review in chapters 2 and 3, the cognitive-behavioral approach should be a feasible way to underpin an educational intervention.

The activating event-belief-consequences (or A-B-C) model where an activating event A leads to emotional or behavioural consequences at C, with the consequences being mediated by beliefs at B (Chan & Leung, 2002; Freeman& Freeman, 2005, p39).

Figure 1: The ABC model of Cognitive behavioral approach



In pain management, pain is the activating event (A), beliefs are related to patients ' beliefs and knowledge about pain and the use of medication (B), the consequences are ways patients cope with pain (C). Cognitive factors (beliefs) play an important part and influence patients' response to treatment. The goal of a cognitive-behavioral based educational intervention (C-BEI) is to help patients identify and modify dysfunctional thoughts and/or assumptions about pain and the use of analgesics. For example, Chinese patients have a common belief that they should bear pain as much as possible, and refuse analgesics as a result. With C-BEI, it is hoped that patients will alter their dysfunctional thoughts and accept pain management, thus resulting in better pain control. With good control, patients will

experience less anxiety and probably have better sleep quality. In addition, practicing breathing and relaxing skills is a means to enhance self-pain management, improve patients' self-efficacy and help them to cope more effectively with pain.

The Objectives of C-BEI

The C-BEI consisted of two sessions (each of 30 minutes). The aims of the intervention are to:

- enhance patients' knowledge of pain management
- modify patients' beliefs about pain and pain management
- increase patients' constructive coping behavior in pain management.

The Content of C-BEI

The content of the first session is summarized in Appendix 7 and includes:

- knowledge of pain and its impact on mood, sleep, daily living activities, mobility, the rehabilitation process and recovery
- modifying beliefs: state the positive impact of good pain control on recovery in terms of physical and psychological functioning. Use of analgesics is necessary for good pain control, especially during the first few days after surgery
- the importance of self-pain management

- the options among pain relief methods during hospitalization
- the use of breathing relaxation exercises for pain relief.

The content of the second education session acts as reinforcement only, and the content covered are similar to that in the first session. Specific emphasis is put on:

- the importance of self-pain management at home
- identifying and correcting misconceptions about pain relief, if any.

The content of the educational sessions is summarized in a booklet for the patients to take home (Appendix 8.). It is also act as a reinforcement material.

Dosage of the Intervention

The dosage of an intervention refers to the ideal amount, frequency and duration of the intervention required to produce the desired effect (Sidani & Braden, 1998). In previous studies, the length of an educational intervention devoted to learning a relaxation exercise varied from 15 minutes to several hours (Morley, 1995). Recent literature suggests that shorter programmes can be effective (Chan, 2003). In view of patients' pain, stress levels and physical condition after injury, it is not suitable to have a lengthy session of education. The first session takes about 30 minutes: five minutes of warm-up and build up raport

with the participant, 10 minutes covers the key knowledge of pain and pain manageemtn after surgery. Then demonstation and redemonstration of breathing relaxing exercise is taught. The last 5 minutes is used for questions and answering time related to patients' experience and beliefs, if any. The relaxing breathing is to be performed by patients three times a day (frequency), and throughout hospitalisation and then for another month (duration), or until no pain was felt.

The second session takes about 30 minutes and conducted at day 7. This session carried the same content and regarded as reinforcement session only. The first five minutes was used to build up raport with the participant, 10 minutes reinforce the key knowledge of pain and pain manageemtn after discharge. Then ask the patients to redemonstrate the breathing relaxation exercise to ensure the skill were correct. The last 10 minutes is used for questions and answering time related to patients' experience and beliefs, if any. A booklet was developed for the patients. The content of the booklet is the educational material covered in the first session. It is well supported by previous study that a short, structured educational session should be provided together with repeated reinforcement through written material to achieve the maximun educational effect (Sidani & Baaden, 1998). Content of the first educational intervention was summarized in appendix 7 and booklet was presented in appendix 8.

Content Validity and Consistency of C-BEI

Content validity refers to the degree to which the items in an instrument adequatedly represent the universe of content for the concept being measured. The content validity index (CVI) refers to an indicator of the degree to which an instrument is content valid, based on average ratings of a panel of experts (Pilot & Beck, 2008). In this study, the content of the educational intervention was examined by a panel of five experts in trauma care (a nurse specialist and a doctor in the trauma unit, a nurse teacher, a physiotherapist and a nurse from a pain team) and a patient who had experienced a fractured limb and surgery. Based on the rating of each item on a 4-point scale (from 1=not relevant to 4=very relevant, the CVI of the C-BEI content was rated as either 3 or 4 in terms of relevance, feasibility and appropriateness. In the C-BEI evaluation, the content-validity index scores ranged from 0.8 to 0.9, indicating good content validity. A CVI score of 0.8 or higher is generally considered to indicate good content validity (Pilot & Beck, 2008). The expert panel agreed that the educational intervention was relevant, feasible and appropriate in preparing patients with fractured limbs to cope with pain. To maintain consistency in delivering interventions, all educational intervention was conducted by the researcher herself, a nurse experienced in pain management.

Intervention Procedure

By appointment, the researcher conducted the educational intervention at the patient's bedside with curtains drawn, as most patients were immobile and confined to bed. The time chosen for C-BEI was mainly 2 to 4 pm, when the ward environment was quiet, no doctor's round was scheduled and no visitors were about. Patients' general condition was screened by checking their vital signs (blood pressure and pulse) and establishing their current physical status. During the intervention process, patients were told the focus of the intervention and given an outline. First, the patients were told about the advantages of good pain management as related to their recovery. Second, the researcher explained the facts about analgesics and emphasized that they could relieve pain; good pain control could help to improve sleep and active capability. Third, apart from medicine, there were other, non-pharmacological methods to reduce pain. Breathing relaxation skills were taught, demonstrated and practiced under instruction. Patients were encouraged to raise their concerns and questions. Finally, the researcher also emphasized the importance of positive attitudes and self-care strategies (self-initiation of breathing exercises and requesting analgesics if in pain).

The second session of C-BEI was conducted on day seven after surgery.

The researcher briefly explained the content of the information leaflet to the patients. She then invited them to share their experience of coping with pain over the previous few days. Concerns and questions were answered. The content of this second session was loosely structured, to fit an individual patient's needs. A returned demonstration of breathing relaxation skills ensured the correct skills had been acquired. The patients were encouraged to carry on the breathing exercises at home, and the importance of good pain management again emphasized.

Usual Care

All informants of both groups received the usual care when they were admitted to the trauma unit after injury. This standard care involved a ten-minute session explaining the coming surgery, the pain management regimen and the use of a pain scale for assessment (Appendix 9). Regarding the pain regimen, all patients received pethidine 50mg to 100mg IMI on request during hospitalization. On day 2 onward after surgery, all patients received oral Dologesic four times per day as routine. In addition, the usual care also included the similar care performed by the health care professionals such as doctors, nurses and physiotherapists.

Piloting Study

A pilot study on four patients was conducted to examine the feasibility of delivering the intervention and patients' responses to it, and how to collect data. Data collection was conducted at days one, two, three, four and seven, to test its feasibility. Patients were interviewed at day seven. Two female and two male participants joined and completed the pilot study. All of them attended the standard education performed by the ward staff. Baseline data was collected and summarized in table 5. C-BEI was provided to all informants, the intervention lasting for 25 minutes, and most patients indicated positive acceptance. One patient emphasized that 30 minutes was the maximum time they could afford for the education session, as they had some pain and were tired. However, they were interested and eager to know more about coping skills. They all found the information in C-BEI useful. All patients demonstrated the correct skills of breathing and relaxing and most were able to follow the instructions to carry out the exercises three times a day. However, two patients did so more than three times on days one and two, when they had some pain. No patients reported experiencing any harm or discomfort during and after C-BEI.

Only two patients completed the data collection at day one as they felt very drowsy and tired at that point. Three patients provided similar findings at days

any harm or discomfort during and after C-BEI.

Only two patients completed the data collection at day one as they felt very drowsy and tired at that point. Three patients provided similar findings at days three and four, and one said that daily data collection was too tiring for her.

Table 5. Demographic characteristic of the participants in the pilot study (N=4)

	Frequency	% of the sample
Age		
38	1	25%
46	1	25%
68	1	25%
70	1	25%
Gender		
Male	2	50%
Female	2	50%
Type of injury		
Upper limb	1	33%
Lower limb	3	67%
Mechanism of injury		
Sport injury	1	25%
Vehicle accident	1	25%
Falls	2	50%
Educational level		
Primary	1	25%
Secondary or above	3	75%

Modification of Intervention after Pilot Study

The completion of the pilot work suggested that the total length of time of C-BEI was 30 minutes, so that the patients could raise their concerns if required. The C-BEI was feasible, well tolerated and practical as an intervention for patients with fractured limbs. They demonstrated a high adherence rate of performing breathing relaxing exercise during the hospitalization period, especially on days one and two. Patients perceived the intervention was useful and caused no harm. However, two patients claimed that data collection on day one was very difficult for them, as they felt pain and were tired.

Data collection was re-scheduled to days two, four and seven during hospitalization, as day one was found to be unsuitable because patients might be too tired and weak physically to cope with it, and both days three and four in succession were reckoned too much by most patients. Collection was therefore reduced in this way to make it more consistent and better tolerated by the patients.

Summary

In this chapter, qualitative interviews were conducted with twenty six Chinese patients who had traumatic limb fractures and were undergoing surgery regarding their experiences of and beliefs about pain management. Ten orthopaedic nurses were also interviewed about their pain management practices and the barriers that they perceived prevented better pain control among patients. The findings from these qualitative interviews were used to develop a cognitive behavioural approach educational intervention (CBEI). The intervention aimed to promote better pain management and was tailor-made to meet local patients' needs. It consisted of a 30-minute education session to enhance patients' knowledge of pain, modify their beliefs about pain management and analgesics, decrease their negative thoughts, and become more active in coping with their pain. A reinforcement session was conducted at discharge. The effectiveness of the C-BEI was examined in phase two and will be presented in chapter five.

CHAPTER 5 PHASE TWO STUDY METHODOLOGY

Introduction

This chapter describes and discusses the methodology of the main study, which is focused on evaluating both short- and long-term effects of a cognitive-behavioral educational intervention (C-BEI) on the outcomes of Chinese patients who have sustained traumatic limb fractures and have undergone surgery.

This chapter starts with the research aims, objectives, and hypotheses, followed by a discussion of the design, sampling, and measures adopted at the outcome and process evaluation stages. The data collection procedure is then explained, followed by a consideration of ethical concerns involved in the study.

Research Aims and Objectives

The aims of the main study were to implement C-BEI and evaluate its effects on the short-term and long-term outcomes of limb-fracture patients. The specific objectives were to:

1. Examine the effect of C-BEI on patients' pain barriers during hospitalization from T0 (pre-surgery) toT3 (seven days after surgery);
2. Examine the effect of C-BEI on patients' intensity of pain, level of anxiety, and sleep satisfaction across three months during hospitalization from T0 (pre-surgery) toT3 (seven days after surgery) and across three months (T0 to T5);

3. Examine the effect of self-efficacy during hospitalization from T0 (pre-surgery) toT3 (seven days after surgery) and across three months (T0 to T5);
4. Examine the effect of C-BEI on health-related quality of life across three months (T0 to T5); and
5. Examine the effect of C-BEI on analgesic use during hospitalization
6. Examine the effect of C-BEI on length of stay of stay of hospitalization ;
7. Investigate patients' perceptions of the benefits and limitations of C-BEI.

The short-term outcomes during hospitalization were evaluated by pain barrier (Modified Pain Barrier Questionnaire – Taiwan, BQT), level of pain (Visual Analogue Pain Scale, VAS), level of anxiety (State-Trait Anxiety Inventory, STAI), sleep satisfaction, self-efficacy in pain management, and analgesic use. These were measured at T0 (one day before surgery), T1 (two days after surgery), T2 (four days after surgery), and T3 (seven days after surgery). The total length of stay in the hospital was also compared between two groups, the experimental group and the control group. Long-term outcomes were also evaluated across three months at T0, T1, T2, T3, T4 (one month after surgery), and T5 (three months after surgery), and included VAS, STAI, and sleep satisfaction. General self-efficacy was measured at T0, T3, T4, and T5, while health-related quality of life (SF-36) was measured at T0, T4, and T5. The current study attempts to examine the effectiveness of C-BEI on acute pain management and assumes that C-BEI might change a client's belief about pain, which might affect the clients' pain and emotion. Therefore, the short-term outcomes during hospitalization were regarded as the primary outcomes of this study.

Hypotheses

Eight specific hypotheses are listed below. Patients with fractured limbs receiving C-BEI when compared with those in the control group would demonstrate

1. Lower pain-barrier scores during hospitalization (T0 to T3);
2. Less pain as measured by VAS during hospitalization (T0 to T3) and across three months (T0 to T5);
3. Less anxiety as measured by STAI (Chinese version) during hospitalization (T0 to T3) and across three months (T0 to T5);
4. Better sleep satisfaction as measured on the sleep satisfaction scale during T0 to T3 and across three months (T0 to T5);
5. Higher self-efficacy in pain management as measured by the general self-efficacy scale during hospitalization at (T0 to T3) and across three months (T0 to T5);
6. Greater improvement in health-related quality of life as measured by SF-36 PCS and MCS across three months (T0 to T5);
7. More acceptance of analgesics use as measured by the frequency of use during hospitalization (T0 to T3); and
8. Shorter length of hospital stays as recorded by the hospital record.

Method

The study consisted of an outcomes evaluation research study and a process evaluation. A quasi-experimental design of two groups' pre-test and post-test between subjects was employed for the outcomes evaluation. The process

evaluation involved a qualitative study using telephone interviews. The study was conducted at two regional public hospitals in Hong Kong.

Outcomes Evaluation Study Using Quasi-experimental Design

Outcomes are the effects of intervention or treatment, which are manifested by the changes in any dimensions of health or the evolution of the present problem for which the intervention or treatment is given (Sidani & Braden, 1998). An outcomes evaluation study is a research study focused on an appraisal of a specific, new intervention and the findings of the outcomes research have been used as the blueprint or evidence for the development of nursing standards and care (Sidani & Braden, 1998; Polit & Beck, 2008). In this study, the quasi-experimental design was used for outcomes evaluation. Like true experimental design, it is a powerful way of establishing causal connections between interventions and outcomes. It has two identifying properties: the use of controls over the experimental situation, including the use of a control group, and the manipulation of the intervention as an independent variable. Although it lacks randomization, it can still offer validity in determining whether the independent variable has had an effect on the dependent variable if the researcher carefully controls the research protocol and uses blinding as much as possible. A great strength of quasi-experimental designs is that they are feasible in real-life settings and present reasonable alternatives to randomized trial (Portney & Watkins, 2000; Polit & Beck, 2008).

Randomization is a method used to ensure that patients are organized at random into treatment groups in order to diminish bias that may otherwise be introduced into the data sets (Portney & Watkins, 2000). In this study, it was not

feasible to conduct a randomized controlled trial (RCT). However, it is widely recognized that such trials (RCT) are preferable as study designs when researchers want to examine the effectiveness of the intervention or treatment options.

Randomization Issues

In this study, the researcher randomized the wards rather than the participants as it was not feasible to randomize the participants. According to the hospital's admission policy in traumatic limb-fracture cases, a patient who had sustained injury was admitted into an assigned ward according to the admission roster. Bed assignment depended on the availability of beds. For example, if Ward A was assigned to admit emergency patients every three days, all patients who had sustained injuries on that particular date might have the chance of being admitted to the same ward or even the same cubicle. The researcher in the present study could not influence admission policy and patients' bed assignments. Thus, a participant in the experimental group might be placed next to one in the control group. As patients tend to communicate and discuss their treatment, sample contamination between the experimental and control group would probably result. The intervention effect or dosage might be altered if participants learned from each other's experience. For example, if a participant in the control group found out that his or her neighbor in the experimental group received some intervention and perceived less pain or better outcomes, he/she might ask for the same, which might eventually increase the attrition rate or alter the outcome.

To address the above issue, a quasi-experimental design with randomization of wards was adopted in this study. Portney & Watkins (2000) suggests that

quasi-experimental design is regarded as powerful in establishing causal connections between interventions and outcomes in real clinical settings. It can offer validity in determining whether the independent variable has had an effect on the dependent variable if the researcher carefully controls the research protocol and uses blinding as much as possible. In the current study, random assignment was performed on six wards of two regional hospitals to ensure that there is no risk of sample contamination.

Six wards of the two regional public hospitals under the control of the Hospital Authority were randomized into experimental and control groups, with three wards in each group. These wards had similar patient profiles, staff mix, treatment protocol, and pain-management protocol.

Design Issues

The study adopted a single blind design in which the healthcare professionals working at the study venues and the research assistant who collected the data were not informed of the group assignment. For example, the doctors continued to provide fair medical treatment; the nurses provided usual nursing care; and the physiotherapist provided the usual rehabilitation exercise to all the participants.

The purpose was to ensure fair usual care to all participants and minimize assessment bias arising from the knowledge of the intervention group's status or the evaluators' expectations (Polit & Beck, 2008).

A design of repeated measurements was adopted for the following reasons: (1) collection of data at the baseline (T0) could strengthen a study's validity in terms of detection of any initial difference between groups (Polit & Beck, 2008); (2) collection of data at T1, T2, and T3 (two, four, and seven days after surgery)

provided the researcher with information on short-term outcomes (changes in pain barrier, intensity of pain, anxiety, sleep satisfaction, or analgesic use) during the period, as patients with fractured limbs and who have undergone surgery would generally be discharged to their homes on day 7 or day 8 (HA, 2007). Data collected at T4 and T5 (one and three months after surgery) provided information on long-term outcomes (i.e., quality of life). As patients with traumatic fractured limbs and who have had surgery were stressed physically and psychologically and more rest should be provided to them after surgery, the researcher tried to cut down the data collection as much as possible with the consideration of the scientific interest of acute pain management and the patient's burden or ability. Eventually, self-efficacy and quality of life were only taken at four time points, specifically, at T0, T3, T4, and T5.

Study Setting

The study was carried out at two large regional public hospitals in Hong Kong. The hospitals provide acute care to a population of 1,600,000. Six orthopedic and trauma wards of the two hospitals were randomized into experimental or control groups by drawing lots, with three wards in each group. These wards had similar patient profiles, staff mix, treatment protocol, and pain-management protocol and governed by Hospital Authority.

Participants

During the study period, all eligible patients at the study venues who met the inclusion criteria were recruited. These criteria were: Chinese adult, age $\geq$ 18-years-old, able to communicate in Cantonese, ambulatory before injury,

medically diagnosed with limb fracture, and will undergo internal fixation surgery. Patients were excluded if they had an unstable hemodynamic state, a past history of chronic pain problems, or cognitive and mental impairment.

In order to reduce the risk of committing a type II error as a result of insufficient sample size and statistical power, the study adopted some measures. First, the researcher incorporated power analysis into the determination of sample size to minimize the risk of type II error. The researcher established a power at .80 and a significance of criterion (α) at 0.5 which was commonly used by most researchers (Portney & Watkins, 2000). In addition, based on a systematic review of 25 trials, the cognitive-behavioral approach was used for chronic pain management and a medium-effect size (0.5) was also reported (Devine & Westlake, 1995; Morley et al., 1999). Therefore, the determination of a sample size of 64 per group was established to ensure the adequate power of the analysis (Cohen, 1992; Morley et al., 1999; Polit & Beck, 2008). The researcher anticipated a potential attrition rate of 10% for the study, as reported in similar literature (Giraudet-Le et al., 2003; Lin & Wang, 2005). Thus, 70 participants in each arm were required (Cohen, 1992; Morley et al., 1999; Polit & Beck, 2008).

Intervention

Details of the development of the cognitive-behavioral educational intervention (C-BEI) are fully described in Chapter 4. On top of the usual care, the participants in the experimental group received an educational intervention. C-BEI consisted of two 30-minute individual educational sessions, which were conducted the day before the surgery and again on day 7 after the surgery. The first session covered the knowledge of pain and its physical and psychological

impact, the benefits of pain management in the process of recovery, the importance of self-pain-management, and the use of breathing relaxation exercises for pain relief. During the session, participants were invited to return-demonstrate the breathing and relaxing skills that had been taught and were encouraged to raise their concerns about pain management related to the coming surgery. The content of the second session was the same as the first but also involved the reinforcement of the importance of self-pain-management at home, clarifying the participants' understanding of pain and pain management. A booklet in Chinese, 'Control Your Pain', (Appendix 8), which had been developed by the researcher, was given to each participant. The content of the booklet was described in chapter 4, p.112. It consisted of the content of the first educational intervention which covered the information on pain management and breathing relaxation exercises. The aim of this booklet was to remind the participants of what they had learned in the hospital and to encourage them to continue self-pain-management after discharge. It also served as an additional reinforcement material for the participants to take home upon their discharge.

Outcome Measures

The Modified Pain Barrier Questionnaire–Taiwan Version (BQT) - Appendix 10

The pain barrier of the participants was assessed by using the modified BQT at T0 and T3. The modified BQT, which consists of seven items, using a six-point Likert scale ('0' indicates no barrier and '5' a substantial barrier), was used and the sum of the scores ranged from 0-35 and indicated the intensity of pain

barriers among the participants. This was derived from the Modified American Pain Society's Patient Outcome Questionnaire (APS-POQ-Modified)-Chinese version.

APS-POQ was developed by the Society to cover the management of acute pain and cancer pain (APS Quality of Care Committee, 1995). APS-POQ-Modified (Chinese version) is a questionnaire which consists of two main components: the Brief Pain Inventory, which measures pain intensity and the extent to which it interferes with life (Cleelad & Ryan,1994), and barriers to pain management. The former is a self-report instrument containing 11 pain-related questions: four focusing on pain intensity (worst, least, average, and current) and seven on pain interference with general activity, mood, work, relations with others, sleep, and enjoyment of life, where 0 indicates 'no interference' and 10 'total interference'. The modified APS-POQ has been endorsed by Agency for Healthcare Policy and Research (AHCPR) and recommended as a tool to measure patient satisfaction in acute and chronic pain management (Bookbinder et al., 1996; Ward & Gordon, 1996). According to the APS quality of care committee (1995), APS-POQ may be selected or modified to suit the needs of the particular setting, patient, and intention of the study.

Original Barrier questionnaire shows good internal consistency (alpha from 0.72 to 0.82), excellent test and retest reliability ($\alpha = 0.85$), and content and construct validity (Ward & Gordon, 1996). In Chinese population of Taiwan, Lin & Wang (1995) conducted a study for cancer patients using BQT and found good internal consistency (the total scale of BQT $\alpha = 0.78$, with range of subscale from $\alpha = 0.53$ to 0.96).

Visual Analogue Pain Level (VAS) – Appendix 11

Pain level was assessed by using VAS. This consists of a horizontal 10 cm line on a piece of paper with descriptive words such as 'no pain' at one end and 'worst pain' at the other. VAS was easy to administer and participants were asked to place a mark indicating the degree of their current pain on the line at each assessment time. To score the result, a ruler was placed along the line and the distance from the no pain end to the mark made by the participant. This represented the participant's pain intensity score. VAS is a valid measure of pain and is sensitive to changes in pain perception (Jensen, Chen, & Brugger, 2002). It has been shown to have good psychometric properties with high correlation between patient's scores on the Numeric Pain Intensity Scale and Visual Analogue Scale (r = -.85 to 0.96), indicating good instrument validity (Paice & Cohen, 1997), especially for those experiencing acute pain (Kruger, 1996). Generally, pain recorded on VAS at 1–4, 5–6, and 7–10 is regarded as mild, moderate, or severe, respectively (Kruger, 1996; Wang, Mendoza, & Gao, 1996). Since pain VAS was a single measure as perceived by the patients, measure to ensure accurate measurement was adopted such as double checking of measurement.

The Chinese Version of the State Scale of the State-Trait Anxiety Inventory(C-STAI) - Appendix 12

State anxiety level was assessed by using C-STAI, which consists of 20 items that indicate how the participant feels at that moment on a 4-point Likert scale of increasing intensity from 1 'not at all' to 4 'very much so'. The sum of the responses to all 20 items yields the final composite score, ranging from 20 to 80;

high scores reflect greater levels of anxiety. The instrument is self-administered and takes less than five minutes to complete.

According to Spielberger (1983), state anxiety refers to a transitory emotional reaction characterized by objective, perceived feelings of apprehension, tension, and worry that vary in intensity from time to time. It increases when an individual is exposed to a stressful situation or event. The state-anxiety scale can be used clinically to determine the actual levels of anxiety intensity induced by stressful events such as surgery or injury. The Spielberger STAI has been widely used in applied psychology research (Spielberger, Vagg, Varker, Donham, & Spielberger, 1983). The Chinese version of STAI (C-STAI) has been translated, validated, and proved to be reliable, with internal consistency (alpha from .8-.9) and good psychometric properties. Additionally, it can be used as an objective assessment tool to measure anxiety in a Chinese population (Shek, 1988; 1991; 1993). The test-retest reliability coefficient of C-STAI is .9 (Shek, 1991; 1993; 1998).

Sleep Satisfaction - Appendix 13

Sleep satisfaction was assessed by an item using a 6-point Likert scale of sleep satisfaction with 1 indicating 'least satisfied' and 6 'most satisfied'. In addition, a subscale of pain interfering with sleep satisfaction was added. The scales were derived from the Brief Pain Inventory part of the Modified American Pain Society's patient outcome questionnaire, the APS-POQ-Modified (Chinese version). The details of APS-POQ-Modified are described in the pain barrier section.

The Chinese Version of the Self-Efficacy Scale (C-SES) - Appendix 14

The self-efficacy of pain management was assessed by C-SES, which consists of 10 items, using a 4-point Likert scale, to assess the general sense of perceived self-efficacy in coping with stressful life events (Schwarzer & Jerusalem, 1995). The sum of the responses of the 10 items yields the final composite score, ranging from 10 to 40. Self-Efficacy Scale (SES) has been validated in 14 languages, including Chinese, and was designed for the general adult population, requiring four minutes to complete. Good test-retest reliability and internal consistency were established in a study conducted in 23 countries, with an internal reliability coefficient ranging from Cronbach's alpha 0.76 to 0.90, with the majority in the high 0.80 (Zhang & Schwarzer, 1995; Schwarzer & Born, 1997; Cheung & Sun, 1999). Owing to the limitation of the general measure, it does not tap specific behavior change, and Schwarzer and Jerusalem (1995) suggested that the user add a few items to suit the specific need of the study. Thus, in the current study, one item (Appendix 14, Q11) with a self-developed 4-point scale focusing on self-pain-management was added to the original C-SES. The style of the item writing was similar to C-SES. The item was "I am confident that I can handle my pain at home".

The Chinese (HK) Version of the Health Survey Questionnaire (SF-36) - Appendix 15

Health-related quality of life was measured by the Short Form 36-item Health Status Survey (SF-36) (Ware & Sherbourne, 2001). The tool contains 36 items, takes about 5–10 minutes to complete, and measures eight dimensions of health: physical, social, and role limitations caused by health problems, bodily pain,

mental health, role limitations caused by emotional problems, vitality, and general health perceptions (Ware et al., 2000). Each scale consists of 2 to 10 items, and each item is rated on a 2- to 6-point Likert scale. The total score is calculated by the summation of the scores of items belonging to the same scale.

SF-36 was originally designed as a generic indicator of health status for use in population surveys and evaluation studies on health policy. It was developed by the Rand Corporation in the USA for use in the Health Insurance Study/ Experiment /Medical Outcome Study (HIS/ MOS) (Ware et al., 2001). The psychometric properties of the English version of SF-36 have undergone extensive testing (Ware et al., 2000). Ware et al. (1993) reviewed 14 studies which analyzed the reliability of SF-36 and found that it had good internal consistency in 11 out of 14 studies reported in the USA and UK, with reliability coefficients ranging from 0.62 to 0.94. Therefore, this instrument is regarded as psychometrically sound and can be applied in a wide range of settings. Ware et al. (2001) demonstrated and used the two-factor structure of SF-36 scales in the United States (US standard): the physical health (PCS) and mental health summary (MCS) components.

A Chinese version of SF-36 has been developed and validated by Lam et al. (1998) in a Hong Kong population. First, the data was computed and transformed according to the SF-36 User Manual (Physical & Mental Health Summary Scales: A Manual for Users of Version 1, 2001). The transformed scores were calculated according to physical health (PCS) and mental health summary components (MCS) for a Chinese population (Lam et al., 2005). The PCS and MCS scales bring together all eight SF-36 dimension scores into two summary scores that give an overall assessment of the quality of life related to physical and mental

health. Lam et al. (2005) demonstrates that SF-36 summary scales are valid and equivalent in an Asian population. The internal reliability coefficients of PCS and MCS range from 0.85 to 0.87. The method of transformation of PCS and MCS scores is summarized in Appendix 16. The HK-specific PCS and MCS of SF-36 (Chinese version) have become the most common health-related quality of life measures used with Chinese adults of Hong Kong.

