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PAIN PERCEPTION AND JOINT MOBILITY BEFORE AND AFTER TOTAL KNEE ARTHROPLASTY

by

Christine Lucy Arslanian

A Thesis Submitted to the Faculty of the

COLLEGE OF NURSING

In Partial Fulfillment of the Requirements
For the Degree of

MASTER OF SCIENCE

In the Graduate College

THE UNIVERSITY OF ARIZONA

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ABSTRACT

Joint mobility is dependent on comfort, thus pain is associated with mobility. This study examined the relationship between pain perception and joint mobility in arthritis patients before and after total knee arthroplasty. Pain perception was indicated by pain intensity, pain distress and pain expectation; joint mobility was represented by the degree of knee joint flexion. Visual analogue scales were used for pain intensity, pain distress and pain expectation; knee joint flexion as measured using a goniometer. Data were collected on 24 subjects preoperatively (T_1), immediately postoperatively (T_2) and forty-eight to seventy-two hours postoperatively (T_3).

Twenty-four subjects participated in the study. Significant paired t-test resulted for joint flexion at T_1 and T_3 and pain expectation at T_2 and T_3. Pearson product-moment correlation coefficients were significant for pain intensity and pain distress at all three times, pain intensity and joint flexion at T_1 and pain intensity at T_1 and at T_2.

CHAPTER 1

INTRODUCTION

The pain of arthritis is a special phenomenon for patients. In arthritis, the pain experience is coupled with physical disability. Focusing on the perception of pain and disability, joint mobility becomes an important concern for patients and health care providers alike. Specifically, the extent of joint mobility may be influenced by the degree of pain perceived by a person (Adler, 1985; Pigg & Schroeder, 1984). If a person experiences some degree of pain with flexion of a joint, then the tendency toward mobility of that joint would seemingly decrease knowing that joint flexion may increase pain.

Joint arthroplasty is a widely used orthopaedic technique to relieve pain, increase mobility and improve function in patients with debilitating arthritis of weight-bearing joints. Pain relief is the most quickly realized and remarkable result; joint mobility improvements are also evident, but not so dramatically (Roush, 1985). However, health care providers often hear a variety of statements in relation to pain from patients who have undergone joint replacement surgery. From statements such as "I can't believe I'm not having any pain" to "If I had known I'd be having this much pain I wouldn't have had surgery done," varying degrees of perceived pain are expressed. Because pain perception and joint mobility are related to one another, there is a

need to explore the relationship further within the context of joint arthroplasty. Thus the focus of this study was to describe the relationship between pain perception and joint mobility before and after arthroplasty, specifically in the knee.

Background and Significance

According to figures obtained from the Arthritis Foundation (1982), 30 million people suffer from arthritis. Of this number, 6.5 million Americans suffer from rheumatoid arthritis (RA). The remaining arthritis sufferers are comprised of those with osteoarthritis (OA) and other forms of arthritis. Rheumatoid arthritis usually affects people from the age of 25 on while the onset of OA usually occurs after the age of 45 (Sutton, 1984). Because of the large number of Americans afflicted with arthritis, it is appropriate to study the problems which they experience. No other group of diseases causes so much pain and disability over so long a period of time (Burkhardt, 1985). Because a cure is not a realistic expectation for most arthritis sufferers, the emphasis of care is on maintaining or improving their quality of life rather than on a complete and permanent remission.

Quality of life for arthritis sufferers is an increasing concern to health care providers. An elusive term that defies specific definition, quality of life for arthritis sufferers refers to the ability to move joints sufficiently to accomplish activities of daily living, a sense of well-being and the ability to participate in some

form of recreation (Gurin, Veroff & Felt, 1960; Cantril, 1965; Bradburn, 1969). LaBorde & Powers (1980) found that persons with OA had significantly lower quality of life scores than persons with other disease processes and attributed this finding to preoccupation with the disease, chronic pain and decreased mobility.

Mobility is dependent on adequate range of motion, strength and comfort to accomplish the component movements, as well as safety throughout the process (Banwell, 1984). Maintenance of joint mobility is one of the most important facets of arthritis (Sutton, 1984). Good body alignment and positioning can assist the arthritis patient in improving and preventing strain. Because mobility in arthritis is also affected by fatigue, energy conservation is an important factor for consideration in activities. Loss of mobility threatens independence for a patient with arthritis. When joint mobility limits physical capabilities, the quality of life for arthritis sufferers is affected.

Patients seek treatment for relief of pain and improved mobility. Hospitalization for surgery of the arthritis patient is frequently indicated at some point in the course of the disease process. One treatment of choice for patients with arthritic knee joints is total knee arthroplasty (TKA). In the case of TKA the first expected outcome of surgery is pain relief (Sutton, 1984; Fahey, 1984; Burton, Wright & Richards, 1979). The second expectation is improvement of joint function (Fahey, 1984). Combined, these two expectations, if met, will produce a positive postoperative course. However, if either

one is not met, the postoperative course could progress more slowly and be a less positive experience (Burton, Wright & Richards, 1979).

To accomplish the goals of TKA, postoperative exercise is important. Initially it was believed that immobilization of the knee joint was most beneficial to the healing of the TKA. More recently, however, immobilization of weight bearing joints has been shown to be harmful and can lead to disastrous consequences (Enneking & Horowitz, 1972). Passive motion appears to reduce adhesions and stimulate healing, resulting in a stronger fixation of the prosthesis (Sapega, Quedenfeld, Moyer & Butler, 1981).

The ultimate hospital discharge criterion for TKA patients is related to substantial joint mobility. As nurses are taking a more active role in the rehabilitation of TKA patients, nurses need to examine ways in which joint mobility and subsequent independence can he enhanced. Postoperative TKA patients may be adverse to initiating mobility due to pain. Pain management is a primary concern for postoperative orthopaedic patients. Since pain can affect the attainment of discharge criteria related to mobility, it becomes imperative that pain perception be examined more closely. The relationship of pain to the achievement of discharge criteria related to joint mobility is especially applicable to patients who have undergone TKA, because pain may decrease the motivation to reach the flexion necessary for discharge.

Since nurses give direct patient care over the 24 hour period, the practicing nurse has a key role in coordination of patient care activities. Encouragement to do exercises, reinforcement of teaching of exercise and control of pain reducing measures are autonomous nursing functions that have a great impact on the rehabilitation of the TKA patients.

In postoperative TKA patients a decrease in patients' perception of pain may increase their mobility, which will ultimately decrease the possible complications associated with surgery. The hazards of immobility (thrombophlebitis, pneumonia, impairment of skin integrity and alterations in bowel elimination) may at times increase the length of hospital stay (Jeffrey, 1986). Decreasing pain to increase mobility may help to alleviate the potential complications of immobility, improve the postoperative course and shorten the period of hospitalization.

Statement of the Problem

If the perception of pain is related to joint mobility, then pain perception and mobility preoperatively and postoperatively may be related to postoperative mobility, and thus ultimately plot the course of success for surgery. There are some patients who appear to have a delay in mobility following TKA due to high expectation of pain and high distress with pain which results in increased length of hospital stay. There are also patients who seem to have a high intensity of

pain, low expectation of pain and high distress with pain and who have a shortened length of stay due to attaining the substantial joint mobility more quickly than other TKA patients. On the other hand, there are patients who are thought to have a low pain intensity, low expectation of pain but high distress with pain who have a difficult time reaching the discharge criteria of substantial knee mobility. The relationship between the TKA patient's perception of pain and the joint mobility postoperative TKA needs to be described.

Purpose of the Study

The purpose of this descriptive study was to examine the relationship between pain perception and joint mobility in arthritis patients undergoing TKA. The study examined the relationships among three components of pain perception (pain intensity, pain distress and pain expectation) and joint flexion preoperatively and postoperatively TKA.

The specific research questions were:

1. What are the differences in pain intensity and pain distress between preoperative (T_1) and first postoperative times (T_2)?
2. What are the differences in pain intensity and pain distress between preoperative (T_1) and second postoperative times (T_3)?
3. What are the differences in pain intensity, pain distress, and pain expectation between first postoperative (T_2) and second postoperative times (T_3)?