Analgesic Use - Appendix 17

Since participants' medical record were not allowed to reviewed by the research assistant, the participant was asked to recall the frequency and attitude of requesting for analgesics at T1, T2, and T3. In addition, questions from APS-POQ were used to identify a client's intention of analgesic use when he/she was faced with stronger pain (Appendix10, Q6). In the current study, from surgery up to day 2 after surgery, intramuscular (IMI) analgesic was provided upon request. From day 3, oral analgesic was provided four times a day as a routine for all patients. Patients' analgesic acceptance behavior could be reflected by the frequency of requests for analgesics and attitude.

Length of Stay - Appendix 18

Length of stay was recorded to determine the period of hospitalization in the trauma and orthopedic wards. It was used as an indirect indicator of patients' recovery. Length of stay is regarded as an objective indicator to measure a patient's post-operative wellness in terms of complication, such as chest infection, wound infection, and deep vein thrombosis for orthopedic surgery (Maher et al.,

2002). It is anticipated that if a patient recovers without any complication, the length of stay should not be prolonged. An intervention was regarded as cost-effective if the length of stay of hospitalization could be shortened (Devine and Cook, 1986; McDonald et al., 2004).

Demographic and clinical characteristics - Appendix 19

The demographic characteristics of the participants include age, gender, educational level, and marital status. Clinical data consisted of type of injury, mechanism of injury, and type of operation. All data were retrieved from the participants' medical records.

For the experimental group, the frequency of performing breathing relaxation exercise was collected at T1, T2, and T3 as recorded in Appendix 20.

Time of Measures

Measurements of short-term outcomes, levels of pain and anxiety and sleep satisfaction, were taken at six intervals: (i) pre-test T0 (before the commencement of the intervention), (ii) first post-test (two days after surgery, T1), (iii) second post-test (four days after surgery, T2), (iv) third post-test (seven days after surgery, T3), (v) fourth post-test (one month after surgery, T4), and (vi) fifth post-test (three months after surgery, T5). Measurements of long-term outcomes, self-efficacy in pain management and quality of life, were taken at four intervals, at T0, T3, T4, and T5.

Ethical Considerations

Approval was sought from the Joint CUHK-NTEC Clinical Research Ethics Committee. Ethical considerations were based on the principles of beneficence, respect for human dignity, and confidentiality.

The Principle of Beneficence

Clinical research needs to be able to demonstrate that the benefit outweighs any risks of possible harm to the participants during intervention or data collection. A lengthy intervention or questionnaire may possibly create a certain degree of inconvenience to patients when they have sustained fracture limbs or after an operation. The researcher has considered these challenges and carefully monitored the patients' physical condition and tolerance during both data collection procedure and educational intervention. For example, the duration of C-BEI as an intervention lasted about 30 minutes and was adopted out of consideration for patients' physical tolerance. Physical stability was ensured by assessing their record of blood pressure, respiration, and pulse rate. These vital signs were maintained within the normal range without complaints of dizziness or feeling sick. Patients were able to adopt the most comfortable position during the implementation of C-BEI or data collection. The duration of data collection at baseline and post-operative points was kept at about five minutes to minimize any disturbance to the participants' rest. They were also assured that they could refuse the intervention or data collection procedure if they experienced any discomfort. All participants received the standard hospital care, which ensured that the control group was not being disadvantaged.

Respect for Human Dignity and Justice

The principle of respect for human dignity involves the right to voluntary participation or self-determination of participation in the study. Patients who met the inclusion criteria were fully informed of the overall aims of the study and their involvement in data collection. A Chinese information sheet (Appendix 21 & 5) that summarizes the essential components of the research was provided to each participant. Participants were clearly informed about the purpose and procedure of the study and the nature of group interventions, supplemented by the information sheet.

The study was totally voluntary. All patients were given time for consideration. Written consent was obtained from those who agreed to participate.

Principle of Confidentiality

When patients were invited to participate in the study, they were assured of their right to privacy and their participation was confidential and anonymous. In addition, they had the right to discontinue participation at any time they wished without affecting their normal treatment. Data would be treated as confidential. The anonymity of participants was maintained by ensuring that their names did not appear on, or were at any time attached to, the questionnaire. Participants were informed that results would be reported in such a way that no particular hospital or individual person was identifiable. Questionnaires were coded by numbers to enable identification and follow-up. The code could also be used by the participants as a method of withdrawing from the study at any time they

wanted. Data were stored in a database on the researcher's personal computer, access to which was limited only to the researcher. During the course of the research, data in document form were stored in the researcher's home office in a locked cabinet. Upon completion of the research, all questionnaires and records were secured and will be retained within a locked cabinet for ten years, before eventually being destroyed.

Data Collection Procedures

A flowchart of the procedure is summarized in Figure 5.

All patients with fractured limbs and admitted to the orthopedic and trauma ward were assessed to determine their eligibility for joining the study, and those who met the inclusion criteria were recruited for the study. All eligible patients were approached by the research assistant (RA), clearly informed about the purpose of the study and the nature of the intervention, and were also supplied with an information sheet in Chinese. Consent forms were obtained after explanation of the study objectives and clarification of all queries (Appendix 21). Participants' general condition and comfort were ensured before conducting the data collection. All consenting subjects completed all instruments at the baseline, which was normally 6–12 hours after admission but before surgery. To avoid contamination, all medical and nursing staff were blinded to the grouping and continued to provide their usual care to all patients.

By appointment, the intervention group received the first C-BEI session

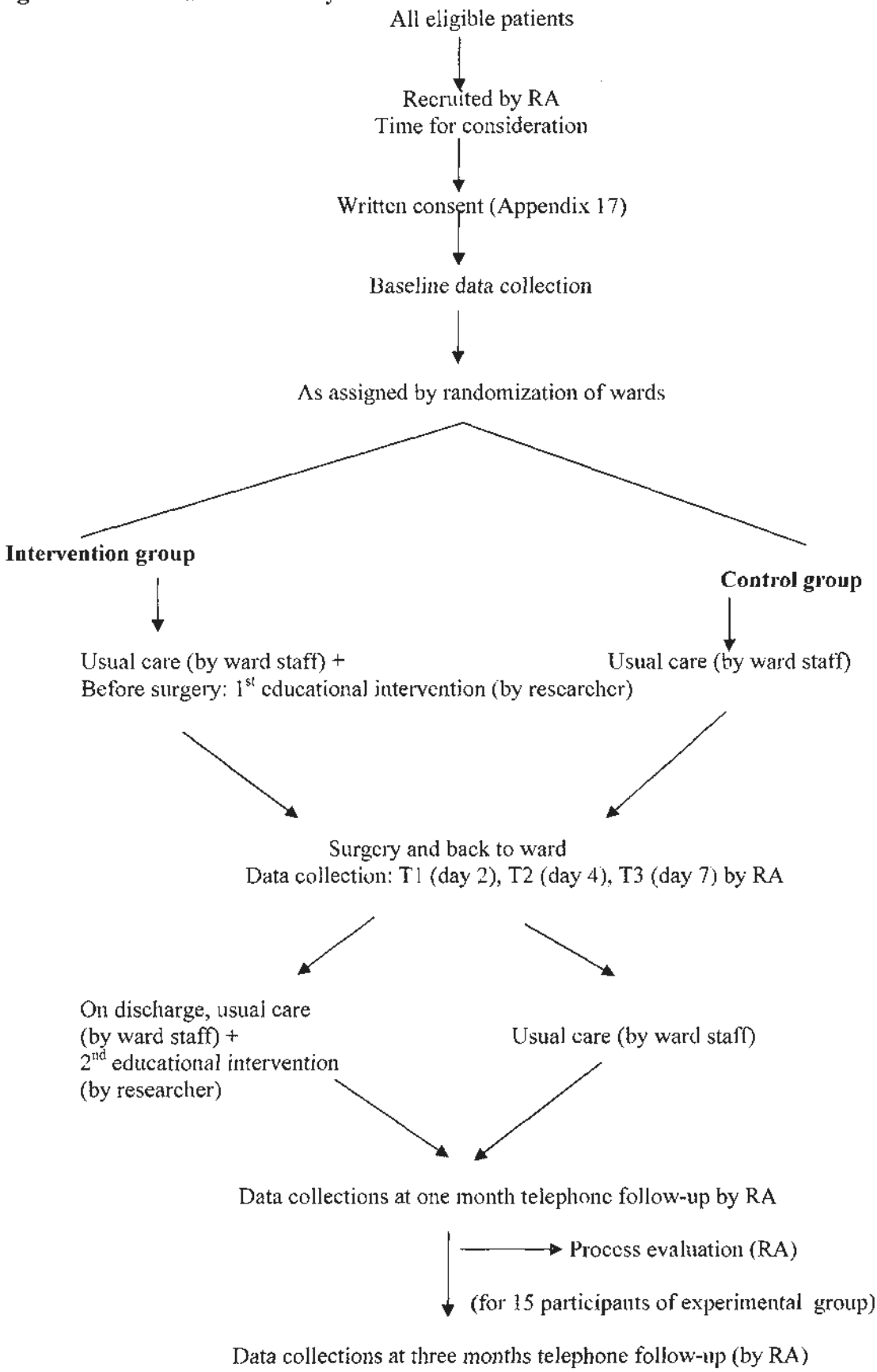
from the researcher one day before surgery. Privacy was assured by using a quiet room. The content of the second C-BEI session was the same as that of the first but with more emphasis on the reinforcement of self-pain-management at home; and an educational booklet was provided to all experimental participants before discharge. The first and second education sessions lasted 30 and 20 minutes, respectively.

Data were obtained by another RA, who was blind as to the intervention grouping. The RA collected data at T1 (day 2), T2 (day 4), T3 (day 7) after surgery. Data collection was conducted again by the RA using telephone interviews at T4 (one month) and T5 (three months) after the surgery. Questionnaires to be answered at each of these time points are summarized in the table 6. In addition, at T4, a purposive sample of 15 participants from the experimental group was invited for another telephone interview for process evaluation one month later. The details of the process evaluation are described at P. 137 of this chapter.

Table 6. Time of data collection activity

	Baseline T0	**Day 2 T1**	**Day 4 T2**	**Day 7 T3**	**1 month T4**	**3 months T5**
Demographic data	X					
Analgesic use	X	x	x	x		
Pain barrier	X			x		
Pain (VAS)	X	X	x	x	x	x
Anxiety (STAI)	X	X	x	x	x	x
Sleep satisfaction	X	X	x	x	x	x
Self-efficacy	X			x	x	x
SF-36	X				x	x
Process evaluation (for selected cases)					x	

Figure 5 Flowchart of the study



Data Analysis

The Statistical Package for Social Sciences (SPSS) software (version 15) was used for the analysis of quantitative data. The level of significance selected for this study was $\alpha = 0.05$, indicating the risk of making a type-I error was set at 5%. This study adopted an intention-to-treat analysis. First, those patients who withdrew through non-adherent with the intervention but continued to provide data were included in the analysis according to their original group. Second, those patients who did not continue to provide data at any point of the collection process would be treated under missing data. As recommended by the Cochrane Collaboration (Mulrow & Oxman, 1997), an intention-to-treat analysis should include a patient's loss of follow-up by making data adjustments.

Handling Missing Data

This study adopted an intention-to-treat analysis. First, those patients who withdrew through non-compliance with the intervention but continued to provide data were included in the analysis according to their original group. Second, those patients who did not continue to provide data at any point of the collection process would be treated under missing data. As recommended by the Cochrane Collaboration (Mulrow & Oxman, 1997), an intention-to-treat analysis should include a patient's loss of follow-up by making data adjustments. The missing continuous data (those incomplete data owing to default follow-up or loss of contact) were adjusted by assuming no change or the average change before and after the missing value as shown in that group (Engels & Diehr, 2003). Engels

and Diehr compared 14 methods of inputting missing data in longitudinal studies and concluded that the input values of missing data should be based on a person's value before and after the missing value ('last and next' method). This method takes into consideration individual differences and is therefore superior to a method that uses a group value. If the data are only available before the missing data, the input should then be based on a person's value before the missing data ('carry forward' method). In this study, most of the missing data were handled either by the last and next or by the carry forward methods. In addition, the participants in default of follow-up or who withdrew were contacted and their reasons were elicited in either case. These reasons were then analyzed and reported.

Screening and Cleaning the Data

The data screening process involved a number of steps: (1) ensuring the data have been typed into the computer file correctly. Missing data, outliers, and incorrect entries were detected and corrected by double checking of each variable against the questionnaires; (2) finding the errors in the data file. Descriptive statistics were used for data cleaning. For example, the data was again checked for errors, examining frequencies, and the range of minimum and maximum values (Pallant, 2005). This method allowed for the detection of missing data and for establishing whether the values were out of the normal range. Box plots of each outcome score also helped to identify any outliers. Any errors in the data file were corrected accordingly.

Sample Description

After data cleaning, the recruitment of participants and the attrition rate at each data collection period was examined and summarized. Baseline data were categorized into demographic, clinical and baseline measures. Frequency counts and percentages were used to summarize and describe the categorical data such as gender, educational level, financial status, employment status, and mechanism of injury. Mean and standard deviation were used to describe the continuous variables such as age, pain level, pain barrier score, anxiety level, self-efficacy level, and PCS and MCS of quality of life (SF-36).

Check for Homogeneity of the Study Groups

Inferential statistics were used to determine whether there were any significant differences between the two study groups with respect to demographic data, clinical data, and baseline measures (VAS pain level, STAI anxiety score, sleep satisfaction, pain barrier score, general self-efficacy scale, and SF-36 physical health summary (PCS) and mental health summary (MCS) components). Chi-square test/Fisher's Exact Test were used to test baseline homogeneity of the categorical variables or binary variables, such as gender, educational level, marital and employment status, and the mechanism of injury; whereas an independent t-test was used for continuous data such as age, baseline pain level, anxiety score, pain barrier score, self-efficacy score, sleep satisfaction, and baseline PCS and MCS of SF-36. The statistical assumption of equal variance between the study groups by way of an independent t-test was confirmed by Levene's test for the homogeneity of variance.

Outcomes Evaluation Data Analysis

The Use of Parametric and Non-Parametric Test

The choice of using parametric or non-parametric statistics is determined by the normal distribution of the data and the level of measurement of the variable being used (Portney & Watkins. 2000; Pallant, 2005). Normal distribution refers to the distribution of the scores on the dependent variables being 'normal' or symmetrical. Level of measurement refers to whether the data is measured on a nominal, ordinal, interval, or ratio scale. Non-parametric statistics emphasize the need for robustness, but lack the means to control the effects of covariates in the subsequent analyses. For non-normal or ordinal data, a non-parametric test was used to compare between two groups. For example, the Mann-Whitney test was used to compare two groups while Chi-Square/Fisher Exact test was used to test the binary data or compare three or more unmatched groups (Darren & Mallery, 2006). Parametric statistics have a greater power or ability to detect a difference where it actually exists. A number of studies (Zumbo & Zimmerman, 1993; Barnason, Zimmerman, Bery, Catlin, & Nieveen, 2006) have supported the view that parametric statistics are as robust as non-parametric types in the case of ordinal data, particularly if the sample size is adequate and the data are normally distributed.

The normality of the distribution of scores on all the dependent variables in this study was assessed. Both graphical and statistical methods were used. In the former case, the normality of the data was assessed by a normal probability plot (Normal Q-Q plots). A reasonably diagonal line indicated that there were no violations of the assumption of normality. For the statistical method, the

Kolomogorov-Smirnov statistic was used to compute each variable, where a non-significant result ($p > .05$) indicates normality.

In this study, the sample size was satisfactory and most of the data were distributed in a reasonably normal way. Therefore, a parametric test was chosen for most of the ordinal data, such as the visual analogue scale (VAS) of pain, STAI (State-Trait Anxiety Inventory), sleep satisfaction, general self-efficacy, and transformed scores of SF-36. Before conducting proper data analysis of parametric tests, including Pearson's product-moment coefficient, independent t–test, repeated measures ANOVA, and 2x2 between group analyses of covariance, several steps were performed beforehand to ensure reliability of the data. This covered data screening and cleaning, checks for normality and homogeneity, and tests for assumption for multivariate testing.

There are two different errors (type-I and type-II errors) that often occur in data analysis. A type-I error is possible when the researcher rejects the null hypothesis when it is true. This error may be reduced by selecting an appropriate alpha level ($p = .05$) (Darren & Mallery, 2006). Type-2 error refers to the researcher failing to reject a null hypothesis when it is in fact false. This error may be reduced by selecting an appropriate test to prove the result. The power of the test might be influenced by sample size, effect size (the strength of the difference between groups), or the influence of the independent variables and the alpha level set by the researcher.

Moreover, it is always impossible to control all extraneous variables especially for the initial difference of the individual characteristics (Polit & Beck, 2008). Some measures are adopted to increase the statistical power. First, an independent t-test was used to determine whether there was any significant

difference between the two study groups regarding the continuous variable at baseline, while Chi-square tests were used to test for baseline homogeneity of the categorical variables. If the result was not homogenous for the variable at baseline, the variable was then identified as a potential risk factor, which might have a significant impact on the outcomes. If the potential risks were identified, the analysis of covariance (ANCOVA) method would then be adopted which can be adjusted for initial differences between two groups. The final analysis could then be compared (Darren & Mallery, 2006).

Repeated Measures ANOVA

In this study, there were no initial differences in the continuous baseline variables such as pain barrier score, pain level, anxiety level, sleep satisfaction score, self-efficacy scale, and PCS and MCS of quality of life. Therefore, the repeated measures ANOVA was used to test the difference between experimental and control groups. It represents a class of statistical methods that aim at comparing a continuous outcome variable for the same patients on several occasions over time. There were Between-group and within-group measures and the two groups—the experimental group and the control group—constituted the between-group measure. Each group was measured at different time points (i.e., T0, T1, T2, T3, T4, and T5 for VAS pain level), which constituted the within-group measure. Using the repeated measure procedure, the researcher can test the null hypotheses concerning the existence of effects of both within-subject and between-subject factors (Darren & Mallery, 2006; Pallent, 2005). An F-statistic would be computed to test for a between-subject effect (i.e., differences between

experimental and control subjects). This statistic indicates whether across all time periods, the mean score differed in the experimental and control groups. Another F-statistic is computed to test for a within-subjects effect or time factor (i.e., differences at T1, T2, T3, T4, and T5). This statistic indicates whether, across both groups, the mean score differed over time. Finally, an interaction effect would be tested to determine whether there are group differences across time (Pallant, 2005). One drawback of repeated measure ANOVA is that the result do not indicate which time period is different from which period (i.e. does Time 1 is different form time 2 or do time 2 differ from time 3). Therefore post-hoc tests of pair-wise comparison (Turkey test) with Bonferroni adjustment were conducted. The post-hoc tests are designed to reduce the risk of Type I error as a result of large number of different comparisons being made. In addition, pair wise comparison such as Turkey test is good for data interpretation and appropriate in repeated measures design (Darren & Mallery, 2006).

Two-by-two between-gender analysis of covariance

Gender difference related to pain and pain barrier were always reported in the literature (Holroyd et al., 1998; Leung & Chung, 2008). A two-by-two between-group analysis of covariance was conducted to assess the effectiveness of the intervention in reducing pain for male and female participants. Educational intervention and gender were two independent variables. The dependent variable was VAS on discharge. The baseline variable (T0) VAS pain was adjusted. A similar analysis was applied to STAI and sleep satisfaction.

Two-by-two between-age group analysis of covariance

Age might affect pain response and pain barrier were always reported in literature (Holroyd et al., 1998; Leung & Chung, 2008). A two-by-two between-age group analysis of covariance was conducted to assess the effectiveness of the intervention in reducing pain for older participants (age> 65) and younger participants (<65). Educational intervention and age group were two independent variables. The dependent variable was VAS pain level at day 7. The baseline variable (T0) VAS pain was adjusted. A similar analysis was applied to STAI and sleep satisfaction.

Testing of Hypotheses

Testing of Hypothesis 1: The effect of intervention on pain barrier

The sum of the barrier score was computed at two time points (T0 and T3). An independent sample t-test was performed to detect the group difference in the sum of the barrier/belief score (0-35) at T0 and T3 to detect any changes in the participant's pain barrier relating to pain management. Levene's test for equality of variances was shown in the output box of the independent sample t-test to determine whether the data violated the assumption of equal variance or not. Assessing differences between the groups was determined by choosing an appropriate P-value. A P-value of < .05 indicates a significant difference in the mean pain barrier score.

Testing of Hypotheses 2-4: The effect of intervention on the visual analogue pain level, anxiety level, and sleep satisfaction level across seven days and across three months

The repeated measures ANOVA was used to test the group difference in VAS at six points of time: T0 (one day before surgery), and T1 (day 2), T2 (day 4), T3 (day 7), T4 (one month), and T5 (three months) after surgery. Regarding within-group measures on short- and long-term outcomes, each group was measured at four time points (T0, T1, T2, and T3) during their hospitalization, and six time points (T0, T1, T2, T3, T4, and T5) across three months. A within-subject comparison would be able to identify differential effects of the intervention (interaction effects) during hospitalization (T0 to T3) and across three months (T0 to T5). In the output generated by SPSS, both multivariate and univariate analyses can be shown.

The sum of anxiety scores (STAI) was computed at different time points. Same as above, the repeated measures ANOVA was used to test the between-group and the within-group differences in anxiety level during hospitalization (T0 to T3) and across three months (T0 to T5). Moreover, a similar analysis was done for sleep satisfaction.

Testing Hypothesis 5: The effect of intervention on the self-efficacy of pain management across three months

The repeated measures ANOVA was used to test the group difference on the self-efficacy scale at four points of time, T0, T3, T4, and T5. In this study, there were also between- and within-group comparisons as discussed in the previous section. Additionally, a Mann-Whitney U test was performed on a subscale, 4-point Likert scale of efficacy on pain management at T3 to detect the participant's self-efficacy in pain management before discharge.

Testing Hypothesis 6: The effect of intervention on health-related quality of life in terms of physical and psychological dimensions across three months

First, the data were computed and transformed according to the SF-36 User Manual (Physical & Mental Health Summary Scales: a Manual for Users of Version 1, 2001). The transformed scores were calculated in terms of a physical health summary component (PCS) and a mental health summary component (MCS) for a Chinese population (Lam et al., 2005). In addition, an independent sample t-test was run using the transformed scores of the eight dimensions to detect the difference between the experimental group and the control group.

Testing Hypothesis 7: The effect of intervention on analgesic use during hospitalization

The Fisher's exact test or Chi-square tests on the binary variable of requesting analgesics was compared between groups at T0, T1, T2, and T3. Fisher's Exact test should be used for a 2x2 table and is especially useful when the sample size and expected frequencies are less than five (Pallant, 2005). In addition, a Chi-square test was performed on a binary question on the participant's intention to use analgesics when facing more intense pain.

Testing Hypothesis 8: The effect of intervention on the length of stay during hospitalization

An independent sample t-test was performed to detect the group difference in length of stay. Levene's test for equality of variances was shown in the output box of the independent sample t-test to determine whether the data violated the assumption of equal variance or not. Assessing differences between the groups was determined by choosing an appropriate P-value. A P-value of $< .05$ indicates a significant difference in the mean scores of length of stay.

Post hoc test

One drawback of the repeated measure ANOVA is that the result only showed overall significant difference among the mean score on the dependent variable (e.g. measures across three time periods), the result do not indicate which time period is different from other period, therefore post-hoc test with

pariwise comparison was used in this study to identify which specific time period differed. Turkey's test together with Bonferroni adjustment was used to show different comparison from different time point. This Post-hoc test had the advantage of reducing the risk of type I error (a result of large number of different comparison being made in the same study). Stevens (2002) support the use of pairwise comparison, such as Turkey procedure, as they are easily interpreted and powerful and suitable in repeated measure designs if the sphericity assumption is met.

Further data analysis

Sub-group analysis

One of the aims of the study was to investigate the effect on outcomes during hospitalization. A regression procedure was run to identify the risk factor of pain or anxiety across seven days after surgery. If risk factors were identified, the whole data set was re-run using risk factors as covariates. Since the literature has frequently reported that there are differences of response among different genders and different age-groups, a comparison of genders and age-group was analyzed using Two-by-two between-gender analysis of covariance Two-by-two between-age group analysis of covariance was to examine the effect of gender or age on the effectiveness of outcomes.

The purpose of gender analysis was to find out the difference in outcomes between male and female in their responses to intervention. The purpose of age-group analysis was to find out the difference in outcomes between older people (>65) and younger people (<65) in their responses to intervention.

Relationship among outcomes after surgery

The multidimensional phenomenon of pain may affect patient's physical, affective and behavioral reaction (Melzack 2003) which results in changes in the patient's pain perception, attitude and emotion. Lazarus and Folkmans (1984) suggested that anxiety reflects tension created by a reduced cognitive ability to assign full meaning to stressful events such as injury and surgery. Carr (2000; 2005) further confirmed that anxiety level is a predictive factor for post-operative pain. In view of sleep satisfaction and pain, evidence supports that sleep disturbance is a common problem for hospitalized patients, especially after surgery characterized by wakefulness and pain (Kain & Caldwell, 2003; Gabor, 2003). In addition, studies have reported that patients' beliefs on ingesting analgesics and their reluctance to report pain were important barriers to effective pain management and consequently affect patient's pain behaviour (Chung, French & Chan, 1999; Carr, 2000; 2007; Meuser et al., 2001; Chung et al., 2003; Leung & Chung, 2008). In view of self efficacy and anxiety, Gammon & Mulholland (1996) Pellino et al (1998) supported that surgical patients undergo many physically and psychologically stressful and compromising events and patients with higher self efficacy demonstrated better coping with this stressful event and reduce their post-operative anxiety. In this study, in order to explore and confirm the relationships among outcomes variables (pain, anxiety, sleep satisfaction and pain barrier and self efficacy), a Pearson's correlation test was used to test the relationships among these variables on T3 (day 7). In addition, Multiple Regressions was conducted to investigate the variance of pain as affected by self –efficacy and pain barrier. In the regressions test, dependent variable was the day 7 VAS pain level while independent variables are Day 7 self

efficacy score and day 7 pain barrier score. Further, Multiple Regressions was conducted to investigate the variance of anxiety by the effect of self –efficacy and pain barrier. In regressions test, dependent variable was the day 7 STAI anxiety score while independent variables are Day 7 self efficacy score and day 7 pain barrier score.

Process Evaluation

Besides the evaluation of outcome-focused measurement, process evaluation was used to examine the perceived benefit and limitation of the educational intervention. It is a strategy for addressing the questions of why and how the intervention works. To understand the participants' perceptions and experience of the intervention, a telephone interview was conducted on a purposive sample of 15 patients from the experimental group one month after surgery.

The aim of the process evaluation was to collect information regarding participants' perceptions of the benefits and the perceived limitations of the educational intervention and of the components contributing to its success. Information collected from the interviews enabled the researcher to explain why and how the intervention worked. In addition, it may help the researcher to understand the strengths and limitations of C-BEI and make suggestions for further improvement in future studies.

Methodology of the Process Evaluation

An individual telephone interview was used to collect data. The rationale of adopting telephone interview is due to the consideration that the participants were not fully recovered and could not travel back for a face-to-face interview. Besides, in the pilot study, the participants refused to return for an interview, instead they agreed to have a telephone interview one month after the surgery. Pilot and Beck (2008) suggests that a telephone interview can be a convenient and feasible

method of collecting information if the interview is short and specific and the researcher has had prior personal contact with the participants.

Interview guidelines were developed to guide the researcher in conducting the interviews consistently. The interview was semi-structured using open-ended questions, which encouraged interactive involvement from the informants to promote the emergence of new ideas during the interviews (Fontana & Frey, 1998). The questions in the interview guidelines (Appendix 22) were derived from the literature dealing with process evaluation (Sidani & Braden, 1998). The telephone interviews were conducted by the RA one month after participants were discharged from the hospital. The time of data collection ensured that participants had gone through the experience of the intervention and that their memory of it was still fresh.

A purposive sample of 15 patients was recruited from the experimental group. Participants were identified from the quantitative data analysis. Pain reduction was one of the primary outcomes in this study. Five patients showing the greatest reduction in pain, moderate reduction, and little reduction during their hospitalization were respectively chosen for the telephone interview.

Data Collection

The telephone interview was conducted by the RA and the interview lasted from 25 to 35 minutes, or ended when patients believed they had exhausted their description. All conversations were audio-taped by a telephone recorder. The interview took the style of a normal conversation as directed by the interview guideline (Appendix 22), which consisted of a series of open-ended questions presented in Cantonese, asking them about pain experience during their stay,

from admission to discharge; the effect of the education program on their perceived knowledge and behavior in coping with pain; and the factors they believed were helpful in pain control. An example of the questions asked is 'Can you tell me your feelings about this educational session?'. This was followed by other questions such as 'Which part of the educational session did you regard as important?', 'In what ways did you perceive it as useful or not useful?', 'what are the factors facilitating or hindering the program's delivery?' Interviewing skills such as probing were used to encourage patients to explain or elaborate their experiences in more depth.

The RA also took written notes to document what she had heard, together with tones and mood of voice of the patients during the telephone interview to achieve a comprehensive understanding of the data. To ensure the credibility of the data, the RA reviewed the major points with each interviewee at the end of the interview, and asked if the description truly reflected the participant's experience.

Process Evaluation Data Analysis

Content analysis was used to analyze the qualitative data collected from the telephone interviews. Data were analyzed concurrently with data collection. Content analysis is a method for categorizing the content of narrative communications in a systematic and objective fashion (Sandelowski, 2000). The analysis of this study was guided by the steps suggested by Berg (2007). Interviews were transcribed verbatim. The researchers read informants' oral transcripts in order to obtain a feel for them. Each transcript was then read line-by-line again. From each transcript, significant statements and phrases or

commonalities among the data that directly pertained to the study objectives were extracted and coded. Codes were used to describe various dimensions of experiences perceived by the informants. Furthermore, the researcher condensed the codes with similar meaning and organized them into descriptive subcategories. Similar subcategories were then condensed into main categories or main themes. Translation into English was undertaken at the conclusion of the analysis (Sandelowski, 2000; Morse & Field, 1995). Appendix 23 provides an example of the process of analysis and provides an illustration of how categories and themes were generated from the verbatim transcription.

In order to ensure the consistency, neutrality, and credibility of the data, several measures were adopted. First, an interview guide was used to maintain the consistency of the interview process itself. Second, only one RA did all the interviews. She was trained to do the telephone interview and was asked not to have any preconceived beliefs and opinion about the patients' pain or feeling (Bracketing). Bracketing refers to a process of identifying and holding in abeyance any preconceived beliefs and opinions about the phenomenon under study (Polit & Beck, 2008). By the above measures, the consistency and neutrality was maintained (Lincolin & Guba, 1985). Third, the researcher and one supervisor who is familiar with qualitative research and content analysis, analyzed the transcripts independently to identify significant statements and did their own separate coding. Bracketing was also applied during data analysis. The transcribed information was read and re-read. Tapes were listened to several times and checked against the verbatim transcript. Both researcher and supervisor developed categorization schemes independently. The main categories were then compared. If similar categories and subcategories were identified, there was a

strong possibility that the original categorical system had "credibility" (Lincolin & Guba, 1985). There were minor differences among the interpretations of meaning by the researcher and the supervisor, which were mainly related to their choice of words. These were discussed until a consensus was reached.

Summary

This chapter presented the methodology of the main study. The methods used for outcomes evaluation, aims, objectives, and hypotheses, and rationale for choosing the design, sampling, and measures adopted at the outcomes and process evaluation were described and discussed.

Data analysis was performed by the outcomes evaluation and the process evaluation. For the outcomes evaluation, the repeated measures ANOVA was used to test the outcomes of pain level, anxiety, sleep satisfaction, self-efficacy, and quality of life during hospitalization (T0 to T3) and across three months (T0 to T5). The independent t- test was used to detect the group difference for continuous variables such as pain barrier score and length of stay at T3. The non-parametric test such as the Chi-square test was used to test the group difference for variables (analgesic use), while the Mann Whitney test was used to detect the between-group difference for the subscale analysis of the self-efficacy of pain management.

For the process evaluation, an individual semi-structured telephone interview was used to collect data, and content analysis was used for data analysis.

CHAPTER 6 - RESULTS

Introduction

This chapter presents the results of the main study, which examines the effectiveness of a tailor-made cognitive-behavioral educational intervention (C-BEI) on patients who undergo surgery for limb fractures during hospitalization (T0 to T3) across three months (T0 to T5).

The chapter consists of three sections. The first section describes the recruitment of participants and the general characteristics in terms of demographic, clinical, and baseline outcome variables between intervention and control groups. The second section presents the results of the statistical analyses undertaken to test the hypotheses. The short-term outcomes on level of pain (Visual Analogue Pain Scale, VAS), level of anxiety (State-Trait Anxiety Inventory, STAI), sleep satisfaction, pain barrier scale, frequency of analgesic use, and self-efficacy in pain management were evaluated. These variables were measured at T0 (1 day before surgery), and T1 (day 2), T2 (day 4), and T3 (day 7) after surgery. The total length of stay in hospital was also compared between the two groups. Long-term outcomes, including pain, anxiety, sleep satisfaction and health-related quality of life (SF36), were evaluated across three months, and were measured at T0, T4 (one month) and T5 (three months) after surgery. The findings are presented to cover both short-term (across seven days) and

long-term (across three months) so as to grasp the whole picture and interpret the effects of the C-BEI on patients during their stay in the acute hospital and during their rehabilitation period afterwards.

The Characteristics of Participants

Subject Recruitment

Data collection lasted for 16 months, from November 2005 to March 2007. Two hundred and twenty-six patients with limb fractures were assessed for eligibility. Forty-six (20%) did not meet the eligibility criteria, mainly because they had emergency operations during the night (9 pm to 9 am) when the researcher was unavailable (n=16); operations were cancelled (n=10) or patients were found to suffer from other serious conditions such as rib fractures, multiple fractures, or head injuries (n=20). Forty patients (18%) refused to participate because they were not interested in the study, or because they asserted that they were too tired or not well enough to take part. Eventually 140 eligible patients agreed to participate and 125 completed the intervention. The reasons for the drop-out before the intervention in the experimental group were: (i) haemodynamic instability (blood pressure lower than the normal range) barring attendance at the C-BEI (n=2), (ii) pending operations were cancelled (n=3), and (iii) participants transferring to emergency

operations or other units before attending the C-BEI (n=3). The reasons for the drop-out rate in the control group were similar. Pending operations were cancelled because it was decided to use an alternative non-surgical approach to treatment (n=4) and three patients transferred to other units or private hospitals for surgery.

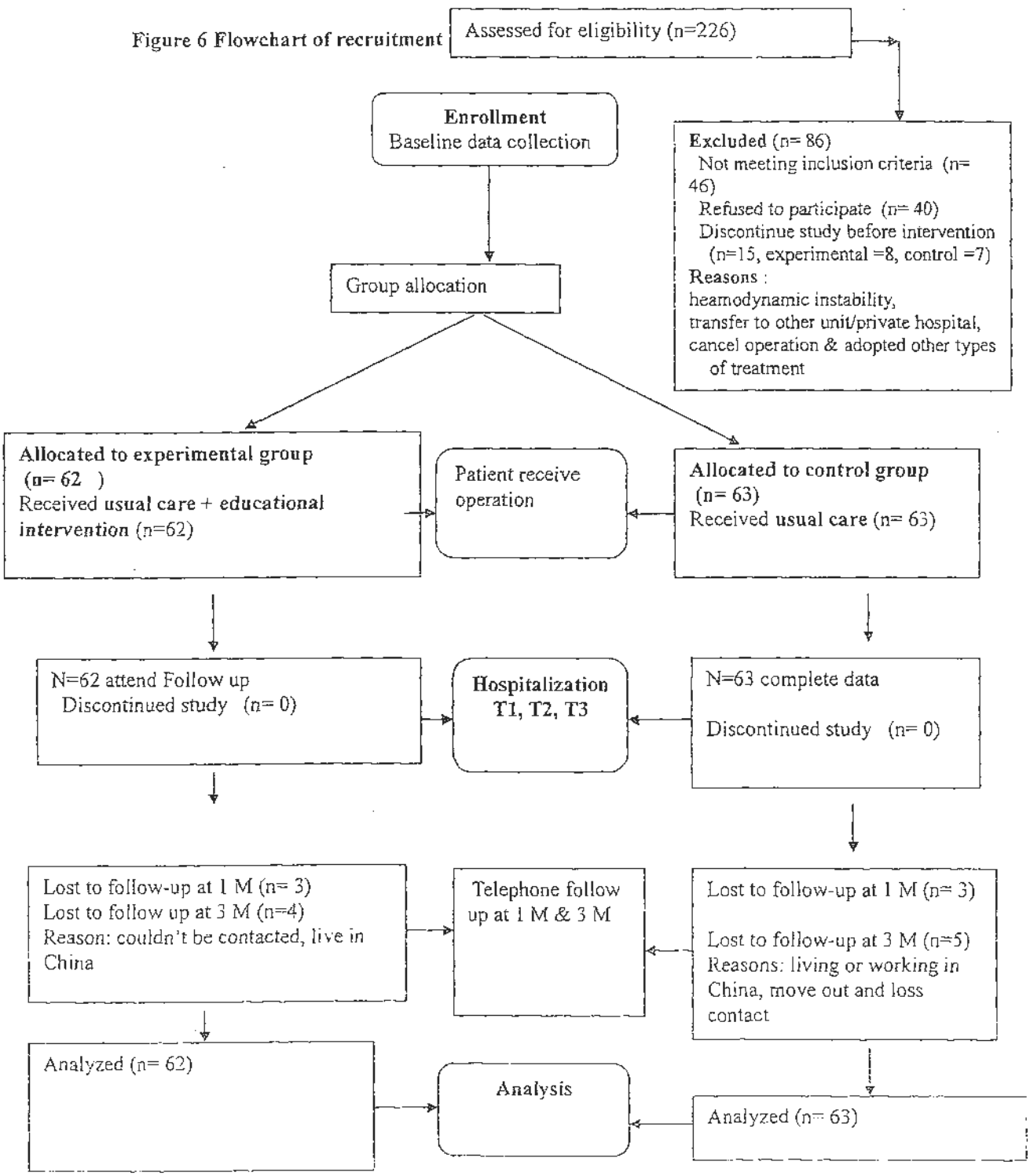
Attrition Rate

The baseline data were collected from 125 Chinese limb-fractured patients who agreed to participate in the study. All 125 participants completed the data collection during hospitalization. A total of six participants could not be contacted for follow up at one month and eight participants could not be contacted for follow up at three months. The drop out rate was 4.8% at one month and 7.2% at three months. There was no significant difference between the experimental group and control group in term of numbers and the reasons for drop-out were similar. The reasons for drop-out included 'moved out to nursing home', 'lived or worked in China', and 'lost contact'. Comparison was done between the patients who completed the study and who dropped out in term of baseline characteristic, demographic and clinical characteristic; there were no significant difference between them.

Figure 6 presents a flowchart of recruitment. Data analysis was performed using the intention to treat method. The missing continuous data (incomplete data caused by missing follow-up or loss of contact) were adjusted by the average change

before and after the missing value or by the carrying-forward method. A recruitment status flowchart is shown as follows.

Figure 6 Flowchart of recruitment



Baseline Characteristics of the Participants

Of 125 participants, the majority of participants were male (68 %), married (79%), full-time employed (47 %), received secondary-school education (52%), with a mean hospitalization of 8.96 days. All participants had single-limb fractures and their operations involved internal fixation with nail, pin, and plate. There were no significant different in injury type indicating similar severity of fracture. There was no significant different between groups in term of injury sites as well although 26% of patients suffered from upper limb injury and 74 % of patients suffered from lower limb injury. The reasons for sustained injury were mainly falls (62%), vehicle accidents (10%), or sports injuries (10%).

Chi-square tests were used to detect differences in demographic and clinical variables such as gender, marital status, education level, and mechanism of injury. A t-test was performed on continuous variables such as age and other outcome variables. Normal Q-Q plots and Kolomogorov-Smirnow statistics were used to check the distribution of continuous data before analysis by t- test. All variables were distributed in a reasonably normal way as presented in Normal Q-Q plots or Kolomogorov-Smirnow statistics. T-tests were used to detect differences at T0 (one day before surgery) in pain barrier, pain VAS, anxiety, sleep satisfaction, and self-efficacy and SF36 scores. The results showed that there were no statistically significant differences in demographic characteristics (age, gender, marital status, religion, education level, and employment status), clinical characteristic (injury site

and mechanism of injury) and baseline outcome measures (pain VAS, STAI, sleep satisfaction, pain barriers, general self-efficacy, PCS of SF36, and MCS of SF36) between the experimental group and control group. Tables 7 and 8 summarize the findings. Table 7 shows the baseline outcome variables of participants groups while Table 8 shows the demographic and clinical characteristics of the participants,

Table 7. Baseline outcome measures for participants

Baseline measures	**All participants**	**Experimental N=62 Mean (SD)**	**Control N=63 Mean (SD)**	***p* value (t test)**	***t* value**	***95% Confident interval of the difference***
Pain barrier (0-35)	15.97 (5.45)	15.97 (5.65)	15.98 (5.27)	.99	-.017	-1.95 to 1.92
Pain VAS (0-100)	59(18.8)	56.7 (13)	61.1 (23)	.2	-1.1	-11.0 to 2.3
STAI (20-80)	53.06 (13.6)	50.82 (10.9)	55.27 (15.6)	.07	-1.84	-9.23 to .33
Sleep satisfaction (1-6)	2.63 (1.2)	2.74 (1.19)	2.52 (1.23)	.32	.48	-.21 to .64
Self-efficacy (11-44)	26.17 (6.57)	26.45 (6.7)	25.9 (6.4)	.88	-.16	-1.85 to 2.66
PCS (0-100)	49.3 (12.84)	49.23 (12.34)	49.39 (13.42)	.95	-3.02	-4.72 to 4.41
MCS (0-100)	52.7 (7.32)	52.83(6.78)	52.62 (7.87)	.88	-.009	-2.40 to 2.81

Table 8. Demographic and clinical characteristics of participants

participants	All N=125 n(%)	Experimental (C-BEI) N=62 n (%)	Control N=63 n(%)	p *
Age Mean (SD)	54.4 (18)	51.69 (17.09)	57.08 (18.6)	.095*
Gender				
Male	68 (54.4%)	31(50%)	37(58.7%)	.1 #
Female	57 (45.6 %)	31(50%)	26(41.3%)	
Marital status				.63 #
Married	99 (79.2%)	49 (79.0%)	50(79.4%)	
Single	26 20.8 %)	13 (20.9%)	13(20.6%)	
Financial status				.44 #
Good	10 (8%)	4 (6.5%)	6(9.5%)	
Average	99 (79.2%)	52 (83.9%)	47(74.6%)	
Poor	16 (12.8%)	6 (9.7%)	10(15.9%)	
Religion				.42 #
Yes	20 (16%)	9(14.5%)	11(17.5%)	
No	105 (84%)	53(85.5%)	52(82.5%)	
Education level				.24 #
Less than Primary	29 (23.2%)	10(16.1%)	19(30.2%)	
Primary level	26 (20.8%)	13(21.0%)	13(20.6%)	
Secondary level	65 (52%)	37(59.7%)	28(44.4%)	
University level or above	5 (4%)	2(3.2%)	3(4.8%)	
Employment status				.095 #
Employed	59 (47.2%)	39(62.9%)	28(44.5%)	
Retired	39 (31.2%)	13(21.0%)	26(41.3%)	
Unemployed	3 (2.4%)	2(3.2%)	1(1.6%)	
Employed	59 (47.2%)	39(62.9%)	28(44.5%)	
Others	16 (12.8%)	8(12.9%)	8(12.6%)	
Injury type				.69 #
MVA (motor vehicle accident)	13 (10.4%)	5(8.1%)	8(12.7%)	
Industrial	11 (8.8%)	4(6.5%)	7(11.1%)	
Sport	16 (12.8%)	9(14.5%)	7(11.1%)	
Fall	78 (62.4%)	42(67.9%	36(57.2%)	
Others	6(4.8%)	2(3.2%)	4(6.3%)	
Injury site N (%)				
Upper limb	32 (26)	15(12)	17 (13.6)	.44#
Lower limb	93(74)	47(37.6)	46(36.8)	

*** by two independent t-test # by χ^2 test**

Testing of Hypotheses

Testing of Hypothesis 1 : The effect of intervention on pain barrier during hospitalization

An independent sample t-test was conducted to compare the pain barrier score for the experimental and control groups. There was no significant difference between experimental and control groups at T0 (pre-surgery). In T3 (day 7 after surgery), there was significant difference in pain barrier score for the experimental group with the mean (M) =11.98, SD=14.92) and control group (M=14.95, SD =5.69); t (123) =-3.04, p=.003). The magnitude of the difference in the means was moderate (eta squared=.07). Table 9 shows the result in detail.

Chi-square test was performed on a binary variable about participants' attitudes towards intention to use analgesics when facing further severe pain. There was no significant difference between the experimental and control groups. In a post-test at day 7, the experimental group had a statistically higher frequency of taking stronger analgesics if they had further severe pain, p= <.001. Table 10 shows the results in detail.

In summary, participants of the experimental group had statistically less pain barrier score during hospitalization and statistically higher intention to request stronger analgesic when faced with strong pain. Therefore, Hypothesis 1 was supported.

Table 9. The results of t-test of pain barrier score

	Experimental group Mean (SD)	**Control group Mean (SD)**	**P value**	***t* value**	***95% Confident interval of the difference***
T0(Prc-surgery) 0-35	15.97 (5.65)	15.98 (5.27)	.987	-.017	-1.95 to 1.92
T3 (day 7)	11.98 (5.2)	14.95 (5.69)	.003	-3.04	-4.9 to -1.03

Table 10. Results of X2 test on participants' attitude to stronger analgesic

		Experimental group n=62 Number (%)	**Control group n=62 Number (%)**	**P value (X^2 test)**
Pretest (baseline) Will take stronger analgesic if necessary	Yes	40 (32.3%)	38 (30.6%)	.43
	No	22 (17.7%)	24 (19.4%)	
Posttest (D7) Will take stronger analgesic if necessary	Yes	55 (44%)	35 (28.6%)	<.001
	No	7 (5.6%)	27 (21.8)	

Testing of Hypothesis 2 : The effect of intervention on the visual analogue pain level across seven days and across three months

The level of pain as measured by VAS was measured at T0 (pre-surgery), T1 (day 2), T2 (day 4), T3 (day 7), T4 (one month) and T5 (three months) after surgery. The VAS pain level with zero being 'no pain' and 100 being 'most intense pain'

Repeated measure ANOVA was used to test the group difference of VAS for short term during hospitalization at four time points: T0 (pre-surgery) , T1 (day 2) , T2 (day 4) and T3 (day 7) as well as longer-term effect at six further times: T0, T1, T2, T3, T4 (one month), and T5 (three months) after surgery as perceived by the participants. The mean scores of experimental groups from T0 (pre-surgery) to T5 (three months) were 55.8, 46.0, 29.8, 22.7, 32.7, and 19 while the mean scores were 61.1, 54.1, 42.7, 30.8, 32.7, and 17.9 for the control group.

From the analysis, the Mauchly test of sphericity was significant (p <.001), indicating that these data violate the assumption of the univariate approach to repeated measures of variance. Wilks's Lambda was suggested for report (Pallant, 2003). Regarding VAS pain during hospitalization (T0 (pre-surgery) to T3 (day 7), the two groups differed significantly on VAS across time from T0 to T3 (F (1, 123) = 9.46, p= .003).

Within-subject tests showed a significant time effect (F (3, 121) = 5.43,

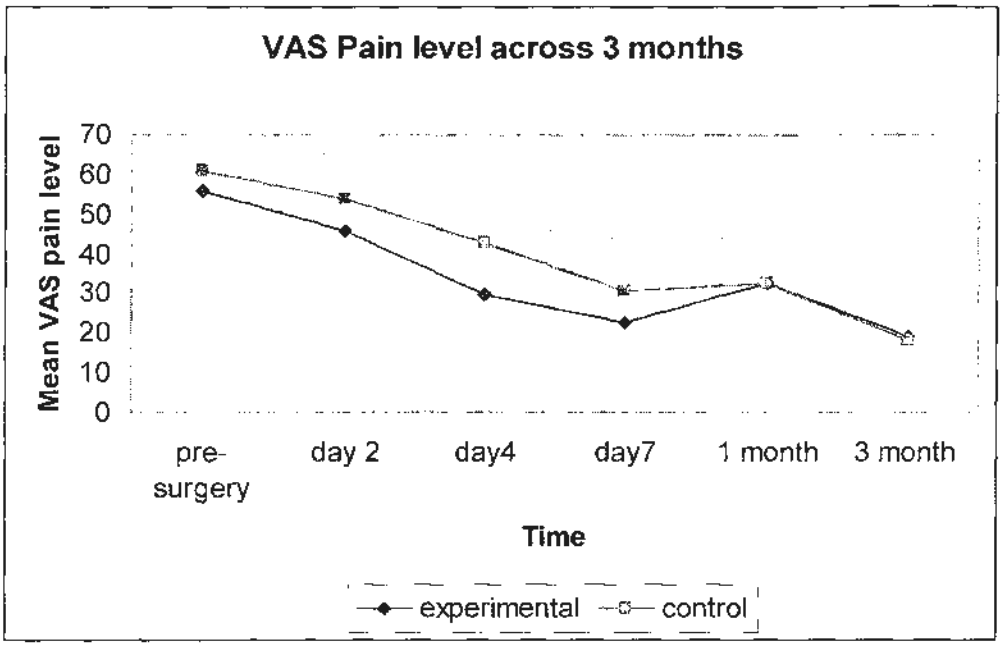
P= .002) indicating a significant time effect for both groups. The change in VAS over time between both groups was significantly different, with an interaction effect of (F (3, 121) = 4.17, P= 0.008).

When the outcome across three months (T0 to T5) was examined, the results were not consistent with the short-term effect (T0 to T3), with VAS decreasing in both groups from T1 to T5 with a significant time effect (F (5, 119) =132.3, p <0.001) and also a non-significant interaction effect between the experimental and control groups F (5,119) =1.25, p= .29. Further, there was no significant difference between the experimental and control groups with between-subject effect, F (1,123) = 2.26, p = .14.

Post hoc test with Turkey test and pairwise comparison was performed to find out which time slots showed significant impact by the educational intervention. The results reviewed that the interaction effect was maximum at day 4 and day 7 for the experimental group.

In summary, participants of the experimental group had statistically less pain during hospitalization from T0 (pre-surgery) to T3 (day 7), but there was no significant difference between the experimental and control groups across three months from T0 (pre-surgery) to T5 (three months) after surgery. Therefore Hypothesis 2 was partially supported for short term only.

Figure 7 VAS pain level across 3 months



Testing of Hypothesis 3 : The effect of intervention on the anxiety level across seven days and across three months

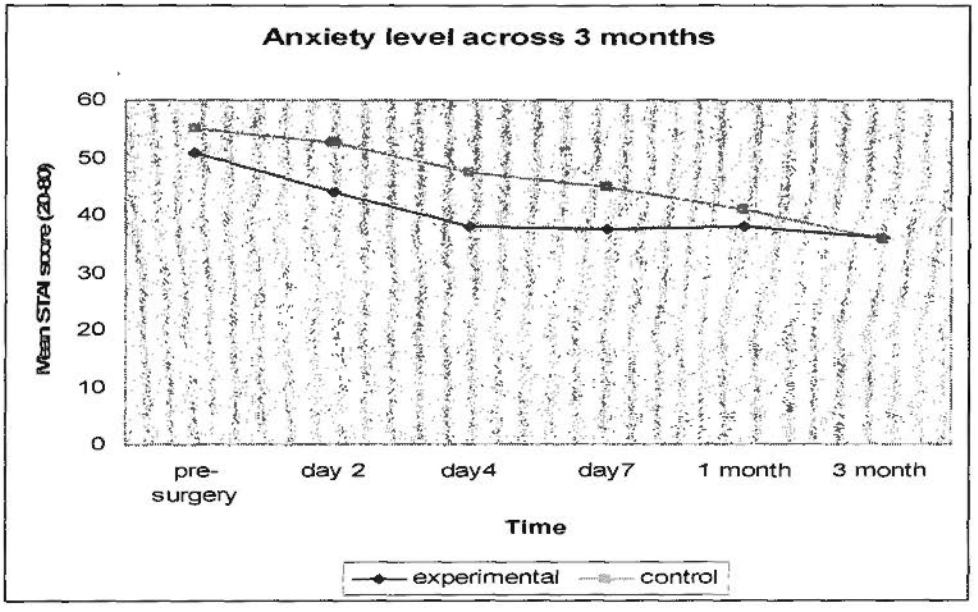
The level of anxiety as measured by STAI was measured at T0 (pre-surgery), T1 (day 2), T2 (day 4), T3 (day 7), T4 (one month) and T5 (three months) after surgery. The total score of STAI ranged from 20 (no anxiety) to 80 (highest anxiety). Figure 8 shows the pattern of change or anxiety of each study group across time. Repeated measure ANOVA was used to test the group difference of the anxiety score for short-term outcomes during hospitalization at four points of time: T0 (pre-surgery), T1 (day 2), T2 (day 4) and T3 (day 7), as well as longer-term effect at six time points: T0, T1, T2, T3, T4 (one month), and T5 (three months) as perceived by the participants. The mean STAI from T0 to T5 for the experimental group were 50.82, 43.97, 38.1, and 37.65, 37.89 and 36.14 while the mean score of STAI for the control group were 55.27, 52.44, 47.38, 44.87, 40.89 and 35.71 respectively.

Regarding STAI outcomes during hospitalization T0 (pre-surgery) to T3 (day 7), the two groups differed significantly on STAI across time from T0 to T3, $F(1, 123) = 12.9$, $p = <.001$. The within-subject effect showed a significant difference with time effect ($F(3,121) = 8.9$, $p = <.001$) and interaction effect ($F(3, 121) = 25.8$, $p < .001$).

Regarding the STAI outcome across three months (T0 to T5), the results were consistent with the short-term effect (T0 to T3), with STAI decreasing in both groups from T1 to T5 with a significant time effect (F (5, 119) =71.19, p <.001), and also a significant interaction effect (F (5,119) =3.1, p=.011) between the experimental and control groups. The standard effect size (partial eta square) was .074 and observed power was .87. The results reviewed the moderate effect size of the STAI outcomes. Further, the between-subjects effect was F (1,123) =9.79, p= .002, showing a significant difference between the experimental and control groups. Post hoc test with Turkey test and pair wise comparison was performed to find out which time slots showed significant impact by the educational intervention. The results reviewed that the interaction effect was maximum at day 2, day 4 and day 7 for the experimental group.

In summary, participants of the experimental group had statistically less anxiety during hospitalization from T0 (pre-surgery) to T3 (day 7) and across three months from T0 (pre-surgery) to T5 (three months) after surgery. Thus, Hypothesis 3 was supported.

Figure 8. STAI outcomes across three months



Testing of Hypothesis 4 : The effect of intervention on the sleep satisfaction level across seven days and across three months

The sleep satisfaction as measured by a 6-point Likert scale was used at T0 (pre-surgery), T1 (day 2), T2 (day 4), T3 (day 7), T4 (one month) and T5 (three months) after surgery. The scale of 1 indicates 'least satisfied with sleep' and 6 indicate 'extremely satisfied with sleep. The mean scores of sleep satisfaction of the experimental group from T0 (pre-surgery) to T5 (three months) were 2.82, 3.52, 4.34, 4.26, 4.71, and 4.84 for the experimental group while the mean scores were 2.54, 3.11, 3.43 , 3.84 .4.52, and 4.7 for the control group.

Repeated measure ANOVA was used to test the group difference of sleep satisfaction for short-term outcomes at four points of time: T0 (pre-surgery), T1 (day 2) , T2 (day 4) and T3 (day 7), as well as longer-term effect at six further points: T0, T1, T2, T3, T4 (one month), and T5 (three months) as perceived by the participants. Figure 9 shows the pattern of change or sleep satisfaction of each study group across time. Both groups experienced increased sleep satisfaction over time. However, the experimental group experienced better sleep satisfaction over time when compared with the control group.

Across seven days, the within-group effect on the sleep-satisfaction outcome showed that sleep satisfaction increased in both groups from T0 to T3 with time

effect, F(3,121) =54.9, $p < .001$; the interaction effect was F(3, 121) =3.85, $p = .011$, indicating that the change in sleep satisfaction across seven days in both groups was significantly different. There were also significant group differences between the experimental and control groups in between-subject effects, F (1,123) =10.88, $p= .001$.