4. What are the differences in degrees of joint flexion between preoperative (T_1) and second postoperative time (T_3)?
5. What are the relationships among pain intensity, pain distress and pain expectation and joint flexion at preoperative time (T_1)?
6. What are the relationships among pain intensity and pain distress and joint flexion at first postoperative time (T_2)?
7. What are the relationships among pain intensity and pain distress, and pain expectation and joint flexion at second postoperative time (T_3)?
8. What are the relationships among pain intensity, pain distress and joint flexion preoperatively with each postoperative time (T_2 and T_3)?

Operational Definition of Terms

1. Pain Perception: The cognitive awareness of hurt or discomfort.
2. Pain Intensity: The cognitive perception of pain, rated on a scale of "no pain" to "pain as bad as it can be."
3. Pain Distress: The extent to which the pain intensity perception is disturbing or bothersome to the person, rated on a scale of "Pain not bothersome" to "Pain as bothersome as it can be."
4. Pain Expectation: The amount of pain the person anticipates he or she will have rated on a scale of "No pain expected" to "Expected pain as bad as it can be."

5. Joint Flexion: The degree of flexion in the knee joint as measured by the goniometer.
6. T_1 (Preoperative Time): The time at which the patient receives preoperative assessment prior to TKA surgery.
7. T_2 (First Postoperative Time): The first time at which the patient is turned following return to his/her room after surgery.
8. T_3 (Second Postoperative Time): The time when the immobilizing dressing is removed and the first flexion attempted 72 hours after surgery.

Summary

In summary, joint arthroplasty is a technique used to relieve pain, increase mobility and improve function in patients with debilitating arthritis of weight-bearing joints. Because the ultimate hospital discharge criterion is dependent upon substantial joint flexion after total knee arthroplasty, and because pain perception may influence the attainment of that flexion, the relationship between pain and joint flexion becomes an important concern. This study examined differences in pain intensity, pain distress, pain expectation and joint flexion before and after total knee arthroplasty. Also this study examined the relationships among pain intensity, pain distress, pain expectation and joint flexion before and after total knee arthroplasty.

CHAPTER 2

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

The weight bearing joints in the body are areas most frequently affected by arthritis. The effect of pain on those joints needs to be examined. The knee has been chosen for focus in this study because of the ease of describing the relationship between pain perception and mobility without risk to the patient. The conceptual framework and literature review related to the conceptual framework is presented in Chapter 2. The conceptual framework for this study is designed to support the proposed relationship between pain and mobility in arthritis patients undergoing TKA (see Figure 1).

The conceptual framework has two related constructs: pain perception and joint mobility. At the conceptual level arthritic knee joint pain perception is a type of pain perception and arthritic knee joint mobility is a type of joint mobility. At the observational level pain intensity, pain distress and pain expectation are the indicators of arthritic knee joint pain perception. Likewise, arthritic knee joint mobility is operationalized as joint flexion. Pain perception was measured using visual analogue scales (VAS) and flexion was measured using the goniometer.

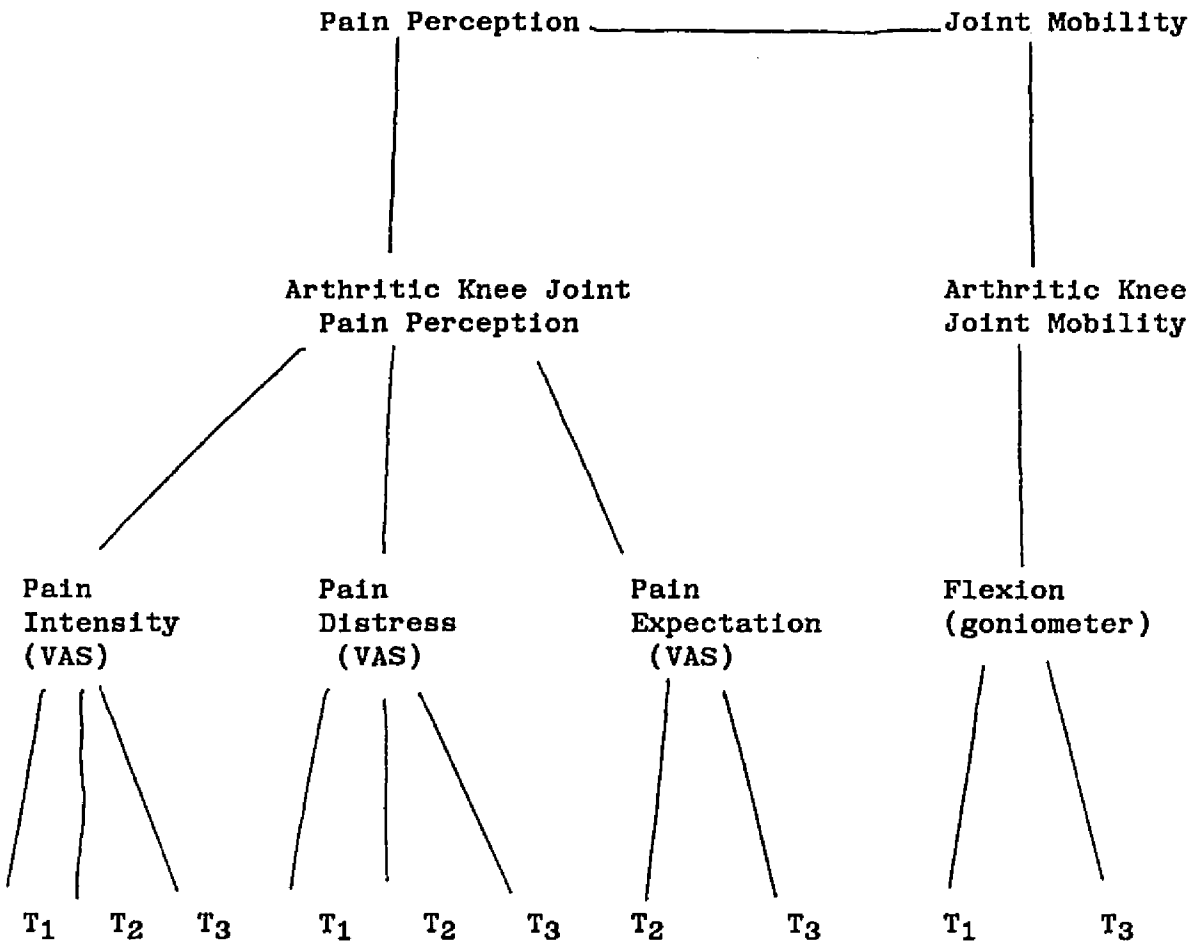

Figure 1. Conceptual Framework for Study of Pain Perception and Joint Mobility Before and After Total Knee Arthroplasty

Literature related to each component of the conceptual framework will be reviewed. Each construct and concept will be discussed and appropriate related literature will be presented.

Pain

Pain Perception

Pain may be defined as an unpleasant, subjective experience that cannot be measured objectively (Roy & Tunks, 1982; McGuire, 1984). Pain is recognized as a sensation and the subjectivity involved in perceiving and responding to it is often overlooked. Pain perception includes certain characteristics: location, intensity, quality, onset, duration and variations. There is a great deal of variation in what people define as painful or as producing discomfort. The pain sensation is precise, known, and seems easier to bear than the anticipation of pain (Meinhart & McCaffrey, 1983).

Pain is a universal complaint and it is estimated that 75 million Americans suffer from some kind of pain (Brena, 1976). Pain can be classified as acute (lasting a few days in duration, as a result of recent tissue damage), subacute (a few days to a few weeks), recurrent acute (as in rheumatoid arthritis flareups), continuous or chronic (lasting more than six months, as in rheumatoid arthritis or osteoarthritis) (Escobar, 1985). Until recently, pain has been housed under the structure of the medical model of illness, leading to a dissatisfaction with the basic assumption that disordered bodily states

result from physical cause (Engel, 1977; Garfield, 1979). Health care professionals tend to dichotomize patients' pain into organic and functional/psychogenic types which may have a profound influence on certain groups of patients. In any case the physical as well as the psychological aspects of the perception of pain are important to consider.