Across three months, sleep satisfaction increased in both groups from T1 to T5 with significant time effect (F (5, 119) =71.19, $p < .001$). In addition, there was also significant difference in the within-group and between-group comparison with the interaction effect (F (5, 119) =3.1, $p= .011$) and between-group effect (F (1, 123) =9.79, $p = .002$), respectively. The standard effect size (partial eta square) was .079. It was also noted that there was a slight decline in sleep satisfaction (with the mean score falling from 4.34 to 4.26 between T2 (day 4) and T3 (day 7) for the experimental group. Post hoc test with Turkey test and pairwise comparison was performed to find out which time slots are influenced by the educational intervention. The results reviewed that the interaction effect was maximum at day 4 and day 7 for the experimental group.

In summary, participants of the experimental group had statistically better sleep satisfaction during hospitalization from T0 (pre-surgery) to T3 (day 7) after surgery and across three months (from T0 to T5, three months) after surgery. Thus,

Hypothesis 4 was supported.

Figure 9 Sleep satisfaction outcomes across three months

Testing of Hypothesis 5: The effect of intervention on the self-efficacy of pain management across three months

The level of self-efficacy as measured by General Self-efficacy (GES) was measured at T0 (pre-surgery), T3 (day 7), T4 (one month) and T5 (three months) after surgery. The sum of GES ranged from 11 to 44, with 11 as 'worst self-efficacy' and 44 'highest self-efficacy. The mean scores of GES at T0, T3, T4 and T5 were 26.45, 27.05, 27.34, and 28.44 for the experimental group while the mean scores were 25.89, 25.50, 25.44 and 25.94 for the control group.

Repeated measure ANOVA was used to test the within-group and between-group difference in general self-efficacy across three months at four points: T0 (pre-surgery) , T3 (day 7) , T4 (one month) and T5 (three months). Figure 10 shows the pattern of change of self-efficacy of each study group across time. Both groups experienced increased self-efficacy over time.

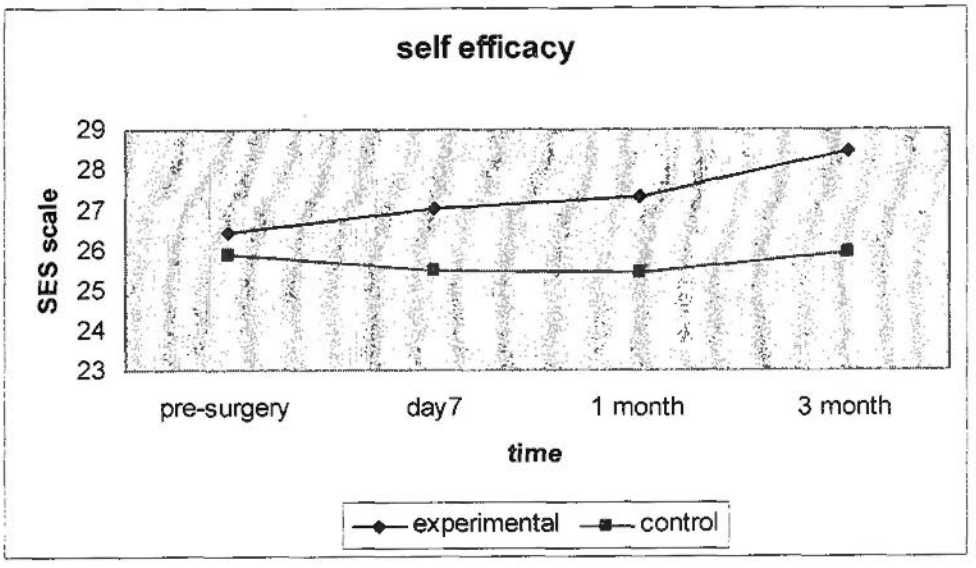
In the between-group comparison, there were significant group differences between the experimental and control groups, F (1,123) =4.25, p =0.048. The experimental group experienced increased self-efficacy over time, while the control group experienced decreased self-efficacy from T0 to T4 (one month) and then started to increase from T4 to T5. .

In the within-group comparison, there was no significant difference between the experimental and control groups across time (F (3, 121) =1.33, p =.27) and interaction effect was (F (3,121) =.81, p = .49), also indicating no intervention effect on the self-efficacy scale.

The Mann-Whitney U test was used to check the group difference on an extra item of a 4-point Likert scale for self-efficacy in pain management at T3 (day 7), T4 (one month) and T5 (three months), and only T3 (day 7) and showed a significant difference between groups. The experimental group had a statistically higher score on self-efficacy in pain management at T3 (day 7) with p =.011.

In summary, although participants of the experimental group had statistically higher self-efficacy at T3 (day 7) as evidenced by the Mann-Whitney test, there was no significant difference (no interaction effect) between the experimental and control groups across three months from T0 (pre-surgery) to T5 (three months) after surgery. Therefore Hypothesis 5 was not supported.

Figure 10. General self-efficacy (GSE) scales across three months



Testing of Hypothesis 6: The effect of intervention on health-related quality of life in terms of physical and psychological dimensions across three months

The data were computed and transformed according to the SF36 User Manual (Physical & Mental Health Summary Scales: a Manual for Users of Version 1, 2001). The transformed scores were calculated in terms of a physical health summary component (PCS) and a mental health summary component (MCS) for a Chinese population (Lam et al., 2005).

In addition, an independent sample t- test was run using transformed scores of eight dimensions to detect the difference between the experimental group and the control group. Table 11 below shows the mean scores of the eight dimensions of SF36, and the t-test also revealed no difference between groups. Table 12 shows the mean scores of PCS and MCS in detail.

Figure 11 Physical health component summary (PCS) across 3 months

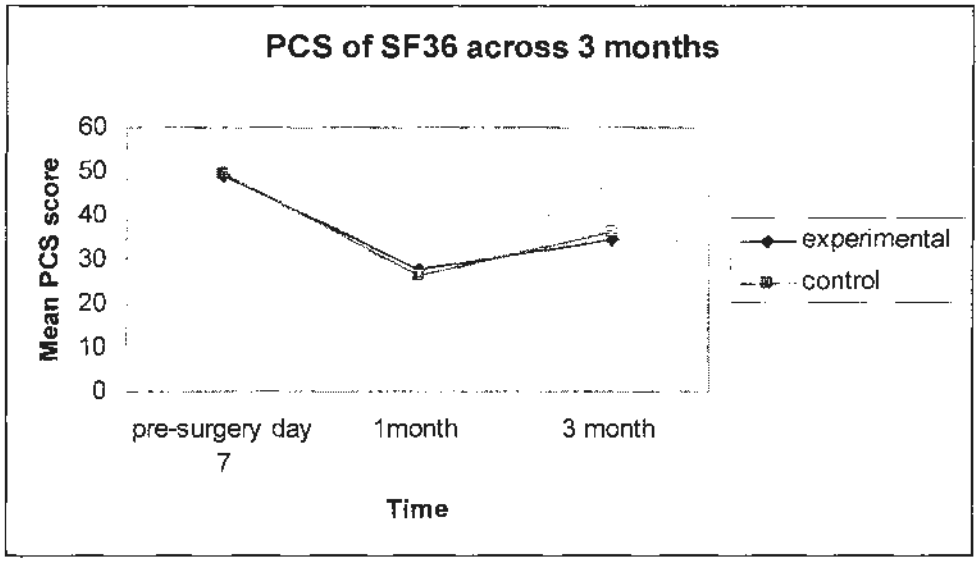


Figure 12. Mental health component summary (MCS) across 3 months

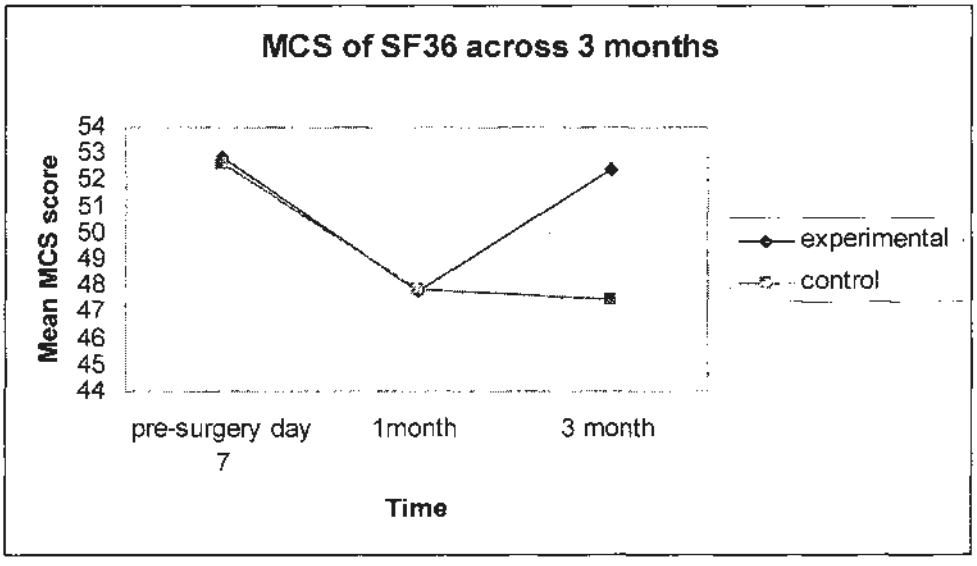


Table 11 Mean score of eight dimensions of SF 36

	T0	T4	T5	*p* value T test at T5
	Mean (SD)	Mean (SD)	Mean (SD)	
Physical Functioning				
Experimental	83.28(27.85)	41.39(28.46)	61.97(25.89)	.35
Control	87.94(27.67)	44.13(28.59)	56.03(28.43)	
Role Physical				.95
Experimental	87.30(32.48)	11.07(34.32)	46.31(51.61)	
Control	86.90(31.39)	20.24(38.85)	32.94(45.53)	
Bodily Pain				.33
Experimental	89.59(16.69)	62.03(25.28)	75.81(23.08)	
Control	92.82(19.67)	66.62(28.23)	74.89(25.97)	
General Health				.76
Experimental	59.16(20.20)	58.62(20.86)	60.77(18.51)	
Control	60.27(20.09)	57.03(18.67)	57.35(19.35)	
Vitality				.57
Experimental	64.75(14.45)	65.16(20.23)	68.93(16.41)	
Control	66.19(13.64)	61.83(14.57)	65.32(21.21)	
Social Functioning				.47
Experimental	89.14(18.33)	45.08(27.70)	66.39(29.01)	
Control	87.50(15.06)	55.36(29.50)	55.75(32.13)	
Role Emotional				.58
Experimental	92.90(23.66)	49.73(52.22)	71.04(103.54)	
Control	89.42(29.22)	47.09(45.45)	58.73(47.03)	
Mental Health				.72
Experimental	71.21(14.01)	69.90(21.98)	72.79(16.55)	
Control	72.13(14.21)	68.51(15.47)	72.63(18.96)	

Repeated measure ANOVA was used to test the within-group and between-group differences of PCS and MCS across three months at three points: T0 (pre-surgery), T4 (one month) and T5 (three months). In the between-subjects effect, there were no significant group differences between intervention and control groups in terms of PCS and MCS components.

Physical health summary component

In the between-subjects effect, there was no significant difference on physical health between the experimental and control groups ($F(1,124) = 1.68$, $p = .2$) across three months. In respect of the within-subject effect test with main effect for time ($F(2,122) = 11.9$, $p < .001$), both groups improved in the PCS across the three months but with no interaction effect ($F(2, 122) = 1.72$, $p = .18$).

Mental health summary component

In the between-subjects effect, there was no significant difference, $F(1,124) = 1.68$ $P < .2$, while the within-subject effect indicated significant difference in time effect, $F(2,122) = 11.9$, $p < .001$, but no interaction effect: $F(2, 122) = 1.72$, $p = .18$; the finding indicates that both groups improved the MCS across time although the MCS of the experimental group had a better score than the control group at T5 (52.4

VS 47.6). The mean scores of PCS and MCS are summarized in Table 12

Table 12 Mean scores of PCS and MCS of SF 36 at T0, T4, and T 5

Variables	Experimental group Mean (SD)	Control group Mean (SD)	*p* value T test at T5	*95% confident Interval of the difference*
T0 PCS	49.23 (12.3)	49.38 (13.53)	.95	-4.72 to 4.40
T4 PCS	27.95 (12.44)	26.23 (14.42)	.48	-3.10 to 6.41
T5 PCS	34.69 (13.71)	36.17 (14.19)	.56	-6.64 to 3.24
T0 MCS	52.83 (6.78)	52.83 (7.77)	.99	-2.40 to 2.81
T4 MCS	47.86 (9.43)	47.86 (10.71)	.98	-3.49 to 3.64
T5 MCS	52.4 (15.32)	47.57 (14.22)	.06	-.32 to 10.11

Testing of Hypothesis7 : The effect of intervention on analgesic use during hospitalization

The Fisher's exact test on the binary variable of requesting analgesics was compared between groups at T0 (pre-surgery), T1 (day 2), T2 (day 4), and T3 (day 7). From surgery up to day 2 after surgery, an intramuscular (IMI) analgesic was provided on request. From day 3, an oral analgesic was provided four times a day as routine. The patient's behavior in respect of analgesic use was reflected by the frequency of IMI requests. There was no significant difference for both groups at T0, T2, and T3 (Chi-square test, P value ranges from .1 to .3). However, at T1 (two days after surgery), there was a significant difference between groups (Chi-square test, $p < .001$), the experimental group made more requests for IMI of analgesic than the control group.

Testing Hypothesis 8: The effect of intervention on the length of stay during hospitalization

An independent t-test was performed to assess the group difference in length of stay. There were no significant differences in length of stay (t, -1.58, p =.12) between the experimental and control groups, although the result favored the former. The mean length of stay of the experimental and control groups was 8.1 days (SD 5.8) and 10.1 days (7.3), and the median length of stay of the experimental and control group was seven days and eight days, respectively. Two participants in the experimental group and 11 in the control group extended their length of stay in another rehabilitation hospital for further care. The median length of stay of these 13 patients in the rehabilitation unit was 20 days.

Table 13 summarized the means (SD) of outcome variables and P value between the experimental and control groups across 7 days while table 14 showed the means of outcomes variables and P value between the experimental and control groups across three months.

Table 13. All outcomes measured across seven days

Outcomes Mean (SD)	Experimental group N=62				Control group N=63				
	T0	T1	T2	T3	T0	T1	T2	T3	*p* value
Pain VAS (0-100)	55.8 (1.3)	46.00 (21)	29.8 (18)	22.7 (17)	61.10 (23)	54.10 (21.2)	42.70 (20.4)	30.8 (21.2)	.003*
STAI (40-80)	50.82 (10.9)	43.97 (8.8)	38.10 (8.6)	37.65 (7.42)	55.27 (15.63)	52.44 (17.34)	47.38 (14.96)	44.87 (14.53)	<.001*
Sleep satisfaction (1-6)	2.82 (1.27)	3.52 (1.14)	4.34 (.87)	4.26 (1.01)	2.54 (1.33)	3.11 (1.32)	3.43 (1.07)	3.84 (1.0)	<0.001*
Pain barrier (0-35)	15.97 (5.65)			11.98 (5.2)	15.98 (5.27)			14.95 (5.69)	.003t
Self-efficacy (11-44)	26.45 (6.7)			27.05 (5.4)	25.89 (6.38)			25.50 (5.37)	.32*
Pain efficacy (1-4)	2.63 (0.75)			3.34 (0.83)	2.65 (0.79)			2.91 (0.69)	.011 @

TO = 1 day before surgery, T1= day 2, T2=day 4, T3=day 7, * Repeated measure ANOVA
@ Mann Whitney U test *t-test* Significant at $p<.05$

Table 14. All outcomes measured across three months

Outcomes Mean (SD)	Experimental group N=62						Control group N=63						
	T0	T1	T2	T3	T4	T5	T0	T1	T2	T3	T4	T5	*p* value
Pain VAS (0-100)	55.8 (1.3)	46.00 (21)	29.8 (18)	22.7 (17)	32.7 (24.3)	19.00 (12.2)	61.10 (23)	54.10 (21.2)	42.70 (20.4)	30.8 (21.2)	32.7 (24.4)	17.90 (20.3)	.14*
STAI (40-80)	50.82 (10.9)	43.97 (8.8)	38.10 (8.6)	37.65 (7.42)	37.89 (9.41)	36.14 (11.08)	55.27 (15.63)	52.44 (17.34)	47.38 (14.96)	44.87 (14.53)	40.89 (11.9)	35.71 (10.55)	<.002*
Sleep satisfaction (1-6)	2.82 (1.27)	3.52 (1.14)	4.34 (.87)	4.26 (1.01)	4.71 (0.71)	4.84 (0.75)	2.54 (1.33)	3.11 (1.32)	3.43 (1.07)	3.84 (1.0)	4.52 (1.01)	4.7 (0.89)	.002*
Pain barrier (0-35)	15.97 (5.65)			11.98 (5.2)			15.98 (5.27)			14.95 (5.69)			.003t
Self-efficacy (11-44)	26.45 (6.7)			27.05 (5.4)	27.34 (5.98)	28.44 (6.2)	25.89 (6.38)			25.50 (5.37)	25.44 (5.3)	25.94 (5.83)	.048*
Pain efficacy (1-4)	2.63 (0.75)			3.34 (0.83)	3.37 (0.71)	3.37 (0.79)	2.65 (0.79)			2.91 (0.69)	3.1 (0.86)	3.33 (0.78)	.011 @
PCS (0-100)	49.23 (12.33)				27.94 (12.44)	34.69 (13.7)	49.39 (6.38)				26.29 (14.3)	36.38 (14.18)	.99 *
MCS (0-100)	52.83 (6.78)				47.8 (9.43)	52.4 (15.3)	52.62 (7.87)				47.73 (10.66)	47.5 (14.11)	.2 *

TO = 1 day before surgery, T1= day 2, T2=day 4, T3=day 7, T4 =1 month, T5 =3 months * Repeated measure ANOVA @ Mann Whitney U test *t-test* **Significant at $p<.05$**

Impact of CBEI on outcomes and Post –hoc test

Although the result of repeated measure ANOVA showed that the experimental group had lower pain VAS, less anxiety level, better sleep satisfaction and better self efficacy level across three months, the result did not indicate which time period **is** different from other period. Thus, post –hoc test was conducted to identify which specific time period differed and showed significant different. Turkey procedure test was used and an overall $\alpha = .05$ was set to allow a 5% chance of one or more false rejections.

Table 15 summarized the post hoc test result and parameter of the outcomes variables of Pain barrier, VAS pain level, STAI, sleep..

With reference to the table 15, it might be useful to interpret the impact of intervention on outcomes at each time point. The result indicated that the experimental group had less pain level, less anxiety and better sleep satisfaction indicating the positive impact of intervention on short term outcomes.

In examine the effect size of of pain VAS, anxiety and sleep satisfaction and self efficacy, partial eta squared ranged from 0.018 to .079, suggesting that the effect size was small to moderate .

Table 16 summarized the ANOVA result in details. Of which within subject effect

including time effect and interaction effect are presented as well as the between subject effect. The time at which the researcher assesses patients is the within–subjects factor. The whole population is further divided into groups receiving CBEI and usual care for the experimental group while usual care for the control group. Using the repeated measure procedure, the researcher can test the null hypotheses concerning the existence of effects of both within-subject and between-subject factors. (Pallant, 2005) A within-subject comparison would be able to identify differential effects of the intervention (interaction effects) during hospitalization (T0 to T3) and across 3 months (T0 to T5) (Pallant, 2005) .

Table 15 *S*ummary of post- hoc test and parameter of outcomes during hospitalization

Variables	**P value**	**Partial Eta squared**	**Effect size**	**Post –hoc test**
Pain barrier	0.003 (t test)	0.07	Moderate	NA
VAS	0.14 (Between subject effect)	.018	Small effect size	Significant at D4 and D7
STAI	0.002 (Between subject effect)	.074	Moderate effect size	Significant at D2/D4/D7
Sleep	0.002 (Between subject effect)	.074	Moderate effect size	Significant at D4 and D7

Table 16 ANOVA result with within subject and between subject results

Variables	P value (Time effect)	P value (Interaction effect)	P value (Between subject effect)
Pain VAS (T0-T3)	.003	.008	.003
Pain VAS (T0-T5)	<.001	.29	.14
STAI (T0-T3)	<.001	<.001	<.001
STAI (T0-T5)	<.001	.011	<.002
Sleep satisfaction (T0-T3)	<.001	.011	<.001
Sleep satisfaction (T0-T5)	<.001	.011	.002
Self efficacy (T0-T3)	.66	.18	.32
Self efficacy (T0-T3)	.27	.49	.048

Breathing Relaxation Exercise

The frequency of performing breathing relaxing exercise was recorded for the experimental group only. From surgery up to T1 (day 2) after surgery, all participants of the experimental group completed the breathing relaxing exercise. At T2 (day 4), 50 (80.6%) participants completed the assigned task (six cycles each time and three times per day). Five participants (8%) completed it two times per day while seven participants (11%) completed it one time per day. At T3 (day 7), a majority of 75.8% (n=47) participants completed the assigned task, eight (13%) completed it two times while the remaining 11% (n=7) only completed one time of breathing relaxation exercise.

Further Data Analysis

Relationship among outcomes after surgery

The multidimensional phenomenon of pain may affect patients' physical, affective, and behavioral reaction, which results in changes in the patients' pain perception, attitude, and emotion. To explore and confirm the relationships among outcome variables (pain, anxiety, sleep satisfaction and pain barrier, and self-efficacy), a Pearson's correlation test was used to test the relationships among these variables on T3 (day 7). According to the Pearson's correlation test, there were medium negative correlations (r=-.46) between anxiety and sleep satisfaction and positive correlations between pain and anxiety (r= .52). Further, Pain had moderate positive relationship with pain barrier (r=.4).

Table 17. Pearson correlations among all patient outcomes at day 7

Variables	VAS pain	Pain barrier score	STAI score	Sleep satisfaction
VAS pain	1			
Pain barrier score	.40**	1		
STAI score	.52**	.42**	1	
Sleep satisfaction	.33**	.2*	-.46**	1

**correlation is significant at the 0.01 level (2-tailed)

*correlation is significant at the 0.05 level (2-tailed)

Relationship among pain level, self efficacy and pain barrier

Multiple regression was conducted to investigate the variance of pain by increase self –efficacy and decrease pain barrier. In regression test, dependent variable was the day 7 VAS pain level while independent variable are Day 7 self efficacy score and day 7 pain barrier score . The result indicated that Pain level was positively correlate to pain barrier but show negative minimal relationship to self efficacy. In pain barrier, B=0.9 indicating that increasing pain barrier by 1 unit would increase 1unit (1mm) of VAS pain. In self efficacy, B=-.01, indicated that by increasing 10 units of Self efficacy score would decrease 1 unit of VAS pain level. The regression test indicated that the variance of pain level was highly affected by pain barrier.

Relationship among anxiety level, self efficacy and pain barrier

Multiple regression was conducted to investigate the variance of anxiety by increase self-efficacy and decrease pain barrier. In regression test, dependent variable was the day 7 STAI anxiety score while independent variable are Day 7 self efficacy score and day 7 pain barrier score. The result indicated that STAI Anxiety level was positively correlate to pain barrier but show negative correlation to self efficacy. In pain barrier, B=0.85 indicated that increasing pain barrier by 1 unit would

increase 0.85 unit of STAI score. In self efficacy, B=-3.85, indicated that by increasing 1unit of self-efficacy score would decrease 3.85 unit of STAI . The above test indicate the variance of anxiety was highly affected by self - efficacy and decrease pain barrier.

Sub group comparison

Multiple regressions was used to identify the risk factors affecting the outcomes of pain and anxiety from the independent variables of age, gender, educational level, financial status, marital status, site of fracture, mechanism of injury, and waiting time for operation. The model summary revealed that none of the variables contributed to an impact on the pain outcomes (p = 0.3 to 0.7).

Gender Difference on Outcomes

A two-by-two between-group analysis of covariance was conducted to assess the effectiveness of the intervention in reducing pain for male and female participants. Educational intervention and gender were two independent variables. The dependent variable was VAS on discharge. The baseline variable T0 VAS was adjusted. A similar analysis was applied to STAI. There was no significant difference

between males and females in their response to pain and pain barrier, STAI (p = 0.31 - 0.98). Table 18 summarizes the mean difference of pain barrier, VAS pain, and STAI in detail.

Table 18 : Mean of pain barrier , VAS pain, and STAI between genders

	Variables	**Male** Mean (SD)	**Female** Mean (SD)	***p* value**
Experimental group	Pain barrier	11.97 94.48)	12(5.95)	.98
Control group	Pain barrier	14.11 (6.14)	16.15(4.85)	.98
Experimental group	VAS Pain	40(21.29)	44.19(24.19)	.76
Control group	VAS Pain	48.65 (24.62)	52.69 (22.9)	.76
Experimental group	STAI	37.65 (6.2)	37.65 (8.58)	.31
Control group	STAI	45.38 (15.21)	4.15(13.17)	.31

Test by two-way between group ANOVA

Comparison of age groups

A 2-by-2 between-group analysis of covariance was conducted to assess the effectiveness of the intervention in reducing pain for different age groups – a younger group (18-65) and an older one (over 65). The dependent variables used were VAS, STAI and sleep satisfaction. The independent variables were the educational intervention and age grouping. There was no significant difference between younger and older age groups on the three dependent variables (P= 0.27 - 0.4).

However, sub-group analysis to detect the difference in the pain barrier score between younger and older age group, a significant difference was found in the younger age group. As summarized in the table 19, the younger age group had a statistically lower pain barrier score than the older group.

Table 19 Between- age group comparisons of pain barrier score

Group Statistics

age grouping		grouping	N	Mean	Std. Deviation	P value
younger than 65	baseline pain barrier score	experimental	48	15.5833	5.84492	.93
		control	38	15.4737	4.85874	
	discharge pain barrier score	experimental	48	11.5625	5.42220	.05
		control	38	13.8947	5.41664	
older than 65	baseline pain barrier score	experimental	14	17.2857	4.90570	.78
		control	25	16.7600	5.87566	
	discharge pain barrier score	experimental	14	13.4286	4.32727	.65
		control	25	16.5600	5.83152	

Summary of the Results for the Main Study

This chapter has reported the results of sample recruitment, sample characteristics, and the effects of C-BEI on the post-operative outcomes of Chinese traumatic limb fracture patients undergoing surgery. A total of 125 patients participated in and completed the study. The attrition rate was about 7.2% at three month. Of 125 participants, 62 were assigned to the experimental group and 63 to the control group. The results revealed that there were no statistically significant differences in any demographic, clinical, and baseline data between the experimental and control groups. The short-term outcome measures (during hospitalization) included pain barrier, VAS pain level, state anxiety, sleep satisfaction, and self-efficacy scores, together with analgesic use and length of stay. The long-term outcome measures included VAS pain level, state anxiety and sleep satisfaction scores, self-efficacy, and quality of life across three months.

The overall results showed that the C-BEI was effective in terms of pain barrier reduction, post-operative pain relief, anxiety reduction, and sleep satisfaction promotion among patients with fractured limbs during the first week of hospitalization after surgery. There was a statistically significantly higher frequency of analgesic use at T1 (day 2) after surgery and better self-efficacy in pain management at T3 (day 7) in the experimental group. There was no statistically

significant difference in total length of stay, although a shorter stay (8.1 days versus 10.1 days) was demonstrated in the experimental group.

As for the longer-term outcomes, the C-BEI was effective in terms of anxiety reduction and improving sleep satisfaction. There were no statistically significant differences in pain level or general self-efficacy scale across three months. There was no statistically significant difference in physical or mental dimensions of health-related quality of life (SF36), although the experimental group showed a better score in the mental health dimension.

In examining treatment effect on gender, there was no significant difference between different genders on the three dependent variables (pain barrier, pain, and anxiety).

Table 13 and table 14 summarizes all mean scores, standard deviations, P values, and statistical test used for each outcome variable across seven days and across 3 months. Related to the hypotheses tested, the main findings of this study, which examined the effectiveness of CC-BEI on post-operative outcomes of Chinese patients with fractured limb, are highlighted as follows: The C-BEI provided to Hong Kong Chinese patients who are undergoing surgery for fractured limbs was effective and participants of experimental group demonstrated:

- Lower pain-barrier scores during hospitalization (T0 to T3);

- Less pain as measured by VAS during hospitalization (T0 to T3) only
- Less anxiety as measured by STAI (Chinese version) during hospitalization (T0 to T3) and across three months (T0 to T5);
- Better sleep satisfaction as measured on the sleep satisfaction scale during T0 to T3 and across three months (T0 to T5);
- Higher self-efficacy in pain management as measured by the general self-efficacy scale during hospitalization at (T0 to T3) but no difference across three months (T0 to T5);
- No statistically difference in health-related quality of life as measured by SF-36 PCS and MCS across three months (T0 to T5) although the MCS results favored the experimental group;;
- More acceptance of analgesics use as measured by the frequency of use at day two during hospitalization only); and
- No statistically difference in length of hospital stays although the results favored the experimental group.