In support of a psychological component of pain, Jacox and Stewart (1979) designed an instrument to describe the pain of a current illness and how the pain might be related to a patient's past experience with pain. The rationale used to develop this scale was that pain cannot be viewed as a physiological phenomenon and must be incorporated into a biopsychological framework. The instrument was tested in a study of 102 patients undergoing treatment for pain. The study was developed to collect historical data showing the psychosocial contingencies of the pain experience. The primary results reported in this study were the reliability and validity of the instrument.

Arthritic Knee Joint Pain Perception

Arthritic pain in osteoarthritis and rheumatoid arthritis follows a characteristic cycle. For many people, arthritic pain is a chronic uncomfortable perception of hurt and usually is not completely relieved by more conservative treatment modalities. The pain, a result of joint inflammation and/or swelling, results in a joint resting in the most comfortable position, a position of partial flexion (Sutton, 1984). As immobilization continues, joint stiffness and loss of

functional capacity result. Further immobilization perpetuates the arthritis pain cycle (Sutton, 1984). The patient with rheumatoid arthritis or osteoarthritis always experiences a certain degree of pain which never leaves. Pain can result from over or ill use and reduces functional activity. The appropriate use of anti-inflammatory and pain relieving drugs alleviates the pain and reduces the effusions, but there are circumstances under which these modalities are no longer effective for the arthritic patient (Sutton, 1984).

Although the perception of pain is one of the foremost sensations in the patient with arthritis of the knee, these perceptions are subjective. The arthritis sufferer who has knee joint involvement complains of constant knee pain or pain with every step. Pain in the knee joint precludes extensive knee flexion, thereby reducing mobility. In addition, a small amount of edema in the knee can increase the pressure on the knee as much as seven times (Ellis, 1981). Therefore, the patient's arthritic knee joint pain perception is an important concept to be considered in caring for patients with arthritis of the knee.

The chronic pain of arthritis also has acute pain characteristics at times during exacerbation periods (Sutton, 1984). Although health care providers help to manage both types of pain at some time, acute pain is the type of arthritic pain encountered most often in the acute care setting. The primary goal of post TKA is

toward pain relief: chronic pain relief immediately postoperatively and acute pain relief within a few days.

Pain Intensity, Pain Distress and Pain Expectation

Currently, instruments are available that measure intensity, behavioral and/or physiological phenomena associated with pain, and multiple dimensions of clinical pain (Johnson & Rice, 1974; Jacox, 1979). Pain is subjective, "whatever the experiencing person says it is, existing whenever he says it does" (McCaffrey, 1983). Subjective reports of painful sensations are difficult to realistically assess and analyze. There have been Likert-type scales that have been used to measure the subjectivity of the pain experience, but many do not measure the full pain experience. For purposes of the present study, pain components will include intensity, distress and expectation.

Johnson (1971) suggests that the intensity of pain is a function of the congruency between expected and experienced sensations. That is, the intensity of the pain reported by patients is related to their expectation of pain and the actual pain experienced. She also suggests that information which accurately describes postoperative sensations allows the patient to form an accurate expectation of pain.

An extension of the expectation component of the present study is the extent to which pain distresses the patient. Accurate expectations have been known to reduce the distress reaction (Bray, 1986). The distress component is similar to the reactive component of pain perception of Johnson and Rice (1974). In their laboratory

study, 52 male subjects experienced ischemic pain for the purpose of testing the hypothesis that the intensity of the reactive component of the pain experience is a function of the congruency between expected and experienced physical sensations. Expected physical sensations were varied by the type of preoperative information given. Findings suggested that patients who received a partial description of the sensation they might experience had as much of a reduction in distress as those who received a complete description of sensations they might experience.

Casey and Melzack (1967) suggested that the intensity of the sensory and reactive components are not necessarily a one to one relationship. That is, high intensity of pain sensation may not have a high distress rating. Thus the components may be evaluated separately and could be affected by different factors. The idea that the intensity of sensation and emotional reaction may not be the same could explain why patients with similar intensity sensations vary in their responses to those sensations; some patients appear to be highly distressed while others appear to be slightly distressed from what appears to be the same intensity of pain.

The purpose of a study done by Feldman (1986) on 109 healthy, non-institutionalized males, aged 21 to 50 years, focused on self esteem and types of attributional style and distress pain ratings. Sensation and distress pain ratings were measured using visual analogue scales. Negative correlations were hypothesized between self esteem and

each pain rating. The rationale behind this study involves perception of objects, events, scenes and the awareness passing through the senses in the very recent past (Schiff, 1980). Each study subject was administered the Tennessee Self Concept Scale and the Revised Attributional Style Questionnaire prior to the pain experience. Degrees of congruency were proposed between self esteem and the sensory and reactive experiences of the individual. There negative correlations between self esteem and sensory expectation ($r = -.003$, $p > .05$), and between pain and reactive expectation ($r = -.168$, $p < .05$). Thus, as self esteem increased, expectation of pain decreased and as pain intensity increased, pain distress decreased.

A study by Thomas and Lyttle (1980) of 100 subjects lends support to the congruence of self concept and chronic pain. Patients' expectation of successful treatment for chronic back pain was positively related to self concept and symptom relief. Patients who scored high in self concept subjectively rated their pain treatment as providing greater relief than those who rated low in self concept.

Frank (1968) tried to establish the exact relationship between expectation and outcome. In his study, the method was to tell patients what to expect, then assured the nature of the expectation. Frank reported results which indicate that the relationship is not causal, but is predictive. He concluded that patients who had experiences they expected had a better "outcome" from treatment modalities because of their expectations.

Bray (1986) reported hospitalized patients have an anxiety pain cycle that relates to preoperative expectation for postoperative pain relief. Although preoperative instruction specifically geared toward postoperative discomfort does not change the existence of pain, its intensity is reduced because some of the fear of the unknown is relieved. Bray stated that patients do not usually ask "Will I have pain?" but ask "How much pain will I have?" indicating the expectation of pain. This preoperative expectation leads to anxiety preoperatively and could have an adverse effect if allowed to continue. Recent studies indicate that preoperative anxiety and expectation is a significant predictor of postoperative pain in many patients (Stimmel, 1983; Scott, Clum & Peoples, 1983).

In a study done by Burton et al. (1979), 88 patients rated their expectations in relation to total joint arthroplasty. Only 55% had their expectations fulfilled. Despite this, 86% of patients claimed that their operation was successful. Unfortunately this study was done retrospectively and relied upon the patient's memory of expectations rather than an actual "now-time" frame. The authors also compared patients using pain scores to determine if pain could be related to outcome in terms of expectation. Results showed that the term "expectation" deals with the complexities of patients' feelings and thoughts and the majority of subjects had high expectations. Those with unfulfilled expectations generally had a lower rating on quality of

life than those subjects that had unfulfilled expectations who were noted to have more optimism about their life.

Although pain perception is one entity of the preoperative and postoperative pain experience for arthritic patients, it has three components: intensity, distress and expectation. Taking this into account, pain management modalities can be used to facilitate adaptation in the preoperative and postoperative phases of TKA.

Joint Mobility

Mobility, defined as the degree of functional motion of a joint, is dependent on adequate range of motion, strength and comfort (Banwell, 1984). Degree of mobility relates to the ultimate function of a joint and several approaches are available to define function (Roush, 1985). Knee motion in the sagittal plane, flexion and extension have been the most widely studied. Gyory (1976) in a descriptive study using 95 subjects demonstrated that standing flexion is a good predictor of disability. Symptoms associated with disability included distance walking, stair climbing and pain with walking. In Gyory's study there does seem to be some evidence that women have less flexion than men. Kettelkamp et al. (1970) measured motion in the knees of 16 men and five women yielding the results that knee motion in men and women differed only in the amount of flexion during the stance phase. This would indicate that the amount of flexion in the prone position would not differ between men and women.

Arthritic Knee Joint Mobility

Mobility of arthritic knee joints is less than in patients without arthritis. The loss of function appears to be related to the status of the articular surface of the knee, and the amount of pain experienced by the arthritic patient. In a study by Kettelkamp et al. (1970), 41 patients with rheumatoid arthritis of the knee demonstrated significant ($p \leq .05$) relationships between gait characteristics of knee motion. The rheumatoid knee used less of the available motion in walking than did normal knees. Range of motion of the knee has also been found to correlate with pain, instability of the knee, joint effusion and bony hypertrophy (Kettelkamp et al., 1972; Gyory, 1976).

Since there is a difference in knee mobility between healthy subjects and patients with arthritis, surgical intervention is sometimes the only method of treatment to reduce the pain and disability associated with arthritis. The surgical treatment of choice is usually the TKA. The goal of TKA is to correct pain, weakness, motion and deformity and to restore normal function. In a study by Collopy et al. (1977), 29 patients who had undergone TKA were assessed for functional performance, and the effectiveness of TKA in correcting these problems. In the study, rheumatoid arthritis patients improved after TKA in the ability to exercise and in increased activity levels due to relief of pain.

Range of motion is an integral part of the postoperative TKA program. Under both normal and pathological conditions, the range of

motion in most body joints is primarily limited by one or more connective tissue structures. Laboratory studies have demonstrated that the principal sources of passive resistance at the normal extremes of joint motion are ligamentous joint capsules, tendons and muscles (Johns & Wright, 1962; Wright & Johns, 1961). The goal of increasing range of motion must be accomplished without physically tearing the connective tissue, because the subsequent pain, instability and/or scar formation tend to make the condition worse.

There is a relative paucity of literature dealing specifically with functional outcomes of TKA. Studies have shown a relationship between range of motion and functional outcome. In the Roush study (1985) data were collected from 43 subjects, six to 35 months after they had had either total hip or total knee replacement surgery. Approximately 65% of the subjects reported no change in their ability to perform the 22 surveyed activities. Two obvious factors involved in the decreased ability were decreased flexion and increased pain. Findings indicated that men tended to let the disease process progress longer before surgery, thereby allowing more deformity and damage to occur.

However, in 1977 Manske and Gleeson reported little or no change in range of motion. A review of 56 consecutive TKA cases indicated a statistically insignificant improvement in range of motion postoperatively.

In general, surgery is advocated to improve motion. Improved range of motion is a result of the design of the prosthesis and the surgical technique. This may be the reason behind conflicting results of the success of TKA surgery in that postoperative rehabilitation was not taken into account for range of motion improvement. To obtain the discharge criterion of 90° of flexion, a vigorous postoperative exercise program is required. As a rule, this degree of flexion is usually attained by the date of discharge (Manske & Gleeson, 1977).

Range of motion is generally initiated 48 to 72 hours after TKA. The rationale behind this is that immobilization of the human knee for an extended period of time results in stiffness and diminished range of motion. In a study done by Bohannon et al. (1985), a healthy 17 year old male who was immobilized for three and one-half weeks had a loss of 75° of active flexion following the immobilization.

The fact that most research on mobility and the knee joint has been on the healthy population shows the need for additional research on arthritic knee mobility. On one of the few studies done on arthritic knee patients, gait velocity was assessed in relation to flexion and extension. Brinkmann and Perry (1985) reported that preoperatively, 160 total knee patients with rheumatoid arthritis had significantly lower flexion and extension rates than normal subjects. For osteoarthritis patients, only the preoperative flexion rates and postoperative extension rates were less than healthy subjects. Both groups ambulated with a reduced range of motion, both preoperatively and postoperatively.

Based on the results of this particular study it appears that knee flexion and extension and total range of motion improved postoperatively, but still remained below values obtained for healthy subjects. This may be the area of conflict in whether or not TKA is successful. Do patients expect an ultimate outcome of being just like normal people, or do they expect some limitations in light of the normal pathology of arthritis of joints?

Joint Flexion

Flexion, a component of range of motion, is an important factor in human performance. Accurate assessment of the procedures designed to improve flexion calls for reliable and reproducible objective methods of measurement (Ekstrand et al., 1982). Estimation of range of motion by eye is too inaccurate when precision and objectivity are needed. A goniometer is an instrument designed to measure joint flexion. Measuring with a goniometer is more reliable than estimating with the naked eye (Ekstrand et al., 1982).

Summary

The conceptual framework and review of the literature are presented in this chapter. The review of the literature described pain perception, arthritic knee joint pain perception and three components of the perception of pain: intensity, distress and expectation. Joint mobility, arthritic knee joint mobility and flexion of arthritic knee joints were discussed. In arthritis, destruction of joints leads to

decreased joint flexion. The present study focused on the differences between pain intensity, pain distress and pain expectation in three time periods: preoperatively, immediately and forty-eight hours postoperatively, and the relationship between and among pain intensity, distress and expectation and joint flexion preoperatively and one time postoperatively.

CHAPTER 3

METHODOLOGY

The study design, sample, setting, human subjects protection methods and instruments are described in this chapter. Also described in this chapter are the method of data collection and the plan for data analysis.

Design

A descriptive time series design was used to examine subjective ratings of patients' perception of pain intensity, pain distress and pain expectation and their relationship to joint flexion preoperatively and postoperatively TKA. Relationships were examined between each component of pain perception and joint mobility. Data collection began 24 hours to one week preoperatively for each study subject and was conducted over a period of not more than four inpatient hospital days. Data collection was completed over a two month period.

Sample

The subjects for this study were patients who had one of the following diagnoses: degenerative joint disease, degenerative arthritis, osteoarthritis, rheumatoid arthritis, traumatic arthritis, failed total knee or painful knee. These diagnoses comprise the usual

admitting diagnoses for patients undergoing elective TKA. A convenience sample of 24 male and female subjects was utilized and the admission criteria to the study were as follows:

1. Age 18 or older.
2. Able to read, write and understand English.
3. Patient has elected TKA for purposes of pain relief and/or increasing joint mobility.

Demographic data collected to identify the sample were age, sex, ethnic group and occupation (Appendix B). Historic data were also collected regarding the pain experience including prior experience with pain, previous knee surgery, method of pain control prescribed postoperatively, last pain medication and the first turning time.

Setting

The setting was a 600 bed medical center in a southwestern city. Data were collected on patients who were admitted to the orthopaedic unit which is a 36 bed unit consisting of private and semiprivate rooms. The data collection instruments were completed by the patient in his/her room. The availability of adequate lighting, a smooth writing surface, a pen or pencil and privacy were the criteria considered for the setting.

Human Subjects

The study was approved by the Human Subjects Committee at the clinical site and by the Ethical Review Subcommittee of the College of

Nursing prior to data collection (Appendix A). Confidentiality of data and anonymity of the respondents were assured through the use of confidential code numbers. Freedom to ask questions and to withdraw from the study were also assured (Appendix D).

Instruments

Two types of instruments were used in this study. Both are described and reliability and validity estimates will be reported where available.

Visual Analogue Scales

Visual Analogue Scales (VAS) were used to index perception of preoperative and postoperative pain in the areas of intensity, distress and expectation (Appendix C). The VAS consists of a horizontal, straight line which represents a continuum of intensity from zero or none to the most possible and has verbal anchors of "No pain" or "Pain as bad as it can be" (Feldman, 1986) at either end. The horizontal line has been found easier to understand, easier to complete and more likely to have uniform distribution than a vertical scale (Huskisson, 1974). The VAS is thought to produce more sensitive measurements since subjects may choose to mark anywhere along the continuum rather than being forced to choose one category, or focus on descriptors chosen for them. The validity of the VAS has been reported to be reasonably good (McGuire, 1984; Johnson & Rice, 1974). Interrater reliability of a pain VAS has been reported at 1.00 (Gerhard, 1984).

For this study, the pain intensity VAS asked the question "How strong is your pain? The verbal anchors were "No pain" and "Strongest pain possible." The directions stated "Draw a single mark across the line at the location that indicates the strength of your pain at this moment" (see Appendix C). This scale was administered upon admission when the subject was asked to flex the knee, at the first postoperative turning onto the unaffected side and at the time of flexing the knee for the first time after the bulky dressing was removed.