To conclude, participant receiving C-BEI had greater improvement in reducing pain score, pain level and anxiety level and improving sleep during hospitalization . There were only longer term effect on anxiety reduction and sleep satisfaction. In next chapter, the result of process evaluation is presented.

CHAPTER 7 RESULTS OF PROCESS EVALUATION

Introduction

This chapter reports the results of the process evaluation. In this study, educational intervention had two major components: knowledge related to pain management and the use of analgesics after surgery; and the use of a breathing and relaxation exercise. An educational booklet was provided to the participants upon discharge as supplementary information, and all participants completed the 30-minute intervention once it started. Two patients cancelled the intervention owing to dizziness. The aim of the process evaluation was to understand participants' perception on which educational intervention they found useful, which component(s) of the intervention they found useful, and the benefits of the intervention. Data were collected from telephone interviews of 15 participants. This chapter begins with the description of participants' demographic and clinical characteristics. The categories and subcategories generated from the data will be presented with support from verbatim interviews.

Participants' Demographic and Clinical Characteristics

A purposive sample of 15 participants was recruited from the experimental group (N = 62), and was identified from the quantitative data analysis. Pain

reduction was one of the primary outcomes in this study. Five patients with greatest reduction of pain, moderate reduction of pain, and less reduction of pain during their hospitalization were recruited for telephone interviews.

Majority of the participants were male (n = 9, 60%) and married (n = 14, 80%), with a mean age of 48 (standard deviation [SD] = 20, range 36 to 68). Six participants (40%) had education up to secondary level or above. Nine participants (60%) were fully employed. Majority (n = 9, 60%) sustained hip or femur fractures because of a fall, three participants (20%) from motor vehicle accidents, and three participants (20%) from sports injuries (20%). Ten participants (67%) had internal fixation of the lower limbs, including the hip and the femur; the rest had internal fixation of upper limbs as their treatment. Generally, those who sustained fractures because of motor vehicle accidents or sports injuries were younger (mean age of 42) than those who sustained fractures because of a fall (mean age of 64). Their waiting time for surgery ranged from 24 hours to 48 hours.

The demographic and clinical characteristics of the 15 participants were similar to the participants of the main study. All patients had completed both sessions of educational intervention during their hospitalization.

Analgesic Use and Breathing and Relaxation Skills

Of the five patients, majority (n = 12, 80%) demonstrated a high level of participation, such as requesting for an analgesic on days 1 and 2 after the surgery. All participants followed instructions to perform the breathing exercise for at least six cycles three times a day on days 1 and 2. Three patients performed the breathing exercises with more frequency on the first day after surgery. On day 4 after surgery, owing to the provision of routine oral analgesics, only two patients (13%) ordered extra pain relief. All the patients accepted routine oral analgesics for their pain. Upon discharge, all patients were prescribed oral analgesics for the pain. All of the participants claimed that they took analgesics regularly if they had pain. Their median visual analog scale (VAS) pain level on discharge is about 40 mm during movement and 20 mm at rest. However, the adherence rate to the breathing and relaxation exercise also dropped to 80% (n = 12) on day 4 and 73.3% (n = 11) on day 7 and only 47% (n = 7) of participants regularly performed the breathing and relaxation exercise for one month at home. The patients claimed that they normally performed the exercise in the morning or before sleeping. Most of the patients (87%) mentioned that they would take analgesics if they had succeeding pain.

Participants' Perception of Educational Intervention

Three main categories were identified that describe participants' perception on the strength and limitations of educational intervention. Each category has subcategories as illustrated in Table 20. The following describes each category and subcategories with support from participants' verbatim interviews.

Table 20. Categories and Subcategories of Telephone Interviews

Categories	**Subcategories**
Components of a successful intervention	Short duration Conduct before surgery
Perceived benefits of the intervention	Enhance knowledge in pain management Clarify pain beliefs Do no harm Reduce pain Promote sleep Regain self-control
Reasons for discontinuation of practice	Did not feel the need to continue

Three major categories were identified from the interview data: components of a successful intervention, perceived benefits of the intervention, and the reasons for discontinuation of practice.

Subcategories of 'components of a successful intervention' included short duration and conduct before surgery. Subcategories of 'perceived benefits of the intervention' included 'enhance knowledge in pain management', 'clarify pain beliefs', 'do no harm', 'reduce pain', 'promote sleep', and 'regain self-control'. Subcategories of 'reasons for discontinuation of practice' included 'did not feel the need to continue'.

Results

Category 1: Components of a Successful Intervention

Conduct before Surgery

Participants identified components that contributed to the success of the intervention, and majority was related to the timing and duration of the educational intervention. They generally agreed that it was good that the intervention was conducted before the surgery.

One participant said:

> *It was good to conduct the talk before surgery, I could self-practice the breathing and relaxation exercise as instructed when I was not tired and got used to it... then after surgery, I was very weak and tired... I could only remember the key message she said.*

Short Duration

Nine patients highlighted the importance of short and concise education content. Because of their physical condition, they could not concentrate for long periods.

One participant said:

> *Luckily, the nurse (researcher) only delivered brief educational content because I was very tired after admission although I was eager to learn anything to improve my condition (physical health and pain). I paid much attention to her talk. I lay in bed and listened to her talk. It was good that I did not feel any discomfort if I didn't move my limb... The talk was short, lasted for about half an hour (Informant 13).*

Another participant said:

> *The exercise she taught was easy to understand. I could perform the breathing and relaxation exercise right after her talk (Informant 1.)*

Category 2: Perceived Benefits of the Intervention

Enhance Knowledge in Pain Management

Six participants reported the benefits of gaining better knowledge about pain management after surgery. One participant said:

At the beginning, I was really anxious about my upcoming surgery and really nervous about the pain that I would suffer. You can imagine that my operation was not a simple one; the doctor put the pins inside my bone to secure the broken area and it was painful. However, in my mind, analgesics are no good to my health. It is Western medicine with some side effects. I would bear my pain as far as I could. I didn't think I would request the analgesic if I did not receive the talk. After the talk, I gained more understanding related to the benefit of pain control, Analgesics are good in reducing pain quickly especially during the acute period after surgery... (Informant 8)

Clarify Pain Beliefs

Many participants commented that apart from understanding the importance of using analgesics to manage their pain, the educational intervention also helped them clarify some of their misconception about using analgesics and helped change their attitude toward using analgesics. One participant said:

The nurse (researcher) was good in clarifying my concept related to pain management... In the past, I always thought that analgesics were not good for the body (health) and it was better not to take it. After her concise explanation, I understood the key things such as stopping pain are important

to recovery. It helps me perform better during physiotherapy. Now I take the analgesic before attending physiotherapy.

Another participant said:

She said that the analgesic was good to stop the pain and it was important to speed up my recovery... I could move more during the rehabilitation exercise with good pain control.

Do No Harm

All the participants expressed that the breathing and relaxation exercise was easy to perform; one participant said:

The exercise is easy and does no harm; I didn't feel any discomfort and didn't need to move much on my affected limb, I can do it when I was in a lying or sitting position. (Informant 1)

Participants also perceived the breathing and relaxation exercise as safe with no harm done to their body. One said:

I enjoy doing it (breathing and relaxation exercise) especially at night. There is no fear and no risk of doing harm. At least I can do something to make myself sleep better. (Informant 4)

Participants expressed their appreciation of the educational intervention because it improved their knowledge of pain management after surgery. They believed that the breathing and relaxation exercise they learned was helpful for them to reduce pain and regain self-control. One participant stated:

> *The breathing and relaxation exercise is good to keep me busy. I just focused on the breathing part, which is good to reduce some of my anxiety. I felt more relaxed and had the feeling of regaining some control of my body... At least, I could do something to make myself better. I didn't need to rely on calling others. (Informant 4)*

Reduce Pain

Nearly half of the participants mentioned that the breathing and relaxation exercise was helpful in reducing pain. They felt more relaxed after performing it. A participant said:

> *When I was transferred back to the ward after surgery, I really lost nearly all of my control and no idea how to stop my pain. I remembered that I was awakened by the pain in the middle of the night after surgery. I called the nurse seeking for help and the nurse mentioned to me that the medicine was not due yet. I closed my eyes and did not know what to do. Suddenly, I*

remembered I could do the breathing and relaxation exercise. I did six cycles then I fell asleep for a while. When the pain woke me again, it was time for my medicine. I particularly appreciated the usefulness of the relaxing exercise in the first few days after surgery. When I looked back at my acute pain experience, it was still awful... something you could not stop... but at least, I felt less pain and I could do something to make it better. (Informant 5)

Another participant recalled:

The education provided me with knowledge of pain control by relaxing. With a more relaxed mood, it appeared that I suffered less pain although I still felt some pain during body movement in the first three days after surgery. With the knowledge I attained, now I even teach my neighbors and friends to perform the breathing exercise... (Informant 9)

Promote Sleep

Majority of participants experienced a reduction in pain and believed that pain relief could promote sleep. One patient said:

It was helpful to promote sleep. You know, we worried too much after injury... surgery... going home, and then the uncertainty of long sick leave, which might affect my future work... However, I feel much more relaxed after the breathing exercise. Gradually I fell asleep. It became my habit now to practice the breathing and relaxation exercise before sleep. (Informant 2)

Regain self-control

Nearly all patients mentioned that they were happy that they could do something to speed up their recovery. This ability fostered the importance of self-practice, which help them regain their self-efficacy and some self-control of their body. A participant recalled:

The nurse who gave the talk was positive to me. She encouraged me that I could help myself to reduce the pain by doing relaxation exercise whenever I feel the need and at any time... That was really good. I wanted to recover as quickly as possible so I could walk again. I felt that I have regained some self-control on my health and am not relying on nurses or doctors to do everything... (Informant 4)

Another participant said:

> *With the knowledge I gained, I seemed to be more stable in my mood and I knew my pain and the way to deal with it. I felt less stressed as I could do something to make myself feel better... (Informant 1)*

Category 3: Reasons for Discontinuation of Practice

Did Not Feel the Need to Continue

Though all the participants adhere to the breathing and relaxation exercise during hospitalization, about half of the participants discontinued the exercise one month after the surgery. The participants said that it was mainly due to the reduced pain, and they did not feel the need to continue the practice. A patient said:

> *I performed the breathing and relaxation exercise regularly during the first week after discharge. However, I gradually decreased the frequency bit by bit because I did not have much pain. I have returned to my usual life pattern before the injury except I am on sick leave. I can do almost everything with one hand now. (Informant 14)*

Another patient said:

> *The intervention was useful during the first few days after surgery. When I was discharged. I could not see much difference in whether I practiced it or*

not. The mild pain I had did not bother me much. Then I gradually forgot about it. I even forgot to take the medication... However, I will take analgesics again if I am in great pain. I still remember the benefit of good pain control. (Informant 12)

Summary

This chapter reported the results of the process evaluation. Fifteen participants of the experimental group were interviewed via telephone. Majority of participants had high regard toward the intervention. They concluded that the educational intervention was conducted at the appropriate time and with appropriate length. They perceived that the intervention helped enhance their knowledge on pain management; clarified their misconception about the use of analgesics, and helped them reduce pain, improve sleep, and regain self-control.

CHAPTER 8 DISCUSSION

This chapter presents a discussion of the results of the main study. The discussion starts with an examination of the sample of baseline characteristics and clinical profiles, attrition rates, and how these characteristics compare with those observed in previous studies. The research hypotheses that provide the framework for the discussion on the effect of the cognitive behavioural approach to educational intervention (C-BEI) on short-term outcomes during hospitalization and other long-term outcomes are then described, together with the effect of this approach on patient beliefs and behavioural change. The results of this study are also compared with previous studies. In addition, this chapter includes a summary of a C-BEI framework based on the outcomes and knowledge generated from the current study.

Characteristics of the Sample

There were no significant differences between the experimental group and the control group in terms of demographics, clinical outcomes or baseline outcomes, indicating that the homogeneity of the two groups was maintained. The characteristics of the study participants are explored and discussed in the following section.

Demographic and Clinical Characteristics of the Study Participants

This section describes the characteristics of the sample, including age, gender, educational level, marital status, financial status, religion, employment status and mechanism of injury, providing a clear picture of the socio-economic status and clinical characteristics of the sample used in this study. These details have enabled the

researcher to assess whether any favourable outcomes can be attributed to intervention effects or, alternatively, result from individual differences. At baseline, there were no significant differences between the groups in terms of age, gender, marital status, educational level, or mechanism of injury, indicating a high degree of homogeneity between the two groups in terms of their demographic and clinical characteristics.

There were no significant differences in terms of a pain barrier scores, pain levels, anxiety levels, sleep satisfaction, self-efficacy or HRQOL as between the experimental group and the control group at baseline. The mean age of the experimental group participants was similar to that of the control group participants (51 years of age vs. 57 years of age) and most of them were married, perceived themselves to be of average financial status (did not require any government subsidies), and had an educational level at the primary level or above. Their baseline characteristics were similar to those of other patients that undergo similar orthopaedic surgery in Hong Kong (HA, 2008).

There was a strong relationship between mechanism of injury and age. The majority of the older participants (>60 years of age) in this study had sustained a fracture due to a slip or fall suffered either at home or in a public area. The younger participants (<60 years of age) had sustained a fracture as a result of a motor vehicle accident, a work-related injury or a sporting injury. Older adults constituted a large proportion of those participants who had suffered a fractured femur or hip, which is similar to patterns observed both locally and globally (Tornetta, Mostafavi, & Riina, 1999; Simpson, 2002; Bergh et al., 2005; HA, 2008).

The Baseline Measures

The overall pain levels at T0 (1 day before surgery) for both groups were high, with the mean VAS pain level (5.9 ± 1.9) indicating that while all patients suffered from moderate to severe pain, they were well cared for in the hospital. According to WHO (1996), a visual analogue score (VAS) of 5-7 is regarded as moderate pain, while a score of 7-9 is regarded as severe pain. In this study, nearly all participants reported severe pain at T0 (1 day before surgery), a result consistent with previous studies in which patients have reported severe pain during the early admission period after injury (Joy et al., 2000; Bergh et al., 2005). Patients with traumatic limb fractures suffer from stress and pain, especially during the admission period. Consistent with other literature (Klofenstein, 2000; Chung & Lui, 2003), in this study a high number of patients who had undergone surgery reported unrelieved pain.

The participants in this study had a mean pain barrier of about 16 out of 35 (with a range of 3-28), and 60% of the participants stated that they would not take any analgesic when faced with more severe pain. There were no significant differences between the experimental and control groups in terms of these observations. These findings are consistent with both other literature (Wong et al., 2007; Leung & Chung, 2008) and the results of the Phase I study in which it was found that patient beliefs formed the major barrier to pain management. Beliefs commonly held by patients included the view that analgesics have side effects and are detrimental to one's health, and should only be used as a last resort.

The overall baseline anxiety level was high for all participants, with a mean STAI of 53.06 ± 13.6. In line with previous literature, patients who faced forthcoming surgery were anxious and stressed (Munafo & Stevenson, 2001; Carr, 2005). Furthermore, the sleep satisfaction level among all participants in this study was poor. This may be related to the change in environment experienced by patients during a hospital stay, as well as by their pain and patient concerns about their physical condition (Edell-Gustafsson & Hetta, 1999; Kain, 2003).

Regarding the baseline mean of the physical component summary (PCS) score and the mental component summary (MCS) score for HRQOL (SF 36) before injury, the results were similar to the norms observed among similar age groups in the Chinese population (Lam et al., 2005). It appears that all participants enjoyed good health before injury.

In summary, the demographic and clinical characteristics of the participants in this study were comparable to those observed in previous studies carried out both overseas and locally. There were no significant differences between the experimental and control groups in terms of demographic or clinical baseline characteristics. Portney and Watkins, (2000) emphasized that homogeneity between two groups can reduce the degree of variation that may affect the outcomes of an intervention study. This provides support for the view that the direct effects of intervention could be determined accurately in the current study.

Effectiveness of the Intervention

Effect of C-BEI on Pain Relief, Pain Barrier and Analgesic use during Hospitalization

Although the effectiveness of the C-BEI has been widely examined in studies on chronic pain, to the best of the researcher's knowledge, this may be the first study to investigate its effect on outcomes among Chinese patients with traumatic limb fractures. The findings of this study support hypothesis 1 and partially support hypothesis 2. While the C-BEI was effective in reducing pain barriers and pain levels during hospitalization from T0 (1 day prior to surgery) to T3 (7 days after surgery), it had no long-term effect on pain in the three-month period from T0 to T5 (3 months after surgery).

The findings also support hypothesis 7, which predicted that the participants in the experimental group would use analgesics more frequently than those in the control group. Patients' analgesic use was measured by the frequency of requests made for intramuscular injections (IMI) of analgesics. Although there was no significant difference between the two groups at T0 (pre-surgery), T2 (day 2) or T3 (day 4), there was a significant difference at T1 (day 2). The experimental group made more requests for IMI analgesics than the control group.

In terms of pain outcomes during hospitalization, pain levels decreased in both groups from T1 (day 2) to T3 (day 7). The changes in pain level over time across both groups were significantly different when the interaction effect was taken into account,

indicating the significant impact of educational intervention on pain outcomes during hospitalization. This partially supports hypothesis 2.

There was also a reduction in pain levels for both groups between T1 (day 2) and T5 (3 months after surgery). However, educational intervention (as showed by interaction effect in SPSS data analysis) had no significant effect on the control group, indicating that educational intervention did not have a significant impact on pain outcomes when measured over a period of three months. The impact of intervention could not be sustained over a long period of time, with both the experimental group and the control group reporting similar levels of pain three months after surgery.

The results of this study confirm that during hospitalization, the participants in the experimental group experienced better pain control than the control group participants for the first seven days post-surgery. This finding is consistent with previous studies which have indicated the positive effect of educational intervention on pain management after orthopedic surgery (La Montagne, 2003; Giraudet-Le, 2003).

The better pain control observed in the experimental group could be related to the amount of analgesic used, which was influenced by the pain beliefs held by each individual. The experimental group demonstrated greater reduction of pain barrier scores when compared with the control group.

This study used the modified pain barrier questionnaire – Taiwan (BQT) to measure pain barriers. There was no significant difference between the experimental and control group in terms of baseline pain barrier scores. Previous literature has indicated the possibility that personal factors such as culture and gender may influence

a person's beliefs (Holroyd, 1998; Leung & Chung, 2008). In the current study, a sub-group gender analysis was performed to assess the impact of these factors on participants' beliefs. The baseline pain barrier scores of older participants were higher than those of younger participants (Table18, Chapter 6). This observation might be explained by the impact of the Chinese culture. Many studies (Todd, 1993; Holroyd et al., 1998; Chen, 2001) have reported that Chinese people are more stoic and less likely to report pain when compared to other cultural groups. Holroyd et al. (1998) also reported that Chinese patients tend to be more emotionally stable and have greater powers of self-control, and that they possess a harmonic attitude and are not willing to disturb others at any cost. An individual with a high degree of emotional self-control manifests this trait through rather reserved and formal public verbal and non-verbal communication and by keeping arguments, disagreements or demands to a minimum (Holroyd et al., 1998). The findings of the Phase I study also supported the conclusion that because some patients considered that voicing a complaint about pain would disturb the harmony in the ward, they would try to bear the pain and were less likely to report it.

Hong Kong was a small British colonial city from early nineteenth century till 1997 and the educational system adopted the British system which might affect or dilute the culture belief if one received the education in Hong Kong. In this study, the younger participants, who were from the generation that has received a British education system in Hong Kong, were likely to be less influenced by Chinese culture than the older generation who received educational in China. The younger generation in Hong Kong may be more assertive in expressing their needs and less likely to bear

pain in silence as the older adult . This finding was also well evident in phase 1 study in chapter 4 (Holroyd et al.,1998; Wong et al 2008).

Effect of Pain Belief on Pain Management

In the current study, pain barrier scores within the experimental group at T3 (day 7) were significantly lower than those recorded for the control group. The effect of changes in pain beliefs among experimental group participants on pain management may have had an impact on both participants' cognitive knowledge of analgesic use and behavioral change. To recap the framework outlined Chapter 3, the C-BEI was used to break the vicious cycle by enhancing patients' knowledge of pain relief and analgesics, as well as by mediating and correcting their beliefs on analgesics. The fundamental concept underlying pain management in this context is that analgesics are useful for pain relief and should be used if needed, and that analgesic is good for the rehabilitation of fractured limb patients after surgery. Patients who have positive thoughts in managing their pain, and would be more active in coping with pain. There would be behavioral changes, such as performing breathing relaxation exercises and accepting analgesics when suffering from pain. In this study, patients in the experimental group demonstrated a reduction in pain level that might be a result of changing cognitive factors (enhanced levels of knowledge, changed beliefs about analgesics) and through changing behavioral factors such as acceptance of pain medication and the acquisition of relaxed breathing skills. This eventually led to reduced pain barrier scores and improved pain tolerance, with less pain being perceived. This particular result on the change in pain barrier scores is important in illustrating and explaining why the experimental group enjoyed better

pain relief. Furthermore, the experimental group requested more analgesics at T1 (day 2). These results are particularly important in that they provide evidence of patients taking the initiative to request analgesics. Whether or not intramuscular injections of analgesics were used depended largely on whether or not the patient made a request. The experimental group experienced a significant reduction in pain levels, as measured by the VAS Pain level during hospitalization, when compared to the change in pain levels in the control group. Post hoc test indicated the significant effect of intervention were mainly at day 4 and day 7 indicating the significant effect during hospitalization. From post-surgery day 3 onwards, regular oral analgesics were routinely provided to both groups, with pain levels in both the control group and the experimental group reducing over time and no significant difference between the two groups in terms of pain level from post-surgery day 3 onwards. The results of this study agree with Vlaeyen and Linton's (2000) cognitive-behavioral fear-avoidance model. This model explains the role of fear and avoidance behavior in the development and maintenance of chronic pain and related functional limitations. According to this model, there may be two opposing responses when an individual experiences pain. A patient may consider pain to be non-threatening and consequently engage in adaptive behavior that promotes the restoration of functions. Alternatively, pain may be viewed as threatening, contributing to a fear of pain and potentially leading to passive coping and depression, further fuelling the cycles of pain and increasing fear and avoidance. When the C-BEI was used in this study, it appears that the experimental group was able to adopt a positive attitude and engage in adaptive behavior such as relaxing breathing exercises and accepting analgesic to relieve pain, leading to a lower pain level at day 4 and day 7

and higher efficacy score at T3 (day 7). The current study provides empirical evidence on the value of using the C-BEI for acute pain management.

The better pain control observed in the experimental group during hospitalization may also be related to the use of breathing relaxation exercises. The findings show that the frequency with which breathing and relaxation exercises were practiced was higher at T1 (day 2) than at T2 (day 4) or T3 (day 7), suggesting that the experimental group used breathing relaxation exercises to cope with their pain. Breathing relaxation exercises are regarded as a form of non-pharmacologic pain intervention. The mechanism by which pain was reduced using relaxation exercises can be explained by the fact that stress aggravates pain (McCaffery & Pasero, 1999; Kristine et al., 2006).

It is an observation that both group decreased the pain level from day 7 till 3 months. Post hoc pair wise comparison indicated no significant difference between the experimental and the control groups. The findings might be due to the pain level perceived by both groups became less which was less sensitive to detect the difference. In addition, small effect size (0.18) also indicated that the sample size might be not sufficient to detect the different between groups especially the change was minimal.

Effect of the C-BEI on Anxiety

The findings of this study support hypothesis 3, which predicted that the experimental group participants would demonstrate less anxiety than those in the control group both during hospitalization (T0 to T3) and over the three-month period (T0 to T5) after surgery.

In this study, moderate correlation was found between pain and anxiety. The result was consistent with previous literature that there is a close relationship between pain and anxiety (Lazarus & Folkmans, 1984; Carr, 2005). Severe anxiety can distort thought processes and reduce the ability to reason and make decisions. In the event of panic, an individual may exhibit a wide range of anxiety reactions, such as dizziness, palpitations and feelings of unreality and depression. These reactions are often accompanied by sleep disturbance, fatigue and aggravated pain (Lazarus & Folkmans, 1984; Edell-Gustafsson & Hetta, 1999; Kain & Caldwell, 2003). An injury such as a fractured limb is often unexpected and beyond the patient's control, and the physical instability related to such a fracture may provoke much anxiety (Ilya & Yoram, 2007). Lazarus and Anerill (1972) suggested that anxiety reflects tension created by reduced cognitive ability to assign full meaning to stressful events. This highlights why a threatening and painful experience such as a fractured limb and related surgery can lead to anxiety. In the current study, all participants reported a high anxiety level, with a mean of 53 (on a scale of 20-80) at T0 (pre-surgery). Carr et al. (2005) reported that pre-operative anxiety is predictive of post-operative anxiety and pain and highlighted the importance of providing pre-operative intervention. Educational intervention can play an important role in enhancing patients' knowledge about their problems, reduce anxiety among patients with orthopedic trauma (McCarthy et al., 2003; Starr et al., 2004), and help patients regain their confidence in terms of the ability to manage their health problems themselves (Ersek et al., 2003).

In this study, breathing relaxation exercises were included as an element of the C-BEI. C-BEI patients experienced a reduced level of anxiety. The use of breathing

relaxation exercises is a common relaxation technique which helps to decrease anxiety levels. Relaxing breathing exercises can act as a distraction method so that the patient's mind is taken off the pain from which he or she is suffering (Seers & Carroll, 2001; Kristine et al., 2006). The Gate Control Theory (Melzack & Wall, 1965) explains that experience of pain is not simply the result of the interpretation of nerve impulses sent directly from sensory neurons to the brain. The impulse pathway might be modulated by other incoming stimuli before such impulses reach the brain. The "gate" opens and closes depending on feedback received from other nerve fibers in the body, including descending neural impulses from the brain such as those related to an individual's thoughts or mood (e.g. anxiety or depression). Relaxation and concentration on stimuli other than pain can close the gate, resulting in less pain (Melzack & Wall, 1996).

In a state of psychological distress, the heart rate of an individual accelerates and breathing becomes shallow and irregular, leading to a decrease in oxygenated blood. A low level of oxygenated blood contributes to lethargy and psychological distress (Lemone & Burke, 2004). Relaxation breathing exercises can increase the oxygen level in circulating blood and reduce anxiety (Kristine et al., 2006). Many studies (Barnason et al., 1995; Kristine et al, 2006; Leardi et al., 2007) have reported that specific relaxation techniques, such as breathing relaxation exercises, together with educational intervention, can have a positive effect by reducing anxiety. Several studies have shown that relaxation techniques can inhibit stress, reduce anxiety and reduce neurohormonal responses, including anxiety and post-operative pain, to psychological stress (Asmundson & Taylor, 1996; Bourdarne, Legros, & Timsit-

Berthier, 2002; Carr, 2005; Kristine et al., 2006). According to the AHCPR (1992) and APS: SE (2005) guideline, a non-pharmacological intervention should be used in conjunction with analgesics to manage pain, an approach which may benefit patients whose pain is only partially relieved after analgesics have been tried.

The findings of this study support the conclusion that the C-BEI had an impact on participants' anxiety levels both while they were in hospital and over the 3-month period after discharge. The current study provides empirical evidence that a C-BEI that incorporates breathing relaxation exercises can help patients with fractured limbs to manage their anxiety levels after surgery.

Effect of the C-BEI on Sleep Satisfaction

The findings of the present study support hypothesis 4 that the experimental group participants would demonstrate better sleep satisfaction when compared with those in the control group both during hospitalization (T0 to T3) and over the three–month period after surgery (T0 to T5).

Some studies (Kain & Caldwell, 2003; Gabor et al., 2003) have reported that sleep disturbance is a common problem for hospitalized patients, especially after surgery. Kain and Caldwell (2003) found that 23% of patients reported clinically significant sleep disruption, characterized by more wakefulness and pain and less energy. The reasons for sleep disruption can include noise, lighting and routine care. Other studies (Simpson, 1996; Raymond, 2002) have reported that pain results in moderate sleep disturbance. Boman (1997) found that patients with more severe pain suffer from poor sleep satisfaction. Pain relief is therefore an extremely important

factor in promoting sleep during hospitalization. Dysfunctional sleep can have an impact on patient recovery. Griffiths (2005) identified that dysfunctional sleep during hospitalization leads to chronic insomnia and depression. It is thus important to enhance patients' sleep satisfaction during hospitalization.

The experimental group displayed a greater level of improvement in sleep satisfaction than the control group from T0 (pre-surgery) to T2 (day 4) despite the fact that the participants in both groups slept in an unfamiliar hospital setting with noise and light disturbance at night. In light of the pain and anxiety results discussed above, this suggests that these factors can have an effect on patients' sleep.