The pain distress VAS asked the question "How much does your pain bother or distress you?" The directions stated "Draw a single line at the location that indicates how much your pain is bothering you at this moment? This scale was administered at the same times as the intensity VAS: upon admission, at the first turn postoperatively and at first flexion.

The expectation VAS asked the stem question "How much pain do you expect . . . ?" and either " . . . when you turn for the first time after surgery." or " . . . when you bend your knee for the first time." was added to the end of the stem. The directions stated "Draw a single mark across the line at the location that indicates how much pain you expect to have after surgery." Thus, expectation was ascertained preoperatively for two postoperative times.

For scoring purposes, the VAS had a range of 0-100 millimeters (mm) where the greater the intensity and distress, the higher the

value. Likewise, the expectation VAS measured a higher expectation of pain with a higher value.

Goniometer

The goniometer was used in this study to measure joint flexion. Goniometry is the use of instruments to measure the angular motion of the body parts. The goniometer is a clear plastic caliper-type instrument with degree readings at every two degrees from 0 to 180 degrees. Interrater reliability of the goniometer has been reported at .869 in a study done by Boone et al. (1978) on 12 healthy male patients to determine specifically the intratester and intertester reliability of the goniometer. The subjects were measured once weekly for four weeks by different raters. The minimal use of investigators in Boone's (1978) study allowed increased reliability of measurements. Interrater reliability of the goniometer has been reported at r = .58 (Boone, 1978). In addition, intrarater reliability was reported at r = .80 (Boone, 1978). The raters in the study by Boone et al. (1978) followed specific written directions that defined the extremity position and the goniometer alignment for each motion and those same directions were used for this study. The goniometer was placed with the stationary arm parallel to and aligned with the shaft of the femur and directed toward and aligned with the shaft of the tibia. Special precautions were taken to ensure that the patient did not move his/her foot from the bed where he/she was lying supine. Movement will change the position of

the goniometer. Joint flexion was measured from zero position with the knee in total extension to the peak of flexion.

Method of Data Collection

Data collection occurred preoperatively as well as postoperatively. The data were collected by the investigator and two research assistants who were trained in the use of the VAS and goniometer.

Preoperative data collection commenced during the patients' preoperative admission assessment, one day to one week before surgery. At that time the study was explained to the patient. Prospective subjects were given a review of the study consent form and written consent was secured from the patient to participate in the study (Appendix D). Initial pain and flexion ratings were ascertained at this time: Pain intensity, distress and expectation VAS were used in a "now-time" frame. This time is referred to as T_1.

For the purposes of this study T_2 has been defined as the time the patient first turned to his/her side after surgery. This time was chosen because it allowed the patient time to have received initial postoperative assessment and care. Also, the nursing staff had time to do necessary assessments and data collection avoided interrupting the normal routine of the unit. At T_2 pain intensity, distress, and expectation were assessed. The same VAS was used as in T_1. Flexion was not assessed this time because it is the practice for orthopaedic

surgeons to keep the knee joint in an immovable splint and ace wrap for 48 to 72 hours.

When the splint and ace wrap were removed on the second or third day postoperatively, the patient was encouraged to flex the knee frequently. T_3 was the time when initial mobilization was assessed for pain intensity and distress as well as the flexion in the knee joint. Again the VAS was used for assessment of perception of pain intensity, distress and expectation. At this time the goniometer was used to assess the degree of flexion. The patient was lying flat in bed and knee flexion was assessed. Thus the data collected included three VAS measurements and two goniometer measurements as well as the demographic data.

Data Analysis Plan

Descriptive statistics were used to analyze the demographic data. Data analyses were done in relation to each of the research questions. Paired t-tests with one group over time were used to:

1. Measure differences in pain intensity and distress preoperatively and at two times postoperatively.
2. Measure differences in joint flexion preoperatively and post-operatively.

Pearson product-moment correlation coefficients were used to describe the relationship between and among pain perception and joint flexion preoperatively and postoperatively. For both the t-tests and

correlation coefficients, a preselected level of $p \leq .05$ was used to determine significance.

Summary

A descriptive study was used to describe the relationships between pain perception (intensity, distress and expectation) and joint flexion. Data collection began preoperatively with an initial assessment of the three pain perception components and flexion. The second assessment was done postoperatively when the subject was turned onto the unaffected side for the first time and the third assessment was done when the first knee flexion was attempted after surgery. Other demographic data were collected for sample description purposes.

Three visual analogue scales (VAS) were used to measure the pain components. A goniometer was used to determine degrees of flexion of the knee joint.

The data analysis used paired t-tests to describe the differences in means of the variables. Pearson product-moment correlation coefficients were used to describe the relationships between and among the pain perception components and joint flexion. For both the t-tests and correlation coefficients, a preselected level of $p \leq .05$ was used to determine significance.

CHAPTER 4

RESULTS OF DATA ANALYSIS

Introduction

The results of data analysis are presented in Chapter 4. A descriptive design was used to examine the relationship between pain perception and joint mobility as reflected by flexion, in arthritis patients undergoing total knee arthroplasty (TKA). The study examined the relationships among pain intensity, distress and expectation and flexion of the joint preoperatively and postoperatively in patients with TKA. Specifically, the differences between pain intensity and distress at a preoperative time and two postoperative times were measured. Paired t-tests were used with one group of subjects over time to measure differences in pain intensity and pain distress preoperatively and with expectation at two times postoperatively and to measure differences in joint flexion preoperatively and postoperatively. Pearson correlation coefficients were used to describe the relationship between pain intensity and pain distress and joint flexion preoperatively and pain intensity, pain distress, and pain expectation postoperatively.

Pilot Study

A pilot study was completed with five subjects to determine the feasibility of the methodology. The results of the pilot study indicated that patients scheduled to be admitted to the hospital the

morning of surgery should be interviewed prior to admission. Arrangements were made to interview those patients approximately one week before admission in the out patient department during the time preadmission laboratory studies were conducted. This time was determined to be the most convenient for the subject. The same environmental requirements related to the setting were met in the outpatient department and on the patient unit.

Characteristics of the Study Sample

Twenty four TKA candidates agreed to participate in the study. All 24 subjects, 19 females and 5 males, completed the demographic data form and participated in all phases of the study.

The demographic information on the subjects is presented in Table 1. Only 29% of the sample was in the 46-65 years old age range while 71% was 66+ years of age. The Caucasian ethnic group represented 87% of the sample while 13% of the sample were Hispanic. Most of the sample (83%) listed "retired" under "occupation." The two subjects of the sample who reported employment were working as a mother and as a secretary. Recreational activities were separated into physical and sedentary types. The sample was evenly distributed into 50% of subjects indicating sedentary leisure activities and 50% physical activities. Included in activities that were considered physical were swimming, walking, bowling, horseback riding and tennis. Sedentary activities included beadwork, reading and craftwork.

Table 1. Demographic Information for the Total Sample of Total Knee Arthroplasty Subjects (N = 24)

Characteristics	Frequency	Percent
Sex:		
Male	5	23
Female	19	77
Age:		
18-25	0	0
26-45	0	0
46-65	7	29
66+	17	71
Employment:		
Yes	2	17
No	22	83
Ethnic Group:		
Hispanic	3	13
Caucasian	21	87
Recreational Activities:		
Physical	12	50
Sedentary	12	50

The self-reported reasons for choosing to have a TKA performed were separated into two components: pain control and/or increased joint mobility. Of the 24 subjects who participated in the study, 46% chose TKA for pain control; 54% chose TKA for increased joint mobility and pain control (Table 2). None of the subjects chose TKA solely for increased joint mobility. Almost all the subjects (96%) had prior experience with pain. Only one subject had claimed no prior experience with pain, and he did not equate the arthritis pain he had at this time as a prior pain experience.

For 88% (N = 21) of the sample the patient controlled analgesia (PCA) pump was prescribed for postoperative pain control. Twelve percent (N = 3) of the sample did not use the PCA pump. In all cases where the PCA pump was used, morphine sulfate was the drug of choice and it was administered intravenously. In the three cases where the PCA pump was not used, the drug administered was Demerol 75 mg. intramuscularly.