In this study, sleep satisfaction was negatively correlated with level of pain (r=-.33) and anxiety (r=.52) (Chapter 6, P. 195). The increased use of analgesics in the experimental group may have helped to reduce participants' pain and anxiety, thus contributing to better sleep.

It was noted that participants in both groups showed improvement in their sleep satisfaction levels from T0 (the baseline date) to T3 (day 7), which may be due to their familiarization with the hospital environment and the decrease in their pain and anxiety levels after surgery. However, it was also noted that there was a slight decline in sleep satisfaction (with the mean score falling from 4.34 to 4.26 between T2 (day 4) and T3 (day 7)) for the experimental group. This may have been due to the impact of intervention, which had its maximum effect on T2 and T3. However, some participants might have had concerns about their pending discharges, which may in turn have affected their sleep satisfaction. An interventional dosage may have been required to sustain a constant intervention effect in the experimental group. In fact, the

qualitative data from this study supports the conclusion that participants suffered from poorer sleep when they were worried about their physical condition or financial status... Examining the sleep satisfaction of both groups during the 3-month period after surgery, both groups enjoyed better sleep when compared with their sleep satisfaction in hospital. This may have been related to a reduction in pain levels and the return of participants to a familiar home environment. However, there was a still significant difference in sleep satisfaction between the two groups. This could be related to the level of anxiety in each group; participants in the experimental group had a significantly lower level of anxiety than those in the control group three months after discharge. Many studies (Dinges, 1997; Burckhardt, 1997; Uchitomo et al., 2003) have supported the view that poor sleep is associated with fatigue, anxiety and depression. In the process evaluation of this study, some participants from the experimental group said that they continued to practice breathing relaxation exercises in spite of the fact that they were no longer suffering from pain. This may have been a factor contributing to their lower levels of anxiety and better sleep satisfaction.

The findings of this study suggest that the C-BEI can have an impact on patient sleep satisfaction both in hospital and over the 3-month period after discharge. The current study provides empirical evidence on the use of the C-BEI for acute pain management.

Effect of the CBE-I on Self-Efficacy

The findings of this study do not support hypothesis 5 that the experimental group participants would demonstrate better self-efficacy in pain management when

compared with those in the control group over the three-month period after surgery. However, the short-term effect during hospitalization was supported.

The findings showed no significant difference between the perceived self-efficacy of experimental group participants and those in the control group across time. However, comparing these two groups on the basis of the one added item which was specifically related to pain management, "I have confidence in handling my pain at home," it was found that the experimental group had a statistically higher score on this item on discharge when compared to the control group. Nevertheless, there were no significant differences in the remaining sub-scales of the General Self–efficacy Scale. The C-BEI might have a short-term effect on patients' self-efficacy in pain management.

In the context of stressful life transitions, self-efficacy serves as a personal resource that can be used to cope with stress (Jerusalem, 1993; Schwarzer, 1992). High perceived efficacy enables a person to face stressful demands with confidence and feel motivated, while a person with low perceived efficacy may have self-doubt, anxiety, and a perception of coping deficiencies when confronted with difficult situations. Perceived efficacy can change as a result of cumulative personal experiences or stress coping experience (Jerusalem & Schwarzer, 1992; Schwarzer, 1992). The significantly higher score in the extra item indicated that the experimental group participants might have had more confidence in their ability to manage pain and felt more in control. In addition, in data analysis of the relationship between self efficacy and anxiety level during the hospitalization, the result demonstrated that by increasing 1 unit of self efficacy score would decrease 3.85 unit of STAI anxiety score

which high-lighted the importance of increased self efficacy on reducing the anxiety of the participant. They also used analgesics more on day 2 of hospitalization. Consistent with these findings, Bandura (1997) and Pellino et al. (1998) reported that by regaining self-efficacy, one can effectively perform a given behavior and the behavior will result in the desired outcome. Education intervention is regarded as important in enhancing patients' knowledge about their problems and helping them to regain their confidence to manage their health problems themselves (Ersek et al., 2003)

In this study, the results indicated that while the C-BEI might be capable of changing an individual's perceived self-efficacy in pain management, it is not capable of changing his or her general self-efficacy while in hospital. Even if it were, the effect could not be sustained after discharge. General self-efficacy serves as a personal resource used to cope with different types of stress such as pain, employment problems, social problems, unexpected surgery, medical treatment or even a strange environment (Schwarzer, 1992; Jerusalem & Schwarzer, 1992). The C-BEI may not necessarily have an effect on all these components, which may explain the fact that their overall effect was not significant. Once the participants had been discharged and sent home, their stress levels may have subsided because of their return to a familiar home environment. Furthermore, the recovery process may have resulted in a much-reduced level of pain one month and three months after surgery. The participants' self-efficacy might have returned to its pre-injury level. The General Self-Efficacy scale, which is not designed specifically for pain management, might not be capable of detecting changes in self-efficacy in such a context, although one extra item was

added to the scale to make it more relevant to this study. Future studies might aim to develop an instrument that can be used to measure self-efficacy in acute pain management.

In this study, it was found that the use of breathing and relaxation exercises could help participants gain a sense of self-control (Kristine, et al., 2006). If a patient believed that he or she had adequate self-control over his or her pain, the perception of threat would decrease, leading to a reduction in anxiety. In the process evaluation of this study, the participants praised the C-BEI for encouraging them to regain self-control over their body through the use of relaxation exercises whenever they felt the need. These participants felt that they had regained some degree of self-control over their health and was not reliant on health care professionals.

Effect of the C-BEI on Health- related quality of life (HRQOL)

In this study, perception of HRQOL was measured using the SF-36. The SF-36 has eight dimensions and patients were asked about their perceptions or abilities in the previous month. The scores for the eight dimensions were combined and transformed into a physical health component summary (PCS) and a mental health component summary (MCS) (Lam et al., 2005). In this study, there was no significant difference between the experimental group and the control group in terms of their self-perceived HRQOL as measured by the PCS and the MCS. Hypothesis 5 of the study, which predicted that the experimental group would demonstrate greater improvement

than the control group in health-related HRQOL as measured by the SF36 PCS and MCS over the three months following surgery (T0 –T5), was thus rejected.

The findings of this study indicate that both groups showed improvement in their PCS and MCS scores over the three–month period. The findings indicate that the C-BEI did not have a significant impact on HRQOL for participants in the experimental group over the 3 months. As shown in the baseline data, all participants had a relatively good self-perceived HRQOL before they suffered an injury. One month after surgery, the PCS score was typically at its lowest, indicating that the participants had not fully recovered from their fractures, and that their fractures affected their HRQOL over the first month following surgery.

Physical Component Summary (PCS)

Within group analysis indicated that both groups improved their PCS scores over the three-month period. This indicates the significant effect of time on improved quality of life. However, the overall PCS scores for both groups at T5 fell when compared to those recorded at T0 (pre-injury status). A limited number of previous studies have included measures of HRQOL outcomes when evaluating the effect of educational intervention on post-operative outcomes for orthopedic surgery. Van Balen et al. (2001) studied hip fractures in elderly patients in the Netherlands, finding that the patients' HRQOL had been reduced overall and was especially poor at four months after injury. The main factors in decreased HRQOL were decreased physical mobility (60% of patients could not reach the level of walking ability they had before the injury) and pain. The results of the current study are consistent with the Van Balen

et al. (2001) study in that the participants did not recover their pre-injury physical functioning abilities. In this study, the SF36 PCS scores were used to summarize eight scales based on the transformation scores for eight dimensions of health: physical, social and role limitations due to health problems, and bodily pain, and mental health, role limitations due to emotional problems, vitality, and general health perceptions. When the researcher examined the mean scores for the eight dimensions of the current study, the participants in the experimental group were found to have demonstrated more improvement than the control group in all eight physical domains of the SF36. However, for both groups, the role-physical dimension provided the worst outcome from among the eight dimensions of the SF36. The role-physical dimension only recovered to just under half the original score when compared with the pre-injury level. Future studies might focus in more detail on longer term physical outcomes to provide a clearer picture of the extent to which physical functioning abilities can be recovered by fractured limb patients and the timing of such recovery.

Mental Component Summary (MCS)

The findings of this study showed no significant differences between the experimental and control group over the three months following surgery in terms of mental component. Although the MCS scores for the experimental group were higher than those for the control group three months after surgery, the differences were not statistically significant.

Within group analysis indicated that both groups improved their MCS scores over the 3 months following surgery. The MCS scores for the experimental group

nearly returned to pre-injury levels, and while the control group MCS scores were lower than they had been pre-injury, the result was statistically insignificant.

The lower MCS scores in the control group could be related to the levels of anxiety among participants in this group. In this study, the participants in the control group had higher levels of anxiety than their counterparts in the experimental group both during hospitalization and one month and three months after injury. These results are consistent with previous literature. Scaf-Klompm et al. (2003) conducted a study to examine emotional changes among people with fall-related injuries and the effect on depression of an incomplete recovery of physical function after injury. They found that poor recovery of physical functions might lead to a loss of independence and negative mental functioning such as depression, worry and anxiety, although their findings were confined to older patients. Many studies (Jurkovich, 1995; Mackenzie, 1996; Butcher, 1996; Van Balen et al., 2001) have reported similar findings, whereby negative emotions such as post-injury depression, worry and anxiety are a reaction to the stress induced by injury and surgery, and might persist for a long time after recovery. In this study, the C-BEI may have assisted the experimental group to improve pain control and relaxation and reduce anxiety, thus leading to a better perception of mental health. It is important for health care professionals to recognize patients with fractured limbs at an early stage, move quickly to identify any mental health problems that such patients may have, and address their psychological needs as appropriate.

Effect of the C-BEI on Length of Hospital Stay

Although participants in the experimental group typically stayed in hospital for a shorter period of time than those in the control group, the difference between the experimental and control groups was not statistically significant. Hypothesis 8 of this study, which predicted that participants in the experimental group would require a shorter stay than those in the control group, was thus rejected.

Length of stay is an indirect indicator of patient recovery that is used to measure patients' post-operative wellness in terms of orthopedic surgery, complications such as chest infections, wound infections and deep vein thrombosis (Maher et al., 2002). It is anticipated that if a patient recovers well, his or her length of stay should not be extended. An intervention is regarded as cost-effective if the length of stay in hospital can be shortened (McDonald et al., 2004). In evaluating previous literature relating to the effect of pre-operative educational interventions on length of stay, a limited number of the recent studies that were reviewed reported on length of stay as the outcome. The inclusion criteria, types of intervention, disease groups and outcomes used in these studies varied, making comparison difficult (Ponzer et al., 1996; Daltroy, 1998; Dai et al., 2002; Giraudet-le Quintrec et al., 2003). Daltroy (1998) reported that educational intervention reduces length of stay for patients who have a tendency to avoid thinking about unpleasant events and reduces post-operative anxiety, although the underlying reasons for these conclusions were not clearly described. While Giraudet-le Quintrec et al. (2003) reported no significant difference in length of hospital stay as between patients who had been subject to educational interventions

and those who had not, they reported that patients that had received an educational intervention were significantly less anxious, experienced less pain and were able to stand up sooner than those in the control group. The educational session in Giraudet-le Quintrec at al.'s (2003) study lasted for half a day and was delivered to patients for whom elective hip surgery was pending. The educational session was structured and comprehensive, with multidisciplinary information being provided, together with a leaflet. In this study, participants in the experimental group typically had shorter stays in hospital than those in the control group, although the difference was not statistically significant. The effect might be explained by the impact on anxiety reduction and pain relief. Previous studies suggest that the effect of educational intervention on length of hospital stay is strongly associated with anxiety and the effect of the stress response. The stress response after a limb fracture can contribute to physiological changes that are associated with poor patient outcomes. McRae and Esser (2002) highlighted that tissue injury and surgery is a strong stressor from which recovery is influenced by the response in the hormonal and sympathetic nervous system. A high stress response may cause vascular shunting and hypo-perfusion of vital organs in patients, which can eventually affect the speed at which they recover from tissue injuries and thus the length of time they stay in hospital.

In this study, re-admission rates were not measured due to the various individual factors which might have affected them. Future studies could consider other measures such as readmission rate and type of complication to measure patient's post-operative wellness, as the presence of bone-related or other complications will lead to

readmission. It is also recommended that the effect of the type and duration of educational intervention on length of stay be examined in future studies.

Clinical significance of short term outcomes

According to APS (2003) and APS:SE (2005), VAS pain level less than 30mm is regarded as mild pain and acceptable to most of the patients.

In this study, the experimental group perceived less VAS pain level at day 4 and day 7 (29.8 and 22.7) which was less than 30mm and was regarded as mild pain. In the control group, patients perceived VAS of <30mm only happened at 3 months.

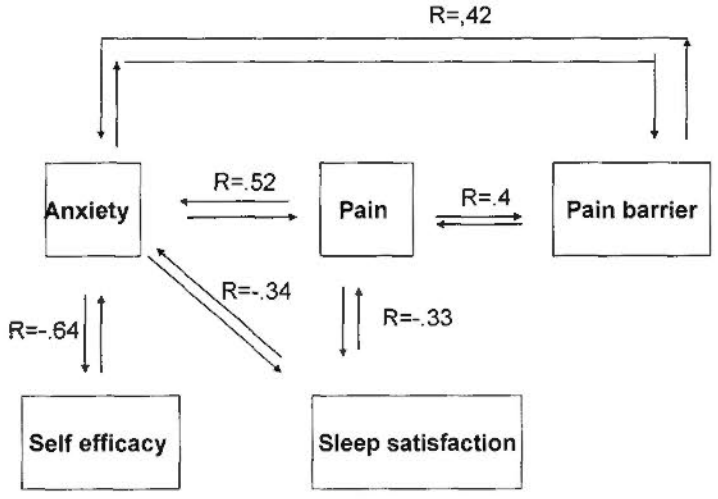
Relating to STAI anxiety level (range from 20-80), anxiety level greater than 40 is regarded as moderate anxious while <60 is regarded as extremely anxious (Shek, 1993). In this study, the experimental group perceived less anxiety level compared to the control group (STAI score less than 40 from day 4 till 3 months) while the control group perceived less than 40 at 1 month and 3 months. In view of the clinical significance issue, it seems that the experimental group perceived both statistically significant and clinical significant in pain and anxiety outcomes during hospitalization.

Relationships among short term outcomes after surgery

Figure 15 shows the relationships among the variables of pain, pain barrier, anxiety, sleep satisfaction and self-efficacy for the experimental group. The multidimensional phenomenon of pain can affect a patient's physical, affective and behavioral reactions (Melzack, 2003), which in turn result in changes in the patient's

pain perception, attitude and emotions. To explore and confirm the relationships among the outcome variables measured in this study (pain, anxiety, sleep satisfaction, pain barrier and self-efficacy), a Pearson's correlation test was used to test the relationships among these variables on T3 (day 7).

Fig 13. Relationships among outcomes



The results showed that there was a medium negative correlation (r=-.34) between anxiety and sleep satisfaction and a positive correlation between pain and anxiety (r= .32). Many studies (Simpson, 1996; Raymond, 2002; Doering, 2002) have examined factors related to sleep disturbance among hospitalized patients, reporting that pain is moderately disturbing to sleep and that pain relief is perceived as an extremely important measure for the promotion of sleep during hospitalization. Furthermore, Carr et al. (2005) reported that pre-operative anxiety is predictive of post-operative anxiety

and pain. In this study, pain intensity had a positive relationship with pain barrier (r=.4), the scores for which were in line with previous literature which has found that there is a strong relationship between a patient's pain barrier and his or her perception of pain (Chung et al., 1999; Leung & Chung, 2008). In light of this conclusion, understanding the relationships among pain, anxiety, sleep satisfaction and pain barrier may help nurses to implement appropriate measures designed to promote better post-operative care.

Summary of the Effect of the C-BEI in phase two study

The C-BEI provided to participating Hong Kong Chinese patients with fractured limbs who underwent surgery was effective in improving patients' short-term outcomes in terms of reducing pain barrier scores, pain levels and anxiety levels, promoting sleep satisfaction, and prompting more requests for analgesic during hospitalization. The mechanism underlying the interaction effect may be explained by the effect the education intervention had on patients' beliefs and attitudes towards pain and the use of analgesic, as well as the use of breathing relaxation exercises.

The C-BEI was used as an intervention aimed at mediating the beliefs of patients. From a cognitive perspective, the first 10-minute session of the C-BEI was the most important component, and aimed to enhance patients' knowledge of pain and analgesics, as well as to correct patients' beliefs on pain and pain management. Having adopted correct beliefs, patients became more positive in terms of their

emotions and coping behavior. They became more willing to accept analgesics if needed. The second 10-minute session of the C-BEI was aimed at using breathing relaxation exercises to assist patients to reduce their anxiety levels and regain their sense of self-control over their bodies. After performing breathing relaxation exercises and accepting analgesic, patients in the experimental group demonstrated higher levels of self-control. Their self-efficacy in terms of pain management and thought benefited from the active steps they took to improve their condition and promote their recovery and wellness after suffering a limb fracture and undergoing surgery. Emotionally, patients became less anxious.

Knowledge Generated by this Study

In phase one study, qualitative interviews were conducted with Chinese patients who had traumatic limb fractures and were undergoing surgery regarding their experiences of and beliefs about pain management. Ten orthopedic nurses were also interviewed about their pain management practices and the barriers that they perceived prevented better pain control among patients. The findings from these qualitative interviews enhance the understanding of patients' belief of pain and analgesic. Patient's belief of pain was regarded as major barrier to effective pain management and therefore the tailored -made educational intervention could be designed to clarify their pain belief. In this study, the common belief from the Chinese patients included: 'pain is a negative sign; analgesic had side effect and not good for health, I should bear the pain and I should only take pain relief as a last resort; I have no control over my pain', From the phase one study, psychological factors could have important roles in the experience of pain, including its

intensity, duration and consequences. For example, when pain persists over time, people may develop negative beliefs about their pain. Negative pain beliefs contribute to passive coping, leading to negative moods, increasing pain and passive coping..

In line with the cognitive behavioral approach to the treatment of chronic pain, the C-BEI was developed and could be applied in the area of acute pain management. Understanding patients' pain experiences and beliefs is fundamental to the use of cognitive-behavioral methods in education.

The ABC model, which is the basic concept underlying the C-BEI, postulates that an activating event, A, leads to emotional or behavioral consequences at C, with those consequences being mediated by beliefs at B. In this study, limb fractures, surgery and pain are the 'activating events,' 'beliefs' are represented by patients' beliefs and knowledge about pain, and the use of analgesic and 'consequences' are the ways in which patients cope with their pain.

In the C-BEI framework, the C-BEI has the role of enhancing knowledge about pain and pain management and dispelling negative thoughts. By mediating his or her beliefs, a patient may come to view pain as non-threatening and consequently engage in adaptive behavior that decreases his or her pain barrier and mitigates the pain suffered during hospitalization.

This study has shown that the C-BEI can be used to help patients achieve an understanding of their problems and develop more effective coping strategies. It has been demonstrated that specific breathing relaxation exercises incorporated into the C-BEI have a positive effect on pain reduction, anxiety reduction and sleep satisfaction

both during hospitalization and over the following 3 months. The sustainable long-term effect of such exercises on self-efficacy and HRQOL should be explored further.

Conclusion

This study examines the effectiveness of an educational intervention on pain management and post-operative outcomes among Chinese patients with fractured limbs. This chapter discusses the findings of the main study. The baseline data show that most of the participants had high pain barrier scores, high levels of stress when suffering from severe pain, high anxiety levels and poor sleep satisfaction during their early period of hospitalization. Their pre-injury HRQOL in terms of physical and mental components was similar to the norm among the Hong Kong Chinese population.

The findings of this study support the view that educational interventions are effective in decreasing patients' pain levels and pain barrier scores during hospitalization (from 1 day before surgery until 7 days after surgery). Such interventions are also effective in decreasing patients' anxiety levels and improving their sleep satisfaction both during hospitalization (from 1 day before surgery until 7 days after surgery) and over the 3-month period following surgery. Those participants who received the educational intervention demonstrated more frequent use of analgesics as measured on day 2 after surgery.

In terms of general self-efficacy, quality of life, and length of hospital stay over the 3-month period following surgery, although the results favored the

experimental group, there was no statistically significant difference between the experimental and control groups.

CHAPTER 9 CONCLUSION

Introduction

In this final chapter, the strengths and limitations of the main study are discussed. Implications for clinical practice and future research are also presented, and conclusions are drawn.

Strengths of the Study

A quasi-experimental design was employed in this study. Studies of nursing intervention in acute care settings are often difficult to conduct because of problems with blinding, the control of extraneous variables, the busyness of the setting, and limited resources. Despite these difficulties, the researcher tried every means to control the extraneous variables, such as confining the study to one type of condition (limb fracture) and operation (internal fixation). The interventions were delivered by the researcher herself to ensure consistency in the method of delivery and the intervention dosage. There were no significant differences between the experimental and the control groups for the baseline demographic and clinical variables, which ensured the homogeneity of the groups. The findings showed the effect size in terms of eta squared to be approximately .07 for all of the outcome variables. Eta squared represents the proportion of variance of the dependent variable, and can range from 0 to 1, where 0.01 denotes a small effect, 0.06 a moderate effect, and .14 a large effect (Cohen, 1988). The value of .07 is therefore at the medium level and indicates that the intervention was successful in improving outcomes for patients with fractured limbs who were undergoing surgery. The effect size also indicates that the risk of type II errors in the study was low (Cohen, 1988; Pilot & Beck, 2008).

The intervention C-BEI was developed based on the phase I study results and a well-defined theoretical framework. The framework provided a clear understanding of the patients' problems and a good theoretical basis for the educational intervention which ensured that it could meet patients' needs. It also aided the interpretation of the findings. A protocol was used to guide the intervention to ensure that research integrity was maintained during its implementation, thereby reducing type III error that is, concluding that an intervention is ineffective when it has not been implemented as designed (Sidani & Braden, 1998).

The attrition rate of this study over three months was 7.2%, which is low compared with other studies (Portney and Watkins, 2000; Barnason, et al., 2006). All of the participants who joined this study and completed the intervention indicating the C-BEI were well accepted by the patients although they were in pain and pending for their surgery and it did no harm to the patients. Both the quantitative and qualitative findings support that the intervention was acceptable to patients and can feasibly be implemented in an acute setting.

Previous educational interventions using the cognitive behavioral approach have mainly focused on chronic pain management (Keefe, 2000; White, 2001). This may well be the first study to use the cognitive behavioral approach to design an educational intervention to help Chinese patients with fractured limbs cope with acute pain after surgery. The study provides empirical evidence supporting the effectiveness of education interventions rooted in the cognitive behavioral approach in acute pain management. The C-BEI that was developed enhanced patients' knowledge of pain management, clarified their pain belief, and helped them to adopt positive coping behavior to manage their pain. The process

evaluation in this study further shows that these outcomes were confirmed and supported by the participants. Implementing the C-BEI can help clients to consider pain as non-threatening and consequently to engage in adaptive behavior.

Limitations of the Study

This study has several limitations. First, it was not a proper RCT with non-probability sampling for each subject. A true RCT is not feasible in the clinical setting, and thus the researcher randomized the wards in the hospital. It could be argued that this may have caused sampling bias, and random assignment of the participants has the advantage of enhancing the distribution of uncontrollable factors across the groups, thereby reducing the potential effects of confounding factors on the achievement of the intended effect and increasing the confidence with which the observed changes in the outcomes could be attributed to the intervention (Sidani & Braden, 1998).

When conducting an intervention study, Polit and Beck (2008) recommended introducing an additional "no intervention" control group or placebo control group to determine whether the differences among groups are due to the normal response during recovery, the intervention effect, or the Hawthorne effect. However, for ethical reasons it was not possible to provide no intervention or a placebo to clients, and thus only the alternate treatment control (usual care) was used in this study.

Another limitation is that the study was single-blinded. Ideally, a double-blinded method is preferable, and the intervener, the data collector, and the patients should not know the grouping allocation to minimize bias in the intervention and assessment. However, due to the nature of the intervention, it was not possible for the intervener (the role was performed by the researcher) to conduct an educational

intervention without knowing the allocated group. Further, the participants knew that they were participating in an experimental group, as the extra educational sessions were provided by a researcher who was not working in that unit. Nevertheless, the ward staff, including the doctors, nurses, and physiotherapists, and the research assistant who collected the data were blinded to the sample allocation. This was to ensure that no bias occurred in the assessment and that fair and consistent usual care was provided by the healthcare professionals. For example, the doctors continued to provide fair medical treatment, the nurses provided the usual nursing care, and the physiotherapist provided the usual rehabilitation exercises to all of the participants.

There may be other factors in addition to the intervention that could have influenced the outcomes of surgery especially after patient's discharge, such as the patients' financial status, social support, family support and home environment, none of which could be controlled by the researcher. Further, individual health condition varies from person to person, which may have influenced the outcomes of this study despite the fact that the same intervention was delivered (Brooten & Nayler, 1995). The findings should thus be analyzed and interpreted with these influencing factors in mind. Future studies on intervention effectiveness could take into account these factors. In this study, these factors were considered during data analysis. Multiple regressions was used to identify the risk factors affecting the outcomes of pain and anxiety from the independent variables of demographic characteristic and clinical characteristics. Any potential confounder were treated as covariates during data analysis.

About 40 (18%) eligible patients refused to participate in the study because they were not interested or claimed that they were too tired, too ill, or in too much

pain. Some patients were excluded because they were confused on admission, possibly due to the administration of intramuscular pethidine in the emergency department (Rainer, Jacob, Ng, Chung, Tam et al., 2001). It is thus possible that those recruited into the study were not representative of the whole population because they might have been more physically fit with haemodynamic stability. This limits the extent to which the results can be generalized to patients with critical conditions.

Implications

Implications for Clinical Practice

This study is the first one of its kind in an Asian population with fractured limbs. The study adds new evidence regarding the therapeutic value of C-BEI for patients with fractured limbs who are undergoing surgery. The developed C-BEI appears to be an effective intervention to reduce the pain barrier, the level of pain, and the level of anxiety and to improve sleep satisfaction in patients undergoing orthopedic surgery. It is an acceptable, safe, and feasible intervention and can be implemented by ward nurses with minimal additional training. The total length of both educational sessions is 30 minutes and it is thus feasible to incorporate it into routine care. Future incorporation of the C-BEI as a routine component of nursing care for all orthopedic patients with acute pain could be considered.

The C-BEI developed in this study could be used to achieve more effective use of nursing time and to promote positive patient outcomes. The training and resources required for its delivery should be manageable in most clinical settings in Hong Kong although there is a consideration of the increased amount of time required to implement the intervention in the context of the increasing workload of

the registered nurses. Further study about the cost-effectiveness of the C-BEI might be useful to confirm it.

Similar cognitive behavior approach educational interventions could also be applied to patients undergoing stressful events such as injury, surgery, and acute pain, and the effects could be evaluated.

In-service training could be provided to teach nurses the skills to apply the principles of the cognitive behavior approach in patient education. It is also recommended that cognitive behavior approach educational intervention be incorporated into the undergraduate nursing curriculum so that nursing students can acquire the necessary knowledge and skills to use such interventions in the clinical setting. The teaching materials and structure developed in this study could serve as an example to illustrate to students how a patient education plan that integrates the principles of cognitive behavioral approach is developed. Thus would give students the ability to effectively administer well-structured, consistent educational interventions to patients.

Implications for Future Research

It is recommended that further studies be conducted to confirm the cost effectiveness of the intervention using cost-effectiveness analysis. Similar interventions could also be applied to other orthopedic problems involving acute pain or other type of surgery and the effects evaluated.

The General Self-Efficacy scale was used in this study, as it has been applied with success in many countries (Jerisalem & Schwarzer, 1992). However, the scale may not be sufficiently specific to assess patient's self-efficacy in

managing pain. Future studies could therefore develop a specific tool to measure self-efficacy in pain management.

About 18% of eligible patients refused to participate, indicating that they were very stressful physically and psychologically after sustaining a fracture. In future research, extra measures should be put in place to enhance patient comfort, such as the provision of a more comfortable environment or reassurance about the educational intervention, given that in this study all of the participants were able to complete the session once they had started and suffered no harmful effects.

To further improve the study, a true RCT with cluster sampling may be considered, Randomization is a method used to ensure patients are organized at random into treatment groups in order to diminish bias that may otherwise be introduced into the data sets (Portney & Watkins, 2000). In this study, it was not feasible to conduct a randomised controlled trial, although it is widely recognised that such trials (RCT) are preferable as study designs when researchers want to examine the effectiveness of the intervention or treatment options. However, block randomization of weeks or months as a unit might be adopted for similar study in the future. It has the advantage of balancing the view of random sampling and minimizes the chance of subject contamination. However, more resources and more samples and time are required to adopt this method.