Information on turning times and medication administration times is presented in Table 3. The time that elapsed between pain medication administration and the first time the patient was turned postoperatively ranged from 0 to 90 minutes with a mean of 14.5 minutes and a standard deviation of 22.83.

Table 2. Information on Reason for TKA, Pain Experience and Pain Control Measures (N = 24)

Characteristics	Frequency	Percent
Reason for TKA		
Pain Control	11	46
Increased Joint Mobility	0	0
Both	13	54
Prior Experience with Pain		
Yes	23	96
No	1	4
Pain Control		
PCA Pump	21	88
No PCA Pump	3	12

Table 3. Time Elapsing Between Medication and First Postoperative Turn (N = 24)

Minutes	Frequency
0	7
5	4
10	3
15	4
20	1
30	1
70	1
90	1

Results Related to Research Questions

The first research question asked, What are the differences in pain intensity and pain distress between preoperative and first postoperative times?

Information on means, standard deviations (S.D.) and ranges for pain intensity, pain distress and pain expectation and joint flexion T_1, T_2 and T_3 is presented in Table 4. Pain intensity preoperatively (T_1) averaged 64.14 mm with a range of 0-100 mm and a standard deviation of 30.61. Pain intensity at T_2 had a mean of 62.14 mm with a range of 5-100 mm and a standard deviation of 29.71. The difference in means for pain intensity at T_1 and at T_2 was 2.00 (Table 5). The paired t-test was not significant ($p = .78$).

Pain distress preoperatively (T_1) averaged 63.0 mm with a range of 0-100 mm and a standard deviation of 27.20 (Table 4). Pain distress at the first postoperative time had a mean of 55.82 mm with a range of 1-100 mm and a standard deviation of 36.17. The difference in means for pain distress at preoperative time and at first postoperative time was 7.18 (Table 6). The t-test was not significant at $p = .51$.

The second research question asked, What are the differences in pain intensity and pain distress between preoperative (T_1) and second postoperative times (T_3)? Tables 4 and 5 contain information related to this information. Paired t-tests were used to test significance of the difference in means. A $p \leq .05$ was preselected for the level of significance. Pain intensity had a mean of 75.32 mm at the second

able 4. Means, Standard Deviations and Ranges of Pain Intensity, Pain Distress, Pain Expectation and Joint Flexion at Preoperative Time (T_1), First Postoperative Time (T_2) and Second Postoperative Time (T_3)

	T_1			T_2			T_3		
	$\bar{x}$	S.D.	Range	$\bar{x}$	S.D.	Range	$\bar{x}$	S.D.	Range
ain Intensity	64.14	30.61	0-100	62.14	29.71	5-100	75.32	25.64	23-100
ain Distress	63.00	27.20	0- 93	55.82	36.17	1-100	66.68	27.77	25-100
ain Expectation				67.00	32.31	0-100	81.27	21.27	26-100
oint Flexion	96.36	20.77	35-120				31.73	10.98	15- 56

Table 5. t-Test Values for Pain Intensity at Preoperative Time (T_1), First Postoperative Time (T_2) and Second Postoperative Time (T_3) (N = 24)

	$\bar{x}$	Difference	S.D.	t Value
Pain Intensity (T_1)	64.14		30.61	
		2.00		.28 (NS)
Pain Intensity (T_2)	62.14		29.71	
Pain Intensity (T_1)	64.14		30.61	
		-11.18		-1.76 (NS)
Pain Intensity (T_3)	75.32		25.64	
Pain Intensity (T_2)	62.14		29.71	
		-13.18		-1.77 (NS)
Pain Intensity (T_3)	75.32		25.64	

df = 23
NS = not significant

Table 6. t-Test Values for Pain Distress at Preoperative Time (T_1), First Postoperative Time (T_2) and Second Postoperative Time (T_3) (N = 24)

	$\bar{x}$	Difference	S.D.	t Value
Pain Distress (T_1)	63.00	7.18	27.20	.67 (NS)
Pain Distress (T_2)	55.82		36.17	
Pain Distress (T_1)	63.00	-3.68	27.20	-.48 (NS)
Pain Distress (T_3)	66.68		27.77	
Pain Distress (T_2)	55.82	-10.86	36.17	-1.24 (NS)
Pain Distress (T_3)	66.68		27.77	

df = 23
NS = not significant

postoperative time (T_3) with a range of 23-100 mm and a standard deviation of 25.64. The difference in means for pain intensity at preoperative time and second postoperative time of -11.18 yielded a t of -1.76 ($p = .09$).

Pain distress at the second postoperative time (T_3) had a mean of 66.68 mm with a range of 25-100 mm and a standard deviation of 27.77 (Table 4). Pain distress at preoperative time and second postoperative time had a difference in means of -3.68 (Table 6). The t of -.48 ($p = .63$) was not significant (Table 6).

The third research question asked, What are the differences in pain intensity, pain distress and pain expectation between first postoperative (T_2) and second postoperative times (T_3)? Pain intensity at first postoperative time and second postoperative time had a difference in means of -13.18 (Table 5). The paired t-test for pain intensity at these two times was not significant at $t = -1.77$ ($p = .09$).

Pain distress at first postoperative time (T_2) and second postoperative time (T_3) had a difference in means of -10.86 (Table 6). The paired t-test, $t = -1.24$, was not significant ($p = .227$).

Pain expectation at first postoperative time (T_2) had a mean of 67.0 mm with a range of 0-100 mm and standard deviation of 32.31 (Table 4). Pain expectation at the second postoperative time (T_3) had a range of 26-100 mm with a mean of 81.27 mm and a standard deviation of 21.27.

The difference in means was -14.27. The t-test was significant at t = -2.06 (p = .05) (Table 7).

Research question number 4 asked, What are the differences in degrees of joint flexion between preoperative and second postoperative times? The mean-joint flexion preoperatively was 96.36 degrees with a range of 35-120 degrees and a standard deviation of 20.77 (Table 4). Joint flexion at second postoperative time had a mean of 31.73 degrees with a range of 15-56 degrees and a standard deviation of 10.97. Results yielded a difference in means of 64.64 and the t-value of 14.64 was significant at p = .000 (Table 8).

The fifth research question asked, What are the relationships among pain intensity, pain distress and joint flexion at preoperative time? Table 9 contains information related to this information. Pearson product moment correlation coefficients were used to describe the relationship between the variables. Again a p value $\leq$ .05 was preselected for the level of significance. The correlation between pain intensity and pain distress at preoperative time was significant at r = .50 (p = .02). Also significant at r = -.49 (p = .02) was the correlation of pain intensity with joint flexion at preoperative time. The correlation for pain distress and joint flexion at preoperative time was not significant at r = -.23 (p = .28).

The sixth research question asked, What are the relationships among pain intensity, pain distress and expectation and joint flexion at first postoperative time (T_2)? The correlation between pain

Table 7. t-Test Values for Pain Expectation at First Postoperative Time (T_2) and Second Postoperative Time (T_3) (N = 24)

	$\bar{x}$	Difference	S.D.	t Value
Pain Expectation (T_2)	67.00	-14.27	32.31	-2.06*
Pain Expectation (T_3)	81.27		81.27	

df = 23
*$p \leq .05$

Table 8. t-Test Values for Joint Flexion at Preoperative Time (T_1) and Second Postoperative Time (T_3) (N = 24)

	$\bar{x}$	Difference	S.D.	t Value
Joint Flexion (T_2)	96.36	64.64	20.71	14.64*
Joint Flexion (T_3)	31.73			

df = 23
*$p \leq .05$

Table 9. Pearson Product Moment Correlation Coefficients for Pain Intensity, Distress, and Expectation and Joint Flexion at Preoperative Time (T_1), First Postoperative Time (T_2) and Second Postoperative Time (T_3) (N = 24)

	Pain Intensity			Pain Distress			Pain Expectation		Joint Flexion	
	T_1	T_2	T_3	T_1	T_2	T_3	T_2	T_3	T_1	T_3
. Pain Intensity (T_1)r	--	.38	.45	.50	--	--	--	--	-.49	--
(p)		(.08)	(.04)*	(.02)*					(.02)*	
. Pain Intensity (T_2)r		--	.21	--	.79	--	.08	--	--	--
(p)			(.35)		(.00)*		(.73)			
. Pain Intensity (T_3)r			--	--	--	.78	--	.01	--	.05
(p)						(.00)*		(.96)		(.82)
. Pain Distress (T_1)r				--	-.26	.16	--	--	-.23	--
(p)					(.24)	(.48)			(.28)	
. Pain Distress (T_2)r					--	.20	.35	--	--	--
(p)						(.37)	(.11)			
. Pain Distress (T_3)r						--	--	.06	--	.12
(p)								(.76)		(.60)
. Pain Expectation (T_2)r							--	.32	--	--
(p)								(.15)		
. Pain Expectation (T_3)r								--	--	.11
(p)										(.63)
. Joint Flexion (T_1)r									--	.27
(p)										(.22)
. Joint Flexion (T_3)r										--
(p)										

$\leq$ .05
= not analyzed for purposes of this study

intensity and pain distress at first postoperative time was significant at $r = .79$ ($p = .00$). Pain intensity and expectation correlated at $r = .08$ ($p = .73$). Pain distress and expectation correlated at $r = .35$ ($p = .11$). Neither of these two correlations was significant.

Research question number 7 asked, What are the relationships among pain intensity, pain distress and pain expectation and joint flexion at second postoperative time (T_3)? Pain intensity and pain distress correlated significantly at $r = .78$ ($p = .00$). Pain intensity did not correlate significantly with pain expectation at $r = -.01$ ($p = .96$). Pain expectation and pain distress did not correlate significantly at $r = .06$ ($p = .80$). In addition, pain intensity and joint flexion did not correlate significantly at $r = .05$ ($p = .82$). Joint flexion also did not correlate significantly with both pain distress and pain expectation at $r = .12$ and .11 respectively ($p = .60$ and .63 respectively).

The last research question asked, What are the relationships between pain intensity and pain distress at each postoperative time? Pain intensity at preoperative time did not correlate significantly with pain intensity at first postoperative time at $r = .38$ ($p = .08$). Likewise, pain distress preoperatively did not correlate significantly with pain distress at first postoperative time at $r = -.26$ ($p = .24$).

Pain intensity at preoperative time correlated significantly with pain intensity at second postoperative time at $r = .45$ ($p = .04$).

However, pain distress preoperatively did not correlate significantly with pain distress at second postoperative time at r = .16 (p = .48).

Pain intensity at first and second postoperative times did not correlate significantly at r = .211 (p = .35). Likewise, pain distress at first and second postoperative times did not correlate significantly at r = .20 (p = .37).

Pain expectation at first and second postoperative times correlated insignificantly at r = .32 (p = .15). Joint flexion preoperatively and at second postoperative time did not correlate significantly at r = .27 (p = .22).

Summary

The results of data analysis were presented in Chapter 4. The majority of the subjects were female, an older age group (45-66+ years), Caucasian and retired. The subjects were evenly distributed according to sedentary and physical activity, and had had some form of pain experience prior to this hospitalization. Choosing TKA for pain control and/or increased mobility was equal, although no one chose TKA for increased mobility alone. Almost all subjects used the PCA pump although the length of time between receiving the medication and actual movement differed greatly. There was a decrease in pain distress from preoperative time to first postoperative time and an increase in pain distress from first postoperative time to second postoperative time. Subjects expected to have more pain at second postoperative time than

at first postoperative time. The only significant t-test values were between pain expectation at first postoperative and at second postoperative time, and for joint flexion at preoperative time and second postoperative time.

Pearson product moment correlation coefficients were significant for: 1) pain intensity between preoperative time and second postoperative time; 2) pain intensity and distress at preoperative time and the two postoperative times; 3) pain intensity with joint flexion at preoperative time. There were no significant correlation coefficients with the pain expectation variable.

CHAPTER 5

DISCUSSION OF RESULTS

Introduction

This study examined the relationship between pain perception and joint mobility in arthritis patients undergoing total knee arthroplasty (TKA). The extent of joint mobility may be influenced by the degree of pain perceived by a person (Adler, 1985; Pigg & Schroeder, 1984), thus there is a need to explore the relationship of pain and joint mobility further within the context of joint arthroplasty. A descriptive design was used to examine that relationship. Pain perception was indexed by pain intensity, pain distress and pain expectation. Joint mobility was indexed by joint flexion. Paired t-tests with one group over time were used to measure the differences in pain intensity and pain distress preoperatively and with pain expectation, pain intensity and pain distress at two times postoperatively and to measure the differences in joint flexion preoperatively and postoperatively. Pearson correlation coefficients were used to describe the relationships between pain intensity, distress and expectation and joint flexion preoperatively and postoperatively. A discussion of these results, limitations of the study, implications for nursing and recommendations for further study are presented in Chapter 5.

Discussion of Significant Results

The results of data analysis regarding the demographic data are presented first. The sample for this study was comprised mostly of females in the age range of 46-66 years old. These findings are consistent with the literature that women are more frequently affected by arthritis and at this age range (Sutton, 1984). The subjects in the sample were similar in that most were retired, a reflection of the age range of subjects. The sample was evenly distributed as to recreational activities: half were physically active and half were sedentary, again reflecting the amount of disability of arthritis.

The choice of TKA was based on whether the subject needed pain control and/or increased joint mobility. In no case did any subject choose increased mobility without pain control. This evidences the existence of pain by itself or with a loss of mobility but never the loss of mobility without concomitant pain. This is consistent with the literature on the expected outcome of TKA as pain relief first (Sutton, 1984; Fahey, 1984; Burton, Wright & Richards, 1979) and improvement of joint function second.

Prior experience with pain was present in all except one of the subjects' lives. The investigator did not ascertain how long that one subject had had the pain of arthritis nor why the subject felt this was not a prior experience with pain.

Another variable common to almost all subjects was use of the PCA pump. In 88% of the cases, the PCA pump was prescribed. However,

there was a wide range of the time elapsing between the use of the PCA pump and the first mobilization. As mentioned in Chapter 4, there was a range of 0 to 90 minutes between pain medication administration and the first postoperative turn with two subjects at the higher end of the range at 70 and 90 minutes. This variance in range may have influenced the degree of pain intensity, or distress at that time depending upon the length of time elapsing from medication to turning.

There were two significant t-test results. The t-test for pain expectation at first (T_2) and second postoperative times (T_3) was significant. This represents a patient expectation that there will be more pain upon bending the knee than upon turning. Since expectation was measured for the first knee bend only, it is not known whether or not the patient expected that the pain would decrease on subsequent bends.

Joint flexion preoperatively and postoperatively yielded the second significant t-test result ($t = 14.64$, $p = .000$). Preoperatively, the mean flexion was 96.36 degrees (range 35-120 degrees). At 72 hours postoperatively, the mean flexion was 31.73 degrees (15-56 degrees). This represents a rather large loss of 64.63 degrees of flexion and thus the significant t-test result would be expected. The results for joint flexion occurred with a pain intensity mean rating of 64.14 preoperatively and at second postoperative time pain intensity mean rating of 75.31. As joint flexion was lost from the TKA procedure so soon after surgery, pain intensity ratings

increased, representing a combination of general postoperative pain and immobilization of the joint. This is also consistent with recent literature available on loss of joint flexion with immobilization (Bohannon et al., 1985). Pain intensity correlated significantly at preoperative time (T_1) with joint flexion but did not correlate significantly with joint flexion at second postoperative time.

Pain distress at all three different times correlated significantly with intensity ($p = <.05$). Although this finding may not support the findings of Casey and Melzack (1967), the distress component of pain was related to the intensity of pain in this study.

The inconsistency of these findings with previously published results may be affected by the sample used in this study. The study of orthopaedic patients in this instance consistently includes some intensity of pain (as shown by the choice of TKA) and the distress component may define the reason for actually having the surgery done. This significant correlation may occur with total knee arthroplasty, and may yield different results than with other orthopaedic surgeries. In addition, active people with prior experience with pain may be affected by the distress component in a direct correlation with intensity.