Since pain VAS is the only subjective pain measure, further consideration of developing other simple tool may be recommended to investigate the multi-dimensional perspective of pain. Validation study might be recommended. Although literature mentioned that pain VAS may have the draw back of inaccurate measurement and difficulties of use by the elderly patients. However, in

this study, pain VAS was user friendly and accurate with the measures of double checking of measurement.

Lastly, the process evaluation used could be further improved. For example by recording the activities of the educational session in real time using an observer to ensure the integrity of the intervention. The choice of process evaluation was subject to by cost constraints, and thus telephone interviews were used in this study rather than face to face interviews. Future studies could consider face to face interviewing participants at their home one or two weeks after discharge from hospital, as their memory of their hospitalization experience would still be fresh and non-verbal cues could be better detected by using face to face interview (Morse and Field, 1995).

Conclusion

The results of the study suggest that that the C-BEI was an effective intervention for Chinese patients with traumatic fracture limb who were undergoing surgery in terms of reducing the pain barrier, the pain level, and the anxiety level and promoting sleep satisfaction during hospitalization. The participants in the experimental group had a statistically significant lower pain barrier score, a lower level of pain, lower levels of anxiety, and better sleep satisfaction than the control group in the first seven days after surgery. The experimental group also had a significantly higher frequency of analgesic use at day two, and better self-efficacy in pain management before discharge compared with the control group. There were no statistically significant differences in the total length of stay in hospital between the two groups, although the mean length of stay was shorter in the experimental group than in the control group.

As far as longer-term effects are concerned, the tailor-made C-BEI was effective at the post-operative stage only in reducing anxiety reduction and promoting sleep satisfaction. There were no statistically significant differences between the two groups in pain level or general self-efficacy in the three months after discharge. There were also no statistically significant differences between the two groups in the physical health summary component (PCS) or mental health summary component (MCS) of their health-related quality of life scores (SF 36), although the experimental group had better scores in the mental health dimension.

There has been an increase in the use of the cognitive behavioral approach as the theoretical framework for educational interventions to assist patients to cope with health problems (White, 2001, Chan 2003). However, there is so far no published study testing the effectiveness of a C-BEI in terms of post-operative outcomes among Chinese adults with fracture limb who are undergoing surgery. This study addresses this research gap and provides empirical evidence for the effective use of a C-BEI in acute pain management in the clinical setting. The findings of the study are encouraging, and add to the theoretical body of knowledge on acute pain management.

The C-BEI aims to break the vicious cycle by enhancing patients' knowledge of pain and clarifying their beliefs about pain management. Through the educational intervention, patients acquire knowledge about their pain and management, modify their misconceptions, reduce their negative thoughts, and become more active in coping with their pain. Patients may as a result manage their pain better by changing certain cognitive factors (negative thoughts, beliefs about analgesics) and behavioral factors (acceptance of pain medication and acquiring skill in relaxed breathing). This eventually reduces the pain barrier.

increases acceptance of analgesics, and engenders the perception of better general well-being with less pain, less anxiety, and better sleep satisfaction.

Clinically, this study indicates that the C-BEI is feasible and worth implementing by nurses, and is likely to be well accepted by patients. From the research point of view, it also demonstrates the feasibility of conducting experimental research in an acute setting. In summary, the C-BEI is effective for Chinese patients with fractured limbs who are undergoing surgery. However, it is recommended that the study be replicated with an RCT design to determine its cost-effectiveness. Subsequent research could also include a study on the effectiveness of C-BEI in patients with other acute orthopedic problems or undergoing other types of surgery.

End

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List of appendices

Appendix 1

Educational intervention studies for the patient undergoing orthopedic surgery

Study & design	**Population and sample size**	**Format of educational intervention**	**Control intervention**	**Theory**	**Remarks**
Katja teal. 2008 Randomized pre & post test	n=75 (experimental) n=75 (control	Internet based education	Face to face education	Not known	Improvement in knowledge Increase cognitive empowerment
Johansson et al, 2004	hip arthoplasty n-62 experimental n= 61 control	Pre-admission education Written material Concept map	Oral education	Empowerment	Better knowledge
Prouty et al, 2006 Survey at the end of education	Total hip joint replacement Not known	Multidisciplinary approach	Usual	Not known	Better knowledge
Yeh et al.,, 2005 Quasi-experimental Before and after	Hip replacement n =33 (control) n= experimental	Multimedia CD with printed nursing guide	Usual	Self -Efficacy theory	Higher self –efficacy Shorter length of stay by 6.3vs 6.9 days
Johansson et al , 2005 Meta-analysis Review 11 papers	Orthopaedic patient	Pre-operative care		Empowerment	Educational intervention varied widely with written material mainly High-lighted the need for well0 designed research into outcome

Johansson et al , 2004 Survey at the end	N=25	Written material		Not known	
Giraudet-Le et al., 2003 RCT	Hip surgery n-52-experimental n=48 control	Multidisciplinary information session 2-6week s before surgery Last for half day		Not known	Less anxious Less pain Can stand up sooner
LaMontagne et al., 2003 Experimental Convenience sample	N=58	Coping instruction		Not known	Better coping Less pain
Lewis, et al., 2002	Convenience of 58 patients	Interactive DVD program	Not –interactive	Not known	Higher knowledge score
Heye etal., 2002 , Review paper				Self –efficacy theory	Improved mobility and self efficacy.
Dai et al, 2002 Single follow up	Hip fracture	Multidisciplinary rehabilitation programme	Usual	Not known	Better functional ability in ADL Mobility
Ponzer et al. 2000 RCT	N=150 hip injury	Psychosocial support in rehabilitation	usual	Not known	Better HRQOL

Daltroy et al. 1998 Randomization 3 groups Pre-post test	Hip and knee surgery n=52 (Experimental group) n=58 information only n=relaxation only n=28 Pre-op teaching and nurse initiated call	Pre-operative education Audio taped slide information Post-operative care and relaxation training		Not known	Reduce length of stay Reduce pain, anxiety
Lilja et al, 1998	Total hip replacement	Pre operative teaching	Routine teaching	Not known	
Pellino et al., 1998	Orthopaedic surgery	Pre operative teaching		Self –efficacy theory	Higher efficacy score
Gammon & Mulgamon	Total hip replacement	Written material		Nile known	Less LOS (2 days) Coping outcomes
Bulter et al ,1996 Randomized to group Pre-and posttest	Total hip replacement N=80 Mean age 62	Booklet Pre-operative , after hospital	Standared discharge teaching	Nil known	Less anxious No difference in LOS
Wong et al. 1990 Randomization 3 groups Pre-post test	Hip arthroplasty n-=146, mean age 66.6	Pamphlet, video and home visit Patient –early discharge	Usual care Discharge normal time	Nil known	

Devine E Meta-analysis 191 studies	Surgical	Psycho-education		Nil known	Reduce pain Emphasize the positive effect of education on outcomes Small to moderate effect size

Ethical approval from Joint the Chinese University of Hong Kong & Clinical research Ethic Committee

香港中文大學醫學院
Faculty Of Medicine
The Chinese University Of Hong Kong

醫院管理局
新界東醫院聯網
Hospital Authority
New Territories East Cluster

Joint The Chinese University of Hong Kong – New Territories East Cluster Clinical Research Ethics Committee
香港中文大學-新界東醫院聯網 臨床研究倫理 聯席委員會

Secretary of the Clinical Research Ethics Committee c/o Centre for Epidemiology and Biostatistics,
Faculty of Medicine, The Chinese University of Hong Kong, 5th Floor, Postgraduate Education Centre, Prince of Wales Hospital.
Tel : (852) 2252 8717 ~~Fax : (852) 2645 3594~~ Fax No.: 2646 6653

To: Ms. Eliza Wong
(PhD Student)
The Nethersole School of Nursing
The Chinese University of Hong Kong

23 August 2004

Ethics Approval of Research Protocol

CREC Ref. No.:	CRE-2004.308
Date of Approval:	23 August 2004*
Protocol Title:	Pain Experience and Pain Management Practice For Chinese Patients Having Traumatic Fracture Femur and Surgery
Investigator(s):	Eliza WONG
Supervisor(s):	Sheila TWINN and Sally CHAN

I write to inform you that ethics approval has been given to you to conduct the captioned study in accordance with the following document(s) submitted:

- Proposal
- Patient Information and Consent Form(for patient interview) in English and Chinese Version
- Patient Information and Consent Form(for nursing staff interview) in English and Chinese Version

This ethics approval* will be valid for 12 months. Application for further renewal can be made by submitting the Renewal and Research Progress Report Form to the CREC. It will be much appreciated if the completion of the project will be reported to the Committee in due course.

The Joint CUHK-NTEC Clinical Research Ethics Committee serves to ensure that research complies with the Declaration of Helsinki, ICH GCP Guidelines, local regulations, HA and University policies.

(Prof. Joseph Lau)
Secretary, Joint CUHK-NTEC

Ethical approval from Joint the Chinese University of Hong Kong & Clinical research Ethic Committee

香港中文大學醫學院
Faculty Of Medicine
The Chinese University Of Hong Kong

醫院管理局
新界東醫院聯網
Hospital Authority
New Territories East Cluster

Joint The Chinese University of Hong Kong – New Territories East Cluster Clinical Research Ethics Committee
香港中文大學–新界東醫院聯網 臨床研究倫理 聯席委員會

Secretary of the Clinical Research Ethics Committee c/o Centre for Epidemiology and Biostatistics,
Faculty of Medicine, The Chinese University of Hong Kong, 5th Floor, Postgraduate Education Centre, Prince of Wales Hospital.
Tel : (852) 2252 8717 ~~Fax : (852) 2645 6656~~Fax No.: 2645 6655

To: Prof. Eliza WONG
(Student, PhD Programme)
The Nethersole School of Nursing
The Chinese University of Hong Kong

29 June 2005

Ethics Approval of Research Protocol

CREC Ref. No.:	CRE-2005.227
Date of Approval:	29 June 2005*
Protocol Title:	The Effect of An Education Programme on Pain Management and Post-Operative Outcome of Chinese Patients Having Traumatic Fracture Limb Undergoing Surgery
Investigator(s):	Eliza MJ Ling WONG
Supervisor(s):	Prof. Violeta LOPEZ and Prof. Sally CHAN

I write to inform you that ethics approval has been given to you to conduct the captioned study in accordance with the following document(s) submitted:

- Proposal dated 06 June 2005
- Information and Consent Form in English and Chinese Version

This ethics approval* will be valid for 12 months. Application for further renewal can be made by submitting the Renewal and Research Progress Report Form to the CREC. It will be much appreciated if the completion of the project will be reported to the Committee in due course.

The Joint CUHK-NTEC Clinical Research Ethics Committee serves to confirm that research complies with the Declaration of Helsinki, ICH GCP Guidelines, local regulations, HA and University policies.

(Ms. Sheron TUNG)
Secretary, Joint CUHK-NTEC
Clinical Research Ethics Committee

SE/el

Appendix 2

Permission letters from Study hospitals

North District Hospital
9, Po Kin Road, Sheung Shui, New Territories
[Tel. (852) 2683 7891 Fax. (852) 2683 8393]

19 December 2005

Ms Eliza Wong
Professional Consultant
The Nethersole School of Nursing
Room 827, Esther Lee building
The Chinese university of Hong Kong
Shatin

Dear Ms Wong

Research Study

Thank you for your letter dated of 1 December 2005.

I am pleased to inform you that permission is granted to you for conducting the research *"the effect of an education programme on pain management and post-operative outcome of Chinese patients having traumatic fracture limb undergoing surgery"* at the Orthopaedics and Traumatology Unit, NDH from January to August 2006.

For making arrangement for the research, please contact Mr Tam, DOM (O&T) at 2683 8022.

I would be appreciated if you could send us a copy of your findings when available.

Wishing you all success.

Yours sincerely,

(W L AU)
For Hospital Chief Executive
North District Hospital

c.c. HCE, NDH
COS(O&T),NDH
DOM (O&T), NDH

PRINCE OF WALES HOSPITAL
威 爾 斯 親 王 醫 院
30-32 Ngan Shing Street, Sha Tin, N.T., Hong Kong Tel: (852) 2632 2211 Fax: (852) 2637 6244
香港沙田銀城街三十至三十二號 電話：2632 2211 傳真：2637 6244

Our Ref : (13) in PWH/CRO/R/1/05

30 AUG 2005

Ms. Eliza WONG
Professional consultant
The Nethersole School of Nursing
Rm 827, Esther Lee Building
The Chinese University of Hong Kong
Shatin, N.T.

Dear Ms. WONG,

Application for conducting the research in Prince of Wales Hospital
(The effect of an education programme on pain management and post – operative outcome of Chinese patients having traumatic fracture limb undergoing surgery)

I refer to your letter of 9th August 2005 regarding the above issue.

I am pleased to inform you that approval has been given for you to carry out the above study in our hospital. Please pass a copy of the research report to us for information upon completion of the survey.

Please feel free to contact me on 2632 2448 for any enquiry.

Thank you for your attention.

Yours sincerely,

(Miss Stella WONG)
for Hospital Chief Executive
Prince of Wales Hospital

c.c. COS (O&T)
DOM (O&T)

Appendix 3a

Interview field note record

Participant code number
Interview date
Time start :
Time end

Location of interview
Environment description:

Non- verbal cues of participant :

Researcher impression :

Remarks

Appendix 3b

Interview guideline -patients

Section A: patient profile
Section B:questions to explore patient's pain experience

Section A :
Age:
Gender:
Educational level:
Marital status :
Employment status :
Previous health problem :

Section B
Rapport building question

1. Please tell me about your accident?
2. What happen when you admitted in the hospital?
3. What treatments did you receive for your fracture?
4. What treatment are you receiving for your pain now
   Prone- what are they? What are their effect and side effect?

Questions about experience of pain

1. What is your experience of pain during hospitalization?
   Prompt- when was the most painful time? Describe the feeling?

2. What do you think about the importance of pain management? Why?
   Prompt-effect of pain on mood, sleep, movement and exercise during hospitalization?

3. What were the measures you receive to reduce your pain?
   Prompt- : In which is adequate? Why?
   In which aspect is not adequate? Why?
   Are they useful and why?
   What is your feeling about this measure?

4. Despite the measures you received, how did you cope with your pain?
   Prompt- why you choose this method? Are they useful and why?

5. In what ways do you think health professionals can assist you for pain relief?
   Prompt -information gained regarding your pain problem/ measures to reduce pain

6. Please make any other comments you feel are related to the issues contained within this interview.

Appendix 3C

Interview Guidelines for nursing staff:

Section A: staff profile
Section B: Open–ended questions will be asked to explore staff's perception about patient's pain experience and pain practice

Section A

1) Rank/Post_____
2) Sex Male/female
3) Year of post-registration experience_____ year
4) Nursing experience _____years in trauma unit
5) Previous experience

   _____years in _____Unit

   _____years in _____Unit

   _____years in _____Unit

6) Pain management course attended Yes/ No ,

   if yes, please specify which course _____

7) Education level in nursing:

Certificate/ Diploma/ Bachelor degree/ Master degree/ others

Section B : Open end questions

1) Can you describe how you help your patients to reduce their pain?

   Prompt: what measure? How?

2) How do you evaluate these measures?

   Prompt: In which aspect is adequate? Why?

   In which aspect is not adequate? Why?

3) What are the factors to facilitate you to carry out your pain practice effectively?

   Prompt : For example? How ?

4) What difficulties do you encounter during the implementation of pain management?

   Prompt : For example? How difficult? How to overcome?

5) What are the effect to patients with regard to the pain management ?

6) Please make any other comments you feel are related to the issues contained within this interview.

Appendix 4

Consent form –qualitative interview with patient (English version)

Patient's code number:

INFORMATION AND CONSENT FORM (for patient interview)

Pain experience and pain management practice for Chinese patients having traumatic fracture limb and surgery.

I am currently a PhD student of The Graduate School of The Chinese University of Hong Kong and I am undertaking a research study as part of my studies. Despite the current knowledge, I want to follow up your pain experience and needs so that we can analyze and plan further strategies to improve pain management. Good pain control can improve the patient's performance of the activities necessary for a smooth recovery.

The aim of this study is to investigate pain experience of patients with fracture femur and surgery. Information will be collected by means of interview. The Interview will be conducted at least once and each interview will last about 30min. to 45 min. The interview will be tape recorded and kept confidential.

At any stage, you can contact Miss Wong (pager: 74798037) for further information.

Thank you for your participation.

I hereby consent to participate in this study

I fully understand the nature, purpose, and procedure of this study which has been explained to me by the researcher. I understand that the interview will be tape-recorded and that all information will be kept confidential, anonymous and used for research purposes only.

I also understand and give consent for the researcher to access my medical records.

I am aware that my participation is voluntary and I am free to withdraw from this study any time without affecting the treatment that I am receiving.

Signature of Subject _____ Signature of Witness_____

Date _____

附件 4

香港中文大學
研究院

「骨折之痛楚處理」

病人須知及研究計劃同意書

本人乃中文大學研究院學生，現正研究有關病人股骨受傷後的痛楚經驗及手術前後之減痛程序，根據文獻,有效的減痛程序有助患者順利康復，減低並發症的發生。是次研究目的是搜集股骨骨折病人受傷及手術前後對止痛程序的需要。

懇請閣下參與是次研究，資料搜集會以面談及錄音形式進行，時間約三十至四十五分鐘。

是項研究屬自願性質，閣下有權隨時撤回參與研究而不須作任何解釋及不會對閣下之治療有任何影響。閣下的個人資料會保密及只作研究之用。如有任何查詢，閣下可致電黃姑娘(74798037), 我們十分感謝閣下的參與。

本人_____茲明白及同意接受此項研究。

本人亦同意面談以錄音形式進行，錄音內容純作研究用途。

本人同意研究員可查看本人之病歷。

本人明白參加與否純屬個人選擇及自由。

本人可向研究員詢問詳情，並有權隨時撤回此項同意而無須作任何解釋及不會對本人之治療有任何影響。

此項研究，絕對保密！

病人/家屬簽署：_____ _____ 研究員簽署_____

日期：_____

Appendix 5
Consent form –qualitative interview with nursing staff (English version)

Code number:

INFORMATION AND CONSENT FORM (for nursing staff interview)
Pain experience and pain management practice for Chinese patients having traumatic fracture femur and surgery.

I am currently a PhD student of The Graduate School of The Chinese University of Hong Kong and I am undertaking a research study as part of my studies. Despite the current knowledge, I want to know more about the pain practice in local setting so that we can analyze and plan further strategies to improve pain management. It is well recognized that good pain control can improve the patient's performance of the activities necessary for a smooth recovery.

The aim of this study is to investigate pain practice experience of nursing staff working in orthopedic and trauma unit. Information will be collected by means of interview. Interview will be conducted at least once and each interview will last about 30min. to 45 min. The interview will be tape recorded and will not share with hospital staff. The final report, containing anonymous quotations will be available to all participants on request at the end of the study. At any stage, you can contact Miss Wong (pager: 74798037) for further information. Your help to this project especially your own time is much appreciated.

Thank you for your participation.

I hereby consent to participate in this study

I fully understand the nature, purpose, and procedure of this study which has been explained to me by the researcher. I understand that the interview will be tape-recorded and that all information will be kept confidential, anonymous and used for research purposes only.

I also understand and give consent for the researcher to observe my work in orthopedic and trauma unit.

I am aware that my participation is voluntary and I am free to withdraw from this study any time without affecting the treatment that I am receiving.

Signature of Subject _____Signature of Witness_____

Name of Subject _____ Name of Witness _____

Date _____

Sample Transcript from Patient Interview (Phase 1 study)

Patient code: 9 Interview date and time: Nov 2, 04, 3 p.m.–3:40 p.m.
Duration of interview: 40 minutes

Location of interview: Patient's room at the study hospital

R: research assistant P: patient

First, the researcher introduced herself to the participants, and stated the purpose of the interview. The audiotaped recorder was turned on. The participant mentioned details of the injury and he was admitted to the ward after stabilization.

R: 50 You just mentioned to me your story of acquiring the injury. You slipped and fell in the bathroom and could not stand up. You called your son for help and then you were admitted to the emergency department for treatment. Eventually you were transferred to this ward and waited for your operation. Three days ago, you had your operation. Now please tell me your feelings during the admission period.

P9: 51 After the doctor had checked the x-ray, I was asked to stay in the ward and wait for my operation for my fractured right femur. I was a bit nervous about my condition, but I wanted to recover quickly.

R: 53 Then did you have any pain at that time?

P9: 54 Yes. Very painful.

R: 55 Well, please tell me more about this experience.

P9: 56 Let's see… It was the first time I had had so much pain in my life. It was extremely painful and stressful. It seemed that it lasted forever and was endless. When I moved my hurt leg, the pain was even stronger… I don't know how to describe the pain level... I felt much stress at that time…

R: 57 Have you ever been hospitalized like this before?

P9: 58 Err… yes, it is seldom. I had been hospitalized for gallstone removal five years ago. The pain after the operation was totally different from this time. This time the pain was more intense.

R: 59 Which area is the most painful part?

P9: 60 Mm... That part was the most painful part (patient pointed to the operated site on right thigh). It was very irritable and painful.

R: 61 How about other parts of your body?

P9: 62 Yes, other parts of my body were okay. Very lucky! Then I had the operation on the second day after admission here.

R: 63 When did you feel the most pain in the whole process from admission until today?

P9: 64 When I just slipped down, I was frightened, alone, and in much pain. Then I was in pain all time. Yes, I kept feeling pain even after the surgery. Of course, the pain has decreased after two days of surgery.

R: 65 So please tell me more about your pain after surgery.

P9: 66 It was not so painful after the operation.

R: 67 Not so painful?

P9: 68 Right, not so painful. After I came back from the theatre, my son asked me if I felt any pain. I answered no. He heard that it is usually very painful after the operation. I think it is because I still have the anaesthetic drug effect in my body. However, at night, the pain came again. I could not sleep and needed to call the nurse for help. Err... I also heard that some patients in this ward yelled for pain relief when they were awake.

R: 69 You mean when you were awake at night, you requested a needle to stop your pain.

P9: 70 Yes. Um... (In the manner of doubt). I tried to wait until it was really painful.

R: 71 What was your pain level at that time. How do you describe it?

P9: 72 I think it was 100 if 100 was the full mark of pain. When I look back, it was awful... something you could not control... I was thinking of a Chinese idiom 'pork on a chopping board,' meaning you were totally reliant on how the butcher treated you. All my fate was in the doctor's hands. There was nothing that I could do to relieve my pain. In my working life as a construction worker, I could control the quality and outcome of my work. As a patient, I lost all control, especially when the pain was severe...

R: 73 Yes, I can imagine it was painful.

P9: 74 Exactly, it was really painful and I did not know how to move my body correctly, for example, sit on the bedpan.

R: 75 So it was painful when you sat on the pan. But when you lay down and do not move frequently, your back would be tired. So what do you think about the importance of pain management?

P9: 76 I think it is important after injury and the night after surgery. Oh, I think I also need it when I use the bed pan. It was so painful when I was raising my bottom to sit on the pan.

R: 77 So pain management was important for your sleep after surgery and during some movement?

P9: 78 Yes. I take it (analgesic) only when I can't stand it (pain). Mm... It is a matter of personal will that I want to use it as my last option. I remembered that when my son said goodbye to me on admission day, he reminded me to bear the pain as much as possible and try to avoid any pain relief until I really couldn't bear the pain. I agreed. Analgesic is a Western medicine; most of them have the effect of 'Shan.'

R: 79 Can you elaborate a bit more on "Shan feeling?"

P9: 80 I become dizzy and want to vomit; "Shan" is always present in Western medicine. I try to avoid this (drug) if I can.

R: 81 Despite the measures you received, how did you cope with your pain?

P9: 82 I tried my best not to move my body so much to aggravate the pain. For example, I kept my body still, not moving my affected limb until the operation. But it was bad for me to keep still. I felt very tired and exhausted.

R: 83 It was painful when you sat on the bed pan. But when you lay down without movement, your back would be tired. You said you felt much pain and avoided any movement; do you think pain management is adequate for you?

P9: 84 No. it was enough to stop my pain. I did not want to press the call bell because there were more and more patients being admitted late that night. The nurses were very busy. I did not want to bother them so much...

Appendix 7

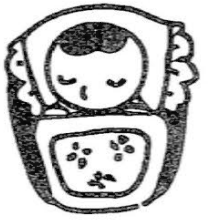
Educational intervention content

Time	Objectives	Contents covered
First 5 minutes	Build up rapport with the participant	Introduction self
10 minutes	Enhance patients' knowledge on pain and pain management	State the key points of benefit of good pain management - Good pain relief can improve sleep and capability of activities and speed up recovery. - Pain leads to all kinds of psychological discomfort, results in vicious circle of tension and more pain. - Option of pain relief available after surgery - Measures to do when pain is present
10 minutes	To regain self control and self efficacy	- Demonstration & redmonstration of Breathing relaxation exercises skill 1. Sit up right or lie flat, fully breathe out by mouth (purse lip and blow air), breathe in by nose and count to 4 simultaneously and slowly. 2. Hold your breath, count to 3 slowly, then count again to 4 slowly, breathe out through mouth in a relaxing manner. 3. 3. 3. Finally, lower down your shoulder and relax, feel your tummy, it shrinks a bit, continue practicing for 6 cycles. 4. Practice 4 times (6 cycles each time) a day, in the morning, afternoon, evening and before sleep; it helps to relax your body. Detail –refer to booklet at appendix x)
5 minutes	Dispel the negative thought	- Clarify the correct pain belief and analgesic - encourage participant to have positive attitude to face the pain

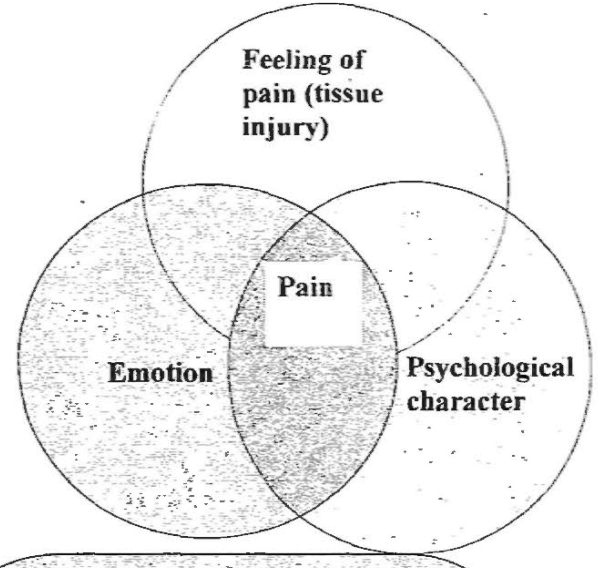

For my pain management, I am Confident in handling it.

Self pain Management Goal

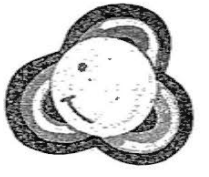
1. To improve the understanding of pain.
2. To bring up correct attitude and enhance self-confidence.
3. To diminish the thought that hinders pain management, so as to promote recovery.

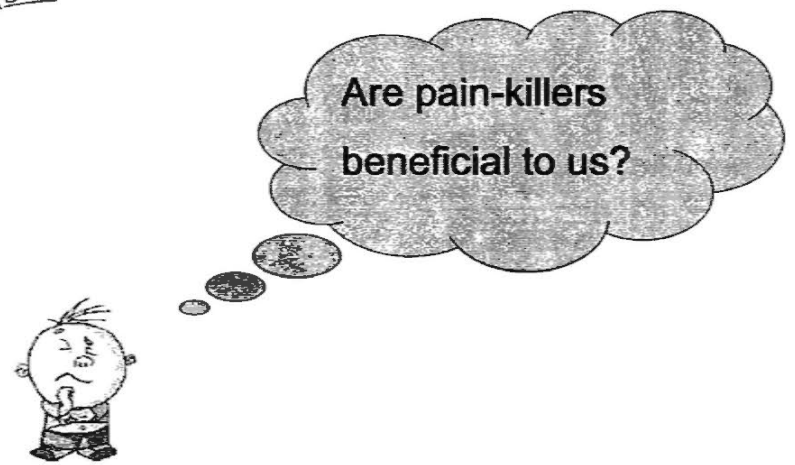


Pain is influenced by physical and psychological factors



Physical, psychological and emotional factors converge to pain; they can intensify and alleviate pain.





Short term use of pain-killers is effective in relieving pain and it will not cause addiction. Some medication causes nausea and vomiting, but these symptoms are only temporary. Let nurses know about your problem, so they can help in soothing these symptoms.

Despite of relieving pain, pain killers can improve sleep and capability of activities.

Apart from medicine, what else can be helpful to reduce pain ? ?

Apart from medicine, there are other non-pharmacological methods used to reduce pain.

Conquer tension — Vicious circle of pain

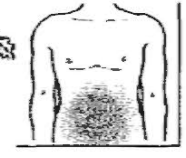
Pain leads to all kinds of psychological discomfort, results in vicious circle of tension and more pain. Relaxation technique is an effective way to break this circle, alleviate tension and pain.

How can I relax?

- Relax every day—Relax in your own way for 30 minutes.
- After practice, think of different situations and your corresponding coping methods.
- Remember you are the one to control— "I can control my pain."
- Be optimistic about future— "I can make it."

Respiratory Relaxation Technique

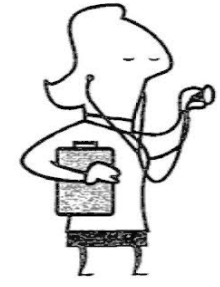
The best way is to sit up right or lie flat, fully breathe out by mouth (purse lip and blow air), breathe in by nose and count to 4 simultaneously and slowly. During inspiration, fill the lower part of the tummy completely. The tummy becomes flatten and allows the lungs to hold much air. Try to feel your tummy, it distends.



Hold your breath, count to 3 slowly, then count again to 4 slowly, breathe out through mouth in a relaxing manner. While breathing out, follow the procedure as above, shrink the abdomen, then breathe out the air in the thorax.

Finally, lower down your shoulder and relax, feel your tummy, it shrinks a bit, continue practicing for 6 cycles. Practice 4 times (6 cycles each time) a day, in the morning, afternoon, evening and before sleep; it helps to relax your body.

If pain persists, what should I do ?



If pharmacological and non-pharmacological methods fail to relieve pain, contact your doctor for further assessment as soon as possible.

Record of daily medication, respiratory activities and pain

For pain assessment record, please fill in the form according to the example given below. Use (0-10) to indicate the pain level.

Example：Pain level

0 1 2 3 4 5 6 7 8 9 10

No pain Extreme pain

My 1st month after OT

Date	Week 1	Week 2	Week 3	Week 4
Frequency of taking pain killers (times per day)				
Highest level of pain				
Lowest level of pain				
Average level of pain				
Frequency of respiratory activity (times per day)				

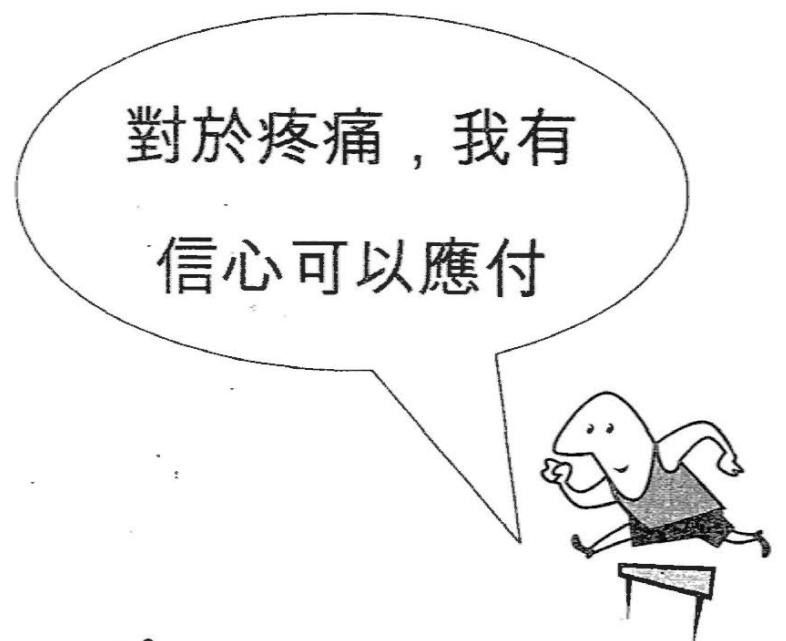
My second month of OT

Date	Week 1	Week 2	Week 3	Week 4
Frequency of taking pain killers (times per day)				
Highest level of pain				
Lowest level of pain				
Average level of pain				
Frequency of respiratory activity (times per day)				

My third month of OT

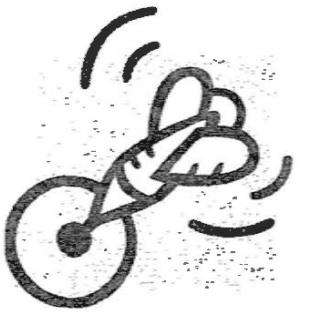
Date	Week 1	Week 2	Week 3	Week 4
Frequency of taking pain killers (times per day)				
Highest level of pain				
Lowest level of pain				
Average level of pain				
Frequency of respiratory activity (times per day)				

For my pain management, I am Confident in handling it.



疼痛自理

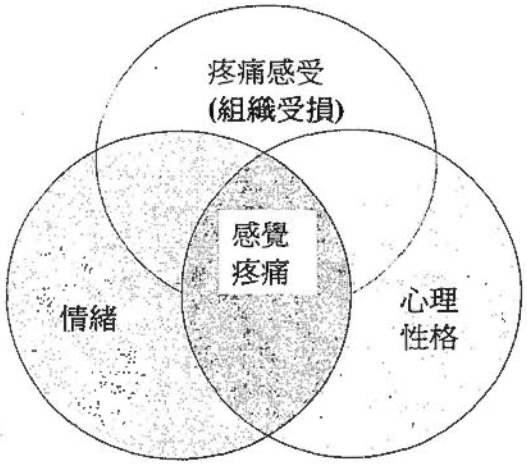
目標



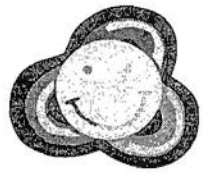
1 改善對於疼痛的了解。

2 培養正確的態度，增強自信。減少對疼痛無益的想法，可以加速康復。

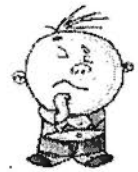
疼痛是受生理及心理影響的



疼痛主要層面包括生理、心理及情緒，各方面均會使疼痛加劇或減輕。



怎樣減少疼痛？



短期的止痛藥物對我們止痛很有幫助，不會做成上癮。有些藥物會有暈眩或作嘔徵象，但只是短期現象，可以告訴護士處理問題。

止痛藥可以助我們治少疼痛，對於改善睡眠和活動能力均有幫助。

除了藥物外，怎樣可以減少疼痛呢？

除了藥物外，還可以用其它非藥物性的方法減少痛楚。

打破緊張 — 疼痛的惡性循環

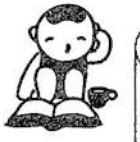
慢性疼痛會導致各種心理痛苦，造成緊張與更多疼痛的惡性循環。放鬆技巧就是打破這個循環、減輕緊張疼痛的一種有效辦法。

怎樣放鬆?

- 每天放鬆—從事三十分鐘自己所選的放鬆方式。
- 在練習之後想像不同的情況，以及自己可能應付之方式。
- 記得自己內在的控制位—「這裡由我控制」。
- 對未來抱持樂觀的想法—「我將能夠做這件事」。

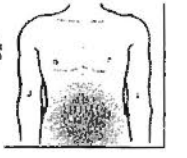
呼吸鬆弛法

1



較好的方式是脊椎挺直地坐或躺，充分吐氣後，用鼻子邊吸邊慢慢數到四。吸氣時，先將氣充滿肺部下方。你的橫膈膜會將你的腹部往外推，讓出空間給空氣。摸摸你的肚皮,應是脹脹的。

2



憋氣，慢數到三，然後再慢慢數到四，一邊由口中發出像風聲一樣的放鬆嘶嘶聲，將氣吐掉。吐氣時，遵循和吸氣一樣的步驟，將腹部往內縮，然後吐掉胸腔中間部分的氣。最後，一邊沉下肩膀放鬆，摸摸你的肚皮,是稍為收縮的,繼續練習 6 次。每天早午晚各練習一次,對身體鬆弛很有幫助。

若持續疼痛，怎麼辦？

如藥物及非藥物也不能改善情況，應盡快找醫生再進行評估你的情況。

每天進食藥物，呼吸運動及疼痛紀錄

做痛楚評分記錄，請按記錄表中的例子方法。請用(0-10)來記錄痛楚程度分數。

例子：痛楚評分

0 1 2 3 4 5 6 7 8 9 10

無痛 極痛

手術後首一月

日期（ 月 日至 月 日)

日期	首一星期	首二星期	首三星期	首四星期
今星期服止痛藥次數				
今星期最高的痛楚程度				
今星期最低的痛楚程度				
今星期平均的痛楚程度				
呼吸運動次數				

手術後首二月

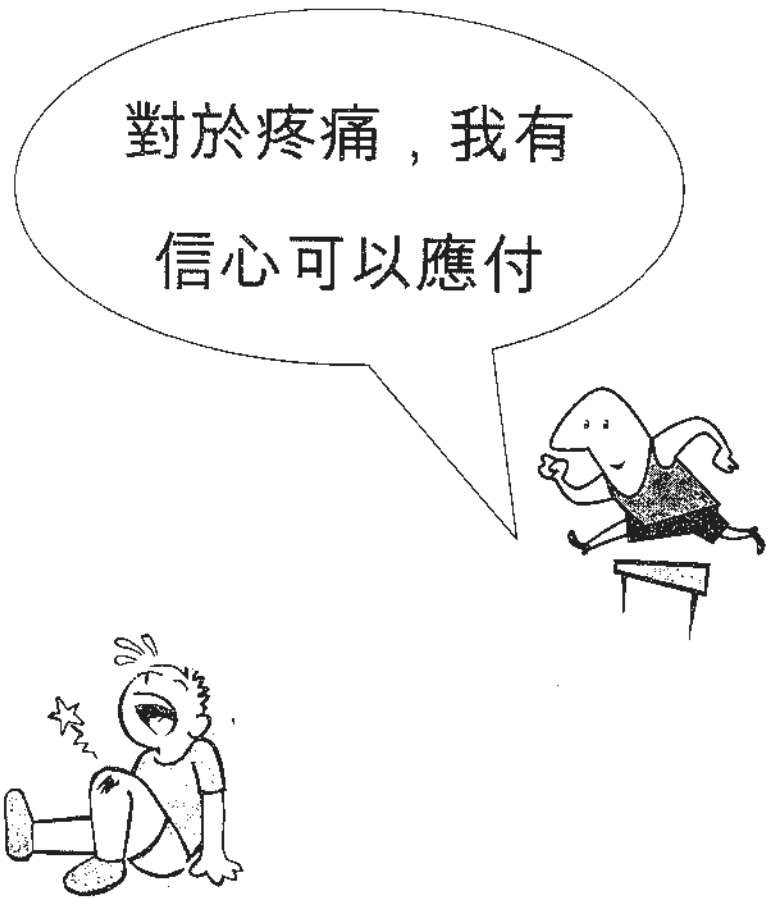
日期（ 月 日至 月 日)

日期	首一星期	首二星期	首三星期	首四星期
今星期服止痛藥次數				
今星期最高的痛楚程度				
今星期最低的痛楚程度				
今星期平均的痛楚程度				
呼吸運動次數				

手術後首三月

日期（ 月 日至 月 日)

日期	首一星期	首二星期	首三星期	首四星期
今星期服止痛藥次數				
今星期最高的痛楚程度				
今星期最低的痛楚程度				
今星期平均的痛楚程度				
呼吸運動次數				


對於疼痛，我有
信心可以應付

Appendix 9

Usual care pattern of patient with fracture limb

Patient with fracture limb

↓

Admit in Accident and Emergency Department for stabilization and x -ray

↓

Transfer to orthopedic and traumatology unit to optimize medical condition t (Pethidine 50 mg-100mg IMI Q4H or Q6H for pain relief)

↓

Operation

↓

Day 0 – bed rest, IV drip (Pethidine 50mg-100mg IMI Q4H Prn)

↓

Day 1 Pethidine 50mg-100mg IMI Q4H Prn

↓

Day 2, off drain if present, sit out (Pethidine 50mg-100mg IMI Q4H Prn)

↓

Day 3 or 4, change to light dressing, start rehabilitation exercise. (Dologesic tab 2 qid)

↓

After D7 Discharge home if wound and walking exercise with crutches is okay

Appendix 10

The Modified Pain Barrier Questionnaire–Taiwan Version (BQT)

1. Please respond to the next seven items by circling the number (0, 1, 2, 3, 4, or 5) that comes closet to how much you agree with that item. There are no right or wrong answers: we just want to know what you think.

   A. Pain medication cannot really control pain

   0 1 2 3 4 5

   Do not agree at all Agree very much

   B. People get addicted to pain medicine easily.

   0 1 2 3 4 5

   Do not agree at all Agree very much

   C. Good patients avoid talking about pain.

   0 1 2 3 4 5

   Do not agree at all Agree very much

   D. It is easier to put up with pain than with the side effects that come from pain medicine.

   0 1 2 3 4 5

   Do not agree at all Agree very much

   E. Complaints of pain could distract a physician from treating my underlying illness.

   0 1 2 3 4 5

   Do not agree at all Agree very much

   F. Pain medicine should be "saved" in case the pain gets worse.

   0 1 2 3 4 5

   Do not agree at all Agree very much

   G. The experienced of pain is a sign that the illness has gotten worse.

   0 1 2 3 4 5

   Do not agree at all Agree very much

2. If you still have pain, would you like a stronger dose of pain medication?
   ___(1) Yes ___(2) No
   If you answered no, please indicate why not.
   _____

Appendix 11

Visual Analogue Scale

1. On this scale, how much pain are you having right now?

(Not satisfied) (very satisfied)

STAI-State Anxiety Inventory **Appendix 12**

Instructions:

Below are some more statements which people have used to describe themselves. Please read each statement and **tick** (✓) the appropriate answer to indicate how you **feel right now**, that is, **at this moment**. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your **present feelings** best.

	Not at all	*Somewhat*	*Moderately so*	*very much so*
1. I feel calm				
2. I feel secure				
3. I feel tense				
4. I feel strained				
5. I feel at ease				
6. I feel upset				
7. I am presently worrying over possible misfortunes				
8. I feel satisfied				
9. I feel frightened				
10. I feel comfortable				
11. I feel self-confident				
12. I feel nervous				
13. I am jittery				
14. I feel indecisive				
15. I am relaxed				
16. I feel content				
17. I am worried				
18. I feel confused				
19. I feel steady				
20. I feel pleasant				

Appendix 13

Sleep satisfaction questionnaire

1. Circle the number below that describes how, during the past 24 hours, pain has interfered with you.

   E. Sleep

   0 1 2 3 4 5 6 7 8 9 10

   Does not interfere Completely interferes

2. Select the phrase that indicates how satisfied or dissatisfied you are with the results of your sleep satisfaction .

   ____(1) Very dissatisfied
   ____(2) Dissatisfied
   ____(3) Slightly dissatisfied
   ____(4) Slightly satisfied
   ____(5) Satisfied
   ____(6) Very satisfied

Appendix 14

General Self-Efficacy Scale

	Absolutely incorrect	Quite Correct	Correct	Absolutely correct
1. I can always manage to solve difficult problems if I try hard enough.	☐	☐	☐	☐
2. If someone opposes me, I can find the means and ways to get what I want.	☐	☐	☐	☐
3. It is easy for me to stick to my aims and accomplish my goals.	☐	☐	☐	☐
4. I am confident that I could deal efficiently with unexpected events.	☐	☐	☐	☐
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.	☐	☐	☐	☐
6. I can solve most problems if I invest the necessary effort.	☐	☐	☐	☐
7. I can remain calm when facing difficulties because I can rely on my coping abilities.	☐	☐	☐	☐
8. When I am confronted with a problem, I can usually find several solutions.	☐	☐	☐	☐
9. If I am in trouble, I can usually think of a solution.	☐	☐	☐	☐
10. I can usually handle whatever comes my way.	☐	☐	☐	☐
11. I am confident that I can handle my pain at home.	☐	☐	☐	☐

Appendix14

Chinese Adaptation of the General Self-Efficacy Scale

Chinese Self-Efficacy Scale

	完全不正確	尚算正確	多數正確	完全正確
1. 如果我盡力去做的話，我總是能夠解決難題的。	☐	☐	☐	☐
2. 即使別人反對我，我仍有辦法取得我所要的。	☐	☐	☐	☐
3. 對我來說，堅持理想和達成目標是輕而易舉的。	☐	☐	☐	☐
4. 我自信能有效地應付任何突如其來事情。	☐	☐	☐	☐
5. 以我的才智，我定能應付意料之外的情況。	☐	☐	☐	☐
6. 如果我付出必要的努力，我一定能解決大多數的難題。	☐	☐	☐	☐
7. 我能冷靜地面對困難，因爲我可信賴自己處理問題的能力。	☐	☐	☐	☐
8. 面對一個難題時，我通常能找到幾個解決方法。	☐	☐	☐	☐
9. 有麻煩的時候，我通常能想到一些應付的方法。	☐	☐	☐	☐
10. 無論什麼事在我身上發生，我都能夠應付自如。	☐	☐	☐	☐

SF-36 HEALTH SURVEY

INSTRUCTIONS: This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities.

Answer every question by marking the answer as indicated. If you are unsure about how to answer a question, please give the best answer you can.

1. In general, would you say your health is:

(circle one)

Excellent 1

Very good 2

Good 3

Fair 4

Poor 5

2. Compared to one year ago, how would you rate your health in general now?

(circle one)

Much better now than one year ago 1

Somewhat better now than one year ago 2

About the same as one year ago 3

Somewhat worse now than one year ago 4

Much worse now than one year ago 5

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

(circle one number on each line)

ACTIVITIES	Yes, Limited A Lot	Yes, Limited A Little	No, Not Limited At All
a. Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports	1	2	3
b. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	1	2	3
c. Lifting or carrying groceries	1	2	3
d. Climbing several flights of stairs	1	2	3
e. Climbing one flight of stairs	1	2	3
f. Bending, kneeling, or stooping	1	2	3
g. Walking more than a mile	1	2	3
h. Walking several blocks	1	2	3
i. Walking one block	1	2	3
j. Bathing or dressing yourself	1	2	3

4. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

(circle one number on each line)

	YES	NO
a. Cut down on the amount of time you spent on work or other activities	1	2
b. Accomplished less than you would like	1	2
c. Were limited in the kind of work or other activities	1	2
d. Had difficulty performing the work or other activities (for example, it took extra effort)	1	2

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

(circle one number on each line)

	YES	NO
a. Cut down the amount of time you spent on work or other activities	1	2
b. Accomplished less than you would like	1	2
c. Didn't do work or other activities as carefully as usual	1	2

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

(circle one)

Not at all 1

Slightly 2

Moderately 3

Quite a bit 4

Extremely 5

7. How much bodily pain have you had during the past 4 weeks?

(circle one)

None 1

Very mild 2

Mild 3

Moderate 4

Severe 5

Very severe 6

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

(circle one)

Not at all 1

A little bit 2

Moderately 3

Quite a bit 4

Extremely 5

9. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks -

(circle one number on each line)

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

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

(circle one)

All of the time 1

Most of the time 2

Some of the time 3

A little of the time 4

None of the time 5

11. How TRUE or FALSE is each of the following statements for you?

(circle one number on each line)

	Definitely True	Mostly True	Don't Know	Mostly False	Definitely False
a. I seem to get sick a little easier than other people	1	2	3	4	5
b. I am as healthy as anybody I know	1	2	3	4	5
c. I expect my health to get worse	1	2	3	4	5
d. My health is excellent	1	2	3	4	5

Appendix
Hong Kong–specific scoring algorithms

Scoring algorithm for the Hong Kong–specific SF-36 PCS and MCS scales

PF_Z = (PF − 91.82573)/12.88527

RP_Z = (RP − 82.42739)/30.97154

BP_Z = (BP − 83.97801)/21.89251

GH_Z = (GH − 55.97759)/20.17986

VT_Z = (VT − 60.27178)/18.64714

SF_Z = (SF − 91.19295)/16.56710

RE_Z = (RE − 71.65975)/38.36354

MH_Z = (MH − 72.78506)/16.56739

HK-Specific SF-36 PCS Score

(PF_Z × 0.46095 + RP_Z × 0.27474
+ BP_Z × 0.35475 + GH_Z
× 0.32470 + VT_Z × 0.03257 + SF_Z
× −0.07846 + RE_Z
× −0.19399 + MH_Z × −0.12198) × 10 + 50

Analgesic use

Appendix 17

1. If you still have pain, would you like a stronger dose of pain medication?
   ___(1) Yes ___(2) No
   If you answered no, please indicate why not.

2. Analgesic request : In the past 24 hours, did you request IMI pethidine for pain relief yourself

Before surgery : yes /no if yes , when _____

Day 2 after surgery : yes /no if yes , when _____

Day 4 after surgery : yes /no if yes , when _____

Day 7 after surgery : yes /no if yes , when _____

Total length of stay in hospital:

- acute trauma unit _____ days
- rehabilitation unit_____days

Date of readmission after discharge from acute ward: Yes / No
If yes, please specify date of re-admission_____

Appendix 19

Demographic and clinical data
(Information will obtained from Medical records and completed by researcher)

1. **Social history ⇒**

Occupation_____
Marital status : Married / not married / Widow

Live alone/ live with family / nursing home

Financial status good / average / poor

Financial assistance Yes/no

Religion yes / No
If yes, please specify_____

2. **Past health problem ⇒**

Regular follow up in :
Surgical _____
Medical _____
Others_____
Please specify health problems if yes _____

- Routine Drugs _____

Any chronic pain : yes/ No
Please specify location and drug use
_____

3. At what level is your educational level?

    1. Less than Primary 1
    2. Primary level
    3. Secondary level
    4. University level or above

4. What is your employment status
    1. Retired
    2. Unemployed
    3. Full time employment
    4. Part time employment
    5. student

6. housewife

5. Trauma type
- ☐ 1. MVA (motor vehicle accident)
- ☐ 2. Industrial
- ☐ 3. Sport
- ☐ 4. Assault
- ☐ 5. Domestic accident
- ☐ 6. Fall
- ☐ 7. Others (please specify)_____

6. Mechanism of injury
- ☐ 1. MVA
  - i. Driver
  - ii. Pedestrian
  - iii. Passenger
- ☐ 2. Fell from height ____ (Meters)
- ☐ 3. Slipped and fell
  - i. Home
  - ii. Nursing home
  - iii. Public area

  Others _____

7) Operation type _____

8) Waiting time for operation (from admission to operation) _____

11) Postoperative complication Yes / No,
if yes, please specify type of complication _____

Appendix 20

Breathing relaxation exercise

For Experimetnal group only

In the past 24 hours , did you completed the breathing exercise 6 cycle x 3 times per day

Day 2 after surgery : yes /no if yes/no , when _____

Day 4 after surgery : yes /no if yes/no , when _____

Day 7 after surgery : yes /no if yes/no , when _____

Appendix 21

INFORMATION AND CONSENT FORM (main study)

The effectiveness of an educational intervention on pain management and post –operative outcomes of Chinese patients with traumatic fracture limb

My name is Eliza Wong and I am undertaking a research project to examine the effect of an education program on pain management for patients with fracture limb and surgery.

You have a limb injury for which you would normally be treated and care for in the orthopedic and trumatology unit. Operation would be normally performed followed by rehabilitation. Since limb fracture and its operation is usually painful, pain relief is usually prescribed to maximize your comfort. Despite the current knowledge, I want to follow up your pain level, psychological level and post-operative health outcome so that we can record, analyze, plan further strategies to improve pain management and post operative outcomes.

I would like to invite you to participate in this research . In this study, you may be randomized to receive two additional 25 minutes education sessions despite the usual care. Our contents of education involve some information related to your pain management of your fracture limb.

The follow up interviews are designed to gather information about your pain and psychological and physical outcome in relation to pain relief. It is envisaged that each interview will take approximately from 10 to 30 minutes. Please note that participation in this study is completely voluntary .

You are entitled to withdraw from the study at any moment if you wish to do so without affecting your care

All the information that we will collect for this study will be confidential, anonymous and used for research purposes.

At any stage, you can contact Miss Wong (tel: 26096027) for further information.

Thank you for your involvement.

Consent form

I agree to take part in this study. The details have been explained to me and I give consent for the research nurse to access my medical records. I also understand that all information will be kept confidential. I am aware that my participation voluntary and I am free to leave the study at any time I wish.

Signature of patient or guardian

Signature of witness

Date:_____

香港中文大學 **Appendix 21**

「有關止痛認知的健康教育
對骨折及手術後病人之影響」

病人須知及研究計劃同意書

本人是黃姑娘，現正研究止痛認知及自理的健康教育對骨折及手術後病人之影響。

閣下因受傷骨折而需於在骨科及創傷病房進行治療，接受手術及康復治療。閣下通常會於手術後接授康復治療。由於骨折及手術均會令閣下感到痛楚，醫生通常會處方止痛藥物以舒緩痛楚。本人除了對閣下現有的認識外，也希望可以跟進閣下的痛楚程度，心理狀況及手術後的健康情況，從以令我們可以作進一步的記錄，分析及制訂一些方法去改善病人骨折及手術後的痛楚情況。

本人現誠邀閣下參與此項研究並十分感激閣下的參與。是次研究會以六次的面談進行。閣下除了會接受一般性的護理外，也會以電腦隨機抽籤的方法決定是否接受額外的兩項護理教育。在閣下的留院期間，閣下將會接受研究員進行的簡短健康教育。內容包括一些有關閣下骨折的痛楚管理，時間約爲 25 分鐘。

在往後的跟進訪問是要收集有關止痛方法對於閣下的痛楚和身心狀況的影響。我們期望訪問的時間大約會是 10 至 25 分鐘。而是次研究是屬自願性質參與的，閣下有權隨時撤回此項同意而不會對閣下之治療有任何影響。是次的研究是以不記名的方式進行的，閣下的個人資料也會保密及只作研究之用。

在任何情況下，如閣下想知道更多資料，可隨時聯絡這項研究的負責人黃姑娘（電話：26096023）。

我們十分感謝閣下的參與。

同意書

本人 _____ 茲明白及同意接受此項研究。研究員已詳細地把研究細節講解予本人，本人也同意研究員可查看本人之病歷。本人明白本人之資料將會保密。本人明白參加與否純屬個人選擇及自由並有權隨時撤回此項同意而不會對本人之治療有任何影響。

簽署：_____ 日期：_____
(病人或家屬)

簽署：_____ 日期：_____
(見証人)

Appendix 22

Process evaluation _ Telephone interview guideline (conducted at 1 months after surgery)

1. Tell me your experience of feeling after surgery?
   - 可否告訴我，你手術後的感覺是如何?
2. Tell me your experience of pain management after surgery?
   - 可否告訴我，你手術後處理痛的方法?
3. Tell me your feeling about the education session ?
   - 在健康教育裡，你的感覺是如何?
4. Which part of education session did you regarded as important to affect your feeling?
   - 在健康教育裡，那一方面較有用呢?
5. How was it helpful/not helpful?
   - 那是怎樣有用呢?
6. What are the factors facilitating or hindering the education session's delivery?'
   - 你認爲有什麼因素改進或阻礙健康教育呢
7. What aspects of education session do you want to be improved?
   - 你認爲有什麼可以改進健康教育呢?
8. What is the perceived usefulness of educational session in self pain management at home?
   - 出院後所學到的健康教育對你的痛楚處理 有何幫助呢
   -

Appendix 23

Examples of the process of content analysis –process evaluation transcript

Meaningful units	What does it mean?	Sub-categories	Categories
I lay in bed and listened to her talk. It was good that I didn't feel any discomfort if I didn't move my limb... The talk was short and easy to understand. I could follow her demonstration of the breathing and relaxation exercise right after her talk	Intervention of short duration is appropriate for patients due to their tiredness	Short duration	Components of a successful intervention
It was good to conduct the talk before surgery, I could self-practice the breathing and relaxation exercise as instructed when I was not tired and got used to it... then after surgery, I was very weak and tired... I could only remember the key message she said.	Patient would like to learn before their surgery	Conduct before surgery	
The intervention provided me with knowledge of pain control by relaxing. With a more relaxed mood, it appeared that I suffer less pain although I still felt the pain during body movement in the first three days after surgery	Educational intervention helped to enhance relaxation, thus reducing pain	Reduce pain	Perceived benefit
When I was transferred back to the ward after surgery, I really lost nearly all of my control and no idea how to stop my pain. I remembered that I was awakened by the pain in the middle of the night after surgery. I called the nurse seeking for help and the nurse mentioned to me that the medicine was not due yet. I closed my eyes and did not know what to do. Suddenly, I remembered I could do the breathing and relaxation exercise. I did six cycles then I fell asleep for a while. When the pain woke me again, it was time for my medicine. I particularly appreciated the usefulness of the relaxing exercise in the first few days after surgery.			