In summary the significant findings show that there was a significant relationship between intensity and distress. In addition there was a significant relationship between pain intensity and joint flexion preoperatively. These two significant relationships suggest a

focus for further research on the variables of pain intensity, pain distress and joint flexion.

Limitations of the Study

There are several limitations of this study. The small sample size of N = 24 yielded some significant statistics, but may offer more with a larger sample size. In addition, the lack of a diversity of cultural groups may have biased the sample.

A second limitation of this study is the omission of precise data in hospital records of pain medication times when using the PCA pump. The system uses an eight hour end-of-shift total but does not allow for individual time documentation. Thus, attempting to trace back to times of pain medication administration and concomitant turning time was difficult. Relying on nursing staff to document pain medication administration and turning time in the hospital record would seem unrealistic if solely for the purposes of this study. In addition, documentation in the hospital record showed that the first turning time postoperatively occurred sometimes eight to ten hours postoperatively. When it was difficult to determine if this finding was an omission of documentation or actual practice, the data collector was asked to clarify those findings and thus documentation was validated. This also gave the investigator a chance to validate the data collection sheet.

A third limitation of this study was the possible effect of prior total arthroplasty surgery on the other knee. Knowledge of

routine and realistic expectations may influence the intensity and distress, components of pain perception.

The fourth limitation of this study concerns the subjectivity of pain, what the subject considers pain intensity, distress even expectation. Since consistency of perception can not always be ensured, the subjectivity of pain will always remain a limitation.

The fifth limitation of this study is that there is no interrater reliability assurance for the visual analogue scale or for the goniometer measurements. Differences in measurement of knee flexion as well as visual analogue instructions may have had an effect on rating markings.

Implications for Nursing

Though the ultimate hospital discharge criterion for TKA patients is dependent upon substantial joint flexion (90°), nurses are taking a more active role in the rehabilitation of TKA patients. Joint flexion appears to be affected by pain intensity in conjunction with the distress component of pain perception. Understanding the distress component of pain perception allows a more comprehensive and individualized plan of care for the patient undergoing TKA.

A rapidly growing change in postoperative care of TKA patients already in use in facilities in and around the Western U.S. includes a shortened length of stay (LOS) to 7 days maximum where presently a minimum of 7 days to as long as 14 days is in effect. The key to a

shortened LOS may be an understanding of patients' perception of pain including expectation and intensity correlation and the relationship of distress on intensity. For caregivers to understand the relationship of distress may enhance awareness of the intricacies of pain.

Pain is subjective and investigators will continue to have difficulty ascertaining intensity perceptions objectively. However, because there is a correlation between pain intensity and distress, there may be a method of becoming more attuned and more sensitive to patients' perception of pain and the distress it brings.

Turning protocols enhance the consistency of patient care and promote proper postoperative care. A turning protocol might enhance the effect of administered pain medication if the turning were accomplished at peak medication effectiveness.

Recommendations

1. Replicate this study using a larger sample size to obtain more significant results related to pain expectation.
2. Use one researcher on each shift at study site to increase continuity of care and ensure thorough documentation of study information.
3. Use a quasi-experimental design with a control group of patients who already have undergone one TKA and the experimental group of first time patients to ascertain if prior knowledge decreases the effect of the distress and expectation components.

4. Extend present study design to describe progress of subjects over entire hospitalization and actual days taken to achieve discharge criteria.

Summary

The discussion of study results, study limitations and implications for nursing are presented in this chapter. A descriptive design was used to measure the relationship between joint mobility as indexed by joint flexion and three components of pain perception: intensity, distress and expectation. Twenty four subjects who participated in the study were similar in retired occupational status but differed in recreational activities. Results of paired t-tests showed that joint flexion decreased significantly postoperatively, while pain expectation differed at two postoperative times. Pearson product-moment correlation coefficients yielded significant results for pain intensity and pain distress at all three times, pain intensity and joint flexion preoperatively, and pain intensity preoperatively and first postoperative. Based upon these results, further consideration of the pain perception components together may facilitate an understanding of the effect of pain intensity and pain distress on postoperative joint flexion in patients undergoing total knee arthroplasty.

APPENDIX A

HUMAN SUBJECTS REVIEW LETTER

THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721

COLLEGE OF NURSING

MEMORANDUM

TO: Christine Lucy Arslanian
College of Nursing

FROM: Linda R. Phillips, PhD, RN LRP
Acting Director of Research

DATE: February 25, 1987

RE: Human Subjects Review: Pain Perception and Joint Mobility Before and After Total Knee Athroplasty

Your project has been reviewed and approved as exempt from University review by the College of Nursing Ethical Review Subcommittee of the Research Committee and the Director of Research. A consent form with subject signature is not required for projects exempt from full University review. Please use only a disclaimer format for subjects to read before giving their oral consent to the research. The Human Subjects Project Approval Form is filed in the office of the Director of Research if you need access to it.

We wish you a valuable and stimulating experience with your research.

LRP/fp

APPENDIX B

DEMOGRAPHIC DATA FORM

DEMOGRAPHIC DATA FORM

Code # _____

Diagnosis _____

Patient chose TKA for pain control _____
increased joint mobility _____

Age: 18-25 ____ 26-45 ____ 46-65 ____ 66+ ____

Sex: M ____ F ____

Ethnic group: Hispanic _____
Asian _____
Black _____
Caucasian _____

Occupation: _____

Recreational activities: _____

Prior experience with pain: Yes ____ No ____
If yes, what and when _____

_____

Previous knee surgery: Yes ____ No ____
If yes, what and when _____

_____

PCA pump _____ No PCA pump _____

Last pain medication: (Name, time, route): _____

Turning time _____

Difference in med. admin. and turning time in minutes _____

Joint Flexion: T1 ____ degrees
T2 ____ degrees

APPENDIX C

VAS DATA COLLECTION INSTRUMENTS

HOW STRONG IS YOUR PAIN?

NO PAIN _____ STRONGEST PAIN POSSIBLE

DIRECTIONS: Draw a single mark across the line at the location that indicates the strength of your pain at this moment.

HOW MUCH DOES YOUR PAIN BOTHER OR DISTRESS YOU?

NO DISTRESS _____ MOST DISTRESS POSSIBLE

DIRECTIONS: Draw a single mark across the line at the location that indicates how much your pain is bothering you at this moment.

HOW MUCH PAIN DO YOU EXPECT?

NO PAIN EXPECTED _____ PAIN AS BAD AS IT CAN BE

DIRECTIONS: Draw a single mark across the line at the location that indicates how much pain you expect to have after surgery.

APPENDIX D

SUBJECT'S CONSENT FORM

SUBJECT'S CONSENT FORM

I am requesting your voluntary participation in a study on Perception of Pain and Joint Mobility Before and After Total Knee Replacement. The purpose of the study is to gain knoweldge that can be used to help nurses and other health care providers understand and meet the needs of patients undergoing total knee replacement.

Participants in the study are adults who are admitted for total knee replacement, and who can read and understand English. Participation requires completion of background information about you and 3 questions about your pain at three different times: Once when you first come into the hospital, once when you first turn after surgery, and once when the dressing is taken off your leg and you bend your knee. Your knee flexion will be measured at two times during your hospital stay: Once upon admission, and then when the dressing is removed from your leg. These measurements will take place in the hospital and each measurement will take 5 to 10 minutes. It may be necessary for the reseracher to review your medical record to complete the study.

By signing the consent form you will be giving your consent to participate in the study and for the researcher to review your medical record. There are no known risks or any costs involved; you will not be compensated for your time involved in the study. A possible benefit is knowing you may have contributed to the provision of more comprehensive care for patients undergoing total knee replacement. You are free to withdraw from the study at any time with no adverse consequences to you of any kind. Any questions you may have about the study and your participation will be answered. A copy of the consent form may be available to you upon request.

No identifying information will be kept beyond the study. You will not be identifed on the questionnaire by name or by descriptive information. Analysis of the results will refer only to the group, not the individual. The information gained will be used only for reserach and educational purposes, but may be published in professional literature at a later date. A copy of the consent form will be filed with the University of Arizona College of Nursing.

I have read the above; I understand what it says; and I consent to participate in this study.

Subject _____ Date _____

Witness _____ Date _____

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